Cambridge Assessment International Education

Grade thresholds – November 2017

Cambridge IGCSE Physics (0625)

Grade thresholds taken for Syllabus 0625 (Physics) in the November 2017 examination.

		minimum raw mark required for grade:						
	maximum raw mark available	A	B	C	D	E	F	G
Component 11	40	–	–	23	20	18	16	14
Component 12	40	–	–	21	19	17	15	13
Component 13	40	–	–	22	20	17	15	13
Component 21	40	27	23	20	17	15	13	11
Component 22	40	28	24	21	18	16	14	12
Component 23	40	28	24	21	18	16	13	10
Component 31	80	–	–	55	49	41	33	25
Component 32	80	–	–	47	40	32	25	18
Component 33	80	–	–	54	46	39	31	23
Component 41	80	49	40	31	27	21	15	9
Component 42	80	53	43	33	29	22	16	10
Component 43	80	45	35	26	23	18	14	10
Component 51	40	30	27	24	20	17	14	11
Component 52	40	29	25	22	19	16	14	12
Component 53	40	27	24	21	18	16	14	12
Component 61	40	29	26	23	20	17	14	11
Component 62	40	28	24	21	18	16	14	12
Component 63	40	26	22	19	16	14	11	8

Grade A* does not exist at the level of an individual component.

The maximum total mark for this syllabus, after weighting has been applied, is **200**.

The overall thresholds for the different grades were set as follows.

Option	Combination of Components	A*	A	B	C	D	E	F	G
BX	21, 41, 51	149	130	111	93	79	66	52	38
BY	22, 42, 52	155	135	115	95	81	68	55	42
BZ	23, 43, 53	142	123	104	85	74	63	51	39
CX	21, 41, 61	148	129	110	92	79	66	52	38

Grade thresholds continued
Cambridge IGCSE Physics (0625)

Option	Combination of Components	A*	A	B	C	D	E	F	G
CY	22, 42, 62	154	134	114	94	81	68	55	42
CZ	23, 43, 63	142	122	102	83	72	61	48	35
FX	11, 31, 51	–	–	–	127	111	95	79	63
FY	12, 32, 52	–	–	–	112	97	82	68	54
FZ	13, 33, 53	–	–	–	122	106	90	75	60
GX	11, 31, 61	–	–	–	126	110	95	79	63
GY	12, 32, 62	–	–	–	111	96	82	68	54
GZ	13, 33, 63	–	–	–	120	104	88	72	56

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/51**

Paper 5 Practical Test **October/November 2017**

CONFIDENTIAL INSTRUCTIONS

Great care should be taken to ensure that any confidential information given does not reach the candidates either directly or indirectly.

If you have any queries regarding these Confidential Instructions, please contact Cambridge stating the Centre number, the nature of the query and the syllabus number quoted above.

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This document consists of **7** printed pages and **1** blank page.

DC (NH) 133343/5

Instructions for preparing apparatus

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In addition to the usual equipment of a physics laboratory, each candidate will require the apparatus specified in these Confidential Instructions. If a candidate breaks any of the apparatus, or loses any of the material supplied, the matter should be rectified and a note made in the Supervisor's Report.

Number of sets of apparatus

As a *minimum*, the number of sets of apparatus provided should be $N/3$, where N is the number of candidates (per session). A few spare sets should, preferably, be available to avoid any candidate being delayed when moving to another question.

The order in which a given candidate attempts the four questions is immaterial. It is suggested that candidates spend **about 20 minutes on each of questions 1 to 3 and about 15 minutes on question 4**.

Assistance to candidates

The purpose of the Physics Practical Test is to find out whether the candidates can carry out simple practical work themselves. The Examiners are aware that candidates may sometimes be unable to show their practical ability through failure to understand some point in the theory of the experiment. If an Examiner were present in the laboratory, he/she would be willing to give a hint to enable such a candidate to get on with an experiment. In order to overcome this difficulty, the Supervisor is asked to cooperate with the Examiners to the extent of being ready to give (or allow the physics teacher to give) a hint to a candidate who is unable to proceed.

The following regulations must be strictly adhered to.

(i) No hint may be announced to the candidates as a whole.

(ii) A candidate who is unable to proceed and requires assistance must come up to the Supervisor and state the difficulty. Candidates should be told that the Examiners will be informed of any assistance given in this way.

(iii) A report must be made of any assistance given to the candidate, with the name and candidate number of the candidate.

It is suggested that the following announcement be made to the candidates.

'The Examiners do not want you to waste time through inability to get on with an experiment. Any candidate, therefore, who is unable to get on with the experiment after spending five minutes at it may come to me and ask for help. I shall report to the Examiners any help given in this way, and some marks may be lost for the help given. You may ask me for additional apparatus which you think would improve the accuracy of your experiments, and you should say, on your script, how you use any such apparatus supplied.'

Question 1

Items to be supplied by the Centre (per set of apparatus, unless otherwise specified)

(i) Metre rule with a mm scale. See note 1.

(ii) Triangular block to act as a pivot for the metre rule. This block is to stand on the bench.

(iii) A 200 g mass, labelled **P**. See notes 2 and 3.

(iv) Masses of 100 g, 200 g, 300 g, 400 g and 500 g labelled **1.0 N**, **2.0 N**, **3.0 N**, **4.0 N** and **5.0 N**, respectively. See note 2.

Notes

1. If the metre rule has two scales in opposite directions, one scale must be taped over.

2. Any suitable masses that can rest on the metre rule can be used.

3. The value of the mass of **P** must **not** be visible to the candidates.

Action at changeover

Remove the masses from the rule.
Remove the metre rule from the pivot.
Check that the apparatus is ready for the next candidate.

Question 2

Items to be supplied by the Centre (per set of apparatus, unless otherwise specified)

(i) Power supply of approximately 1.5 V–3 V. Where candidates are provided with a power supply with a variable output voltage, the voltage must be set by the Supervisor and fixed (e.g. taped). See note 2.

(ii) Three resistors of nominal value 4.7 Ω with a power rating of at least 2 W. See note 3.

(iii) Switch. The switch may be an integral part of the power supply.

(iv) Ammeter capable of reading up to 1.00 A, with a resolution of at least 0.05 A. See note 4.

(v) Voltmeter capable of measuring the supply p.d. with a resolution of at least 0.1 V. See note 4.

(vi) Sufficient connecting leads to construct the circuit shown in Fig. 2.1, with two additional leads.

Notes

1. The circuit is to be connected by the Supervisor as shown in Fig. 2.1.

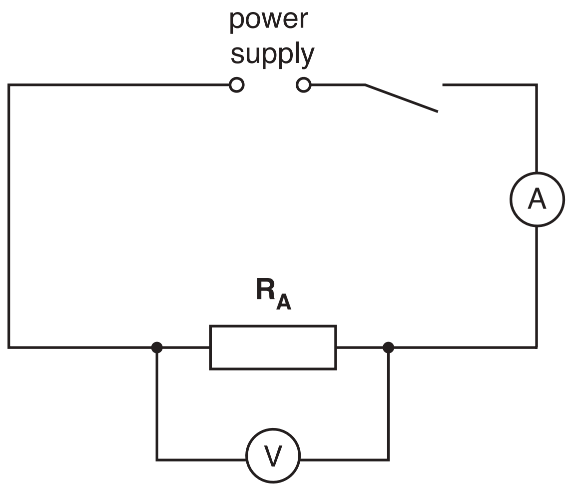

Fig. 2.1

2. If cells are to be used, they must remain adequately charged throughout the examination. Spare cells must be available.

3. The resistors must be labelled $\mathbf{R_A}$, $\mathbf{R_B}$ and $\mathbf{R_C}$. The values of resistance must **not** be visible to the candidates. The resistors must have suitable terminals so that candidates are able easily and quickly to rearrange the circuit.

4. Either analogue or digital meters are suitable. Any variable settings must be set by the Supervisor and fixed (e.g. taped). Spare meters should be available.

5. Spare leads should be available.

Action at changeover

Set up the circuit so that it is arranged as shown in Fig. 2.1.
Check that the circuit works. Switch off.

Question 3

Items to be supplied by the Centre (per set of apparatus, unless otherwise specified)

(i) Converging lens, focal length approximately 15 cm, with a suitable holder.

(ii) Illuminated object with a triangular hole of height 1.5 cm (see Fig. 3.1). The hole is to be covered with thin, translucent paper (e.g. tracing paper). See note 2.

(iii) Metre rule with a mm scale.

(iv) Screen. A white sheet of stiff card approximately 15 cm × 15 cm, fixed to a wooden support is suitable. See Fig. 3.2.

(v) A 12 V, 24 W lamp and holder. A 12 V power supply. Spare lamps should be available.

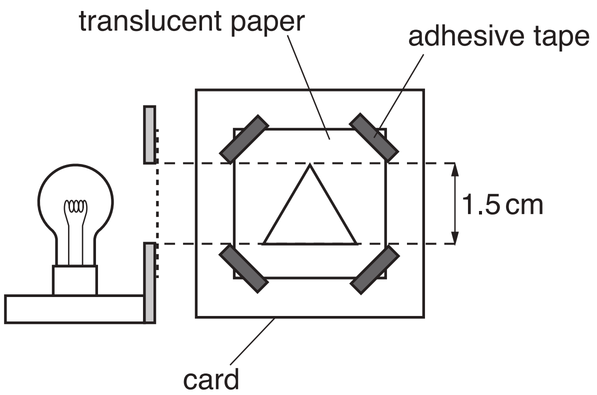

Fig. 3.1

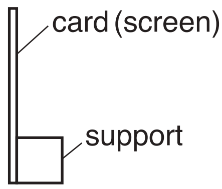

Fig. 3.2

Notes

1. The lamp for the illuminated object should be a low voltage lamp, approximately 24 W or higher power (a car headlamp bulb is suitable), with a suitable power supply.

2. The centre of the hole which forms the object, the lamp filament and the centre of the lens in its holder are all to be at the same height above the bench.

3. The apparatus is to be situated away from direct sunlight.

Action at changeover

Check that the apparatus is ready for the next candidate.

Question 4

No apparatus is required for this question.

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This form must be completed and returned with the scripts.

SUPERVISOR'S REPORT

General

The Supervisor is invited to give details of any difficulties experienced by particular candidates giving their names and candidate numbers. These should include reference to:

(a) difficulties due to faulty apparatus;

(b) accidents to apparatus or materials;

(c) any other information that is likely to assist the Examiner, especially if this cannot be discovered in the scripts;

(d) any help given to a candidate.

Information required

A plan of workbenches, giving details by candidate number of the places occupied by the candidates for each experiment for each session, must be enclosed with the scripts.

Information required (cont.)

A list by name and candidate number of candidates requiring help, with details of the help provided.

CENTRE NO. ....

NAME OF CENTRE ....

Declaration (to be signed by the Supervisor).

The preparation of the practical examination has been carried out so as to maintain fully the security of the examination.

SIGNED ....
Supervisor

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/52**

Paper 5 Practical Test **October/November 2017**

CONFIDENTIAL INSTRUCTIONS

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DC (ST/SG) 134122/4

CAMBRIDGE International Examinations

Instructions for preparing apparatus

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In addition to the usual equipment of a physics laboratory, each candidate will require the apparatus specified in these Confidential Instructions. If a candidate breaks any of the apparatus, or loses any of the material supplied, the matter should be rectified and a note made in the Supervisor's Report.

Number of sets of apparatus

As a *minimum*, the number of sets of apparatus provided should be $N/3$, where N is the number of candidates (per session). A few spare sets should, preferably, be available to avoid any candidate being delayed when moving to another question.

The order in which a given candidate attempts the four questions is immaterial. It is suggested that candidates spend **about 20 minutes on each of questions 1 to 3, and about 15 minutes on question 4**.

Assistance to candidates

The purpose of the Physics Practical Test is to find out whether the candidates can carry out simple practical work themselves. The Examiners are aware that candidates may sometimes be unable to show their practical ability through failure to understand some point in the theory of the experiment. If an Examiner were present in the laboratory, he/she would be willing to give a hint to enable such a candidate to get on with an experiment. In order to overcome this difficulty, the Supervisor is asked to co-operate with the Examiners to the extent of being ready to give (or allow the physics teacher to give) a hint to a candidate who is unable to proceed.

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(iii) A report must be made of any assistance given to the candidate, with the name and candidate number of the candidate.

It is suggested that the following announcement be made to the candidates.

'The Examiners do not want you to waste time through inability to get on with an experiment. Any candidate, therefore, who is unable to get on with the experiment after spending five minutes at it may come to me and ask for help. I shall report to the Examiners any help given in this way, and some marks may be lost for the help given. You may ask me for additional apparatus which you think would improve the accuracy of your experiments, and you should say, on your script, how you use any such apparatus supplied.'

Question 1

Items to be supplied by the Centre (per set of apparatus unless otherwise specified)

(i) Clamp, boss and stand.

(ii) 2 pendulum bobs. See notes 1, 2 and 3.

(iii) 2 lengths of thin string, each of length approximately 60 cm. See note 1.

(iv) Metre rule, graduated in mm.

(v) Set-square.

(vi) Stopwatch with a resolution of at least 0.1 s.

(vii) Split cork, or similar device, to hold the string of a pendulum between the jaws of the clamp. See notes 1, 2 and 3.

Notes

1. One bob must be made from modelling clay, rolled into a spherical shape with diameter approximately 2.0 cm. This pendulum must be set up for the candidates with length approximately 55 cm from the bottom of the split cork to the bottom of the pendulum bob. The pendulum string must be embedded within the bob so that the pendulum can swing without the bob slipping from the string. See Fig. 1.1.

The second bob must be made from approximately the same mass of the modelling clay as the first bob. This is to be rolled into a cylinder of length approximately 5.0 cm, with the string embedded within the bob so that the pendulum can swing without the bob slipping from the string. See Fig. 1.1.

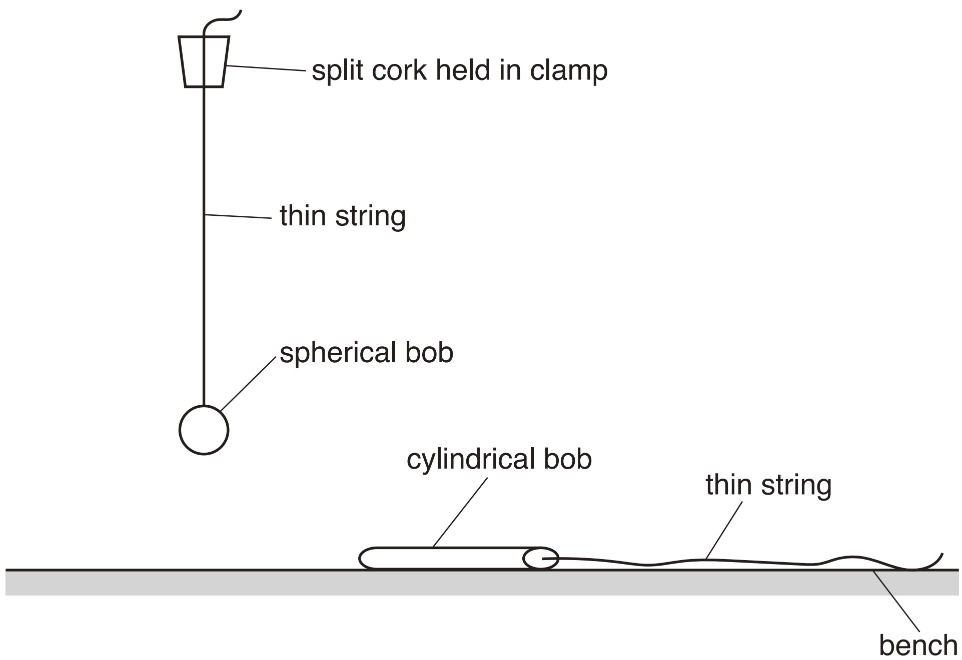

Fig. 1.1

2. Candidates must be able easily to exchange one pendulum for the other pendulum.

3. Candidates must be able easily to adjust the length of a pendulum when it is supported from the split cork.

4. It may be necessary to increase the stability of the clamp stand, for example, by using a G-clamp or by placing a weight on the base.

5. Spare pendulum bobs as described in note 1 must be available.

Action at changeover

Check that the apparatus is set up as described in note 1.

Check that the bobs are the correct shape.

Question 2

Items to be supplied by the Centre (per set of apparatus, unless otherwise specified)

(i) Thermometer, –10 °C to 110 °C, graduated in 1 °C intervals.

(ii) 250 cm^3 beaker, labelled **A**.

(iii) 100 cm^3 or 250 cm^3 measuring cylinder.

(iv) Supply of hot water. See notes 1 and 2.

(v) Supply of water at room temperature. See note 3.

(vi) Supply of paper towels to mop up any spills of water.

(vii) Stirrer.

Notes

1. Hot water is to be available for each candidate throughout the experiment. The water should be maintained at an approximately constant temperature between 75 °C and 85 °C. Each candidate will require about 300 cm^3 of hot water in total. Candidates must be able to pour hot water into the measuring cylinder and beaker safely.

2. Candidates should be warned of the dangers of burns or scalds when using very hot water.

3. Water at room temperature is to be available for each candidate throughout the experiment. The supply of water must be labelled '**cold water**'. Each candidate will require about 300 cm^3 of cold water in total.

Action at changeover

Empty the beaker and measuring cylinder.

Check the supply of hot water.

Check the supply of water at room temperature.

Question 3

Items to be supplied by the Centre (per set of apparatus, unless otherwise specified)

(i) Converging lens, focal length between 14.0 cm and 16.0 cm, with a suitable holder.

(ii) Illuminated object with a triangular hole of height 1.5 cm (see Fig. 3.1). The hole is to be covered with thin translucent paper (e.g. tracing paper). See note 2.

(iii) Metre rule, graduated in mm.

(iv) Screen. A white sheet of stiff card approximately 15 cm × 15 cm, fixed to a wooden support is suitable. See Fig. 3.2.

(v) Spare lamps should be available.

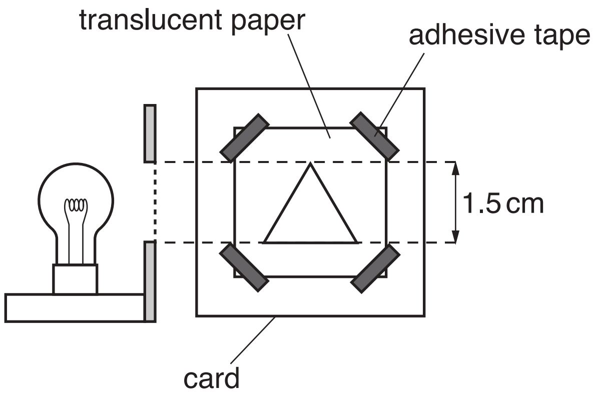

Fig. 3.1

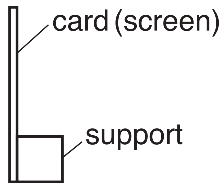

Fig. 3.2

Notes

1. The lamp for the illuminated object should be a low voltage lamp, approximately 24 W or higher power (a car headlamp bulb is suitable), with a suitable power supply.
2. The centre of the hole which forms the object, the lamp filament and the centre of the lens in its holder are all to be at the same height above the bench.
3. The apparatus is to be situated away from direct sunlight.

Action at changeover

Check that the apparatus is ready for the next candidate.

Question 4

No apparatus is required for this question.

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Information required

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The space below can be used for this, or it may be on separate paper.

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NAME OF CENTRE ....

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PHYSICS **0625/53**

Paper 5 Practical Test **October/November 2017**

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CAMBRIDGE International Examinations

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Question 1

Items to be supplied by the Centre (per set of apparatus, unless otherwise specified)

(i) Two 250 cm^3 beakers, one labelled **A** and one labelled **B**. See note 1.

(ii) Lid for beaker **B**, with a hole to allow a thermometer to be inserted. See note 2.

(iii) Thermometer: –10 °C to 110 °C, graduated in 1 °C intervals. See note 3.

(iv) Clamp, boss and stand. See note 3.

(v) Stopclock or stopwatch or wall-mounted clock showing seconds. Candidates will be required to take readings at 30-second intervals. They may use their own wristwatches. The question will refer to a stopclock.

(vi) Supply of hot water. See note 4.

(vii) Paper towels to soak up any water spillages.

Notes

1. If the beakers do not have graduations at 75 cm^3 and 100 cm^3, indelible marks must be drawn. On beaker **A** the mark must be at the 100 cm^3 level and labelled **100 cm^3**. On beaker **B** the mark must be at the 75 cm^3 level and labelled **75 cm^3**.

2. Thin cardboard is a suitable material for the lid.
Spare lids must be available.

3. The thermometer must be supplied mounted in the clamp, so that the bulb of the thermometer will be below the 75 cm^3 level in each beaker. Candidates must be able, easily and safely, to insert the thermometer into each beaker. The thermometer must be clamped near the top so that candidates are able to read temperatures from the maximum temperature of the hot water.

4. Hot water is to be available for each candidate throughout the experiment. The hot water should be maintained at an approximately constant temperature between 80 °C and 100 °C. Each candidate will require about 250 cm^3 of hot water in total.
Candidates must be able to pour hot water into the beakers safely.

5. Candidates should be warned of the dangers of burns and scalds when using very hot water.

Action at changeover

Remove the thermometer from beaker **B**.
Empty the water from the beakers.
Check that the apparatus is intact.
Supply a new lid if necessary.

Question 2

Items to be supplied by the Centre (per set of apparatus, unless otherwise specified)

(i) Two 2 W resistors, one approximately 5 Ω labelled **X**, and the other approximately 10 Ω labelled **Y**. The values should be obscured so that candidates cannot read them. See note 1.

(ii) Power supply of approximately 2 V–3 V. See note 3.
Where candidates are provided with a variable power supply, the voltage should be set by the Supervisor and fixed, e.g. taped.

(iii) Switch. The switch may be an integral part of the power supply.

(iv) Sufficient connecting leads to set up the circuit shown in Fig. 2.1, with 4 spare leads.

(v) Ammeter capable of measuring currents up to 1.00 A with a resolution of at least 0.05 A. See note 4.

(vi) Voltmeter capable of measuring up to 3.0 V with a resolution of at least 0.1 V. See note 4.

Notes

1. The resistors must have suitable terminals so that candidates are able easily and quickly to rearrange the circuit.

2. The circuit is to be set up for candidates as shown in Fig. 2.1.

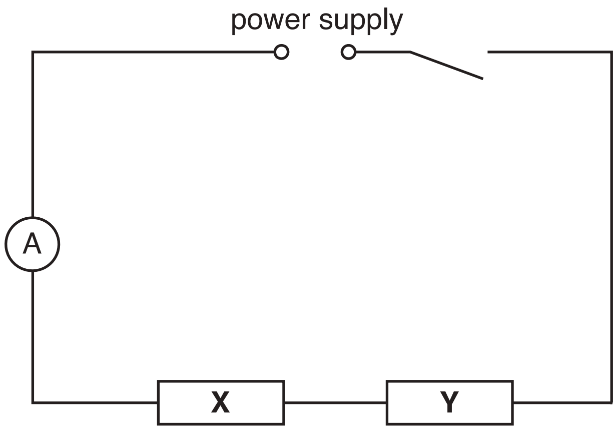

Fig. 2.1

3. If cells are used, they must remain adequately charged throughout the examination. Spare cells must be available.

4. Analogue or digital meters are suitable. Any variable settings should be set by the Supervisor and fixed, e.g. taped. Spare meters should be available. The voltmeter must not be connected to the circuit but must have leads and terminals that enable it to be connected to different parts of the circuit.

Action at changeover

Disconnect the voltmeter with its leads from the circuit.
Connect the circuit as shown in Fig. 2.1 and check that the circuit is working.
Switch the circuit off.

Question 3

Items to be supplied by the Centre (per set of apparatus, unless otherwise specified)

(i) Metre rule, graduated in mm, of weight approximately 1 N to 2 N. See notes 1 and 2.

(ii) 2 loops of thin wire. See note 1.

(iii) 1 loop of thin string. See note 3.

(iv) Forcemeter capable of reading forces up to at least 2.5 N with a resolution of 0.05 N or 0.1 N. See note 5.

(v) 100 g mass, incorporating a hanger.

(vi) 2 bosses, 2 clamps and 2 stands.

(vii) 50 cm ruler or 30 cm ruler graduated in mm. Candidates may use their own.

(viii) Set-square. Candidates may use their own.

Notes

1. A loop of wire is to be taped securely to each end of the metre rule as shown in Fig. 3.1 so that the metre rule can be suspended, with its scale facing upwards. Thin string is a suitable alternative.

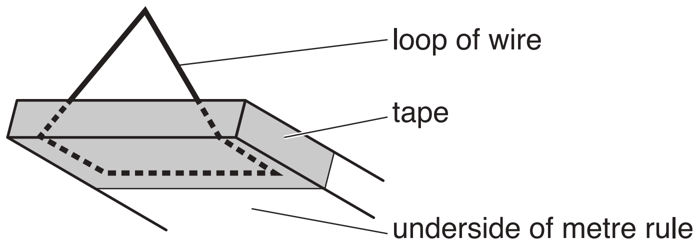

Fig. 3.1

2. If the metre rule has two scales in opposite directions, one scale must be taped over.

3. The loop of string must be looped around the metre rule so that the 100 g mass may be suspended from it in different positions.

4. The apparatus must be set up for the candidates as shown in Fig. 3.2, with the metre rule suspended between a clamp at the 0.0 cm end and the forcemeter at the 100.0 cm end. When the 100 g mass is suspended at the 95.0 cm mark, with the metre rule horizontal, the mass must be clear of the bench and the clamp holding the forcemeter must be below the top of the stand.
The wires suspending the metre rule must be vertical.
The 100 g mass should be suspended near the centre of the rule.

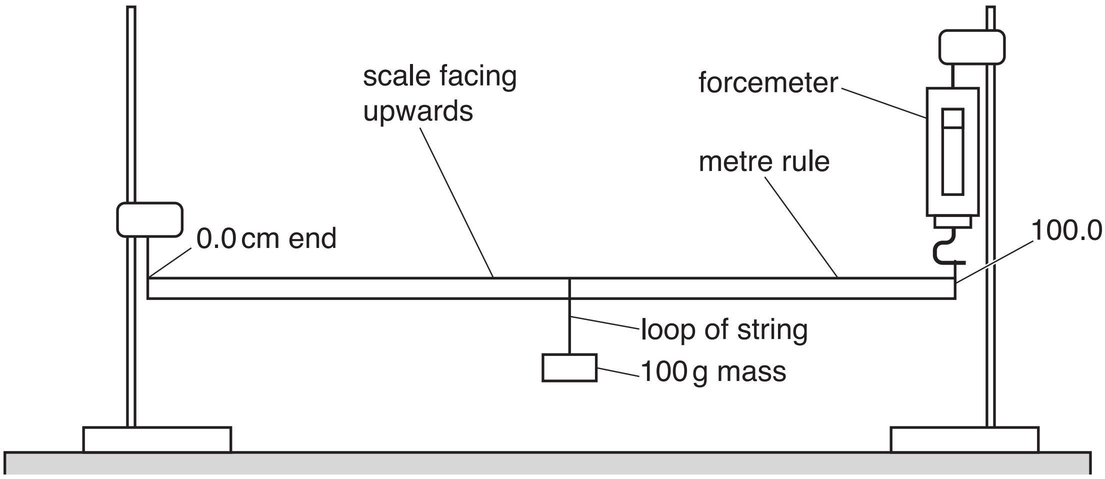

Fig. 3.2

5. The forcemeter must not exceed its full scale deflection when the 100 g mass is suspended at the 95.0 cm mark. If it does, a forcemeter capable of reading higher values must be used.

Action at changeover

Check that the apparatus is arranged as shown in Fig. 3.2 with the 100 g mass near the centre of the rule.
Check that the wire loops are secure.

Question 4

No apparatus is required for this question.

This form must be completed and returned with the scripts.

SUPERVISOR'S REPORT

General

The Supervisor is required to give details of any difficulties experienced by particular candidates, giving their names and candidate numbers. These should include reference to:

(a) difficulties due to faulty apparatus;

(b) accidents to apparatus or materials;

(c) any other information that is likely to assist the Examiner, especially if this cannot be discovered in the scripts;

(d) any help given to a candidate.

Information required

A plan of workbenches, giving details by candidate number of the places occupied by the candidates for each experiment for each session, must be enclosed with the scripts.

The space below can be used for this, or it may be on separate paper.

Information required (cont.)

A list by name and candidate number of candidates requiring help, with details of the help provided.

CENTRE NO. ....

NAME OF CENTRE ....

Declaration (to be signed by the Supervisor)

The preparation of the practical examination has been carried out so as to maintain fully the security of the examination.

SIGNED ....
Supervisor

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/11**

Paper 1 Multiple Choice (Core) **October/November 2017**

MARK SCHEME

Maximum Mark: 40

Published

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Question	Answer	Marks
1	A	**1**
2	C	**1**
3	B	**1**
4	D	**1**
5	A	**1**
6	B	**1**
7	B	**1**
8	B	**1**
9	B	**1**
10	C	**1**
11	B	**1**
12	D	**1**
13	B	**1**
14	A	**1**
15	D	**1**
16	A	**1**
17	D	**1**
18	B	**1**
19	A	**1**
20	B	**1**
21	C	**1**
22	A	**1**
23	D	**1**
24	D	**1**
25	C	**1**
26	B	**1**
27	C	**1**
28	D	**1**

Question	Answer	Marks
29	C	**1**
30	D	**1**
31	C	**1**
32	A	**1**
33	B	**1**
34	B	**1**
35	C	**1**
36	D	**1**
37	B	**1**
38	D	**1**
39	B	**1**
40	B	**1**

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PHYSICS **0625/12**

Paper 1 Multiple Choice (Core) **October/November 2017**

MARK SCHEME

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Question	Answer	Marks
1	B	**1**
2	C	**1**
3	D	**1**
4	D	**1**
5	A	**1**
6	B	**1**
7	A	**1**
8	B	**1**
9	C	**1**
10	B	**1**
11	B	**1**
12	D	**1**
13	B	**1**
14	A	**1**
15	D	**1**
16	D	**1**
17	D	**1**
18	B	**1**
19	C	**1**
20	B	**1**
21	A	**1**
22	C	**1**
23	D	**1**
24	D	**1**
25	A	**1**
26	B	**1**
27	C	**1**
28	C	**1**

Question	Answer	Marks
29	C	**1**
30	C	**1**
31	A	**1**
32	B	**1**
33	B	**1**
34	B	**1**
35	C	**1**
36	C	**1**
37	D	**1**
38	A	**1**
39	B	**1**
40	A	**1**

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PHYSICS	**0625/13**
Paper 1 Multiple Choice (Core)	**October/November 2017**
MARK SCHEME	
Maximum Mark: 40	

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Question	Answer	Marks
1	A	**1**
2	B	**1**
3	B	**1**
4	D	**1**
5	A	**1**
6	B	**1**
7	B	**1**
8	B	**1**
9	D	**1**
10	C	**1**
11	B	**1**
12	B	**1**
13	B	**1**
14	A	**1**
15	D	**1**
16	A	**1**
17	D	**1**
18	C	**1**
19	D	**1**
20	C	**1**
21	D	**1**
22	C	**1**
23	D	**1**
24	D	**1**
25	C	**1**
26	D	**1**
27	C	**1**
28	B	**1**

Question	Answer	Marks
29	D	**1**
30	C	**1**
31	A	**1**
32	C	**1**
33	B	**1**
34	C	**1**
35	D	**1**
36	C	**1**
37	A	**1**
38	D	**1**
39	B	**1**
40	D	**1**

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PHYSICS **0625/21**

Paper 2 Multiple Choice (Extended) **October/November 2017**

MARK SCHEME

Maximum Mark: 40

Published

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Question	Answer	Marks
1	A	**1**
2	A	**1**
3	A	**1**
4	D	**1**
5	B	**1**
6	C	**1**
7	B	**1**
8	C	**1**
9	D	**1**
10	D	**1**
11	B	**1**
12	B	**1**
13	B	**1**
14	A	**1**
15	A	**1**
16	D	**1**
17	A	**1**
18	C	**1**
19	A	**1**
20	C	**1**
21	A	**1**
22	C	**1**
23	D	**1**
24	D	**1**
25	A	**1**
26	B	**1**
27	B	**1**
28	C	**1**

Question	Answer	Marks
29	C	**1**
30	A	**1**
31	C	**1**
32	B	**1**
33	B	**1**
34	B	**1**
35	A	**1**
36	D	**1**
37	C	**1**
38	A	**1**
39	B	**1**
40	A	**1**

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PHYSICS **0625/22**

Paper 2 Multiple Choice (Extended) **October/November 2017**

MARK SCHEME

Maximum Mark: 40

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Question	Answer	Marks
1	B	**1**
2	D	**1**
3	C	**1**
4	D	**1**
5	C	**1**
6	C	**1**
7	C	**1**
8	C	**1**
9	C	**1**
10	C	**1**
11	A	**1**
12	B	**1**
13	B	**1**
14	A	**1**
15	D	**1**
16	A	**1**
17	D	**1**
18	C	**1**
19	B	**1**
20	C	**1**
21	D	**1**
22	A	**1**
23	A	**1**
24	D	**1**
25	B	**1**
26	C	**1**
27	C	**1**
28	C	**1**

Question	Answer	Marks
29	A	**1**
30	A	**1**
31	C	**1**
32	B	**1**
33	C	**1**
34	B	**1**
35	D	**1**
36	A	**1**
37	B	**1**
38	B	**1**
39	D	**1**
40	A	**1**

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PHYSICS	**0625/23**
Paper 2 Multiple Choice (Extended)	**October/November 2017**
MARK SCHEME	
Maximum Mark: 40	

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Question	Answer	Marks
1	A	**1**
2	A	**1**
3	A	**1**
4	D	**1**
5	C	**1**
6	D	**1**
7	D	**1**
8	C	**1**
9	C	**1**
10	B	**1**
11	D	**1**
12	B	**1**
13	B	**1**
14	A	**1**
15	D	**1**
16	A	**1**
17	A	**1**
18	C	**1**
19	C	**1**
20	C	**1**
21	D	**1**
22	C	**1**
23	A	**1**
24	D	**1**
25	D	**1**
26	D	**1**
27	B	**1**
28	C	**1**

Question	Answer	Marks
29	A	**1**
30	B	**1**
31	C	**1**
32	C	**1**
33	D	**1**
34	B	**1**
35	C	**1**
36	D	**1**
37	C	**1**
38	A	**1**
39	C	**1**
40	D	**1**

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS	**0625/31**
Paper 3 Core Theory	**October/November 2017**
MARK SCHEME	
Maximum Mark: 80	

Published

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Question	Answer	Marks
1(a)	stopwatch or stopclock	**B1**
1(b)	improved accuracy	**B1**
1(c)(i)	circle around 3rd OR 3.55	**B1**
1(c)(ii)	3.93 + 4.07 + 3.99 = 11.99	**C1**
	(11.99 ÷ 3 =) 4.0 (s)	**A1**
1(c)(iii)	0.40 (s) OR **(c)(ii)** ÷ 10	**B1**

Question	Answer	Marks
2(a)	Any four from: Measure the distance between the two bridges Start stopwatch when stick hits water / starts moving (with river) stop stopwatch when stick reaches bridge Y Use speed = distance ÷ time repeat procedure and find average	**B4**
2(b)	2nd box ticked The forward force and the backward force are equal	**B1**

Question	Answer	Marks
3(a)	subtraction of forces to obtain resultant or 30 (N)	**B1**
	up(wards)	**B1**
3(b)	any five from: measure mass (on top pan balance) part fill measuring cylinder with water (and note volume) submerge link in measuring cylinder determine increase in volume increase in volume = volume of link use density = mass ÷ volume Only award full marks for a viable method	**B5**

Question	Answer	Marks
4(a)	1 solar / Sun	**B1**
	2 wind	**B1**
4(b)(i)	any two from: (renewable sources) are replaceable in a short time no (atmospheric) pollution conserves fossil fuels do not contribute to global warming no fuel costs	**B2**
4(b)(ii)	any one from: dilute source of energy owtte dependent on weather / intermittent supply	**B1**

Question	Answer	Marks
5(a)	solid	**B1**
5(b)	gas	**B1**
5(c)	liquid	**B1**
5(d)	gas	**B1**

Question	Answer	Marks
6(a)	ray leaves glass at top surface	**B1**
	ray refracted away from normal	**B1**
6(b)(i)	ray reflected into glass	**B1**
	angle *i* = angle *r* by eye	**B1**
6(b)(ii)	total internal reflection	**B1**
6(c)	waves with arcs centred on gap	**B1**
	same wavelength	**B1**

Question	Answer	Marks
7(a)(i)	arrows horizontal / on line from radio to man	**B1**
	arrows in opposite direction	**B1**
7(a)(ii)	middle box ticked longitudinal	**B1**
7(a)(iii)	number in range 20–20 000	**B1**
	hertz	**B1**
7(a)(iv)	(frequency of ultrasound) is above human (hearing) range	**B1**
7(b)(i)	speed = dist ÷ time or any two corresponding values of distance ÷ time e.g. 600 ÷ 0.4	**C1**
	1500 (m / s)	**A1**
7(b)(ii)	900 (m) read from graph	**C1**
	depth = 450 (m)	**A1**

Question	Answer	Marks
8(a)	Any 3 from: compass placed near magnet direction of compass needle marked change position of compass repeat (above procedure) join points(to show field lines) owtte	**B3**
8(b)	complete curved lines drawn in correct pattern	**B1**
	No lines crossing / symmetrical pattern	**B1**
	Correct direction indicated by arrow	**B1**

Question	Answer	Marks
9(a)(i)	Thermistor correctly identified	**B1**
9(a)(ii)	correct symbol for voltmeter	**B1**
	Voltmeter in parallel with thermistor	**B1**
9(b)(i)	V= IR	**C1**
	(R) = 6.0 ÷ 0.010	**C1**
	600 (ohms or Ω)	**A1**
9(b)(ii)	Resistance is decreasing	**B1**
	So current will increase	**B1**
9(b)(iii)	Current greater than 0.04 (A)	**B1**
9(c)	700 (ohms or Ω)	**B1**

Question	Answer	Marks
10(a)(i)	Pointer(s) not on zero	**B1**
	Pointers in opposite directions	**B1**
10(a)(ii)	Any 2 from:	
	Increase speed of wire	**B2**
	wrap wire into a coil	
	Increase strength of magnet	
10(b)	$N_s/N_p = V_s/V_p$ OR $660 \div 60 = V_s \div 25\,000$	**C1**
	V_s or output voltage = $(660 / 60) \times 25\,000 = 11 \times 25\,000$	**C1**
	275 000 (V)	**A1**
10(c)	Any 2 from:	
	Reduced energy / power losses	**B2**
	Smaller conductors needed	
	Reduced voltage drop (across cable)	

Question	Answer	Marks
11(a)(i)	84	**B1**
11(a)(ii)	126	**B1**
11(a)(iii)	84	**B1**
11(b)	beta and gamma OR gamma and beta	**B1**
11(c)	0.4 ÷ 2 = 0.2	**C1**
	AND 0.2 ÷ 2 = 0.1 or 2 × 138	**C1**
	276 (days)	**A1**

Question	Answer	Marks
12(a)(i)	(They) emit ionising radiation	**B1**
	(which) damage DNA/cells/cause tumours/cancers	**B1**
12(a)(ii)	Any 2 from:	
	reduce exposure time	**B2**
	keep source at distance	
	use of suitable shielding	
	monitor exposure to radiation	

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS	**0625/32**
Paper 3 Core Theory	**October/November 2017**
MARK SCHEME	
Maximum Mark: 80	

Published

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Question	Answer	Marks
1(a)	2nd line – advantage	**B1**
	3rd line – advantage	**B1**
	4th line – disadvantage	**B1**
1(b)	any three from: (cold) water is pumped into the ground warm rocks heat water / hot water turns to steam / water boils (steam) drives or turns or moves turbine (turbine) drives or turns or moves generator	**B3**

Question	Answer	Marks
2(a)	A – accelerates (from rest)	**B1**
	B – constant speed (of 2 m / s)	**B1**
	C – accelerates at faster rate / higher acceleration than previously	**B1**
	D – faster constant speed (of 10 m / s)	**B1**
2(b)	2 minutes = 120 s	**C1**
	area under the graph OR $d = s \times t$ OR 2×120	**C1**
	240 (m)	**A1**

Question	Answer	Marks
3(a)(i)	$D = M / V$	**C1**
	450 / 145	**C1**
	3.1 (g / cm^3)	**A1**
3(a)(ii)	$W = m \times g$ in any form	**C1**
	0.45×10	**C1**
	4.5 (N)	**A1**
3(b)	$P = F / A$ in any form	**C1**
	30 / 80	**C1**
	0.375 (N / cm^2) OR 0.38 (N / cm^2)	**A1**

Question	Answer	Marks
4(a)	(gravitational) <u>potential</u> (energy)	**B1**
4(b)	arrow at the lowest point of swing	**B1**
4(c)	friction / air resistance / drag	**B1**
4(d)	any three from: cabin has kinetic energy two surfaces rub together / friction thermal energy generated / KE transferred to thermal dissipated to surroundings / air	**B3**

Question	Answer	Marks
5(a)	<u>insulator</u>	**B1**
5(b)	Any five from: conduction / slow or limited transfer of thermal energy molecules move slower / lose kinetic energy convection stated as (drink cools) volume decreases density (of cooler drink) increases cooler water falls evaporation (of hot water) more energetic molecules escape / less energetic molecules remain	**B5**

Question	Answer	Marks
6(a)	normal correctly positioned	**B1**
6(a)(ii)	correct reflected ray at 45° to normal	**B1**
6(a)(iii)	*r* correctly indicated	**B1**
6(a)(iv)	angle *i* = angle *r*	**B1**
6(b)	parallel to the incident ray at P	**B1**
6(c)	F correctly labelled / 10 cm from lens	**B1**
	<u>10</u> (<u>cm</u>)	**B1**

Question	Answer	Marks
7(a)	<u>green</u> and <u>indigo</u>	**B1**
7(b)	<u>radio</u> and <u>microwaves</u>	**B1**
	<u>infra-red</u>	**B1**
7(c)	damages cells / heats cells	**B1**
7(d)	reduced exposure / leave room / move far away	**B1**
	metal apron / exposure badge / metal shielding	**B1**

Question	Answer	Marks
8(a)	1st row tick under orbiting the nucleus	**B1**
	2nd row tick under in the nucleus	**B1**
	3rd row tick under in the nucleus	**B1**
8(b)(i)	<u>6</u>	**B1**
8(b)(ii)	<u>13</u>	**B1**
8(c)(i)	same proton / atomic number	**B1**
	different nucleon number / number of neutrons / mass number	**B1**
8(c)(ii)	any acceptable isotope with proton number of 6	**B1**

Question	Answer	Marks
9(a)(i)	steel	**B1**
9(b)(i)	variable resistor indicated	**B1**
9(b)(ii)	(steel) bar inside coil	**B1**
	switch closed OR current increased through coil	**B1**
	bar moved through coil (in same direction) OR current decreased and switch opened	**B1**
9(c)	at least one complete correct field line through and above coil	**B1**
	at least one complete correct field line through and below coil	**B1**

Question	Answer	Marks
10(a)(i)	<u>25.6</u> (Ω)	**B1**
10(a)(ii)	$V = IR$ in any form	**C1**
	0.23×5.6	**C1**
	1.29 OR 1.3	**A1**
10(b)	resistance decreases	**B1**
	current increases	**B1**

Question	Answer	Marks
11(a)	$N_1 / N_2 = V_1 / V_2$	**C1**
	(49 / 900) × 220 OR use of ratios seen	**C1**
	11.98 OR 12 (V)	**A1**
11(b)	copper	**B1**
11(c)	d.c. is in one direction only / a.c. changes direction	**B1**

Question	Answer	Marks
12(a)(i)	electric bell working owtte	**B1**
	no sound from bell / bell is quieter	**B1**
12(a)(ii)	any two from: sound will travel through air / glass sound will not cross a vacuum sound needs a medium to travel through	**B2**
12(a)(iii)	<u>vibrations</u>	**B1**
12(b)	20 Hz from first column	**B1**
	20 kHz from second column	**B1**

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PHYSICS **0625/33**

Paper 3 Core Theory **October/November 2017**

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks
1(a)(i)	A **AND** B cars identified	**B1**
	A = fastest AND B = slowest	**B1**
1(a)(ii)	speed = distance ÷ time in any recognised form	**C1**
	50 ÷ 4	**C1**
1(b)(i)	12.5 (m / s)	**A1**
	100 × 3.6 **OR** 360 (s) indicated	**C1**
	answers in the range 5–7 minutes	**A1**
1(b)(ii)	any one from:	
	car will move faster / slower at times / speed not constant	**B1**
	road will have bends / hills etc.	
	slower moving traffic or other sensible road conditions	

Question	Answer	Marks
2(a)	measuring cylinder (partially filled) with water / displacement can filled with water	**B4**
	object (submerged) into water owtte	
	new volume noted / displaced water collected in measuring cylinder	
	(volume of object =) difference in volumes / volume of water collected	
2(b)	density = mass ÷ volume written in any recognised form	**C1**
	347 ÷ 18	**C1**
	19.28 **OR** 19.3 (g / cm^3)	**A1**

Question	Answer	Marks
3(a)	$w = m \times g$ in any recognised form	**C1**
	2250 / 10	**C1**
	225 (kg)	**A1**
3(b)(i)	moment = force × distance from pivot in any recognised form	**C1**
	400 × 0.4 **OR** 400 × 40	**C1**
	160 **OR** 16 000	**A1**
	Nm **OR** Ncm	**B1**
3(b)(ii)	apply force further from pivot owtte	**B1**

Question	Answer	Marks
4(a)(i)	elastic	**B1**
4(a)(ii)	elastic	**B1**
	kinetic	**B1**
4(a)(iii)	kinetic	**B1**
	thermal	**B1**
4(b)	pull band further back / exert greater force on band / increase elastic potential energy	**B1**

Question	Answer	Marks
5(a)	<u>Tyre B</u>	**B1**
	<u>larger / bigger surface area</u>	**B1**
	less pressure (on ground) / weight distributed	**B1**
5(b)	molecules gain kinetic energy / move faster	**B1**
	more (frequent) / harder collisions (with tyre)	**B1**
	Increased / greater pressure (on tyre)	**B1**

Question	Answer	Marks
6(a)(i)	mercury	**B1**
6(a)(ii)	arrow between 0 °C and start of capillary tube	**B1**
6(a)(iii)	0 (°C) **AND** 100 (°C)	**B1**
6(b)	<u>emitter</u>	**B1**
	<u>conductor</u>	**B1**
	<u>convection</u>	**B1**
	<u>radiation</u>	**B1**

Question	Answer	Marks
7(a)	wavelength correctly indicated	**B1**
7(b)	<u>12</u> (cm)	**B1**
7(c)	40 / 60	**C1**
	0.67 (Hz)	**A1**
7(d)	direction of travel perpendicular to direction of vibration owtte	**B1**
7(e)	any component of the electromagnetic spectrum	**B1**

Question	Answer	Marks
8(a)(i)	top ray passes through f_2	**B1**
	bottom ray passes through f_2	**B1**
	refraction correctly shown either at centre of lens **OR** at both edges of lens	**B1**
8(a)(ii)	C to f_2	**B1**
8(b)(i)	critical angle	**B1**
8(b)(ii)	ray internally reflected	**B1**
	reflecting angle = incident angle	**B1**

Question	Answer	Marks
9(a)	light travels faster than sound **OR** reverse argument	**B1**
9(b)	reflection (from building) / bouncing back (from building)	**B1**
9(c)	time taken for first sound = 0.5 s	**C1**
	Time taken for echo = 2.5 s **OR** time for sound to travel from hammer and return = 2.0 s	**C1**
	2.0 s	**A1**
9(d)	quieter / less amplitude / less energy	**B1**

Question	Answer	Marks
10(a)(i)	two curved field lines drawn above and below the magnet	**B1**
	lines start and finish at the poles of the magnet	**B1**
10(a)(ii)	both arrows point left	**B1**
10(a)(iii)	(plotting) compass	**B1**
10(b)	place end on end / see if attraction / repulsion occurs	**B1**
	repulsion at one end	**B1**

Question	Answer	Marks
11(a)	ammeter in series	**B3**
	voltmeter across wire	
	two cells correctly linked positive to negative	
11(b)	$V = IR$ in any recognised form	**C1**
	$R = 2.7 \div 0.3$	**C1**
	9 (Ω)	**A1**
11(c)	1 higher / more	**B1**
	2. lower / less	**B1**

Question	Answer	Marks
12(a)	Gamma	**B1**
12(b)	1 helium nuclei **OR** nuclide notation **OR** 2p, 2n	**B1**
	2 low / few cm of air / stopped by paper	**B1**
12(c)	2 half-life indicated	**B1**
	<u>25</u> (%)	**B1**

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS	**0625/41**
Paper 4 Extended Theory	**October/November 2017**
MARK SCHEME	
Maximum Mark: 80	

Published

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Question	Answer	Marks
1(a)(i)	Distance = area under graph OR $0.5 \times 20 \times 13$	**C1**
	130 m	**A1**
1(a)(ii)	(a =) (v – u) / t OR (a =) v / t OR 13 / 20	**C1**
	0.65 m / s^2	**A1**
1(a)(iii)	(F =) ma OR 1200×0.65	**C1**
	= 780 N	**A1**
1(b)	Acceleration decreases OR rate of increase of speed decreases OR speed increases at a lower rate	**B1**

Question	Answer	Marks
2(a)	Extension of a spring is (directly) proportional to load / force / weight OR $F = ke$ where e is extension	**B1**
2(b)(i)	Straight line drawn from origin to (64 mm, 120 N)	**B1**
2(b)(ii)	$F = ke$ in any form OR 120 / 64 OR 120 / 6.4 OR 120 / 0.064	**C1**
	c.a.o. 1.9 N / mm OR 19 N / cm OR 1900 N / m	**A1**
2(c)	Above 120 N / at 140 N, the spring does not obey Hooke's law OR the extension is not proportional to the load / weight / force	**B1**
	The elastic limit / limit of proportionality of the spring has been exceeded	**B1**

Question	Answer	Marks
3(a)	(Measure of) quantity / amount of matter OR (property) that resists change in motion / speed / momentum OR measure of a body's inertia	**B1**
3(b)(i)	$d = m / V$ OR in words OR 0.44 / 0.080^3 OR 0.44 / 5.12×10^{-4} OR 440 / 8^3 OR 440 / 512 OR 0.44 / 8^3 OR 0.44 / 512	**C1**
	0.86 g / cm^3 OR 860 kg / m^3 OR 8.6×10^{-4} kg / cm^3	**A1**
3(b)(ii)	Sinks OR does not float AND (cube) denser (than oil)	**B1**
3(c)(i)	$W = mg$ OR (g =) W / m OR 0.70 / 0.44	**C1**
	1.6 N / kg	**A1**
3(c)(ii)	(P =) hdg OR $0.030 \times 850 \times 1.6$	**C1**
	41 Pa	**A1**

Question	Answer	Marks
4(a)	Atoms collide with wall (and rebound) OR atoms rebound from wall	**B1**
	(Atoms) undergo change of momentum	**C1**
	Force on wall = (total) rate of change of momentum (of atoms) OR = change of momentum (of atoms) per second OR = change of momentum (of atoms) / time	**A1**
4(b)(i)	Fewer atoms per unit volume OR density of gas less	**B1**
	Rate of collision (with walls of balloon) decreases OR Fewer collisions per unit area	**B1**
4(b)(ii)	PV = constant OR $P_1V_2 = P_2V_2$ OR (P_2 =) P_1V_1 / V_2 OR $1.0 \times 10^5 \times 9.6 / 12$	**C1**
	8.0×10^4 Pa	**A1**

Question	Answer	Marks
5(a)	Tick 2nd box only	**B1**
5(b)(i)	At least 3 parallel wavefronts in shallow water sloping upwards from left to right	**B1**
	Wavefronts in shallow water meet wavefronts in deep water	**B1**
5(b)(ii)	Indication that frequency is same in deep and shallow water	**C1**
	In deep water $v = f\lambda$ in any form OR (f =) v / λ OR 80 / 1.4	**C1**
	= 57.1 (Hz)	**C1**
	Wavelength in shallow water = v / f OR 60 / 57.1 = 1.05 cm	**A1**
	OR	
	speed in deep water / speed in shallow water = 0.80 / 0.60	**(C1)**
	= 1.33	**(C1)**
	(f is constant so) λ in deep water / λ in shallow water = 1.33	**(C1)**
	λ in shallow water = 1.4 / 1.33 = 1.05 cm	**(A1)**

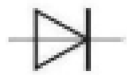
Question	Answer	Marks
6(a)	1500 m / s liquid 5000 m / s solid 300 m / s gas	**B2**
6(b)(i)	X and Y marked at centres of any two rarefactions	**B1**
6(b)(ii)	Area of low pressure or low density (of atoms) or where atoms / molecules far apart	**B1**
6(c)	v = = d / t or 2 d / t in any form	**C1**
	$d = vt / 2$ OR $3.0 \times 10^8 \times 2.56 / 2$	**C1**
	3.84×10^8 m OR 3.84×10^5 km	**A1**

Question	Answer	Marks
7(a)	One ray with correct path through lens	**B1**
	Another ray with correct path through lens Rays intersect to right of F and below axis, inverted image	**B1**
	drawn <u>and</u> labelled I	**B1**
7(b)	enlarged, upright and virtual <u>only</u> underlined or ringed	**B2**
	Two of above descriptions underlined	**B1**
7(c)	On entering prism: green ray deflection more than red ray and above normal	**B1**
	On leaving prism: diverging downwards from red ray and not along surface of prism	**B1**

Question	Answer	Marks
8	Hydroelectric	
8(a)	Hydroelectric named OR water from behind dam	**B1**
	K.E. of (falling) water used / P.E. of stored water	**B1**
	Turbine / waterwheel / paddle wheel operated	**B1**
	(Turbine) turns / drives a generator (that produces electricity)	**B1**
8(b)	Rain (fills lakes in high places)	**B1**
	Cause of rain is the Sun, so renewable	**B1**
8(c)	Sun evaporates water from sea etc. to fall (later) as rain	**B1**
	Sun is the source of energy.	**B1**
8	Tidal flow	
8(a)	Tides / tidal flow named	**B1**
	K.E. of water used	**B1**
	Turbine / waterwheel / paddle wheel operated	**B1**
	(Turbine) turns / drives a generator (that produces electricity)	**B1**
8(b)	Moon (and Sun) causes tides	**B1**
	Moon (and Sun) permanently in place, so renewable	**B1**
8(c)	Attraction due to Moon's (and Sun's) gravity causes tides	**B1**
	Sun is a source of (part of) the energy OR Sun is not the primary source of energy	**B1**

Question	Answer	Marks
8	Waves	
8(a)	Waves on surface of sea	**B1**
	K.E. of water used to oscillate a floating mechanism	**B1**
	Turbine / waterwheel / paddle wheel operated	**B1**
	(Turbine) turns / drives a generator (that produces electricity)	**B1**
8(b)	Wind causes waves	**B1**
	Sun causes wind, so renewable	**B1**
8(c)	Winds are air currents caused by thermal energy / heat from the Sun	**B1**
	Sun is the source of energy	**B1**

Question	Answer	Marks
9(a)(i)	(3×1.5 =) 4.5 V	**B1**
9(a)(ii)	$1 / R = 1 / R_1 + 1 / R_2$ OR $R = 1 / (1 / R_1 + 1 / R_2)$ OR (R =) $R_1R_2 / (R_1 + R_2)$	**C1**
	Correct substitution of 3 and 6	**C1**
	(R =) 2.0 Ω	**A1**
9(a)(iii)	$V = IR$ in any form OR (I =) V / R OR 4.5 / 3	**C1**
	1.5 A	**A1**
	OR	
	I_{total} = 4.5 / 2 = 2.25 A	**(C1)**
	For 3 Ω, $I = 2.25 \times 6 / 9 = 1.5$ A	**(A1)**
9(b)(i)	Connect ammeter (in wire) from A to B OR from H to G	**B1**
9(b)(ii)	Connect voltmeter (terminals) to A and H OR B and G OR C and D OR E and F	**B1**

Question	Answer	Marks
10(a)(i)		**B1**
10(a)(ii)	To allow flow (of current) in one direction	**B1**
10(b)(i)	Wire from B to + or – terminal of battery and wire from A to other terminal of battery	**B1**
	Diode to allow current in at + terminal or out at – terminal	**B1**
10(b)(ii)	Alternating current in coil Y sets up alternating magnetic field OR causes change in magnetic flux	**B1**
	Alternating field / change in flux cuts coil X OR Alternating field links with coil X	**B1**
	(Alternating) voltage / current is induced in coil X OR (Alternating) voltage / current is produced in coil X by electromagnetic induction	**B1**

Question	Answer	Marks
11(a)(i)	An electron	**M1**
	In / from / by the nucleus	**A1**
11(a)(ii)	Proton numbers balance on left and right sides of equation	**B1**
	Nucleons numbers balance on left and right sides of equation	**B1**
	${}^{0}_{-1}\beta$	**B1**
11(b)	Time for activity / count rate / number of nuclei / number of atoms to halve	**B1**
11(c)(i)	α-particles would be stopped / absorbed by <u>the plastic</u> / <u>bottle</u>	**B1**
11(c)(ii)	γ-rays would not be absorbed by the liquid / bottle OR reading not reduced (in passing through liquid / bottle) OR very penetrative so no change in detector reading	**B1**

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/42**

Paper 4 Extended Theory **October/November 2017**

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks
1(a)	$\rho = m / V$ in any form OR $(m =)\ \rho V$ OR $(m =)$ $9000 \times 7.5 \times 10^{-5}$	**C1**
	$(m =)$ 0.68 kg **accept** 680 g	**A1**
1(b)(i)	$W = m g$ in any form or $(W =)\ m g$ OR $(W =)$ 0. 68 × 10	**C1**
	$(W =)$ 6.8 N	**A1**
1(b)(ii)	any **one** of: weight has direction / mass does not weight is a vector / mass is not weight varies / mass does not mass is amount of matter weight is a force / mass is not	**B1**
1(c)(i)	$\rho = h \rho g$ in any form OR $(\rho =)\ \rho / h g$ OR $(\rho =)$ 560 / (0.027 × 10)	**C1**
	$(\rho =)$ 2.1×10^3 kg / m^3	**A1**
1(c)(ii)	explains why there is a resultant downward force	**B1**

Question	Answer	Marks
2(a)	accelerate / increase speed OR decelerate / decrease speed OR stop	**B1**
	change direction / move in a curve o.w.t.t.e.	**B1**
2(b)	change of shape OR size	**B1**
2(c)(i)	$F = m\,a$ in any form OR (a =) F / m OR (a =) 3500 / 1400	**C1**
	(a =) 2.5 m / s^2	**A1**
2(c)(ii)	$a = (v - u) / t$ in any form OR (t =) $(v - u) / a$ OR (t =) (30 – 0) / 2.5 OR 30 / 2.5	**C1**
	(t =) 12 s	**A1**
2(c)(iii)	friction / air resistance / drag	**B1**

Question	Answer	Marks
3(a)	suitable fuel for a power station	**B1**
	any **three** from five: • thermal energy / heat (from fuel) • water / steam / gas heated OR steam produced • (steam / gas) turns / moves / drives turbine • (turbine) turns / moves / drives generator • 2 correct energy transfers	**B3**
3(b)	sun is energy source for plants / living matter (to grow) o.w.t.t.e.	**B1**
	plant / animal (remains compressed) into fuel OR carbon / chemical energy stored / trapped in plant / animal (remains)	**B1**
3(c)	not renewable (as fuel is consumed)	**M1**
	could only be replaced over very long time period (e.g. clearly > 50 years)	**A1**

Question	Answer	Marks
4(a)(i)	any **one** of these six: • <u>evaporation</u>: at <u>surface</u> OR no bubbles form) pair 1 • <u>boiling</u>: throughout liquid OR bubbles form) • <u>evaporation</u>: at any temperature OR no heat needed) pair 2 • <u>boiling</u>: at specific temperature OR heat needed) • <u>evaporation</u>: affected by draught / surface area) pair 3 • <u>boiling</u>: not affected by draught / surface area)	**B1**
	any **one** pair of points	**B1**
4(a)(ii)	(it / rate) increases AND {more molecules have enough energy to escape OR break bonds}	**B1**
4(b)(i)	remains constant	**B1**
4(b)(ii)	$E = ml$ in any form OR (E =) ml	**C1**
	P = energy / t in any form OR (P =) energy / t	**C1**
	($P = 0.095 \times 2.3 \times 10^6 / (12 \times 60)$ =) 300 W	**A1**

Question	Answer	Marks
5(a)	any **three** of these five: • any sensible mention of the sun (as source of energy) • (thermal / heat / IR / electromagnetic) radiation • white (or clearly implied) surfaces absorb less or don't absorb • white (or clearly implied) surfaces reflect more • to keep house cooler OR to reduce thermal energy / heat transferred to house	**B3**
5(b)	decreases	**B1**

Question	Answer	Marks
6(a)(i)	diffraction	**B1**
6(a)(ii)	4 arcs between dashed lines centred vertically at centre of gap	**B1**
	any 3 wavelengths same as incident wavelengths including wavelength from wavefront in gap	**B1**
6(b)(i)	wavefronts have smaller angular width OR do not extend as far as dashed lines OR less (angular) spread	**B1**
6(b)(ii)	increased wavelength OR more spreading	**B1**
	use of $v=f\lambda$ OR increased wavelength	**B1**

Question	Answer	Marks
7(a)	real (answers in any order for **7(a)**)	**B1**
	enlarged OR magnified	**B1**
	Inverted OR upside down	**B1**
7(b)(i)	1st straight incident ray from close to point object to mirror correctly reflected, $i = r$	**M1**
	2nd straight incident ray <u>from point object</u> to mirror correctly reflected, $i = r$	**A1**
7(b)(ii)	BOTH reflected rays extended back to intersect behind mirror	**M1**
	BOTH reflected rays extended back <u>in straight lines</u> AND I in correct position AND {labelled OR clearly indicated}	**A1**

Question	Answer	Marks
8(a)	$R_S = R_A + R_B$ in any form OR (R_S =) $R_A + R_B$ OR (R_S =) 4 + 8	**C1**
	(R_S =)12 (Ω)	**C1**
	(R_P =)1 / (1 / R_S + 1 / R_C) in any form OR (R_P =) $R_S R_C$ / (R_S + R_C) OR (R_P =) 1 / (1 / 12 + 1 / 6) OR (R_P =) (6 × 12) / 18	**C1**
	(R_P =) 4.0 Ω	**A1**
8(b)	V_8 = supply V × (8 / 12) OR = 24 × (8 / 12)	**C1**
	(V_8 =) 16 V	**A1**
	OR alternative route	
	I_8 = supply V / 12 OR = 24 / 12 OR = 2 (A)	**(C1)**
	(V_8 = 2 × 8 =) 16 V	**(A1)**

Question	Answer	Marks
9(a)(i)	A (fixed)resistor B thermistor C L.E.D. OR light emitting diode	
	2 correct	**B1**
	3 correct	**B1**
9(a)(ii)	any **four** from six: • if cold / hot resistance of thermistor high / low • if cold / hot voltage (across) thermistor high / low • if cold / hot voltage of input to LED high / low • if cold / hot there is current / no current in LED • if cold LED lights / brighter • if hot LED does not light / dimmer	**B1**
9(b)	(truth table below)	
	row 1 of X correct – answer 0	**B1**
	rows 2 AND 3 of X correct – both answers 0	**B1**
	rows 4–8 of X correct – all answers 1	**B1**

Row	A	B	C	(output of AND)	X
1	0	0	0	0	0
2	0	1	0	0	0
3	1	0	0	0	0
4	1	1	0	1	1
5	0	0	1	0	1
6	0	1	1	0	1
7	1	0	1	0	1
8	1	1	1	1	1

Question	Answer	Marks
10(a)(i)	clockwise arrows on <u>at least 3</u> circles	**B1**
10(a)(ii)	(magnetic) field becomes weaker / decreases (as distance from wire increases)	**B1**
10(b)(i)	any **four** from these six: • charge flows OR current in solenoid / wire / circuit • solenoid becomes magnet / magnetised • bolt becomes magnet / magnetised • (such that) unlike poles (of solenoid and bolt are) facing o.w.t.t.e. • bolt is attracted • bolt moves / (door) locks / spring stretched	**B4**
10(b)(ii)	solenoid OR bolt no longer magnetised OR bolt no longer attracted	**B1**
	(spring contracts and pulls) bolt back / bolt returns (to original position) / (door) unlocked	**B1**

Question	Answer	Marks
11(a)	nucleon numbers balance each side of equation	**B1**
	proton numbers balance each side of equation	**B1**
	${}^{0}_{-1}\beta$	**B1**
11(b)(i)	background radiation OR radiation from the environment	**B1**
	rocks / ground / buildings / food / space / weapons testing / nuclear accidents or waste / sun / air / radon / argon	**B1**
11(b)(ii)	random (variation)	**B1**
11(b)(iii)	clear evidence of subtracting 23 from (original) count	**C1**
	clear evidence of dividing original / corrected count by 4	**A1**
	clear evidence of adding <u>23</u> correctly to result after division	**A1**

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PHYSICS	**0625/43**
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Question	Answer	Marks
1(a)(i)	$(x =)\frac{1}{2} v_f t$ **or** $\frac{1}{2} \times 12 \times 30$ **or** $(x =)\frac{1}{2} at^2$ **or** $\frac{1}{2} \times 0.40 \times 30^2$	**C1**
	180 m	**A1**
1(a)(ii)	$(a =)\Delta v / t$ **or** 12 / 30	**C1**
	0.40 (m/s^2) **or** 12 / 30	**C1**
	$(F =)ma$ **or** $2.0 \times 10^4 \times 0.40$ **or** $2.0 \times 10^4 \times 0.40 \times 12/30$	**C1**
	8000 N	**A1**
1(b)	drag / friction / air resistance mentioned	**C1**
	drag / friction / air resistance increases (as speed increases)	**A1**

Question	Answer	Marks
2(a)	$(m =)\rho V$ **or** $950 \times 8.2 \times 10^{-5}$ **or** 0.95×82	**C1**
	$7.8 / 7.79 \times 10^N$ (where N is a integer)	**C1**
	0.078 / 0.0779 kg **or** 78 / 77.9 g	**A1**
2(b)(i)	$(p =)h\rho g$ **or** $0.094 \times 950 \times 10$	**C1**
	890 / 893 Pa	**A1**
2(b)(ii)	atmospheric pressure (is acting)	**B1**
2(c)(i)	steel is denser (than liquid) **or** denser than 950 kg/m^3	**B1**
2(c)(ii)	take new reading **and** subtract 82 (cm^3) / original reading	**B1**

Question	Answer	Marks
3(a)(i)	nuclear <u>fusion</u>	**B1**
3(a)(ii)	<u>nuclei</u> combine / join together	**B1**
	small <u>nuclei</u> to larger nuclei **or** hydrogen to helium (in some way) **or** loss of mass	**B1**
3(b)	any suitable resource e.g. fossil fuels; hydroelectric; wave; wind	**M1**
	renewable **or** not (according answer) **and** matching explanation	**A1**
3(c)	**two** advantages from: no polluting gases / quiet / low maintenance / can be placed on roofs / clean / cheap <u>to run</u>	**B2**
	two disadvantages from: intermittent supply / unattractive / takes up space / uses land / d.c. output	**B2**

Question	Answer	Marks
4(a)	molecules of solid arranged in lattice / in organised pattern / without gaps / orderly / fixed structure	**B1**
4(b)(i)	glass heated first **or** at first liquid not heated / does not expand / takes time (to heat up) **or** glass poor conductor	**B1**
	glass expands	**B1**
	capacity / volume of flask increases	**B1**
4(b)(ii)	liquid (starts to) warms up	**B1**
	liquid expands more than the solid / glass	**B1**

Question	Answer	Marks
5(a)	(quantity of internal) energy that raises temperature	**M1**
	per degree Celsius / per unit temperature change	**A1**
5(b)(i)	560 / 562 / 561.6 J	**B1**
5(b)(ii)	kinetic energy / potential energy / total energy (of atoms / molecules / particles)	**B1**
	kinetic <u>added to</u> potential energy (of atoms / molecules / particles)	**B1**
5(c)	line from 100 °C **and** falling	**B1**
	falls at decreasing rate	**B1**
	levels off at labelled / approximate 22 °C	**B1**

Question	Answer	Marks
6(a)(i)	box next to 3.0×10^8 (second box down) ticked	**B1**
6(a)(ii)	(λ =)c / f **or** $3.0 \times 10^8 / 4.8 \times 10^{14}$	**C1**
	6.2 / 6.25 / 6.3×10^{-7} m	**A1**
6(b)(i)	1. <u>sines</u> have no unit **or** sines are ratio of two lengths **or** ratio of two speeds (whose units cancel) **or** units cancel	**B1**
	2. (v =) c / n **or** $3.0 \times 10^8 / 1.5$	**C1**
	2.0×10^8 m / s	**A1**
6(b)(ii)	information / message / music/sound / signal / data (encoded as pulses of light) sent	**B1**
	light (travels along fibre) **or** infra-red (radiation)	**B1**
	light detected (at far end) **or** message decoded **or** total internal reflection mentioned	**B1**

Question	Answer	Marks
7(a)(i)	any **two** rays that start at the top of the image from: • seems to come from F_1 to lens and emerges paraxially • passes through centre of lens undeviated • paraxial to the lens and passes through F_2	**M2**
	two correct rays traced back **and** image indicated	**A1**
7(a)(ii)	any **two** of enlarged; inverted; real underlined	**B1**
	enlarged **and** inverted **and** real underlined	**B1**
7(b)	refracted ray in prism below yellow ray **and** above normal	**B1**
	emergent ray diverging away from the yellow ray and above side of prism	**B1**

Question	Answer	Marks
8(a)	touch the sphere with the earth wire	**B1**
	negatively charged **and** electrons flow to sphere	**B1**
	remove earth wire **or** electrons / negative charges attracted (by rod)	**B1**
8(b)	four **or** more straight, radial lines **and** uniformly spaced	**B1**
	at least one arrow outwards **and** no wrong arrows	**B1**
8(c)	(I =) Q / t **or** 7.0 / (5.0 × 60) **or** 7.0 / 5.0 **or** 1.4 (A)	**C1**
	0.023(3333) A	**A1**

Question	Answer	Marks
9(a)(i)	cosine **or** sine curve **and** maximum value equal to |minimum value|	**B1**
	two complete cycles of 0.02 s between 0 and 0.040 s	**B1**
9(a)(ii)	point marked *A* where output voltage is zero	**B1**
9(b)(i)	magnetic field (due to a.c.) mentioned	**B1**
	changing / alternating (magnetic) field **or** field lines cut solenoid	**B1**
	e.m.f. / voltage induced (in coil)	**B1**
9(b)(ii)	diode	**B1**
	prevents / stops the backward current **or** allows only one direction of current	**B1**

Question	Answer	Marks
10(a)	electromagnetic (waves / rays / radiation)	**M1**
	high frequency / energy **or** short wavelength	**A1**
10(b)(i)	no change **or** (stays at) 43	**B1**
10(b)(ii)	no change **or** (stays at) 99	**B1**
10(c)(i)	(radiation) always present / due to environment / in absence of radioactive sample / natural (radiation)	**B1**
10(c)(ii)	112 – 16 **or** 96 **or** 112 / 28 **or** ¼ or 18 / 2	**C1**
	28 – 16 **or** 12 **or** 1 / 8 **or** 18 / 3 **or** 9.0 (hours)	**C1**
	6.0 hours	**A1**
10(d)	any **two** of: • (distance): tongs / manipulator / centre of cardboard box • (absorption): lead gloves / suit / lead glass screen / googles / glasses • (time): limit exposure time / keep in box until needed / film badge	**B2**

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/51**

Paper 5 Practical **October/November 2017**

MARK SCHEME

Maximum Mark: 40

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Question	Answer	Marks
1(a)	a = 19 – 21	**1**
1(b)(i)	Q values 1.(0), 2.(0), 3.(0), 4.(0), 5.(0)	**1**
1(b)(ii)	b values all less than 50 cm and decreasing	**1**
1(b)(iii)	Correct 1 / Q values 1.(0), 0.5(0), 0.33(3), 0.25, 0.2(0)	**1**
1(c)	Graph:	
	Axes correctly labelled	**1**
	Suitable scales	**1**
	All plots correct to ½ small square	**1**
	Good line judgement, thin, continuous line	**1**
1(d)	Triangle method clearly shown on graph	**1**
	At least half line used for triangle method and G recorded	**1**
1(e)	P correct calculation of G / a and in range 1.8 – 2.0	**1**

Question	Answer	Marks
2(a)(i)	V to at least 1 dp and < 3 V	**1**
	I to at least 2dp and < 1 A	**1**
2(a)(ii)	R_1 correct	**1**
2(b)(i),(ii)	New values of V and I and R_2 correct AND 2 × R_1 ± 10%	**1**
2(c)(i)	New values of V and I with $I_3 < I_2$	**1**
2(c)(ii)	R_3 present and V, I, R units seen at least once and not contradicted	**1**
2(d)	Statement to match readings AND Justification to include the idea of within (or beyond, ecf) the limits of experimental accuracy	**1**
2(e)	Determine each resistance in turn	**1**
2(f)	Three resistors in parallel, voltmeter in parallel with resistors and correct symbols for voltmeter and resistors	**1**
	Variable resistor in series, correct symbol in a workable circuit	**1**
2(g)	Repeat with different currents	**1**

Question	Answer	Marks
3(a)	Table:	
	v = in range 45 – 80	**1**
	uv correct	**1**
	$D = u + v \pm 1$ cm	**1**
3(b)	v = in range 25 – 35	**1**
	$D = u + v \pm 1$ cm	**1**
3(c)	One from: Different size / Different brightness Sharpness / clearness / coloured edges	**1**
3(d)(i),(ii)	f values both rounding to 14 – 16 (cm)	**1**
3(d)(iii)	f_A correct	**1**
	2 or 3 significant figures	**1**
3(e)	Any **two** from: Difficulty deciding exact position of sharpest image Difficulty measuring to centre of lens Product uv increases problem Image edges blurred / not clear Insufficient sets of results	**2**

Question		Answer	Marks
4	**MP1**	Stopwatch (or equivalent) AND (metre) rule / ruler	**1**
	MP2	Measure time for 5 (+) oscillations	**1**
	MP3	Divide by number of oscillations to find period (*T*)	**1**
	MP4	Repeat for each bob	**1**
	MP5	Variable; **one** from: Initial amplitude / starting position Length of pendulum / thread Number of oscillations	**1**
	MP6	Table with column headings for *t*, or period (*T*), or both AND *d*, with correct units	**1**
	MP7	Conclusion: Plot graph(s) of *d* against period (*T*) or *t* (or vice versa) OR compare period (*T*) or *t* values for different diameters	**1**

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This document consists of **5** printed pages.

Question	Answer	Marks
1(a)	correct use of set-square <u>AND</u> vertical ruler	**1**
1(b)(i)	t_1 = 29.5 ± 2.5 (s)	**1**
1(b)(ii)	correct T_1 from candidate's value of t_1	**1**
	unit s seen at least once in **(i)** or **(ii)**	**1**
1(c)(i)	t_2 = 27.7 ± 2.5 (s)	**1**
1(c)(ii)	$T_2 < T_1$ and to 2 or 3 significant figures	**1**
1(d)	statement to match readings	**1**
	justification to include the idea of within (or beyond e.c.f) the limits of experimental accuracy e.g. (very) close / almost equal / the same	**1**
1(e)	final box ticked	**1**
1(f)	4 or 5 correct (fewer than 4 correct = 0 marks)	**1**
	From top box to bottom box V, V, V, V, P, P all correct (= full marks)	**1**

Question	Answer	Marks
2(a)	realistic room temperature	**1**
2(b)	realistic hot water temperature	**1**
	mixture temperature between hot and room	**1**
	temperature fall correct AND °C seen at least once and not contradicted	**1**
2(c)	to make sure that the temperature is the same throughout	**1**
2(d)	realistic new temperatures	**1**
2(e)	realistic new temperatures	**1**
2(f)	room temperature seen and correct conclusion	**1**
2(g)	heat loss (to surroundings) / time delays in transferring the water or did not wait for thermometer readings to stabilise	**1**
2(h)	insulation	**1**
2(i)	same starting temperature / same room temperature	**1**

Question	Answer	Marks
3(a)(i),(ii)	correct u values 20(.0), 22(.0), 25(.0), 30(.0), 35(.0)	**1**
	v values decreasing and all > 22.0 cm	**1**
	consistent 2 or consistent 3 significant figures for v	**1**
3(b)	graph:	
	axes correctly labelled and not reversed	**1**
	suitable scales	**1**
	all plots correct to ½ small square	**1**
	good best-fit curve judgement, thin, continuous line	**1**
3(c)(i)	2 points and straight line correct	**1**
3(c)(ii)	u_1 and v_1 read correctly to ½ small square	**1**
3(c)(iii)	correct calculation of f from candidate's values	**1**
	f value rounding to 14–16 cm	**1**

Question	Answer	Marks
4	**method:** **MP1** measure length of band	**1**
	MP2 hang load, measure new length	**1**
	MP3 repeat with different thicknesses/widths	**1**
	control variable: **MP4** use same (original) length of band each time	**1**
	table: **MP5** table with columns for thickness, (load) and length / extension with units	**1**
	conclusion: **MP6** plot a graph of extension / length against thickness (for the same load) OR load against extension / length for different thicknesses OR comparison via a table e.g. compare extensions / lengths of different thicknesses for the same load	**1**
	one additional point: **MP7** use same load / same range of loads use at least 5 thicknesses / take at least 5 different readings to plot a graph show how to measure extension e.g. $l - l_0$ use same type / material of rubber band	**1**

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Question	Answer	Marks
1(a)	θ for beaker A decreasing	**1**
1(b)(i)	θ for beaker B decreasing, more slowly than for A AND all θ values to at least 1 °C	**1**
1(b)(ii)	units ALL correct (symbols or words)	**1**
	t values all present (30, 60, 90, 120, 150 and 180)	**1**
1(c)	**two** appropriate precautions: e.g. avoidance of parallax(only if explained) wait until reading stops rising at start ensure thermometer not touching beaker	**2**
1(d)(i)	conclusion matching results	**1**
	correct mention of comparative temperature change over 180 s	**1**
1(d)(ii)	any suitable improvement relating to comparison: e.g. same volume of water, same initial temperature, insulate sides, use plastic beaker, stand on mat, use a thicker / more insulated lid,	**1**
	<u>matching</u> explanation: e.g. lid only factor changed, cooling more rapid for higher temperatures cooling different for different volumes, thermal energy only escapes from surface, less transfer of thermal energy by sides, effect of lid more marked any appropriate similarity:	**1**
1(d)(iii)	e.g. both cool more rapidly at the start	**1**

Question	Answer	Marks
2(a)	correct voltmeter symbol in parallel with **X**	**1**
2(b)(i)	I_S< 1.00 A AND to 2dp at least	**1**
2(b)(ii)	V_X<V_Y AND both<3.0(V) AND to 1dp at least	**1**
2(b)(iii)	Vs within 10% of V_X+V_Y	**1**
2(b)(iv)	statement matching readings	**1**
	justification, with use of values seen, matching readings and statement e.g.: '3.5 V and 3.6 V are within limits of experimental accuracy'	**1**
2(c)	correct calculation of Rs	**1**
	2 / 3 sig figs and unit(Ω)	**1**
2(d)	resistors in parallel with correct symbol	**1**
	rest of circuit correct	**1**
2(e)	I_P >I_S	**1**

Question	Answer	Marks
3(a)(i)	5 F values all increasing	**1**
	all to at least 1d.p.	**1**
3(b)(ii)	any reliable method e.g. equal distances between rule and bench in at least two places, line up with named horizontal surface, use of set-square between stand and rule	**1**
3(b)	graph:	
	axes labelled with quantity and unit	**1**
	appropriate scales (plots occupying at least ½ grid and scales starting at 0,0)	**1**
	plots all correct to ½ small square AND precise plots	**1**
	Well-judged line AND thin line	**1**
3(c)(i)	F_0 correct from graph	**1**
3(c)(ii)	W_R in range 1 to 3 N AND 2 / 3 sig figs and unit (N)	**1**
3(d)	statement matching plotted points AND explanation referring to line and scatter of data	**1**
3(e)	repeat all readings and take average	**1**

Question	Answer	Marks
4	**MP1** **additional apparatus:** screen AND (metre) rule	**1**
	MP2 **diagram:** suitable arrangement of apparatus with *u* and *v* labelled correctly	**1**
	MP3 **method:** obtain (clear focused) image AND measure *u*, *v*	**1**
	MP4 repeat for other values of *u*	**1**
	MP5 **one precaution for clear, focused image:** move screen slowly / backwards and forwards, object AND lens AND screen perpendicular to bench / vertical, object and lens at same height (from bench), use of dark room / bright light	**1**
	MP6 **one precaution with measurements:** clamp rule / fix to bench, mark centre of lens on holder avoidance of parallax explained and specific	**1**
	MP7 **one additional point:** additional precaution, calculate *f* <u>from given equation</u> at least 3 values obtained, calculate average, mention of at least one appropriate *u* value, mention of preliminary expt to obtain rough *f* value (e.g. light from window)	**1**

Cambridge IGCSE

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PHYSICS **0625/61**

Paper 6 Alternative to Practical **October/November 2017**

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Question	Answer	Marks
1(a)(i)	1.8 (V)	**1**
	0.38 (A)	**1**
1(a)(ii)	R_1 4.74 (4.737, 4.7)	**1**
1(b)	R_2 = 9.47 OR 9.5 (2 or 3 significant figures required)	**1**
1(c)	Pointer at 0.13	**1**
1(d)	Statement YES or NO (owtte) Justification to include the idea of within (or beyond, ecf) the limits of experimental accuracy, matching the statement	**1**
1(e)	Determine each resistance in turn	**1**
1(f)	Three resistors in parallel, ONE voltmeter in parallel with resistors and correct symbols for voltmeter and resistors	**1**
	Variable resistor in series with the supply, correct symbol in a correct circuit	**1**
1(g)	Repeat with different currents OR to obtain a range of readings	**1**

Question	Answer	Marks
2(a)(i),(ii)	v = 6.(0) AND d = 8.(0) or v = 60 AND d = 80	**1**
	correct matching unit	**1**
2(b)(i),(ii),(iii)	V = 60 cm (or 10 × candidate's v) and D = 80 cm (or 10 × candidate's d)	**1**
	UV 1200 (ecf)	**1**
2(c)	**One** from: Different size Different brightness Sharpness / clearness / coloured edges	**1**
2(d)(i),(ii),(iii)	f values 15(.0) and 14.9 (14.87)	**1**
	f_A correct method	**1**
	2 or 3 significant figures	**1**
2(e)	Any **two** from: Difficulty deciding exact position of sharpest image Difficulty measuring to centre of lens Product uv increases problem Image edges blurred / not clear Insufficient sets of results	**2**
2(f)(i)	5 – 10	**1**
2(f)(ii)	Difference of at least 40 cm with a range 15–100	**1**

Question		Answer	Marks
3	**MP1**	Stopwatch (or equivalent) AND (metre) rule / ruler	**1**
	MP2	Measure time for 5 (+) oscillations	**1**
	MP3	Divide by number of oscillations to find period (*T*)	**1**
	MP4	Repeat for each bob	**1**
	MP5	Variable; one from: Initial amplitude / starting position Length of pendulum / thread Number of oscillations	**1**
	MP6	Table with column headings for *t*, or period (*T*), or both AND *d*, with correct units	**1**
	MP7	Conclusion: Plot graph(s) of *d* against period (*T*) or *t* (or vice versa) OR compare period (*T*) or *t* values for different diameters	**1**

Question	Answer	Marks
4(a)	1 / *Q* values 1.(0), 0.5(0), 0.3<u>3</u>(3), 0.25, 0.2(0)	**1**
4(b)	Graph:	
	Axes correctly labelled and right way round	**1**
	Suitable scales	**1**
	All 5 plots correct to ½ small square	**1**
	Good line judgement, thin, continuous line	**1**
4(c)(i),(ii)	At least half line used for triangle method	**1**
	Clearly shown on graph	**1**
	P = 1.8 – 2.2 (N)	**1**
4(d)	1.9	**1**
4(e)	Two from: Difficulty in obtaining balance Difficulty in judging centre of loads Loads may slip / slide Forcemeter not sensitive Forcemeter zero error	**2**

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Question	Answer	Marks
1(a)(i)	*d* = 5.0 (cm)	**1**
1(a)(ii)	*D* = 50 cm	**1**
1(a)(iii)	clear correct use of set-square AND vertical ruler	**1**
1(b)(i)	28.12	**1**
1(b)(ii)	1.406 / 1.41 / 1.4	**1**
	unit s / secs / seconds seen in **1(b)(i)** or **1(b)(ii)** at least once	**1**
1(c)	statement to match readings justification to include the idea of within (or beyond e.c.f.)	**1**
	the limits of experimental accuracy e.g. (very) close / almost equal	**1**
1(d)	final box ticked	**1**
1(e)	V, V, V, V, P, P all correct = 2 marks 4 or 5 correct = 1 mark Fewer than 4 correct = 0 marks	**2**

Question	Answer	Marks
2(a)	24 (°C)	**1**
2(b)	34 (°C)	**1**
2(c)	30 (°C) AND °C seen once in **2(a)**, **2(b)** or **2(c)**	**1**
2(d)	to make sure that the temperature is the same throughout / to allow the water to mix and reach its final temperature faster	**1**
2(e)	heat loss (to surroundings) / time delays in transferring the water / did not wait for thermometer readings to stabilise / (initial) temperatures of the (cold / hot) water not the same	**1**
2(f)	insulation	**1**
2(g)	same starting temperature (of hot / cold water) / same room temperature	**1**
2(h)	recognisable measuring cylinder	**1**
	perpendicular viewing	**1**
	to bottom of mensicus	**1**

Question	Answer	Marks
3(a)	Graph	
	axes correctly labelled	**1**
	suitable scales	**1**
	all plots correct to ½ small square	**1**
	good best-fit curve judgement thin, continuous line based on all the plots	**1**
3(b)(i)	2 points and straight line correct	**1**
3(b)(ii)	u_1 and v_1 read correctly to ½ small square	**1**
3(b)(iii)	correct (calculation of) *f* from candidate's values *f* value <u>rounding to</u> 14 – 16cm	**1**
3(c)	any **two** from: upside down less bright / brighter coloured edges different sizes	**2**
3(d)	any **two** from: darkened room / bright object object AND lens AND screen perp. to bench / vertical object and lens same height (from bench) move <u>screen</u> (**not** lens) slowly / backwards and forwards clamp rule / fix rule to bench	**2**

Question	Answer	Marks
4	**method:** **MP1** measure length of band	**1**
	MP2 hang load, measure new length	**1**
	MP3 repeat with different thicknesses/widths	**1**
	control variable: **MP4** use same (original) length of band each time	**1**
	table: **MP5** table with columns for thickness, (load) and length / extension with units	**1**
	conclusion: **MP6** plot a graph of extension / length against thickness (for the same load) OR load against extension / length for different thicknesses OR comparison via a table e.g. compare extensions / lengths of different thicknesses for the same load	**1**
	one additional point: **MP7** use same load / same range of loads use at least 5 thicknesses / take at least 5 different readings to plot a graph show how to measure extension e.g. $l - l_0$ use same type / material of rubber band	**1**

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Question	Answer	Marks
1(a)	units ALL correct (symbols or words)	**1**
	t values all present (0, 30, 60, 90, 120, 150 and 180)	**1**
1(b)	**two** appropriate precautions, e.g.: avoidance of parallax(only if explained), wait until reading stops rising at start, ensure thermometer not touching beaker	**2**
1(c)(i)	conclusion matching results	**1**
	<u>correct</u> mention of comparative <u>temperature change</u> over 180 s	**1**
1(c)(ii)	any suitable improvement relating to comparison: e.g. same volume of water, same initial temperature, insulate sides, use plastic beaker, stand on mat, use a thicker / more insulated lid,	**1**
	<u>matching</u> explanation: e.g. lid only factor changed, cooling more rapid for higher temperatures, cooling different for different volumes, thermal energy only escapes from surface, less transfer of thermal energy by sides, effect of lid more marked	**1**
1(c)(iii)	any appropriate similarity: e.g. both cool more rapidly at the start	**1**
1(d)(i)	23 (°C)	**1**
1(d)(ii)	any suitable suggestion with a valid explanation greater temperature at end as cannot fall below room temperature, lower rate of cooling as temperature difference between water and room is smaller	**1**

Question	Answer	Marks
2(a)	correct voltmeter symbol in parallel with **X**	**1**
2(b)	I_S = 0.18 (A)	**1**
2(c)(i)	V_X = 1.2 (V) AND V_Y = 2.3 (V)	**1**
2(c)(ii)	correct units (A, V) seen in **(b)** and **(c)**	**1**
2(c)(iii)	statement matching readings	**1**
	justification, with use of values seen, matching readings and statement e.g: '3.5 V and 3.7 V are within limits of expt accuracy'	**1**
2(d)	correct calculation of *R*s (20.6)	**1**
	2 / 3 sig figs and unit(Ω)	**1**
2(e)(i)	resistors in parallel with correct symbol	**1**
	rest of circuit correct	**1**
2(e)(ii)	valid suggestion AND explanation consistent with results	**1**

Question	Answer	Marks
3(a)(i)	F = 0.75	**1**
3(a)(ii)	any reliable method e.g. equal distances between rule and bench in at least two places, line up with named horizontal surface, use of set-square between stand and rule	**1**
3(b)	graph:	
	axes labelled with quantity and unit	**1**
	appropriate scales (plots occupying at least ½ grid and scales starting at 0,0)	**1**
	plots all correct to ½ small square AND precise plots	**1**
	Well-judged line AND thin line	**1**
3(c)(i)	F_0 correct from graph	**1**
3(c)(ii)	W_R in range 0.90 to 1.4	**1**
	2 / 3 sig figs and unit (N)	**1**
3(d)	statement matching plotted points AND explanation referring to line and scatter of data	**1**
3(e)	repeat all readings and take average	**1**

Question	Answer		Marks
4	**MP1**	**additional apparatus:** screen AND (metre) rule	**1**
	MP2	**diagram:** suitable arrangement of apparatus with *u* & *v* labelled correctly	**1**
	MP3	**method:** obtain (clear focused) image AND measure *u*, *v*	**1**
	MP4	repeat for other values of *u*	**1**
	MP5	**one precaution for clear, focused image:** move screen slowly / backwards and forwards, object AND lens AND screen perpendicular to bench / vertical, object and lens at same height (from bench), use of dark room / bright light	**1**
	MP6	**one precaution with measurements:** clamp rule / fix to bench, mark centre of lens on holder avoidance of parallax explained and specific	**1**
	MP7	**one additional point:** additional precaution, calculate *f* <u>from given equation</u> at least 3 values obtained, calculate average, mention of at least one appropriate *u* value, mention of preliminary expt to obtain rough *f* value (e.g. light from window)	**1**

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/11**

Paper 1 Multiple Choice (Core) **October/November 2017**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

2729597850

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **19** printed pages and **1** blank page.

IB17 11_0625_11/3RP

CAMBRIDGE
International Examinations

1 A student measures the volume of a cork.

He puts some water into a measuring cylinder and then one glass ball. He puts the cork and then a second, identical glass ball into the water as shown.

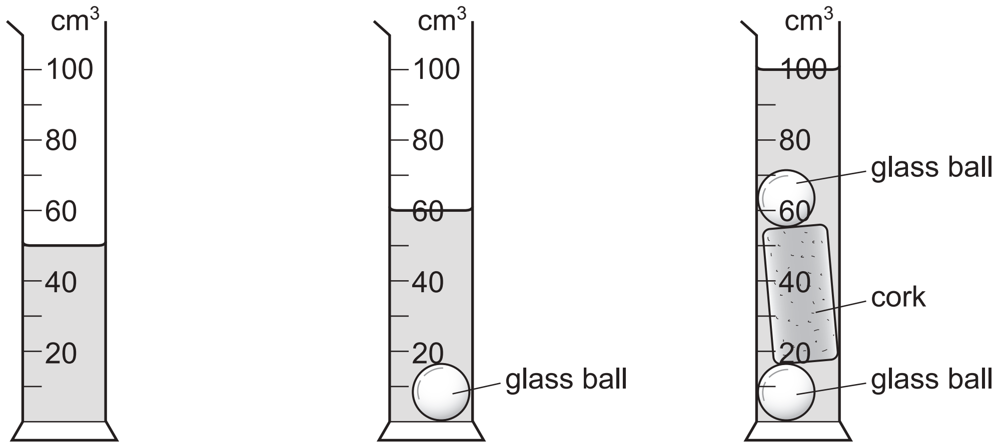


diagram 1 diagram 2 diagram 3

Diagram 1 shows the first water level.

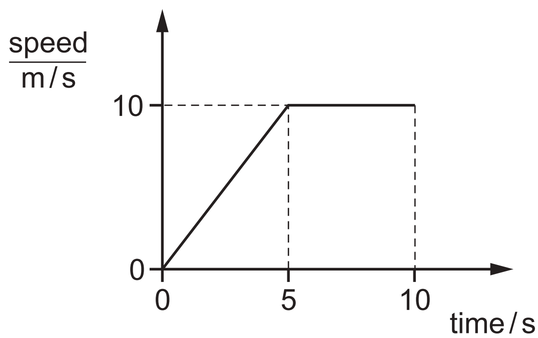
Diagram 2 shows the water level after one glass ball is added.

Diagram 3 shows the water level after the cork and the second glass ball are added.

What is the volume of the cork?

A 30 cm^3 **B** 40 cm^3 **C** 50 cm^3 **D** 100 cm^3

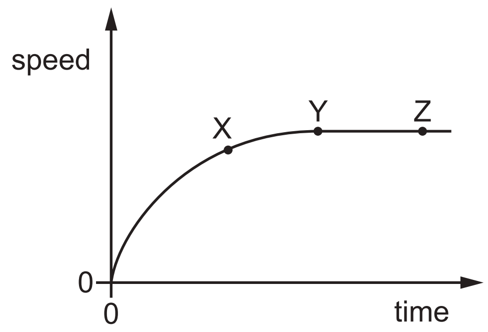
2 The graph shows how the speed of a car varies over a period of 10 s.



How far does the car travel during the 10 s?

A 10 m **B** 50 m **C** 75 m **D** 100 m

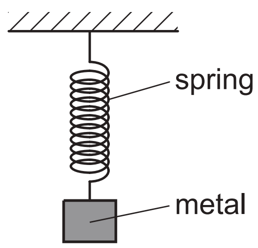
3 The diagram shows how the speed of a falling object changes with time.



Which row describes the motion of the object between X and Y, and between Y and Z?

	between X and Y	between Y and Z
A	accelerating	at rest
B	accelerating	constant speed
C	decelerating	at rest
D	decelerating	constant speed

4 A spring is stretched by hanging a piece of metal from it.



Which name is given to the force that stretches the spring?

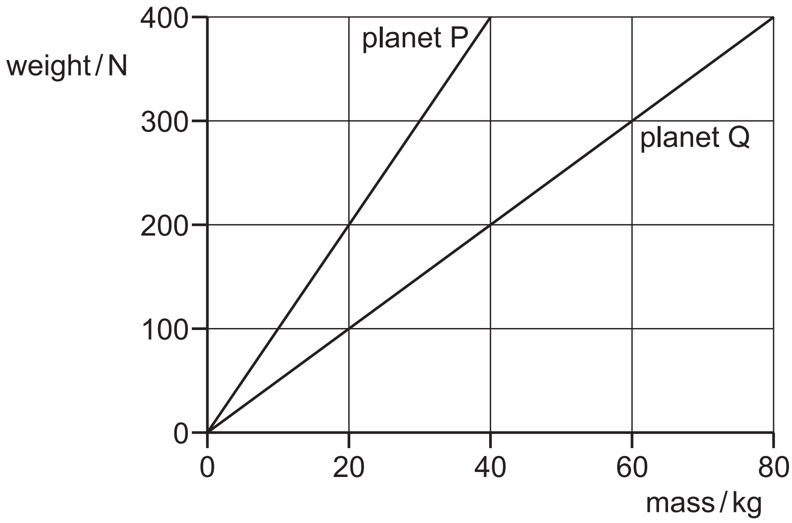
A friction

B mass

C pressure

D weight

5 The graph shows how weight varies with mass on planet P and on planet Q.



An object weighs 400 N on planet P. The object is taken to planet Q.

Which row is correct?

	mass of object on planet Q / kg	weight of object on planet Q / N
A	40	200
B	40	400
C	80	200
D	80	400

6 What is needed to determine the density of a regularly shaped block?

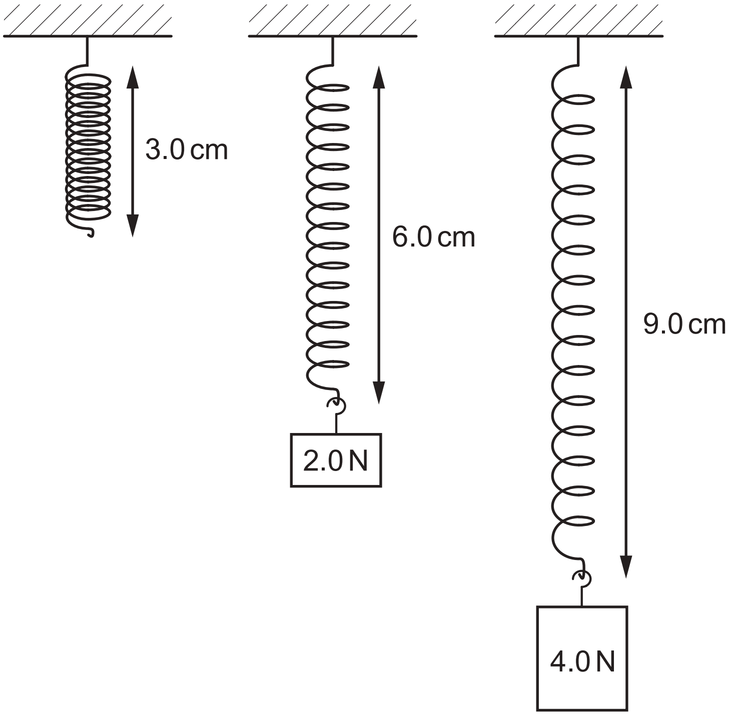
A a balance and a beaker

B a balance and a ruler

C a measuring cylinder and a beaker

D a measuring cylinder and a ruler

7 A student conducts an experiment by hanging different loads on a spring. The diagrams show the lengths of the spring with different loads.



Which row gives the correct extensions of the spring?

	extension / cm		
	0 N	2.0 N	4.0 N
A	0	3.0	3.0
B	0	3.0	6.0
C	3.0	3.0	3.0
D	3.0	6.0	9.0

8 A car mechanic is trying to loosen a wheel nut. He applies a force to the end of a spanner (wrench) at right-angles to the spanner.

Which method provides the largest turning effect on the nut?

A applying double the force to a spanner that is half as long

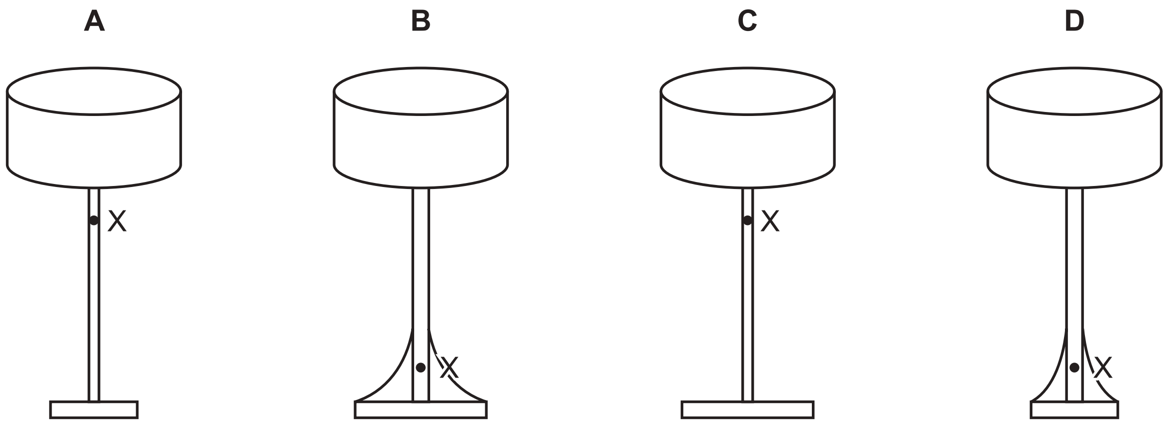
B applying double the force to a spanner that is twice as long

C applying double the force to the same spanner

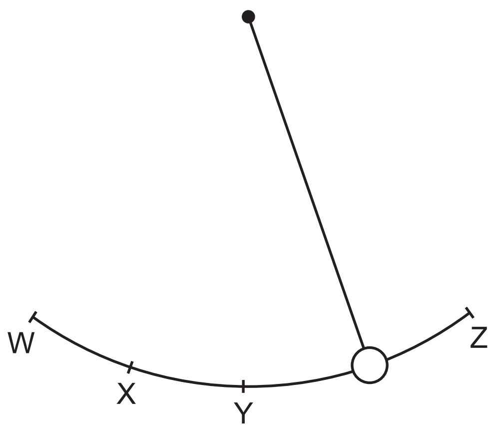
D applying the same force to a spanner that is twice as long

9 The diagrams show four table lamps resting on a table. The position of the centre of mass of each lamp is labelled X.

Which lamp is the most stable?



10 A pendulum bob swings from W, through points X and Y, to Z and then back to W.



Which statement is correct?

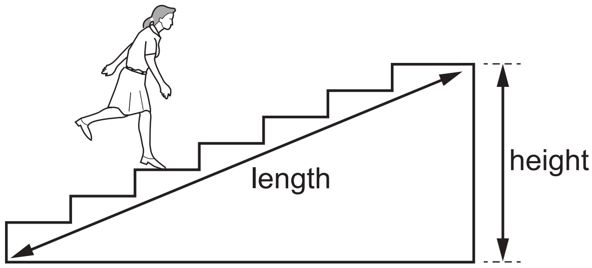
A The gravitational potential energy of the bob is smallest at W.

B The gravitational potential energy of the bob is smallest at X.

C The gravitational potential energy of the bob is smallest at Y.

D The gravitational potential energy of the bob is the same at all points of the swing.

11 A student runs up a flight of stairs.



Which information is **not** needed to calculate the rate at which the student is doing work against gravity?

A the height of the flight of stairs

B the length of the flight of stairs

C the time taken to run up the stairs

D the weight of the student

12 What is a manometer used to determine?

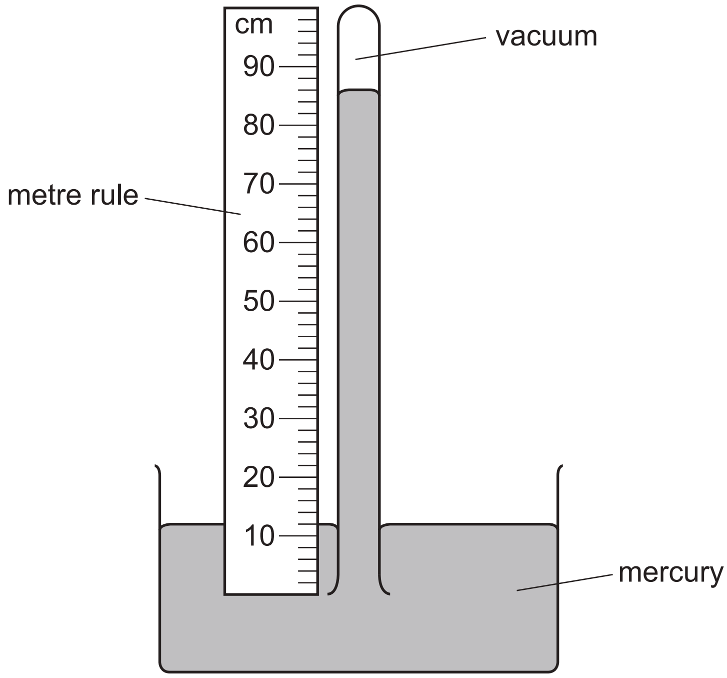
A the difference between two densities

B the difference between two forces

C the difference between two heights

D the difference between two pressures

13 The diagram shows a simple mercury barometer.

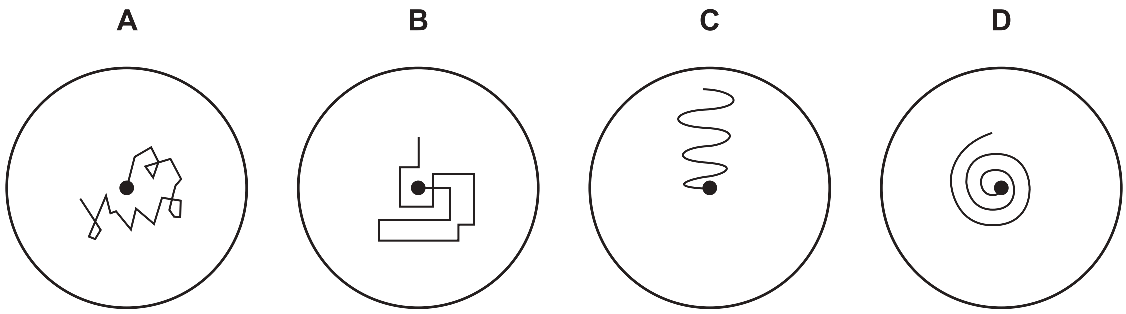


Which length is used to find the value of atmospheric pressure?

A 12 cm **B** 74 cm **C** 86 cm **D** 100 cm

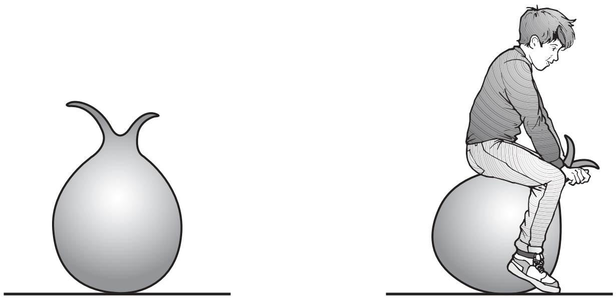
14 A pollen grain in a beaker of still water is viewed through a microscope.

Which diagram shows the most likely movement of the pollen grain?



15 The diagram shows an air-filled rubber toy. A child sits on the toy and its volume decreases.

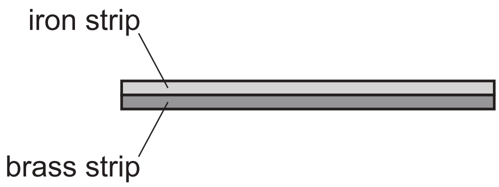
The temperature of the air in the toy does not change.



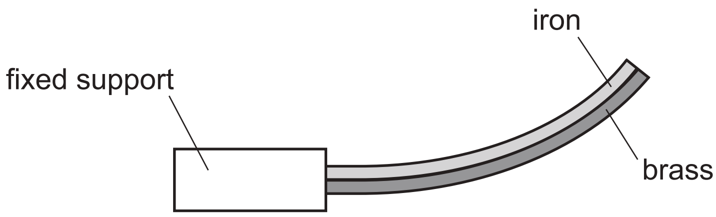
How does the air pressure in the toy change and why?

	pressure	reason
A	decreases	air molecules move more slowly
B	decreases	air molecules strike the rubber less frequently
C	increases	air molecules move more quickly
D	increases	air molecules strike the rubber more frequently

16 A strip of iron and a strip of brass are firmly attached to each other along their entire length. This combination is a bimetallic strip.



This bimetallic strip is heated and it bends as shown.



The bimetallic strip is now cooled and becomes straight again.

What causes the bimetallic strip to become straight again?

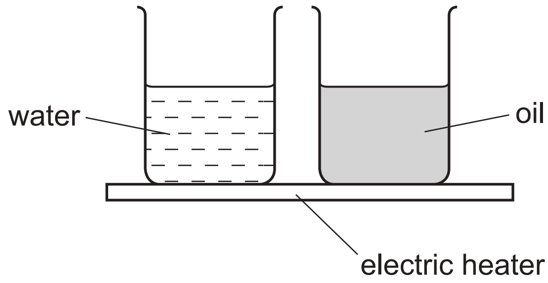
A The brass contracts more than the iron.

B The brass expands more than the iron.

C The iron contracts more than the brass.

D The iron expands more than the brass.

17 The diagram shows an electric heater being used to heat a beaker of water and an identical beaker containing oil. Both are heated for one minute.



The temperature of the water and the temperature of the oil increase steadily. The increase in temperature of the oil is much greater than that of the water.

Why is this?

A Oil has a higher boiling point than water.

B Oil has a lower boiling point than water.

C The oil has a larger thermal capacity than the water.

D The oil has a smaller thermal capacity than the water.

18 The air temperature in a cold room is 15 °C.

A heater that contains water at 50 °C is used to heat the room.

By which process is most of the thermal energy transferred throughout the air in the room?

A conduction

B convection

C evaporation

D radiation

19 Which statement about convection currents is correct?

A Convection currents occur because, when cooled, liquids contract and become more dense.

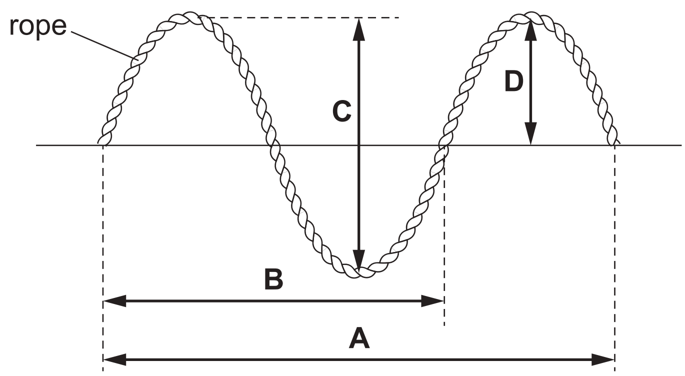
B Convection currents occur because, when warmed, liquids expand and become more dense.

C Convection currents only occur in liquids.

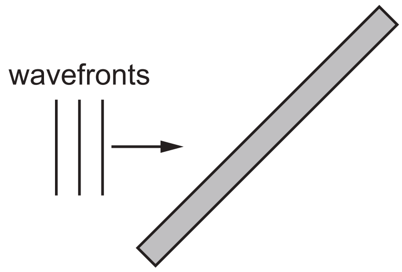
D Convection currents only occur in solids and liquids.

20 The diagram represents a wave travelling along a rope.

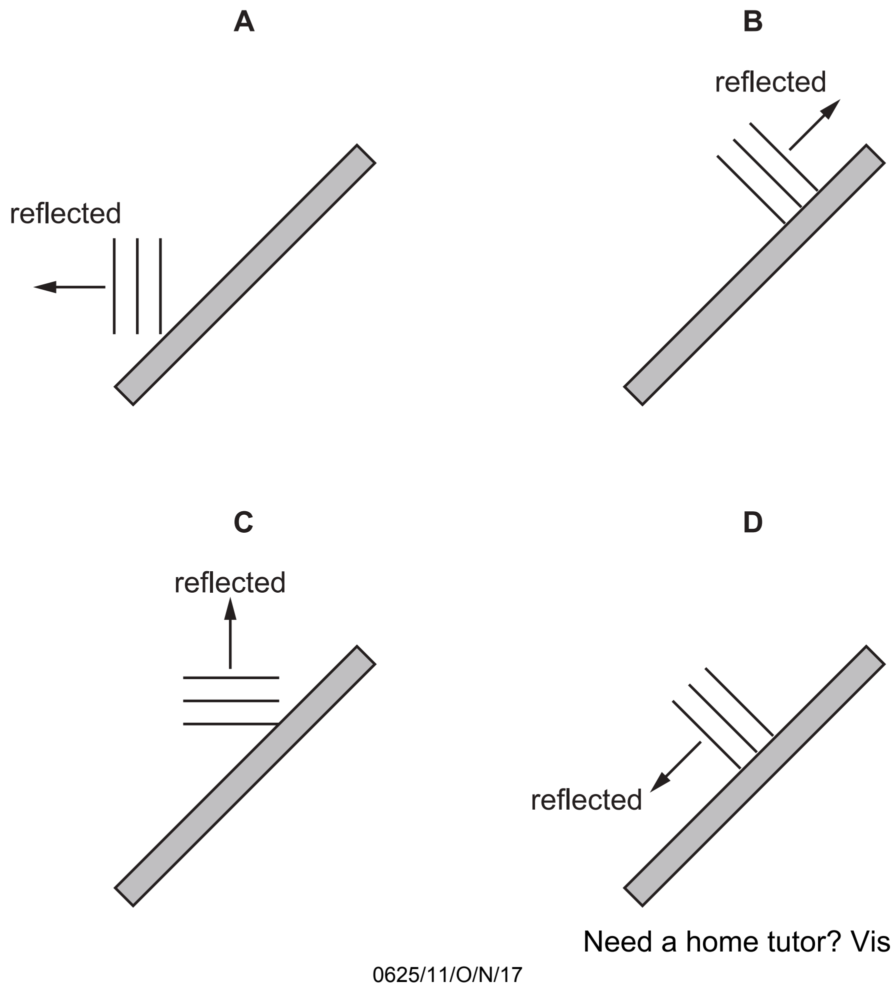
Which labelled arrow indicates the wavelength of the wave?



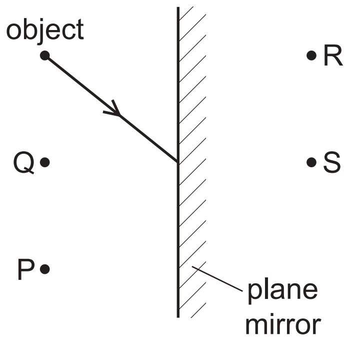
21 The diagram represents plane wavefronts of a water wave about to strike a solid barrier.



Which diagram shows the position of the wavefronts after reflection at the barrier?



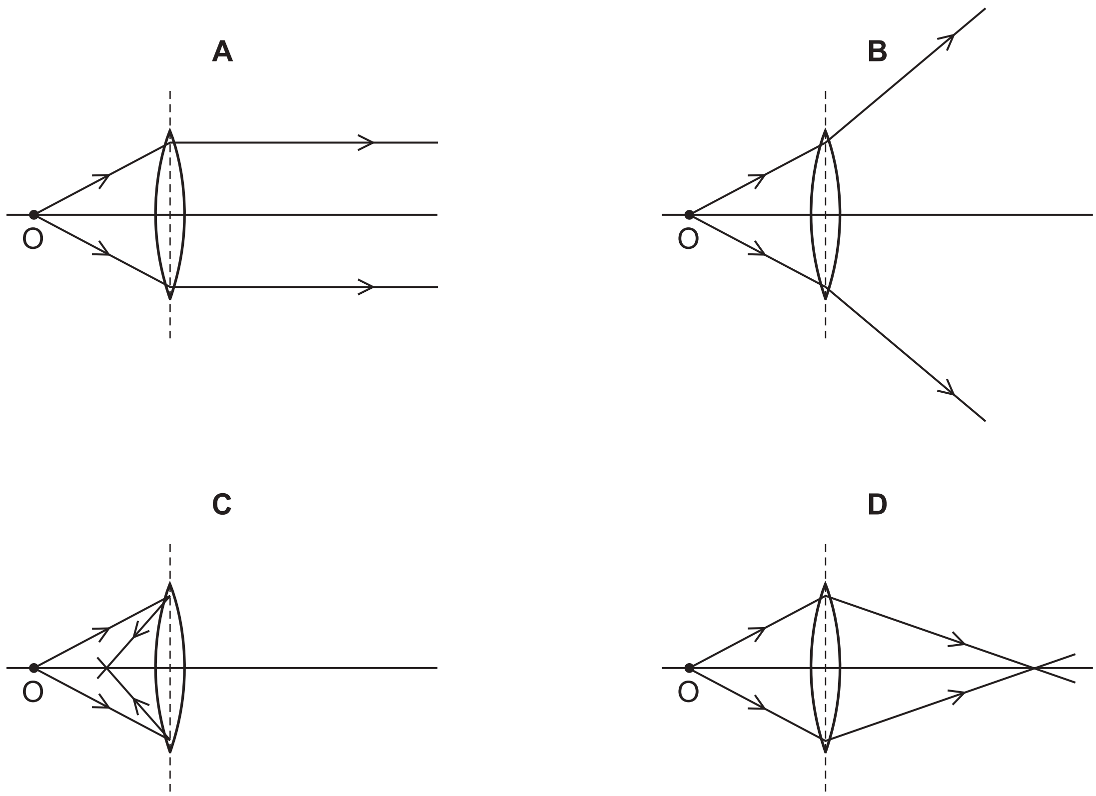
22 The diagram shows an object in front of a plane mirror. A ray of light from the object is incident on the mirror.



Through which point does the reflected ray pass, and at which point is the image of the object formed?

	point through which reflected ray passes	point at which image is formed
A	P	R
B	P	S
C	Q	R
D	Q	S

23 Which ray diagram shows a converging lens forming a real image of a small object O?



24 Visible light, X-rays and microwaves are all components of the electromagnetic spectrum.

Which statement about the waves is correct?

A In a vacuum, microwaves travel faster than visible light and have a shorter wavelength.

B In a vacuum, microwaves travel at the same speed as visible light and have a shorter wavelength.

C In a vacuum, X-rays travel faster than visible light and have a shorter wavelength.

D In a vacuum, X-rays travel at the same speed as visible light and have a shorter wavelength.

25 Space is a vacuum. Waves from stars are used to reveal information about the stars.

Which type of waves do **not** reveal information about stars?

A infra-red

B radio waves

C ultrasound

D γ-rays

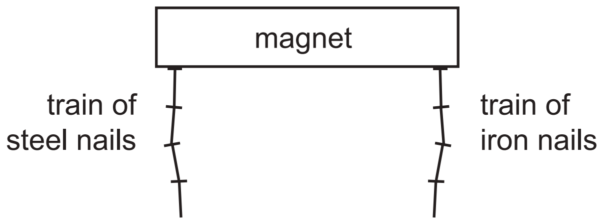
26 A student stands 180 m in front of a vertical, flat cliff and bangs together two pieces of wood to make a short, loud sound.

A timer records the echo of the sound 1.5 seconds after the pieces of wood are banged together.

Based on this result, what is the speed of sound?

A 120 m / s **B** 240 m / s **C** 270 m / s **D** 540 m / s

27 A train of steel nails and a train of iron nails hang from a strong magnet.



The trains are then carefully removed from the magnet.

What happens to the trains?

A Both trains fall apart.

B Both trains stay together.

C Only the train of iron nails falls apart.

D Only the train of steel nails falls apart.

28 The north pole of a bar magnet is placed in turn next to each end of a rod X. One end of the rod moves away from the north pole but the other end moves towards the north pole.

The experiment is repeated with the bar magnet and a different rod Y but this time both ends of the rod move towards the north pole.

From which materials could the rods X and Y be made?

	rod X	rod Y
A	soft iron	copper
B	soft iron	soft iron
C	steel	copper
D	steel	soft iron

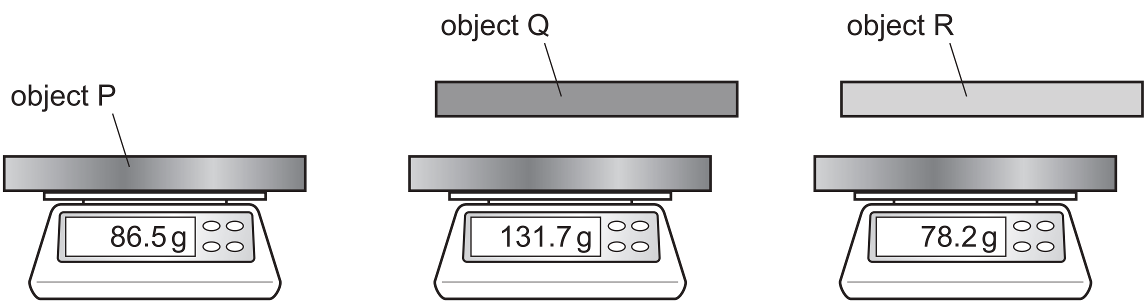
29 A student investigates the electrostatic charges on three objects P, Q and R.

The student places object P on the insulated pan of a balance and notes the reading on the balance.

The student then holds object Q a small distance above object P and notes the reading on the balance.

Finally, the student holds object R the small distance above object P and notes the reading on the balance.

The student's observations are shown.



Which row gives possible charges that explain these observations?

	charge on P	charge on Q	charge on R
A	negative	positive	negative
B	negative	negative	negative
C	positive	positive	negative
D	positive	negative	positive

30 Which equation is used to calculate resistance?

A resistance = p.d. + current

B resistance = p.d. – current

C resistance = p.d. × current

D resistance = p.d. ÷ current

31 A student connects a circuit with a power supply, a lamp and an ammeter.

Where must the ammeter be connected?

A in parallel with the lamp to measure current in the lamp

B in parallel with the lamp to measure potential difference across the lamp

C in series with the lamp to measure current in the lamp

D in series with the lamp to measure potential difference across the lamp

32 Two $3.0\,\Omega$ resistors are connected in parallel.

Which statement about their combined resistance is correct?

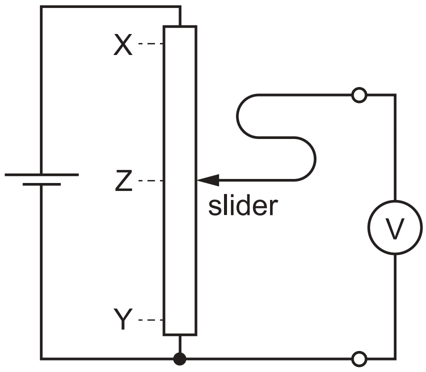
A The combined resistance is less than $3.0\,\Omega$.

B The combined resistance is $3.0\,\Omega$.

C The combined resistance is more than $3.0\,\Omega$ but less than $6.0\,\Omega$.

D The combined resistance is $6.0\,\Omega$.

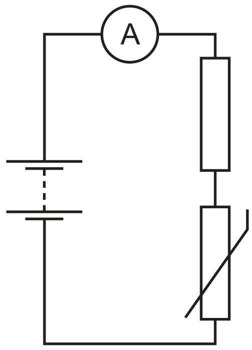
33 The diagram shows a potential divider circuit.



How does the movement of the slider affect the voltmeter reading?

	movement of slider	voltmeter reading
A	Z to X	falls to zero
B	Z to X	increases
C	Z to Y	falls to zero
D	Z to Y	increases

34 The diagram shows a circuit with a fixed resistor connected in series with a thermistor and an ammeter.



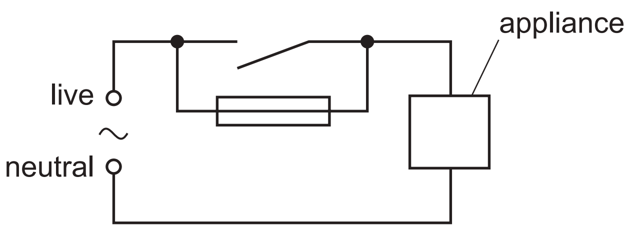
Which row shows how temperature change affects the resistance of the thermistor and the current in the circuit?

	temperature	resistance of thermistor	current in circuit
A	decreases	decreases	increases
B	decreases	increases	decreases
C	increases	decreases	decreases
D	increases	increases	increases

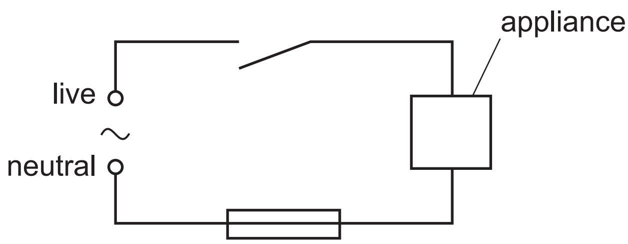
35 An appliance is connected to a mains supply. Its circuit also contains a switch and a fuse.

Which circuit shows the fuse in the correct position?

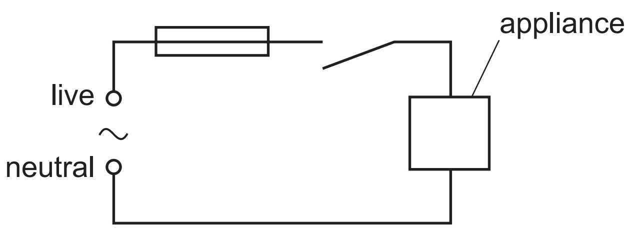
A



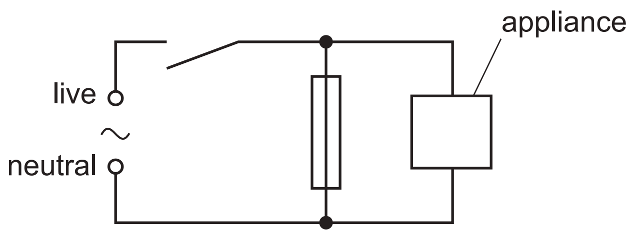
B



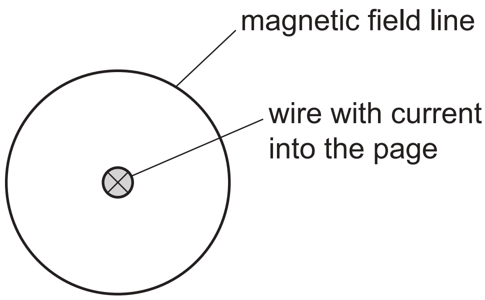
C



D



36 There is an electric current in a straight wire in the direction into the page. This produces a magnetic field around the wire. All the field lines are circles but only one field line is shown.



Which row describes the magnetic field?

	direction of the field lines	spacing of the field lines
A	anti-clockwise	evenly spaced over the whole field
B	anti-clockwise	more widely spaced further from the wire
C	clockwise	evenly spaced over the whole field
D	clockwise	more widely spaced further from the wire

37 A wire carrying a current is placed in a magnetic field. The wire experiences a force due to the field.

Which action does **not** change the direction of the force?

A increasing the current and reversing the field direction

B increasing the current, keeping the field direction constant

C reversing the current and increasing the field strength

D reversing the current, keeping the field direction constant

38 Different isotopes of chlorine are represented as ${}^{35}_{17}Cl$ and ${}^{37}_{17}Cl$.

They behave the same way chemically.

Why is this?

A They have the same nuclide notation.

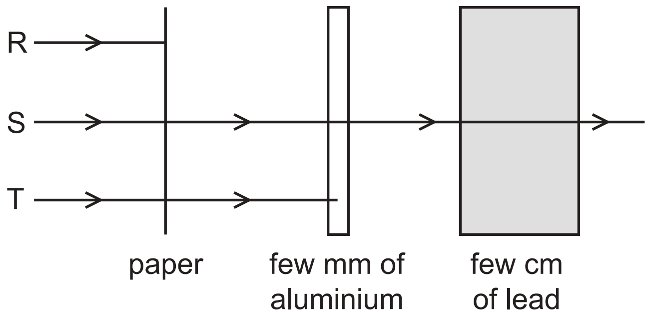
B They have the same number of neutrons.

C They have the same number of nucleons.

D They have the same number of protons.

39 A radioactive source emits three types of radiation R, S and T.

The diagram shows an experiment set up to study the penetrating properties of R, S and T.



Which types of radiation are R, S and T?

	R	S	T
A	α-particles	β-particles	γ-rays
B	α-particles	γ-rays	β-particles
C	β-particles	α-particles	γ-rays
D	γ-rays	β-particles	α-particles

40 What is meant by the *half-life* of a radioactive isotope?

A half of the time taken for all of the original nuclei to decay

B the time taken for half of the original nuclei to decay

C the time taken for the charges on all the nuclei to halve

D the time taken for the mass of each nucleus to halve

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Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/12**

Paper 1 Multiple Choice (Core) **October/November 2017**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

0285820688

READ THESE INSTRUCTIONS FIRST

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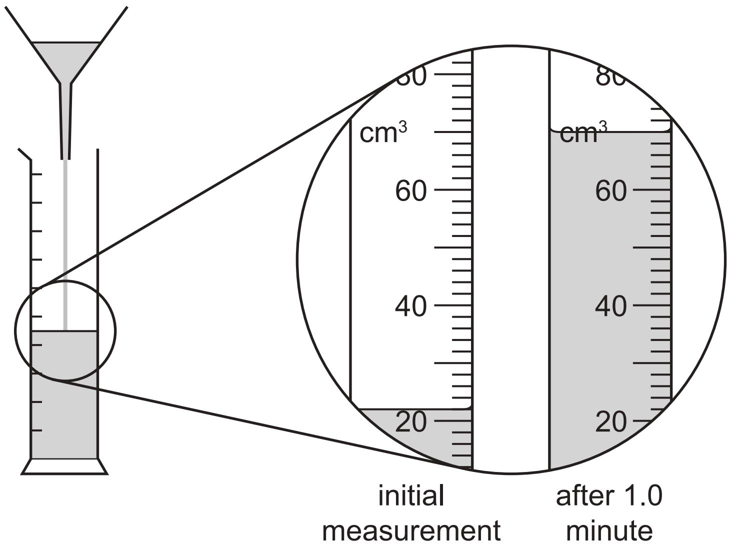
Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

This document consists of **19** printed pages and **1** blank page.

1 A student investigates the rate of flow of oil through a funnel.

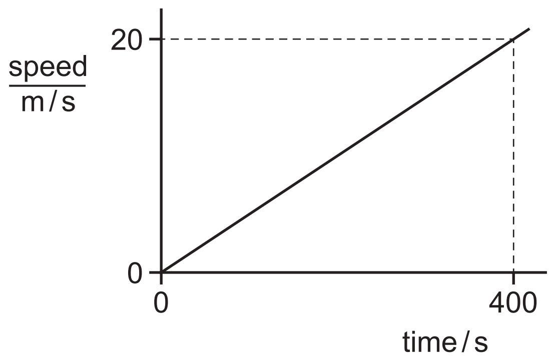
The diagrams show the experiment and the volume of oil in the measuring cylinder at the start of the experiment, and one minute later.



What is the rate of flow of oil through the funnel during the one minute?

A 0.73 cm^3/s **B** 0.80 cm^3/s **C** 44 cm^3/s **D** 48 cm^3/s

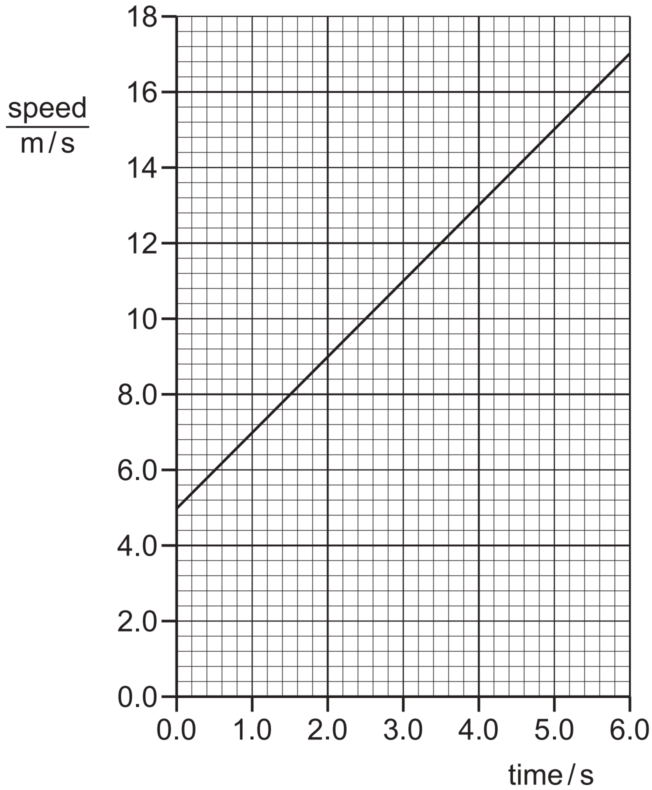
2 The graph represents the motion of a vehicle.



What is the distance travelled by the vehicle in 400 s?

A 20 m **B** 400 m **C** 4000 m **D** 8000 m

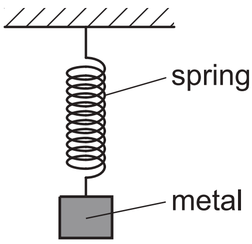
3 The speed-time graph represents the motion of an object.



What is the average speed of the object?

A 2.0 m / s **B** 6.0 m / s **C** 8.5 m / s **D** 11 m / s

4 A spring is stretched by hanging a piece of metal from it.



Which name is given to the force that stretches the spring?

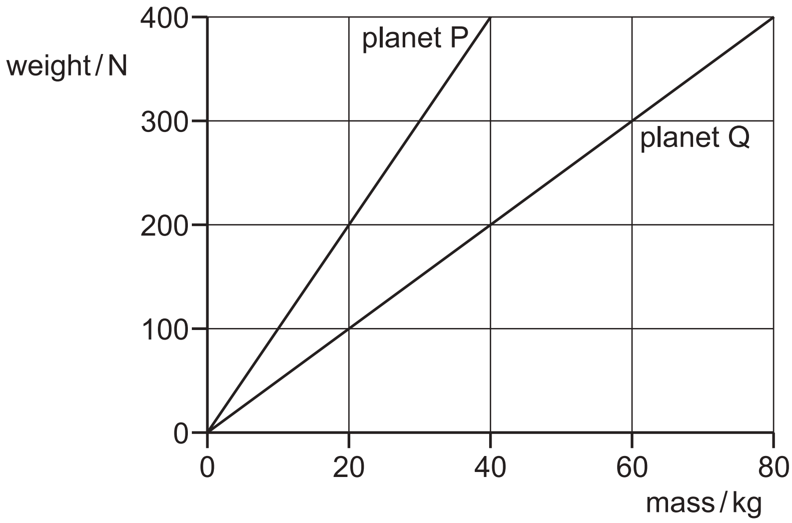
A friction

B mass

C pressure

D weight

5 The graph shows how weight varies with mass on planet P and on planet Q.



An object weighs 400 N on planet P. The object is taken to planet Q.

Which row is correct?

	mass of object on planet Q / kg	weight of object on planet Q / N
A	40	200
B	40	400
C	80	200
D	80	400

6 What is needed to determine the density of a regularly shaped block?

A a balance and a beaker

B a balance and a ruler

C a measuring cylinder and a beaker

D a measuring cylinder and a ruler

7 The diagram shows an aircraft flying in a straight horizontal line at constant speed.

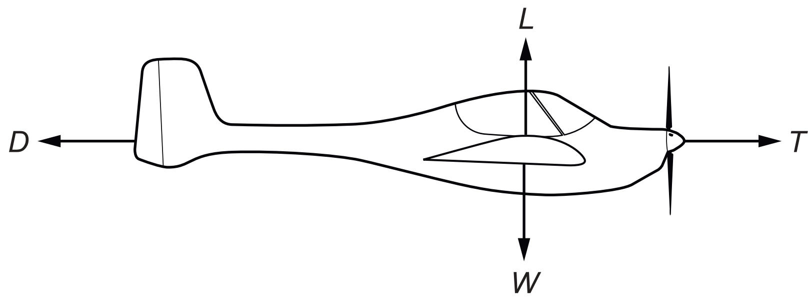
W is the weight of the aircraft.

L is the lift (upward force) due to air flow over the wings.

T is the thrust force due to the engine.

D is the air resistance (drag).

The diagram shows the direction of these forces.



What are the relationships between the forces?

A $L = W$ and $T = D$

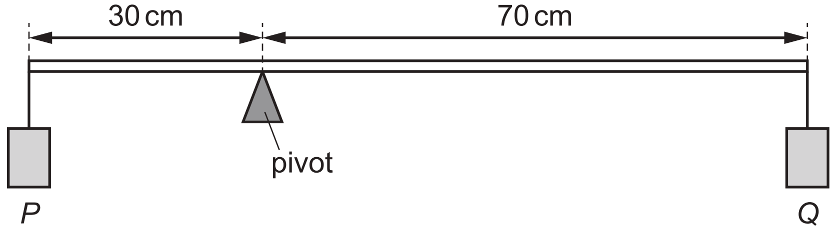
B $L = W$ and T is greater than D

C L is greater than W and $T = D$

D L is greater than W and T is greater than D

8 A pivoted beam supports a load *P* at one end and a load *Q* at the other end.

The weight of the beam can be ignored.



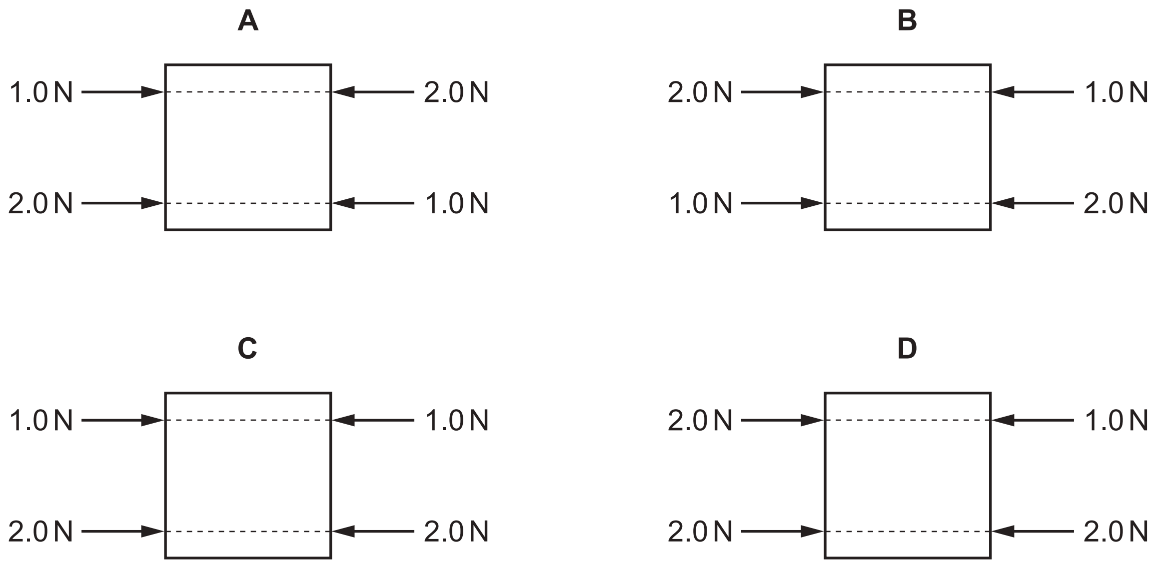
The beam is balanced.

Which row gives possible values for *P* and for *Q*?

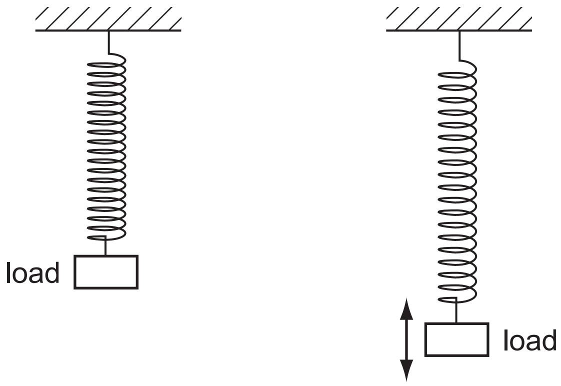
	P / N	*Q* / N
A	21	7
B	21	9
C	30	10
D	30	70

9 Each diagram shows a metal plate with four parallel forces acting on it. These are the only forces acting on the plates.

In which diagram is the plate in equilibrium?



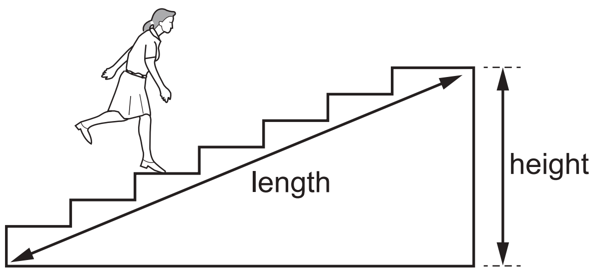
10 A load is attached to the end of a spring. A student pulls the load down from its rest position and releases it. It oscillates vertically and eventually comes to rest.



Which row gives the type of energy transferred to the apparatus, and the type of energy to which this has then been transferred when the load comes to rest?

	type of energy transferred to the apparatus	type of energy to which this has then been transferred when the load comes to rest
A	elastic energy in the spring	chemical energy in the spring and in the air
B	elastic energy in the spring	thermal energy in the spring and in the air
C	gravitational potential energy in the load	chemical energy in the spring and in the air
D	gravitational potential energy in the load	thermal energy in the spring and in the air

11 A student runs up a flight of stairs.



Which information is **not** needed to calculate the rate at which the student is doing work against gravity?

A the height of the flight of stairs

B the length of the flight of stairs

C the time taken to run up the stairs

D the weight of the student

12 A book has a mass of 400 g.

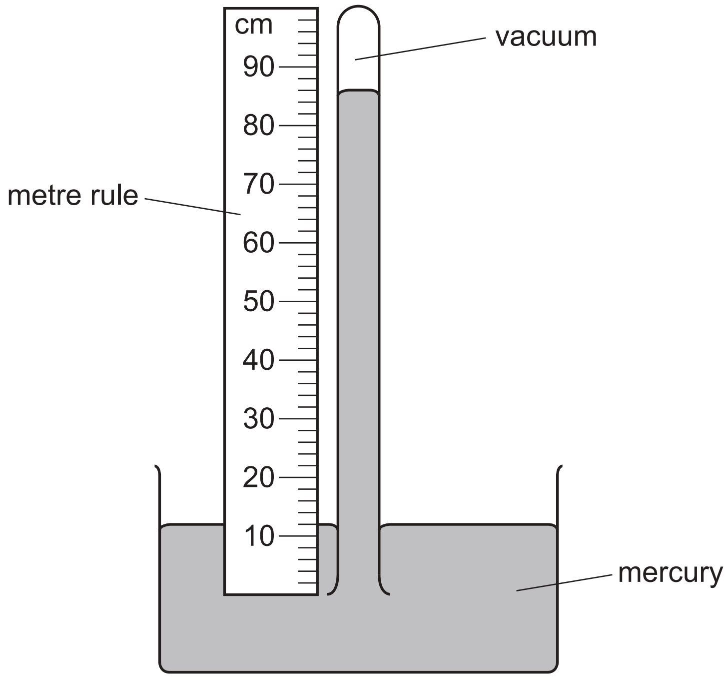
One of its surfaces measures 0.10 m × 0.20 m. This surface is in contact with a table.

The gravitational field strength *g* is 10 N / kg.

What is the pressure exerted on the table due to the book?

A $0.08\,N/m^2$ **B** $8.0\,N/m^2$ **C** $20\,N/m^2$ **D** $200\,N/m^2$

13 The diagram shows a simple mercury barometer.

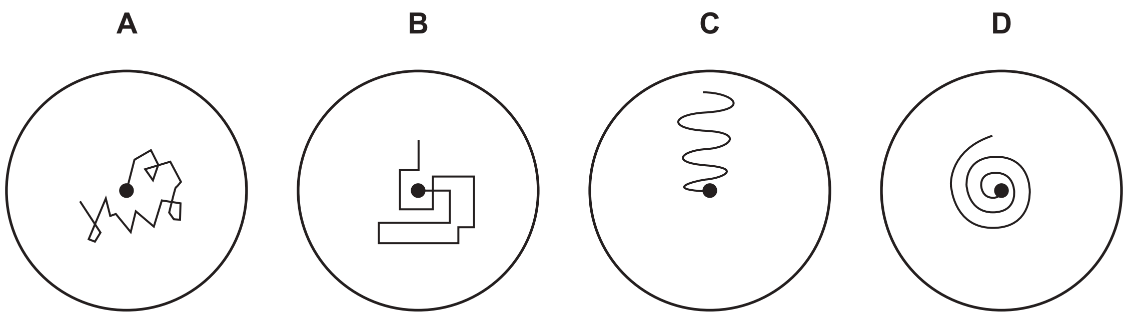


Which length is used to find the value of atmospheric pressure?

A 12 cm **B** 74 cm **C** 86 cm **D** 100 cm

14 A pollen grain in a beaker of still water is viewed through a microscope.

Which diagram shows the most likely movement of the pollen grain?



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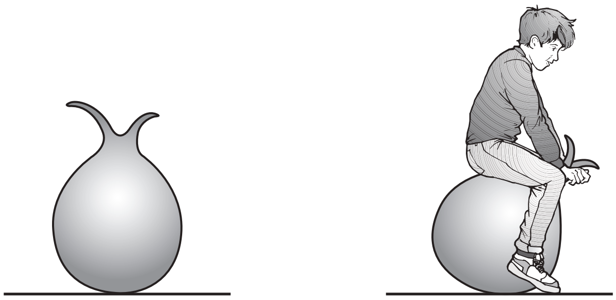
15 The diagram shows an air-filled rubber toy. A child sits on the toy and its volume decreases.

The temperature of the air in the toy does not change.



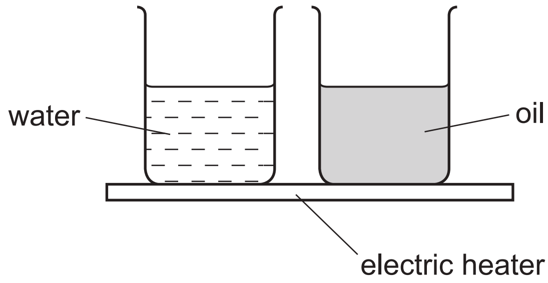
How does the air pressure in the toy change and why?

	pressure	reason
A	decreases	air molecules move more slowly
B	decreases	air molecules strike the rubber less frequently
C	increases	air molecules move more quickly
D	increases	air molecules strike the rubber more frequently

16 Which row identifies the fixed points on the Celsius scale?

	lower fixed point	upper fixed point
A	boiling point of mercury	melting point of pure ice
B	boiling point of pure water	melting point of pure ice
C	melting point of mercury	boiling point of pure water
D	melting point of pure ice	boiling point of pure water

17 The diagram shows an electric heater being used to heat a beaker of water and an identical beaker containing oil. Both are heated for one minute.



The temperature of the water and the temperature of the oil increase steadily. The increase in temperature of the oil is much greater than that of the water.

Why is this?

A Oil has a higher boiling point than water.

B Oil has a lower boiling point than water.

C The oil has a larger thermal capacity than the water.

D The oil has a smaller thermal capacity than the water.

18 Which statement about the direction of a change of state is correct?

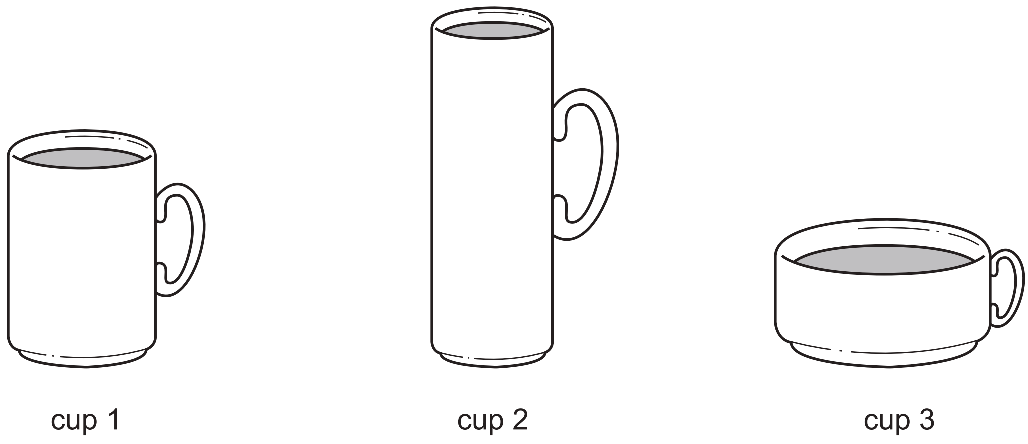
A Evaporation is the reverse process to boiling.

B Evaporation is the reverse process to condensation.

C Evaporation is the reverse process to melting.

D Evaporation is the reverse process to solidification.

19 Three cups are made from the same insulating material.



The cups are each filled with the same volume of hot tea.

In which cup does the tea cool most quickly and in which cup does it cool most slowly?

	most quickly	most slowly
A	1	3
B	2	1
C	3	2
D	3	1

20 Why does a balloon filled with hot air rise?

A Cold air is less dense than hot air.

B Cold air is more dense than hot air.

C Heat rises.

D The density of the balloon is greater than the density of the surrounding gas.

21 A wave moves along the surface of water.

What is the wavelength of the wave?

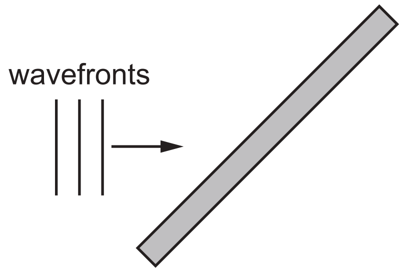
A the distance between one crest and the next crest

B the distance that a crest moves along the surface in one second

C the distance that a particle of water moves up and down

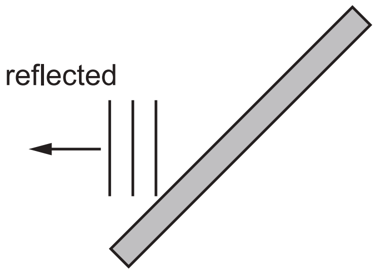
D the number of waves that pass a fixed point in one second

22 The diagram represents plane wavefronts of a water wave about to strike a solid barrier.

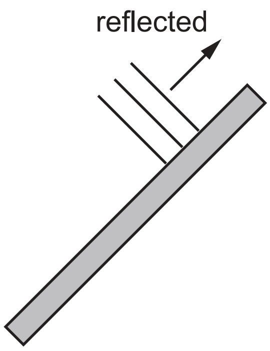


Which diagram shows the position of the wavefronts after reflection at the barrier?

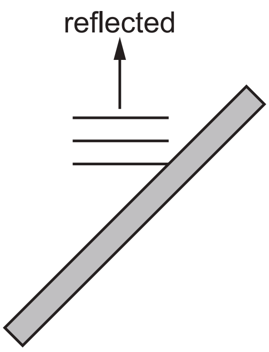
A



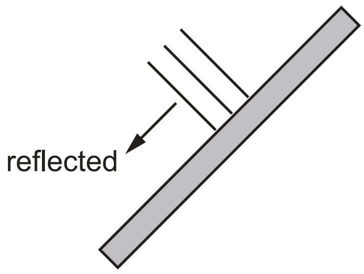
B



C

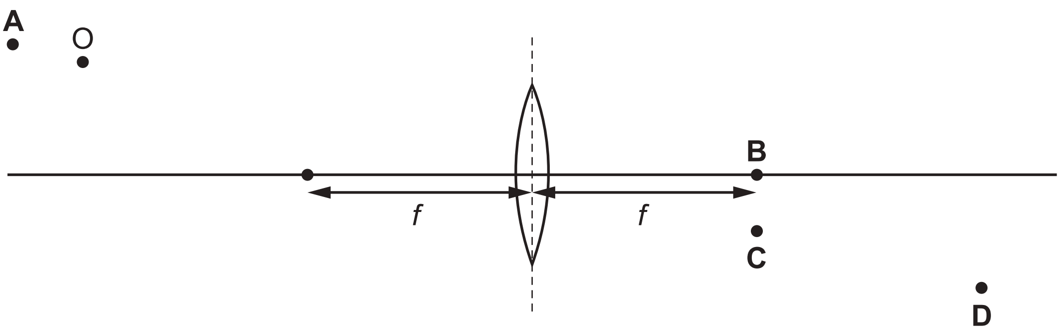


D

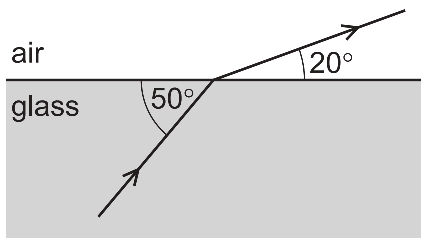


23 The diagram shows an object O in front of a thin converging lens of focal length *f*.

At which point will the lens form a sharp image of the object?



24 The diagram shows light travelling from glass to air.



What is the angle of refraction for this ray of light?

A 20° **B** 40° **C** 50° **D** 70°

25 Which piece of equipment is designed to produce a type of electromagnetic wave?

A electric fire

B electric generator

C electric motor

D electromagnet

26 What is ultrasound?

A sound waves that are so loud that they damage human hearing

B sound waves that are too high-pitched for humans to hear

C sound waves that are too low-pitched for humans to hear

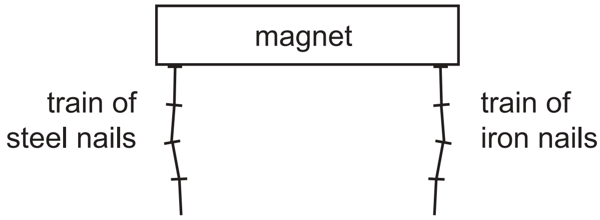
D sound waves that are too quiet for humans to hear

27 A student finds that it takes sound 0.33 seconds to travel 100 metres.

From this information, what is the speed of sound?

A 30 m / s **B** 60 m / s **C** 300 m / s **D** 600 m / s

28 A train of steel nails and a train of iron nails hang from a strong magnet.



The trains are then carefully removed from the magnet.

What happens to the trains?

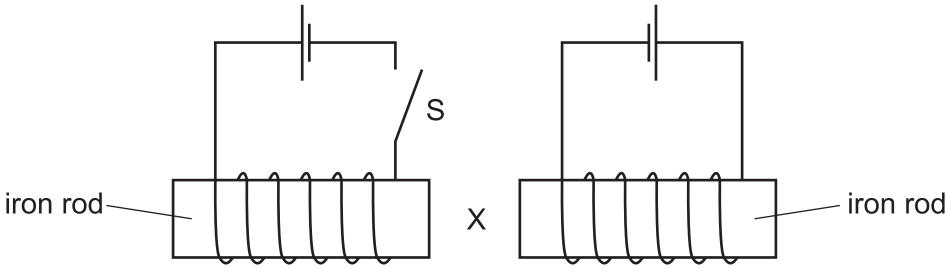
A Both trains fall apart.

B Both trains stay together.

C Only the train of iron nails falls apart.

D Only the train of steel nails falls apart.

29 Two circuits are set up as shown. The iron rods are placed close together and are able to move.



What happens to the size of the gap at X when switch S is closed?

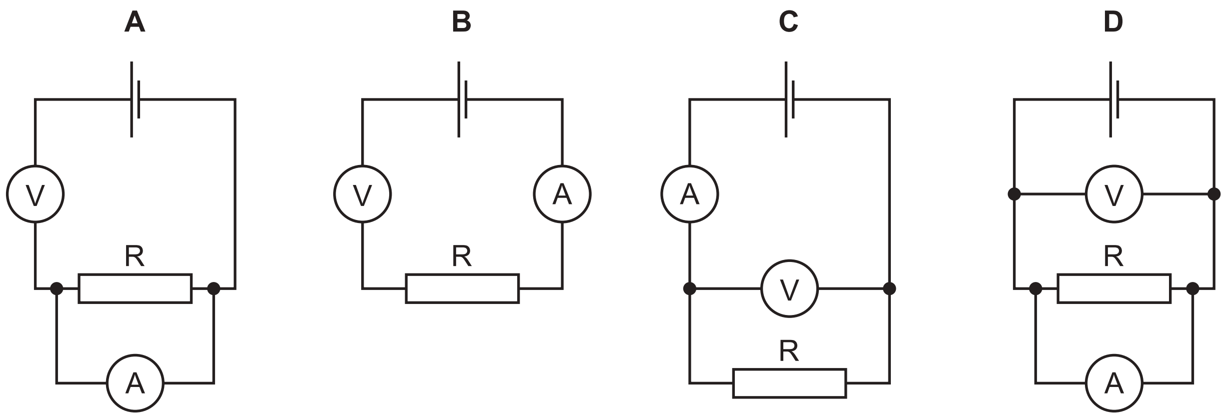
A It decreases.

B It decreases then increases.

C It increases.

D It does not change.

30 Which circuit can be used to determine the resistance of resistor R?



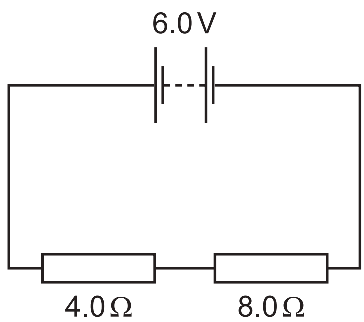
31 A wire has a resistance *R*.

A second wire made from the same metal has double the length and has double the diameter of the first wire.

What is the resistance of the second wire?

A $\frac{R}{2}$ **B** R **C** $4R$ **D** $8R$

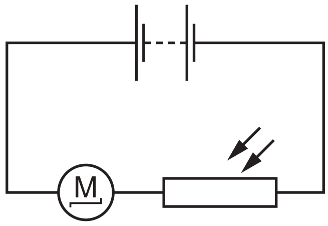
32 The circuit diagram shows a 4.0 Ω resistor and an 8.0 Ω resistor connected to a 6.0 V battery.



What is the potential difference (p.d.) across the 4.0 Ω resistor?

A 0.5 V **B** 2.0 V **C** 4.0 V **D** 6.0 V

33 The diagram shows a motor and a light-dependent resistor (LDR) connected in a circuit.



Which change decreases the current in the motor so that it turns more slowly?

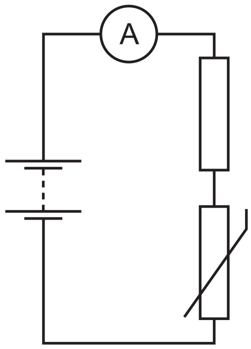
A connecting a resistor in parallel with the LDR

B connecting a resistor in series with the LDR

C exchanging the positions of the motor and the LDR in the circuit

D increasing the brightness of the light falling on the LDR

34 The diagram shows a circuit with a fixed resistor connected in series with a thermistor and an ammeter.



Which row shows how temperature change affects the resistance of the thermistor and the current in the circuit?

	temperature	resistance of thermistor	current in circuit
A	decreases	decreases	increases
B	decreases	increases	decreases
C	increases	decreases	decreases
D	increases	increases	increases

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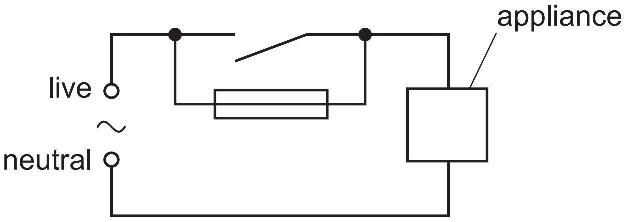
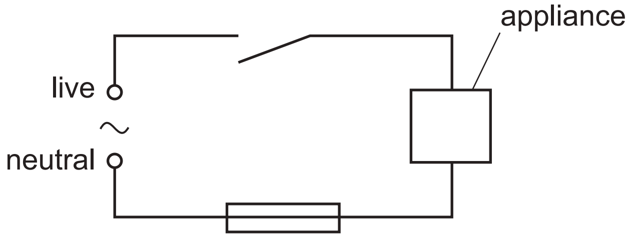
35 An appliance is connected to a mains supply. Its circuit also contains a switch and a fuse.

Which circuit shows the fuse in the correct position?

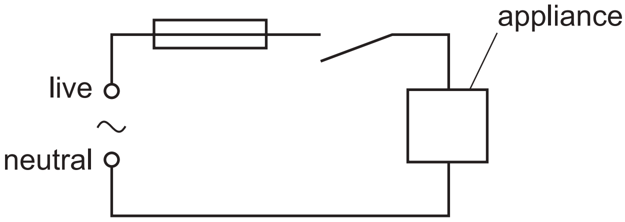
A



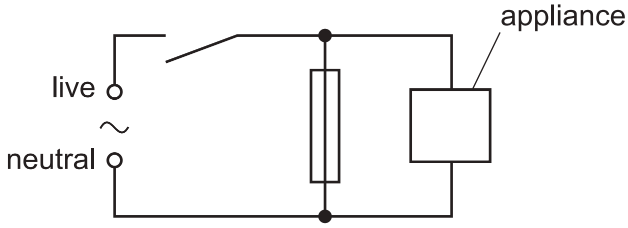
B



C



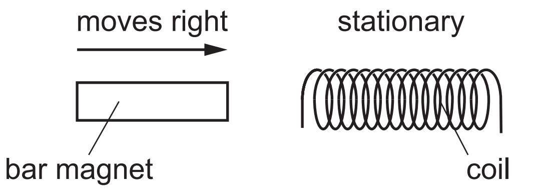
D



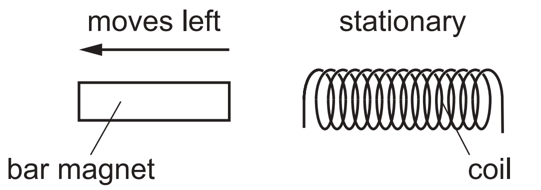
36 The diagram shows a bar magnet and a coil of wire. The bar magnet is moved at the same speed in each experiment.

In which situation is the largest electromotive force (e.m.f.) induced?

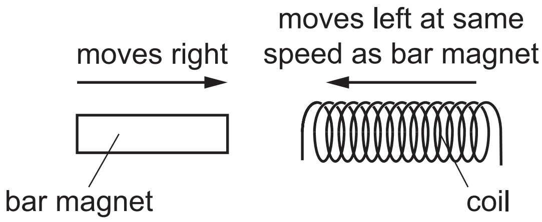
A



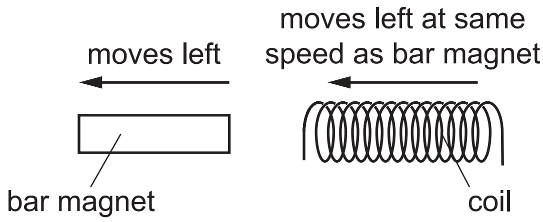
B



C



D



37 Diagram 1 shows a wire carrying an electric current. The wire is between the poles of a magnet.

The current and the magnetic field produce a force on the wire which is upwards, as shown.

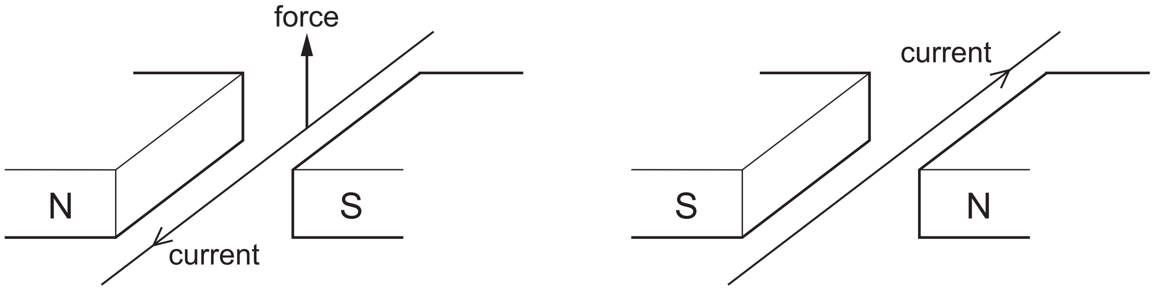


diagram 1 diagram 2

The magnetic poles and the current are now both reversed, as in diagram 2.

In which direction is the force on the wire in diagram 2?

A downwards

B towards the North pole of the magnet

C towards the South pole of the magnet

D upwards

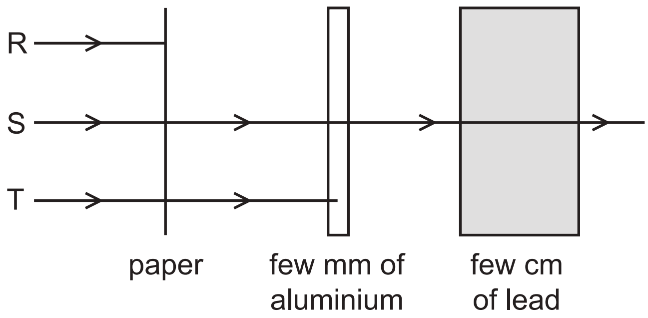
38 A nuclide of radon-222 is represented by $^{222}_{86}\text{Rn}$.

How many protons and how many neutrons are in a nucleus of this nuclide?

	protons	neutrons
A	86	136
B	86	222
C	222	86
D	222	136

39 A radioactive source emits three types of radiation R, S and T.

The diagram shows an experiment set up to study the penetrating properties of R, S and T.



Which types of radiation are R, S and T?

	R	S	T
A	α-particles	β-particles	γ-rays
B	α-particles	γ-rays	β-particles
C	β-particles	α-particles	γ-rays
D	γ-rays	β-particles	α-particles

40 A radioactive source has a half-life of 0.5 hours.

A detector near the source shows a reading of 6000 counts per second.

Background radiation can be ignored.

What is the reading on the detector 1.5 hours later?

A 750 counts per second

B 1500 counts per second

C 2000 counts per second

D 3000 counts per second

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Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/13**

Paper 1 Multiple Choice (Core) **October/November 2017**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

* 2 9 8 2 6 5 4 5 1 3 *

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **19** printed pages and **1** blank page.

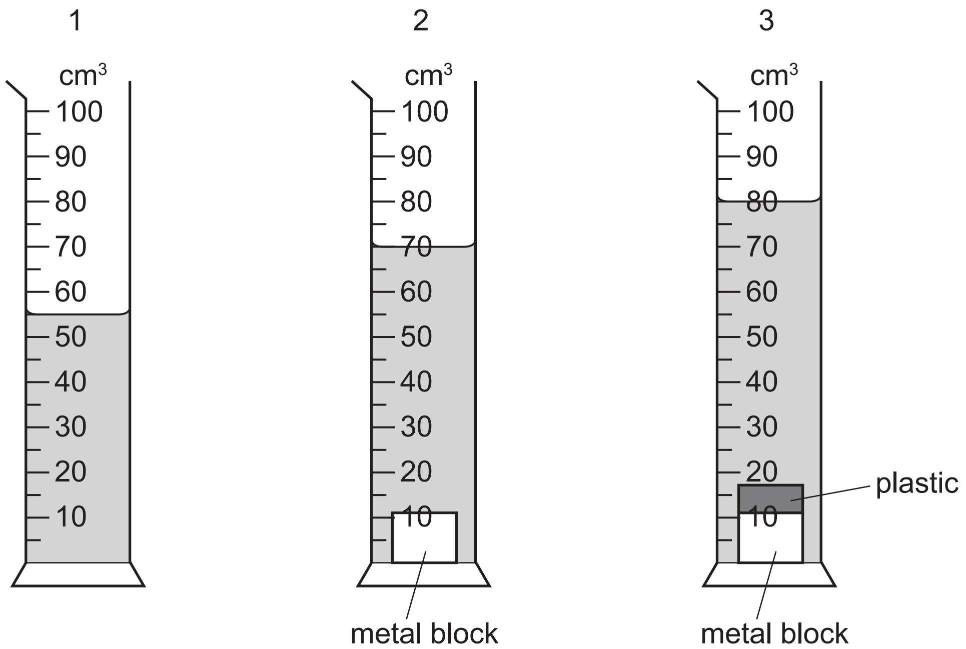
IB17 11_0625_13/4RP

CAMBRIDGE
International Examinations

1 A measuring cylinder contains some water. A small metal block is slowly lowered into the water and is then removed.

Finally a piece of plastic is attached to the metal block and the block is again slowly lowered into the water.

The diagrams show the measuring cylinder at each stage of this process.



What is the volume of the piece of plastic?

A $10\,cm^3$ **B** $25\,cm^3$ **C** $70\,cm^3$ **D** $80\,cm^3$

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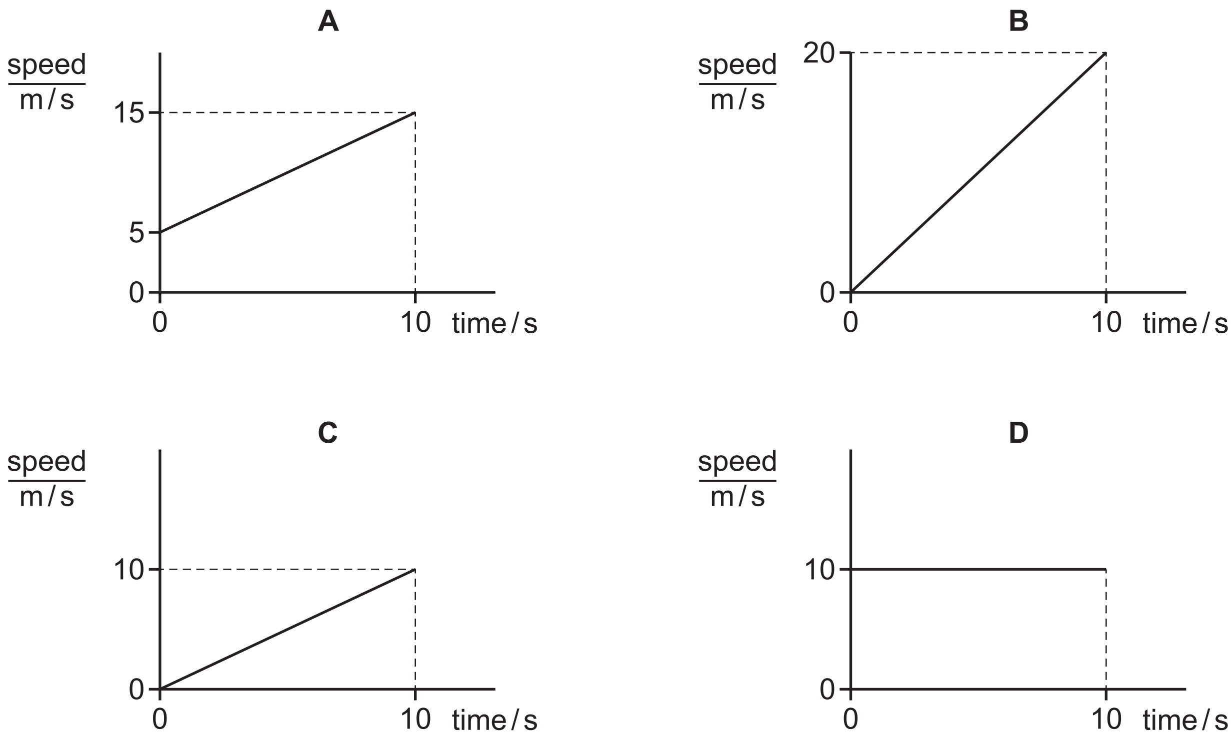
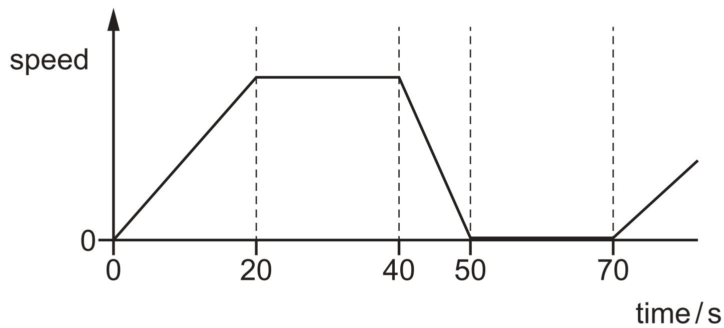
2 A car accelerates from rest and travels a distance of 100 m in 10 seconds.

Which speed-time graph represents the motion of this car?



3 The diagram is the speed-time graph for a bicycle journey.



When is the bicycle moving at a constant speed?

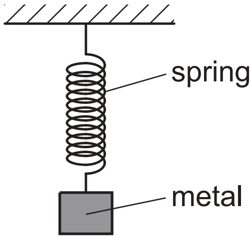
A between 0 and 20 s

B between 20 s and 40 s

C between 40 s and 50 s

D between 50 s and 70 s

4 A spring is stretched by hanging a piece of metal from it.



Which name is given to the force that stretches the spring?

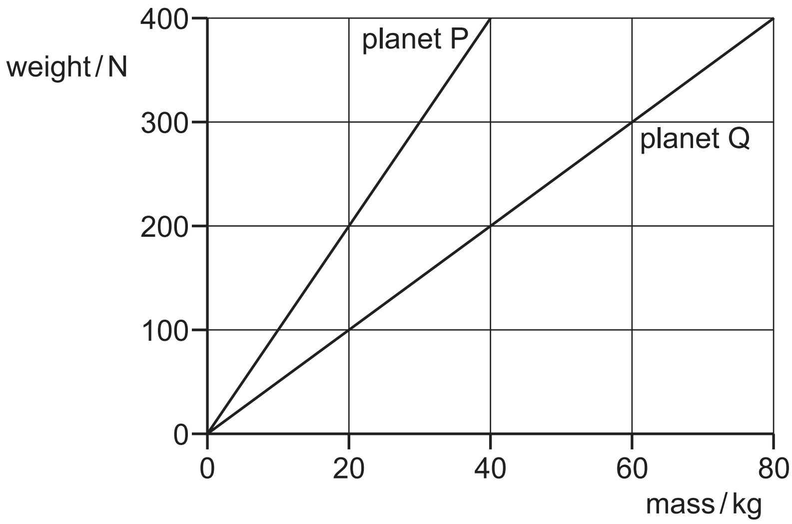
A friction

B mass

C pressure

D weight

5 The graph shows how weight varies with mass on planet P and on planet Q.



An object weighs 400 N on planet P. The object is taken to planet Q.

Which row is correct?

	mass of object on planet Q / kg	weight of object on planet Q / N
A	40	200
B	40	400
C	80	200
D	80	400

6 What is needed to determine the density of a regularly shaped block?

A a balance and a beaker

B a balance and a ruler

C a measuring cylinder and a beaker

D a measuring cylinder and a ruler

7 A cart experiences a forward force of 500 N.

The cart also experiences a backward force of 200 N.

There are no other forward or backward forces on the cart.

What is the resultant force on the cart?

A 300 N backwards

B 300 N forwards

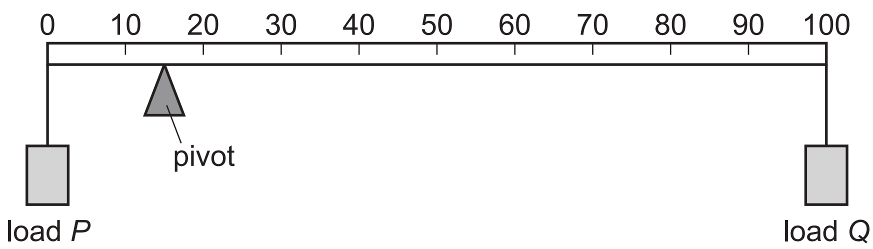
C 700 N backwards

D 700 N forwards

8 The diagram shows a beam with a pivot, a load *P* at one end and a load *Q* at the other end.

The pivot can be moved left or right and the loads can be increased or decreased.

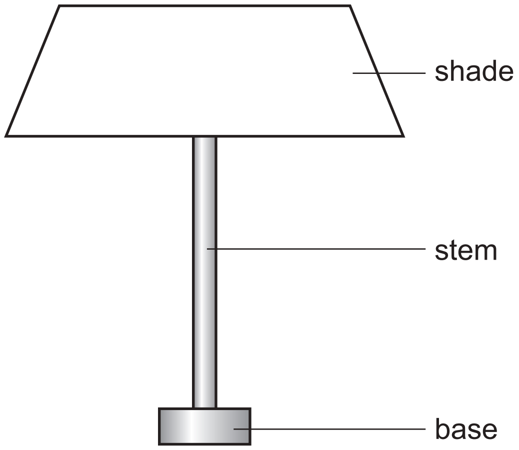
The weight of the beam can be ignored.



Which combination of pivot position and loads causes the beam to be in equilibrium?

	pivot position / cm	load *P* / N	load *Q* / N
A	30	6.0	4.0
B	40	6.0	4.0
C	50	5.0	9.0
D	60	3.0	9.0

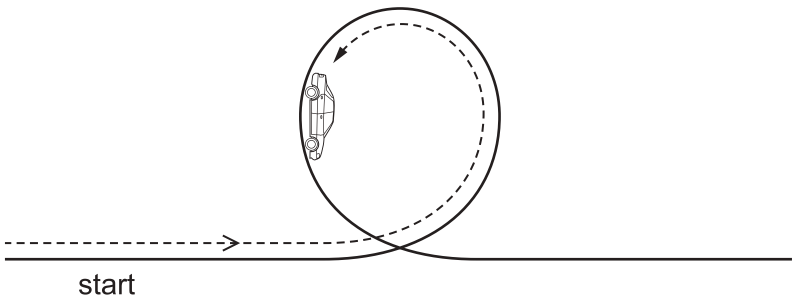
9 The lamp in the diagram is not very stable and falls over easily.



Which row shows changes that would definitely make the lamp more stable?

	base	centre of gravity
A	narrower	higher
B	narrower	lower
C	wider	higher
D	wider	lower

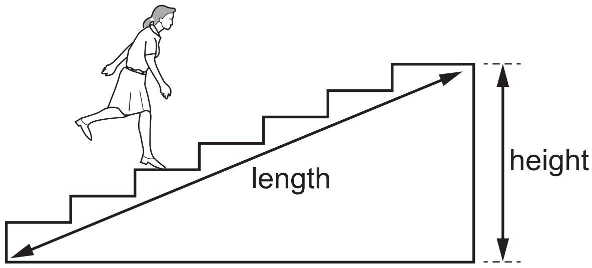
10 A toy car without a motor is moving at high speed along a track. The toy car follows a vertical loop as shown.



Which row describes the changes that are taking place in the kinetic energy and in the gravitational potential energy of the car in the position shown?

	kinetic energy	gravitational potential energy
A	decreasing	decreasing
B	decreasing	increasing
C	increasing	decreasing
D	increasing	increasing

11 A student runs up a flight of stairs.



Which information is **not** needed to calculate the rate at which the student is doing work against gravity?

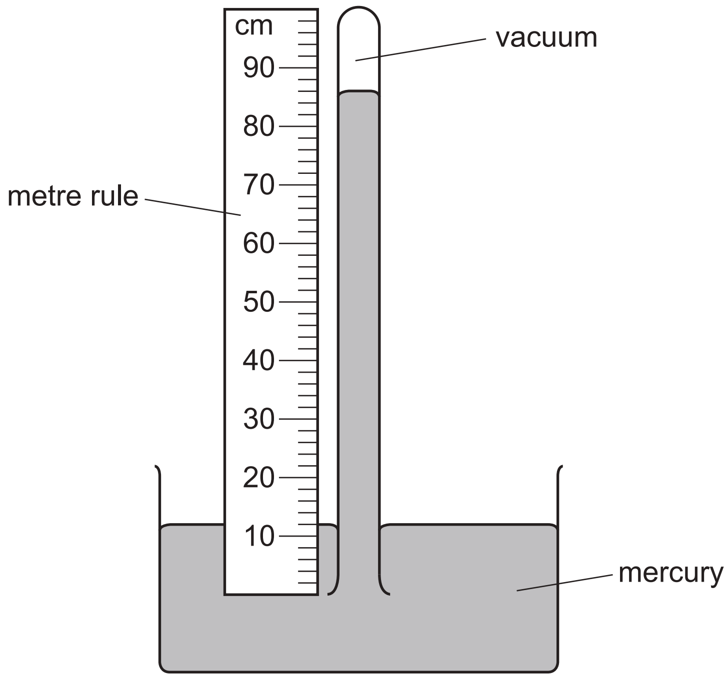
A the height of the flight of stairs

B the length of the flight of stairs

C the time taken to run up the stairs

D the weight of the student

12 The diagram shows a simple mercury barometer.



Which length is used to find the value of atmospheric pressure?

A 12 cm **B** 74 cm **C** 86 cm **D** 100 cm

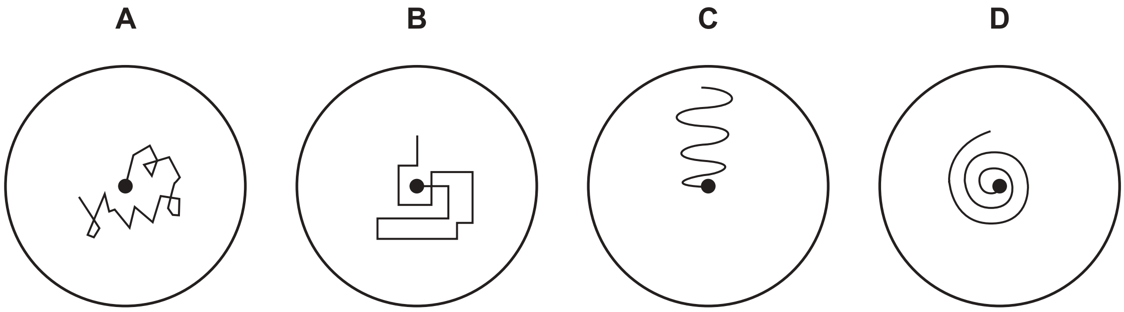
13 A polystyrene cube of mass 5.0 kg is placed on a horizontal surface. The pressure due to the cube is $89\,N/m^2$.

What is the length of the sides of the cube?

A 0.56 m **B** 0.75 m **C** 1.3 m **D** 1.8 m

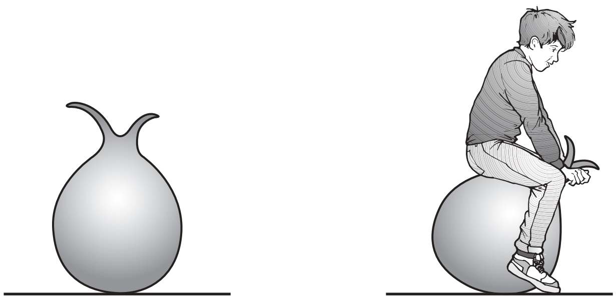
14 A pollen grain in a beaker of still water is viewed through a microscope.

Which diagram shows the most likely movement of the pollen grain?



15 The diagram shows an air-filled rubber toy. A child sits on the toy and its volume decreases.

The temperature of the air in the toy does not change.



How does the air pressure in the toy change and why?

	pressure	reason
A	decreases	air molecules move more slowly
B	decreases	air molecules strike the rubber less frequently
C	increases	air molecules move more quickly
D	increases	air molecules strike the rubber more frequently

16 Which property **cannot** be used for the measurement of temperature?

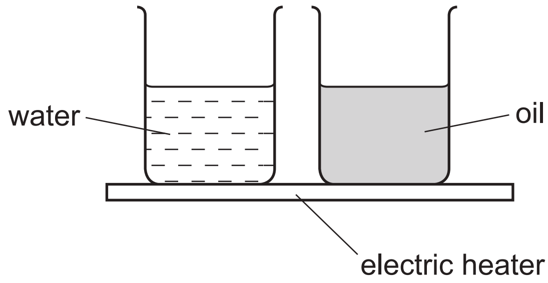
A half-life of a radioactive isotope

B length of a solid metal bar

C pressure of a gas

D volume of a liquid

17 The diagram shows an electric heater being used to heat a beaker of water and an identical beaker containing oil. Both are heated for one minute.



The temperature of the water and the temperature of the oil increase steadily. The increase in temperature of the oil is much greater than that of the water.

Why is this?

A Oil has a higher boiling point than water.

B Oil has a lower boiling point than water.

C The oil has a larger thermal capacity than the water.

D The oil has a smaller thermal capacity than the water.

18 Why is the heating coil of a domestic immersion heater placed at the bottom of the tank?

A Cold water is less dense than hot water and therefore sinks.

B Cold water is more dense than hot water and therefore rises.

C Hot water is less dense than cold water and therefore rises.

D Hot water is more dense than cold water and therefore sinks.

19 A plane wave in a shallow tank of water of uniform depth is incident normally on the small gap in a barrier.

What happens after the wave passes through the gap?

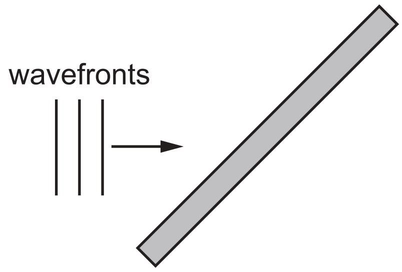
A The frequency increases.

B The speed decreases.

C The wavelength decreases.

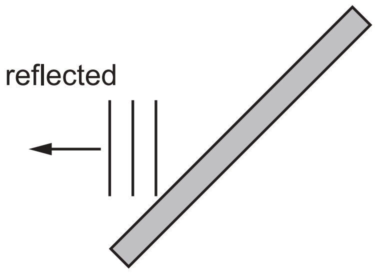
D The wave spreads out.

20 The diagram represents plane wavefronts of a water wave about to strike a solid barrier.

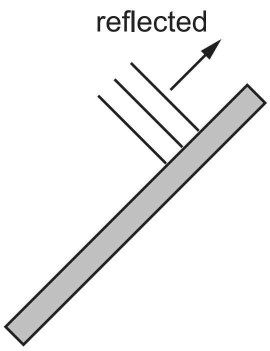


Which diagram shows the position of the wavefronts after reflection at the barrier?

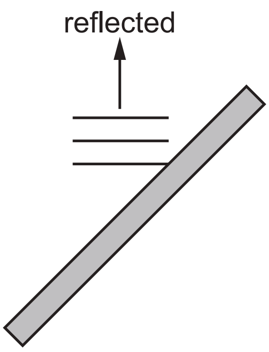
A



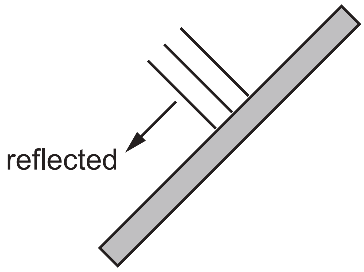
B



C

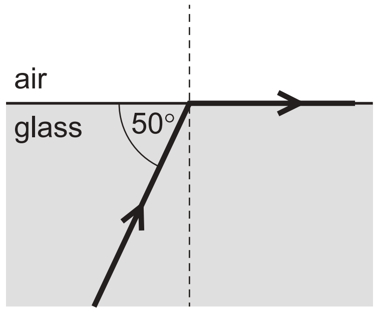


D



21 The diagram shows a ray of light in glass. The ray reaches a boundary with air.

One weak ray of light is missing from the diagram.



Which statement is correct?

A At the boundary, the speed of the light will become less.

B The critical angle for light at this boundary is 50°.

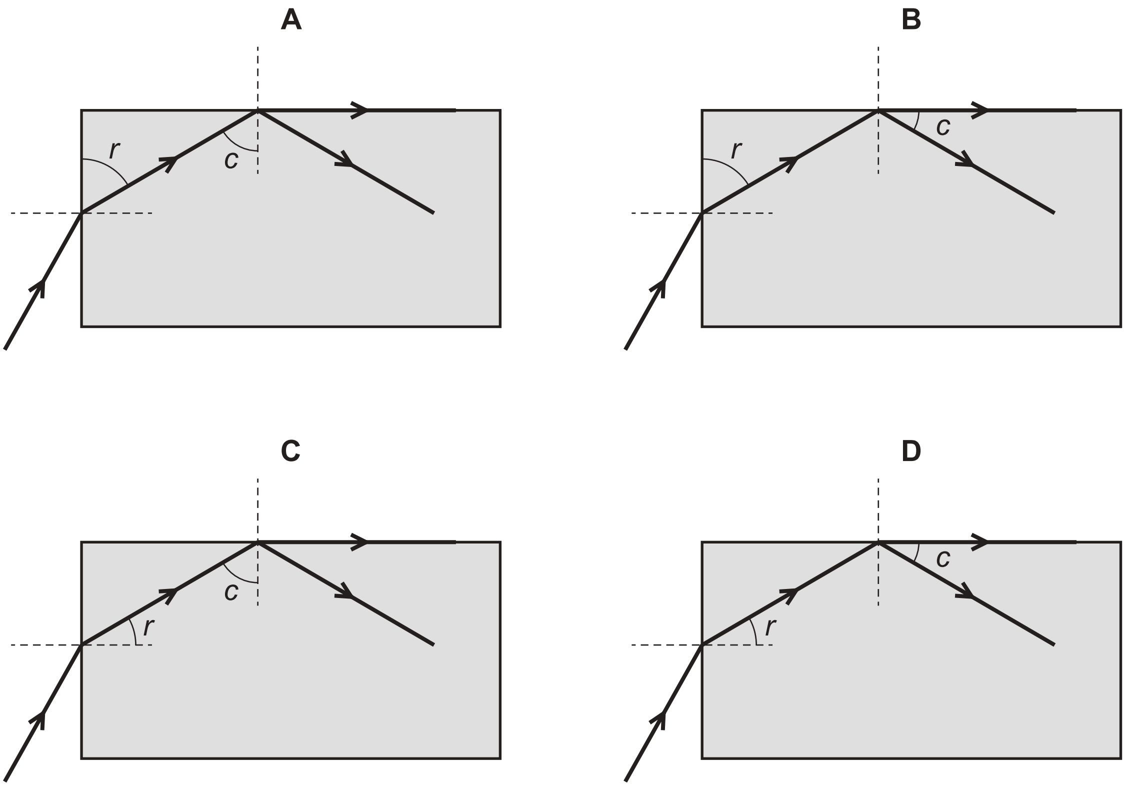
C The diagram shows an example of diffraction of light.

D The missing ray is a weak reflected ray.

22 Light enters a transparent block.

The light is refracted into the block and then strikes the top edge of the block at the critical angle.

Which diagram correctly shows the angle of refraction *r* and the critical angle *c*?



23 Which statement about radio waves is correct?

A They are used in television remote controllers.

B They can be detected by the human eye.

C They travel as longitudinal waves.

D They have the same speed in a vacuum as ultraviolet waves.

24 Which types of thermal energy transfer are due to electromagnetic waves?

A conduction and convection

B convection and radiation

C convection only

D radiation only

25 The speed of sound in air is 330 m / s.

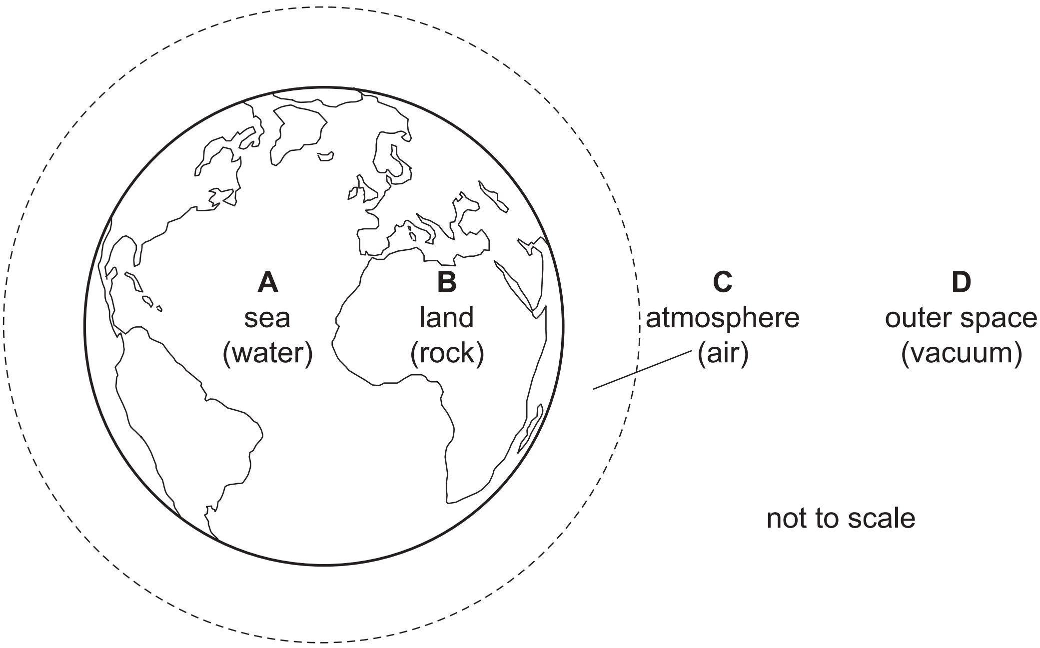
The speed of ultraviolet waves in air is 300 000 000 m / s.

Which row gives a possible frequency and speed of an ultrasound wave in air?

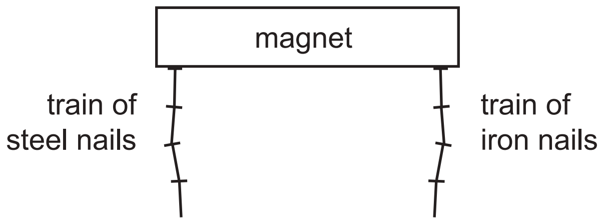
	frequency / Hz	speed / m / s
A	4000	330
B	4000	300 000 000
C	40 000	330
D	40 000	300 000 000

26 The diagram shows the Earth and its surroundings.

Through which labelled region can sound **not** be transmitted?



27 A train of steel nails and a train of iron nails hang from a strong magnet.



The trains are then carefully removed from the magnet.

What happens to the trains?

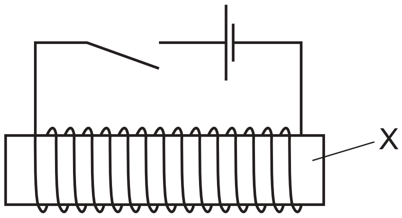
A Both trains fall apart.

B Both trains stay together.

C Only the train of iron nails falls apart.

D Only the train of steel nails falls apart.

28 The diagram shows an electromagnet.



Which material is part X made from?

A copper

B iron

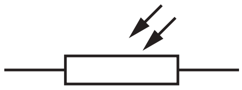
C steel

D tin

29 In which unit is the electromotive force (e.m.f.) of a battery measured?

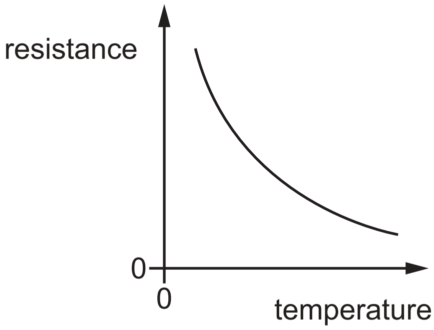
A A **B** J **C** N **D** V

30 The diagram shows a circuit symbol for a component that can be used as an input transducer.

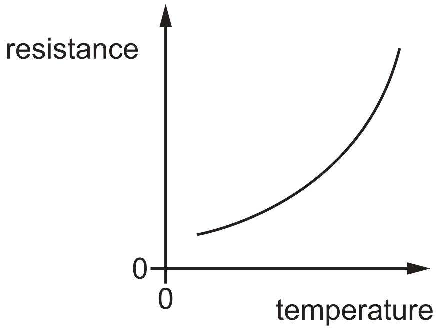


Which graph shows how the resistance of the component varies with its intended input variable?

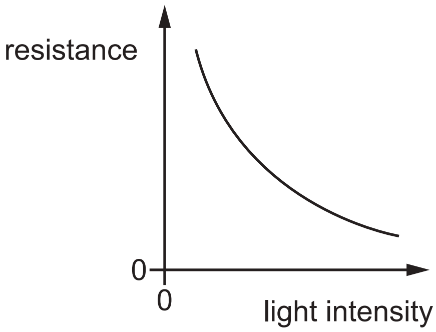
A



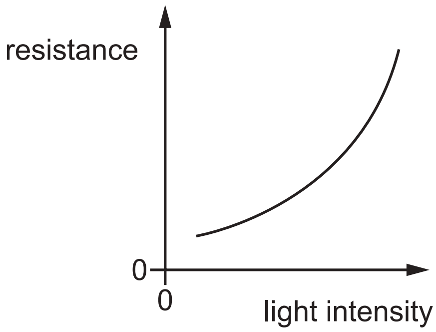
B



C



D



31 Which statement is **not** correct for two identical lamps connected in parallel?

A The potential difference across each lamp is half the supply voltage.

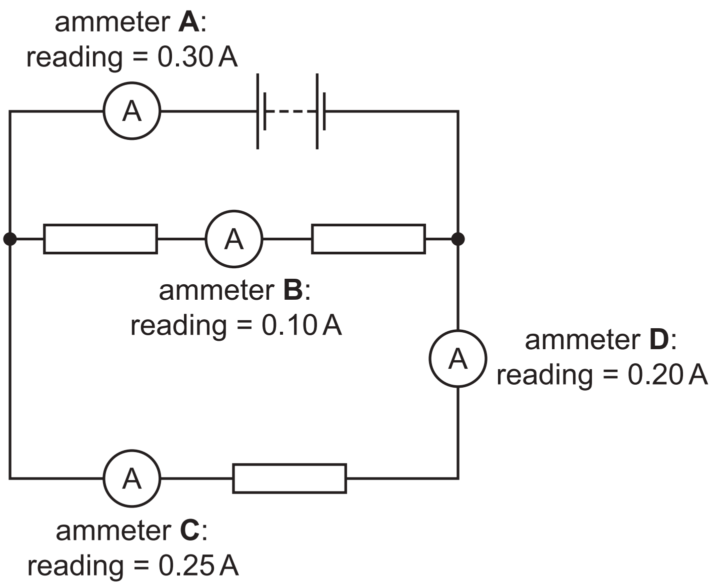
B The remaining lamp still operates when one lamp is removed.

C They can be switched on and off separately.

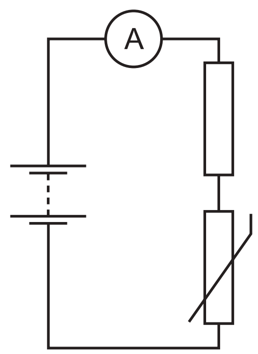
D They remain bright if another lamp is connected in parallel.

32 Only one of the ammeters in the circuit is showing an incorrect reading.

Which ammeter is showing the **incorrect** reading?



33 The diagram shows a circuit with a fixed resistor connected in series with a thermistor and an ammeter.



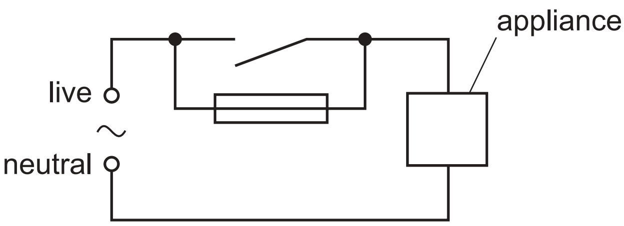
Which row shows how temperature change affects the resistance of the thermistor and the current in the circuit?

	temperature	resistance of thermistor	current in circuit
A	decreases	decreases	increases
B	decreases	increases	decreases
C	increases	decreases	decreases
D	increases	increases	increases

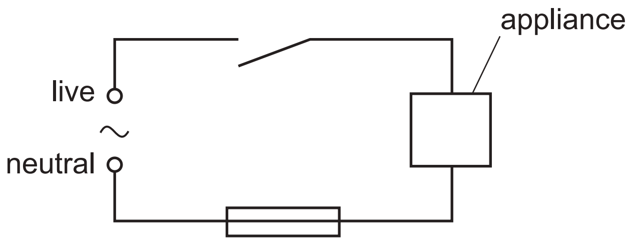
34 An appliance is connected to a mains supply. Its circuit also contains a switch and a fuse.

Which circuit shows the fuse in the correct position?

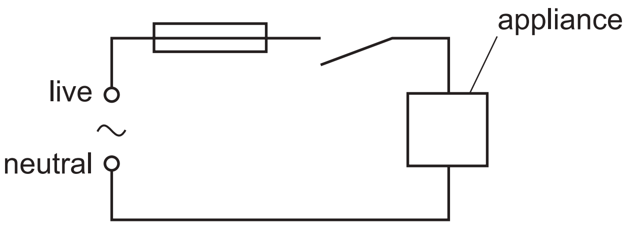
A



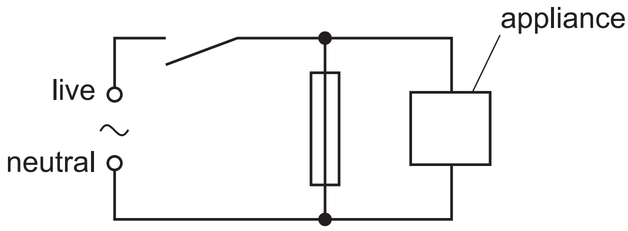
B



C



D



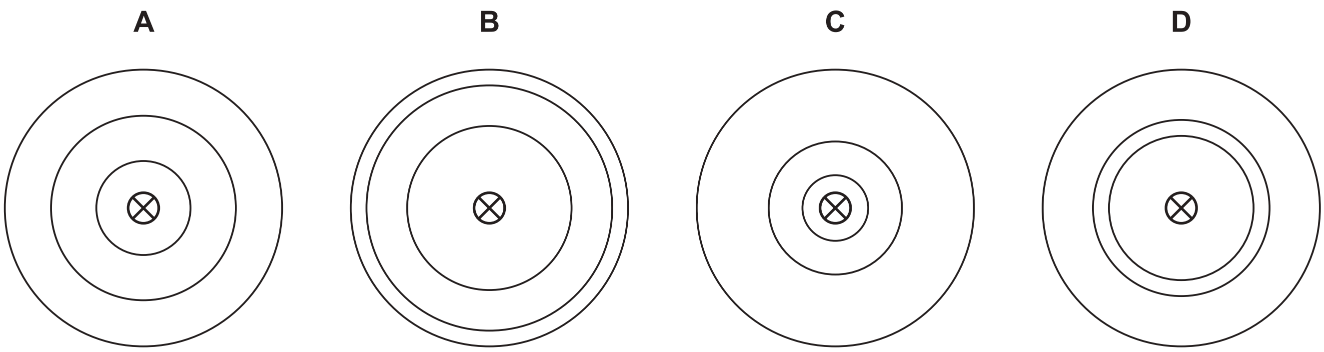
35 An electrical device requires a voltage of 5.0 V to operate normally. The mains supply voltage is 250 V.

Which row shows a transformer that provides output voltage that enables the device to operate normally when connected to the mains supply?

	number of turns on the primary coil	number of turns on the secondary coil
A	500	2500
B	500	25 000
C	2500	500
D	25 000	500

36 A straight current-carrying wire has a magnetic field around it.

Which diagram best shows the magnetic field pattern around the wire?



37 Which row states the charge on an electron and states whether electrons are located inside the nucleus of an atom?

	charge	located inside the nucleus
A	negative	no
B	negative	yes
C	positive	no
D	positive	yes

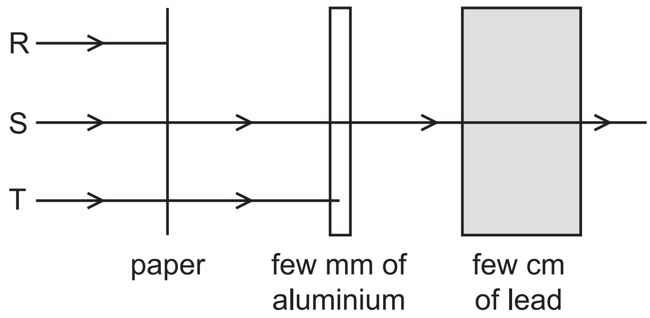
38 The element sodium, symbol Na, has a proton number of 11.

Which is a possible symbol for a sodium nuclide?

A $^{9}_{11}Na$ **B** $^{11}_{9}Na$ **C** $^{11}_{23}Na$ **D** $^{23}_{11}Na$

39 A radioactive source emits three types of radiation R, S and T.

The diagram shows an experiment set up to study the penetrating properties of R, S and T.



Which types of radiation are R, S and T?

	R	S	T
A	α-particles	β-particles	γ-rays
B	α-particles	γ-rays	β-particles
C	β-particles	α-particles	γ-rays
D	γ-rays	β-particles	α-particles

40 Radioactive iodine-131 emits β-particles and has a half-life of 8 days. It decays to produce xenon-131.

Which statement about this decay is correct?

A After 8 days no more β-particles are emitted.

B After 8 days the number of xenon-131 atoms has halved.

C After 16 days the iodine-131 has decayed completely.

D After 16 days the number of iodine-131 atoms has reduced to one quarter.

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Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/21**

Paper 2 Multiple Choice (Extended) **October/November 2017**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

6133216338

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

IB17 11_0625_21/4RP

CAMBRIDGE International Examinations

1 A student measures the volume of a cork.

He puts some water into a measuring cylinder and then one glass ball. He puts the cork and then a second, identical glass ball into the water as shown.

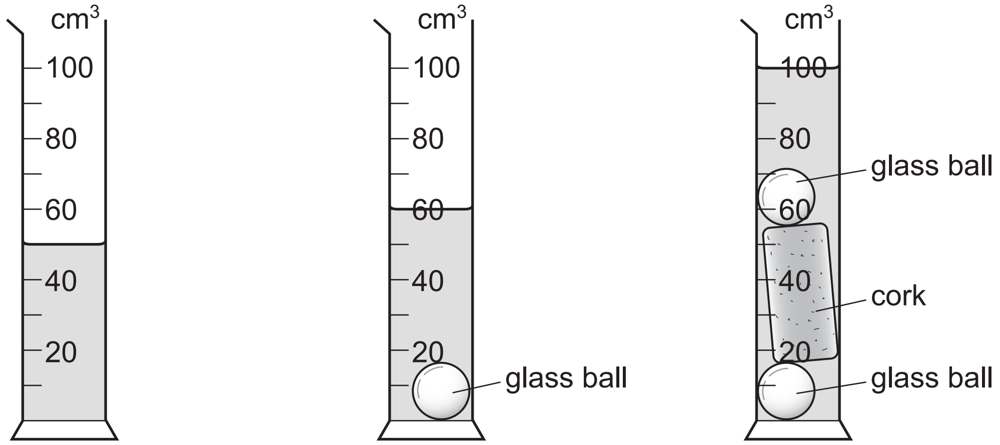


diagram 1 diagram 2 diagram 3

Diagram 1 shows the first water level.

Diagram 2 shows the water level after one glass ball is added.

Diagram 3 shows the water level after the cork and the second glass ball are added.

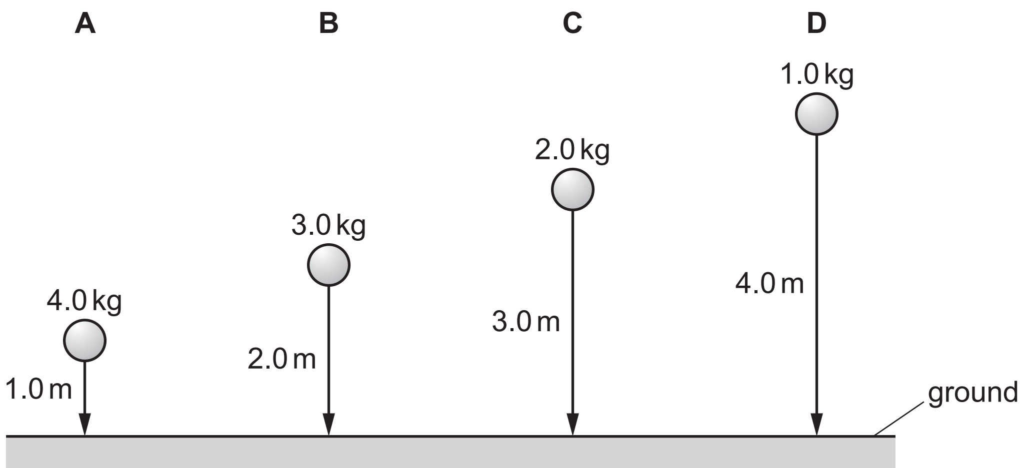
What is the volume of the cork?

A $30\,cm^3$ **B** $40\,cm^3$ **C** $50\,cm^3$ **D** $100\,cm^3$

2 Four balls with different masses are dropped from the heights shown.

Air resistance may be ignored.

Which ball has the smallest average speed?



3 An ice crystal falls vertically from a cloud.

What happens to the acceleration of the ice crystal as it falls?

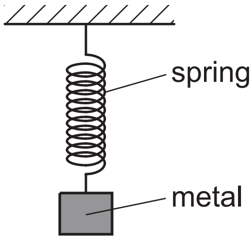
A It decreases because of air resistance.

B It decreases because of gravity.

C It increases because of air resistance.

D It increases because of gravity.

4 A spring is stretched by hanging a piece of metal from it.



Which name is given to the force that stretches the spring?

A friction

B mass

C pressure

D weight

5 Which object has the greatest weight?

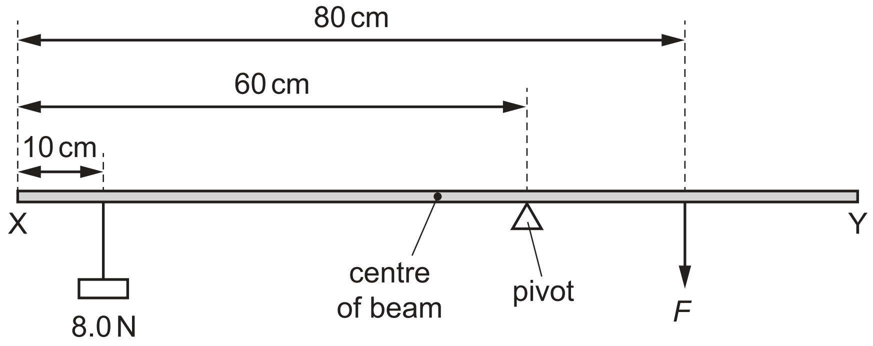
A an object of mass 10 kg in a 15 N / kg gravitational field

B an object of mass 15 kg in a 13 N / kg gravitational field

C an object of mass 20 kg in a 9.0 N / kg gravitational field

D an object of mass 50 kg in a 3.0 N / kg gravitational field

6 A uniform beam XY is 100 cm long and weighs 4.0 N.



The beam rests on a pivot 60 cm from end X.

A load of 8.0 N hangs from the beam 10 cm from end X.

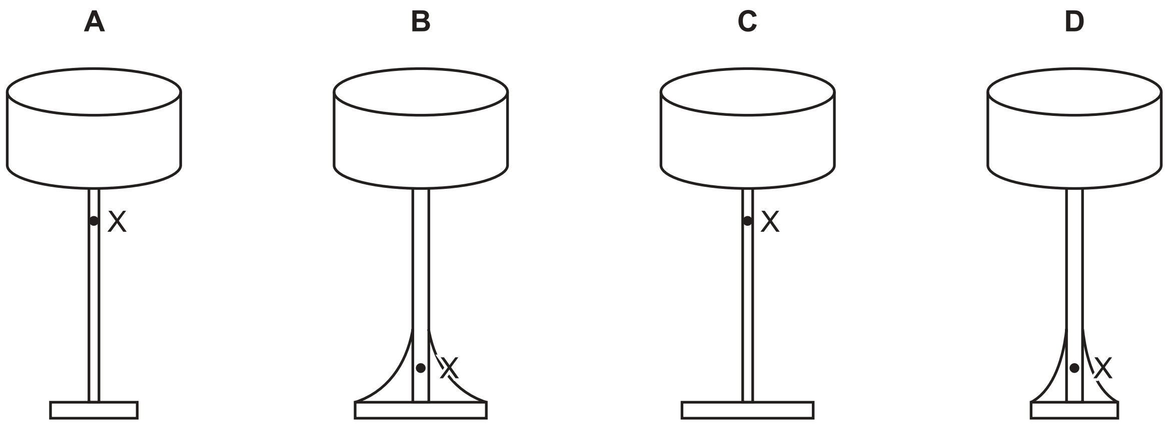
The beam is kept balanced by a force *F* acting on the beam 80 cm from end X.

What is the magnitude of force *F*?

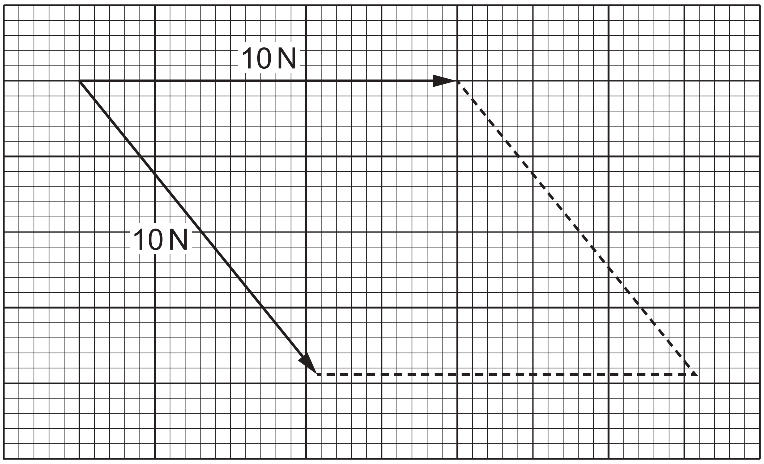
A 8.0 N **B** 18 N **C** 22 N **D** 44 N

7 The diagrams show four table lamps resting on a table. The position of the centre of mass of each lamp is labelled X.

Which lamp is the most stable?



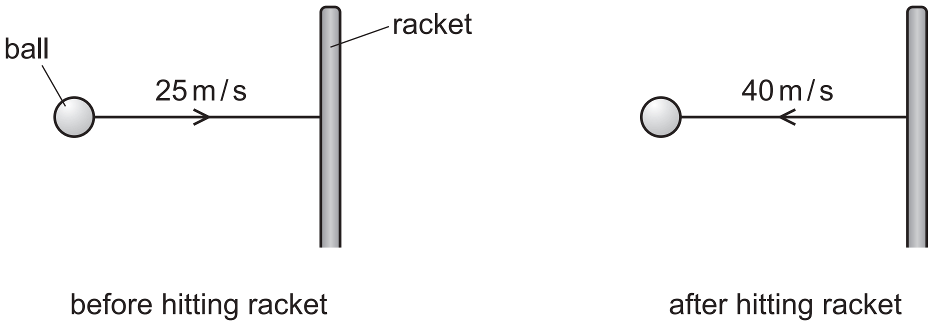
8 The diagram shows an incomplete scale drawing to find the resultant of two 10 N forces acting at a point in the directions shown.



What is the magnitude of the resultant force?

A 7.5 N **B** 8.6 N **C** 18 N **D** 20 N

9 A tennis ball of mass 0.060 kg travels horizontally at a speed of 25 m / s. The ball hits a tennis racket and rebounds horizontally at a speed of 40 m / s.

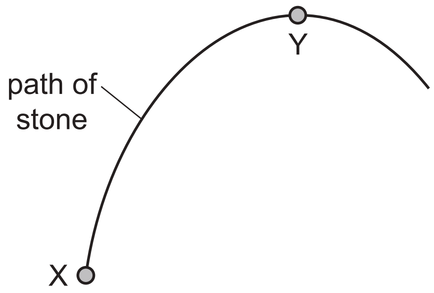


The ball is in contact with the racket for 50 ms.

What force does the racket exert on the ball?

A 0.018 N **B** 0.078 N **C** 18 N **D** 78 N

10 The diagram shows the path of a stone that is thrown from X and reaches its maximum height at Y.



The stone gains 10 J of gravitational potential energy as it moves from X to Y.

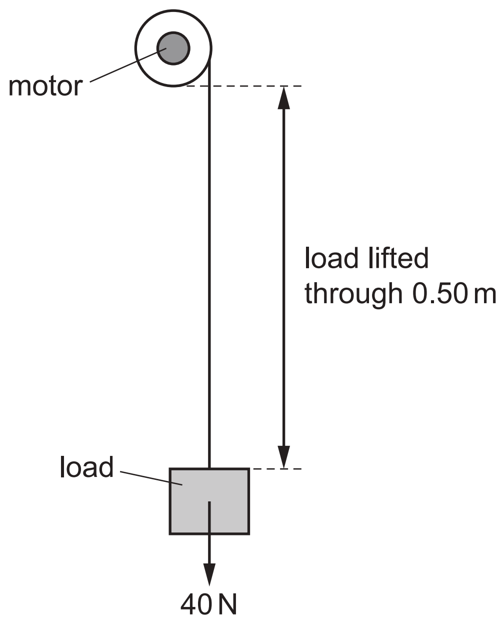
The stone has 2.0 J of kinetic energy at Y.

Air resistance can be ignored.

How much kinetic energy did the stone have immediately after it was thrown at X?

A 2.0 J **B** 8.0 J **C** 10 J **D** 12 J

11 A motor is used to lift a load of 40 N.

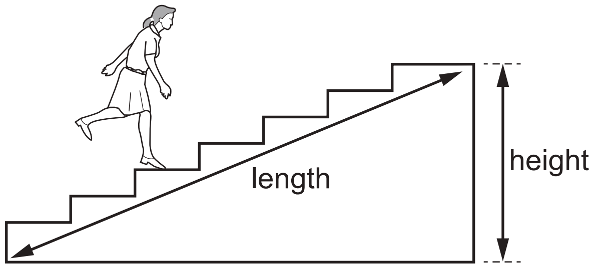


The power of the motor is 40 W and the system is 20% efficient.

How long does it take the motor to lift the load through 0.50 m?

A 0.50 s **B** 2.5 s **C** 5.0 s **D** 25 s

12 A student runs up a flight of stairs.



Which information is **not** needed to calculate the rate at which the student is doing work against gravity?

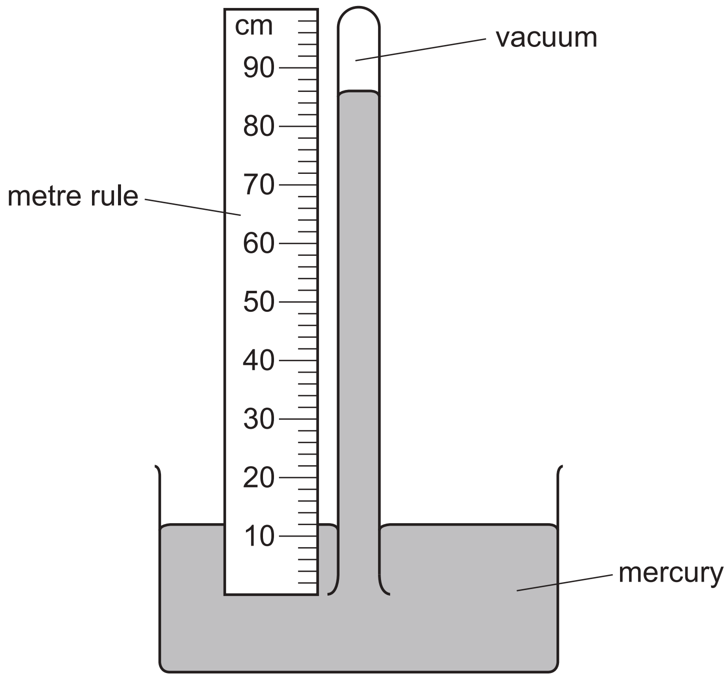
A the height of the flight of stairs

B the length of the flight of stairs

C the time taken to run up the stairs

D the weight of the student

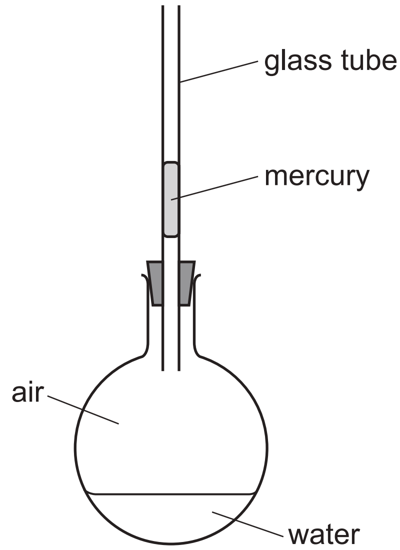
13 The diagram shows a simple mercury barometer.



Which length is used to find the value of atmospheric pressure?

A 12 cm **B** 74 cm **C** 86 cm **D** 100 cm

14 The diagram shows a glass flask, sealed with a small volume of mercury in a glass tube. When the flask is gently warmed the mercury rises up the tube.



What is the main cause of the movement of the mercury?

A expansion of air in the flask

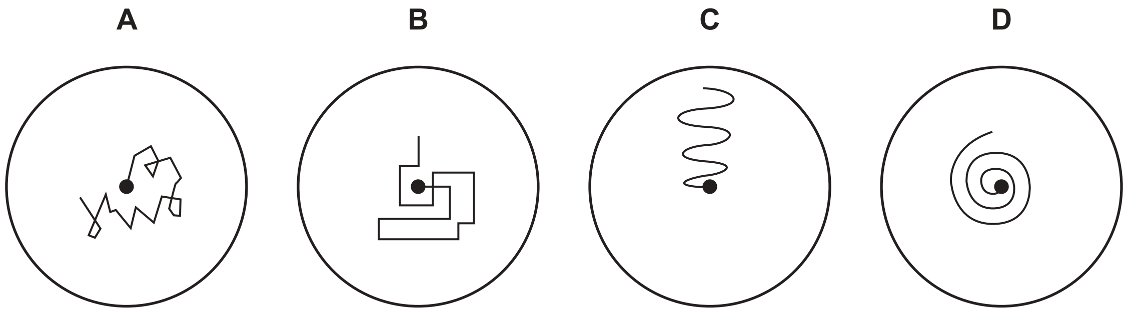
B expansion of the glass flask

C expansion of the glass tube

D expansion of the mercury

15 A pollen grain in a beaker of still water is viewed through a microscope.

Which diagram shows the most likely movement of the pollen grain?



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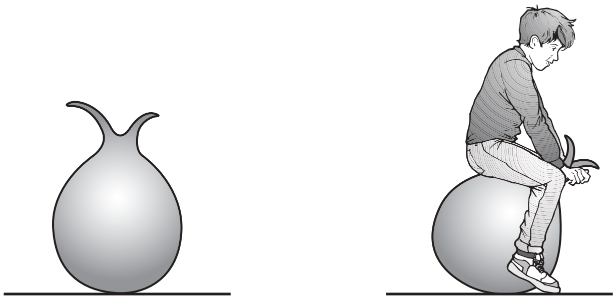
16 The diagram shows an air-filled rubber toy. A child sits on the toy and its volume decreases.

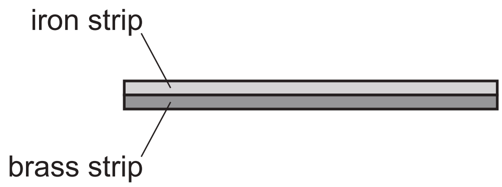
The temperature of the air in the toy does not change.



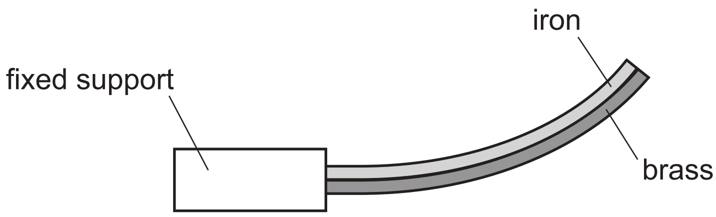
How does the air pressure in the toy change and why?

	pressure	reason
A	decreases	air molecules move more slowly
B	decreases	air molecules strike the rubber less frequently
C	increases	air molecules move more quickly
D	increases	air molecules strike the rubber more frequently

17 A strip of iron and a strip of brass are firmly attached to each other along their entire length. This combination is a bimetallic strip.



This bimetallic strip is heated and it bends as shown.



The bimetallic strip is now cooled and becomes straight again.

What causes the bimetallic strip to become straight again?

A The brass contracts more than the iron.

B The brass expands more than the iron.

C The iron contracts more than the brass.

D The iron expands more than the brass.

18 An aluminium block has a mass of 200 g.

The specific heat capacity of aluminium is 900 J / (kg °C).

How much energy is needed to raise the temperature of the block from 20 °C to 110 °C?

A 2.0 J **B** 200 J **C** 16 200 J **D** 16 200 000 J

19 Which statement about convection currents is correct?

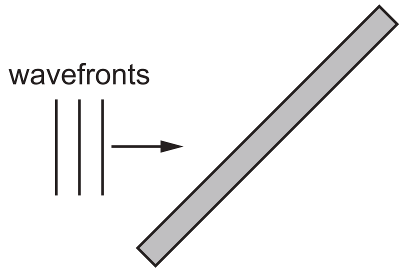
A Convection currents occur because, when cooled, liquids contract and become more dense.

B Convection currents occur because, when warmed, liquids expand and become more dense.

C Convection currents only occur in liquids.

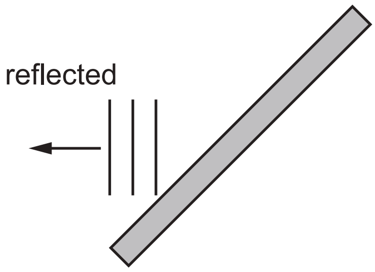
D Convection currents only occur in solids and liquids.

20 The diagram represents plane wavefronts of a water wave about to strike a solid barrier.

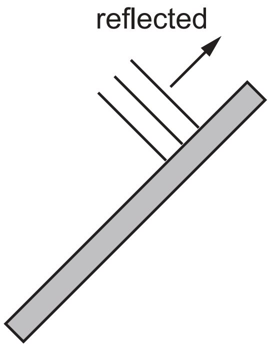


Which diagram shows the position of the wavefronts after reflection at the barrier?

A



B



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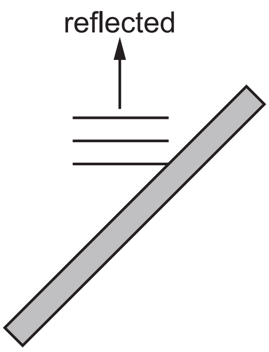
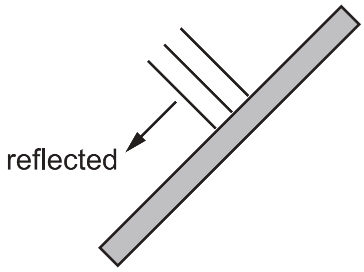
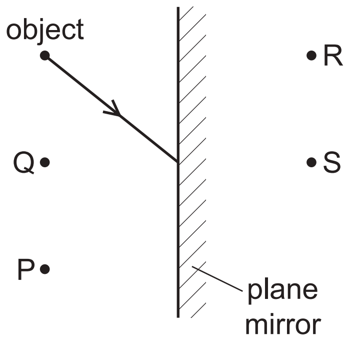


D



21 The diagram shows an object in front of a plane mirror. A ray of light from the object is incident on the mirror.



Through which point does the reflected ray pass, and at which point is the image of the object formed?

	point through which reflected ray passes	point at which image is formed
A	P	R
B	P	S
C	Q	R
D	Q	S

22 A laser is a source of light with a single frequency.

Which description of this type of light is correct?

A dispersed

B focused

C monochromatic

D refracted

23 Visible light, X-rays and microwaves are all components of the electromagnetic spectrum.

Which statement about the waves is correct?

A In a vacuum, microwaves travel faster than visible light and have a shorter wavelength.

B In a vacuum, microwaves travel at the same speed as visible light and have a shorter wavelength.

C In a vacuum, X-rays travel faster than visible light and have a shorter wavelength.

D In a vacuum, X-rays travel at the same speed as visible light and have a shorter wavelength.

24 The Moon is 380 000 km from the Earth. A laser light beam is directed from the Earth to the Moon. The beam is reflected back to the Earth.

How long does it take for the light to travel to the Moon and back to the Earth?

A 1.27 ms **B** 2.53 ms **C** 1.27 s **D** 2.53 s

25 Which wavefront is travelling at a speed closest to that of a sound wave through a solid?

A one that moves 10 m in 0.01 s

B one that moves 50 m in 0.5 s

C one that moves 1000 m in 100 s

D one that moves 2000 m in 2000 s

26 Different waves travel through air.

Which waves have the greatest difference in speed?

A ultrasound waves and sound waves

B ultrasound waves and ultraviolet waves

C ultraviolet waves and light waves

D ultraviolet waves and radio waves

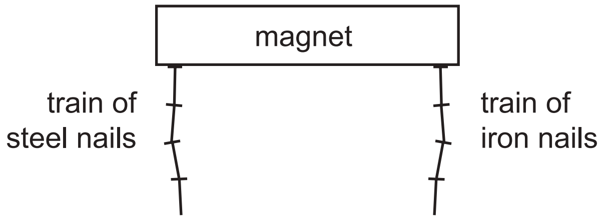
27 A student stands 180 m in front of a vertical, flat cliff and bangs together two pieces of wood to make a short, loud sound.

A timer records the echo of the sound 1.5 seconds after the pieces of wood are banged together.

Based on this result, what is the speed of sound?

A 120 m / s **B** 240 m / s **C** 270 m / s **D** 540 m / s

28 A train of steel nails and a train of iron nails hang from a strong magnet.



The trains are then carefully removed from the magnet.

What happens to the trains?

A Both trains fall apart.

B Both trains stay together.

C Only the train of iron nails falls apart.

D Only the train of steel nails falls apart.

29 How can a permanent magnet be demagnetised?

A Cool the magnet for a long time.

B Place it next to another magnet.

C Slowly pull it out of a coil connected to an a.c. supply.

D Slowly pull it out of a coil connected to a d.c. supply.

30 A positively-charged rod is held near to, but not touching, an uncharged metal sphere.

The sphere is briefly now connected to earth.

The rod is removed.

Which statement about the charge on the sphere is correct?

A It is charged negatively because negative charges have moved from earth to the sphere.

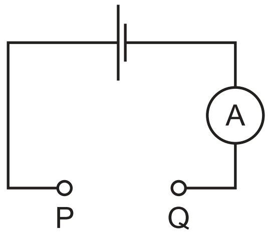
B It is charged negatively because positive charges have moved from the sphere to earth.

C It is charged positively because negative charges have moved from the sphere to earth.

D It is charged positively because positive charges have moved to earth from the sphere.

31 The diagram shows a circuit with a gap between points P and Q.

Four pieces of metal wire of the same material are connected, in turn, between points P and Q in the circuit.



The table gives the diameters and lengths of the wires.

In which wire is the current the largest?

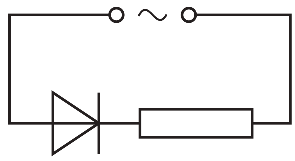
	diameter / mm	length / m
A	0.10	1.0
B	0.10	2.0
C	0.20	1.0
D	0.20	2.0

32 A torch has a simple circuit with a 3.0 V battery and a lamp. There is a 20 mA current in the lamp.

How much energy is transferred to the lamp in 5.0 minutes?

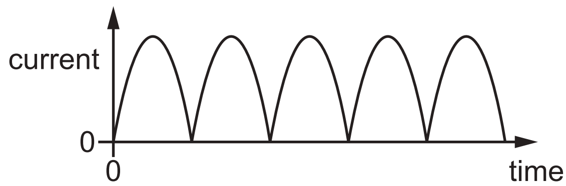
A 0.30 J **B** 18 J **C** 60 J **D** 0.30 kJ

33 A student connects the circuit shown.

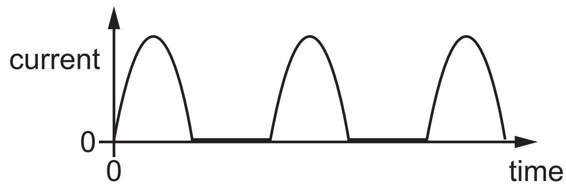


Which graph shows the variation with time of the current in the resistor?

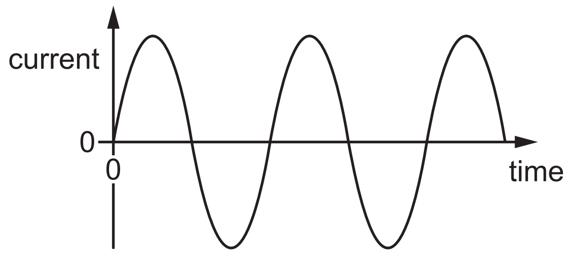
A



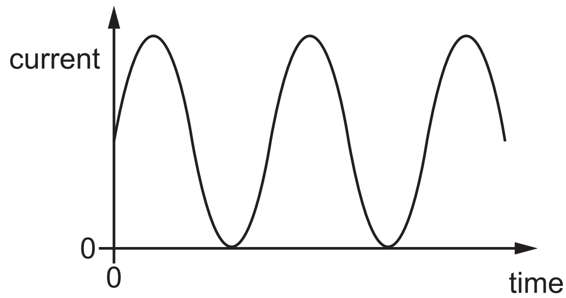
B



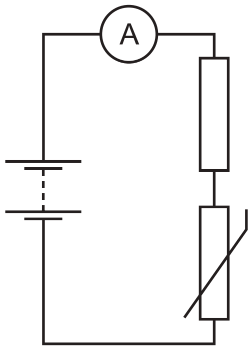
C



D



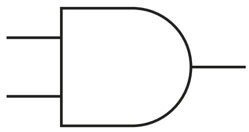
34 The diagram shows a circuit with a fixed resistor connected in series with a thermistor and an ammeter.



Which row shows how temperature change affects the resistance of the thermistor and the current in the circuit?

	temperature	resistance of thermistor	current in circuit
A	decreases	decreases	increases
B	decreases	increases	decreases
C	increases	decreases	decreases
D	increases	increases	increases

35 What does the symbol shown represent?



A an AND gate

B a NOR gate

C a NOT gate

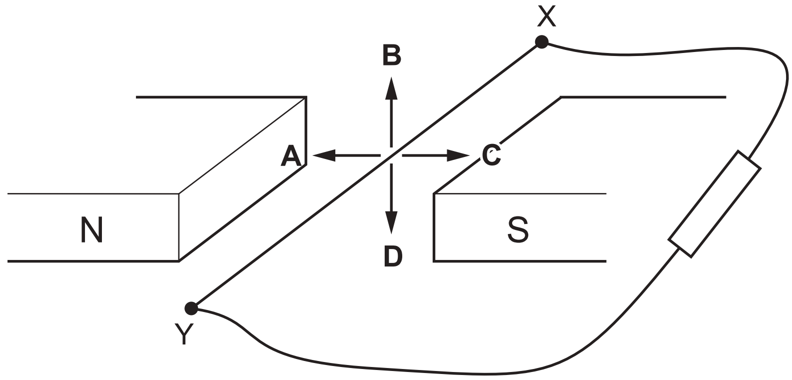
D an OR gate

36 The diagram shows a copper wire XY connected to a resistor.

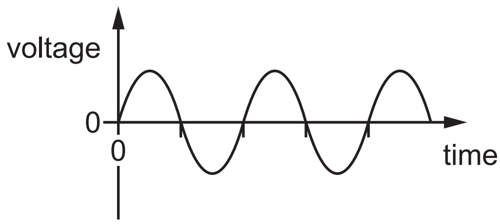
The wire is moved in the magnetic field between the poles of a magnet.

There is an induced current in the wire from X to Y.

In which labelled direction is the wire moving?

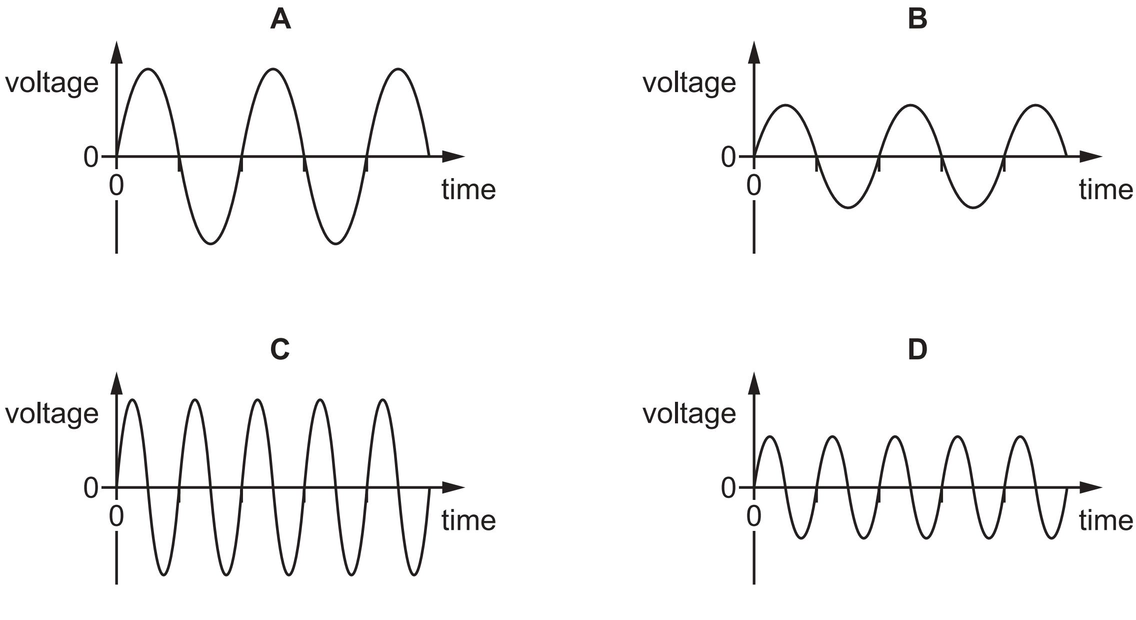


37 The graph shows how the voltage induced across a coil changes with time as the coil spins in a magnetic field.

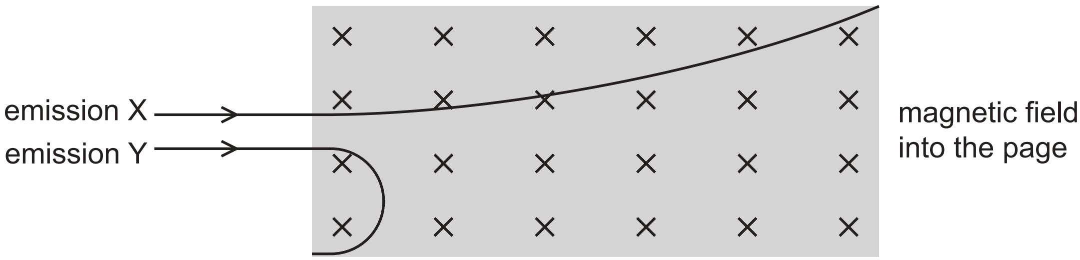


Which graph shows what happens when the coil spins more quickly?

(All graphs are drawn to the same scale.)



38 Emissions X and Y from radioactive material are passed through a magnetic field. The diagram shows the direction of the emissions, the direction of the magnetic field and the effect on the emissions.



Which type of emission is X, and which type of emission is Y?

	emission X	emission Y
A	α-particles	β-particles
B	α-particles	γ-rays
C	β-particles	α-particles
D	β-particles	γ-rays

39 What is meant by the *half-life* of a radioactive isotope?

A half of the time taken for all of the original nuclei to decay

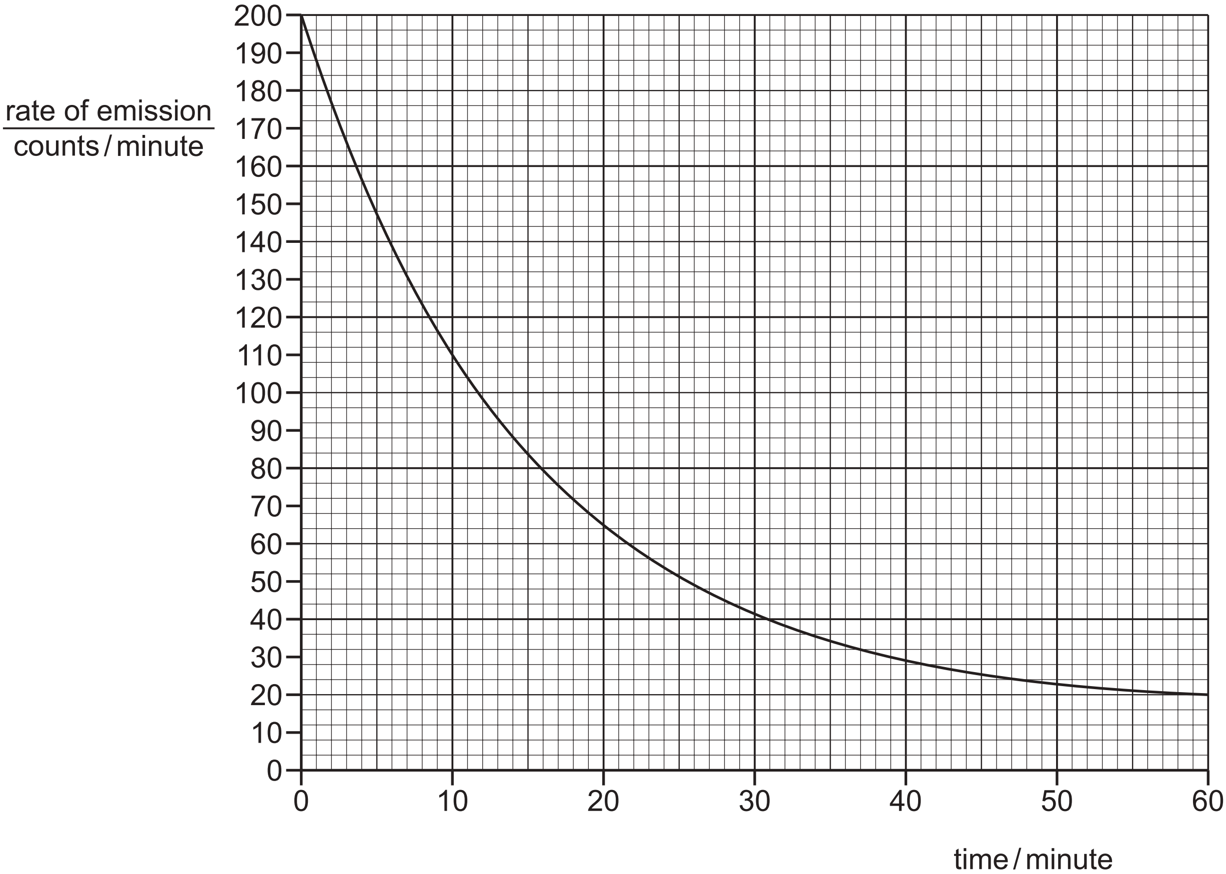
B the time taken for half of the original nuclei to decay

C the time taken for the charges on all the nuclei to halve

D the time taken for the mass of each nucleus to halve

40 The rate of emission of a radioactive source is measured until the reading reaches the background rate of 20 counts per minute.

The results are shown.



What is the best estimate of the half-life of the source?

A 10 minutes

B 12 minutes

C 14 minutes

D 30 minutes

Cambridge IGCSE

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PHYSICS **0625/22**

Paper 2 Multiple Choice (Extended) **October/November 2017**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

2664559192

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **18** printed pages and **2** blank pages.

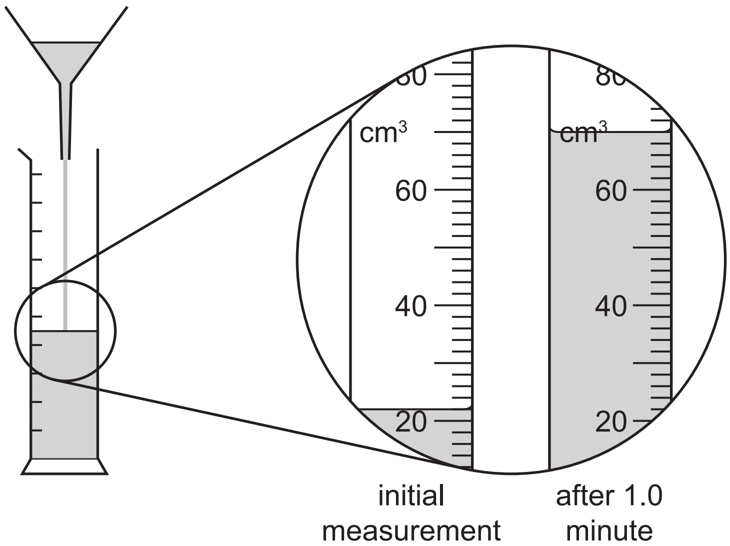
IB17 11_0625_22/4RP

CAMBRIDGE
International Examinations

[Turn over

1 A student investigates the rate of flow of oil through a funnel.

The diagrams show the experiment and the volume of oil in the measuring cylinder at the start of the experiment, and one minute later.



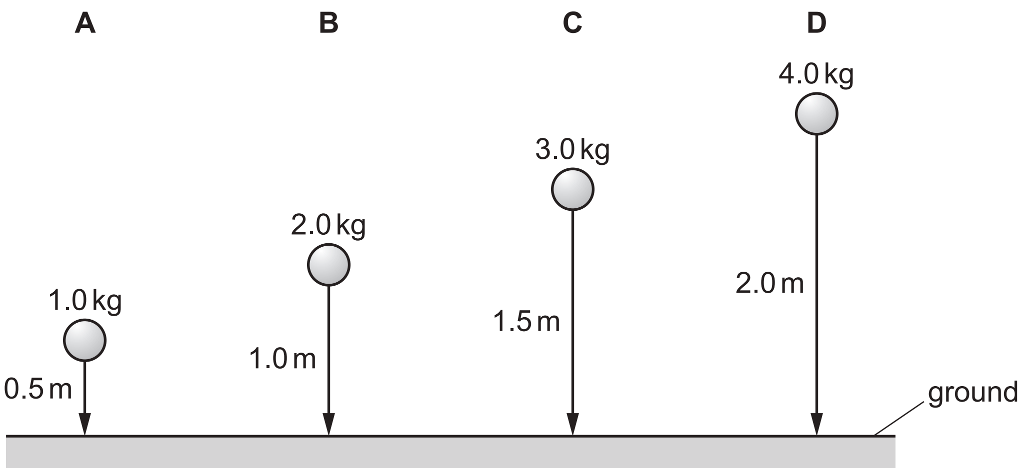
What is the rate of flow of oil through the funnel during the one minute?

A $0.73\,cm^3/s$ **B** $0.80\,cm^3/s$ **C** $44\,cm^3/s$ **D** $48\,cm^3/s$

2 Four balls with different masses are dropped simultaneously from the heights shown.

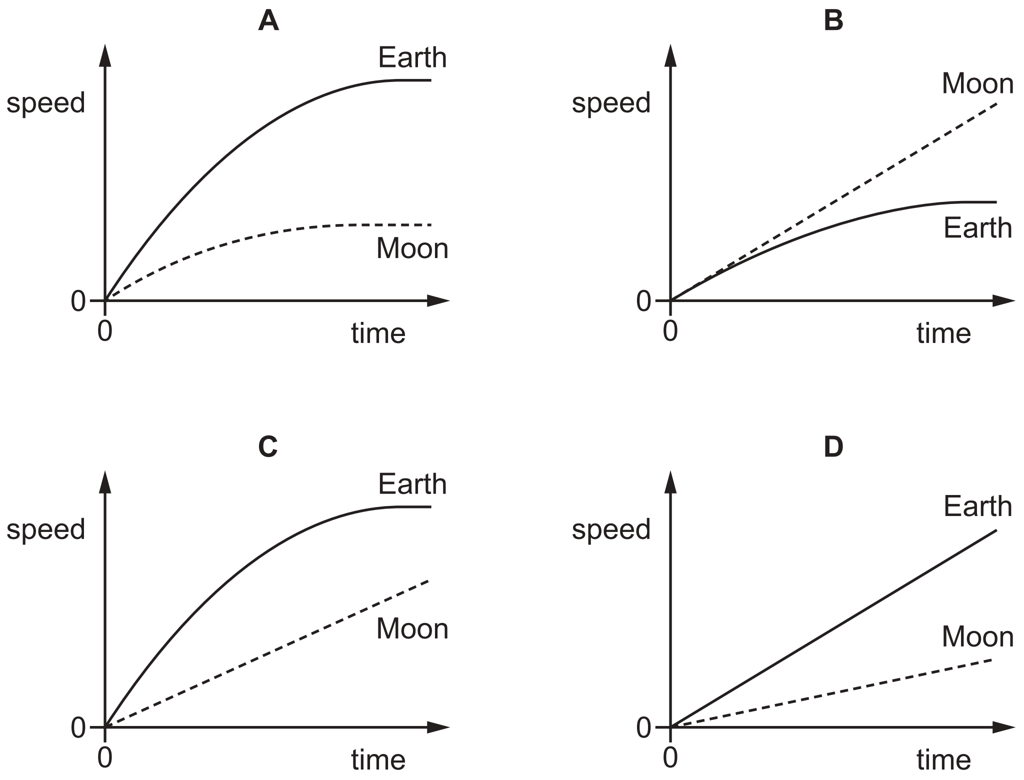
Air resistance may be ignored.

Which ball hits the floor last?

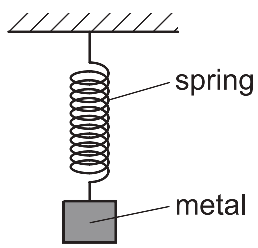


3 The gravitational field strength on the Earth is greater than the gravitational field strength on the Moon. The Earth has an atmosphere, but the Moon does not.

Which speed-time graph represents the motion of a light ball dropped from a great height near the surface of the Earth and near the surface of the Moon?



4 A spring is stretched by hanging a piece of metal from it.



Which name is given to the force that stretches the spring?

A friction

B mass

C pressure

D weight

5 A body of mass m has a weight W in a location where the gravitational field strength is g.

Which statement about these quantities is correct?

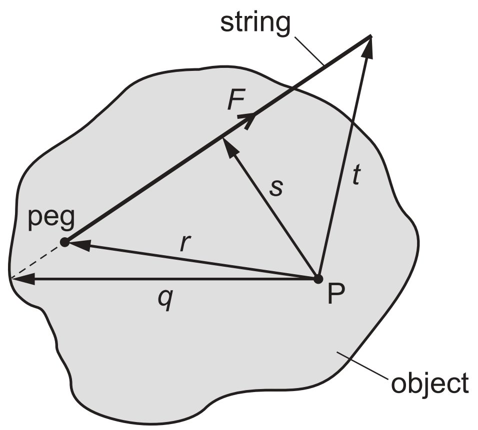
A m and W are both forces.

B m and W are both vector quantities.

C m and W are related by the equation $\frac{W}{m} = g$.

D m and W have the same unit.

6 An object is pivoted at point P. A student ties a length of string to a peg on the object. He pulls the string with a force F.

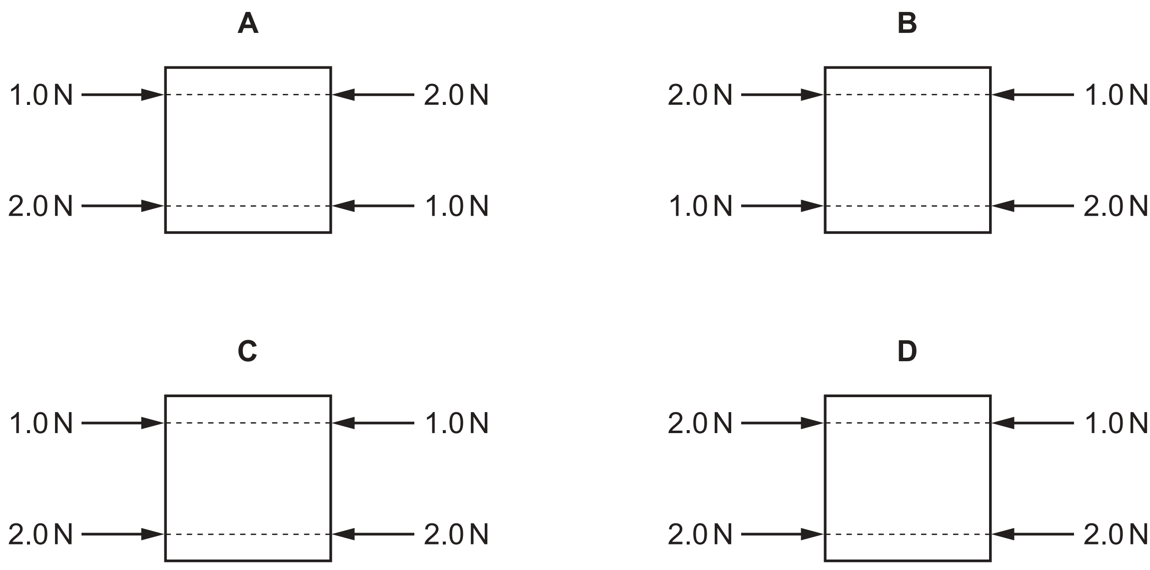


What is the moment of the force F about the point P?

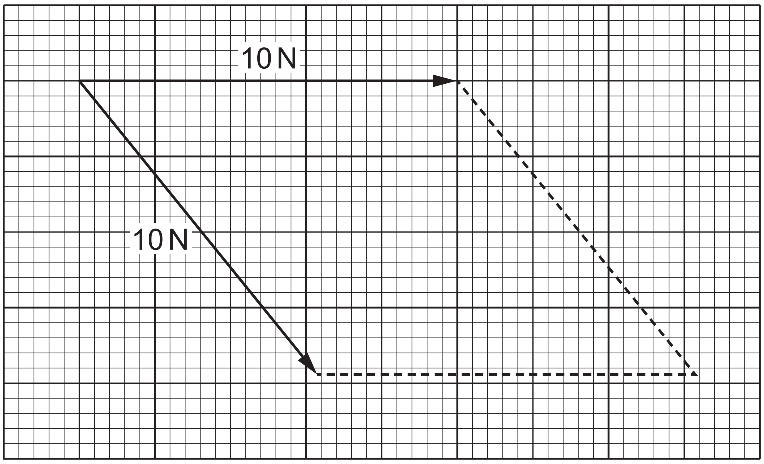
A $F \times q$ **B** $F \times r$ **C** $F \times s$ **D** $F \times t$

7 Each diagram shows a metal plate with four parallel forces acting on it. These are the only forces acting on the plates.

In which diagram is the plate in equilibrium?



8 The diagram shows an incomplete scale drawing to find the resultant of two 10 N forces acting at a point in the directions shown.

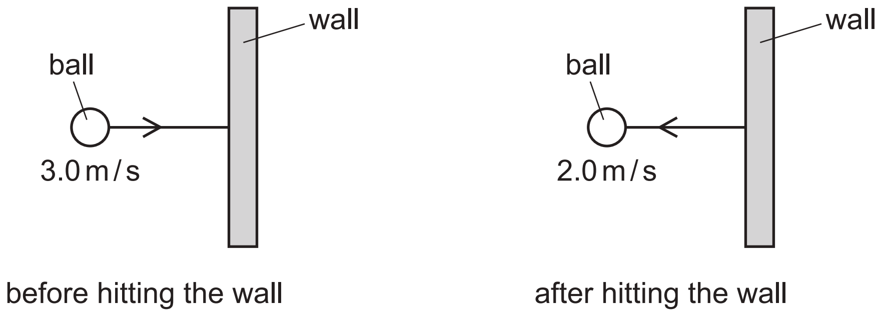


What is the magnitude of the resultant force?

A 7.5 N **B** 8.6 N **C** 18 N **D** 20 N

9 A ball has a mass of 0.30 kg. It moves horizontally with a speed of 3.0 m/s in the direction shown.

The ball hits a wall.



The ball rebounds from the wall with a horizontal speed of 2.0 m/s.

What is the change in momentum of the ball?

A 0.30 kg m/s **B** 1.0 kg m/s **C** 1.5 kg m/s **D** 5.0 kg m/s

10 An object has a mass of 500 kg.

It moves with a speed of 30 m/s.

What is its kinetic energy?

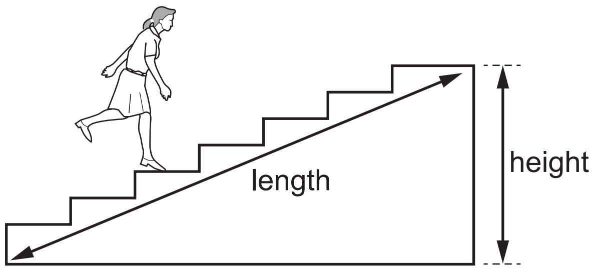
A 7.5 kJ **B** 15 kJ **C** 225 kJ **D** 450 kJ

11 Different processes have different efficiencies.

Which row shows the most efficient process?

	energy input / J	useful energy output / J
A	10	3
B	40	10
C	100	25
D	2000	250

12 A student runs up a flight of stairs.



Which information is **not** needed to calculate the rate at which the student is doing work against gravity?

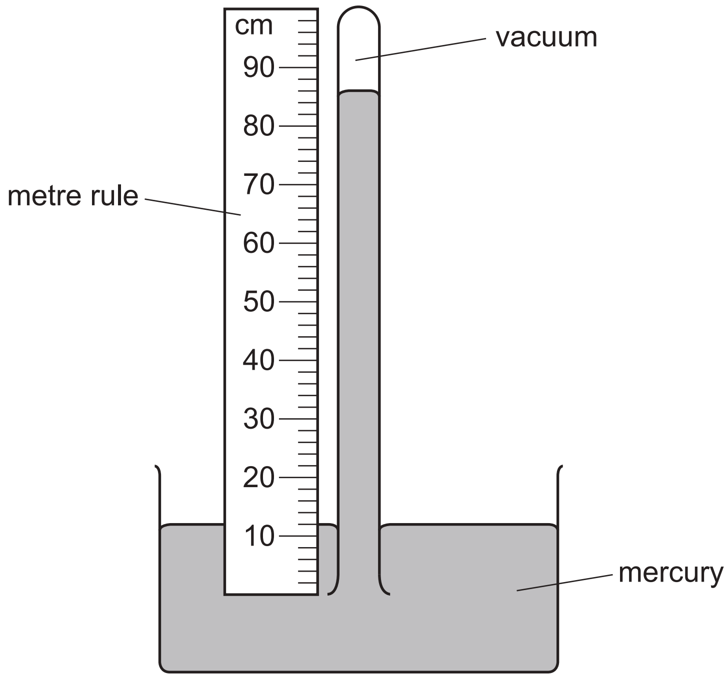
A the height of the flight of stairs

B the length of the flight of stairs

C the time taken to run up the stairs

D the weight of the student

13 The diagram shows a simple mercury barometer.

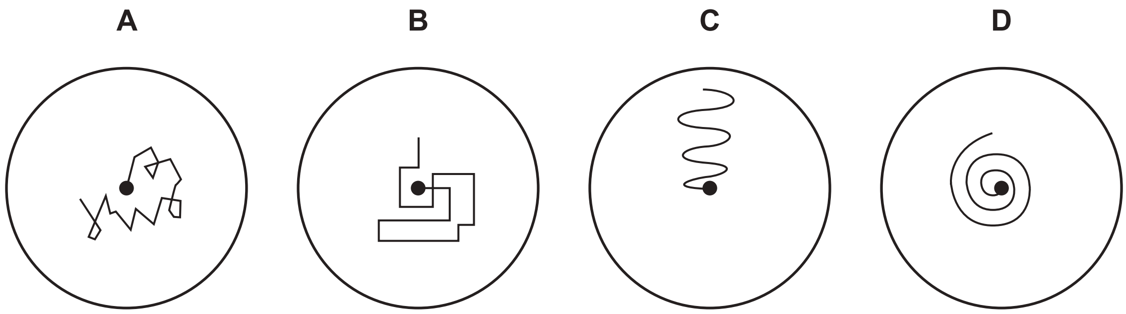


Which length is used to find the value of atmospheric pressure?

A 12 cm **B** 74 cm **C** 86 cm **D** 100 cm

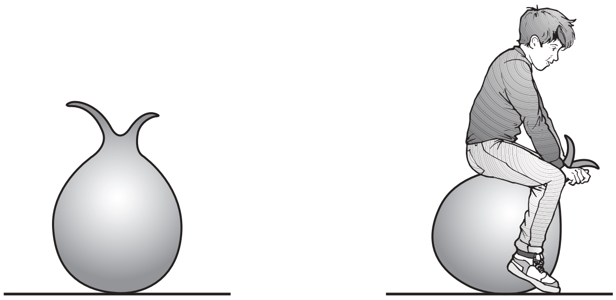
14 A pollen grain in a beaker of still water is viewed through a microscope.

Which diagram shows the most likely movement of the pollen grain?



15 The diagram shows an air-filled rubber toy. A child sits on the toy and its volume decreases.

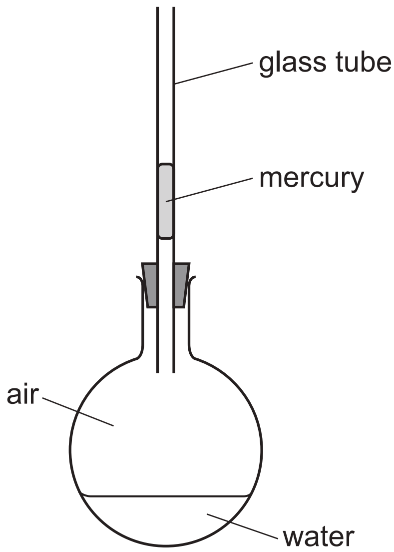
The temperature of the air in the toy does not change.



How does the air pressure in the toy change and why?

	pressure	reason
A	decreases	air molecules move more slowly
B	decreases	air molecules strike the rubber less frequently
C	increases	air molecules move more quickly
D	increases	air molecules strike the rubber more frequently

16 The diagram shows a glass flask, sealed with a small volume of mercury in a glass tube. When the flask is gently warmed the mercury rises up the tube.



What is the main cause of the movement of the mercury?

A expansion of air in the flask

B expansion of the glass flask

C expansion of the glass tube

D expansion of the mercury

17 Which row identifies the fixed points on the Celsius scale?

	lower fixed point	upper fixed point
A	boiling point of mercury	melting point of pure ice
B	boiling point of pure water	melting point of pure ice
C	melting point of mercury	boiling point of pure water
D	melting point of pure ice	boiling point of pure water

18 Aluminium has a specific heat capacity of 900 J / (kg °C).

The internal energy of a 2.0 kg block of aluminium increases by 13 500 J.

By how much does the temperature of the block increase?

A 0.067 °C **B** 0.13 °C **C** 7.5 °C **D** 15 °C

19 Why does a balloon filled with hot air rise?

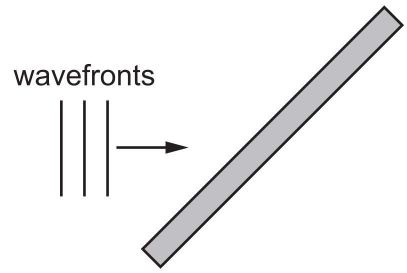
A Cold air is less dense than hot air.

B Cold air is more dense than hot air.

C Heat rises.

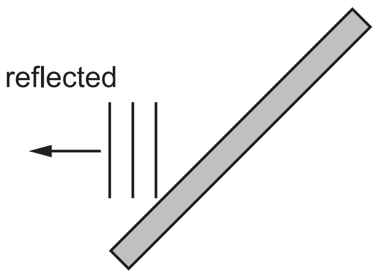
D The density of the balloon is greater than the density of the surrounding gas.

20 The diagram represents plane wavefronts of a water wave about to strike a solid barrier.

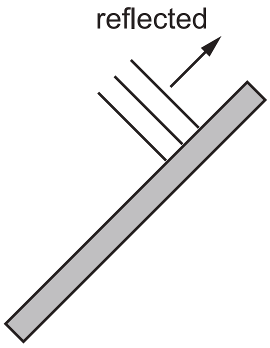


Which diagram shows the position of the wavefronts after reflection at the barrier?

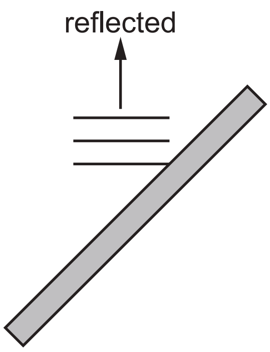
A



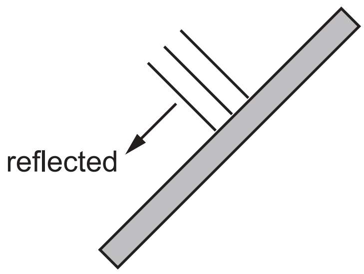
B



C

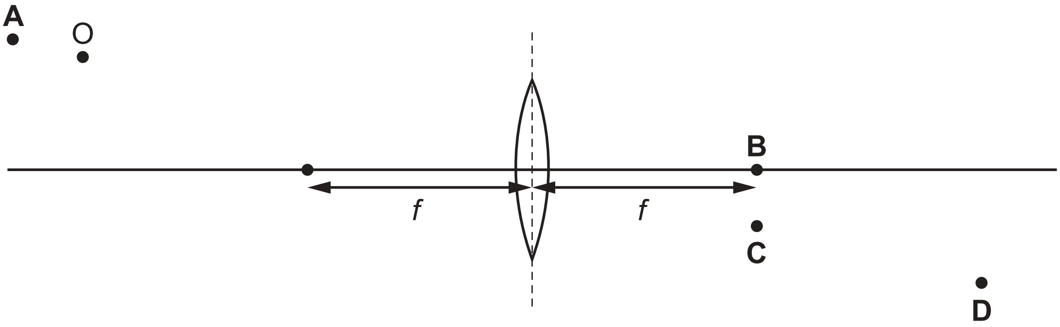


D

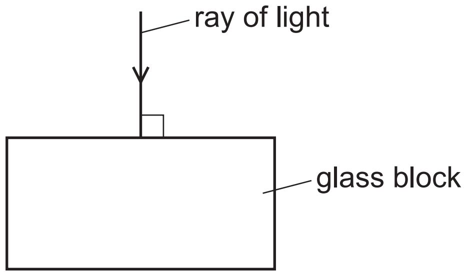


21 The diagram shows an object O in front of a thin converging lens of focal length *f*.

At which point will the lens form a sharp image of the object?



22 The diagram shows a ray of light incident on the surface of a rectangular glass block at 90° to the surface.



Which quantities remain unchanged as the light enters the glass block?

A direction and frequency

B direction and speed

C frequency and speed

D speed and wavelength

23 Which piece of equipment is designed to produce a type of electromagnetic wave?

A electric fire

B electric generator

C electric motor

D electromagnet

24 The Moon is 380 000 km from the Earth. A laser light beam is directed from the Earth to the Moon. The beam is reflected back to the Earth.

How long does it take for the light to travel to the Moon and back to the Earth?

A 1.27 ms **B** 2.53 ms **C** 1.27 s **D** 2.53 s

25 Different waves travel through air.

Which waves have the greatest difference in speed?

A ultrasound waves and sound waves

B ultrasound waves and ultraviolet waves

C ultraviolet waves and light waves

D ultraviolet waves and radio waves

26 The speed of sound is different in different states of matter.

The speed of sound in water is 1500 m / s.

Which row correctly compares the speed of sound in ice and the speed of sound in steam with the speed of sound in water?

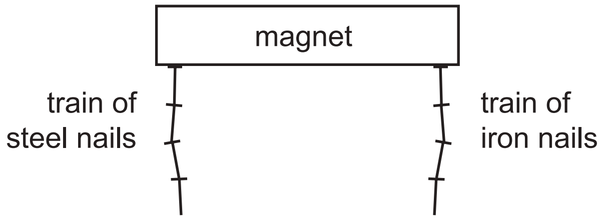
	speed of sound in ice m / s	speed of sound in steam m / s
A	less than 1500	less than 1500
B	less than 1500	more than 1500
C	more than 1500	less than 1500
D	more than 1500	more than 1500

27 A student finds that it takes sound 0.33 seconds to travel 100 metres.

From this information, what is the speed of sound?

A 30 m / s **B** 60 m / s **C** 300 m / s **D** 600 m / s

28 A train of steel nails and a train of iron nails hang from a strong magnet.



The trains are then carefully removed from the magnet.

What happens to the trains?

A Both trains fall apart.

B Both trains stay together.

C Only the train of iron nails falls apart.

D Only the train of steel nails falls apart.

29 An old and expensive steel watch becomes magnetised.

The owner wants to use the watch again. He must demagnetise the watch.

What is the **best** method to do this?

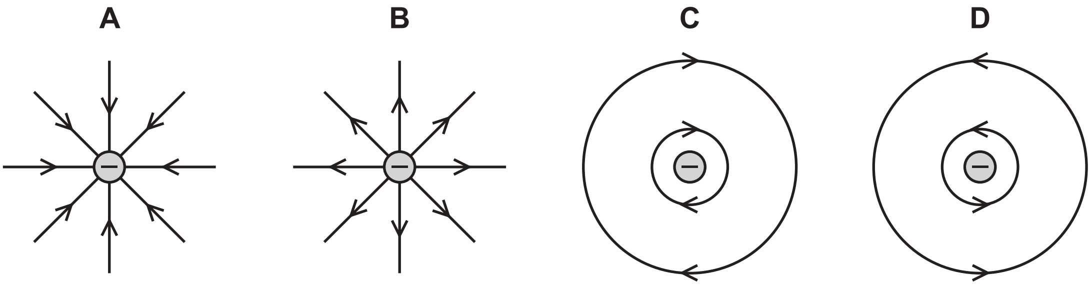
A Insert the watch in a solenoid that carries alternating current and then slowly remove it.

B Insert the watch in a solenoid that carries direct current and then slowly remove it.

C Pass alternating current through the watch.

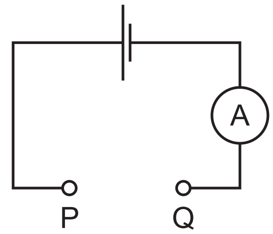
D Pass direct current through the watch.

30 Which diagram represents the electric field due to a negatively-charged conducting sphere?



31 The diagram shows a circuit with a gap between points P and Q.

Four pieces of metal wire of the same material are connected, in turn, between points P and Q in the circuit.

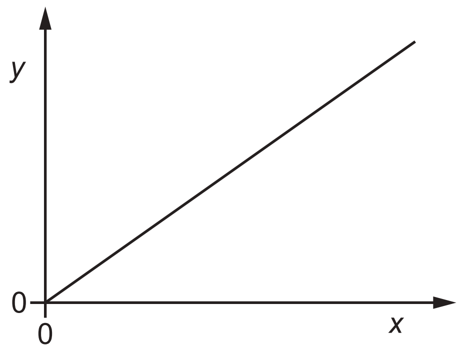


The table gives the diameters and lengths of the wires.

In which wire is the current the largest?

	diameter / mm	length / m
A	0.10	1.0
B	0.10	2.0
C	0.20	1.0
D	0.20	2.0

32 The graph shows the way in which one physical quantity *y* varies with another physical quantity *x*.



Which row gives suitable quantities for *y* and *x*?

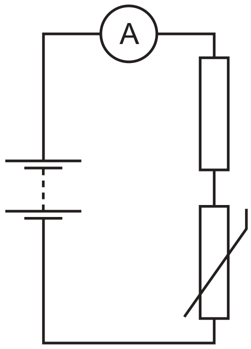
	y	*x*
A	the number of atoms of a radioactive isotope present	the time taken
B	the potential difference across a metallic conductor	the current in the metallic conductor
C	the resistance of a length of wire	the diameter of the wire
D	the volume of a 1.0 kg object	the density of the material from which the object is made

33 The potential difference across a car headlamp is 12 V. The current in the lamp is 2.5 A.

How much energy is transferred by the lamp in 1.0 hour?

A 1800 J **B** 1800 W **C** 108 000 J **D** 108 000 W

34 The diagram shows a circuit with a fixed resistor connected in series with a thermistor and an ammeter.



Which row shows how temperature change affects the resistance of the thermistor and the current in the circuit?

	temperature	resistance of thermistor	current in circuit
A	decreases	decreases	increases
B	decreases	increases	decreases
C	increases	decreases	decreases
D	increases	increases	increases

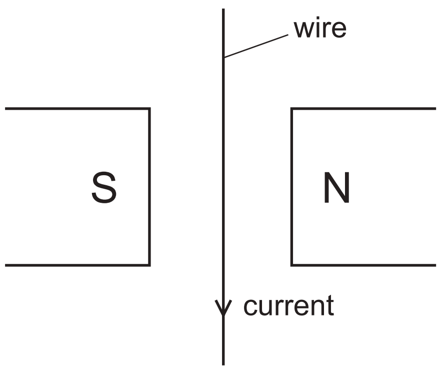
35 An incomplete truth table for a NAND gate is shown.

input P	input Q	output
0	0	W
0	1	X
1	0	Y
1	1	Z

What are the values of W, X, Y and Z?

	W	X	Y	Z
A	0	0	0	1
B	0	1	1	1
C	1	0	0	0
D	1	1	1	0

36 The diagram shows a wire hanging freely between the poles of a magnet. There is a current in the wire in the direction shown.



The magnet and current cause a force to act on the wire.

In which direction does this force act?

A into the page (away from you)

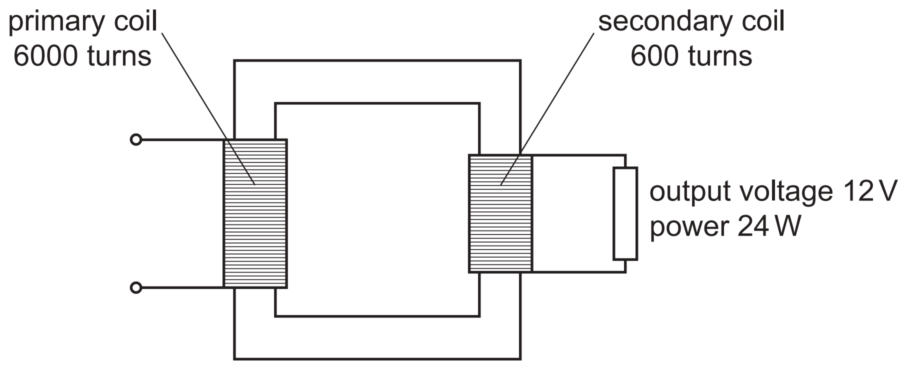
B out of the page (toward you)

C to the left

D to the right

37 A 100% efficient transformer has 6000 turns on its primary coil and 600 turns on its secondary coil. The output voltage of the transformer is 12 V.

A resistor is connected across the secondary coil and dissipates 24 W of power.

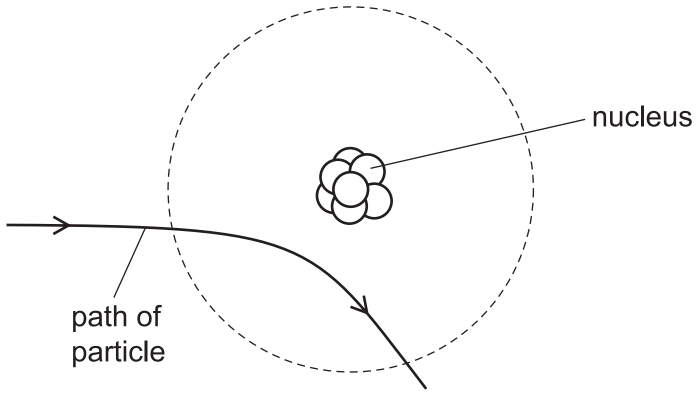


What is the current in the primary coil of the transformer?

A 0.050 A **B** 0.20 A **C** 5.0 A **D** 20 A

38 In the diagram, the circle represents an atom (not to scale) with the nucleus at its centre.

A particle is emitted by a radioactive source and approaches the nucleus of the atom. The curved arrow shows the path of the particle.



What is the nature and charge of the particle?

	nature of particle	charge of particle
A	α-particle	negative
B	α-particle	positive
C	β-particle	negative
D	β-particle	positive

39 Which row describes the behaviour of γ-rays in an electric field and in a magnetic field?

	electric field	magnetic field
A	deflected	deflected
B	deflected	undeflected
C	undeflected	deflected
D	undeflected	undeflected

40 A radioactive source has a half-life of 0.5 hours.

A detector near the source shows a reading of 6000 counts per second.

Background radiation can be ignored.

What is the reading on the detector 1.5 hours later?

A 750 counts per second

B 1500 counts per second

C 2000 counts per second

D 3000 counts per second

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Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/23**

Paper 2 Multiple Choice (Extended) **October/November 2017**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

7509628836

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **18** printed pages and **2** blank pages.

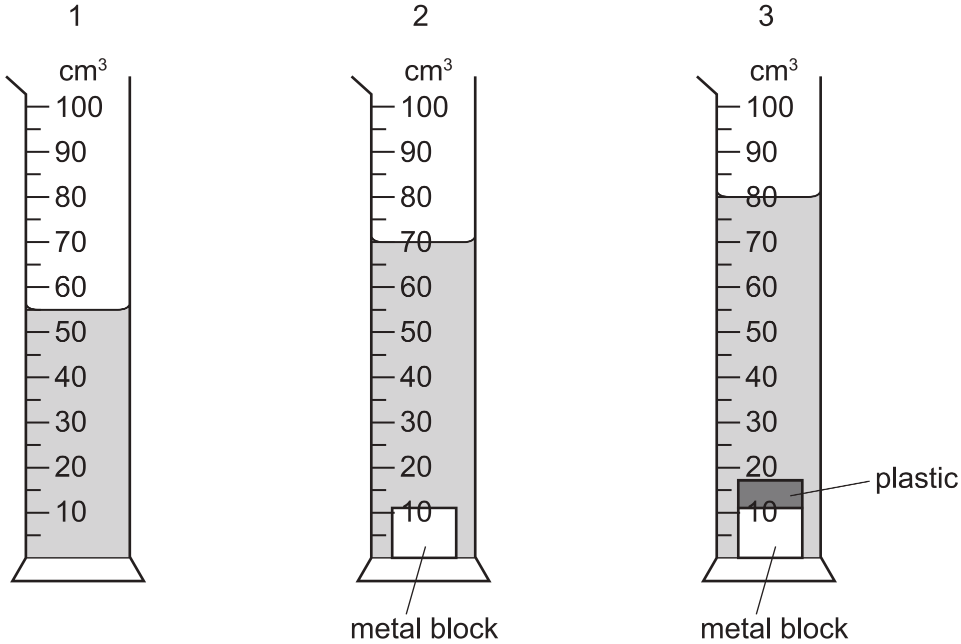
IB17 11_0625_23/4RP

CAMBRIDGE
International Examinations

1 A measuring cylinder contains some water. A small metal block is slowly lowered into the water and is then removed.

Finally a piece of plastic is attached to the metal block and the block is again slowly lowered into the water.

The diagrams show the measuring cylinder at each stage of this process.



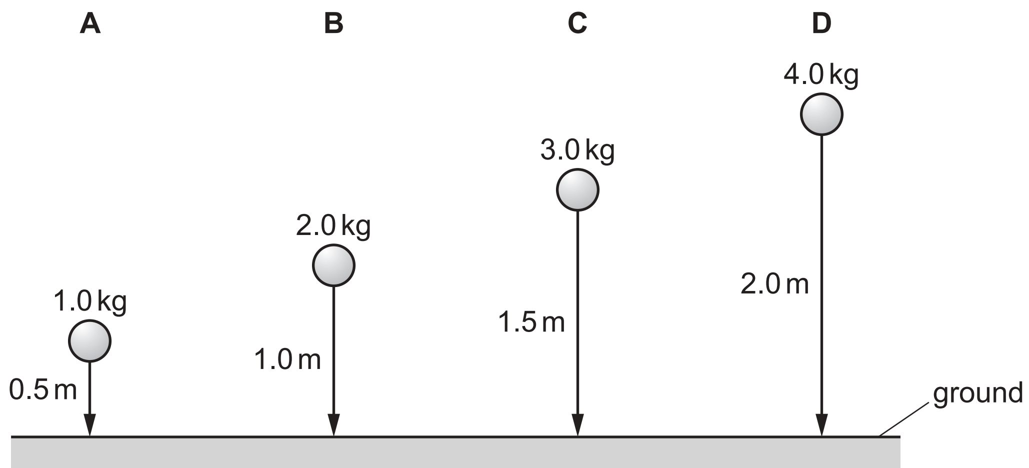
What is the volume of the piece of plastic?

A $10\,cm^3$ **B** $25\,cm^3$ **C** $70\,cm^3$ **D** $80\,cm^3$

2 Four balls with different masses are dropped simultaneously from the heights shown.

Air resistance may be ignored.

Which ball hits the floor first?



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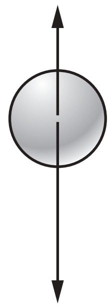
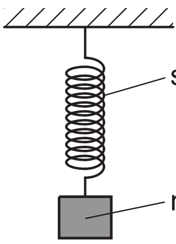
3 The diagram shows the vertical forces acting on a ball as it falls vertically through the air. The ball does not reach terminal velocity.



Which row describes what happens to the resultant force on the ball and what happens to the acceleration of the ball as it falls through the air?

	resultant force	acceleration
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

4 A spring is stretched by hanging a piece of metal from it.



Which name is given to the force that stretches the spring?

A friction

B mass

C pressure

D weight

5 On the Moon, all objects fall with the same acceleration.

Which statement explains this?

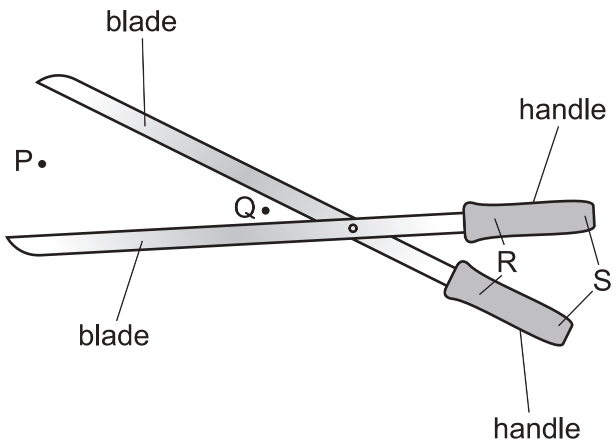
A On the Moon, all objects have the same weight.

B The Moon has a smaller gravitational field strength than the Earth.

C The weight of an object is directly proportional to its mass.

D The weight of an object is inversely proportional to its mass.

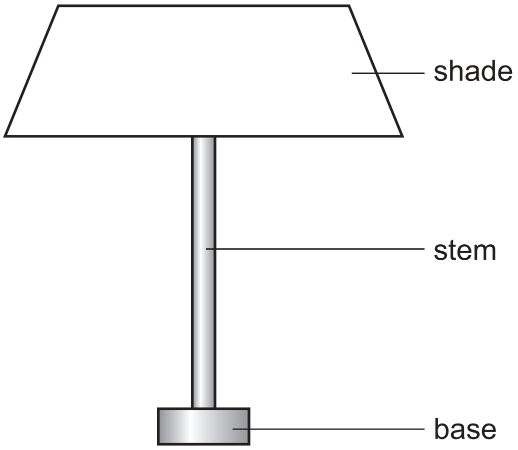
6 A pair of cutters is used to cut a rope.



Where should the rope be positioned and at which labelled points should the hands be positioned to produce the greatest cutting force?

	rope positioned	hands positioned
A	P	R
B	P	S
C	Q	R
D	Q	S

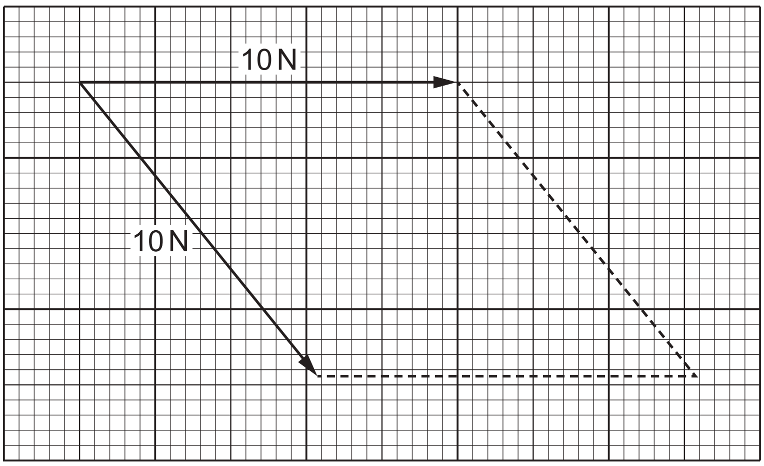
7 The lamp in the diagram is not very stable and falls over easily.



Which row shows changes that would definitely make the lamp more stable?

	base	centre of gravity
A	narrower	higher
B	narrower	lower
C	wider	higher
D	wider	lower

8 The diagram shows an incomplete scale drawing to find the resultant of two 10 N forces acting at a point in the directions shown.



What is the magnitude of the resultant force?

A 7.5 N **B** 8.6 N **C** 18 N **D** 20 N

9 An object has a mass of 60 kg.

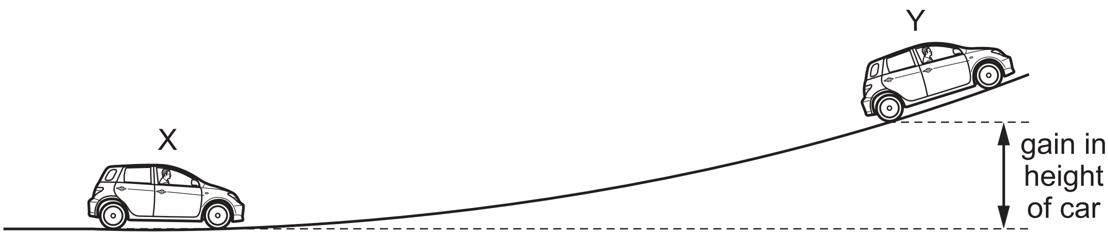
It decelerates from 50 m / s to 20 m / s when a resultant force of 300 N acts on it.

For how long does the force act?

A 0.071 s **B** 0.17 s **C** 6.0 s **D** 14 s

10 A car, starting from rest at position X, accelerates up a hill. The car reaches a speed of 10 m / s at position Y.

The kinetic energy of the car at position Y is equal to its gain in gravitational potential energy from X to Y.



Take the gravitational field strength g to be 10 N / kg.

What is the gain in height of the car between X and Y?

A 0.50 m **B** 5.0 m **C** 10 m **D** 50 m

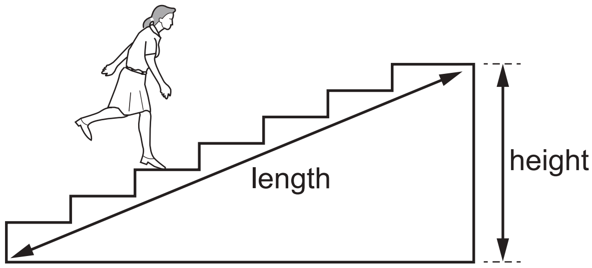
11 A 150 W filament lamp has an efficiency of 10%. A 40 W compact fluorescent lamp (CFL) has an efficiency of 30%.

Each lamp is switched on for the same amount of time.

Which lamp produces more light and which lamp converts more energy into other forms of energy?

	produces more light	converts more energy into other forms
A	CFL lamp	CFL lamp
B	CFL lamp	filament lamp
C	filament lamp	CFL lamp
D	filament lamp	filament lamp

12 A student runs up a flight of stairs.



Which information is **not** needed to calculate the rate at which the student is doing work against gravity?

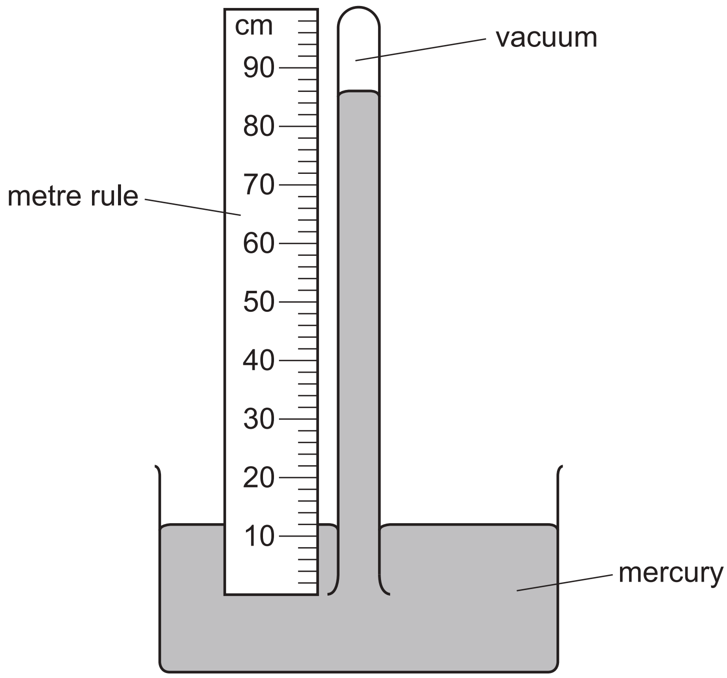
A the height of the flight of stairs

B the length of the flight of stairs

C the time taken to run up the stairs

D the weight of the student

13 The diagram shows a simple mercury barometer.

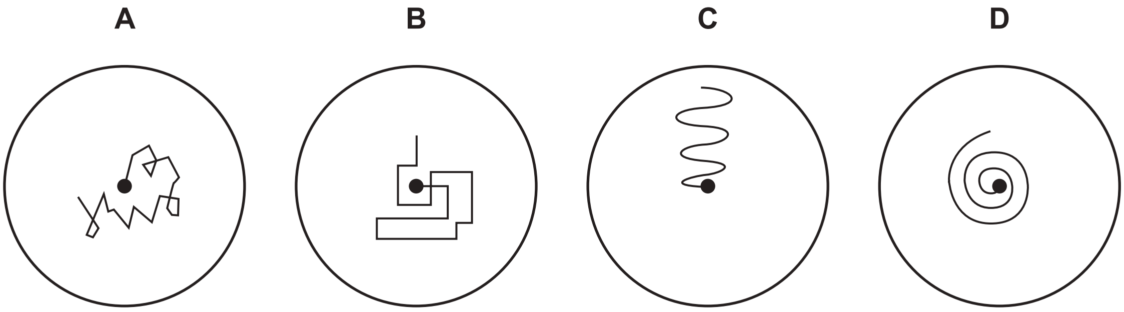


Which length is used to find the value of atmospheric pressure?

A 12 cm **B** 74 cm **C** 86 cm **D** 100 cm

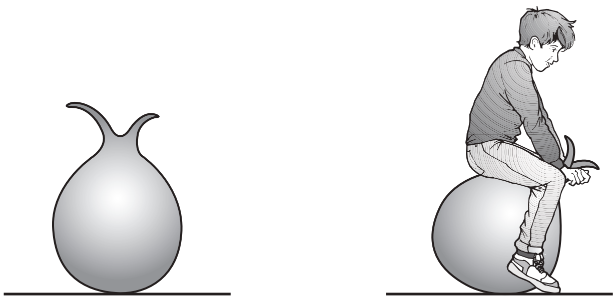
14 A pollen grain in a beaker of still water is viewed through a microscope.

Which diagram shows the most likely movement of the pollen grain?



15 The diagram shows an air-filled rubber toy. A child sits on the toy and its volume decreases.

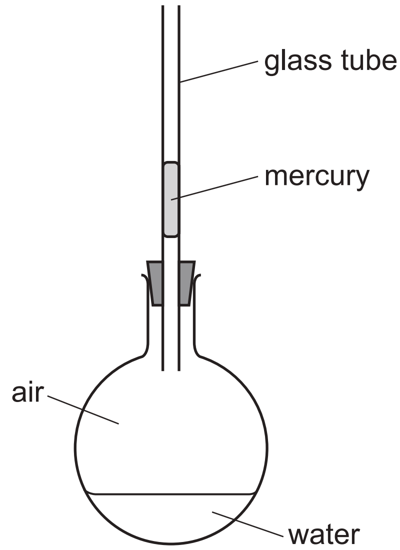
The temperature of the air in the toy does not change.



How does the air pressure in the toy change and why?

	pressure	reason
A	decreases	air molecules move more slowly
B	decreases	air molecules strike the rubber less frequently
C	increases	air molecules move more quickly
D	increases	air molecules strike the rubber more frequently

16 The diagram shows a glass flask, sealed with a small volume of mercury in a glass tube. When the flask is gently warmed the mercury rises up the tube.



What is the main cause of the movement of the mercury?

A expansion of air in the flask

B expansion of the glass flask

C expansion of the glass tube

D expansion of the mercury

17 Which property **cannot** be used for the measurement of temperature?

A half-life of a radioactive isotope

B length of a solid metal bar

C pressure of a gas

D volume of a liquid

18 A student uses an immersion heater to heat some water in a beaker.

The water is heated from 20 °C to 80 °C.

The energy supplied to the water is 60.0 kJ.

What is the thermal capacity of the water? (Ignore any heat loss.)

A 667 J / °C **B** 750 J / °C **C** 1000 J / °C **D** 3000 J / °C

19 Why is the heating coil of a domestic immersion heater placed at the bottom of the tank?

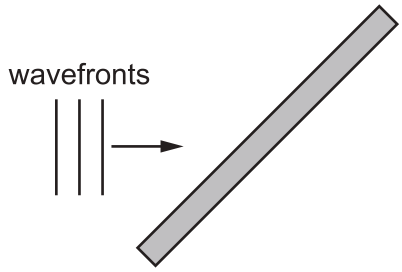
A Cold water is less dense than hot water and therefore sinks.

B Cold water is more dense than hot water and therefore rises.

C Hot water is less dense than cold water and therefore rises.

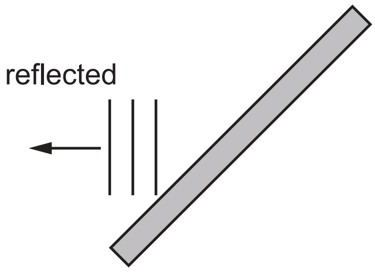
D Hot water is more dense than cold water and therefore sinks.

20 The diagram represents plane wavefronts of a water wave about to strike a solid barrier.



Which diagram shows the position of the wavefronts after reflection at the barrier?

A



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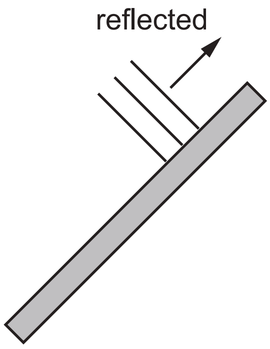

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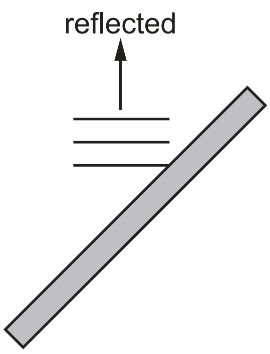
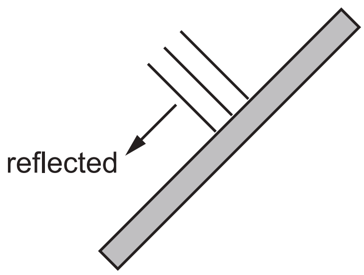
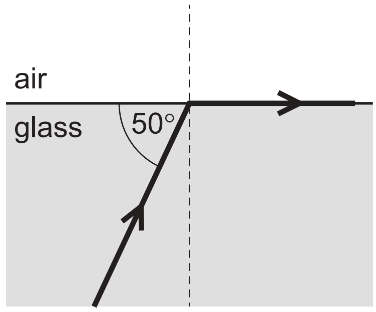


D



21 The diagram shows a ray of light in glass. The ray reaches a boundary with air.

One weak ray of light is missing from the diagram.



Which statement is correct?

A At the boundary, the speed of the light will become less.

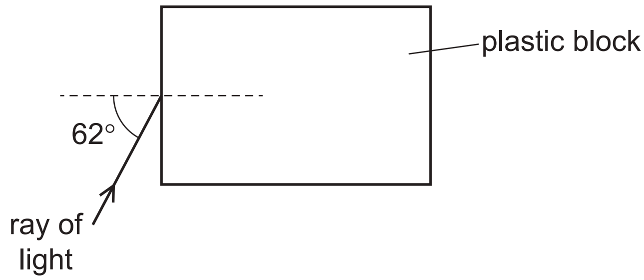
B The critical angle for light at this boundary is 50°.

C The diagram shows an example of diffraction of light.

D The missing ray is a weak reflected ray.

22 Light travelling in air enters a plastic block at an angle of incidence of 62°.

The plastic has a refractive index of 1.48.



What is the angle of refraction?

A 18° **B** 28° **C** 37° **D** 42°

23 A sound wave travels from a medium in one state into the same medium but in another state. This causes the speed of the wave to change from approximately 300 m/s to approximately 3000 m/s.

Between which two states is the sound wave travelling?

A gas to solid

B liquid to gas

C liquid to solid

D solid to liquid

24 The Moon is 380 000 km from the Earth. A laser light beam is directed from the Earth to the Moon. The beam is reflected back to the Earth.

How long does it take for the light to travel to the Moon and back to the Earth?

A 1.27 ms **B** 2.53 ms **C** 1.27 s **D** 2.53 s

25 Which statement about radio waves is correct?

A They are used in television remote controllers.

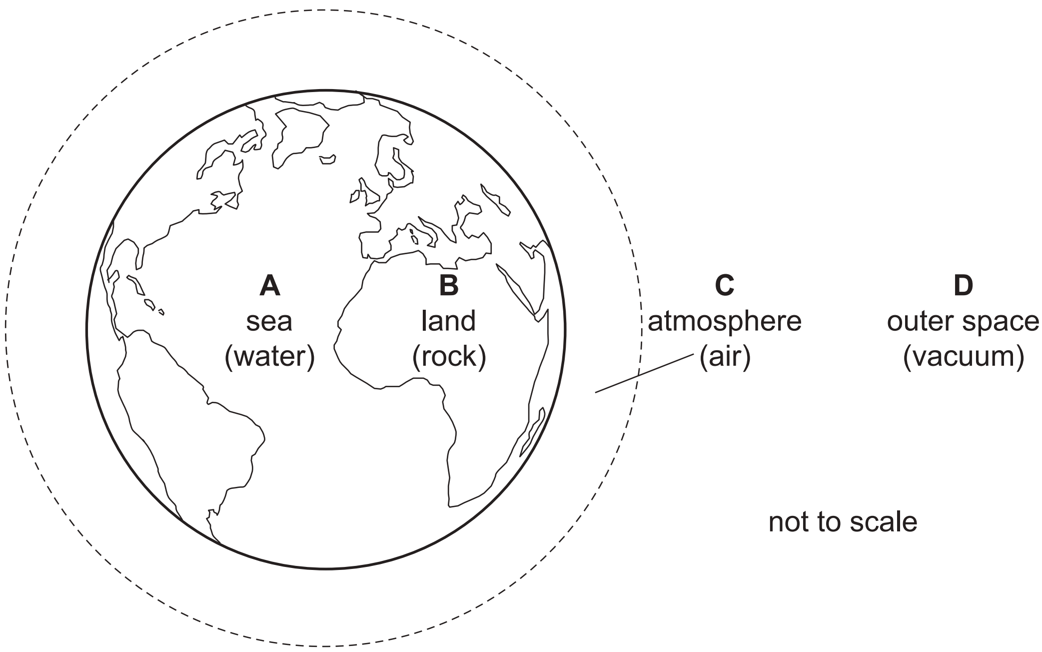
B They can be detected by the human eye.

C They travel as longitudinal waves.

D They have the same speed in a vacuum as ultraviolet waves.

26 The diagram shows the Earth and its surroundings.

Through which labelled region can sound **not** be transmitted?



27 Different waves travel through air.

Which waves have the greatest difference in speed?

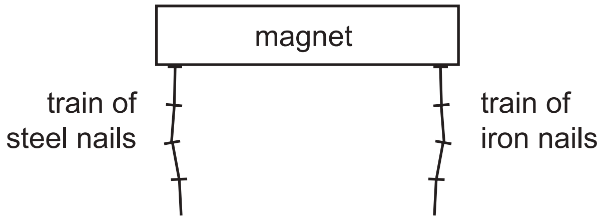
A ultrasound waves and sound waves

B ultrasound waves and ultraviolet waves

C ultraviolet waves and light waves

D ultraviolet waves and radio waves

28 A train of steel nails and a train of iron nails hang from a strong magnet.



The trains are then carefully removed from the magnet.

What happens to the trains?

A Both trains fall apart.

B Both trains stay together.

C Only the train of iron nails falls apart.

D Only the train of steel nails falls apart.

29 What is the best method to demagnetise a steel rod?

A Pass the rod through a coil connected to an a.c. supply.

B Pass the rod through a coil connected to a d.c. supply.

C Place the rod next to another magnet.

D Stroke the rod with another magnet.

30 There is a current in a metal wire.

Which particles in the wire move to cause this current?

A α-particles

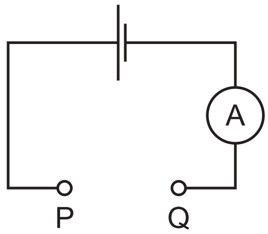
B electrons

C neutrons

D protons

31 The diagram shows a circuit with a gap between points P and Q.

Four pieces of metal wire of the same material are connected, in turn, between points P and Q in the circuit.



The table gives the diameters and lengths of the wires.

In which wire is the current the largest?

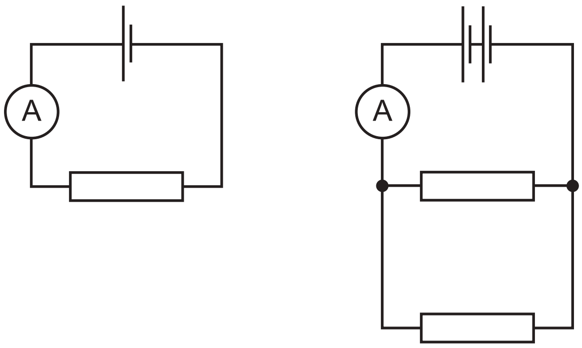
	diameter / mm	length / m
A	0.10	1.0
B	0.10	2.0
C	0.20	1.0
D	0.20	2.0

32 A battery is connected to a circuit. It is switched on for 1.0 minute. During that time, there is a current of 0.40 A in the circuit and the battery supplies a total of 48 J of energy.

Which row gives the charge that passes and the electromotive force (e.m.f.) of the battery?

	charge that passes in 1.0 minute / C	e.m.f. of the battery / V
A	0.40	2.0
B	0.40	120
C	24	2.0
D	24	120

33 Identical cells and identical resistors are used to make the circuits shown.



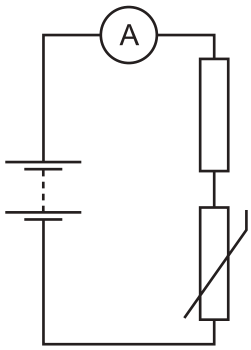
circuit 1 circuit 2

In circuit 1, the ammeter reads 2.0 A.

What is the ammeter reading in circuit 2?

A 1.0 A **B** 2.0 A **C** 4.0 A **D** 8.0 A

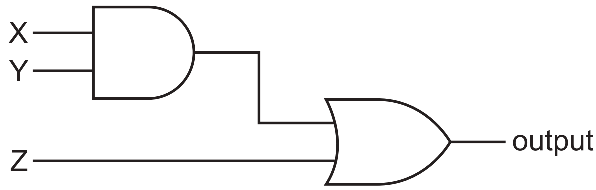
34 The diagram shows a circuit with a fixed resistor connected in series with a thermistor and an ammeter.



Which row shows how temperature change affects the resistance of the thermistor and the current in the circuit?

	temperature	resistance of thermistor	current in circuit
A	decreases	decreases	increases
B	decreases	increases	decreases
C	increases	decreases	decreases
D	increases	increases	increases

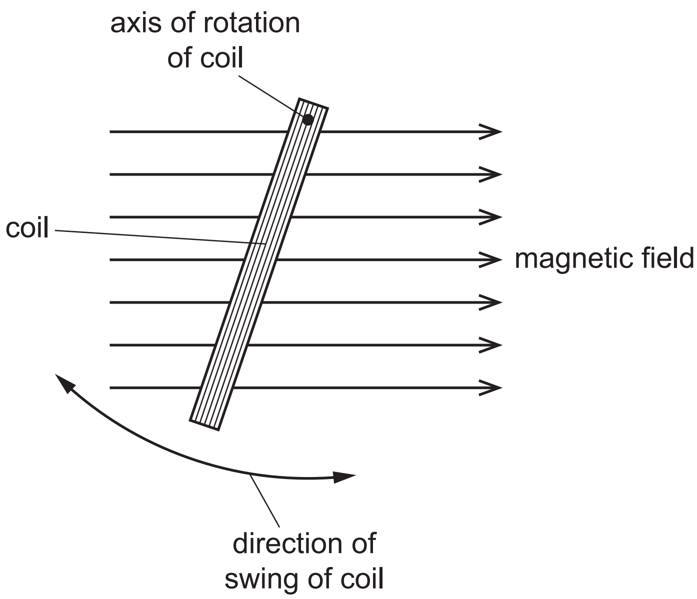
35 The diagram shows an AND gate and an OR gate connected together.



Which combination of inputs X, Y and Z gives an output of 0?

	X	Y	Z
A	0	0	1
B	0	1	1
C	1	0	0
D	1	1	0

36 The diagram shows a short-circuited copper coil swinging about an axis at right-angles to a strong magnetic field. The motion induces a current in the coil.



What is the effect, if any, of this induced current in the coil?

A The induced current has no effect on the movement of the coil because copper is non-magnetic.

B The induced current produces a magnetic field of constant magnitude in the coil.

C The induced current produces forces that assist the change causing it.

D The induced current produces forces that oppose the changes causing it.

37 Diagram 1 shows a magnet being pushed into a coil that is connected to a centre-zero galvanometer.

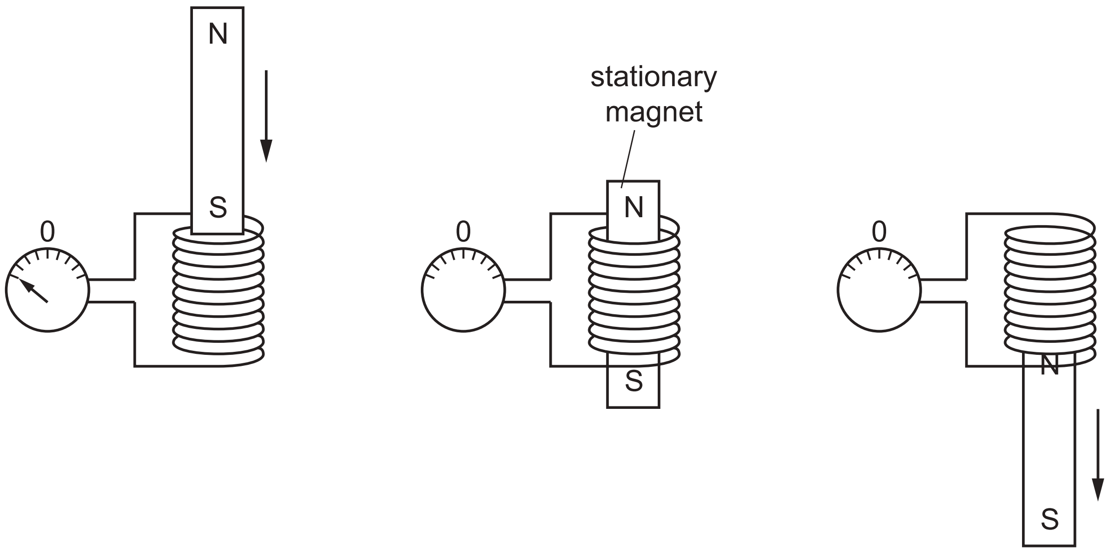
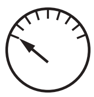
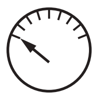
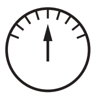
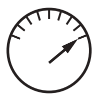
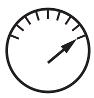
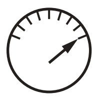


diagram 1 diagram 2 diagram 3

Which row shows the directions of the pointer when the magnet is as shown in diagrams 2 and 3?

	diagram 2	diagram 3
A		
B		
C		
D		

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38 Radioactive carbon-14 decays to nitrogen-14 by the emission of a particle.

$${}^{14}_{6}C \rightarrow {}^{14}_{7}N + \text{particle}$$

Which particle has been emitted in this process?

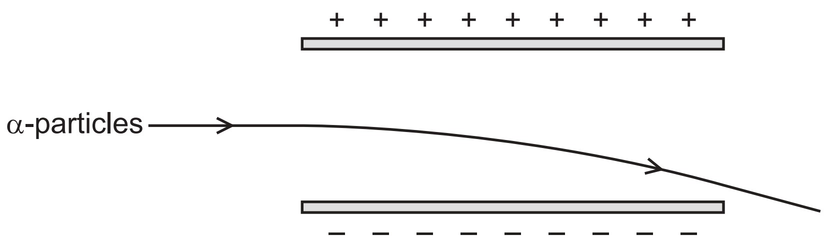
A a β-particle

B an α-particle

C a neutron

D a proton

39 As α-particles pass through the electric field between two charged plates, they are deflected downwards.



What happens to γ-rays passing through the same electric field?

A They are deflected downwards more than the α-particles.

B They are deflected upwards.

C They are not deflected at all.

D They follow the same path as the α-particles.

40 Radioactive iodine-131 emits β-particles and has a half-life of 8 days. It decays to produce xenon-131.

Which statement about this decay is correct?

A After 8 days no more β-particles are emitted.

B After 8 days the number of xenon-131 atoms has halved.

C After 16 days the iodine-131 has decayed completely.

D After 16 days the number of iodine-131 atoms has reduced to one quarter.

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Cambridge IGCSE

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CANDIDATE NAME	

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8414511595

PHYSICS **0625/31**

Paper 3 Theory (Core) **October/November 2017**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m/s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **19** printed pages and **1** blank page.

DC (NF/SG) 132269/7

CAMBRIDGE
International Examinations

[Turn over

1 A student clamps a metre rule to the end of a bench, as shown in Fig. 1.1. He attaches a mass to the end of the rule.

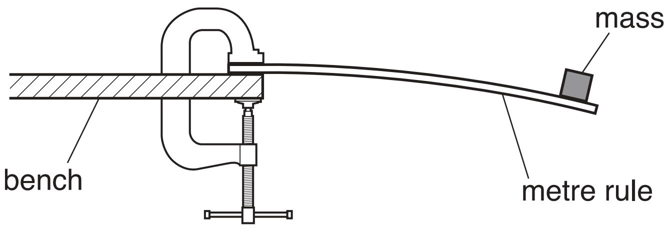


Fig. 1.1

The student displaces the end of the rule by a small distance. The rule oscillates up and down. The student measures the time for ten complete oscillations.

(a) State the name of a measuring device for timing the oscillations.

.... [1]

(b) State a reason why the student measures the time for ten oscillations, rather than for one.

.... [1]

(c) The student repeats the procedure. His results are shown in the table.

results	time for ten complete oscillations / seconds
1st	3.93
2nd	4.07
3rd	3.55
4th	3.99

(i) One of the results is incorrect. On the table, draw a ring around the incorrect result. [1]

(ii) Calculate the average value for the time for ten complete oscillations.

average time = ... s [2]

(iii) Determine the time for one complete oscillation. State your answer to two significant figures.

time = ... s [1]

[Total: 6]

2 Fig. 2.1 shows a river flowing through a village. There are two bridges across the river.

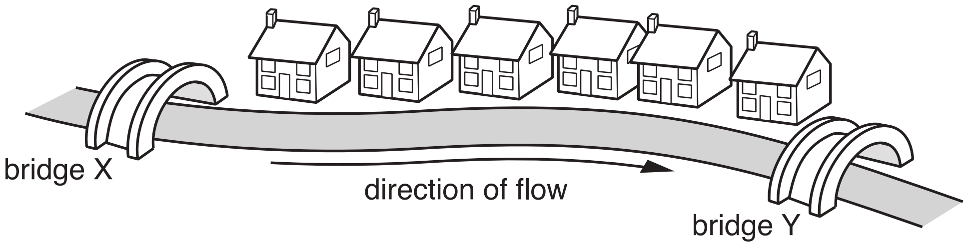


Fig. 2.1

Two students plan to measure the speed of a stick as it floats on the river between bridge X and bridge Y.

(a) The students plan to drop a stick into the middle of the river from bridge X. The stick moves with the water between bridge X and bridge Y.

Describe how the students can determine the average speed of the stick.

....

....

....

....

....

....

....

.... [4]

(b) The stick moves with constant speed.
One statement correctly describes the horizontal forces acting on the stick.

Put a tick (✓) in the box next to the correct statement.

☐ Only a forward force acts.

☐ The forward force and the backward force are equal.

☐ The forward force is greater than the backward force.

☐ The backward force is greater than the forward force.

[1]

[Total: 5]

3 Fig 3.1 shows a warning marker floating on the surface of a lake.

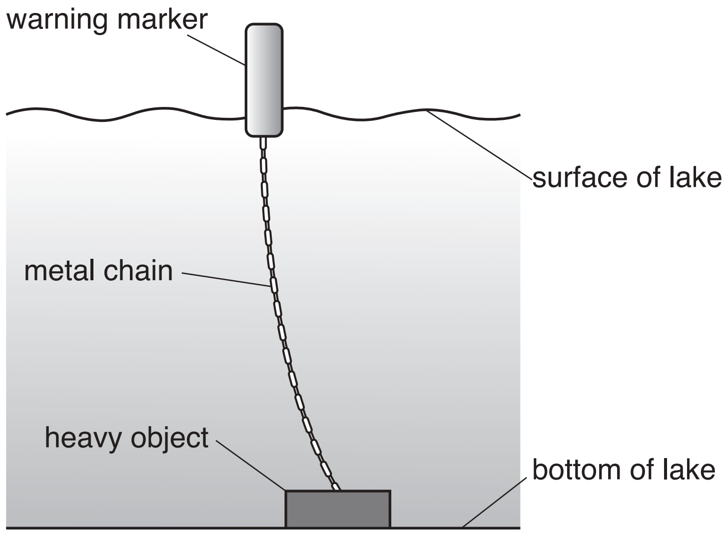


Fig. 3.1

The marker is attached by a metal chain to a heavy object on the bottom of the lake.

(a) Fig. 3.2 shows the forces acting on the marker at one moment in time.

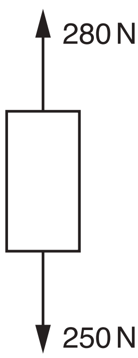


Fig. 3.2

Calculate the resultant force on the marker.

resultant force = ... N

direction = ...

[2]

(b) Fig. 3.3 shows part of the metal chain. It is made from small metal loops.

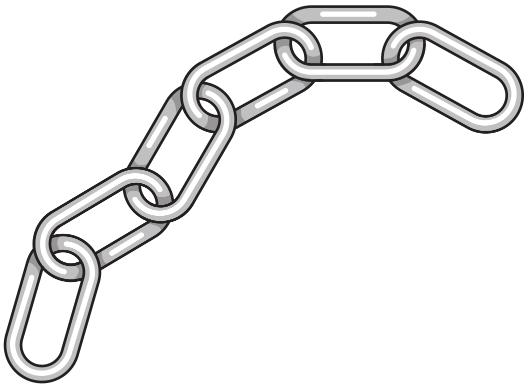


Fig. 3.3

A damaged loop is removed from the chain. Describe a method to determine the density of the metal from which the loops are made.

....

....

....

....

....

....

.... [5]

[Total: 7]

4 Fig. 4.1 shows two methods for generating electricity using renewable sources.

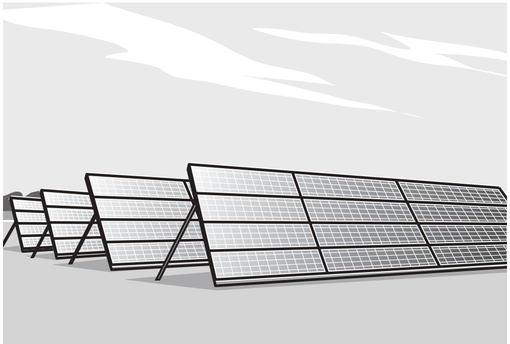


Fig. 4.1a

Fig. 4.1b

Fig. 4.1

(a) Name the energy source for each method.

In Fig. 4.1a, the energy source is ....

In Fig. 4.1b, the energy source is ....
[2]

(b) (i) State **two** advantages of using renewable sources for generating electricity compared to using a coal-fired power station.

1. ....

....

2. ....

.... [2]

(ii) State **one** disadvantage of using renewable sources for generating electricity compared to using a coal-fired power station.

....

.... [1]

[Total: 5]

5 Complete the sentences. Choose from the words in the box.

solid	liquid	gas

The words may be used once, more than once or not at all.

(a) The atoms are usually arranged in regular patterns in a .... [1]

(b) The state of matter with the lowest density is a .... [1]

(c) Evaporation takes place when the most energetic molecules leave the surface of a

.... [1]

(d) A small force can change the volume of a .... [1]

[Total: 4]

6 (a) Fig. 6.1 shows a ray of light inside a semi-circular glass block.

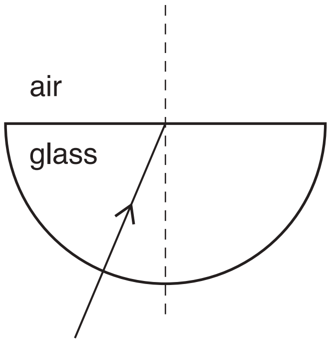


Fig. 6.1

The angle of incidence at the straight surface is **less** than the critical angle for the glass.

On Fig. 6.1, continue the path of the ray. [2]

(b) Fig. 6.2 shows another ray of light inside a semi-circular glass block.

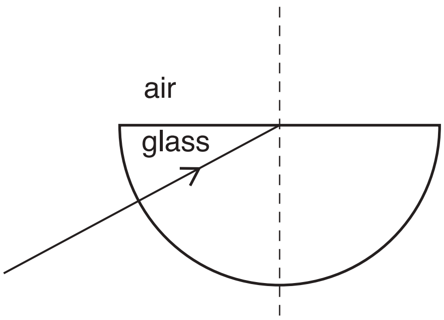


Fig. 6.2

The angle of incidence at the straight surface is **greater** than the critical angle for the glass.

(i) On Fig. 6.2, continue the path of the ray. [2]

(ii) State the term used to describe what happens to the light when it strikes the straight surface in Fig. 6.2.

.... [1]

(c) A wave on the surface of water approaches a barrier. There is a small gap in the barrier, as shown in Fig. 6.3.

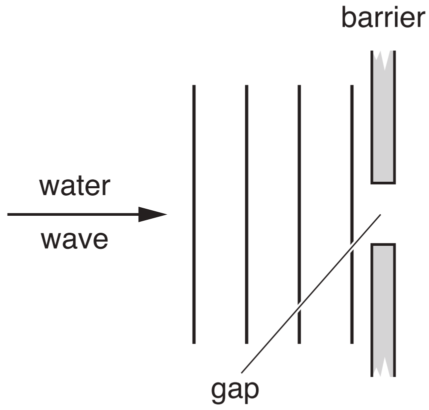


Fig. 6.3

On Fig. 6.3, draw **three** wavefronts that have passed through the gap. [2]

[Total: 7]

7 (a) Fig. 7.1 shows a man listening to a radio.

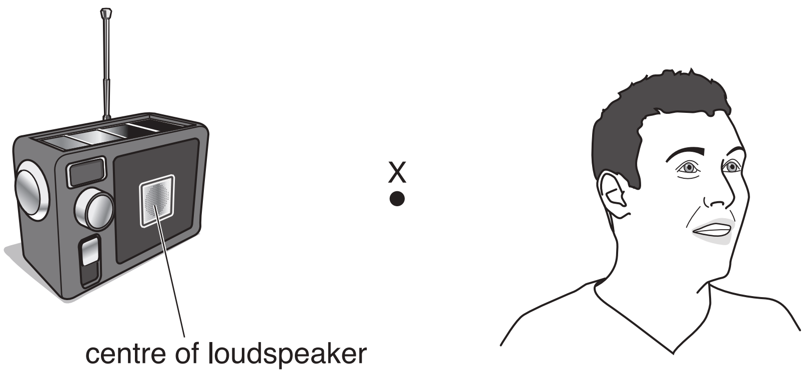


Fig. 7.1

(i) Sound from the radio makes an air particle at X vibrate.

On Fig. 7.1 draw two arrows on point X to show the directions of vibration of the air particle. [2]

(ii) Which of these terms correctly describes the sound wave?

Tick **one** box.

☐ transverse

☐ longitudinal

☐ electromagnetic [1]

(iii) Suggest a value for the frequency of the sound that the man can hear. State the unit.

frequency = ... [2]

(iv) Explain why the man cannot hear ultrasound.

....

.... [1]

(b) Fig. 7.2 shows a distance-time graph for ultrasound travelling in sea-water.

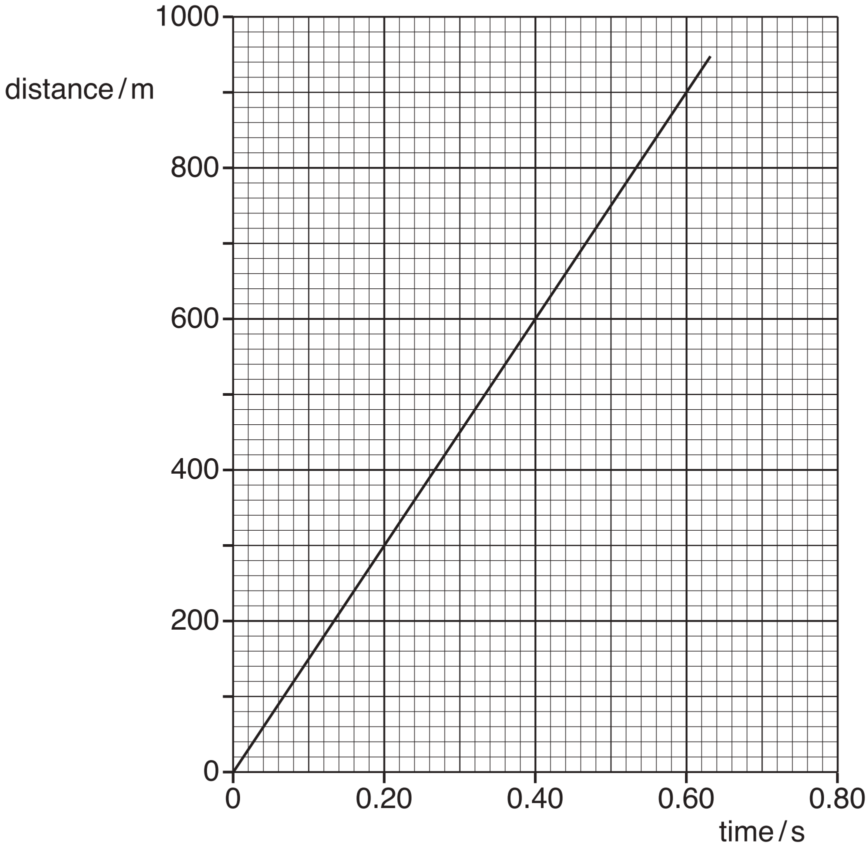


Fig. 7.2

(i) Use the graph to calculate the speed of ultrasound in sea-water.

speed = ... m/s [2]

(ii) A scientist measures the depth of the sea by using ultrasound. She sends a pulse of ultrasound from the ship to the seabed. It reflects from the seabed as shown in Fig. 7.3.

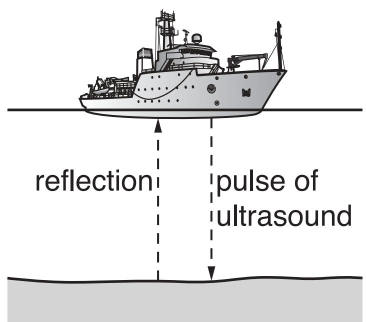


Fig. 7.3

The time taken between sending a pulse and receiving the echo is 0.60 s. Use the graph to determine the depth of the sea.

depth = ... m [2]

[Total: 10]

8 Fig. 8.1 shows a plotting compass and a bar magnet. The plotting compass consists of a small magnet in the shape of an arrow. The arrow can rotate freely on a pivot.

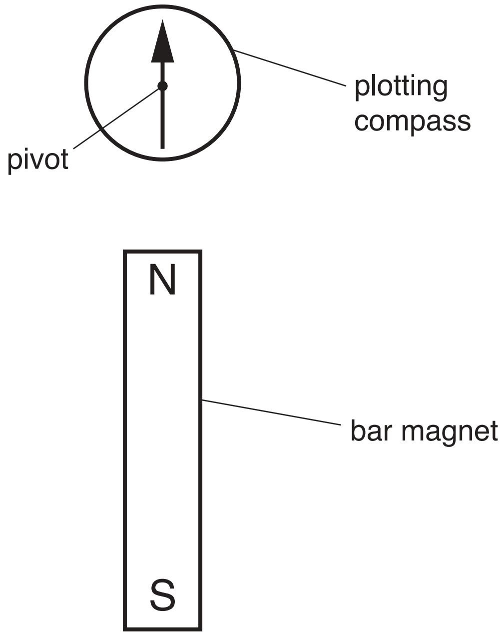


Fig. 8.1

(a) Describe how to use this apparatus to identify the magnetic field pattern of the bar magnet.

....

....

....

....

....

.... [3]

(b) Fig. 8.2 shows a bar magnet.

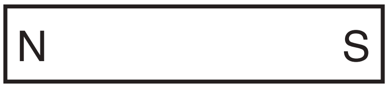


Fig. 8.2

On Fig. 8.2 draw the magnetic field pattern around the bar magnet. Use arrows to show the direction of the field. [3]

[Total: 6]

9 A student investigates how the resistance of a thermistor changes with temperature.
Fig. 9.1 shows part of the circuit the student uses.

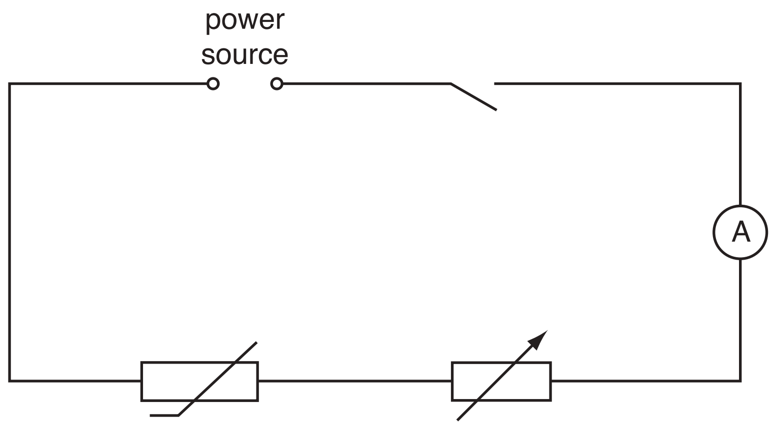


Fig. 9.1

(a) **(i)** On Fig. 9.1, label the thermistor. [1]

(ii) The student measures the potential difference (p.d.) across the thermistor.
On Fig. 9.1, draw a voltmeter symbol, correctly connected, to measure this potential difference. [2]

(b) The student varies the temperature of the thermistor and measures the current in it.
Some of the results are shown in the table.

temperature of thermistor / °C	20	40	60	80
current in thermistor / A	0.005	0.010	0.040	

(i) The potential difference across the thermistor is 6.0 V.

Calculate the resistance of the thermistor when its temperature is 40 °C.

resistance = ... Ω [3]

(ii) Describe and explain what happens to the current in the thermistor as the temperature of the thermistor rises.

....

....

.... [2]

(iii) Suggest a value for the current in the thermistor at 80 °C.

....A [1]

(c) At a different temperature, the resistance of the thermistor is 300 Ω and the resistance of the variable resistor is 400 Ω.

Calculate the value of their combined resistance.

combined resistance = ... Ω [1]

[Total: 10]

10 (a) A student investigates electromagnetic induction.

Fig. 10.1 shows the arrangement she uses.

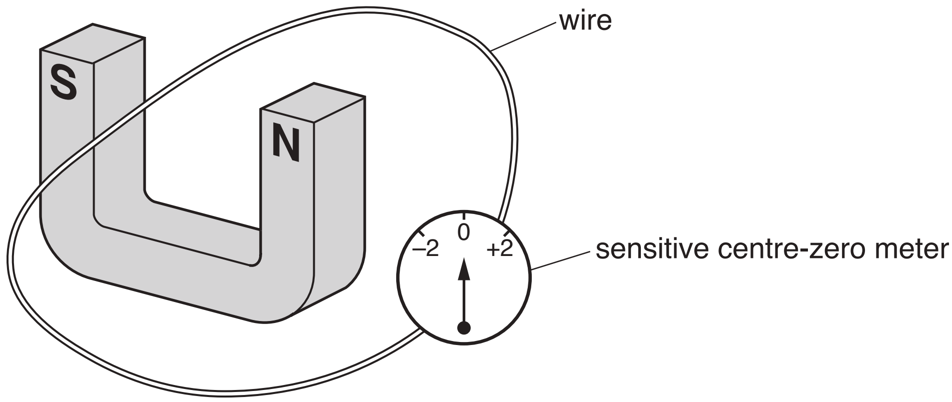
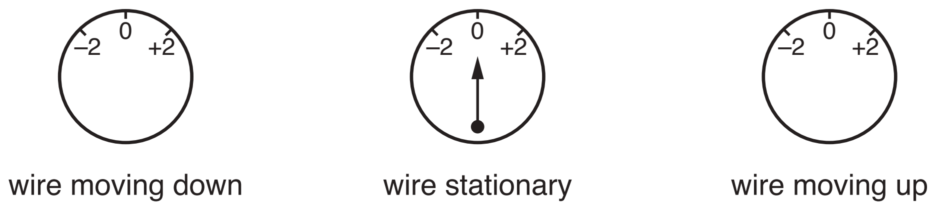


Fig. 10.1

When the student holds the wire stationary, as shown in Fig. 10.1, the reading on the meter is zero.
She moves the wire down between the poles of the magnet. Then she holds it stationary and then moves it up.

(i) The meter measures the size and direction of the induced electromotive force (e.m.f.). On Fig. 10.2, draw the position of the pointer on the meter at each stage.

One has been done for you.



[2]

Fig. 10.2

(ii) Describe how the student could increase the size of the induced electromotive force (e.m.f.).

....

....

.... [2]

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(b) A transformer is used near a power station.
There are 60 turns on the input coil and 660 turns on the output coil.
The input voltage is 25 000 V.

Calculate the output voltage.

output voltage = ... V [3]

(c) State **two** advantages of high-voltage transmission of electrical energy.

1. ....

2. .... [2]

[Total: 9]

11 A nucleus of polonium-210 can be represented as $^{210}_{84}Po$.

(a) **(i)** State the number of protons in a nucleus of polonium-210 .... [1]

(ii) State the number of neutrons in a nucleus of polonium-210 .... [1]

(iii) State the number of electrons in a neutral atom of polonium-210 .... [1]

(b) Polonium-210 is radioactive. When polonium-210 decays it emits alpha radiation.

Name two other types of radiation emitted when radioactive elements decay.

.... and .... [1]

(c) Polonium-210 has a half-life of 138 days.

A sample of polonium-210 has a mass of 0.4 g.

Calculate the time for the sample to decay until only 0.1 g of polonium-210 remains.

time = ... days [3]

[Total: 7]

12 A scientist needs to reduce the risks when working with radioactive sources.

(a) Explain why radioactive sources can be dangerous.

....

....

.... [2]

(b) Describe how to reduce the risks when working with radioactive sources.

....

....

....

.... [2]

[Total: 4]

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Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

4342807288

PHYSICS **0625/32**

Paper 3 Theory (Core) **October/November 2017**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
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At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **15** printed pages and **1** blank page.

DC (NF/SG) 132270/7

[Turn over

1 **(a)** Nuclear power stations generate electricity.

Which of these statements describe an advantage of using nuclear power stations, and which of them describe a disadvantage?

Put a tick (✓) in the correct column for each statement. The first one is done for you.

statement	advantage	disadvantage
nuclear power stations require high levels of security		✓
nuclear power stations produce small amounts of carbon dioxide		
nuclear power stations have a small effect on climate change		
waste radioactive material can take a very long time to decay		

[3]

(b) Describe how electricity may be generated using geothermal resources.

....

....

....

....

....

....

.... [3]

[Total: 6]

2 Fig. 2.1 shows a speed-time graph for a ship starting to move.

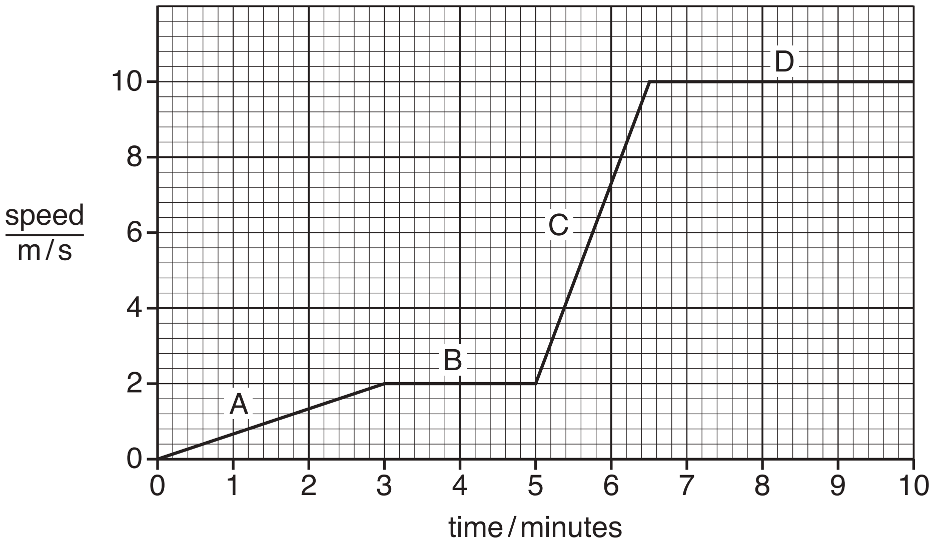

Fig. 2.1

(a) Describe the motion of the ship during each section of the graph.

A ....

....

B ....

....

C ....

....

D ....

.... [4]

(b) Determine the distance travelled by the ship in section B of the graph.

distance = ... m [3]

[Total: 7]

3 Fig. 3.1 shows a glass vase used for displaying flowers.

Fig. 3.1

(a) The mass of the glass is 450 g. The volume of glass in the vase is 145 cm^3.

(i) Calculate the density of the glass.

density = ... g/cm^3 [3]

(ii) Calculate the weight of the glass.

weight = ... N [3]

(b) Another vase has a weight of 30 N. The area of the base in contact with a table is 80.0 cm^2.

Calculate the pressure this vase exerts on the table.

pressure = ... N/cm^2 [3]

[Total: 9]

4 Fig. 4.1 shows a fairground ride.

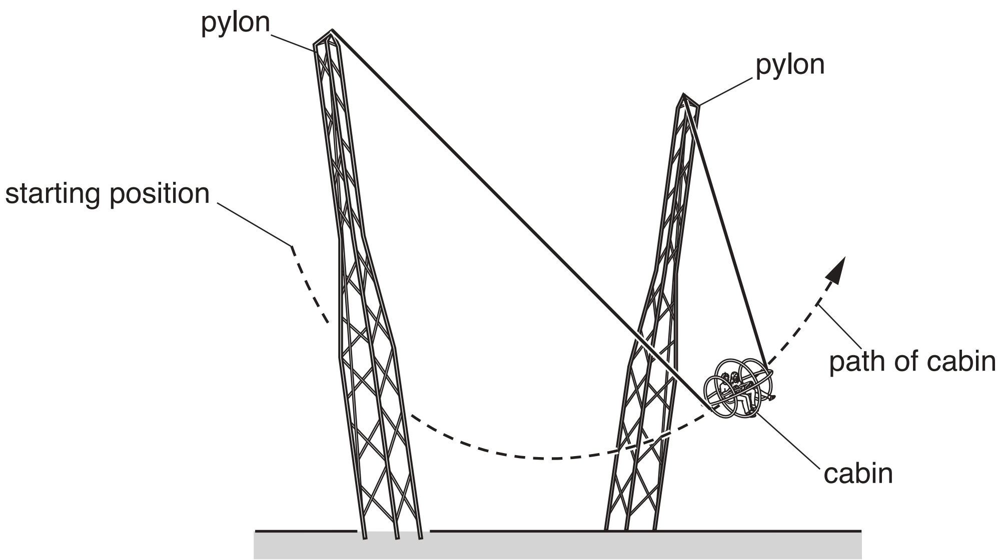

Fig. 4.1

People sit inside a cabin suspended between two pylons. The cabin is lifted to the starting position shown in Fig. 4.1.

(a) State the name of the type of energy gained by the cabin as it rises.

.... [1]

(b) The cabin is released and swings down between the two pylons. The path of the cabin is shown on Fig. 4.1. The cabin has maximum kinetic energy at one point on its path. Draw this point on Fig. 4.1 and label this point X. [1]

(c) A force opposes the motion of the cabin as it falls. State the name of this force.

.... [1]

(d) After a few swings, a brake system stops the cabin (not shown on the diagram).
Use ideas about energy transfer to suggest how the brake system stops the cabin.

....

....

....

.... [3]

[Total: 6]

5 A cup made from plastic, containing a hot drink, is shown in Fig. 5.1.

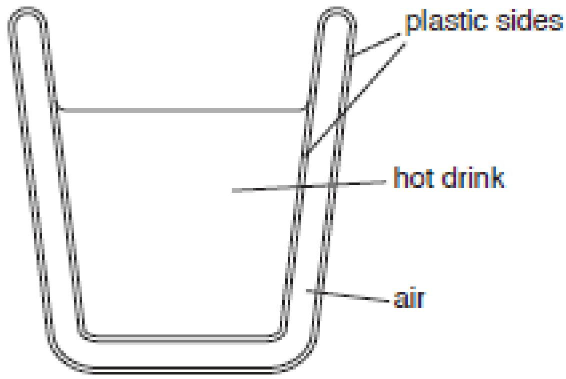

Fig. 5.1

(a) State the term given to materials that reduce the transfer of thermal energy.

.... [1]

(b) The hot drink gradually cools.

Describe and explain two processes by which thermal energy is transferred from the hot drink.

....

....

....

....

....

....

....

.... [5]

[Total: 6]

6 Fig. 6.1 shows a ray of light reflected from mirror 1 at point P and striking mirror 2 at point Q.

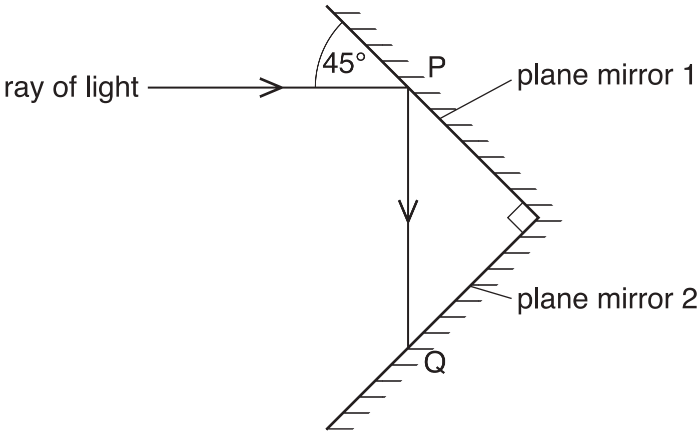

Fig. 6.1

(a) On Fig. 6.1,

- clearly mark the position of the normal at Q,
- draw the ray reflected from point Q,
- mark the angle of reflection at Q using the letter *r*,

State the law you used to draw the reflected ray.

.... [4]

(b) Compare the direction of the ray reflected from mirror 2 at Q with the direction of the ray incident on mirror 1 at P. Tick **one** box.

The ray of light reflected from mirror 2 is

☐ parallel to the incident ray at P,

☐ perpendicular to the incident ray at P,

☐ at an angle of 45° to the incident ray at P. [1]

(c) A thin, converging lens forms an image, I, of an object, O, as shown in Fig. 6.2.

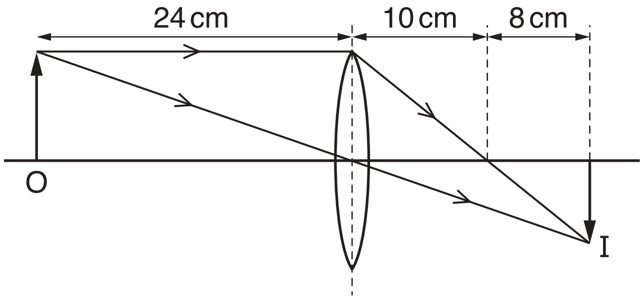

Fig. 6.2

(i) On Fig. 6.2, label a principal focus of the lens, using the letter **F**. [1]

(ii) State the focal length of the lens.

focal length = ... cm [1]

[Total: 7]

7 Fig. 7.1 shows the regions of the electromagnetic spectrum.

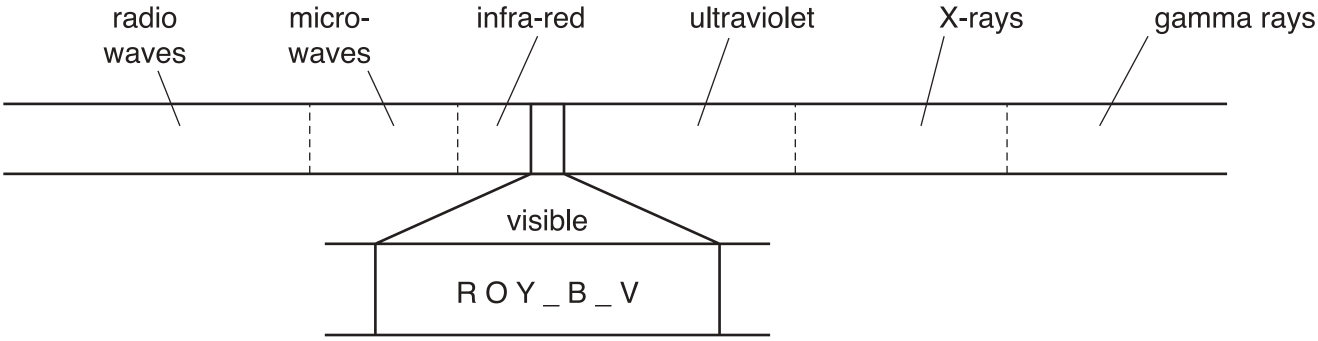

Fig. 7.1

(a) Fig. 7.1 shows the first letter of some colours in the visible part of the spectrum.

State which colours are missing.

.... and .... [1]

(b) State the names of the regions of the electromagnetic spectrum that are used in

(i) communications,

.... and .... [1]

(ii) remote controls for televisions and DVD players.

.... [1]

(c) Describe how high levels of microwave energy can be dangerous to people.

....

.... [1]

(d) State **two** safety precautions required when using X-rays.

1. ....

2. .... [2]

[Total: 6]

8 **(a)** An atom of carbon contains protons, neutrons and electrons.

Indicate where each particle is found in the atom. Place a tick in the appropriate box.

particle	in the nucleus	orbiting the nucleus
electron		
neutron		
proton		

[3]

(b) An atom of carbon contains 6 protons, 7 neutrons and 6 electrons.

(i) State the proton number of the carbon.

.... [1]

(ii) State the nucleon number of the carbon.

.... [1]

(c) Carbon has many different isotopes.

(i) Explain the meaning of the term *isotope*.

....

....

.... [2]

(ii) The nuclide notation for the carbon in **(b)** is ${}^{13}_{6}C$.

Suggest the nuclide notation for another possible isotope of carbon.

.... [1]

[Total: 8]

9 Some metals can be used to make permanent magnets.

(a) Identify the metal that can form a permanent magnet.
Tick **one** box.

☐ copper ☐ iron ☐ steel [1]

(b) Fig. 9.1 shows a circuit that is used to make a permanent magnet.

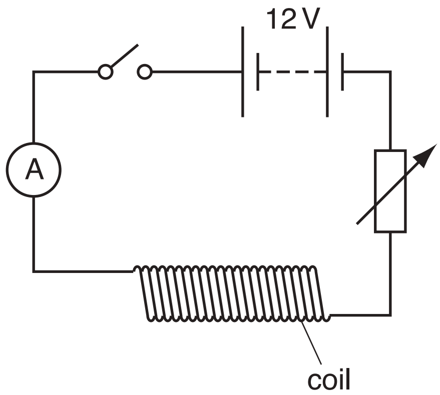

Fig. 9.1

(i) On Fig. 9.1, label the variable resistor with the letter X. [1]

(ii) Describe how the circuit is used to make a permanent magnet.

....

....

.... [3]

(c) Fig. 9.2 shows the coil from Fig. 9.1.

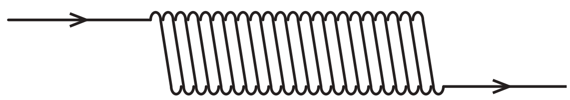

Fig. 9.2

On Fig. 9.2 carefully sketch the pattern of the magnetic field produced by the coil. [2]

[Total: 7]

10 Fig. 10.1 shows a series circuit.

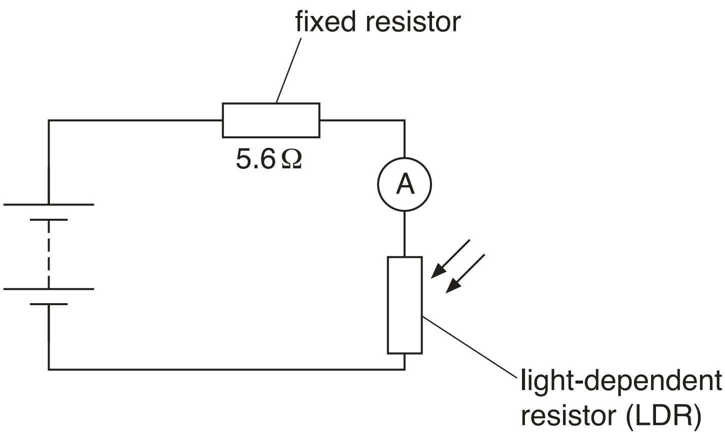

Fig. 10.1

(a) In dim light, the resistance of the LDR is 20.0 Ω.

(i) The resistance of the battery and ammeter can be ignored.

Calculate the resistance of the circuit.

resistance = ... Ω [1]

(ii) The current in the circuit is 0.23 A.

Calculate the potential difference across the fixed resistor.

potential difference (voltage) = ... V [3]

(b) A bright light shines on to the LDR.

State and explain what happens to the current in the circuit.

....

.... [2]

[Total: 6]

11 Fig. 11.1 shows a charger for a mobile (cell) phone. The charger contains a transformer.

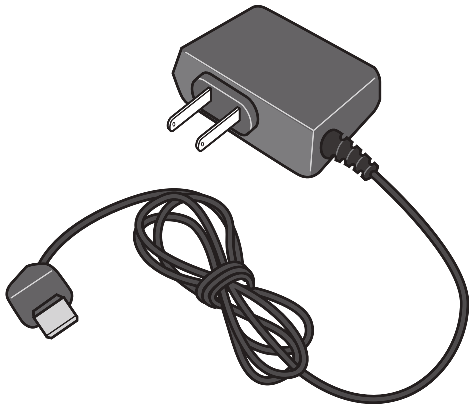

Fig. 11.1

(a) The primary coil of the transformer has 900 turns and the secondary coil has 49 turns. The input voltage to the transformer is 220 V.

Calculate the output voltage.

output voltage = ... V [3]

(b) State the name of the metal used to make the coils of the transformer.

.... [1]

(c) A transformer uses an alternating current (a.c.).

Describe the difference between alternating current (a.c.) and direct current (d.c.).

....

....

.... [1]

[Total: 5]

12 Fig. 12.1 shows some equipment used in a demonstration.

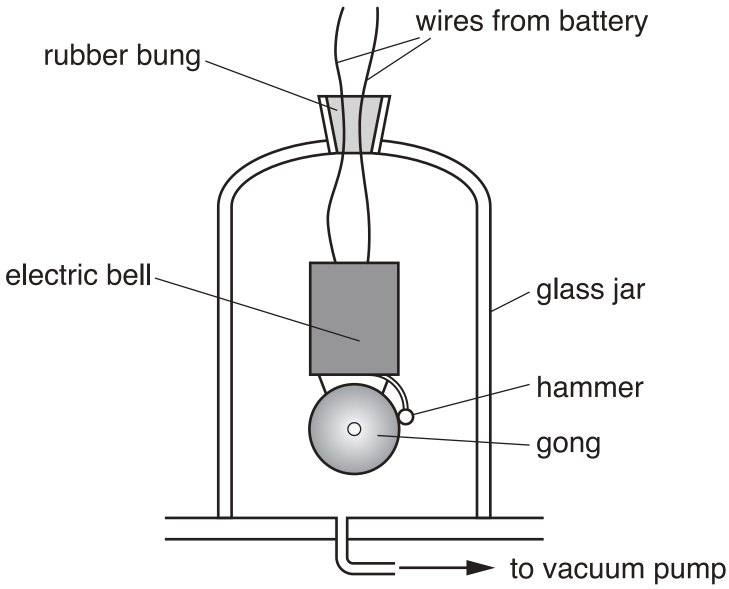

Fig. 12.1

The glass jar is connected to a vacuum pump. The electric bell is switched on. The observers see and hear the bell working.

(a) **(i)** The vacuum pump removes air from the glass jar. State what the observers see and what they hear after the air is removed.

observers see ....

....

observers hear ....

.... [2]

(ii) State what the demonstration in **(a)(i)** shows about the transmission of sound waves.

....

....

.... [2]

(iii) When the bell is working, the hammer strikes the gong. Describe how the gong produces the sound.

....

.... [1]

(b) Indicate the lowest and highest frequencies that can be heard by the human ear.

Tick **one** box from each column.

lowest frequency	highest frequency
☐ 2 Hz	☐ 20 kHz
☐ 20 Hz	☐ 200 kHz
☐ 200 Hz	☐ 2 MHz
☐ 2 kHz	☐ 20 MHz

[2]

[Total: 7]

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Cambridge IGCSE

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Cambridge International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

6324801284

PHYSICS **0625/33**

Paper 3 Theory (Core) **October/November 2017**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = $10\,m/s^2$).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages.

DC (NF/SG) 132271/7

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1 **(a)** A student determines the speed of three cars on a straight road.
The student measured the time for the cars to travel 50 m.

The table shows the measurements.

car	distance travelled / m	time taken / s
A	50	3.2
B	50	4.0
C	50	3.6

(i) Without calculation, identify the fastest car and the slowest car.

Complete the table.

	car
the fastest car	
the slowest car	

[2]

(ii) Calculate the speed of car **B**.

speed = ... m / s [3]

(b) **(i)** Estimate the time, in minutes, for car **C** to travel 5000 m.

estimated time = ... minutes [2]

(ii) Explain why your answer in **(b)(i)** may not be the same as the actual time taken for the car to travel 5000 m.

....

.... [1]

[Total: 8]

2 Fig. 2.1 shows a metal object discovered by a scientist using a metal detector.

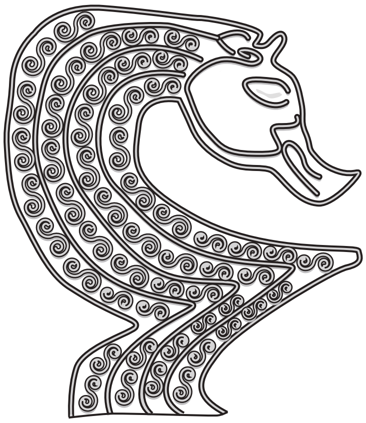

Fig. 2.1

The scientist wants to know the type of metal from which the object is made. She needs to find the density of the metal.

(a) Describe how the scientist can measure the volume of the object, using the method of displacement.

....

....

....

....

....

.... [4]

(b) The mass of the metal object is 347 g and its volume is 18 cm^3.

Calculate the density of the metal.

density = ... g / cm^3 [3]

[Total: 7]

3 Fig. 3.1 shows a large box with a heavy lid.

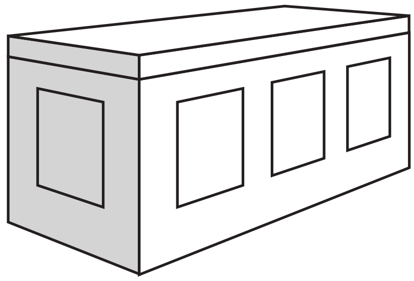

Fig. 3.1

(a) The weight of the box is 2250 N.

Calculate the mass of the box.

mass = ... kg [3]

(b) A man wants to lift the lid of the box. He puts a strong metal bar between the box and the lid. He applies a force to the bar as shown in Fig. 3.2.

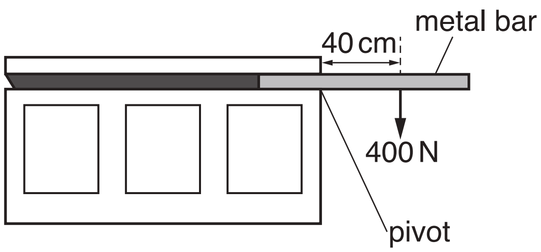

Fig. 3.2

(i) Calculate the moment of his force about the pivot. State the unit.

moment = ... [4]

(ii) The moment in **(b)(i)** is not sufficient to lift the lid. Describe how the man can increase the moment, using the same force.

....

.... [1]

[Total: 8]

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4 A catapult consists of a rubber band attached to a handle. A student uses the catapult to fire a ball towards a target. Fig. 4.1 shows the catapult just before the student releases the rubber band.

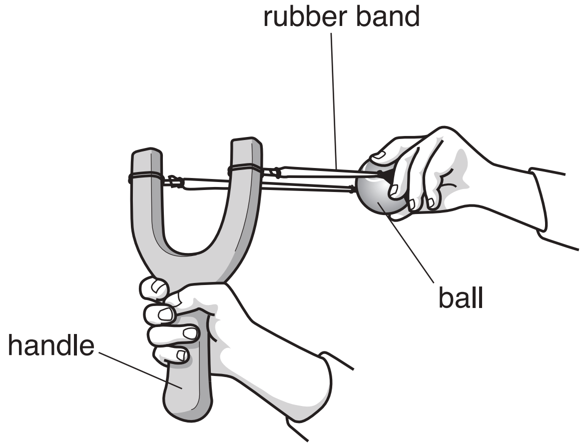


Fig. 4.1

(a) When the student releases the rubber band, the ball moves towards the target.

Complete the following sentences about energy transfers during this process. Use words from the box. You may use each word once, more than once or not at all.

elastic	force	friction	gravitational	kinetic	thermal

(i) As the rubber band is pulled back, the work done is transferred into .... potential energy. [1]

(ii) When the student releases the rubber band, the ball moves forward horizontally. Stored

.... potential energy is transferred into .... energy. [2]

(iii) As the ball travels through the air there is friction with air molecules. This causes some of

the ball's .... energy to be transferred into .... energy. [2]

(b) The ball does not reach the target, as shown in Fig. 4.2.

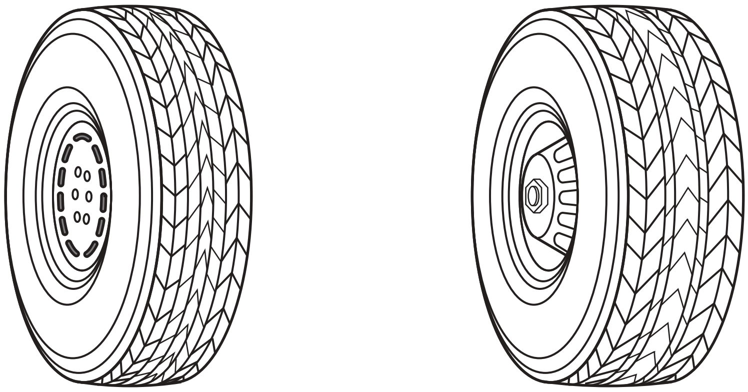
Fig. 4.2

Describe how the student can increase the energy of the ball, using the same catapult.

.... [1]

[Total: 6]

5 A vehicle may have tyres of type **A** or type **B**, as shown in Fig. 5.1.



type A **type B**

Fig. 5.1

(a) State and explain the type of tyre that is suitable for travelling over soft ground.

....

....

....

.... [3]

(b) The temperature of the air in a tyre increases. This affects the motion of the air molecules in the tyre.

Describe and explain the changes.

....

....

....

....

.... [3]

[Total: 6]

6 Fig. 6.1 shows a liquid-in-glass thermometer.

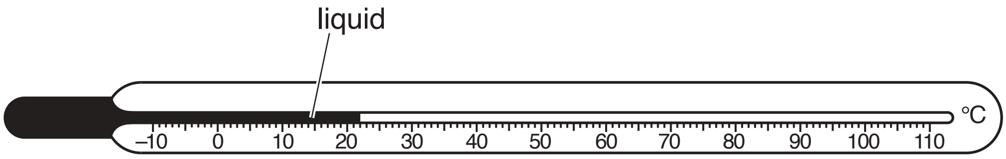


Fig. 6.1

(a) **(i)** Which of these metals is often used for the liquid in thermometers?
Tick the correct box.

☐ magnesium

☐ mercury

☐ silver [1]

(ii) The thermometer is placed inside a freezer containing ice.
Suggest the temperature of the ice. Draw an arrow on Fig. 6.1. [1]

(iii) A thermometer is calibrated using two fixed points. State the temperatures of the two fixed points.

lower fixed point = ... °C

upper fixed point = ... °C [1]

(b) The sentences are about thermal processes.
Complete each sentence. Use words from the box. Each word may be used once, more than once or not at all.

conductor	convection	emitter	insulator	radiation	reflection

- A dull black surface is a good ....
- Copper is used to make pans because it is a good thermal ....
- In fluids, thermal energy is transferred mainly by ....
- Thermal energy reaches Earth from the Sun by means of ....

[4]

[Total: 7]

7 Fig. 7.1 shows a floating plastic ball attached by a long rope to a weight on the bottom of a lake. A water wave on the surface of the lake causes the ball to move vertically up and down.

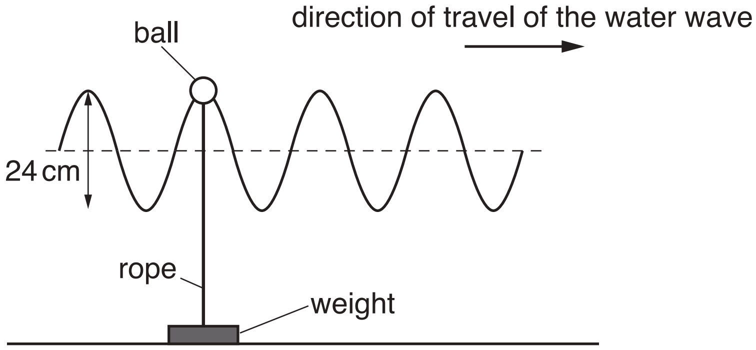


Fig. 7.1

(a) On Fig. 7.1, indicate the wavelength of the wave. Label the distance *W*. [1]

(b) Determine the amplitude of the wave.

amplitude = ... cm [1]

(c) The ball reaches its maximum height 40 times in 60 seconds. Calculate the frequency of the wave.

frequency = ... Hz [2]

(d) Explain how the motion of the ball shows that the water wave is transverse.

....

....

.... [1]

(e) State another example of a transverse wave.

.... [1]

[Total: 6]

8 Fig 8.1 shows two parallel rays of light that pass through a thin converging lens. The diagram is incomplete. There is a principal focus at f_1 and at f_2.

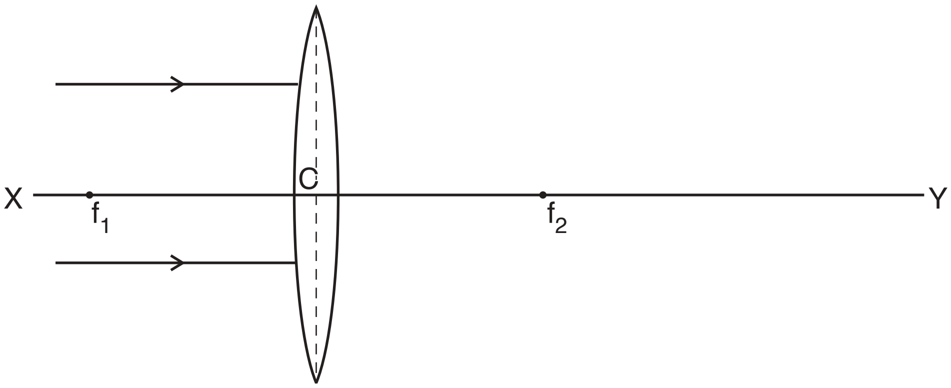


Fig. 8.1

(a) (i) On Fig. 8.1, complete the ray diagram to show how the lens focuses the light. [3]

(ii) Which distance on Fig. 8.1 is a focal length of the lens? Tick (✓) one box.

- ☐ C to f_2
- ☐ f_1 to f_2
- ☐ f_2 to Y [1]

(b) (i) A ray of light travels through a semicircular glass block, as shown in Fig. 8.2.

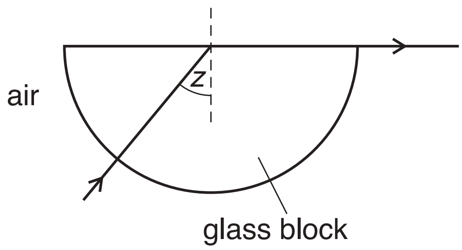


Fig. 8.2

State the term given to the angle of incidence labelled *z*.

.... [1]

(ii) Fig. 8.3 shows another ray of light travelling in the semicircular glass block.

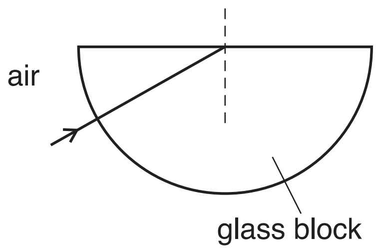


Fig. 8.3

The angle of incidence is greater than *z*. Continue the path of the ray of light until it leaves the block. [2]

[Total: 7]

9 A machine pushes a metal post into the ground using a hammer, as shown in Fig. 9.1. The hammer makes a loud noise when it hits the post.

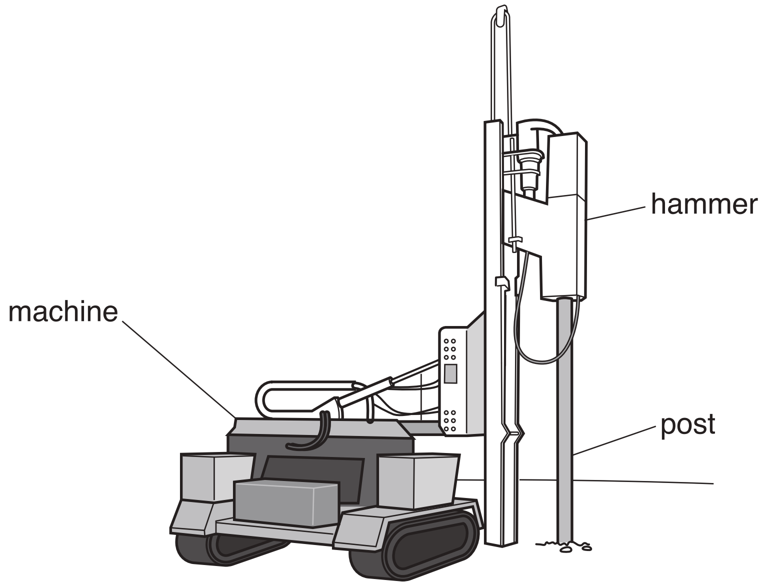


Fig. 9.1

A man stands 160 m from the hammer.

(a) A man sees the hammer hit the post and a short time later hears the sound of the post being hit. Explain the delay in hearing the sound.

....

.... [1]

(b) **(i)** The hammer is 320 m from a large building as shown in Fig. 9.2.

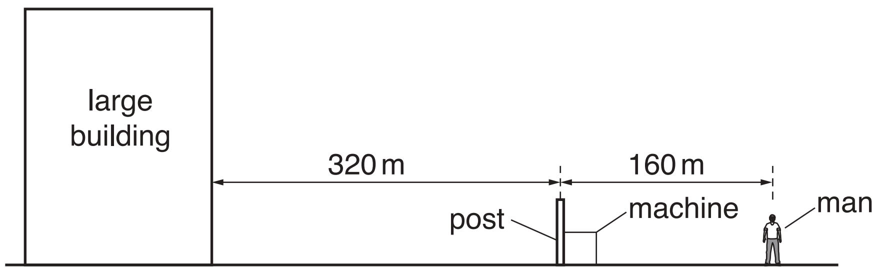


Fig. 9.2

The man hears the hammer hit the post and then hears an echo. Explain why he hears the echo.

....

.... [1]

(ii) The speed of sound in air is 320 m/s.

Calculate the time difference between the man hearing the first sound and the time at which he hears the echo.

time difference = ... [3]

(c) Suggest how the sound of the echo is different from the first sound.

.... [1]

[Total: 6]

10 A student places a bar magnet onto a sheet of paper, as shown in Fig. 10.1.

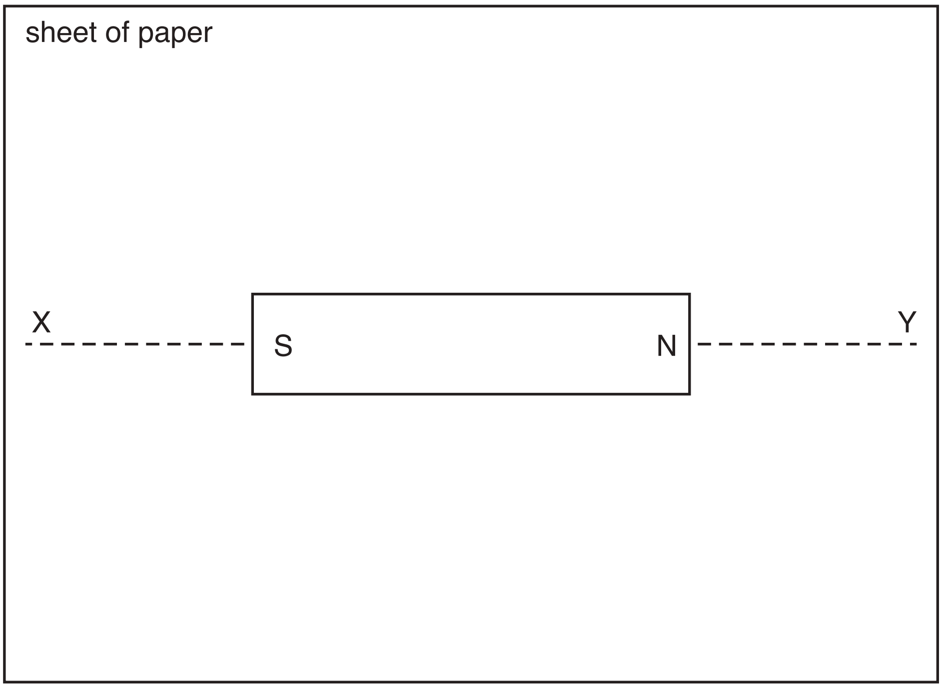


Fig. 10.1

(a) The student shows the pattern of the magnetic field lines around the magnet.

(i) On Fig. 10.1 carefully draw two magnetic field lines above the centre line XY and two magnetic field lines below XY. [2]

(ii) Indicate the direction of the magnetic field lines. Use an arrow. Mark one field line above XY and one field line below XY. [1]

(iii) State the name of a piece of equipment that can be used to determine the direction of the magnetic field.

.... [1]

(b) Describe how the student can use a bar magnet to test whether a metal rod is a magnet.

....

....

.... [2]

[Total: 6]

11 A student wants to find the resistance of a wire. He connects the circuit shown in Fig. 11.1.

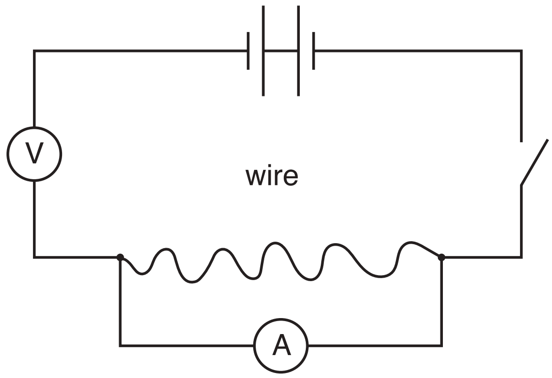


Fig. 11.1

(a) A teacher checks the circuit and identifies three errors.

Using the components given in Fig. 11.1, carefully draw the correct circuit diagram in the space below.

[3]

(b) The student uses the correct circuit. The student finds that the current is 0.3 A when the potential difference across the wire is 2.7 V.

Calculate the resistance of the wire.

resistance = ... Ω [3]

(c) The student tests two other pieces of wire made of the same metal. He compares each resistance value with that of the first wire.

State how the resistance compares with the first wire

(i) for a wire that is longer, but of the same thickness,

.... [1]

(ii) for a wire that is thicker, but of the same length.

.... [1]

[Total: 8]

12 This question is about radioactive materials.

(a) State the name of the electromagnetic radiation emitted by some nuclei when they decay.

.... [1]

(b) Describe the composition and the penetrating ability of an α-particle.

composition ....

....

penetrating ability ....

.... [2]

(c) Americium-241 is a radioactive isotope. It has a half-life of 400 years.

A sample contains americium-241. Calculate the percentage of americium-241 that remains in the sample after 800 years have passed.

percentage remaining = ... % [2]

[Total: 5]

Cambridge IGCSE

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CENTRE NUMBER

CANDIDATE NUMBER

2939187014

PHYSICS **0625/41**

Paper 4 Theory (Extended) **October/November 2017**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

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Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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This document consists of **14** printed pages and **2** blank pages.

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[Turn over

1 Fig. 1.1 shows the speed-time graph for the motion of a car.

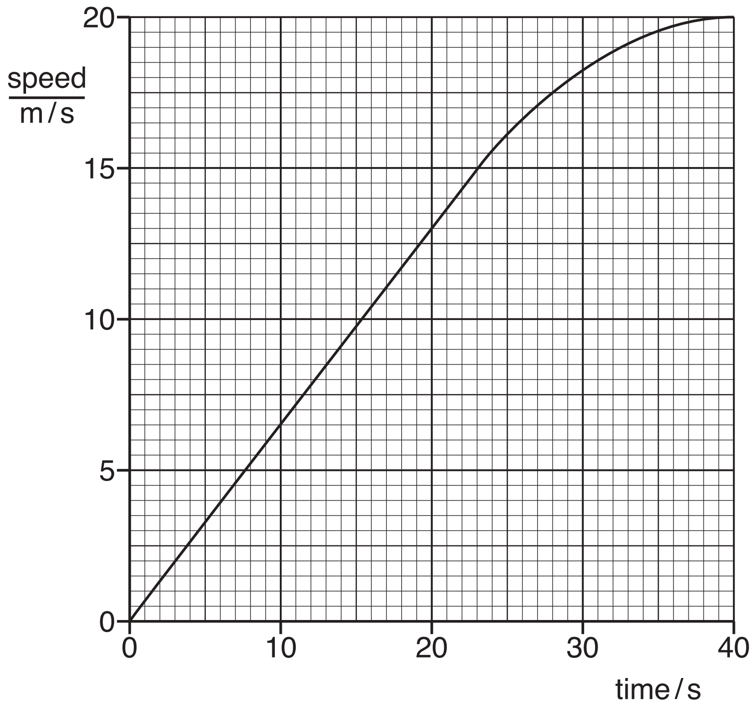

Fig. 1.1

The mass of the car is 1200 kg.

(a) Calculate, for the first 20 s of the motion,

(i) the distance travelled by the car,

distance = ...[2]

(ii) the acceleration of the car,

acceleration = ...[2]

(iii) the resultant force acting on the car.

resultant force = ...[2]

(b) Describe the motion of the car in the period of time from 25 s to 40 s.

....

....[1]

[Total: 7]

2 **(a)** State Hooke's Law.

....

....[1]

(b) For forces up to 120 N, a spring obeys Hooke's Law.

A force of 120 N causes an extension of 64 mm.

(i) On Fig. 2.1, draw the force-extension graph for the spring for loads up to 120 N. [1]

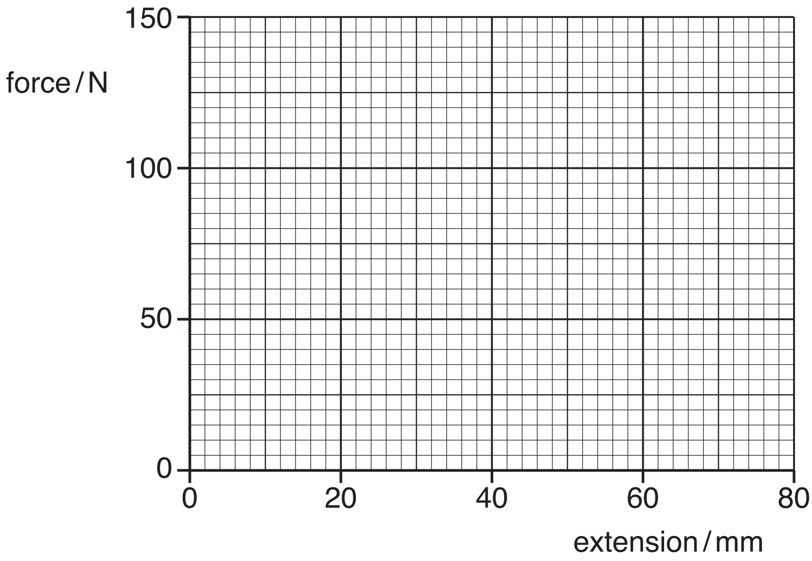

Fig. 2.1

(ii) Calculate the spring constant *k* of the spring.

k = ...[2]

(c) A student makes a spring balance using the spring in **(b)**. The maximum reading of this balance is 150 N.

The student tests his balance with a known weight of 140 N. He observes that the reading of the balance is not 140 N.

Suggest and explain why the reading is **not** 140 N.

....

....

....[2]

[Total: 6]

3 All the sides of a plastic cube are 8.0 cm long. Fig. 3.1 shows the cube.

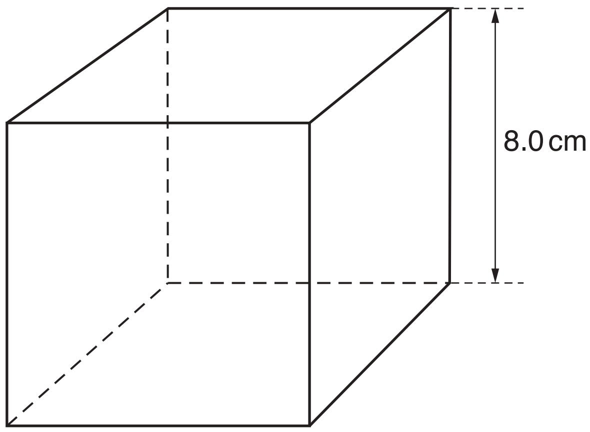

Fig. 3.1 (not to scale)

The mass of the cube is 0.44 kg.

(a) Explain what is meant by *mass*.

.... [1]

(b) **(i)** Calculate the density of the plastic from which the cube is made.

density = ... [2]

(ii) The density of one type of oil is 850 kg / m^3.

State and explain whether the cube floats or sinks when placed in a container of this oil.

....

.... [1]

(c) On the Moon, the weight of the cube is 0.70 N.

(i) Calculate the gravitational field strength on the Moon.

gravitational field strength = ... [2]

(ii) In a laboratory on the Moon, the plastic cube is held stationary, using a clamp, in a beaker of the oil of density 850 kg / m^3.

The arrangement is shown in Fig. 3.2.

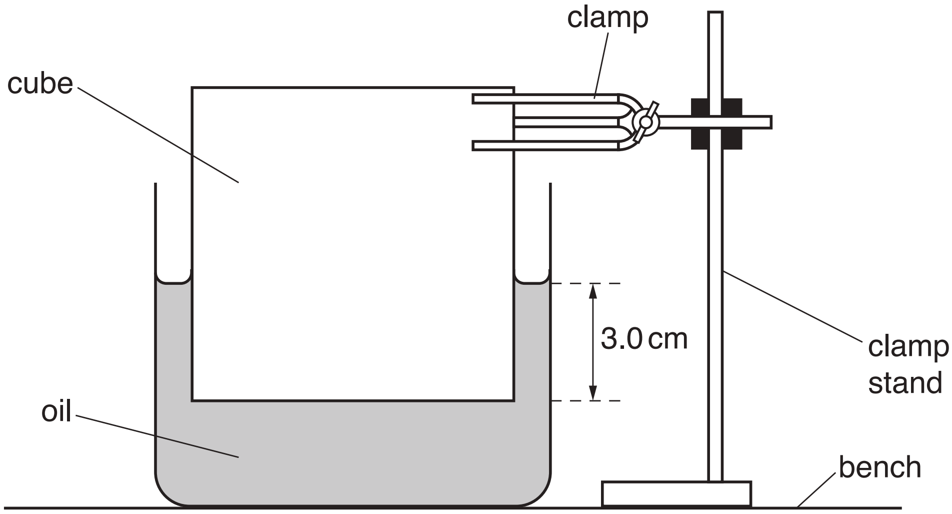

Fig. 3.2

The lower face of the cube is 3.0 cm below the surface of the oil.

Use your answer to **(c)(i)** to calculate the pressure due to the oil on the lower face of the cube.

pressure = ... [2]

[Total: 8]

4 Fig. 4.1 shows a balloon filled with helium that is used to lift measuring instruments to a great height above the Earth's surface.

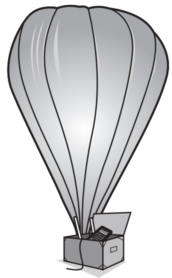

Fig. 4.1

(a) Explain, in terms of momentum, how the atoms of helium produce a force on the wall of the balloon.

....

....

....

....[3]

(b) At ground level, the pressure of the helium in the balloon is 1.0×10^5 Pa. The volume occupied by the helium is $9.6\,m^3$.

The balloon is released and it rises quickly through the atmosphere. The volume occupied by the helium increases, but the temperature of the helium may be assumed to stay constant.

(i) Explain, in terms of the helium atoms in the balloon, why the pressure in the balloon is smaller than at ground level.

....

....

....[2]

(ii) Calculate the pressure of the helium when it occupies a volume of $12\,m^3$.

pressure = ...[2]

[Total: 7]

5 **(a)** A wave passes through a gap in a barrier. The wavelength of the wave is the same magnitude as the width of the gap in the barrier.

Tick **one** box to indicate what happens to the wave.

diffraction and dispersion	
diffraction only	
dispersion only	
refraction and diffraction	
refraction and dispersion	
refraction only	

[1]

(b) Fig. 5.1 shows six wavefronts of a wave travelling on the surface of deep water. The wave is incident on a boundary with a region where the water is shallow.

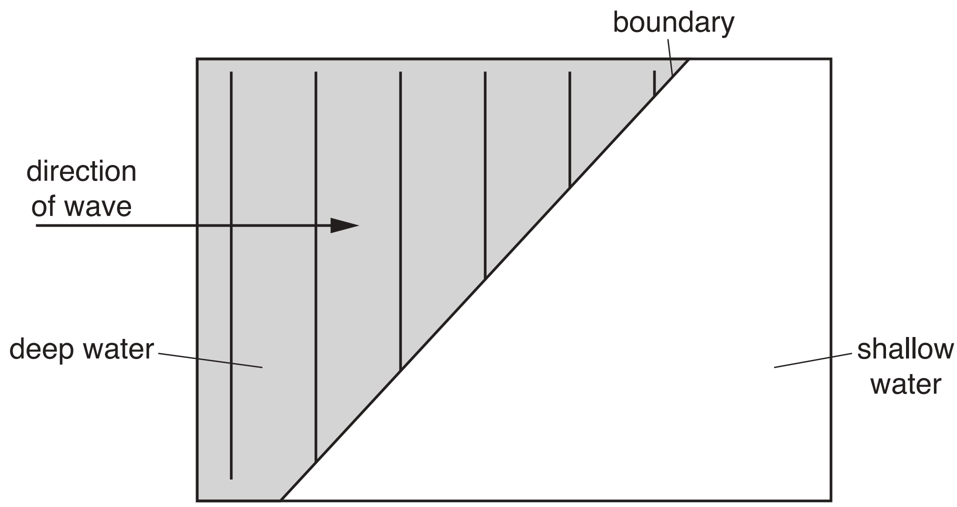

Fig. 5.1

(i) On Fig. 5.1, draw the wavefronts of the wave in the shallow water where the wave travels more slowly. [2]

(ii) The depth of the shallow water is now changed so that the speed of the wave in the shallow water is 0.60 m/s. The speed of the wave in the deep water is 0.80 m/s.
The distance between successive wavefronts in the deep water is 1.4 cm.

Calculate the wavelength of the wave in the shallow water.

wavelength = ...[4]

[Total: 7]

6 **(a)** The left-hand column of the table shows some possible speeds of a sound wave.

In the right-hand column, write down the medium in which a sound wave has this speed.

Choose from solid, liquid or gas.

speed of sound wave m/s	medium
1500	
5000	
300	

[2]

(b) Fig. 6.1 represents a series of compressions and rarefactions of a sound wave.

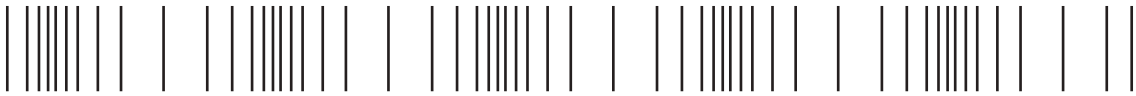

Fig. 6.1

(i) On Fig. 6.1, mark, with the letters X and Y, the mid-points of **two** rarefactions. [1]

(ii) State, in terms of pressure, what is meant by a *rarefaction*.

....

....[1]

(c) Astronauts set up a mirror on the Moon's surface. A laser beam is transmitted from the Earth's surface to the mirror and is then reflected back to Earth.

On a certain day, the time between transmitting the beam from a point on the Earth's surface and receiving the reflected signal at the same point is 2.56 s.

The speed of the laser beam is 3.00×10^8 m/s.

Calculate the distance between the Earth's surface and the Moon's surface.

distance = ...[3]

[Total: 7]

7 **(a)** Fig. 7.1 shows a converging lens and its principal axis. The points labelled F are each a principal focus of the lens.

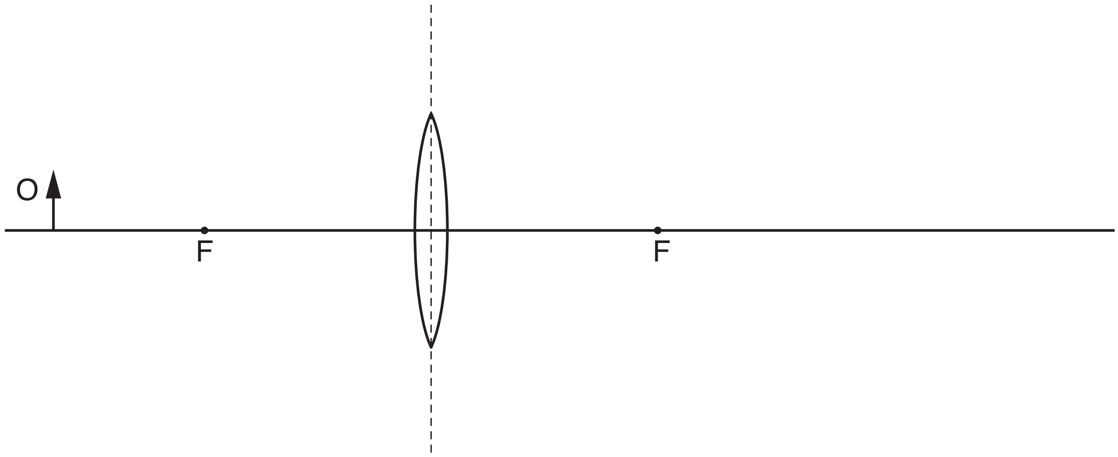

Fig. 7.1

On Fig. 7.1, draw **two** rays from the top of the object O, to locate the image of O.
Label the image I. [3]

(b) Underline **three** of the terms below to describe the nature of the image produced by a converging lens used as a magnifying glass.

diminished **enlarged** **inverted** **real** **same size** **upright** **virtual**

[2]

(c) Fig. 7.2 shows the path of a ray of red light passing through a glass prism.

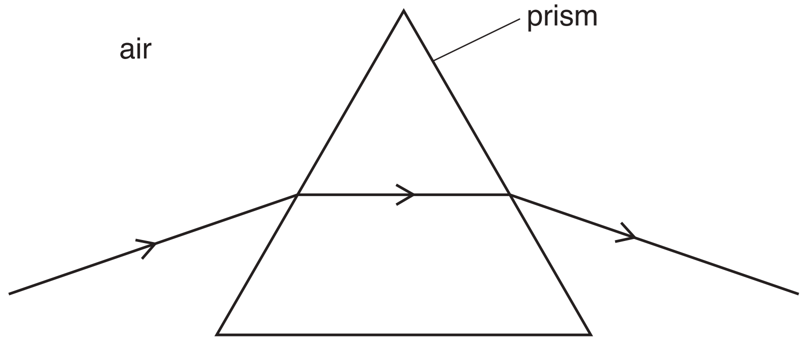

Fig. 7.2

A ray of green light enters the prism along the same path as the ray of red light.

On Fig. 7.2, draw the path of the ray of green light as it passes through the prism and emerges into the air. [2]

[Total: 7]

8 **(a)** Describe a renewable process by which electrical energy is obtained from the energy stored in water. You may draw a diagram in the space.

....

....

....

....

....

.... [4]

(b) Explain why the process described in **(a)** can be regarded as renewable.

....

....

....

.... [2]

(c) Explain whether the Sun is the source of the energy stored in the water in **(a)**.

....

....

....

.... [2]

[Total: 8]

9 Fig. 9.1 shows a circuit with three 1.5 V cells.

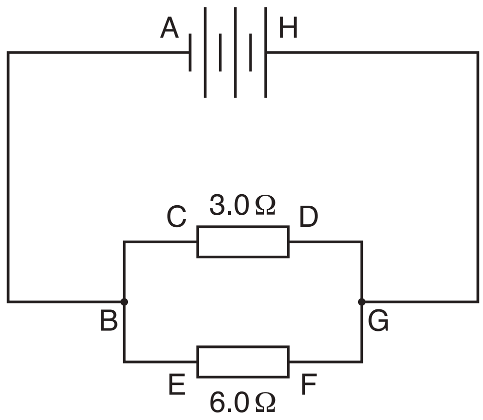

Fig. 9.1

(a) Calculate

(i) the total electromotive force (e.m.f.) of the cells,

e.m.f. = ... [1]

(ii) the total resistance of the circuit,

resistance = ... [3]

(iii) the current in the 3.0 Ω resistor.

current = ... [2]

(b) State, using the letters in Fig. 9.1, how you would connect

(i) an ammeter to measure the total current in the circuit,

....

.... [1]

(ii) a voltmeter to measure the potential difference (p.d.) across the 6.0 Ω resistor.

....

.... [1]

[Total: 8]

10 **(a)** **(i)** Draw the circuit symbol for a diode.

[1]

(ii) State the function of a diode.

....[1]

(b) Fig. 10.1 shows the proposed system for charging the battery of an electric toothbrush.

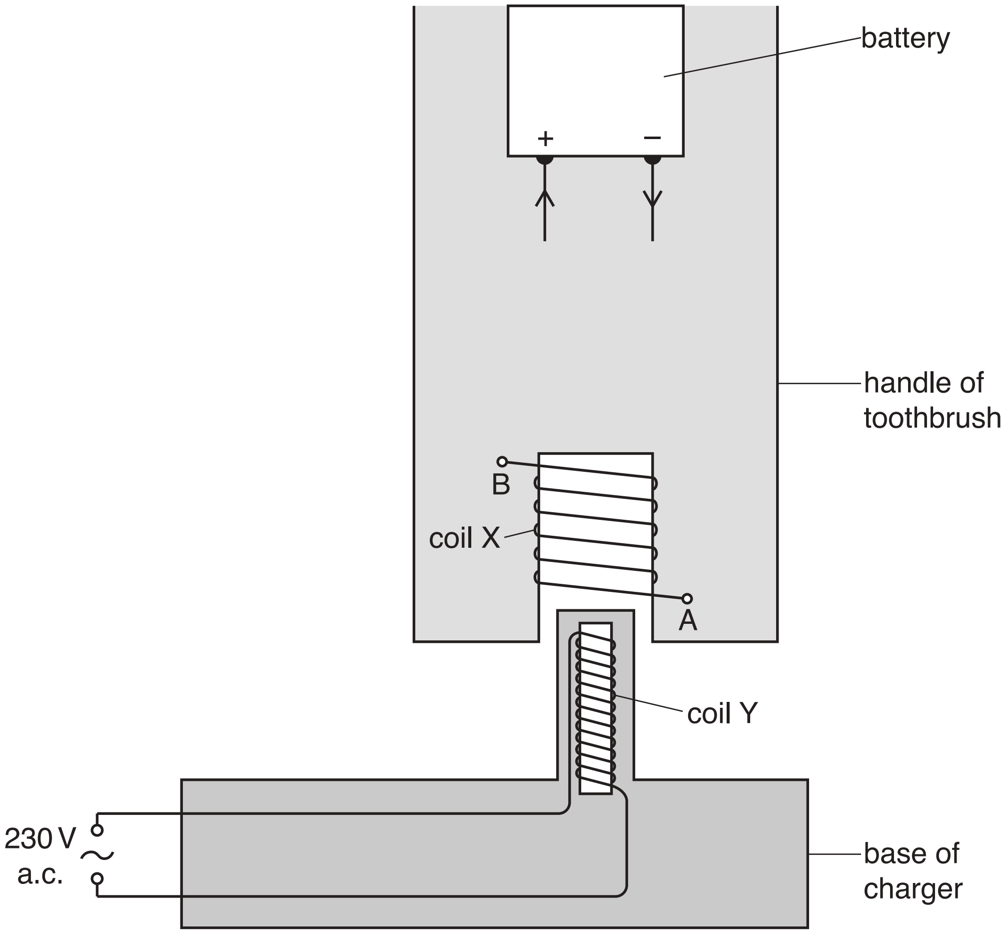

Fig. 10.1

The handle of the brush contains the battery and a coil X. The circuit from coil X to the battery is not shown.

The base of the charger contains a coil Y, wound on an iron core, connected to the a.c. mains supply.

To charge the battery, the handle is lowered so that coil Y is inside coil X.

Fig. 10.1 shows the direction needed for the charging current at the battery.

(i) On Fig. 10.1, complete the circuit from terminals A and B of coil X to the battery. Include a diode. [2]

(ii) Explain how an alternating voltage is produced in coil X.

....

....

....

....

....

....[3]

[Total: 7]

11 The radioactive isotope carbon-14 ($^{14}_{6}C$) emits β-particles as it decays.

(a) The decay of carbon-14 produces an isotope of nitrogen (N).

(i) State the nature of a β-particle and state where it is produced.

....

....[2]

(ii) Complete the nuclide equation for the radioactive decay of carbon-14.

$$^{14}_{6}C \rightarrow \;^{.....}_{.....}N + \;^{.....}_{.....}\beta$$ [3]

(b) The half-life of carbon-14 is 5700 years.

Explain what is meant by the term *half-life*.

....

....[1]

(c) A workman operates a machine that uses β-particles to determine the level of liquid in a plastic water bottle that is being filled.

Suggest why

(i) α-particles are **not** suitable for the same purpose,

....

....[1]

(ii) γ-rays are **not** suitable for the same purpose.

....

....[1]

[Total: 8]

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Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

7664196292

PHYSICS **0625/42**

Paper 4 Theory (Extended) **October/November 2017**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = $10\,m/s^2$).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages.

DC (LK/SG) 133347/6

CAMBRIDGE International Examinations

1 Fig. 1.1 shows a cylinder made from copper of density 9000 kg / m^3.

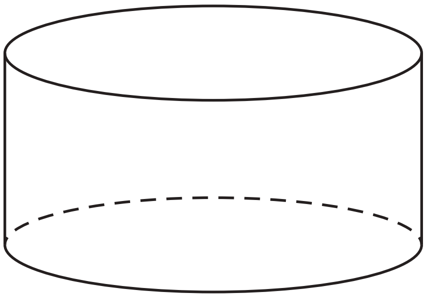

Fig. 1.1

The volume of the cylinder is 75 cm^3.

(a) Calculate the mass of the cylinder.

mass = ...[2]

(b) The gravitational field strength is 10 N / kg.

(i) Calculate the weight of the cylinder.

weight = ...[2]

(ii) State **one** way in which weight differs from mass.

....

....

....[1]

(c) Fig. 1.2 shows the cylinder immersed in a liquid.

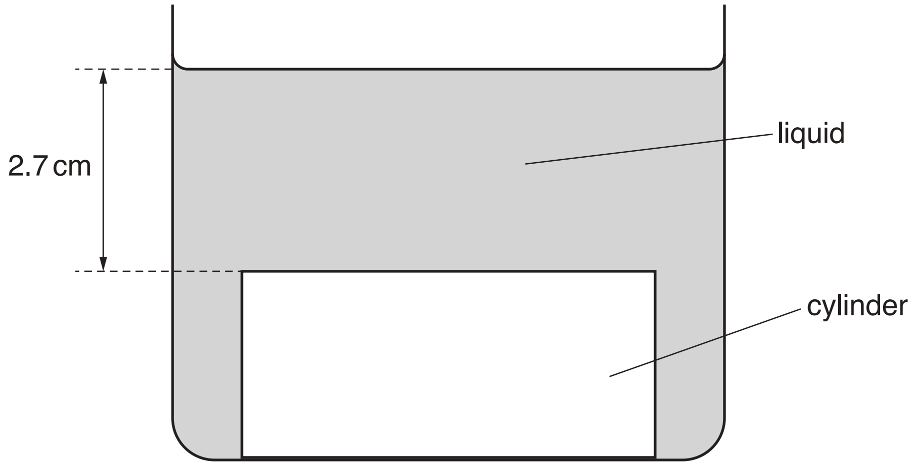

Fig. 1.2 (not to scale)

The upper face of the cylinder is at a depth of 2.7 cm below the surface of the liquid.

The pressure due to the liquid at the upper face of the cylinder is 560 Pa.

(i) Calculate the density of the liquid.

density = ...[2]

(ii) Explain why the cylinder does **not** float in this liquid.

....

....[1]

[Total: 8]

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2 **(a)** An object is moving in a straight line at constant speed. A resultant force begins to act upon the object.

State the ways in which the force may change the motion of the object.

....

....

....

....[2]

(b) State **one** other effect a force could have on the object.

....[1]

(c) The mass of a car is 1400 kg. The car, initially at rest, is moved along a level road by a resultant force of 3500 N. The car reaches a speed of 30 m / s.

(i) Calculate the average acceleration of the car.

acceleration = ...[2]

(ii) Calculate the time for which the force is applied.

time = ...[2]

(iii) State the name of a force which opposes the motion of the car.

....[1]

[Total: 8]

3 **(a)** State the name of a fuel that is burnt to produce large amounts of electrical energy.

Describe a process by which electrical energy is obtained from the chemical energy stored in this fuel.

Name of fuel: ....

Description of process: ....

....

....

....

....[4]

(b) Explain why the Sun is the source of the energy stored in the fuel in **(a)**.

....

....

....

....[2]

(c) Explain whether the process in **(a)** is renewable.

....

....

....

....[2]

[Total: 8]

4 A beaker contains water at room temperature. Fig. 4.1 shows the beaker placed on a tripod above a Bunsen burner.

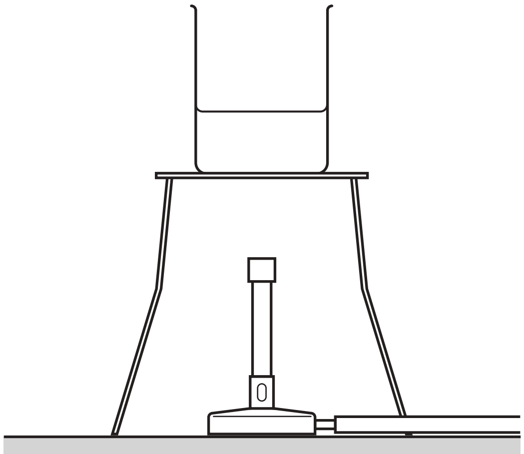

Fig. 4.1

The Bunsen burner is lit and the temperature of the water begins to increase.

(a) The water is evaporating.

(i) Describe **one** difference between evaporation and boiling.

....

....

....[2]

(ii) State and explain what happens to the rate at which the water evaporates as its temperature increases.

....

....

....[1]

(b) After a few minutes, the water reaches its boiling point temperature. The water continues to gain energy from the Bunsen burner.

(i) State what happens to the temperature of the water in the beaker.

....

....[1]

(ii) The specific latent heat of vaporisation of water is 2.3×10^6 J/kg. After the water reaches its boiling point, it takes 12 minutes for 0.095 kg of water to boil away.

Calculate the average rate at which energy is being supplied to the water by heating.

rate of energy supplied = ...[3]

[Total: 7]

5 **(a)** Explain why houses in hot countries are often painted white.
Use ideas about the transfer of thermal energy in your answer.

....

....

....

....[3]

(b) As a star approaches the end of its life, the amount of radiation emitted from it per second changes.

The star cools down.
State any effect on the rate of emission of radiation.

....

....[1]

[Total: 4]

6 Fig. 6.1 represents wavefronts of a water wave on the surface of water approaching a gap in a barrier.

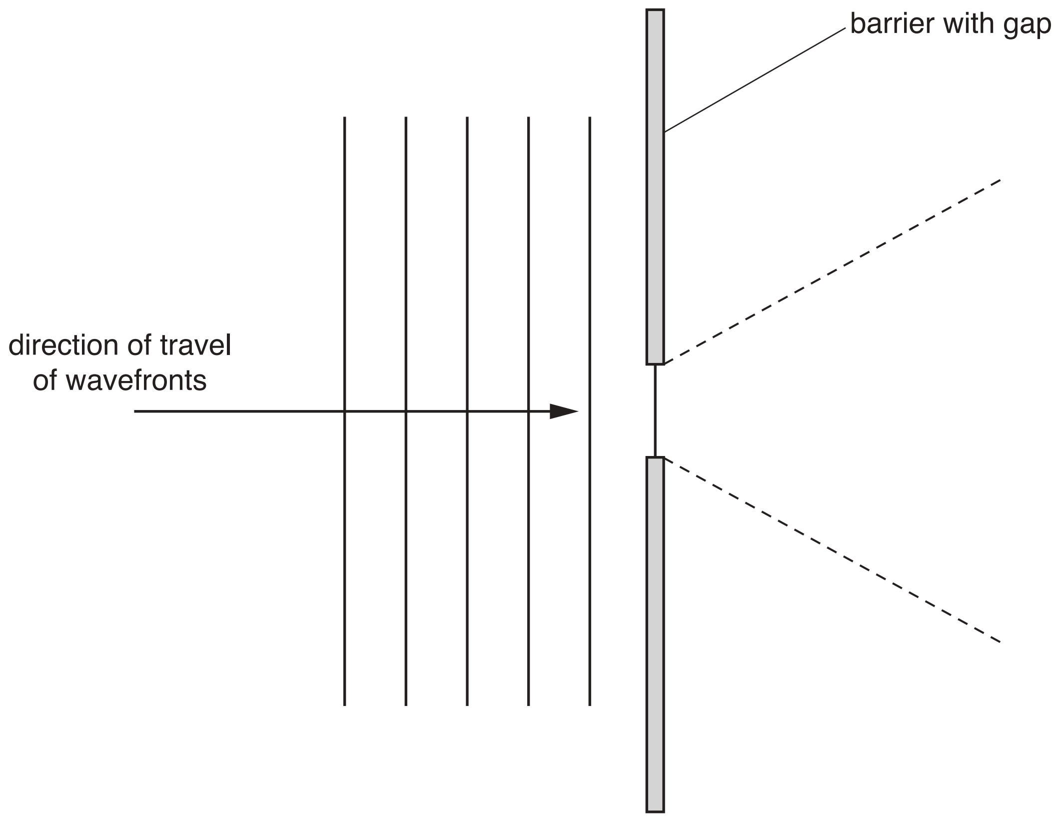

Fig. 6.1

(a) The wavefronts to the right of the barrier spread out as far as the dashed lines in Fig. 6.1.

(i) State the name of the process of spreading out.

....[1]

(ii) Draw **four** wavefronts to the right of the barrier. [2]

(b) (i) State the effect of increasing the width of the gap in the barrier.

....

....[1]

(ii) State and explain the effect of decreasing the frequency of the water wave.

....

....

....[2]

[Total: 6]

7 **(a)** Fig. 7.1 is a diagram of a converging lens used to produce an image of an object. Each point marked F is a principal focus.

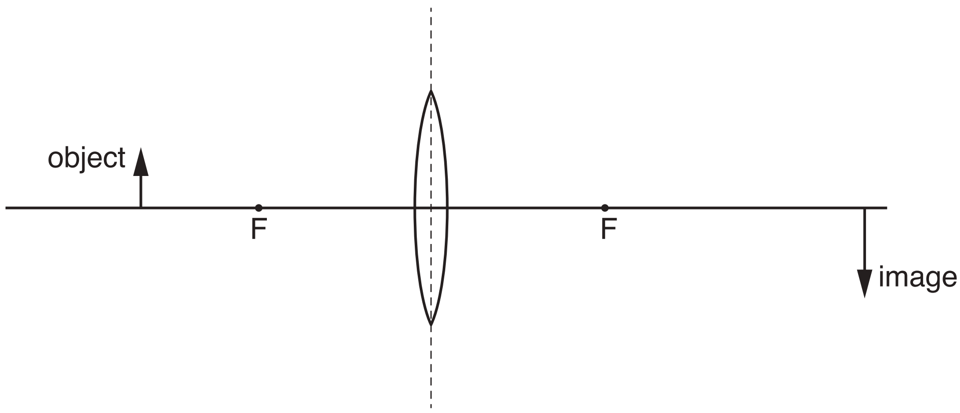

Fig. 7.1

Write down **three** terms that describe the image produced.

....

....

....[3]

(b) Fig. 7.2 shows a plane mirror, a point object O and an observer's eye.

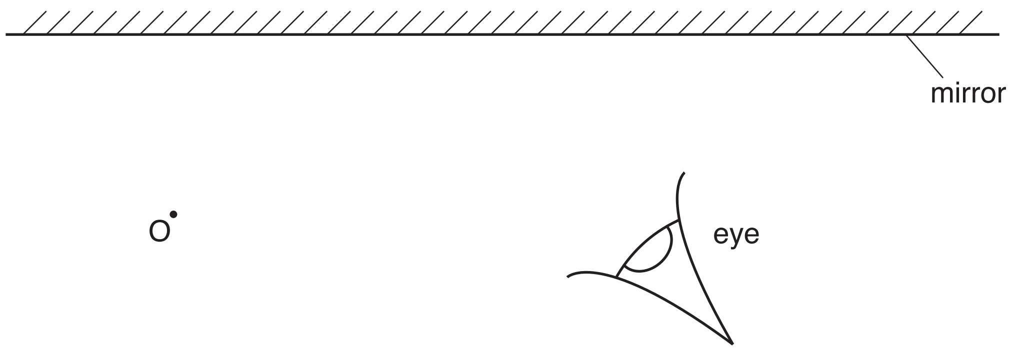

Fig. 7.2

(i) On Fig. 7.2, draw **two** rays from the object reflected to the observer's eye. [2]

(ii) On Fig. 7.2, complete your drawing to determine the position of the image of the object O. Label this image I.

[2]

[Total: 7]

8 Fig. 8.1 is a circuit diagram.

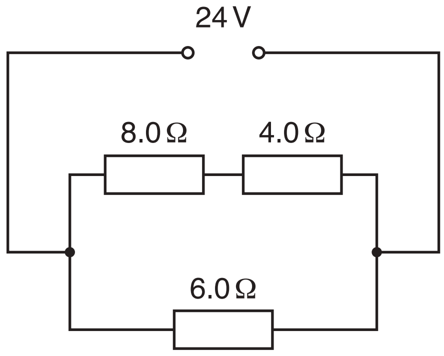

Fig. 8.1

Calculate

(a) the resistance of the circuit,

resistance = ...[4]

(b) the potential difference (p.d.) across the 8.0 Ω resistor.

p.d. = ...[2]

[Total: 6]

9 **(a)** Fig. 9.1 is a circuit diagram.

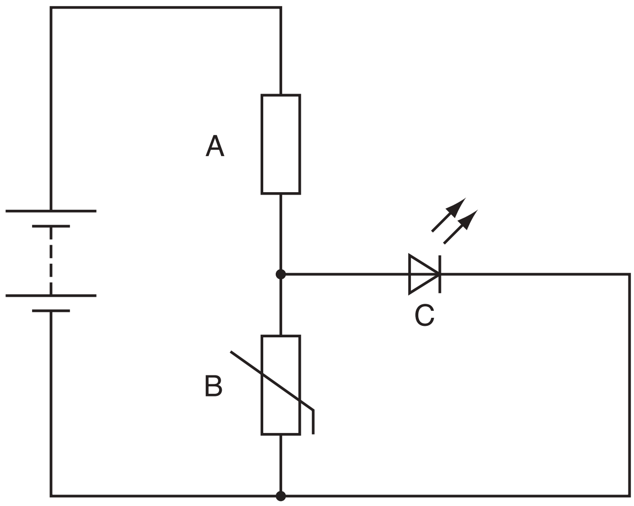

Fig. 9.1

(i) State the names of circuit components A, B and C.

component A ....

component B ....

component C ....
[2]

(ii) The circuit can be used to indicate a change in temperature.

State and explain what would be observed when the temperature changes from hot to cold.

....

....

....

....

....

....[4]

(b) Fig. 9.2 shows a digital circuit.

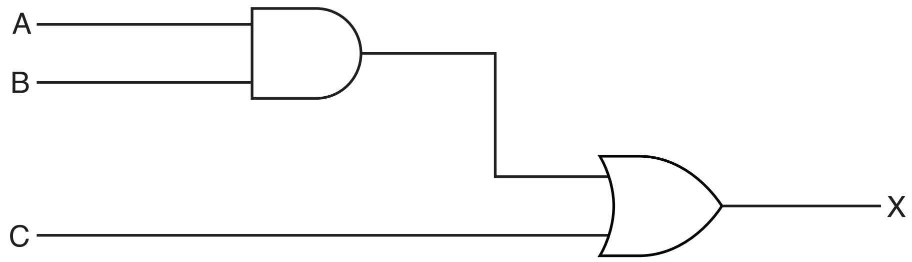

Fig. 9.2

Complete column X of the truth table for this circuit. Use the blank column for your working.

A	B	C		X
0	0	0		
0	1	0		
1	0	0		
1	1	0		
0	0	1		
0	1	1		
1	0	1		
1	1	1		

[3]

[Total: 9]

10 (a) Fig. 10.1 shows a wire that carries a current into the page.
The circles on Fig. 10.1 show the pattern of the magnetic field around the wire.

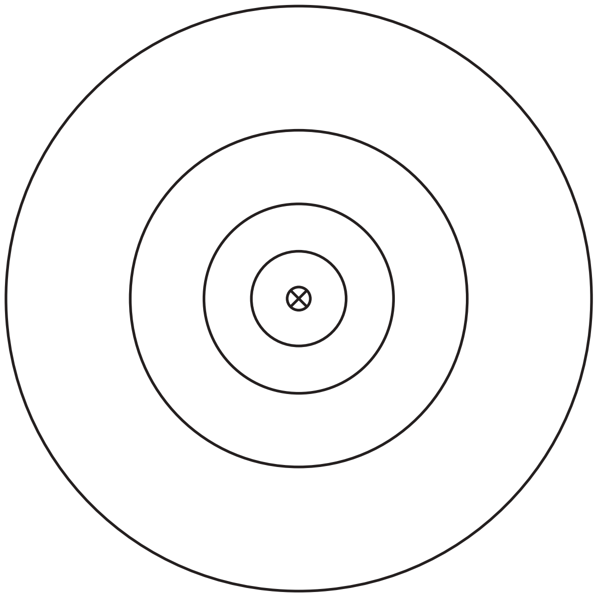

Fig. 10.1

(i) On Fig. 10.1, draw an arrow on each circle to show the direction of the magnetic field. [1]

(ii) State why the spacing of the circles increases as the distance from the wire increases.

....

....[1]

(b) Fig. 10.2 shows an electric door lock.

The slot in the door contains an unmagnetised iron bolt attached to a spring.
The slot in the door frame is empty. This slot is surrounded by the coils of a solenoid.

In Fig. 10.2 the door is unlocked. The spring is not stretched.

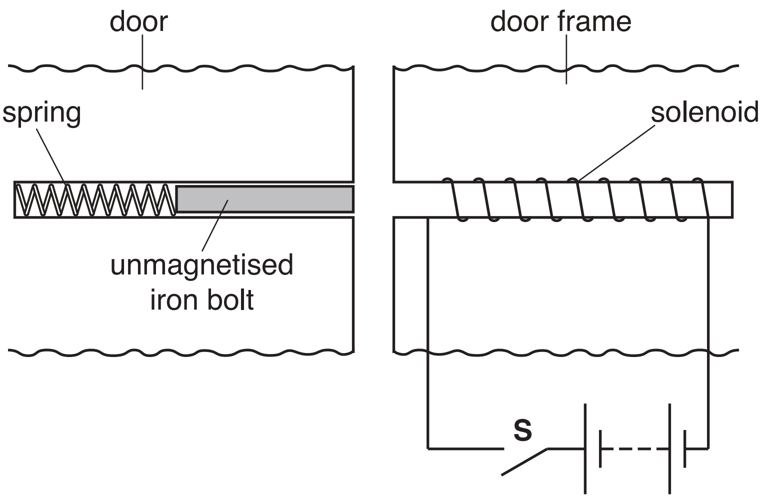

Fig. 10.2

In Fig. 10.3 the door is locked. The spring is now stretched.

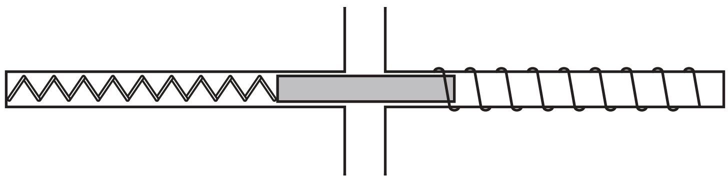

Fig. 10.3

The bolt is initially in the position shown in Fig. 10.2.

Describe and explain what happens when

(i) the switch **S** is closed,

....

....

....

....

....[4]

(ii) the switch **S** is reopened.

....

....

....[2]

[Total: 8]

11 The radioactive isotope bismuth-210 ($^{210}_{83}Bi$) decays by β-particle emission to an isotope of polonium (Po).

(a) Complete the nuclide equation that represents this decay.

$$^{210}_{83}Bi \rightarrow \, ^{.....}_{.....}Po + \, ^{.....}_{.....}\beta$$

[3]

(b) A radiation detector is placed on a bench in a laboratory where there are no artificial sources of radiation. The detector is switched on.

In seven one-minute periods, the detector displays these readings.

24 22 25 25 21 20 24

(i) Explain why, in the absence of any artificial source, there are readings on the detector. Suggest **one** origin of this effect.

....

....

....[2]

(ii) Explain why the readings obtained are not all the same.

....

....[1]

(iii) The half-life of bismuth-210 is 5.0 days.
A sample of bismuth-210 is brought close to the detector and in one minute, the reading displayed is 487. The equipment is left in the same place for exactly 10 days.

Predict the reading in a one-minute period at the end of this time.

reading = ...[3]

[Total: 9]

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CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

1159195484

PHYSICS **0625/43**

Paper 4 Theory (Extended) **October/November 2017**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **14** printed pages and **2** blank pages.

CAMBRIDGE
International Examinations

1 A truck accelerates uniformly along a straight, horizontal road. The mass of the truck is 2.0×10^4 kg.

(a) The speed of the truck increases from rest to 12 m/s in 30 s.

Calculate

(i) the distance travelled by the truck during this time,

distance = ...[2]

(ii) the resultant force on the truck.

resultant force = ...[4]

(b) To maintain a uniform acceleration, the forward force on the truck must change.
Explain why.

....

....

....[2]

[Total: 8]

2 Fig. 2.1 shows a measuring cylinder that contains a coloured liquid.

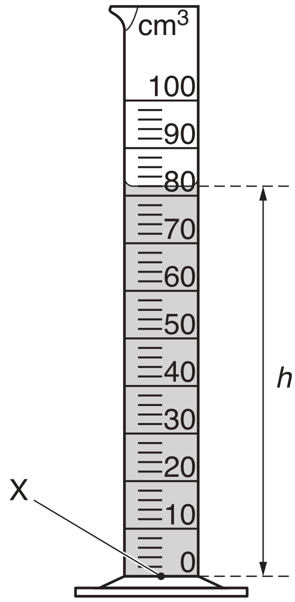

Fig. 2.1

The measuring cylinder contains 82 cm^3 of the liquid. The density of the liquid is 950 kg / m^3.

(a) Calculate the mass of the liquid.

mass = ... [3]

(b) The height h of the liquid in the measuring cylinder is 0.094 m.

(i) Calculate the pressure due to the liquid at point X in Fig. 2.1.

pressure = ... [2]

(ii) The true pressure at point X is different from the value calculated in **(b)(i)**.
Explain why.

....

....[1]

(c) A small object is made of steel. It is placed level with the top surface of the liquid in the measuring cylinder and then released. The object sinks in this liquid.

(i) Explain why the object sinks in this liquid.

....

....[1]

(ii) Describe how the volume of the object can now be determined.

....

....

....[1]

[Total: 8]

3 Fig. 3.1 shows solar cells that use radiation from the Sun to generate electricity.

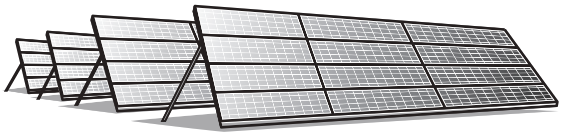

Fig. 3.1

(a) **(i)** State the name of the process which releases energy in the Sun.

.... [1]

(ii) A reaction takes place in the Sun as energy is released.

Describe what happens in this reaction.

....

....

.... [2]

(b) Apart from solar cells, there are other energy resources used on Earth for which the radiation from the Sun is the source.

State the name of **one** of these energy resources and explain whether it is renewable.

....

....

.... [2]

(c) State **two** advantages and **two** disadvantages of using solar cells to generate electricity.

advantage 1 ....

....

advantage 2 ....

....

disadvantage 1 ....

....

disadvantage 2 ....

....

[4]

[Total: 9]

4 **(a)** The molecules of most liquids are, on average, slightly further apart than the molecules of a solid.

State **one** other difference between the molecular structures of a solid and a liquid.

....

....[1]

(b) A glass tube passes through a stopper and into a glass flask. Fig. 4.1 shows that the flask is completely full of a liquid and that there is also some liquid in the tube.

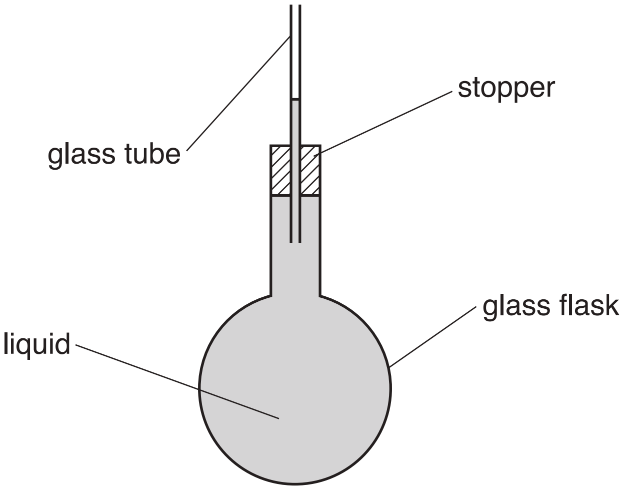

Fig. 4.1

The flask is immersed in a large beaker of very hot water. At first, the level of the liquid in the tube falls, but after a short time it rises.

(i) Explain why, at first, the level of the liquid in the tube falls.

....

....

....

....[3]

(ii) Explain why the liquid level in the tube stops falling and starts to rise.

....

....

....[2]

[Total: 6]

5 A silver spoon has a thermal capacity of 7.2 J / °C.

(a) Explain what is meant by *thermal capacity*.

....

....

.... [2]

(b) The silver spoon is dropped into a saucepan of boiling water. The internal energy of the spoon increases as its temperature increases from 22 °C to 100 °C.

(i) Calculate the increase in the internal energy of the spoon.

increase in internal energy = ... [1]

(ii) State, in terms of the atoms, what is meant by *internal energy*.

....

....

.... [2]

(c) The spoon is removed from the boiling water and immediately it begins to transfer energy to the surroundings. The temperature of the surroundings is 22 °C.

On Fig. 5.1, sketch a graph to show how the temperature of the spoon changes with time from the instant that it is removed from the water. [3]

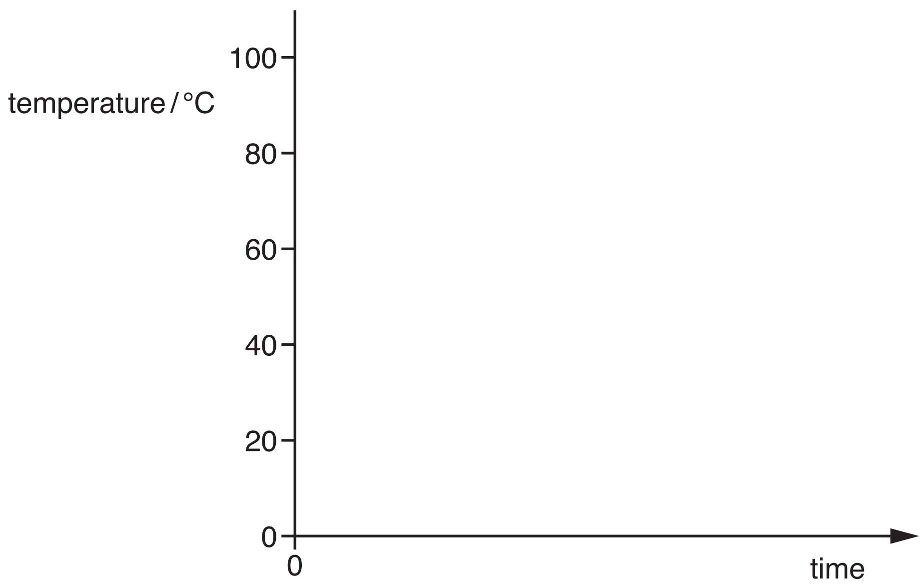

Fig. 5.1

[Total: 8]

6 Visible light is one component of the electromagnetic spectrum.

(a) (i) In the table, place a tick in the box next to the approximate value of the speed of light in air. [1]

speed / m/s	
3.0×10^{10}	
3.0×10^{8}	
3.0×10^{6}	
3.0×10^{4}	
3.0×10^{2}	

(ii) The frequency of a light wave is 4.8×10^{14} Hz.

Calculate the wavelength of this light in air.

wavelength = ... [2]

(b) Light is travelling in an optical fibre that is made of glass.

(i) The glass has a refractive index of 1.5.

1. Explain why the quantity *refractive index* does **not** have a unit.

....

.... [1]

2. Calculate the speed of light in the glass.

speed = ... [2]

(ii) Describe **one** use of optical fibres in communication technology.

....

....

....

....

.... [3]

[Total: 9]

7 **(a)** Fig. 7.1 shows a converging lens and its principal axis. The points F_1 and F_2 are each a principal focus of the lens.

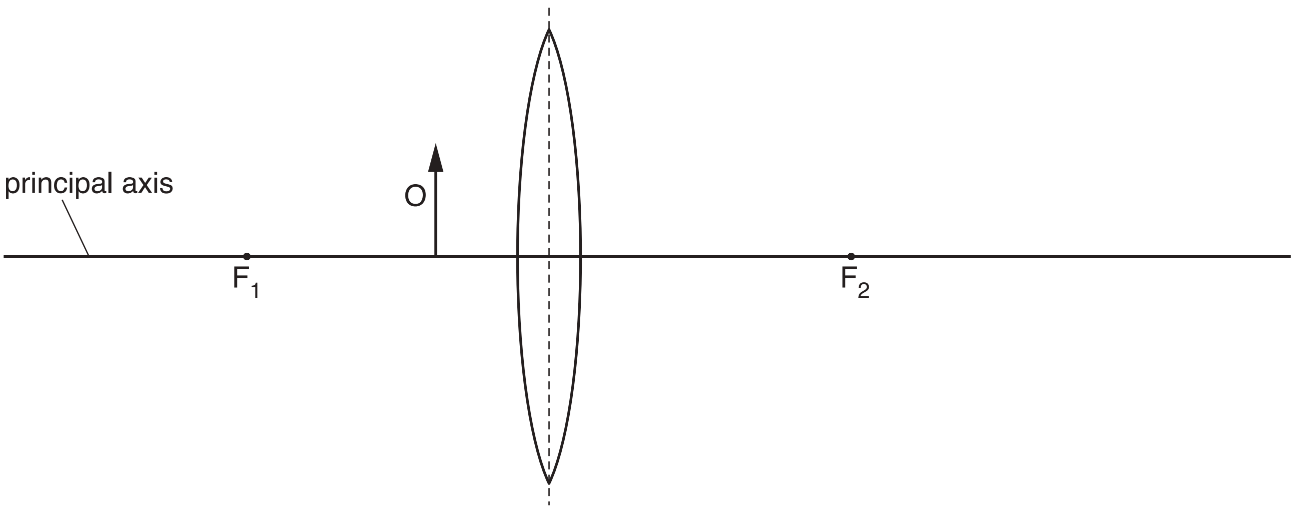

Fig. 7.1

An object O is placed between F_1 and the lens.

(i) On Fig. 7.1, draw **two** rays from the top of the object O to locate the image.
Label the image I. [3]

(ii) The object O is moved to the left along the principal axis so that it is further from the lens than F_1.

Fig. 7.2 is a diagram of the new arrangement with the new image shown.

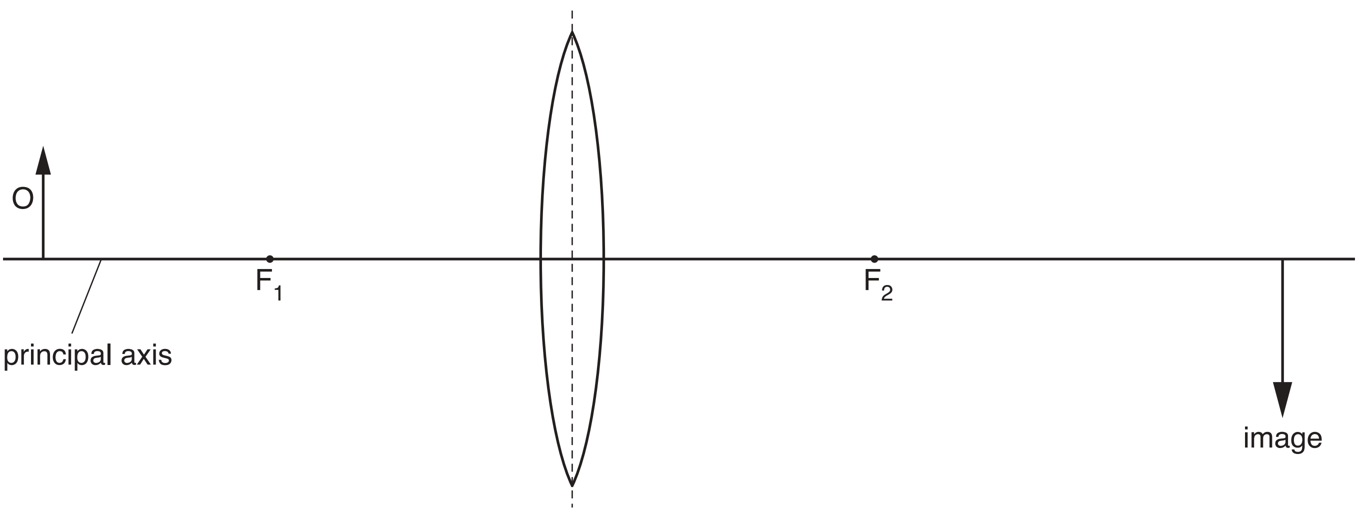

Fig. 7.2

Underline **three** of the terms below that describe the image shown in Fig. 7.2. [2]

diminished **enlarged** **inverted** **real** **same size** **upright** **virtual**

(b) Fig. 7.3 shows yellow light passing through a glass prism.

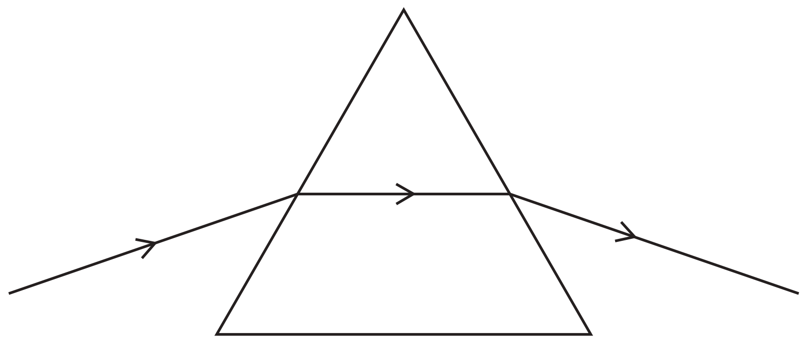

Fig. 7.3

Blue light enters the prism along the same path as the yellow light.

On Fig. 7.3, draw the path of the blue light as it enters, passes through and leaves the prism. [2]

[Total: 7]

8 **(a)** Fig. 8.1 shows an uncharged conducting sphere on an insulating stand placed close to a positively charged rod.

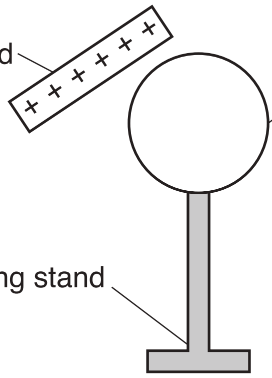

Fig. 8.1

The rod and the sphere are not moved.

Describe how to charge the sphere using a wire connected to earth and explain whether the sphere becomes positively charged or negatively charged.

....

....

....

....[3]

(b) Fig. 8.2 shows a small black circle that represents a positive charge.

On Fig. 8.2, draw the pattern and the direction of the electric field in the region around the charge. [2]

Fig. 8.2

(c) A charge of 7.0 C flows along a wire in 5.0 minutes.

Calculate the current in the wire.

current = ...[2]

[Total: 7]

9 **(a)** Fig. 9.1 shows the structure of an alternating current (a.c.) generator.

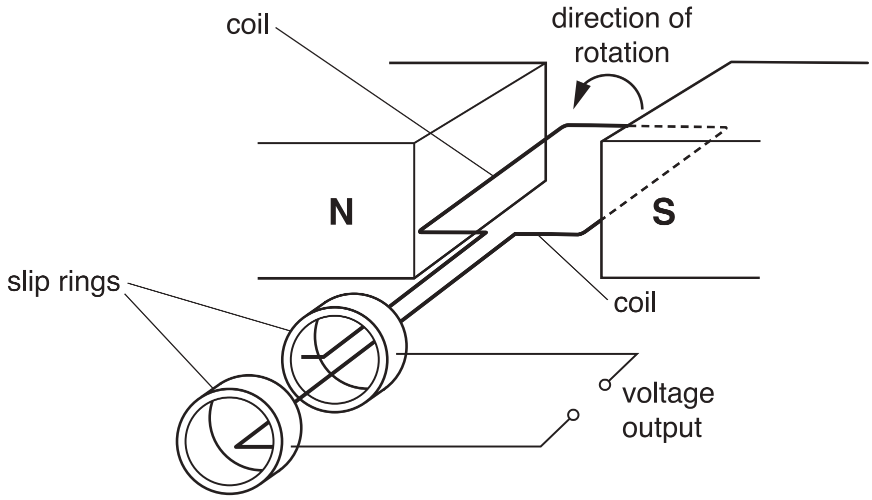

Fig. 9.1

The coil completes one rotation every 0.020 s.

(i) Using the axes in Fig. 9.2, sketch a graph to show how the voltage output of the generator varies with time during a period of 0.040 s. [2]

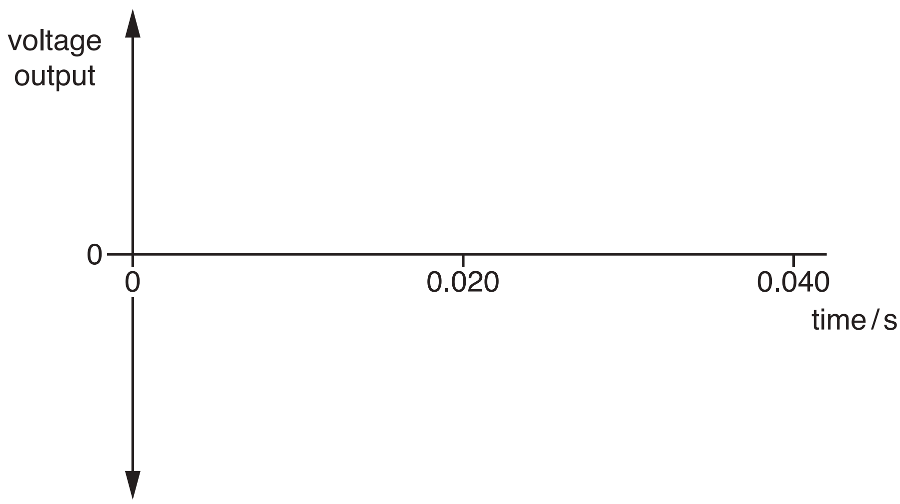

Fig. 9.2

(ii) On your graph in Fig. 9.2, mark a point labelled A to indicate a time when the coil is vertical. [1]

(b) There is an alternating current (a.c.) in a horizontal wire that is buried in a wall. A builder must miss this wire when drilling a hole in the wall.

The builder places an instrument against the wall that registers a reading when it is close to the wire. The instrument includes a long coil (solenoid) S that has an iron core and a sensitive voltmeter. Fig. 9.3 shows the circuit of the instrument close to the wire.

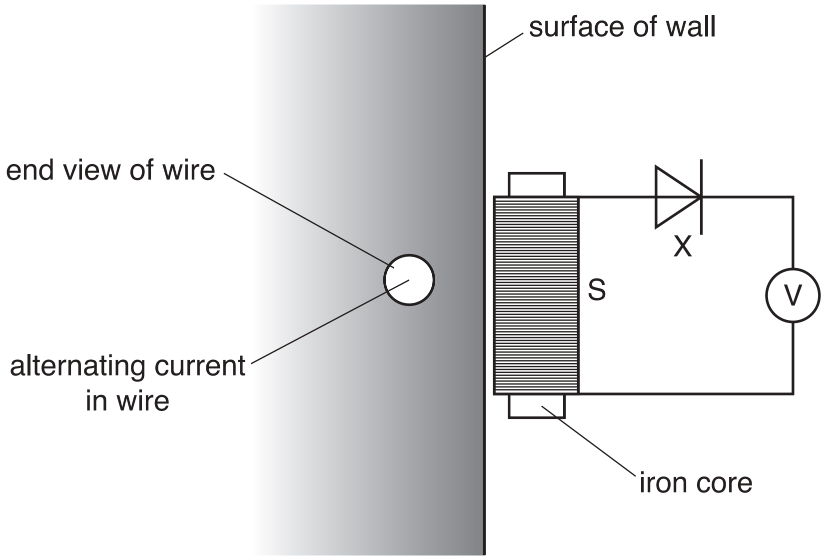

Fig. 9.3

(i) Explain why there is a reading on the voltmeter.

....

....

....

....[3]

(ii) State the name and the effect of the component labelled X in Fig. 9.3.

....

....

....[2]

[Total: 8]

10 **(a)** State the nature of γ-rays.

....

....[2]

(b) A nucleus of technetium-99 ($^{99}_{43}Tc$) emits only a γ-ray.

State any effect of this on

(i) the proton number of the nucleus,

....[1]

(ii) the nucleon number of the nucleus.

....[1]

(c) In a laboratory a radiation detector displays a count rate of 16 counts / minute due to background radiation.

(i) State what is meant by *background radiation*.

....

....[1]

(ii) A sample of a radioactive isotope is placed near to the radiation detector and a count rate of 112 counts / minute is recorded.

After 18 hours, the count rate recorded is 28 counts / minute.

Determine the half-life of this isotope.

half-life = ...[3]

(d) Radioactive isotopes are stored in thick lead containers.

State **two** precautions to be taken when radioactive isotopes are **used**.

1. ....

2. ....

[2]

[Total: 10]

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Cambridge International Examinations
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CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

* 4 6 0 6 2 5 4 8 5 7 *

PHYSICS **0625/51**

Paper 5 Practical Test **October/November 2017**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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This document consists of **10** printed pages and **2** blank pages.

DC (NH/AR) 133341/5

1 In this experiment, you will determine the weight of a load using a balancing method.

Carry out the following instructions, referring to Fig. 1.1.

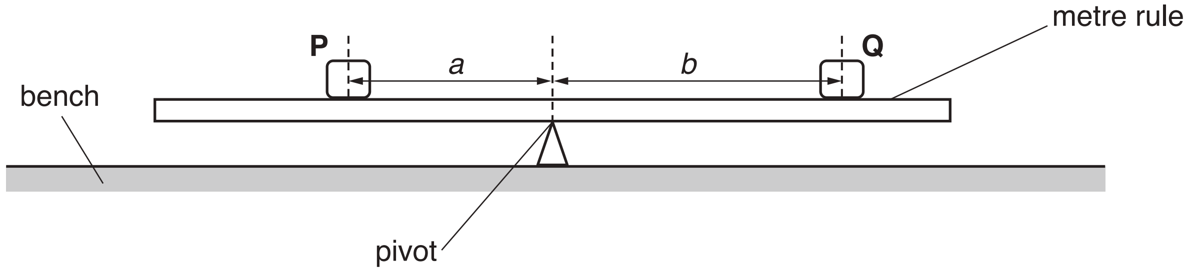

Fig. 1.1

(a) Place the metre rule on the pivot and adjust its position so that the metre rule is as near as possible to being balanced. The 30.0 cm mark must be on the left-hand side of the pivot. **The metre rule must remain at this position on the pivot throughout the experiment.**

Place the load **P** on the metre rule so that its centre is exactly at the 30.0 cm mark on the metre rule.

Record the distance *a* between the 30.0 cm mark and the pivot.

a = ... cm [1]

(b) Place a load **Q** on the metre rule and adjust the position of **Q** so that the metre rule is as near as possible to being balanced. Load **Q** has a weight *Q* of 1.0 N.

(i) Measure the distance *b* between the centre of load **Q** and the pivot. Record the weight *Q* and the distance *b* in Table 1.1.

(ii) Repeat the procedure, with the load **P** remaining at the 30.0 cm mark, using *Q* values of 2.0 N, 3.0 N, 4.0 N and 5.0 N. Record all the readings in the table.

Table 1.1

Q / N	b / cm	$\frac{1}{Q} / \frac{1}{N}$

(iii) For each value of *Q*, calculate $\frac{1}{Q}$ and record the result in the table.

[3]

(c) Plot a graph of b / cm (y-axis) against $\frac{1}{Q} \Big/ \frac{1}{N}$ (x-axis).

[4]

(d) Determine the gradient G of the graph. Show clearly on the graph how you obtained the necessary information.

G = ...[2]

(e) Calculate the weight P of load **P** using the equation $P = \frac{G}{a}$.

P = ...[1]

[Total: 11]

2 In this experiment, you will investigate resistance.

The circuit shown in Fig. 2.1 has been set up for you.

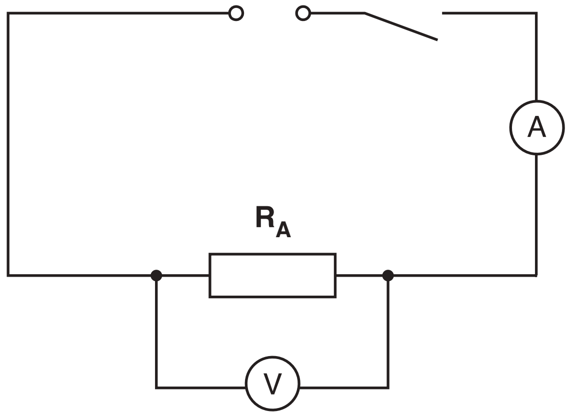

Fig. 2.1

(a) **(i)** Switch on. Measure and record the potential difference V_1 across the resistor $\mathbf{R_A}$ and the current I_1 in the circuit.

V_1 = ...

I_1 = ...
[2]

(ii) Switch off. Calculate the resistance R_1 of the resistor $\mathbf{R_A}$ using the equation $R_1 = \frac{V_1}{I_1}$.

R_1 = ...[1]

(b) Disconnect the voltmeter.

Connect the resistor $\mathbf{R_B}$ in series with $\mathbf{R_A}$.

Connect the voltmeter across the two resistors $\mathbf{R_A}$ and $\mathbf{R_B}$. Switch on.

(i) Measure and record the potential difference V_2 across resistors $\mathbf{R_A}$ and $\mathbf{R_B}$ combined and the current I_2 in the circuit.

V_2 = ...

I_2 = ...

(ii) Switch off. Calculate the resistance R_2 of resistors $\mathbf{R_A}$ and $\mathbf{R_B}$ combined in series, using the equation $R_2 = \frac{V_2}{I_2}$.

R_2 = ...
[1]

(c) Disconnect the voltmeter.

Connect the resistor $\mathbf{R_C}$ in series with $\mathbf{R_A}$ and $\mathbf{R_B}$.

Connect the voltmeter across all three resistors. Switch on.

(i) Measure and record the potential difference V_3 across the three resistors and the current I_3 in the circuit.

V_3 = ...

I_3 = ...
[1]

(ii) Switch off. Calculate the resistance R_3 of resistors $\mathbf{R_A}$, $\mathbf{R_B}$ and $\mathbf{R_C}$ combined in series, using the equation $R_3 = \frac{V_3}{I_3}$.

R_3 = ...[1]

(d) A student suggests that $R_3 = 3 \times R_1$.

State whether your results agree with this suggestion. Justify your answer by reference to your results.

statement ....

justification ....

....

....
[1]

(e) Another student suggests that the three resistors, $\mathbf{R_A}$, $\mathbf{R_B}$ and $\mathbf{R_C}$, have the same value of resistance.

Explain how you could use the circuit shown in Fig. 2.1 to check this suggestion.

You are **not** required to carry out this experiment.

....

....[1]

(f) Complete the circuit diagram in Fig. 2.2 to show:

- the three resistors connected in parallel
- the voltmeter connected to measure the potential difference across the resistors
- a variable resistor connected to control the current in all three resistors.

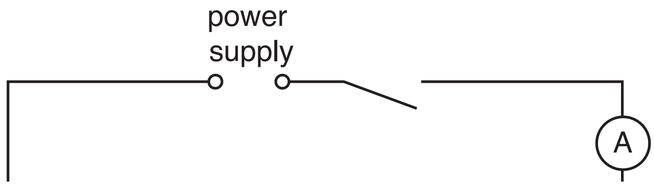

Fig. 2.2

[2]

(g) The circuit in Fig. 2.2 could be used to determine the combined resistance of three resistors connected in parallel.

Suggest a reason for connecting a variable resistor in the circuit.

....

....[1]

[Total: 11]

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3 In this experiment, you will determine the focal length f of a lens.

Carry out the following instructions, referring to Fig. 3.1.

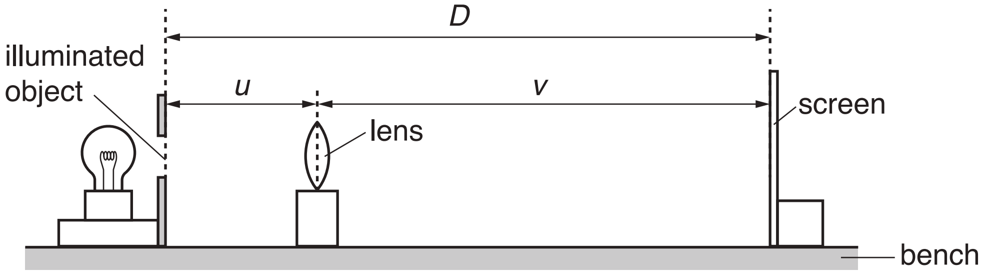

Fig. 3.1

(a) Place the centre of the lens at a distance u = 20.0 cm from the illuminated object.

Place the screen close to the lens and move it away from the lens until a sharply-focused image is formed on the screen.

- Measure the distance v from the centre of the lens to the screen. Record v in Table 3.1.
- Calculate uv and record the result in the table.
- Measure and record in the table the distance D from the illuminated object to the screen.

[3]

(b) Repeat the steps in **(a)** with the lens at a distance u = 30.0 cm from the illuminated object. Record all the readings in the table.

Table 3.1

u/cm	v/cm	uv/cm^2	D/cm
20.0			
30.0			

[2]

(c) State **one** difference that you observe between the image formed on the screen when u = 20.0 cm and when u = 30.0 cm.

....

....[1]

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(d) **(i)** Use the results in the first row of the table to calculate a value f_1 for the focal length of the lens. Use the equation $f_1 = \frac{uv}{D}$.

f_1 = ...

(ii) Use the results in the second row of the table to calculate a value f_2 for the focal length of the lens. Use the equation $f_2 = \frac{uv}{D}$.

f_2 = ...
[1]

(iii) Calculate the average value f_A for the focal length of the lens. Give your answer to a suitable number of significant figures for this experiment.

f_A = ...
[2]

(e) Suggest **two** reasons why the results you have obtained may not be reliable.

1. ....

....

2. ....

....
[2]

[Total: 11]

4 A student is investigating whether the diameter of a pendulum bob affects the period of a pendulum. The period is the time taken for one complete oscillation of the pendulum. Fig. 4.1 shows a pendulum.

Fig. 4.2 shows one complete oscillation.

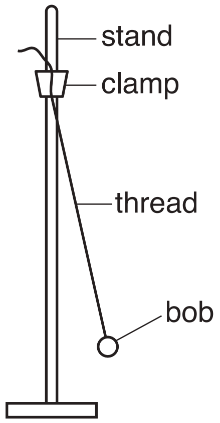

Fig. 4.1

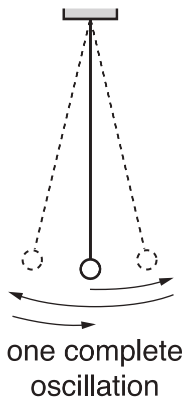

Fig. 4.2

The student has the following apparatus:

pendulum bobs made of polystyrene with diameters 1 cm, 2 cm, 3 cm, 4 cm and 5 cm
a supply of thread and a pair of scissors
clamp and stand

Plan an experiment to investigate whether the diameter of a pendulum bob affects the period of a pendulum. You are **not** required to carry out this experiment.

You should:

- list additional apparatus that you would require
- explain briefly how you would carry out the investigation
- state the key variables that you would control
- draw a table with column headings, to show how you would display your readings (You are **not** required to enter any readings in the table.)
- explain briefly how you would use your readings to reach a conclusion.

....

....

....

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....

....

....

....[7]

[Total: 7]

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Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

9855181159

PHYSICS **0625/52**

Paper 5 Practical Test **October/November 2017**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and about 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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CAMBRIDGE International Examinations

1 In this experiment, you will compare the oscillations of two pendulums. Carry out the following instructions, referring to Figs. 1.1 and 1.2.

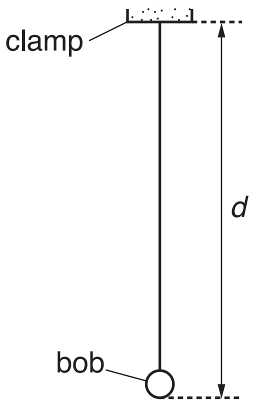

Fig. 1.1

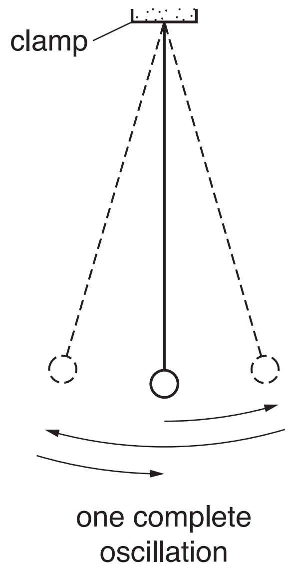

Fig. 1.2

A pendulum has been set up for you as shown in Fig. 1.1. This pendulum has a spherical pendulum bob.

(a) Adjust the pendulum until the distance *d* measured to the **bottom** of the bob is 50.0 cm.

Explain briefly how to use the set-square to avoid a parallax (line of sight) error when measuring the distance *d*. You may draw a diagram.

....

....[1]

(b) Move the bob slightly to the side and release it so that it swings. Fig. 1.2 shows one complete oscillation of the pendulum.

(i) Measure the time t_1 for 20 complete oscillations.

t_1 = ...[1]

(ii) Calculate the period T_1 of the pendulum. The period is the time for one complete oscillation.

T_1 = ...[2]

(c) Remove the pendulum from the clamp and attach the second pendulum provided to the clamp. This has a long, thin bob. Adjust the pendulum until the distance *d* measured to the **bottom** of the bob is 50.0 cm.

Displace the bob slightly and release it so that it swings.

(i) Measure the time t_2 for 20 complete oscillations.

t_2 = ...[1]

(ii) Calculate the period T_2 of the pendulum.

T_2 = ...[1]

(d) A student suggests that the periods T_1 and T_2 should be equal.

State whether your results support this suggestion. Justify your answer by reference to the results.

statement ....

justification ....

....

....[2]

(e) The period T of a pendulum can be determined by measuring the time t for 20 complete oscillations and then calculating the period. Some students are asked to explain the reason for this method being more accurate than measuring the time taken for one oscillation.

Tick the box next to the sentence that gives the best explanation.

☐ The method eliminates errors from the measurements.

☐ The method is more accurate because the experiment is repeated.

☐ The method includes more readings so there is less chance for errors.

☐ The method reduces the effect of errors when starting and stopping the stopwatch.

[1]

(f) A student plans to carry out more pendulum experiments. He considers possible variables, and precautions to improve accuracy.

In the following list, mark the possible variables with the letter **V** and the precautions with the letter **P**.

☐ amplitude of swing

☐ length of pendulum

☐ mass of pendulum bob

☐ shape of pendulum bob

☐ use of a reference point to aid counting

☐ viewing the rule at right angles when measuring the length

[2]

[Total: 11]

2 In this experiment, you will investigate the cooling of water.

(a) Measure room temperature θ_R.

θ_R = ...[1]

(b)
- Pour 50 cm^3 of the hot water provided into beaker **A**.
- Measure the temperature θ_H of the water in beaker **A**.

θ_H = ...

- Add 50 cm^3 of the cold water provided to the hot water in beaker **A**. Stir the water briefly.
- Measure the temperature θ_M of the water in beaker **A**.

θ_M = ...

- Calculate the temperature fall θ_F using the equation $\theta_F = \theta_H - \theta_M$.

θ_F = ...

- Empty beaker **A**. [3]

(c) Suggest **one** reason for stirring the water before reading θ_M.

....

....[1]

(d) Repeat the procedure in **(b)** using 75 cm^3 of hot water and 75 cm^3 of cold water.

θ_H = ...

θ_M = ...

θ_F = ...
[1]

(e) Repeat the procedure in **(b)** using 100 cm^3 of hot water and 100 cm^3 of cold water.

θ_H = ...

θ_M = ...

θ_F = ...
[1]

(f) Measure room temperature θ_R again.

θ_R = ...

Complete the appropriate sentence.

- Room temperature has remained constant at ....
- Room temperature has decreased by ....
- Room temperature has increased by ....

[1]

(g) A student states that the temperature fall θ_F should be the same each time because the proportions of hot and cold water are the same.

Suggest a reason why θ_F could be very different in **(b)**, **(d)** and **(e)**.

....

....

....[1]

(h) Suggest an improvement to the apparatus to make it more likely that θ_F would be the same each time.

....

....

....[1]

(i) Suggest a condition, not included in your answer to **(h)**, that could be controlled to make it more likely that θ_F would be the same each time.

....

....

....[1]

[Total: 11]

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3 In this experiment, you will determine the focal length *f* of a lens.

Carry out the following instructions referring to Fig. 3.1.

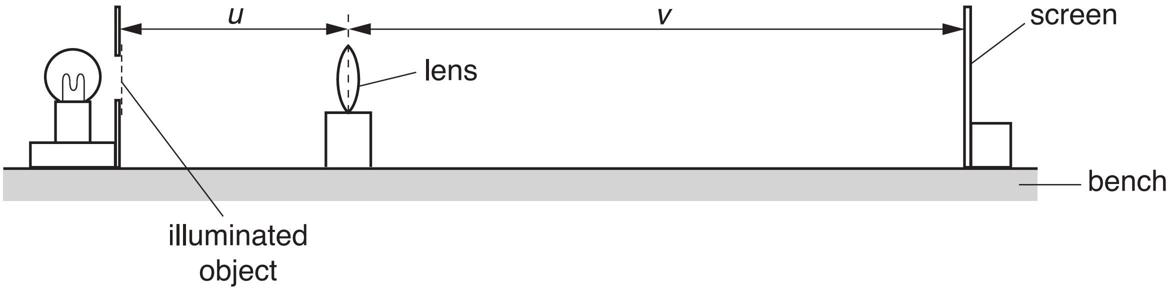

Fig. 3.1

(a) (i) Place the screen 100 cm from the illuminated object.

- Place the lens between the object and the screen so that the centre of the lens is at a distance u = 20.0 cm from the object.
- Adjust the position of the screen until a clearly focused image is formed on the screen.
- Measure the distance v between the centre of the lens and the screen. Record the values of u and v in Table 3.1.

Table 3.1

u / cm	v / cm

(ii) Repeat the procedure using values for u of 22.0 cm, 25.0 cm, 30.0 cm and 35.0 cm. [3]

(b) Plot a graph of v/cm (y-axis) against u/cm (x-axis). You do not need to start your axes at the origin (0, 0). Draw the best-fit curve.

[4]

(c) (i)
- Mark, with a cross, the point on the graph grid where $u = 25.0\,\text{cm}$ and $v = 25.0\,\text{cm}$.
- Mark, with a cross, the point on the graph grid where $u = 35.0\,\text{cm}$ and $v = 35.0\,\text{cm}$.
- Join these two points with a straight line. [1]

(ii)
- Record u_1, the value of u at the point where the straight line crosses your graph line.

u_1 = ... cm

- Record v_1, the value of v at the point where the straight line crosses your graph line.

v_1 = ... cm
[1]

(iii) Calculate the focal length f of the lens using the equation $f = \dfrac{(u_1 + v_1)}{4}$.

f = ... cm
[2]

[Total: 11]

4 A student has a selection of rubber bands of different thicknesses. He is investigating the amount of stretch produced by different loads. Fig. 4.1 shows the set-up used.

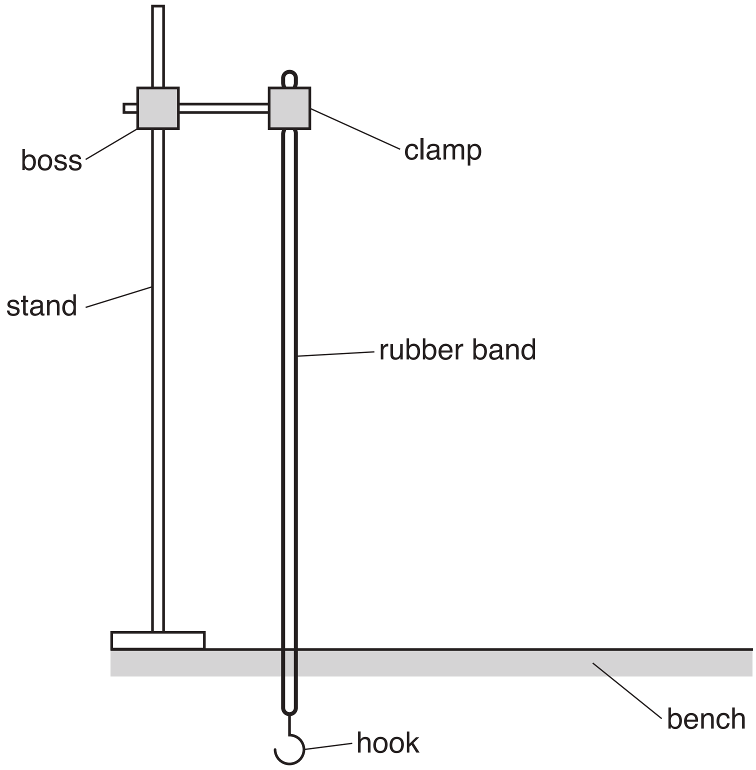

Fig. 4.1

In addition to the apparatus shown in Fig. 4.1, the following apparatus is available to the student:

metre rule
selection of different rubber bands
selection of loads.

Plan an experiment to investigate how rubber bands of different thicknesses stretch when loaded.

You are **not** required to carry out this experiment.

You should

- explain briefly how you would carry out the investigation
- state the key variables that you would control
- draw a table, or tables, with column headings to show how you would display your readings (You are **not** required to enter any readings in the table.)
- explain briefly how you would use your readings to reach a conclusion.

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....[7]

[Total: 7]

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Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

2763230970

PHYSICS **0625/53**

Paper 5 Practical Test **October/November 2017**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and about 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
3	
4	
Total	

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **11** printed pages and **1** blank page.

DC (ST/AR) 132966/7

CAMBRIDGE International Examinations

[Turn over

1 In this experiment, you will investigate how the use of a lid affects the rate of cooling of water in a beaker.

Carry out the following instructions, referring to Fig. 1.1.

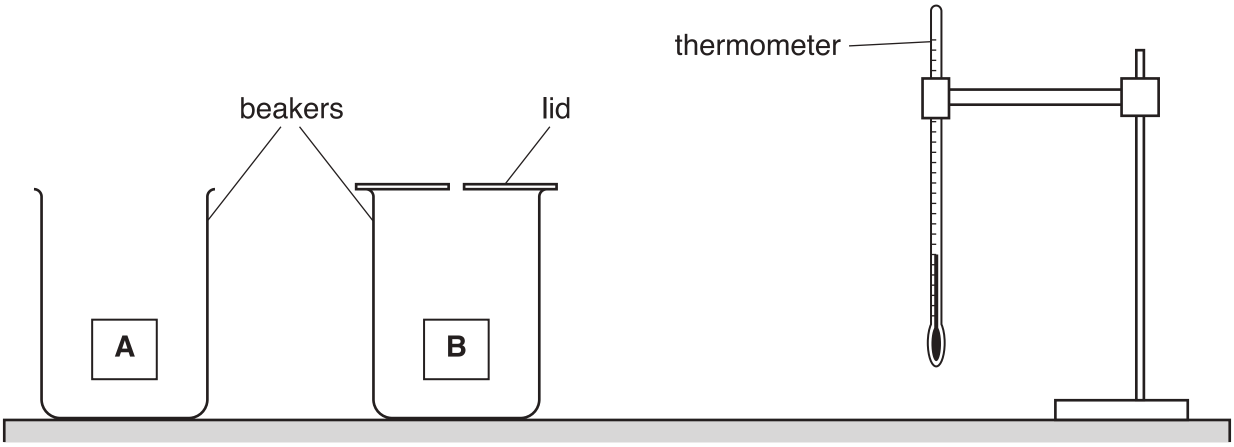

Fig. 1.1

(a)
- Pour 100 cm^3 of hot water into beaker **A**.
- Place the thermometer in the water in beaker **A**.
- In Table 1.1, record the temperature θ of the water at time t = 0 s and immediately start the stopclock.
- Record, in the table, the temperature θ of the water at times t = 30 s, 60 s, 90 s, 120 s, 150 s and 180 s.
- Remove the thermometer from the beaker. [1]

(b) (i) Remove the lid from beaker **B**.
Repeat the procedure in **(a)** for beaker **B**, using 75 cm^3 of hot water, and replace the lid immediately after pouring in the water. [1]

(ii) Complete the headings and the time column in Table 1.1. [2]

Table 1.1

	beaker **A** without a lid	beaker **B** with a lid
t/	θ/	θ/
0		

(c) Describe **two** precautions that you took to ensure that the temperature readings were as accurate as possible in the experiment.

1 ....

....

2 ....

....
[2]

(d) (i) Write a conclusion, stating how the use of the lid affects the rate of cooling of the water. Justify your answer by reference to your results.

....

....

....

....[2]

(ii) Suggest **one** change to the apparatus or procedure to make the comparison a fairer test. Explain why the change makes the test fairer.

change ....

....

explanation ....

....

....
[2]

(iii) The temperature of the water in each beaker decreases.

Describe **one** other similarity in the pattern of cooling in beakers **A** and **B**.

....

....

....[1]

[Total: 11]

2 In this experiment, you will investigate a circuit containing resistors.
The circuit has been set up for you.

Carry out the following instructions, referring to Fig. 2.1.

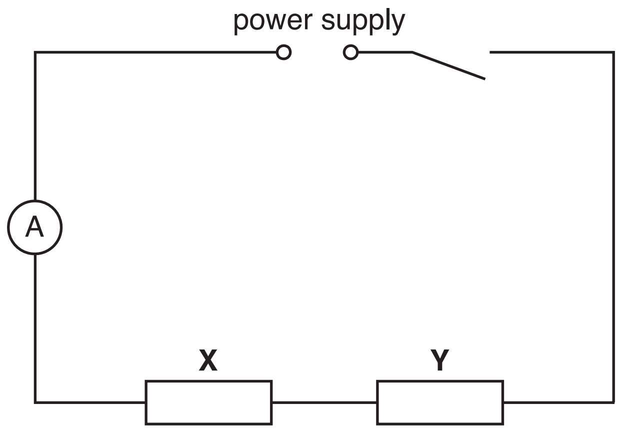

Fig. 2.1

(a) On Fig. 2.1, draw a voltmeter connected so that it measures the potential difference across resistor **X**. [1]

(b) **(i)** Switch on. Record the value of the current I_S in the circuit.

I_S = ...[1]

(ii) • Use the voltmeter to measure and record the value of the potential difference V_X across resistor **X**.

V_X = ...

Disconnect the voltmeter.

• Reconnect the voltmeter to measure and record the potential difference V_Y across resistor **Y**.

V_Y = ...
[1]

Disconnect the voltmeter.

(iii) Reconnect the voltmeter to measure and record the potential difference V_S across the combination of both resistors.

V_S = ...[1]

Switch off.

(iv) A student suggests that V_S should be equal to $(V_X + V_Y)$.

State whether your readings support this suggestion. Justify your statement with reference to your results.

statement ....

justification ....

....

.... [2]

(c) Calculate the resistance R_S of the combination of resistors, using your readings from **(b)(i)** and **(b)(iii)** and the equation

$$R_S = \frac{V_S}{I_S}.$$

R_S = ...[2]

(d) The circuit components are to be rearranged so that:

- resistors **X** and **Y** are in parallel
- the ammeter will measure the total current in the circuit
- the voltmeter will measure the potential difference across both resistors.

In the space below, draw a diagram of this circuit using standard electrical symbols.

[2]

(e) Set up the circuit as described in **(d)**.

Switch on. Measure and record the total current I_P in the circuit and the potential difference V_P across the resistors.

I_P = ...

V_P = ...
[1]

Switch off.

[Total: 11]

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3 In this experiment, you will determine the weight of a metre rule.

Carry out the following instructions, referring to Fig. 3.1.

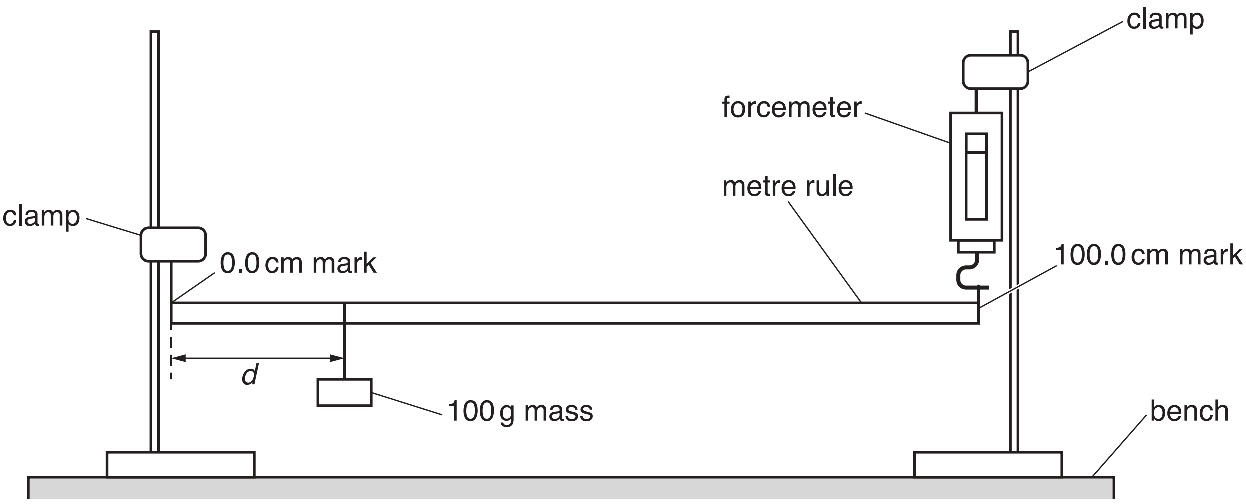

Fig. 3.1

(a) (i)
- Move the 100 g mass to a distance d = 10.0 cm from the 0.0 cm end of the rule.
- Adjust the height of the clamp holding the forcemeter so that the rule is horizontal.
- Read, and record in Table 3.1, the forcemeter reading F.
- Repeat this procedure for values of d = 30.0 cm, 50.0 cm, 70.0 cm and 90.0 cm.

Table 3.1

d / cm	F / N
10.0	
30.0	
50.0	
70.0	
90.0	

[2]

(ii) Explain how you made sure that the rule was horizontal before each reading.
You may draw a diagram.

....

....

....[1]

(b) Plot a graph of F/N (y-axis) against d/cm (x-axis).
Start your axes from the origin (0,0).

Draw a best-fit line.

[4]

(c) (i) From your graph, determine F_0, the value of F when $d = 0.0$ cm.

F_0 ....

(ii) Calculate the weight W_R of the metre rule, using the equation $W_R = 2 \times F_0$.
Give W_R to a suitable number of significant figures for this experiment.

W_R = ...
[2]

(d) A student correctly plots your data points on another sheet of graph paper.

State and explain whether his best-fit line is likely to be the same as yours.
Justify your answer with reference to the plots.

statement ....

explanation ....

....

....[1]

(e) Another student, carrying out the same experiment, is not sure if some of his values of *F* are correct.

Suggest **one** improvement to the procedure which would help him to obtain more reliable *F* values.

....

....

....[1]

[Total: 11]

4 A student has a box of converging lenses, but does not know their focal lengths.

Plan an experiment that will enable her to determine an accurate value for the focal length f of one of the lenses, using the equation

$$f = \frac{uv}{(u + v)}$$

where u is the distance between an object and the lens and v is the distance between the lens and the focused image of the object.

The apparatus available includes:

a lens holder
a 12 V lamp in a holder, with a power supply
a card with a triangular hole covered with tracing paper.

Write a plan for the experiment.

You should:

- list any additional apparatus needed
- draw a diagram of how the apparatus would be arranged, clearly labelling u and v
- write a method for carrying out the experiment including how f would be determined
- state the precautions which should be taken to obtain a clear, focused image
- state the precautions which should be taken to ensure that measurements are accurate once a focused image has been obtained.

You are **not** required to carry out the experiment.

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....[7]

[Total: 7]

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

0337260198

PHYSICS **0625/61**

Paper 6 Alternative to Practical **October/November 2017**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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This document consists of **12** printed pages.

DC (NH/AR) 133344/5

CAMBRIDGE International Examinations

[Turn over

1 A student is investigating resistance using the circuit shown in Fig. 1.1.

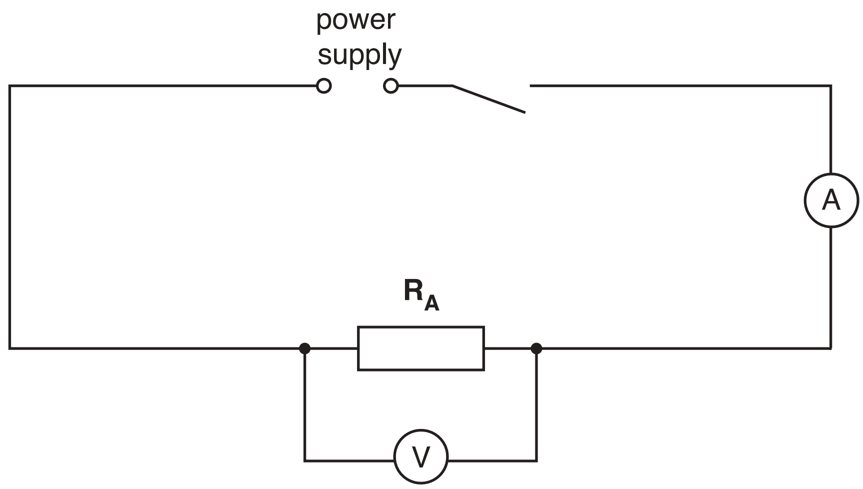


Fig. 1.1

(a) The student measures the potential difference V_1 across the resistor $\mathbf{R_A}$ and the current I_1 in the circuit. Figs. 1.2 and 1.3 show the voltmeter and ammeter scales.

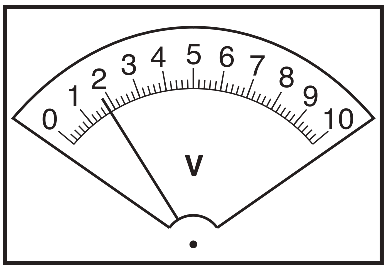


Fig. 1.2

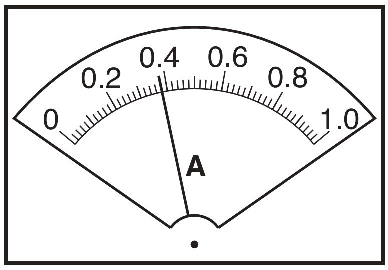


Fig. 1.3

(i) Write down the readings shown on the scales in Figs. 1.2 and 1.3.

V_1 = ...

I_1 = ...
[2]

(ii) Calculate the resistance R_1 of the resistor $\mathbf{R_A}$ using the equation $R_1 = \dfrac{V_1}{I_1}$.

R_1 = ... [1]

(b) The student connects a resistor $\mathbf{R_B}$ in series with $\mathbf{R_A}$.

She measures the potential difference V_2 across the two resistors $\mathbf{R_A}$ and $\mathbf{R_B}$ combined and the current I_2 in the circuit.

V_2 = ...1.8 V........................

I_2 = ...0.19 A........................

Calculate the resistance R_2 of resistors $\mathbf{R_A}$ and $\mathbf{R_B}$ combined in series, using the equation $R_2 = \dfrac{V_2}{I_2}$.

R_2 = ...[1]

(c) The student connects a third resistor $\mathbf{R_C}$ in series with $\mathbf{R_A}$ and $\mathbf{R_B}$.

She measures the potential difference V_3 across the three resistors and the current I_3 in the circuit.

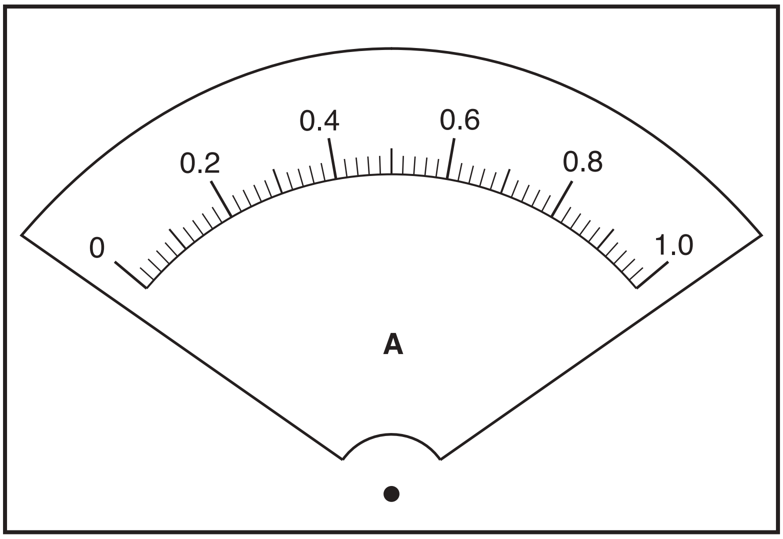
V_3 = ...1.7 V........................

I_3 = ...0.13 A........................

(i) Calculate the resistance R_3 of resistors $\mathbf{R_A}$, $\mathbf{R_B}$ and $\mathbf{R_C}$ combined in series, using the equation $R_3 = \dfrac{V_3}{I_3}$.

R_3 = ...

(ii) On Fig. 1.4, draw a line for the needle on the ammeter to show the reading of 0.13 A.



[1]

Fig. 1.4

(d) A student suggests that $R_3 = 3 \times R_1$.

State whether the results agree with this suggestion. Justify your answer by reference to the results.

statement ....

justification ....

....

....
[1]

(e) Another student suggests that the three resistors $\mathbf{R_A}$, $\mathbf{R_B}$ and $\mathbf{R_C}$ each have the same value of resistance.

Explain how you could use the circuit shown in Fig. 1.1 to check this suggestion.

....

....[1]

(f) Complete the circuit diagram in Fig. 1.5 to show:

- the three resistors connected in parallel
- the voltmeter connected to measure the potential difference across the resistors
- a variable resistor connected to control the current in all three resistors.

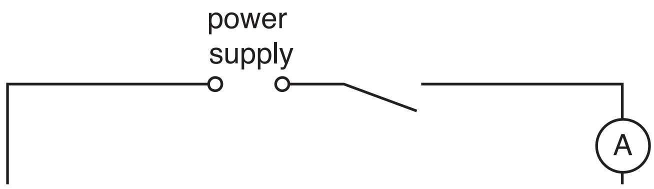


Fig. 1.5

[2]

(g) The circuit in Fig. 1.5 could be used to determine the combined resistance of three resistors connected in parallel.

Suggest a reason for connecting a variable resistor in the circuit.

....

....[1]

[Total: 10]

2 A student is determining the focal length f of a lens.
Fig. 2.1 shows the apparatus used.

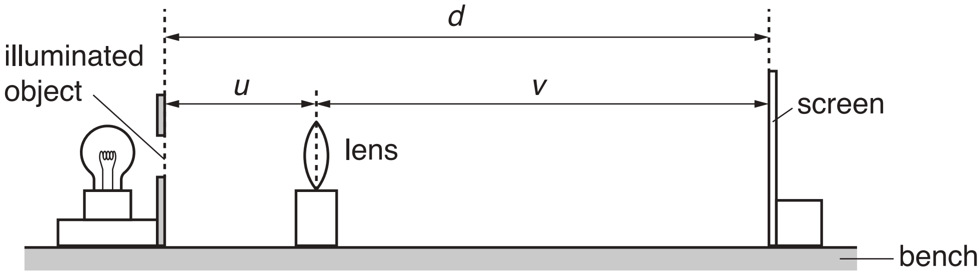


Fig. 2.1

(a) The student obtains a sharply-focused image on the screen.

(i) On Fig. 2.1, measure the distance v from the lens to the screen.

v = ...

(ii) On Fig. 2.1, measure the distance d from the illuminated object to the screen.

d = ...
[2]

(b) Fig. 2.1 is drawn 1/10th actual size.

(i) Calculate V, the actual distance from the lens to the screen. Record the value of V in the first row of Table 2.1.

(ii) Calculate D, the actual distance from the illuminated object to the screen. Record the value of D in the first row of the table.

(iii) Calculate UV and record the result in the table.

[2]

(c) The student repeated the procedure with the lens at a distance U = 30.0 cm from the illuminated object. All the readings are recorded in the table.

Table 2.1

U/cm	V/cm	UV/cm^2	D/cm
20.0			
30.0	29.5	885	59.5

State **one** difference that you would expect to observe between the image formed on the screen when U = 20.0 cm and when U = 30.0 cm.

....

....[1]

(d) **(i)** Use the results in the first row of the table to calculate a value f_1 for the focal length of the lens. Use the equation $f_1 = \frac{UV}{D}$.

f_1 = ...

(ii) Use the results in the second row of the table to calculate a value f_2 for the focal length of the lens. Use the equation $f_2 = \frac{UV}{D}$.

f_2 = ...

(iii) Calculate the average value f_A for the focal length of the lens. Give your answer to a suitable number of significant figures for this experiment.

f_A = ...
[3]

(e) Suggest **two** reasons why it may be difficult to obtain reliable results in this experiment.

1. ....

....

2. ....

....
[2]

(f) A student states that a more reliable value for the focal length is obtained if more values of *U*, *V* and *D* are collected, enabling a graph to be drawn of *UV* against *D*.

(i) Suggest a suitable number of values for *U*.

....

(ii) Suggest a suitable range of values for *U*.

....
[2]

[Total: 12]

3 A student is investigating whether the diameter of a pendulum bob affects the period of a pendulum. The period is the time taken for one complete oscillation of the pendulum. Fig. 3.1 shows a pendulum.

Fig. 3.2 shows one complete oscillation.

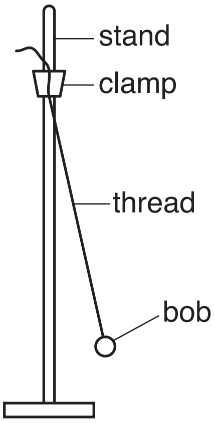


Fig. 3.1

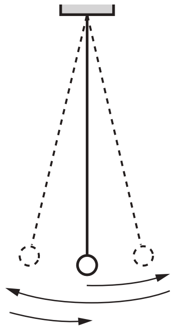


Fig. 3.2

The student has the following apparatus:

pendulum bobs made of polystyrene with diameters 1 cm, 2 cm, 3 cm, 4 cm and 5 cm
a supply of thread and a pair of scissors
clamp and stand.

Plan an experiment to investigate whether the diameter of a pendulum bob affects the period of a pendulum.

You should:

- list additional apparatus that you would require
- explain briefly how you would carry out the investigation
- state the key variables that you would control
- draw a table with column headings, to show how you would display your readings (You are **not** required to enter any readings in the table.)
- explain briefly how you would use your readings to reach a conclusion.

[7]

[Total: 7]

4 A student is determining the weight of a load using a balancing method.

Fig. 4.1 shows the apparatus used.

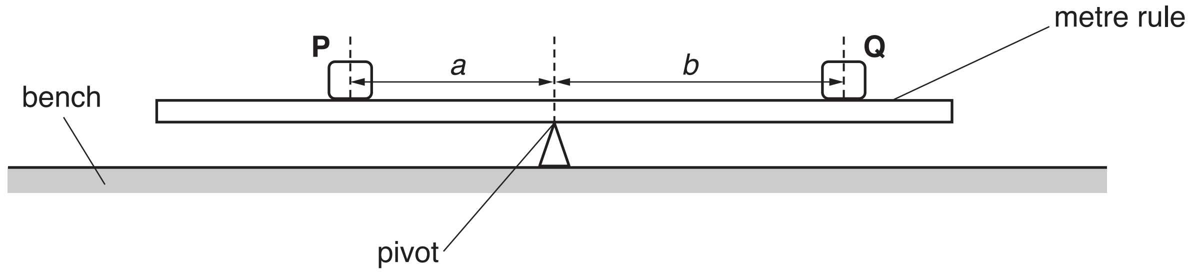


Fig. 4.1

The student places the metre rule on the pivot and adjusts its position so that the metre rule is as near as possible to being balanced.

He places a load **P** on the metre rule so that its centre is exactly at the 30.0 cm mark.

He records the distance *a* between **P** and the pivot.

a = 19.8 cm

He places a load **Q** of weight $Q = 1.0\,N$ on the metre rule and adjusts the position of **Q** so that the metre rule is as near as possible to being balanced.

He measures the distance *b* between the centre of load **Q** and the pivot.

He repeats the procedure, with the load **P** remaining at the 30.0 cm mark, using *Q* values of 2.0 N, 3.0 N, 4.0 N and 5.0 N. All the readings are recorded in Table 4.1.

Table 4.1

Q/N	b/cm	$\frac{1}{Q}\Big/\frac{1}{N}$
1.0	40.0	
2.0	19.5	
3.0	13.5	
4.0	10.5	
5.0	7.5	

(a) For each value of *Q*, calculate $\frac{1}{Q}$ and record the result in the table. [1]

(b) Plot a graph of b/cm (y-axis) against $\frac{1}{Q}\Big/\frac{1}{N}$ (x-axis).

[4]

(c) **(i)** Determine the gradient G of the graph. Show clearly on the graph how you obtained the necessary information.

G = ...[2]

(ii) Calculate the weight P of load **P** using the equation $P = \frac{G}{a}$, where a = 19.8 cm.

P = ...[1]

(d) The student measures the weight *P* of load **P** using a forcemeter. Fig. 4.2 shows the forcemeter.

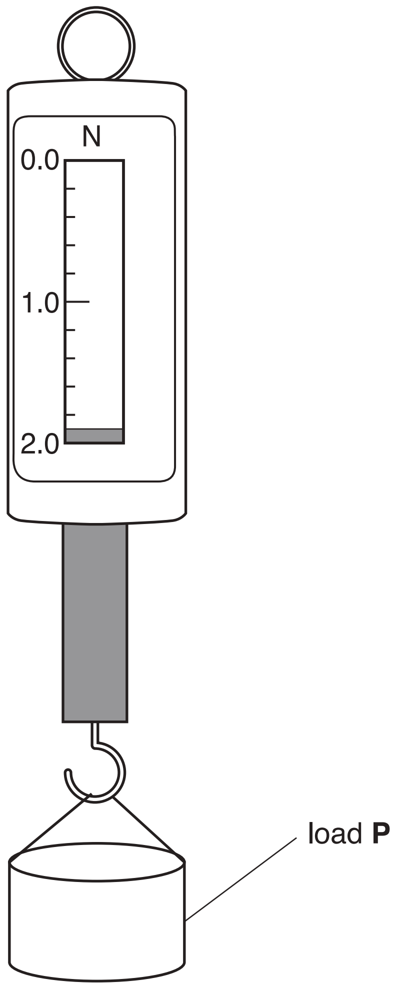


Fig. 4.2

Write down the reading *P* shown on the forcemeter.

P = ... N [1]

(e) The student has carried out the experiment with care and is expecting the two values of *P* in **(c)** and **(d)** to be the same.

Suggest **two** reasons why the values of *P* may be different.

1. ....

....

2. ....

....
[2]

[Total: 11]

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | | CANDIDATE NUMBER | | | | |

PHYSICS **0625/62**

Paper 6 Alternative to Practical **October/November 2017**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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This document consists of **12** printed pages.

DC (ST/FC) 134120/4

CAMBRIDGE International Examinations

[Turn over

1 A student is comparing the oscillations of two pendulums. Fig. 1.1 shows the first pendulum.

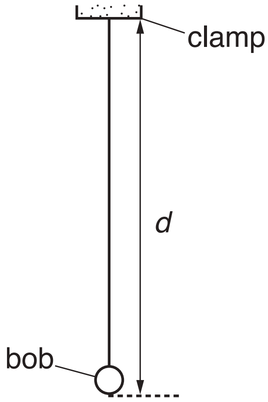

Fig. 1.1

(a) (i) On Fig. 1.1, measure the distance *d*, from the bottom of the clamp to the bottom of the bob.

d = ... cm [1]

(ii) Fig. 1.1 is drawn 1/10th actual size. Calculate the actual distance *D* from the bottom of the clamp to the bottom of the bob.

D = ... cm [1]

(iii) Explain briefly how to use a set-square to avoid a parallax (line-of-sight) error when measuring the length of this pendulum. You may draw a diagram.

....

....[1]

(b) The student displaces the bob slightly and releases it so that it swings. She measures the time t for 20 complete oscillations. The time t is shown on the stopwatch in Fig. 1.2.

Fig. 1.2

(i) Write down the time t shown in Fig. 1.2.

t = ...[1]

(ii) Calculate the period T_1 of the pendulum. The period is the time for one complete oscillation.

T_1 = ...[2]

(c) The student repeats the procedure using another pendulum as shown in Fig. 1.3. This has a long, thin pendulum bob. The distance D from the bottom of the clamp to the bottom of the pendulum bob is the same as for the first pendulum.

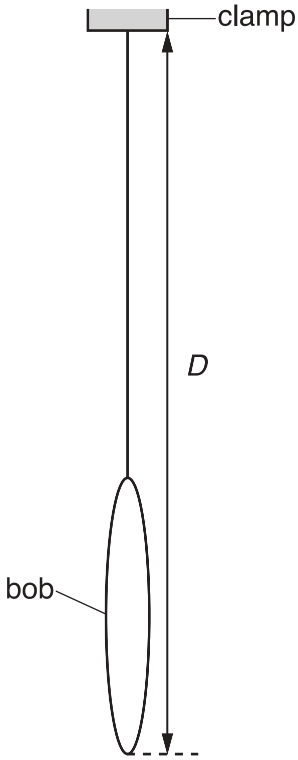

Fig. 1.3

She determines the period T_2 of this pendulum.

T_2 = ...1.37 s............

In this experiment, both pendulum bobs have the same mass. A student suggests that since both pendulums have the same overall length D and mass, the periods T_1 and T_2 should be equal. State whether the results support this suggestion. Justify your answer by reference to the results.

statement ....

justification ....

....

....[2]

(d) The period T of a pendulum can be determined by measuring the time t for 20 complete oscillations and then calculating the period. Some students are asked to explain the reason for this method being more accurate than measuring the time taken for a single oscillation.

Tick the box next to the sentence that gives the best explanation.

☐ The method eliminates errors from the measurements.

☐ The method is more accurate because the experiment is repeated.

☐ The method includes more readings so there is less chance for errors.

☐ The method reduces the effect of errors when starting and stopping the stopwatch.

[1]

(e) A student plans to carry out more pendulum experiments. He considers possible variables and precautions to improve accuracy.

In the following list, mark the possible variables with the letter **V** and the precautions with the letter **P**.

☐ amplitude of swing

☐ length of pendulum

☐ mass of pendulum bob

☐ shape of pendulum bob

☐ use of a reference point to aid counting

☐ viewing the rule at right-angles when measuring the length

[2]

[Total: 11]

2 A student is investigating the cooling of water.

(a) The thermometer in Fig. 2.1 shows room temperature θ_R at the beginning of the experiment. Record θ_R.

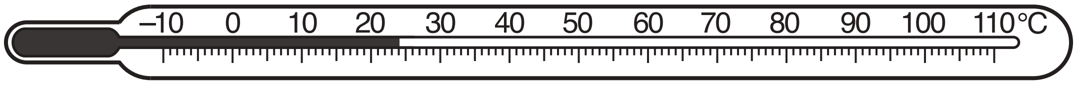

Fig. 2.1

θ_R = ... °C [1]

(b) The student pours 50 cm^3 of hot water into a beaker.

He measures the temperature θ_H of the hot water.

θ_H = ...86 °C..........................

He adds 50 cm^3 of cold water to the beaker. He stirs the water briefly.

He measures the new temperature θ_M of the water in the beaker.

θ_M = ...52 °C..........................

Calculate the temperature fall θ_F using the equation $\theta_F = (\theta_H - \theta_M)$.

θ_F = ...
[1]

(c) He repeats the procedure in **(b)** using 100 cm^3 of hot water and 100 cm^3 of cold water.

θ_H = ...84 °C..........................

θ_M = ...54 °C..........................

Calculate the temperature fall θ_F using the equation $\theta_F = (\theta_H - \theta_M)$.

θ_F = ...[1]

(d) Suggest **one** reason for stirring the water before reading θ_M.

....

....[1]

(e) A student states that the temperature fall θ_F should be the same each time because the proportions of hot and cold water are the same.

Suggest **one** reason why θ_F could be significantly different in **(b)** and **(c)**.

....

....

....[1]

(f) Suggest an improvement to the apparatus to make it more likely that θ_F would be the same each time.

....

....

....[1]

(g) Suggest a condition, not included in your answer to **(f)**, that you would control to make it more likely that θ_F would be the same each time.

....

....

....[1]

(h) The student uses a measuring cylinder to measure the volume of water he uses. Draw a measuring cylinder about half-full of water. Show clearly on your diagram the line-of-sight required for obtaining a correct reading for the volume of water.

[3]

[Total: 10]

3 A student is determining the focal length f of a lens.

Fig. 3.1 shows the apparatus used.

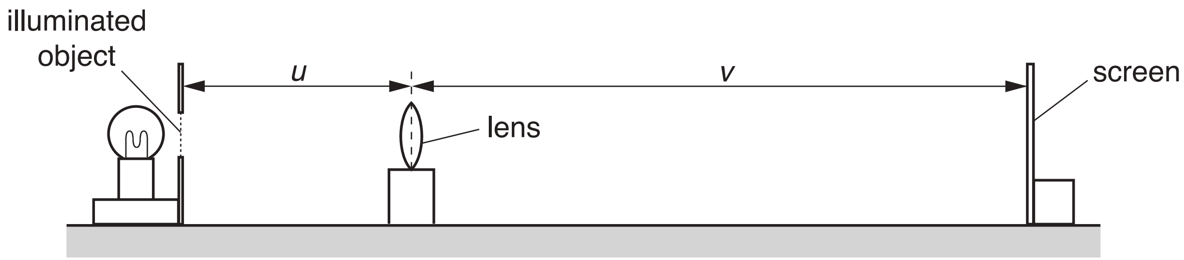

Fig. 3.1

(a)
- The student places the screen about 100 cm from the illuminated object.
- She places the lens between the object and the screen so that the centre of the lens is at a distance u = 20.0 cm from the object.
- She adjusts the position of the screen until a clearly focused image is formed on the screen.
- She measures the distance v between the centre of the lens and the screen.
- She repeats the procedure using values for u of 22.0 cm, 25.0 cm, 30.0 cm and 35.0 cm.
- The readings are shown in Table 3.1.

Table 3.1

u / cm	v / cm
20.0	60.0
22.0	47.1
25.0	37.5
30.0	29.8
35.0	26.3

Plot a graph of v/cm (y-axis) against u/cm (x-axis). You do not need to start your axes at the origin (0, 0). Draw the best-fit curve.

[4]

(b) **(i)**
- Mark, with a cross, the point on the graph grid where $u = 25.0$ cm and $v = 25.0$ cm.
- Mark with a cross, the point on the graph grid where $u = 35.0$ cm and $v = 35.0$ cm.
- Join these two points with a straight line. [1]

(ii)
- Record u_1, the value of u at the point where the straight line crosses your graph line.

u_1 = ... cm

- Record v_1, the value of v at the point where the straight line crosses your graph line.

v_1 = ... cm

[1]

(iii) Calculate the focal length f of the lens using the equation $f = \frac{(u_1 + v_1)}{4}$.

f = ... cm

[2]

(c) Suggest **two** differences that you would expect to see between the appearance of the illuminated object and the image on the screen.

1. ....

2. ....
[2]

(d) Suggest **two** precautions that you would take in order to obtain reliable readings in this experiment.

1. ....

2. ....
[2]

[Total: 12]

4 A student has a selection of rubber bands of different widths. He is investigating the extension produced by adding loads. Fig. 4.1 shows the set-up used.

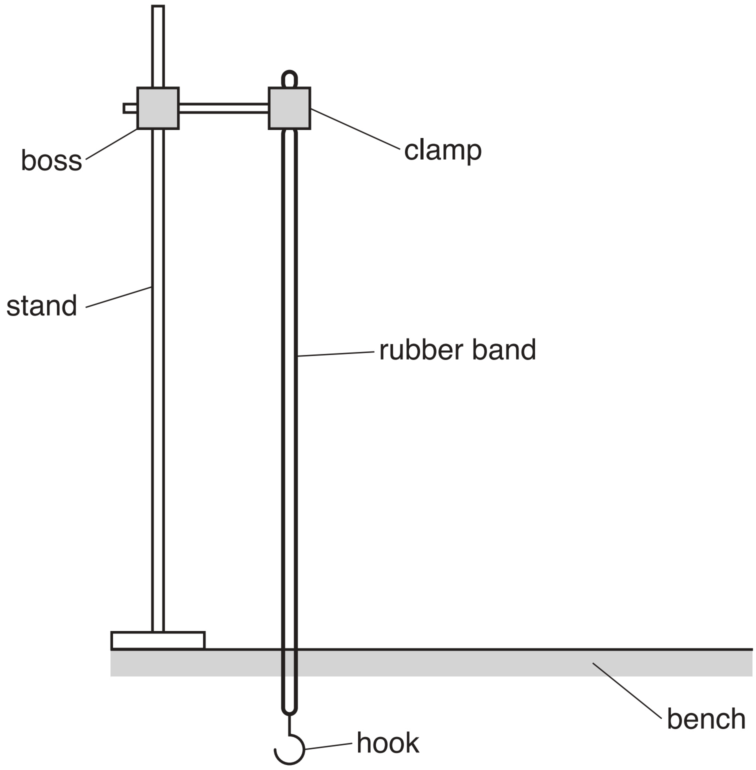

Fig. 4.1

In addition to the apparatus shown in Fig. 4.1, the following apparatus is available to the student:

A metre rule
A selection of different rubber bands
A selection of loads.

Plan an experiment to investigate how strips of rubber of different widths stretch when loaded.

You should

- explain briefly how you would carry out the investigation
- state the key variables that you would control
- draw a table, or tables, with column headings to show how you would display your readings (You are **not** required to enter any readings in the table.)
- explain briefly how you would use your readings to reach a conclusion.

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....[7]

[Total: 7]

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

4841109280

PHYSICS **0625/63**

Paper 6 Alternative to Practical **October/November 2017**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **14** printed pages and **2** blank pages.

DC (NH/CGW) 132967/3

CAMBRIDGE
International Examinations

[Turn over

1 Some students are investigating how the use of a lid affects the rate of cooling of water in a beaker.

They are using the apparatus shown in Fig. 1.1.

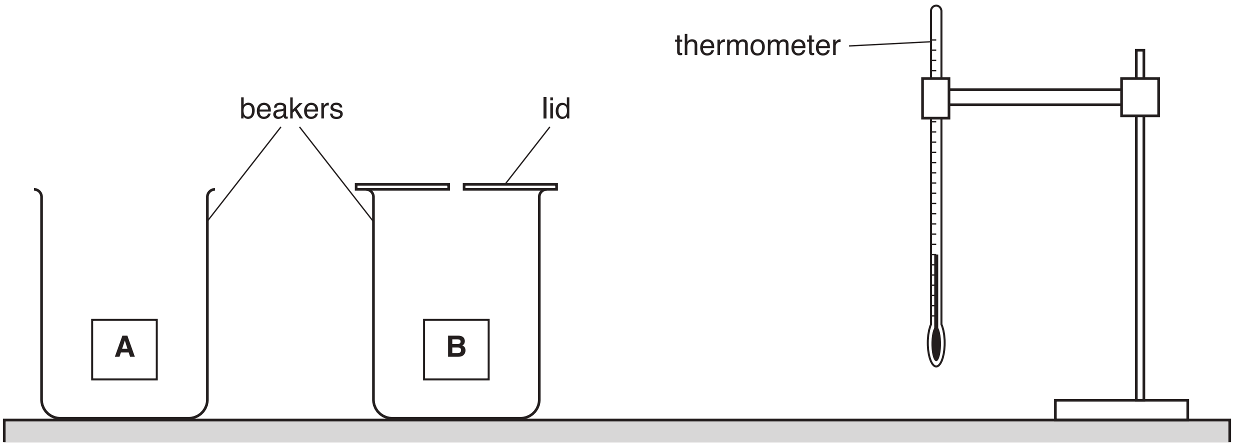

Fig. 1.1

- A student pours 100 cm^3 of hot water into beaker **A**.
- He records the temperature of the water in beaker **A** and immediately starts a stopclock.
- The student records the temperature θ of the water every 30 s. His readings are shown in Table 1.1.
- The student repeats the procedure for beaker **B** using 75 cm^3 of hot water.

(a) Complete the headings and the time column in Table 1.1. [2]

Table 1.1

	beaker **A** without a lid	beaker **B** with a lid
t/	θ/	θ/
	80.0	81.0
	77.0	79.0
	74.5	77.5
	72.5	76.0
	70.5	75.0
	69.0	74.0
	68.0	73.5

(b) Describe **two** precautions which should be taken to ensure that the temperature readings are as accurate as possible in the experiment.

1 ....

....

2 ....

....
[2]

(c) **(i)** Write a conclusion, stating how the use of the lid affects the rate of cooling of the water. Justify your answer by reference to the results.

....

....

....

....[2]

(ii) Suggest **one** change to the apparatus or procedure to make the comparison a fairer test. Explain why the change makes the test fairer.

change ....

....

explanation ....

....

....
[2]

(iii) The temperature of the water in each beaker decreases.

Describe **one** other similarity in the pattern of cooling in beakers **A** and **B**.

....

....[1]

(d)

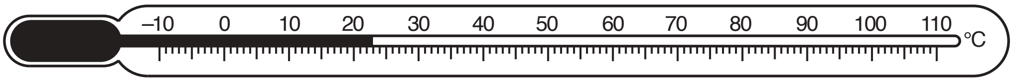

Fig. 1.2

(i) Record the room temperature θ_R, shown on the thermometer in Fig. 1.2.

θ_R = ... [1]

(ii) Another student is carrying out the same experiment in a room with a room temperature that is much higher than θ_R.

Suggest whether this might affect the cooling of the water in beaker **A** in her experiment. Briefly explain your answer.

suggestion ....

explanation ....

....

....
[1]

[Total: 11]

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2 A student is investigating a circuit containing resistors.

She is using the circuit shown in Fig. 2.1.

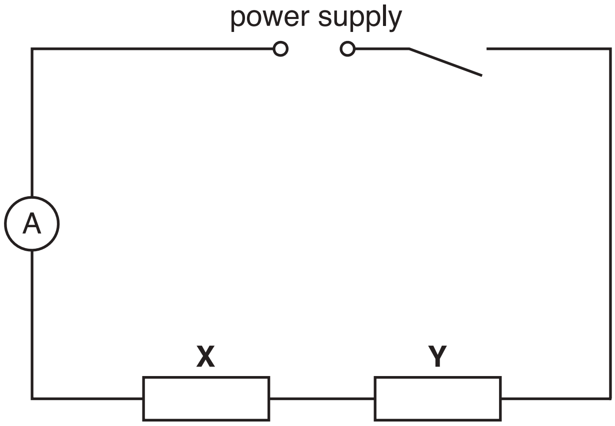

Fig. 2.1

(a) On Fig. 2.1, show a voltmeter connected so that it measures the potential difference across resistor **X**. [1]

(b) The student uses the ammeter to measure the current I_S in the circuit.

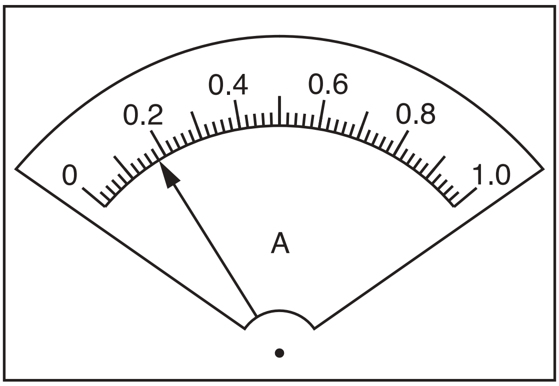

Fig. 2.2

Record the current I_S, as shown on the ammeter in Fig. 2.2.

I_S = ...[1]

(c) (i) The student uses the voltmeter to measure the potential difference V_X across resistor **X** and then reconnects it to measure the potential difference V_Y across resistor **Y**.

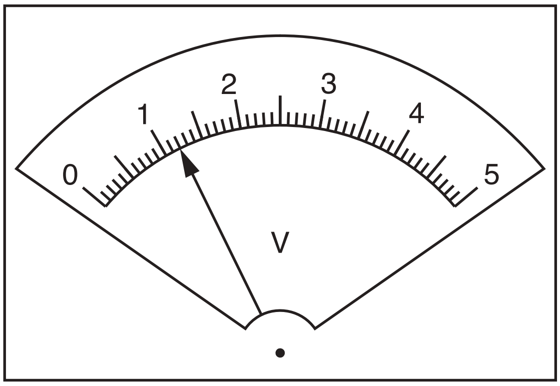

Fig. 2.3

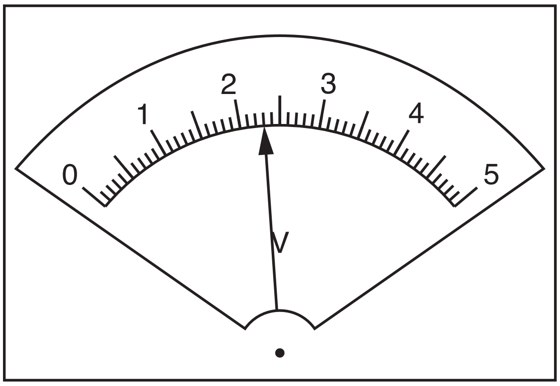

Fig. 2.4

- Record the value of the potential difference V_X across resistor **X**, shown in Fig. 2.3.

V_X = ...

- Record the value of the potential difference V_Y across resistor **Y**, shown in Fig. 2.4.

V_Y = ...
[1]

(ii) She then measures the potential difference V_S across the combination of both resistors.

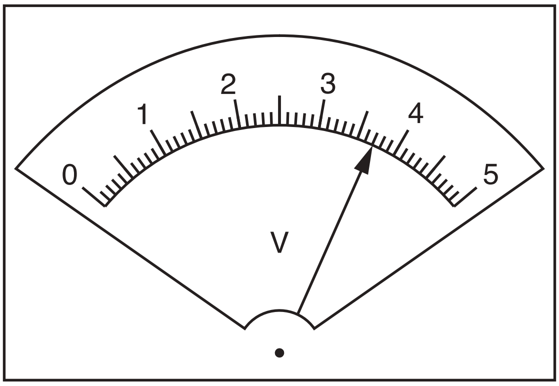

Fig. 2.5

Record the value of the potential difference V_S across the combination of both resistors, shown in Fig. 2.5.

V_S = ...[1]

(iii) A student suggests that V_S should be equal to ($V_X + V_Y$).

State whether the readings support this suggestion. Justify your statement with reference to the results.

statement ....

justification ....

....

.... [2]

(d) Calculate the resistance R_S of the combination of resistors, using the readings from **(b)** and **(c)(ii)** and the equation

$$R_S = \frac{V_S}{I_S}.$$

R_S = ... [2]

(e) **(i)** The circuit components are to be rearranged so that:

- resistors **X** and **Y** are in parallel
- the ammeter will measure the total current in the circuit
- the voltmeter will measure the potential difference across both resistors.

In the space below, draw a diagram of this circuit using standard electrical symbols.

[2]

(ii) The student sets up the circuit as described in **(e)(i)**.

She measures and records the total current I_P in the circuit and the potential difference V_P across the resistors.

I_P = 0.81 A

V_P = 3.6 V

The resistance of two resistors connected in parallel is less than the resistance of the same two resistors connected in series.

State whether the readings indicate that she has set up the circuit correctly.
Explain your answer.

suggestion ....

explanation ....

....

....
[1]

[Total: 11]

3 Some students are determining the weight of a metre rule.
They use the apparatus shown in Fig. 3.1.

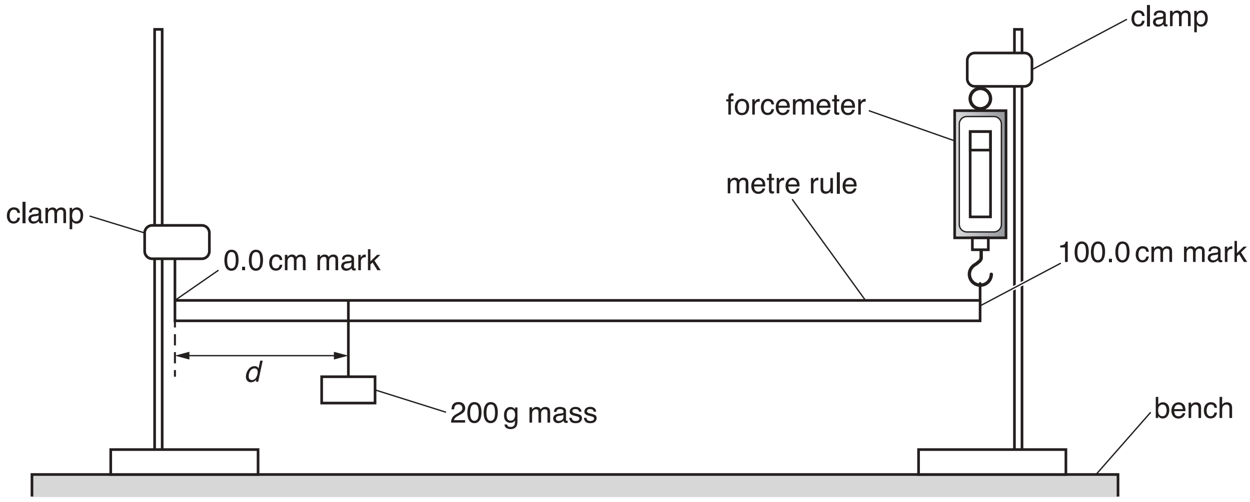

Fig. 3.1

(a) (i) The students suspend a 200 g mass at a distance *d* from the end of the rule.
They then adjust the height of the clamp holding the forcemeter so that the rule is horizontal.

Fig. 3.2 shows the forcemeter when the value of *d* is 10.0 cm.

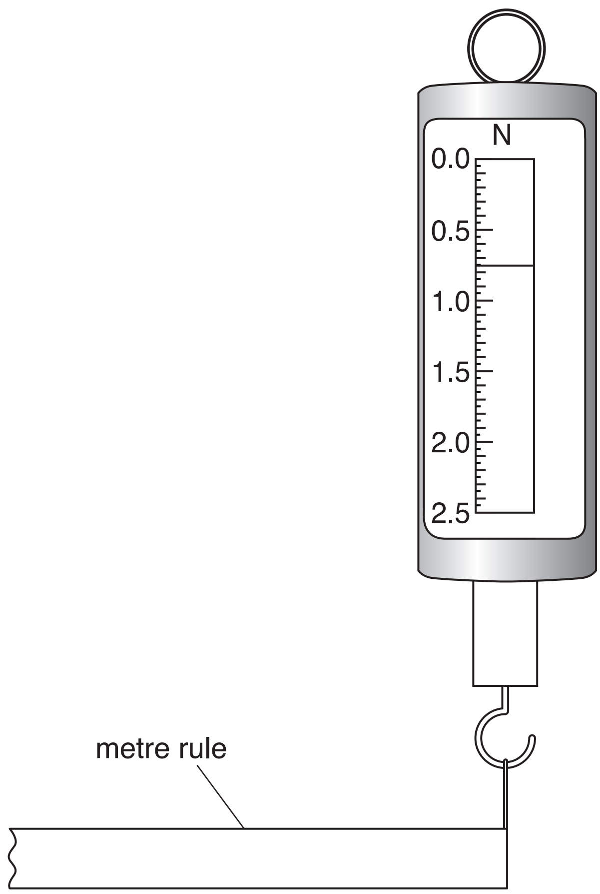

Fig. 3.2

In Table 3.1, record the forcemeter reading F, as shown in Fig. 3.2. [1]

Table 3.1

d/cm	F/N
10.0	
30.0	1.05
50.0	1.65
70.0	1.95
90.0	2.25

(ii) The students repeat the procedure for values of d = 30.0 cm, 50.0 cm, 70.0 cm and 90.0 cm. Their readings are shown in Table 3.1.

Explain how the students could make sure that the rule is horizontal before each reading. You may draw a diagram.

....

....

....[1]

(b) Plot a graph of F/N (y-axis) against d/cm (x-axis).
Start your axes from the origin (0, 0).

Draw a best-fit line.

[4]

(c) **(i)** From your graph, determine F_0, the value of F when d = 0.0 cm.

F_0 = ...[1]

(ii) Calculate the weight W_R of the metre rule, using the equation $W_R = 2 \times F_0$.
Give W_R to a suitable number of significant figures for this experiment.

W_R = ...[2]

(d) A student correctly plots your data points on another sheet of graph paper.

State and explain whether his best-fit line is likely to be the same as yours.
Justify your answer with reference to the plots.

statement ....

explanation ....

....

....
[1]

(e) Another student, carrying out the same experiment, is not sure if some of his values of *F* are correct.

Suggest **one** improvement to the procedure which would help him to obtain more reliable *F* values.

....

....

....[1]

[Total: 11]

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4 A student has a box of converging lenses but does not know their focal lengths.

Plan an experiment which will enable her to determine an accurate value for the focal length f of one of the lenses, using the equation

$$f = \frac{uv}{(u + v)}$$

where u is the distance between an object and the lens and v is the distance between the lens and the focused image of the object.

The apparatus available includes:

a lens holder
a 12 V lamp in a holder, with a power supply
a card with a triangular hole covered with tracing paper.

Write a plan for the experiment.

You should:

- list any additional apparatus needed
- draw a diagram of how the apparatus will be arranged, clearly labelling u and v
- write a method for carrying out the experiment including how f will be determined
- state the precautions which should be taken to obtain a clear, focused image
- state the precautions which should be taken to ensure that measurements are accurate once a focused image has been obtained.

....

....

....

....

....[7]

[Total: 7]

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Cambridge Assessment
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Grade thresholds – March 2018

Cambridge IGCSE Physics (0625)

Grade thresholds taken for Syllabus 0625 (Physics) in the March 2018 examination.

		minimum raw mark required for grade:						
	maximum raw mark available	A	B	C	D	E	F	G
Component 12	40	–	–	25	22	19	16	13
Component 22	40	27	24	22	18	15	13	11
Component 32	80	–	–	49	40	30	21	12
Component 42	80	50	41	31	27	21	15	9
Component 52	40	26	23	21	18	16	13	10
Component 62	40	23	21	19	16	14	11	8

Grade A* does not exist at the level of an individual component.

The maximum total mark for this syllabus, after weighting has been applied, is **200**.

The overall thresholds for the different grades were set as follows.

Option	Combination of Components	A*	A	B	C	D	E	F	G
BY	22, 42, 52	146	128	110	93	79	65	51	37
CY	22, 42, 62	142	125	108	91	77	63	49	35
FY	12, 32, 52	–	–	–	119	100	82	63	44
GY	12, 32, 62	–	–	–	117	98	80	61	42

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/12**

Paper 1 Multiple Choice (Core) **March 2018**

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the March 2018 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **3** printed pages.

Question	Answer	Marks
1	D	**1**
2	A	**1**
3	C	**1**
4	C	**1**
5	D	**1**
6	C	**1**
7	C	**1**
8	B	**1**
9	B	**1**
10	B	**1**
11	A	**1**
12	B	**1**
13	B	**1**
14	C	**1**
15	D	**1**
16	D	**1**
17	A	**1**
18	C	**1**
19	C	**1**
20	D	**1**
21	B	**1**
22	D	**1**
23	B	**1**
24	A	**1**
25	D	**1**
26	C	**1**
27	C	**1**
28	A	**1**

Question	Answer	Marks
29	B	**1**
30	B	**1**
31	A	**1**
32	A	**1**
33	D	**1**
34	A	**1**
35	C	**1**
36	A	**1**
37	A	**1**
38	A	**1**
39	D	**1**
40	B	**1**

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/12**

Paper 1 Multiple Choice (Core) **February/March 2018**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

8208222047

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = $10\,m/s^2$).

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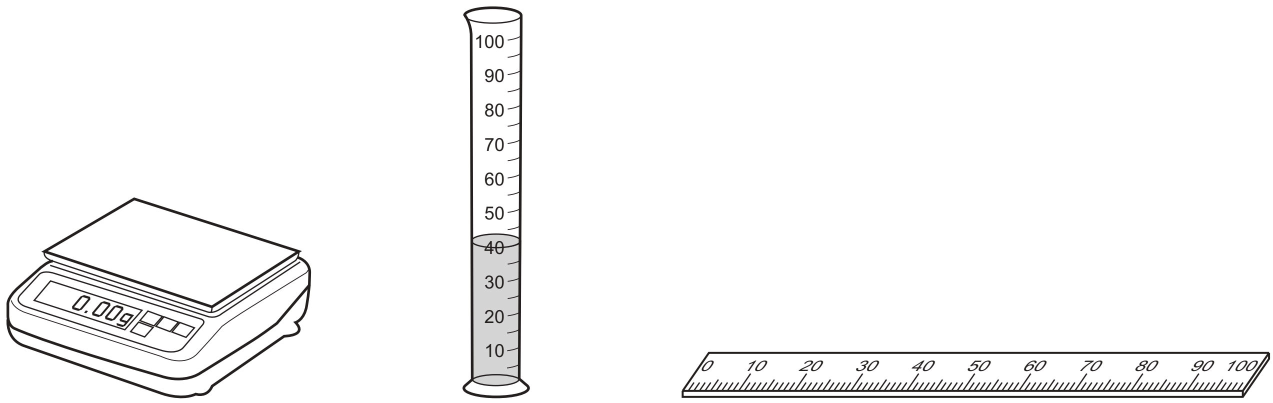
CAMBRIDGE International Examinations

1 A student is asked to find the volume of a small irregularly-shaped piece of rock.

He has the following apparatus available.



balance | measuring cylinder containing water | rule

Which apparatus must the student use to find the volume of the small piece of rock?

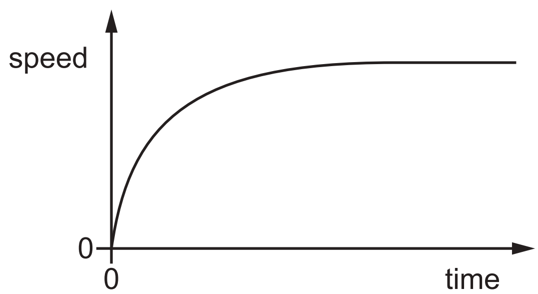
A balance and rule

B rule only

C balance and measuring cylinder

D measuring cylinder only

2 The speed-time graph represents the motion of a car travelling along a straight level road.



Which statement describes the motion of the car?

A It accelerates and reaches a constant speed.

B It accelerates and then stops moving.

C It decelerates and then reaches a constant speed.

D It decelerates and then stops moving.

3 An athlete runs 300 metres up a hill at a steady speed of 3.0 m/s.

She then immediately runs the same distance down the hill at a steady speed of 6.0 m/s.

What is her average speed for the 600 metre run?

A 2.0 m/s **B** 3.0 m/s **C** 4.0 m/s **D** 4.5 m/s

4 Which statement is correct?

A Mass is a gravitational force but weight is not a gravitational force.

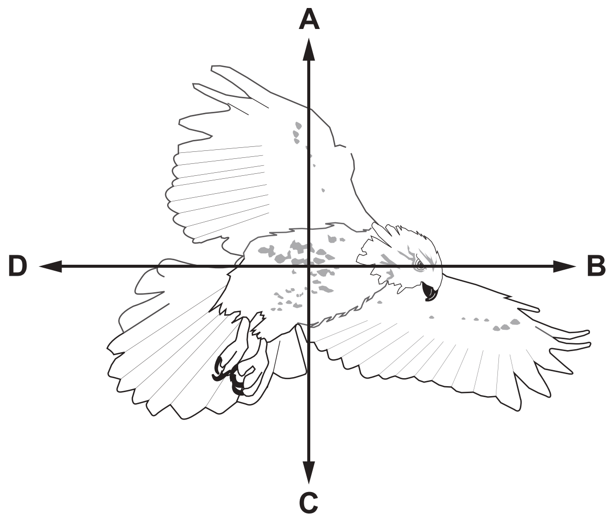
B Mass is not a gravitational force and weight is not a gravitational force.

C The unit of mass is the kilogram and the unit of weight is the newton.

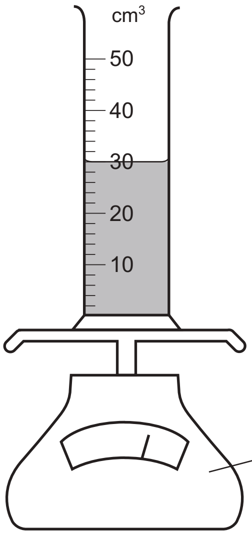
D The unit of mass is the newton and the unit of weight is the kilogram.

5 The diagram shows a bird in flight. The bird is flying in a horizontal direction to the right.

In which direction does air resistance act on the bird?



6 A measuring cylinder contains 30 cm^3 of a liquid.



Some more of the liquid is added until the liquid level reaches the 50 cm^3 mark.

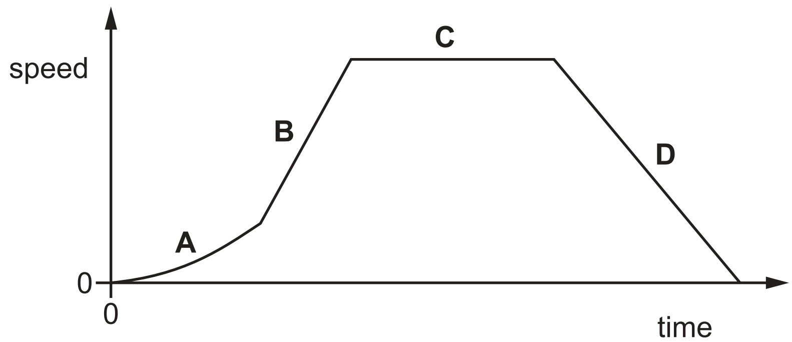
The reading on the balance increases by 30 g.

What is the density of the liquid?

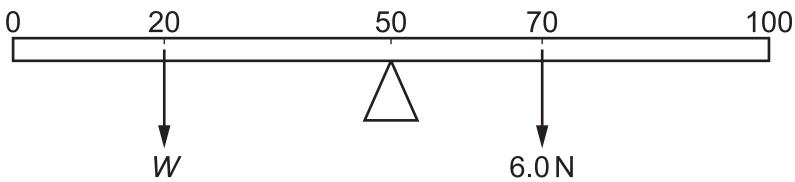
A 0.60 g / cm^3 **B** 0.67 g / cm^3 **C** 1.5 g / cm^3 **D** 1.7 g / cm^3

7 A car is travelling along a straight horizontal road. The speed-time graph is shown.

In which labelled part of the journey is the resultant force on the car zero?



8 The diagram shows a uniform metre rule balanced at its mid-point.

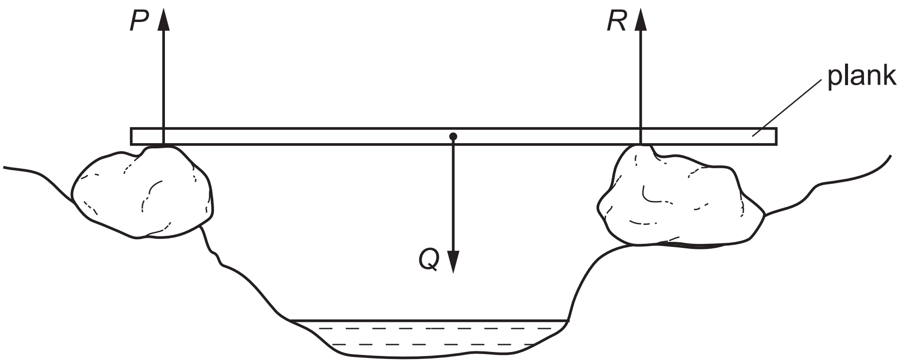


What is the weight W placed at the 20 cm mark?

A 0.25 N **B** 4.0 N **C** 9.0 N **D** 21 N

9 A wooden plank rests in equilibrium on two rocks on opposite sides of a narrow stream.

Three forces *P*, *Q* and *R* act on the plank.



How are the sizes of the forces related?

A $P + Q = R$

B $P + R = Q$

C $P = Q = R$

D $P = Q + R$

10 A ball is at rest at the top of a hill. It rolls down the hill. At the bottom of the hill the ball hits a wall and stops.

Which energy changes occur?

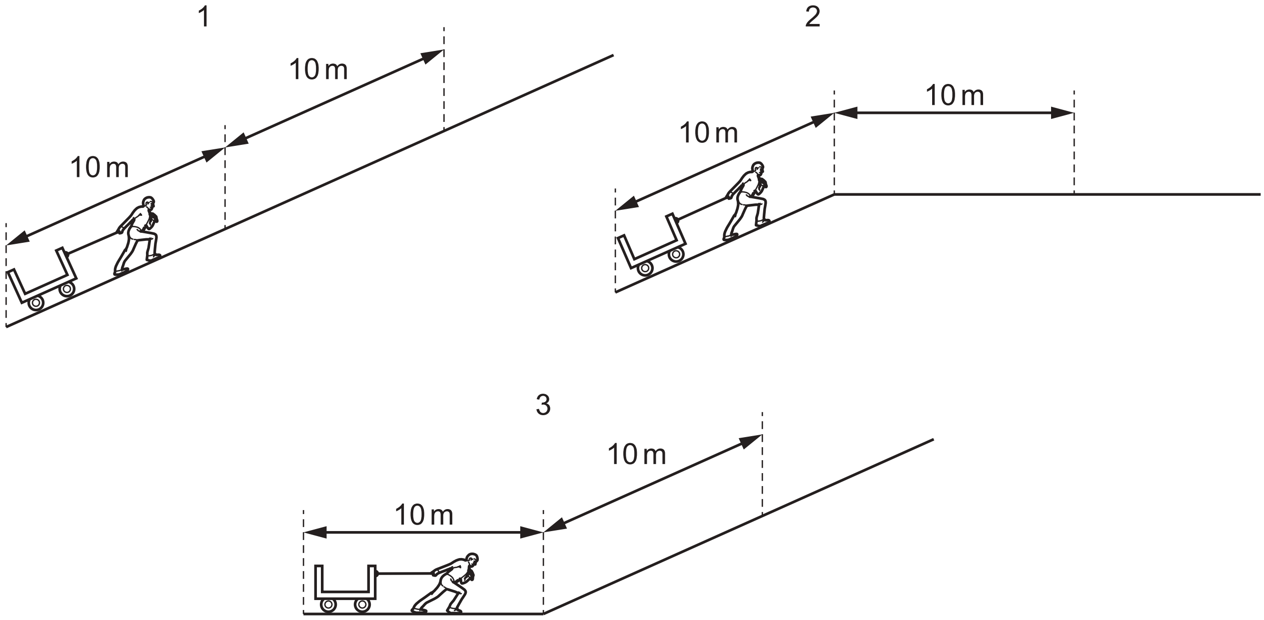
A gravitational potential energy → internal energy → kinetic energy

B gravitational potential energy → kinetic energy → internal energy

C kinetic energy → gravitational potential energy → internal energy

D kinetic energy → internal energy → gravitational potential energy

11 A man pulls a truck a distance of 20 m, as shown in the three diagrams.



Which statement concerning the work done against gravity is correct?

A Most work is done in 1.

B No work is done in 3.

C The work done in all three is equal.

D The work done in 1 and 2 is equal.

12 Which source of energy is used in a nuclear power station to generate electrical energy?

A different types of atom regrouping

B heavy nuclei splitting

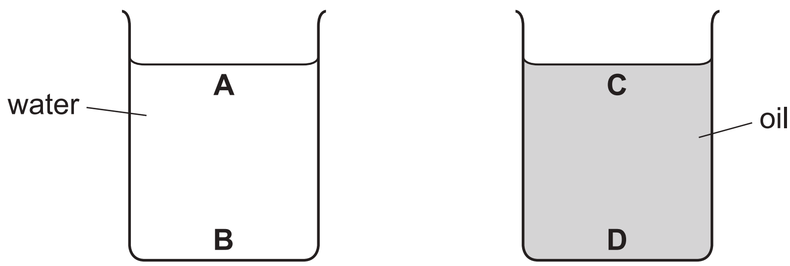
C radioactive isotopes decaying

D radioactive atoms emitting β-particles

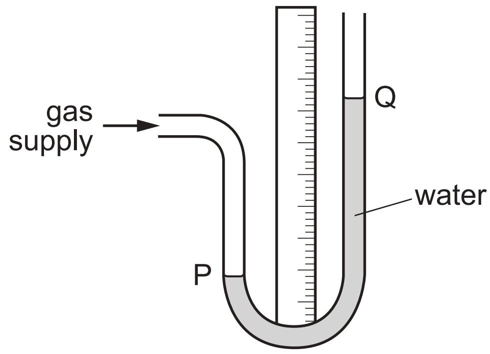
13 Two beakers are filled to the same depth, one with water and one with oil.

The density of water is $1000\,kg/m^3$ and the density of oil is $920\,kg/m^3$.

In which position is the pressure the greatest?



14 A water manometer is connected to a gas supply.

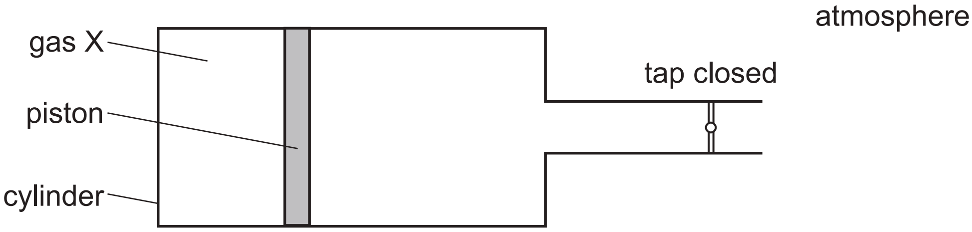


There is a gas leak and the pressure of the gas supply falls.

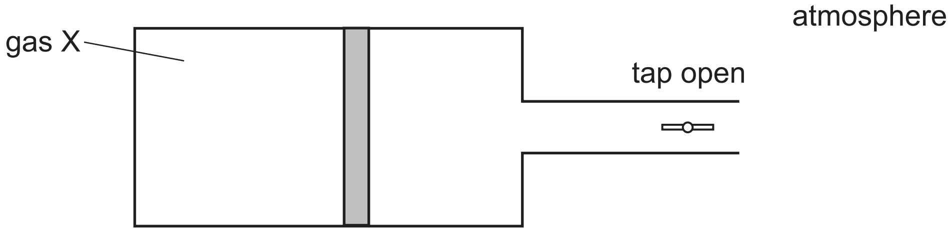
What happens to the water level at P and what happens to the water level at Q?

	water level at P	water level at Q
A	falls	falls
B	falls	rises
C	rises	falls
D	rises	rises

15 A cylinder with a tap contains a fixed mass of gas X. The gas is contained by a piston which can move freely towards or away from the tap.



When the tap is opened, the piston moves slightly to the right, towards the tap.



What can be deduced about the pressure of gas X?

	before opening tap	after opening tap
A	less than atmospheric pressure	more than atmospheric pressure
B	same as atmospheric pressure	more than atmospheric pressure
C	more than atmospheric pressure	less than atmospheric pressure
D	more than atmospheric pressure	same as atmospheric pressure

16 Which quantity does **not** change when there is an increase in temperature?

A the density of a steel block

B the diameter of the hole in a metal nut

C the length of an iron rod

D the mass of a metal coin

17 A thermometer has a low thermal capacity.

Why is this an advantage?

A The thermometer does not absorb much thermal energy to raise its own temperature.

B The thermometer does not conduct much thermal energy to the surroundings.

C The thermometer does not melt when it gets hot.

D The thermometer does not radiate much thermal energy to the surroundings.

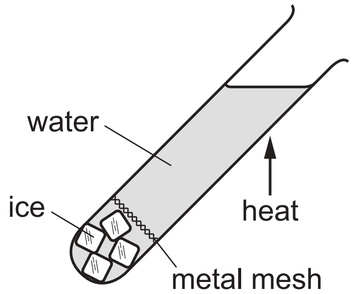
18 In an experiment, a thermometer is placed in a test-tube of hot liquid. The temperature reading of the liquid is recorded every half minute. The table shows the results.

time / minutes	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5
temperature / °C	73	65	59	55	55	55	51	48	45	42	40	38	36	35	34	33

What is the melting point of the substance?

A 0 °C **B** 33 °C **C** 55 °C **D** 73 °C

19 A teacher demonstrates an experiment to a class. A boiling tube is filled with water and some ice cubes are trapped at the bottom of the tube. The teacher then heats the boiling tube in the position shown until the water at the top boils.



The ice does not melt.

What does this demonstrate?

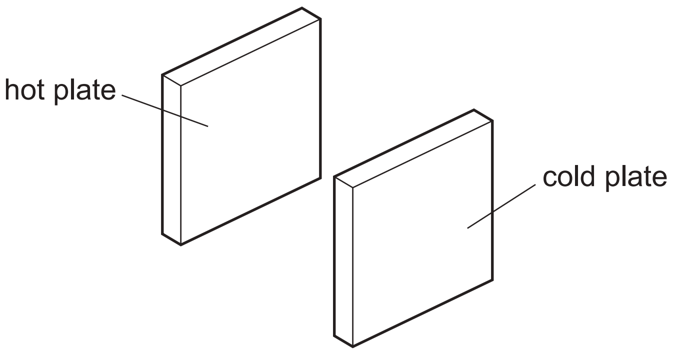
A Water is a good conductor of thermal energy.

B Water is a good convector of thermal energy.

C Water is a poor conductor of thermal energy.

D Water is a poor convector of thermal energy.

20 A hot metal plate is placed near to a cold metal plate. Infra-red radiation transfers thermal energy between the two plates.



Which choice of colour causes the temperature of the cold plate to increase most slowly?

	hot plate	cold plate
A	matt black	matt black
B	matt black	shiny white
C	shiny white	matt black
D	shiny white	shiny white

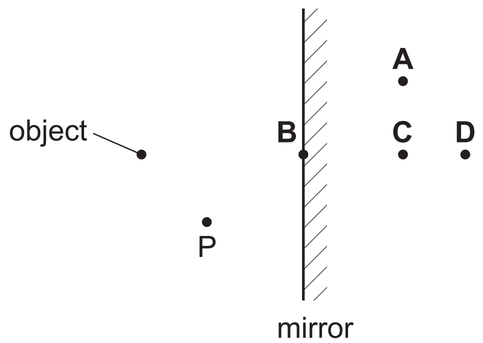
21 Which row shows an example of a transverse wave and an example of a longitudinal wave?

	transverse	longitudinal
A	light	radio
B	radio	sound
C	sound	water
D	water	light

22 An object is placed before a plane mirror as shown.

A student views the image of the object in the mirror from point P.

Where does she see the image?



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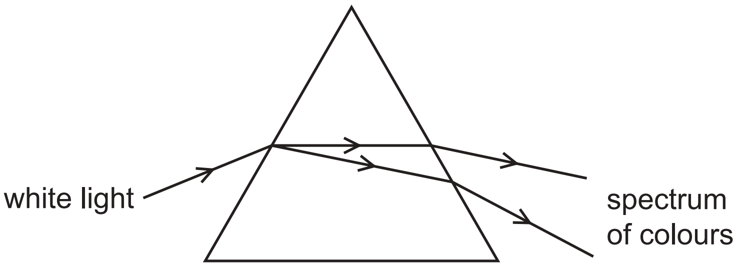
23 Light passes through a prism as shown. The light changes direction and produces a spectrum of colours.



Which term is used to describe the production of the spectrum of colours?

A diffraction

B dispersion

C refraction

D total internal reflection

24 Which type of waves are produced by a television remote controller?

A infra-red waves

B radio waves

C ultraviolet waves

D visible light

25 Both the amplitude and the frequency of a sound wave decrease.

What happens to the sound heard?

A The sound is louder and has a higher pitch.

B The sound is louder and has a lower pitch.

C The sound is quieter and has a higher pitch.

D The sound is quieter and has a lower pitch.

26 An electromagnet is used to remove a splinter from an eye.

What material is the splinter made from?

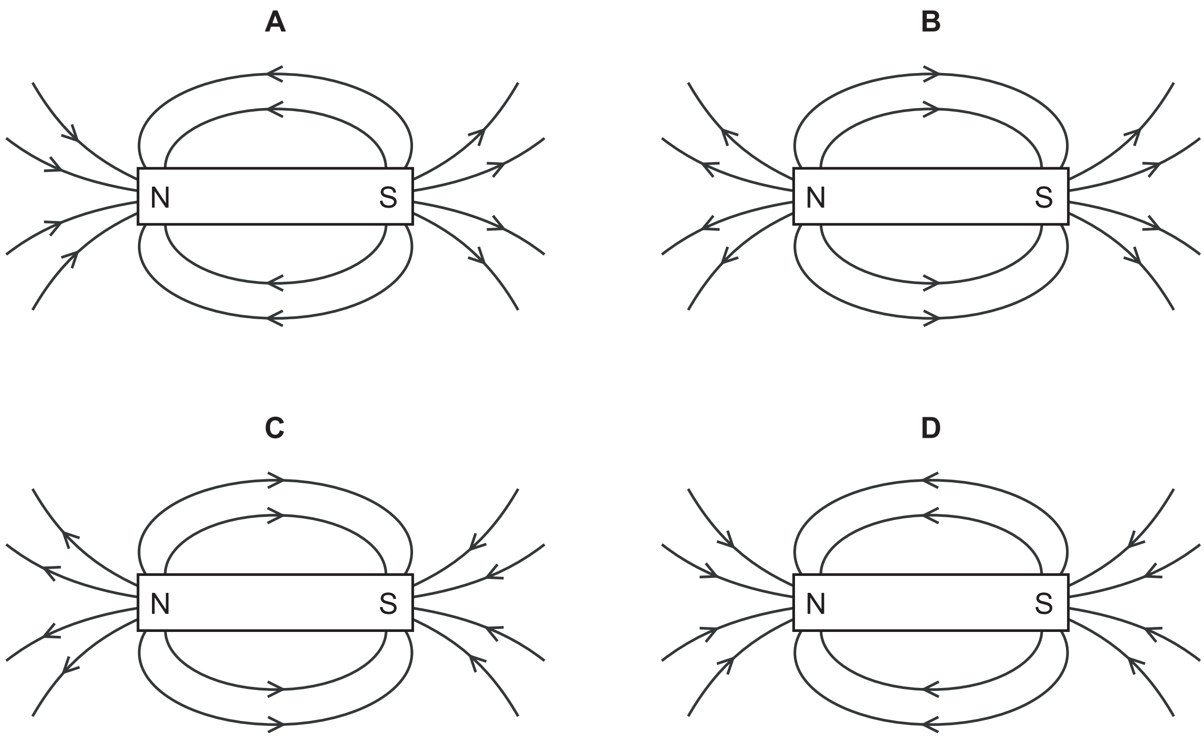
A aluminium

B glass

C iron

D wood

27 Which diagram shows the magnetic field around a bar magnet?



28 A metal conductor is connected to a battery.

Which statement describes the current in the metal conductor?

A It is a flow of electrons from the negative to the positive terminal.

B It is a flow of electrons from the positive to the negative terminal.

C It is a flow of protons from the negative to the positive terminal.

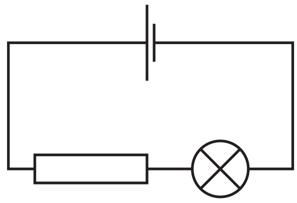
D It is a flow of protons from the positive to the negative terminal.

29 A student sets up the circuit shown to measure three quantities.

1 the current in the circuit

2 the electromotive force (e.m.f.) of the cell

3 the potential difference across the lamp



How many ammeters and how many voltmeters are needed?

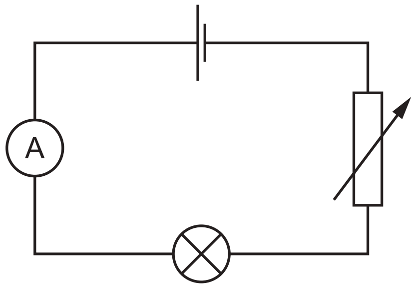
	ammeters	voltmeters
A	0	3
B	1	2
C	2	1
D	3	0

30 The current in a car headlamp is 3.0 A when connected to a 12 V battery.

What is the resistance of the lamp when it is lit?

A 0.25 Ω **B** 4.0 Ω **C** 15 Ω **D** 36 Ω

31 The diagram shows a circuit containing a cell, an ammeter, a lamp and a variable resistor.



The resistance of the variable resistor is increased.

What happens to the ammeter reading and what happens to the brightness of the lamp?

	ammeter reading	lamp brightness
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

32 Diagram 1 shows two identical lamps connected in series with a cell. Diagram 2 shows the same two lamps connected in parallel with an identical cell.

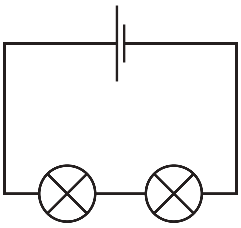


diagram 1

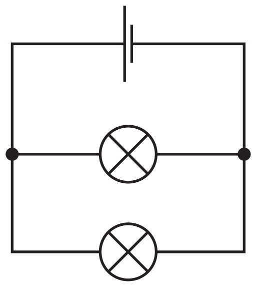


diagram 2

Which statement is correct?

A The cell in diagram 1 can supply current to the lamps for longer than the cell in diagram 2.

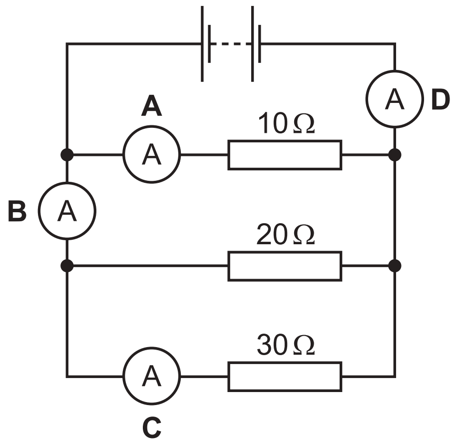
B The current in the cell in diagram 1 is greater than the current in the cell in diagram 2.

C The lamps in diagram 1 are brighter than the lamps in diagram 2.

D The voltage across each lamp in diagram 1 is greater than the voltage in diagram 2.

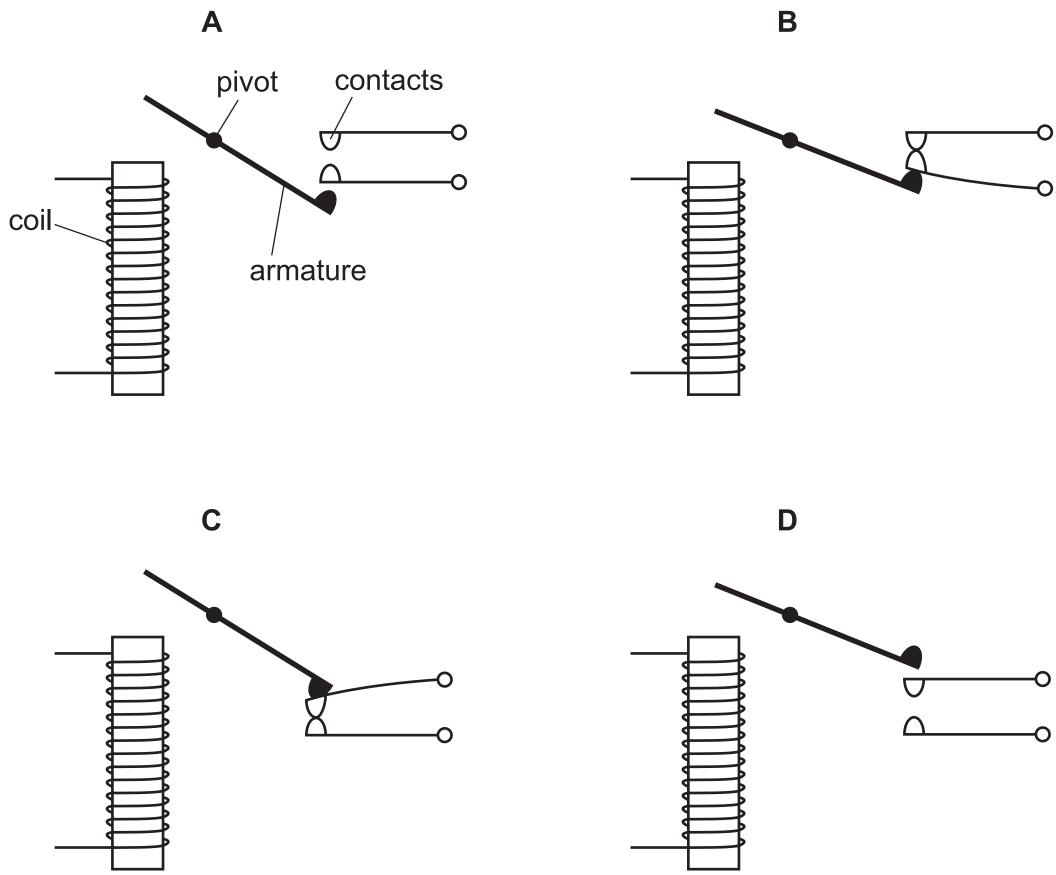
33 A circuit contains four ammeters and three resistors with different values.

Which ammeter shows the largest reading?

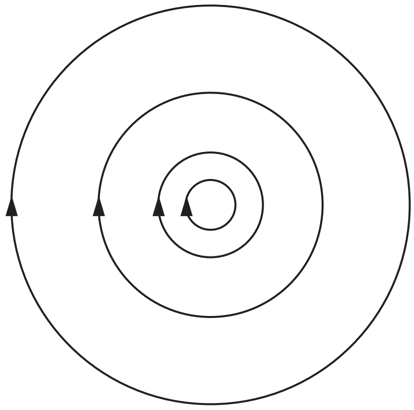


34 The diagram shows the arrangement of the coil, armature and contacts of a relay.

Which diagram shows this arrangement when there is no current in the coil?



35 The diagram represents a magnetic field.



What causes this field?

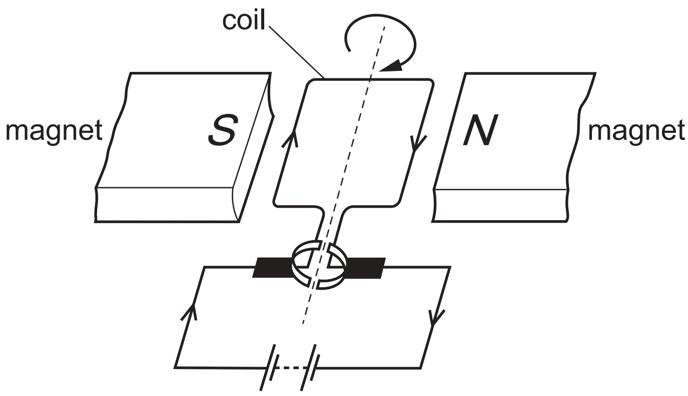
A a bar magnet

B a solenoid carrying a current

C a straight wire carrying a current

D two north poles close together

36 The diagram shows a simple d.c. electric motor which is rotating.



Which change makes the motor rotate more quickly?

A increasing the number of turns on the coil

B removing the magnets

C reversing the battery

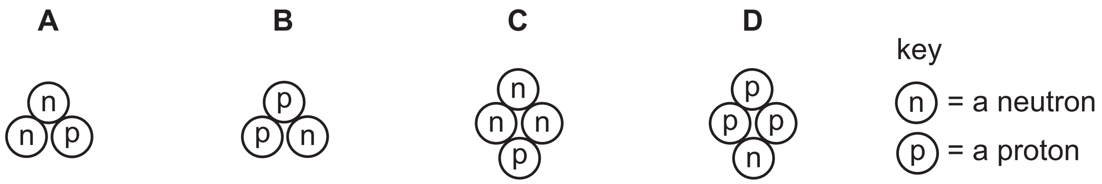
D reversing the polarity of the magnets

37 The notation for an isotope of sodium is ${}^{23}_{11}Na$.

Which row gives the composition of a neutral atom of this isotope of sodium?

	number of protons	number of neutrons	number of electrons
A	11	12	11
B	11	12	12
C	11	23	11
D	12	11	12

38 Which diagram represents a nucleus of ${}^{3}_{1}H$?



39 When measuring the emissions from a radioactive rock brought into the laboratory, a teacher mentions that background radiation must be taken into account.

What is this background radiation?

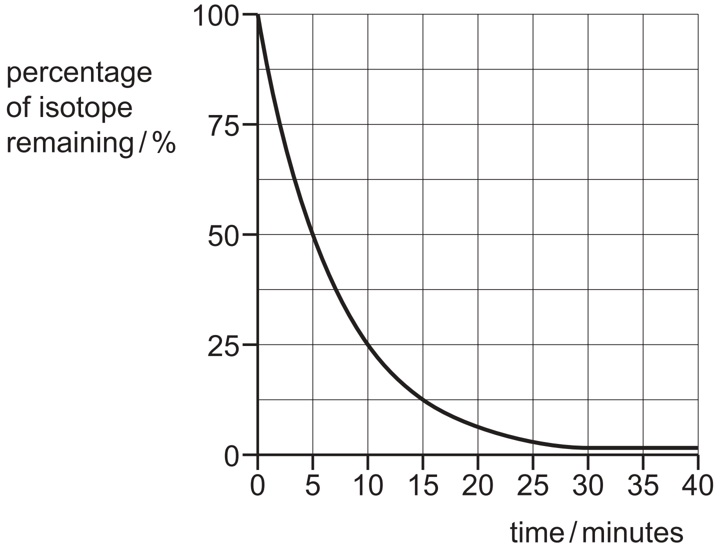
A infra-red radiation from warm objects in the laboratory

B infra-red radiation from the Sun

C ionising radiation from the radioactive rock brought into the laboratory

D ionising radiation in the laboratory when the radioactive rock is not present

40 The graph shows the percentage of a radioactive isotope that remains as time passes.



A student measures the initial rate of emission of this isotope as 40 000 emissions per second.

How long does it take for the rate of emission to fall to 5000 emissions per second?

A 5 minutes **B** 15 minutes **C** 20 minutes **D** 40 minutes

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Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/22**

Paper 2 Multiple Choice (Extended) **March 2018**

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Cambridge Assessment International Education

Question	Answer	Marks
1	D	**1**
2	C	**1**
3	D	**1**
4	D	**1**
5	C	**1**
6	C	**1**
7	A	**1**
8	D	**1**
9	B	**1**
10	B	**1**
11	B	**1**
12	A	**1**
13	C	**1**
14	B	**1**
15	D	**1**
16	A	**1**
17	D	**1**
18	B	**1**
19	A	**1**
20	C	**1**
21	D	**1**
22	B	**1**
23	A	**1**
24	D	**1**
25	C	**1**
26	B	**1**
27	D	**1**
28	C	**1**

Question	Answer	Marks
29	C	**1**
30	A	**1**
31	B	**1**
32	D	**1**
33	A	**1**
34	D	**1**
35	D	**1**
36	A	**1**
37	A	**1**
38	C	**1**
39	D	**1**
40	A	**1**

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/22**

Paper 2 Multiple Choice (Extended) **February/March 2018**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

8385724903

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **15** printed pages and **1** blank page.

IB18 03_0625_22/4RP

CAMBRIDGE International Examinations

1 Which instrument is used to measure accurately the diameter of a thin metal wire?

A 30 cm ruler

B measuring tape

C metre rule

D micrometer screw gauge

2 A parachutist is falling through the air at terminal velocity.

Which statement about the parachutist is correct?

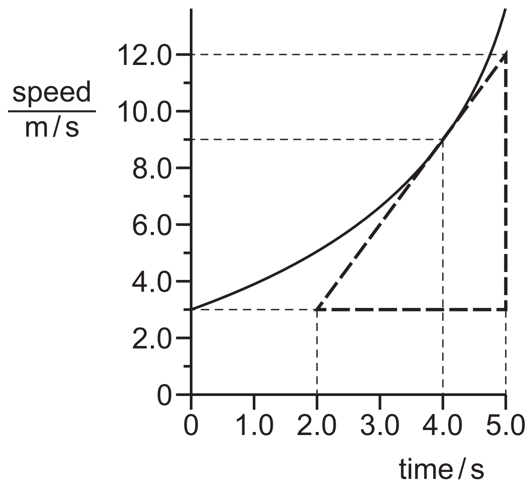
A Every force acting on the parachutist is equal to zero and his acceleration is equal to zero.

B Every force acting on the parachutist is equal to zero and his velocity is equal to zero.

C The resultant force acting on the parachutist is equal to zero and his acceleration is equal to zero.

D The resultant force acting on the parachutist is equal to zero and his velocity is equal to zero.

3 The curved line on the graph shows the motion of a car.

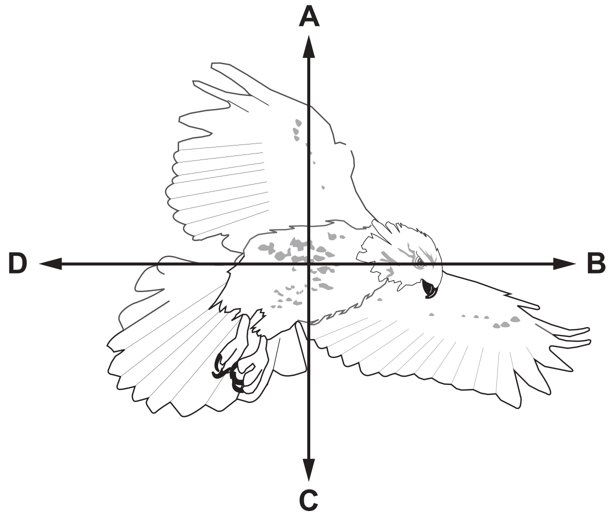


What is the acceleration of the car at the time of 4.0 s?

A 0.33 m/s^2 **B** 0.44 m/s^2 **C** 2.3 m/s^2 **D** 3.0 m/s^2

4 The diagram shows a bird in flight. The bird is flying in a horizontal direction to the right.

In which direction does air resistance act on the bird?



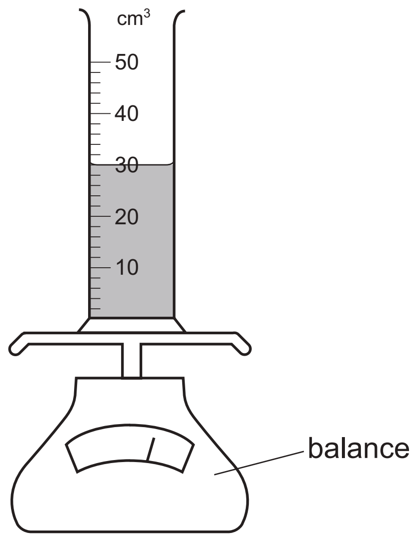
5 The gravitational field strength on the Moon is 1.6 N / kg.

An astronaut has a mass of 75 kg.

What is the weight of the astronaut on the Moon?

A 47 N **B** 75 N **C** 120 N **D** 750 N

6 A measuring cylinder contains 30 cm^3 of a liquid.



Some more of the liquid is added until the liquid level reaches the 50 cm^3 mark.

The reading on the balance increases by 30 g.

What is the density of the liquid?

A 0.60 g / cm^3 **B** 0.67 g / cm^3 **C** 1.5 g / cm^3 **D** 1.7 g / cm^3

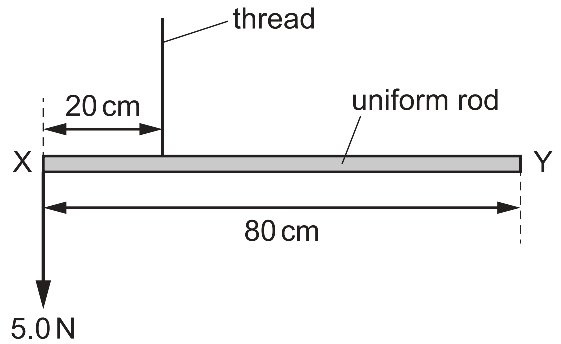
7 A stone of mass 0.12 kg is fired from a catapult. The velocity of the stone changes from 0 to 5.0 m/s in 0.60 s.

What is the average resultant force acting on the stone while it is being fired?

A 1.0 N **B** 2.5 N **C** 3.6 N **D** 8.3 N

8 A uniform rod XY of weight 2.0 N has a length of 80 cm.

The rod is suspended by a thread 20 cm from end X. A weight of 5.0 N is suspended from end X.



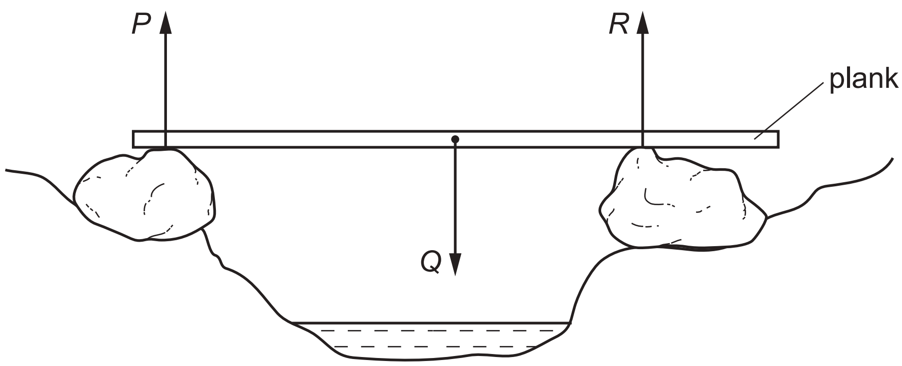
A student hangs a 6.0 N weight on the rod so that it is in equilibrium.

What is the distance of the 6.0 N weight from end X?

A 6 cm **B** 10 cm **C** 26 cm **D** 30 cm

9 A wooden plank rests in equilibrium on two rocks on opposite sides of a narrow stream.

Three forces P, Q and R act on the plank.



How are the sizes of the forces related?

A $P + Q = R$

B $P + R = Q$

C $P = Q = R$

D $P = Q + R$

10 A ball of mass 0.16 kg is moving forwards at a speed of 0.50 m / s. A second ball of mass 0.10 kg is stationary. The first ball strikes the second ball. The second ball moves forwards at a speed of 0.50 m / s.

What is the speed of the first ball after the collision?

A 0.0 m / s **B** 0.19 m / s **C** 0.31 m / s **D** 0.50 m / s

11 A ball is at rest at the top of a hill. It rolls down the hill. At the bottom of the hill the ball hits a wall and stops.

Which energy changes occur?

A gravitational potential energy → internal energy → kinetic energy

B gravitational potential energy → kinetic energy → internal energy

C kinetic energy → gravitational potential energy → internal energy

D kinetic energy → internal energy → gravitational potential energy

12 A student cycles along a level road at a speed of 5.0 m / s.

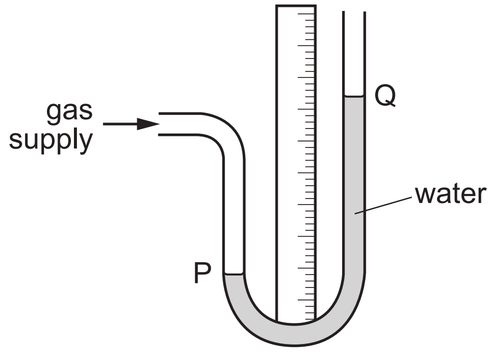
The total mass of the student and bicycle is 120 kg.

The student applies the brakes and stops. The braking distance is 10 m.

What is the average braking force?

A 150 N **B** 300 N **C** 15 000 N **D** 30 000 N

13 A water manometer is connected to a gas supply.



There is a gas leak and the pressure of the gas supply falls.

What happens to the water level at P and what happens to the water level at Q?

	water level at P	water level at Q
A	falls	falls
B	falls	rises
C	rises	falls
D	rises	rises

14 A submarine is 20 m below the surface of the sea. The pressure due to the water at this depth is P.

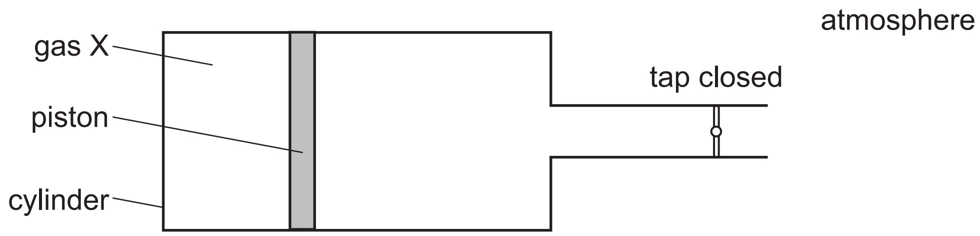
On another day, the submarine is 26 m below the surface of fresh water.

The density of sea water is 1.3 times the density of fresh water.

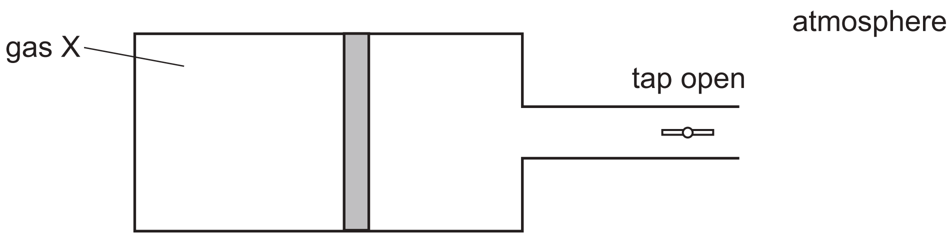
What is the pressure due to the fresh water at a depth of 26 m?

A $\dfrac{P}{1.3}$ **B** P **C** $1.3P$ **D** $1.7P$

15 A cylinder with a tap contains a fixed mass of gas X. The gas is contained by a piston which can move freely towards or away from the tap.



When the tap is opened, the piston moves slightly to the right, towards the tap.



What can be deduced about the pressure of gas X?

	before opening tap	after opening tap
A	less than atmospheric pressure	more than atmospheric pressure
B	same as atmospheric pressure	more than atmospheric pressure
C	more than atmospheric pressure	less than atmospheric pressure
D	more than atmospheric pressure	same as atmospheric pressure

16 Liquid evaporates from a beaker.

What happens to the temperature of the remaining liquid and how does this temperature change affect the rate of evaporation?

	temperature	rate of evaporation
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

17 Which quantity does **not** change when there is an increase in temperature?

A the density of a steel block

B the diameter of the hole in a metal nut

C the length of an iron rod

D the mass of a metal coin

18 A thermocouple is used to measure temperature.

Which is an advantage of using a thermocouple instead of a liquid-in-glass thermometer?

A It can measure temperature in the range –10 °C to 110 °C.

B It can measure temperature that changes rapidly.

C It has a linear scale.

D It is more sensitive.

19 A block of copper has a mass of 2.0 kg.

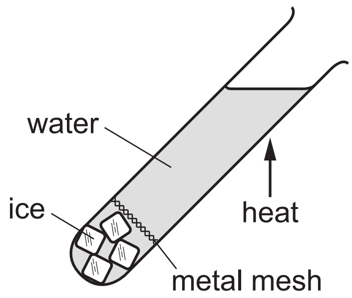
The block of copper absorbs 12 000 J thermal energy.

The specific heat capacity of copper is 385 J / (kg °C).

What is the temperature rise of the copper?

A 15.6 °C **B** 31.2 °C **C** 46.8 °C **D** 62.4 °C

20 A teacher demonstrates an experiment to a class. A boiling tube is filled with water and some ice cubes are trapped at the bottom of the tube. The teacher then heats the boiling tube in the position shown until the water at the top boils.



The ice does not melt.

What does this demonstrate?

A Water is a good conductor of thermal energy.

B Water is a good convector of thermal energy.

C Water is a poor conductor of thermal energy.

D Water is a poor convector of thermal energy.

21 A metal cup has a plastic lining. The cup is filled with hot water and held by a hand.

Which statement about the transfer of thermal energy from the water to the hand is correct?

A In the plastic, no energy is transferred directly between adjacent molecules.

B In the plastic, fast moving molecules interact with free electrons, making the electrons move very quickly.

C In the metal, energy is transferred only by electrons.

D In the metal, energy is transferred by electrons and by vibrations of the lattice.

22 Which row shows an example of a transverse wave and an example of a longitudinal wave?

	transverse	longitudinal
A	light	radio
B	radio	sound
C	sound	water
D	water	light

23 A wave passes through a gap and diffraction causes the wave to spread out.

Which wave spreads out the most?

A large wavelength through a gap slightly larger than the wavelength

B large wavelength through a gap much smaller than the wavelength

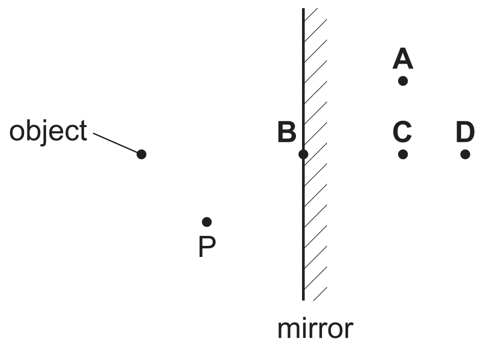
C small wavelength through a gap much larger than the wavelength

D small wavelength through a gap much smaller than the wavelength

24 An object is placed before a plane mirror as shown.

A student views the image of the object in the mirror from point P.

Where does she see the image?



25 Light has a speed of 1.24×10^8 m/s in diamond.

What is the refractive index of diamond?

A 0.41 **B** 1.54 **C** 2.42 **D** 3.72

26 Which statement describes monochromatic light?

A light that does not diffract

B light that has a single frequency

C light that spreads out when shone through a glass prism

D light that travels at the same speed in all materials

27 Both the amplitude and the frequency of a sound wave decrease.

What happens to the sound heard?

A The sound is louder and has a higher pitch.

B The sound is louder and has a lower pitch.

C The sound is quieter and has a higher pitch.

D The sound is quieter and has a lower pitch.

28 A sound wave is travelling through water.

What is a possible speed for the wave?

A 150 m/s **B** 300 m/s **C** 1500 m/s **D** 5000 m/s

29 An electromagnet is used to remove a splinter from an eye.

What material is the splinter made from?

A aluminium

B glass

C iron

D wood

30 A metal conductor is connected to a battery.

Which statement describes the current in the metal conductor?

A It is a flow of electrons from the negative to the positive terminal.

B It is a flow of electrons from the positive to the negative terminal.

C It is a flow of protons from the negative to the positive terminal.

D It is a flow of protons from the positive to the negative terminal.

31 In an electric circuit, 40 C of electric charge pass a point in 5.0 s.

What is the current in the circuit?

A 0.13 A **B** 8.0 A **C** 45 A **D** 200 A

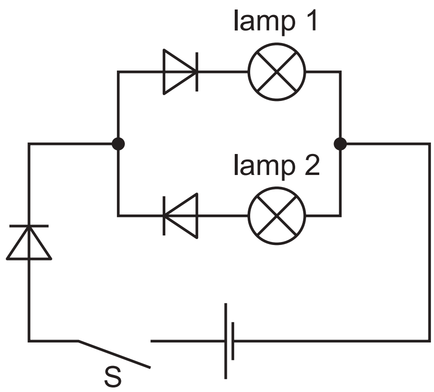
32 There is a current of 5.0 A in a resistor.

The potential difference (p.d.) across the resistor is 24 V.

How much energy is transferred in the resistor in 1.0 minute?

A 5.0 J **B** 120 J **C** 290 J **D** 7200 J

33 The diagram shows a circuit.



Switch S is closed.

Which lamps light?

A lamp 1 only

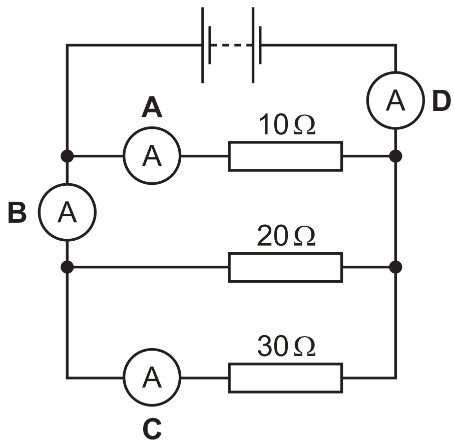
B lamp 2 only

C lamp 1 and lamp 2

D neither lamp 1 nor lamp 2

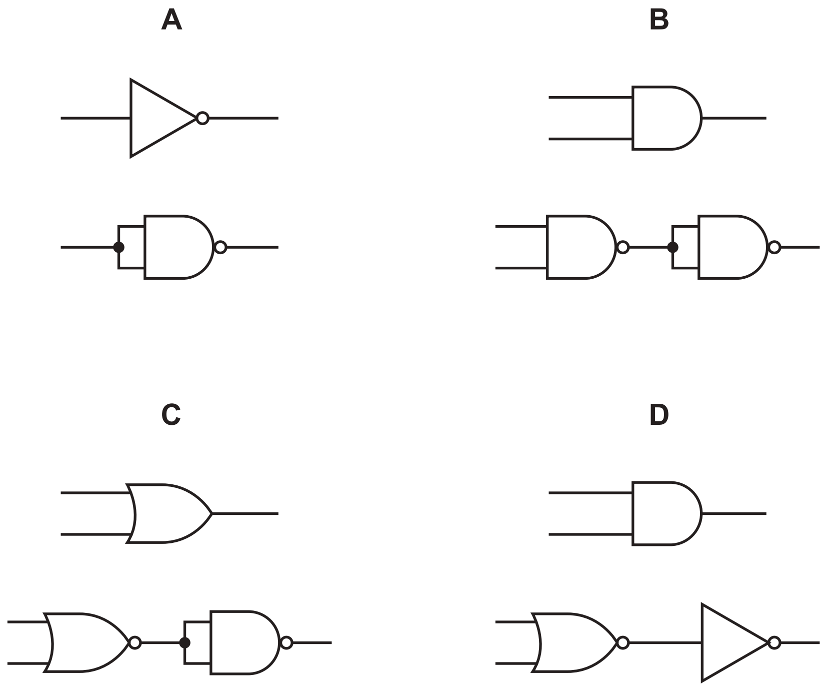
34 A circuit contains four ammeters and three resistors with different values.

Which ammeter shows the largest reading?

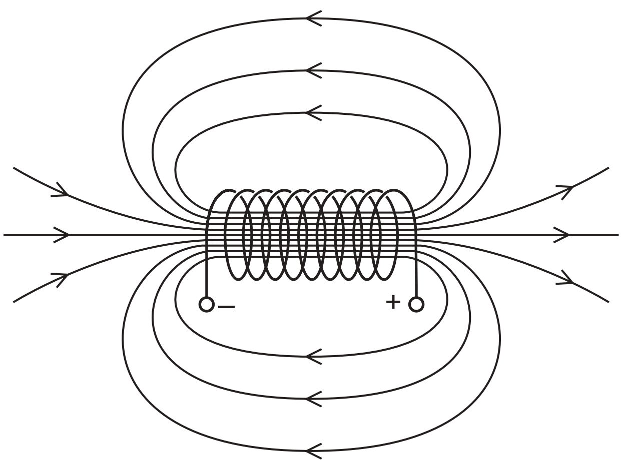


35 The diagrams show pairs of circuits containing logic gates.

In which diagram does the lower circuit of the pair **not** behave in the same way as the upper circuit?



36 The current in a coil produces a magnetic field around it, as shown.



The magnitude of the potential difference across the coil is increased and its direction is reversed.

What happens to the magnetic field?

A The lines become closer together and the right-hand end becomes a south pole.

B The lines become closer together and the right-hand end remains a north pole.

C The lines become further apart and the right-hand end becomes a south pole.

D The lines become further apart and the right-hand end remains a north pole.

37 The notation for an isotope of sodium is ${}^{23}_{11}Na$.

Which row gives the composition of a neutral atom of this isotope of sodium?

	number of protons	number of neutrons	number of electrons
A	11	12	11
B	11	12	12
C	11	23	11
D	12	11	12

38 The radioactive isotope of hydrogen undergoes beta decay to the isotope ${}^{3}_{2}He$.

What is the nuclide notation for the hydrogen isotope?

A ${}^{1}_{1}H$ **B** ${}^{2}_{1}H$ **C** ${}^{3}_{1}H$ **D** ${}^{4}_{2}H$

39 When measuring the emissions from a radioactive rock brought into the laboratory, a teacher mentions that background radiation must be taken into account.

What is this background radiation?

A infra-red radiation from warm objects in the laboratory

B infra-red radiation from the Sun

C ionising radiation from the radioactive rock brought into the laboratory

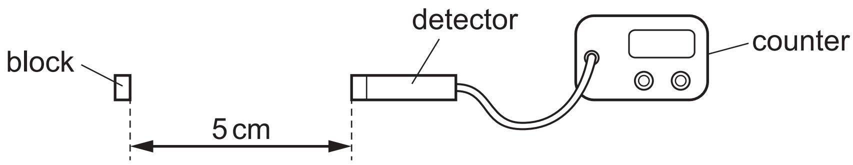
D ionising radiation in the laboratory when the radioactive rock is not present

40 Solid caesium-137 decays by the emission of a β-particle to form solid barium-137, which emits a γ-ray.

The barium-137 undergoes no further decay. The half-life of caesium-137 is 33 years.

A block of pure caesium-137 has a mass of 2.0 μg.

The diagram shows a radiation detector a distance of 5 cm from the block. The detector registers a count rate of 2000 counts / second.



Which statement is **not** correct?

A After 33 years, the mass of the block is 1.0 μg.

B After 66 years, the sample contains 1.5 μg of barium.

C With 5 cm of lead between the block and the detector, the count rate is just above background level.

D With 2 mm of aluminium between the block and the detector, the count rate is reduced significantly.

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Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/32**

Paper 3 Core Theory **March 2018**

MARK SCHEME

Maximum Mark: 80

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the March 2018 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

Cambridge Assessment International Education

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks
1(a)	5.0 ÷ 500 or 0.01 (cm)	**B1**
1(b)	30 × 20 × 5 or length × width × height or cross-sectional area × length	**B1**
1(c)	balance	**B1**
1(d)	D = M / V in any acceptable form	**C1**
	2400 ÷ 3000	**C1**
	0.80 (g / cm^3) or 0.8 (g / cm^3)	**A1**

Question	Answer	Marks
2(a)(i)	2nd box ticked section B	**B1**
2(a)(ii)	distance = area under graph or line or 0.5 × base × height	**C1**
	20 × 5 × 0.5	**C1**
	50 (m)	**A1**
2(b)(i)	(average speed =) (total) dist ÷ (total) time	**C1**
	(250 × 4)	**C1**
	1000 ÷ 80	**C1**
	12.5 (m / s)	**A1**
2(b)(ii)	43.88 – 20.16 or 23.72	**B1**

Question	Answer	Marks
3(a)	12.5 (mm)	**B1**
3(b)	(spring) B	**M1**
	same load gives greater extension (than spring A) owtte	**A1**
3(c)(i)	43.9 – 19.7 or 24.2 (cm)	**B1**
3(c)(ii)	Any **two** from: measure the extension for different (number of 1.0 N) loads repeat each reading (as each (1.0 N) load is removed) AND calculate average (extension for each load) (take reading from ruler with) eye level with pin	**B2**

Question	Answer	Marks
4(a)	any **three** from: water flows down (from reservoir) idea of gravitational / potential energy (transferred to kinetic (energy)) water turns turbine turbine turns generator	**B3**
4(b)	Any **three** from: • does not contribute to atmospheric pollution / acid rain • does not contribute to greenhouse gases / global warming • renewable energy source (so will not run out) • short start-up time / can meet surges in demand owtte • conserve non-renewable reserves / fossil fuels • reduces dependence on fossil fuels (from other countries)	**B3**
4(c)(i)	kinetic	**B1**
4(c)(ii)	efficient	**B1**

Question	Answer	Marks
5(a)(i)	(pressure) increases	**B1**
5(a)(ii)	any **four** from: (air) molecules / particles have more (kinetic) energy / move faster more frequent collisions harder collisions (with walls) collisions with walls idea of collisions causing force	**B4**
5(b)	P = F / A in any form words or numbers	**C1**
	0.59	**A1**
	N / cm^2	**B1**
5(c)(i)	(Area = $\pi \times r^2$ =) 50.2654 (cm^2)	**B1**
5(c)(ii)	smaller <u>area</u> (in contact with the table)	**B1**

Question	Answer	Marks
6(a)	expansion / voltage / potential difference / emf length / colour / pressure / volume / resistance / density	**B1**
6(b)(i)	8:30 pm	**B1**
6(b)(ii)	9:00 pm	**B1**
	(explanation) Slope / gradient of graph is less or temperature drops / falls (more) slowly / slower	**B1**
6(c)	insulator conduction convection	**B3**

Question	Answer	Marks
7(a)(i)	(angle) Z	**B1**
7(a)(ii)	any other part of em spectrum or (seismic) S-waves	**B1**
7(b)(i)	3 curved waves after gap	**M1**
	waves evenly spaced and centred on gap (by eye)	**A1**
7(b)(ii)	diffraction	**B1**

Question	Answer	Marks
8(a)(i)	ammeter in series with power supply	**B1**
8(a)(ii)	variable resistor symbol in series with lamp B	**B1**
8(a)(iii)	voltmeter symbol seen	**B1**
	voltmeter symbol in parallel with lamp B	**B1**
8(b)	$V = I R$ in any form	**C1**
	6.0 ÷ 0.2 accept 6 ÷ 0.2	**C1**
	30 (Ω)	**A1**

Question	Answer	Marks
9(a)(i)	X-rays / X-radiation	**B1**
9(a)(ii)	Radio waves	**B1**
9(b)	ultrasound	**B1**
9(c)	For full marks the method described must work. any **four** from: Means of producing sharp sound use of suitable reflecting surface measure distance travelled by sound Method for measurement of time for sound to travel measured distance. use of speed = distance / time	**B4**

Question	Answer	Marks
10(a)	any **four** from: needle moves (one way) as N pole / magnet moves downward / into coil as coil cuts across magnetic field (of magnet) needle moves in opposite direction as N pole / magnet moves upward / out of coil field is cut in opposite direction needle at zero when spring at max extension magnet is stationary so no cutting of field lines	**B4**
10(b)	(device) X is a step-up transformer	**B1**
	(device) Y is a step-down transformer	**B1**

Question	Answer	Marks
11(a)	friction (between cloth and rod)	**B1**
	(causes) electrons to move	**B1**
	from cloth / to rod	**B1**
11(b)	rod {moves or rotates} away	**B1**
	like charges repel	**B1**

Question	Answer	Marks
12	For full marks the method described must work. any **four** from: take background reading / reading without source use piece of paper between source and detector beta particles can pass through paper or alpha particles stopped / absorbed by paper?) reading on detector similar / unchanged so no alpha particles emitted use few mm of aluminium between source and detector reading on detector now similar to background reading (because) beta particles stopped by a few mm of aluminium	**B4**

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

7183265192

PHYSICS **0625/32**

Paper 3 Theory (Core) **February/March 2018**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **20** printed pages.

DC (NF/SW) 149763/5

CAMBRIDGE International Examinations

1 A student has a pile of A4 paper for his computer printer.

Fig. 1.1 shows the dimensions of the pile of paper.

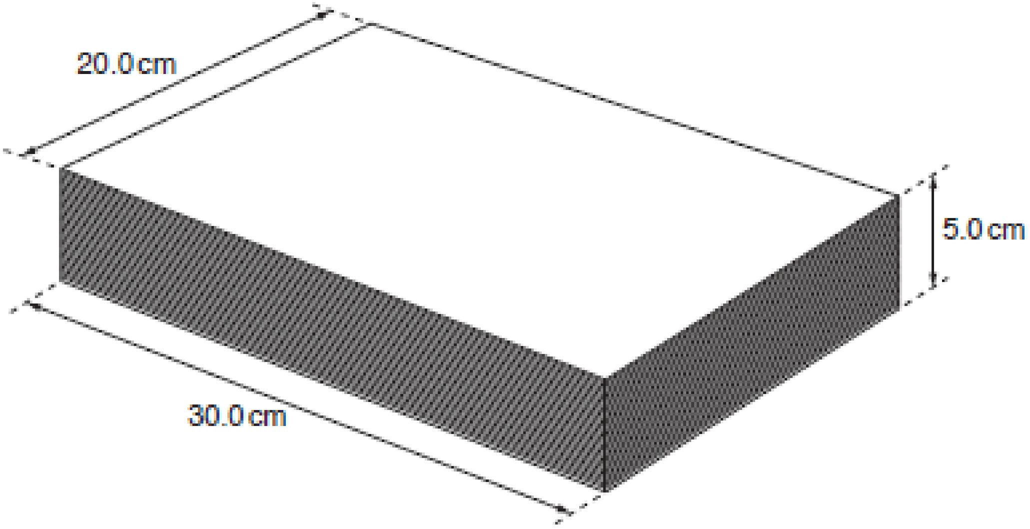

Fig. 1.1 (not to scale)

(a) The pile contains 500 sheets of paper.

Calculate the average thickness of one sheet of paper.

average thickness = ... cm [1]

(b) Show that the pile of paper has a volume of 3000 cm^3. Use the information shown in Fig. 1.1.

[1]

(c) The student measures the total mass of the paper in the pile.

State the name of a device used to measure mass.

.... [1]

(d) The mass of the paper in the pile is 2400 g.

Calculate the density of the paper.

density = ... g/cm^3 [3]

[Total: 6]

2 Some cyclists are racing around a track.

(a) Fig. 2.1 shows the speed-time graph for one cyclist.

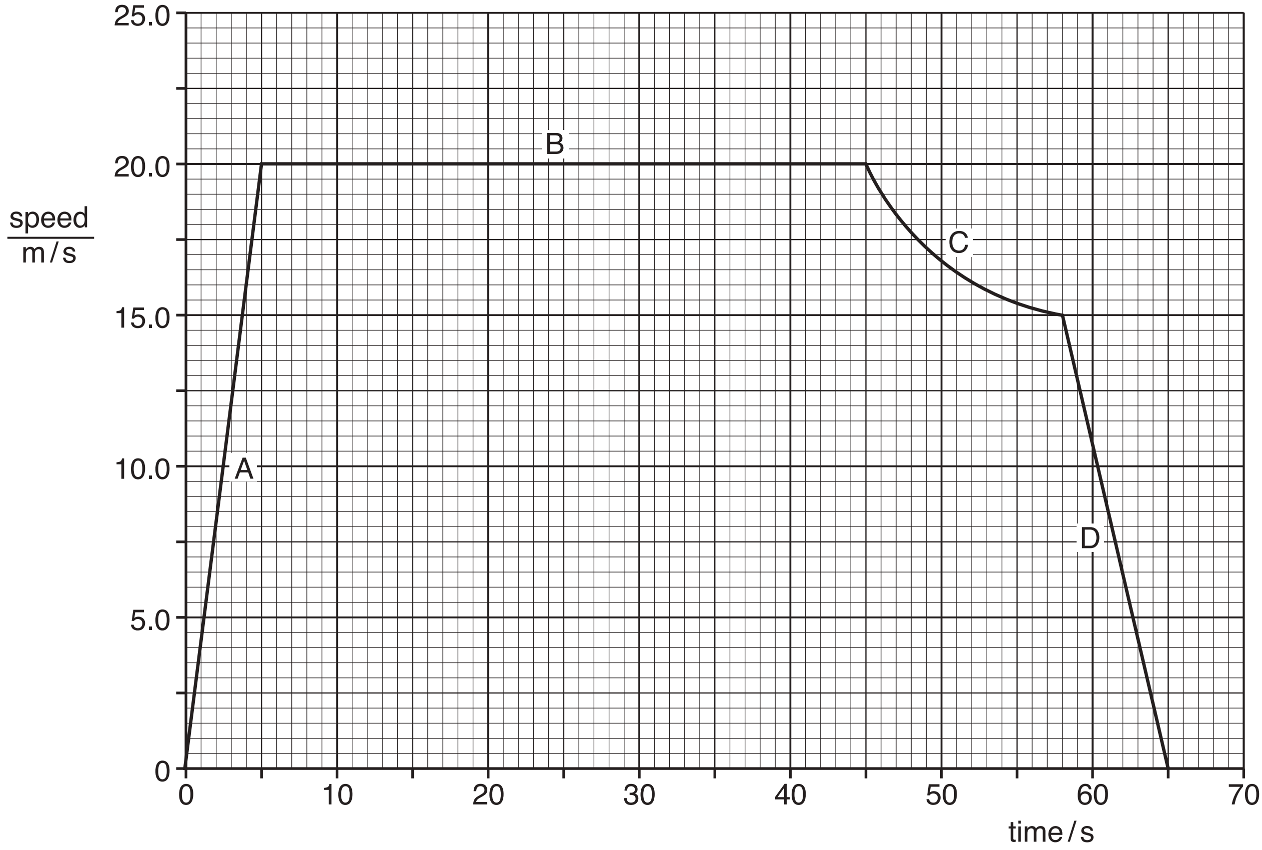

Fig. 2.1

(i) Tick the box that represents the cyclist travelling at constant speed.

☐ A

☐ B

☐ C

☐ D [1]

(ii) Calculate the distance travelled by the cyclist in the first 5 seconds.

distance = ... m [3]

(b) The length of the track is 250 m.

Another cyclist goes around the track four times (four laps). This takes 80.0 seconds.

(i) Calculate the average speed of this cyclist.

average speed = ... m / s [4]

(ii) A friend of the cyclist starts a stopwatch at the beginning of the race.

Fig. 2.2 shows the reading on the stopwatch when the cyclist has gone around the track **once**.

Fig. 2.3 shows the reading on the stopwatch when the cyclist has gone around the track **twice**.

Fig. 2.2

Fig. 2.3

Calculate the time taken for the cyclist to go around the track during the second lap.

time = ... s [1]

[Total: 9]

3 Fig. 3.1 shows the load-extension graphs for two springs, A and B.

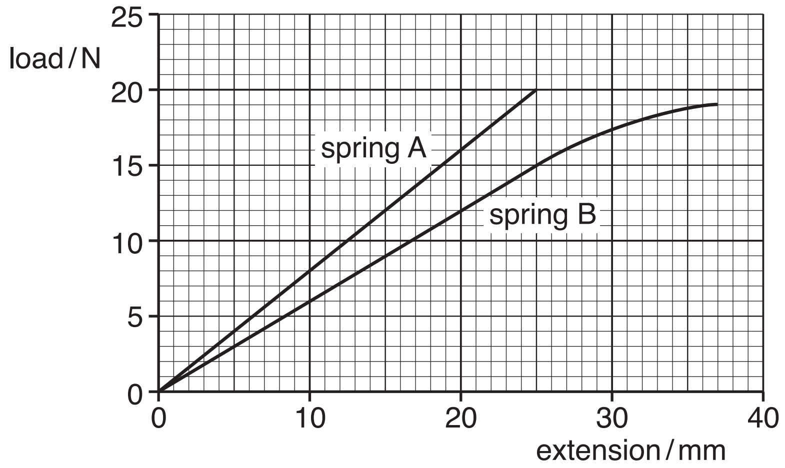

Fig. 3.1

(a) Determine the extension of spring A for a load of 10 N.

extension = ... mm [1]

(b) State which spring is easier to stretch and give a reason for your answer.

spring ....

reason ....

....
[2]

(c) A different spring is suspended from the edge of a bench, as shown in Fig. 3.2.

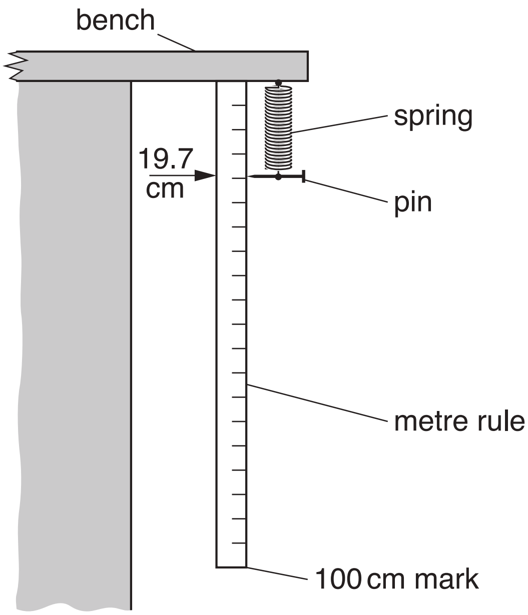

Fig. 3.2

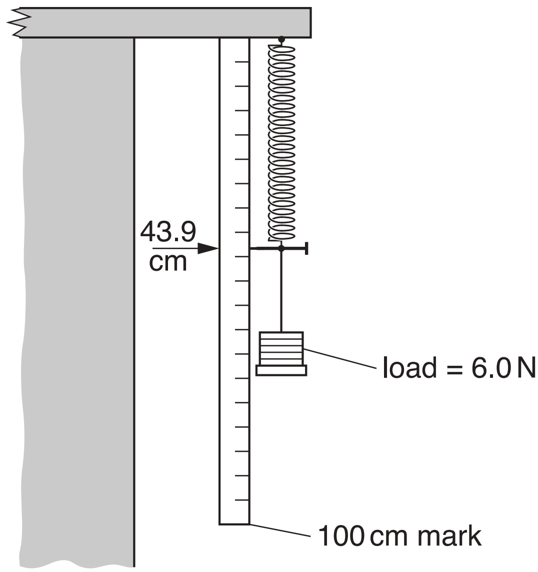

Fig. 3.3

With no load on the spring, the pin points to 19.7 cm on the metre rule, as shown in Fig. 3.2. When a load of 6.0 N is attached to the spring, the pin points to 43.9 cm, as shown in Fig. 3.3.

(i) Calculate the extension of this spring for a load of 6.0 N.

extension = ... cm [1]

(ii) Describe how a student could use the equipment in Fig. 3.2 to obtain accurate readings for a load-extension graph for this spring.

....

....

....

....

.... [2]

[Total: 6]

4 Fig. 4.1 represents a hydroelectric system for generating electrical energy.

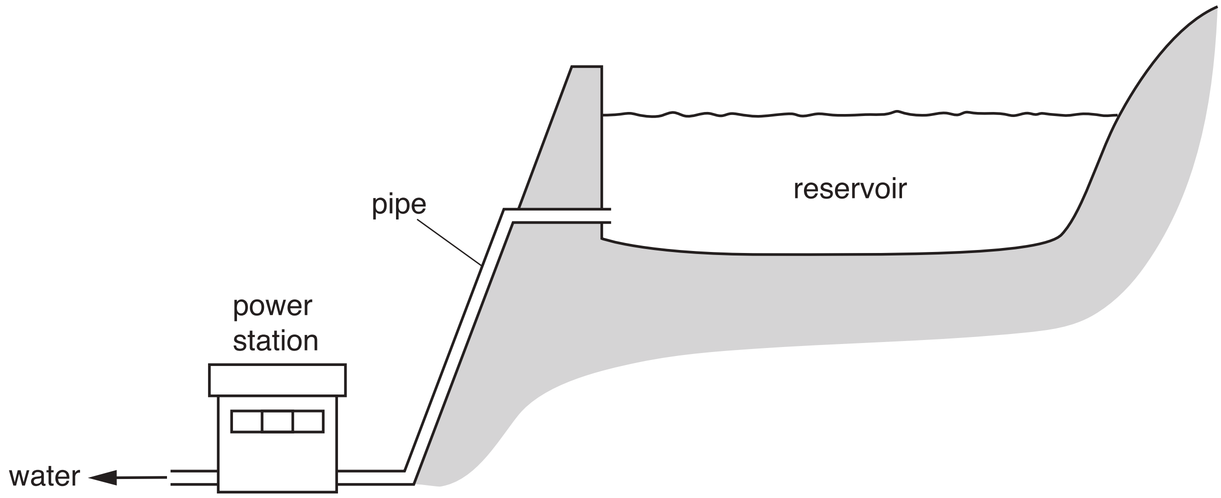

Fig. 4.1

(a) Describe how the power station uses the water in the reservoir to generate electrical energy.

....

....

....

....

....

.... [3]

(b) State **three** advantages of generating electrical energy using a hydroelectric system compared with using a coal-fired power station.

1. ....

....

2. ....

....

3. ....

....
[3]

(c) An electric drill is shown in Fig. 4.2. It uses electrical energy.

Fig. 4.2

Complete the sentences about the electric drill.

Use words from the box. Each word may be used once, more than once, or not at all.

efficient	kinetic	potential	powerful	reliable	thermal

(i) The electric drill **usefully** transforms electrical energy into .... energy. [1]

(ii) A second electric drill transforms the same amount of electrical energy per second as the first one. It wastes more of this energy.

The second drill is **less** .... than the first drill. [1]

[Total: 8]

5 Fig. 5.1 shows a glass bottle containing air. The bottle is sealed with a cap.

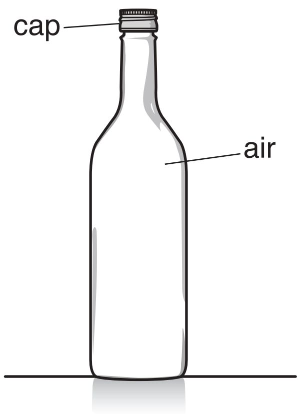

Fig. 5.1

(a) The air in the bottle becomes warmer.

(i) State what happens to the pressure of the air in the bottle.

.... [1]

(ii) Explain why the pressure of the air in the bottle changes. Use your ideas about gas molecules.

....

....

....

....

....

.... [4]

(b) The bottle has a weight of 5.4 N and an area of 9.2 cm^2 in contact with the table.

Calculate the pressure produced by the bottle on the table. Give the unit.

pressure = ... [3]

(c) Fig. 5.2 shows another bottle. The bottle is on a table. Part of the base of this bottle is **not** in contact with the table.

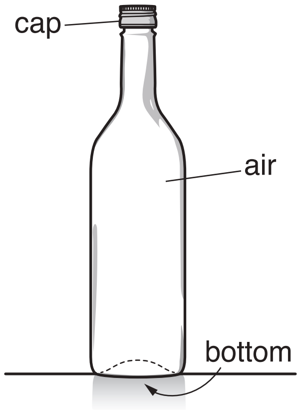

Fig. 5.2

Fig. 5.3 shows the base of the bottle. The shaded area is **not** in contact with the table.

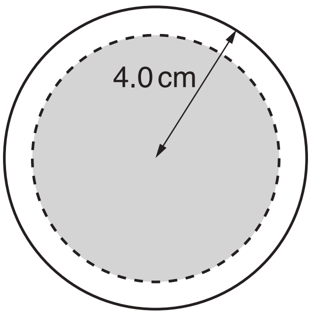

Fig. 5.3 (not to scale)

(i) The base of the bottle is circular. The radius of the outer circle is 4.0 cm as shown in Fig. 5.3. Calculate the area of this circle.

area = ... cm^2 [1]

(ii) The bottle shown in Fig. 5.2 has the same mass as the bottle shown in Fig. 5.1. Explain why the bottle shown in Fig. 5.2 exerts more pressure on the table than the bottle shown in Fig. 5.1.

....

.... [1]

[Total: 10]

6 A thermometer is used to measure the temperature inside a room in a house.

(a) State a physical property that varies with temperature and can be used in a thermometer.

.... [1]

(b) Fig. 6.1 shows how the temperature of the room changes between 6:00 pm and 11:00 pm.

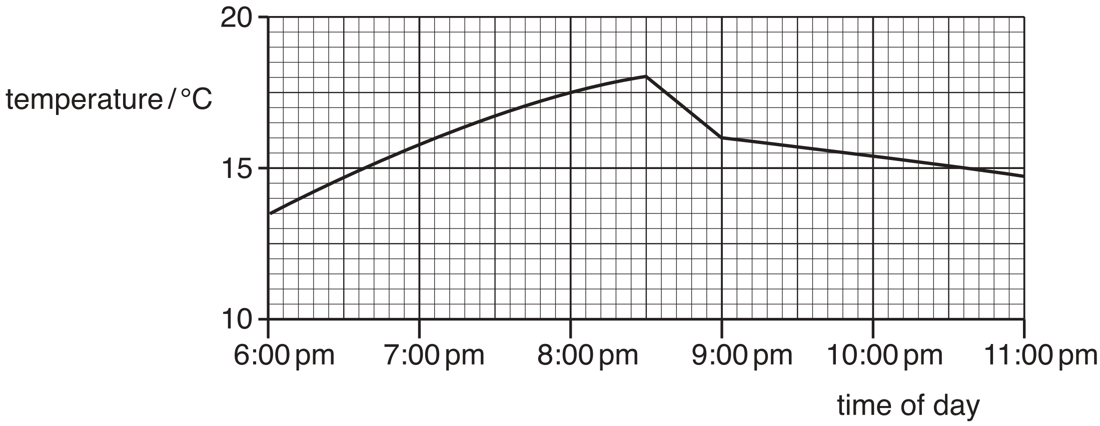

Fig. 6.1

A heater in the room is switched on at 6 pm. The room has a large window. A large amount of thermal energy is transferred through the window. The window in the room has thick curtains. Closing the curtains reduces the loss of thermal energy from the room.

(i) Suggest the time at which the heater is switched off.

.... [1]

(ii) Suggest the time at which the curtains were closed and explain your answer. Use information from the graph.

time ....

explanation ....

....

[2]

(c) In cool climates, people use mineral wool to reduce heat loss from houses. Mineral wool is made of fibres and trapped air, as shown in Fig. 6.2.

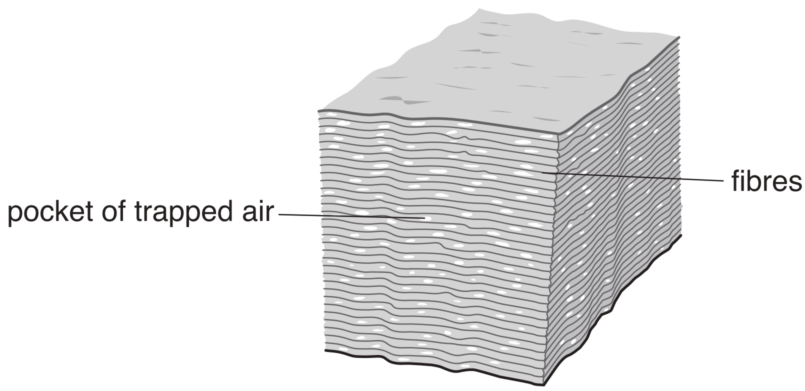

Fig. 6.2

Use words from the box to complete the sentences. Each word may be used once, more than once, or not at all.

conductor	conduction	convection	emitter	insulator	radiation	radiator

Air is a good ....

When air is trapped between fibres, it reduces heat loss by .... and by

....

[3]

[Total: 7]

7 **(a)** A ray of light refracts as it travels from air into glass, as shown in Fig. 7.1.

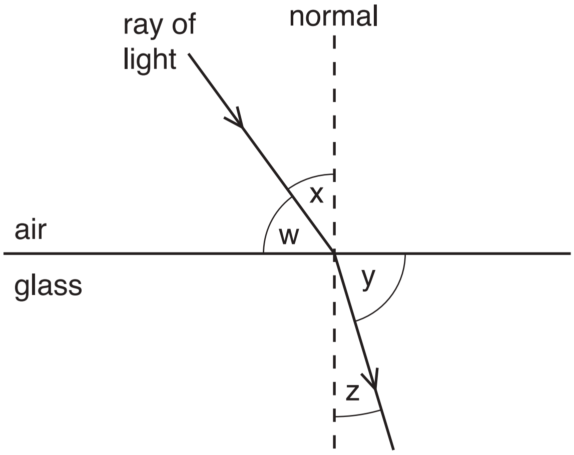

Fig. 7.1

(i) State which angle w, x, y or z, is the angle of refraction.

.... [1]

(ii) Light is a transverse wave.
State another example of a transverse wave.

.... [1]

(b) Fig. 7.2 represents some wavefronts approaching a barrier with a narrow gap.

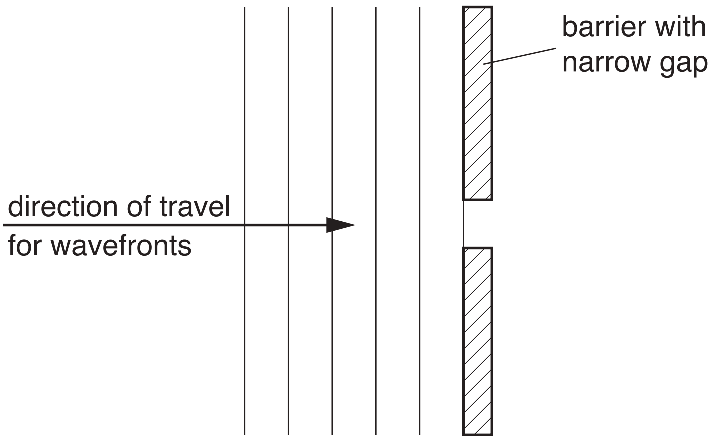

Fig. 7.2

(i) On Fig. 7.2, draw three wavefronts that have passed through the gap. [2]

(ii) State the name of the effect in **(b)(i)**.

.... [1]

[Total: 5]

8 A student sets up an electrical circuit. She draws part of the circuit diagram, as shown in Fig. 8.1.

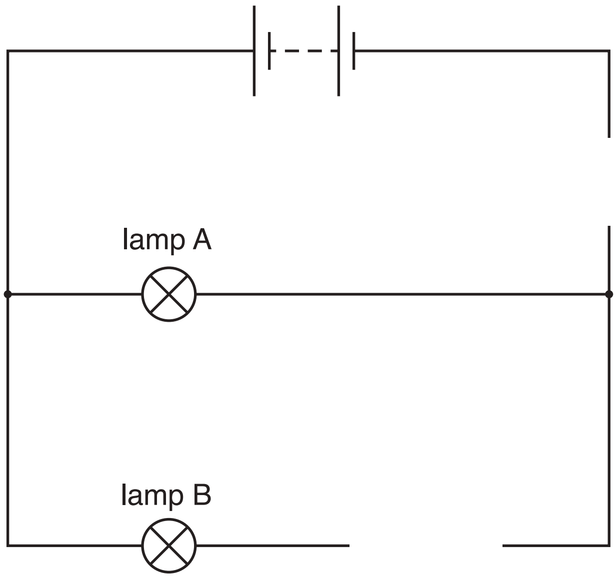

Fig. 8.1

(a) On Fig. 8.1, draw the circuit symbols for three devices so that the student can:

(i) measure the total current in the circuit [1]

(ii) vary the current in the lamp B only [1]

(iii) measure the potential difference (p.d.) across lamp B. [2]

(b) The current in lamp A is 0.20 A. The potential difference (p.d.) across lamp A is 6.0 V.

Calculate the resistance of lamp A.

resistance = ... Ω [3]

[Total: 7]

9 **(a)** Fig. 9.1 represents the seven main regions of the electromagnetic spectrum.

radio waves	microwaves	infra-red radiation	visible light	ultraviolet		gamma rays

Fig. 9.1

(i) In Fig. 9.1, one region is not named.
State the name of the radiation in this region.

.... [1]

(ii) State which region has waves with the longest wavelength.

.... [1]

(b) Tick the box for the wave with the lowest speed in air.

☐ ultraviolet

☐ ultrasound

☐ visible light [1]

(c) A group of students want to determine the speed of sound in air.

Describe a method they can use. State the measurements they need to make.

....

....

....

....

....

....

....

....

.... [4]

[Total: 7]

10 (a) A teacher demonstrates electromagnetic induction using the apparatus shown in Fig. 10.1.

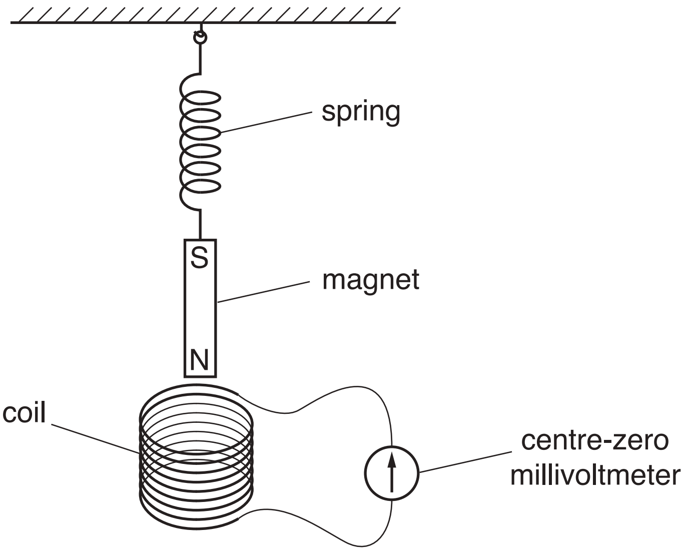

Fig. 10.1

The teacher pulls the magnet down until one end is inside the coil. The teacher then releases the magnet. The magnet moves up and down repeatedly. As it moves, one end of the magnet enters and leaves the coil.

Describe and explain the readings on the centre-zero millivoltmeter as the magnet enters and leaves the coil.

....

....

....

....

.... [4]

(b) Fig. 10.2 shows a system for transmitting electricity from a power station.

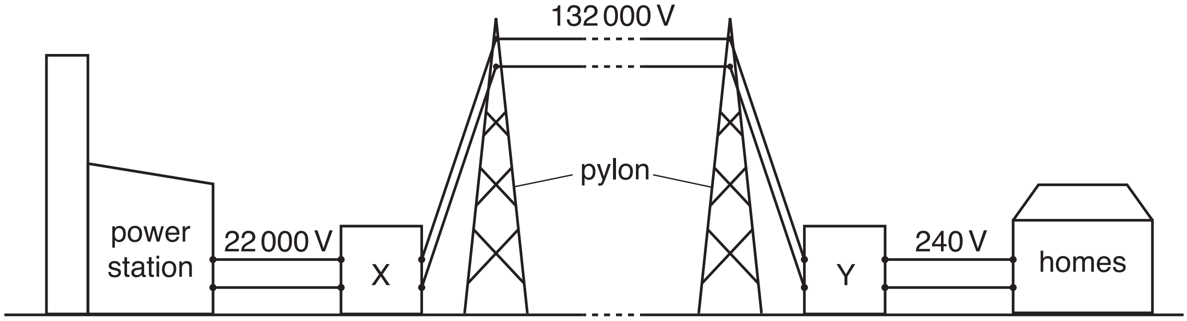

Fig. 10.2

State the name of the device used in X and the name of the device used in Y.

X ....

Y ....

[2]

[Total: 6]

11 **(a)** A student rubs a polythene rod with a dry cloth. The polythene rod becomes negatively charged.

Describe and explain how the rod becomes negatively charged.

....

....

.... [3]

(b) The negatively charged polythene rod hangs from a nylon thread so that it is free to turn.

The student charges a second polythene rod and brings it close to the first rod, as shown in Fig. 11.1.

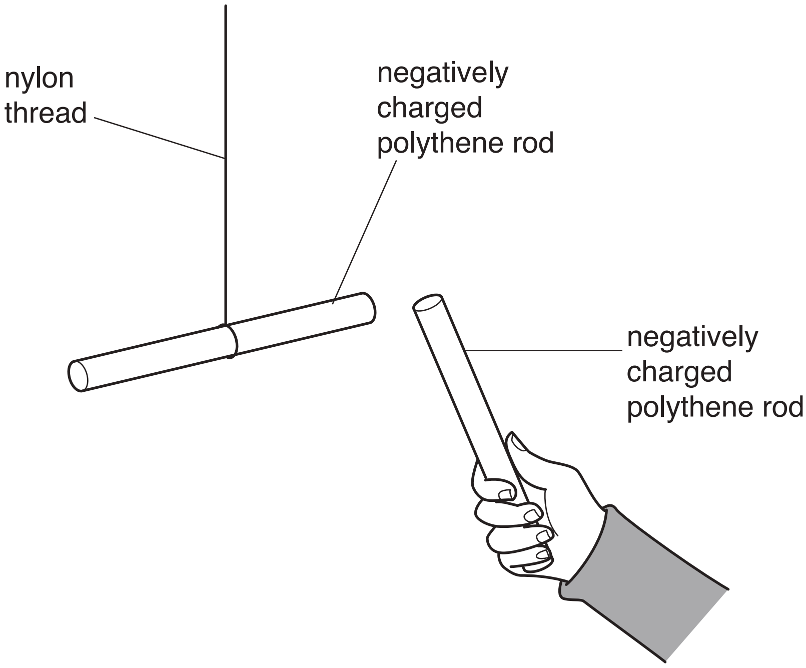

Fig. 11.1

Describe and explain what happens when the negatively charged rods are close to each other.

....

.... [2]

[Total: 5]

12 Fig. 12.1 shows a radioactive source placed close to a radiation detector and counter. The detector can detect α, β and γ radiation.

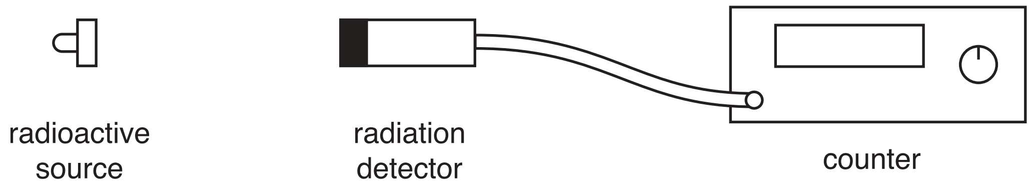

Fig. 12.1

The radioactive source emits β-particles only.

Describe how you could show that the source emits β-particles only.
As part of your answer, you may draw on Fig. 12.1 and add any other apparatus you may need.

....

....

....

....

....

....

.... [4]

[Total: 4]

Cambridge IGCSE

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PHYSICS	**0625/42**
Paper 4 Extended Theory	**March 2018**
MARK SCHEME	
Maximum Mark: 80	

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the March 2018 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

Cambridge Assessment International Education

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks
1(a)	Rate of change of velocity OR change of velocity / time OR change of velocity over time OR (v – u)/t	**B1**
1(b)(i)	Straight line from origin to (15, 28)	**B1**
	Horizontal line {from (15, 28)} to (32, 28)	**B1**
	a = (v – u) / t OR (t =) (v – u) / a OR (0 – 28) / 2.0	**C1**
	= 14 (s)	**C1**
	Straight line from (32, 28) to (46, 0)	**A1**
1(b)(ii)	**1** Towards the centre of the circle / inwards	**B1**
	2 Velocity is (continually) changing its direction	**B1**

Question	Answer	Marks
2(a)	(Because g.p.e. is) the work done by the force OR the force × the distance that the object rises OR mgh and height is <u>greater</u>	**B1**
2(b)	mgh OR 80 × 65 × 10 × 1600	**C1**
	8.3×10^{7} J	**A1**
2(c)	<u>Method 1</u>	
	W = Pt OR E = Pt in any form	**C1**
	Work input =1500 × 10^{3} × 30 × 60 OR 2.7 × 10^{9} J	**C1**
	Efficiency = work output / work input (x 100)	**C1**
	0.031 OR 3.1 %	**A1**
	<u>Method 2</u>	
	P = E/t in any form	**(C1)**
	Power output = 8.3 × 10^{7} / 30 × 60	**(C1)**
	Efficiency = power output / power input (× 100)	**(C1)**
	0.031 OR 3.1%	**(A1)**

Question	Answer	Marks
3(a)	...(the) force × its <u>perpendicular</u> distance from pivot / a point	**B1**
3(b)(i)	centre of mass	**B1**
3(b)(ii)	(mass =) 160 / 10 = 16 kg	**B1**
3(b)(iii)	(Not moving up or down because) no resultant (vertical) force OR upward force = downward force	**C1**
	80 N + 80 N = 160 N	**A1**
	(Not rotating because) no resultant moment (about any point) OR (sum of) clockwise moments = (sum of) anticlockwise moments	**C1**
	clockwise moment (about centre) = 80 × 1.2 anticlockwise moment (about centre) = 80 × 1.2	**A1**

Question	Answer	Marks
4(a)	Molecules of hot liquid collide with (surface of) spoon	**B1**
	transfer energy / heat to (molecules of) spoon	**B1**
	(amplitude of) vibration of spoon's molecules increases / is faster (increasing spoon's temperature)	**B1**
4(b)	Molecules of hot liquid (also) transfer energy to (free) electrons in the spoon	**B1**
	These (free) electrons move through the metal	**B1**
4(c)	(Q =) $mc\Delta\theta$	**C1**
	150 × 4.2 × (80 – 56)	**C1**
	15000 J	**A1**

Question	Answer	Marks
5(a)(i)	Sketch showing straight lines with sudden changes of direction	**B1**
5(a)(ii)	Any 3 marks from 4 points:	
	Air molecules move in random / different directions	**B1**
	Smoke particles are hit	**B1**
	by air molecules	**B1**
	Change direction at each collision OR undergo Brownian motion	**B1**
5(b)	F = (mv – mu) / t in any form OR Impulse = mv – mu	**C1**
	= 20 × 4.2 / 60	**C1**
	1.4 N	**A1**

Question	Answer	Marks
6(a)	A: infra-red B: ultra-violet C: X-(rays) D: γ-(rays)	**B2**
6(b)(i)	n = sin i / sin r OR sin r = sin i / n OR sin r = sin 35 / 1.50	**C1**
	r = 22°	**A1**
6(b)(ii)	Refraction at XY drawn with r < i	**B1**
	Refraction at XZ drawn with r > i	**B1**
6(b)(iii)	Blue ray drawn below red ray in prism and drawn with r < i	**M1**
	Ray to right of prism diverging downwards from red ray	**A1**

Question	Answer	Marks
7(a)	n = speed in air / speed in water OR speed in water = $3.0 \times 10^8 / 1.33$	**C1**
	2.3×10^8 m / s	**A1**
	Answers to **(b)(i)**, **(b)(ii)** and **(b)(iii)** all combined to maximum of 5 marks on same screen	
7(b)(i)	Wavefronts in plastic: meet wavefronts in air	**B1**
	make smaller angle with boundary than wavefronts in air and downwards to the left	**B1**
	parallel to each other	**B1**
7(b)(ii)	Arrow(s) perpendicular to wavefronts in plastic and downwards to right	**B1**
7(b)(iii)	*r* in plastic between refracted wavefront and boundary	**B1**
	OR At a point where refracted wavefront meets boundary, normal to boundary drawn and line perpendicular to wavefront drawn. *r* in plastic between the two lines drawn	**(B1)**

Question	Answer	Marks
8(a)	P = IV OR (I =) 50 / 12	**C1**
	4.2 A	**A1**
8(b)(i)	(E =) QV	**C1**
	(E =) $270 \times 10^3 \times 12$	**C1**
	3.2×10^6 J / 3200 kJ	**A1**
8(b)(ii)	Volume of fuel used = $3.2 \times 10^6 / 3.6 \times 10^4$	**C1**
	89 cm^3 OR 90 cm^3 if 3.24×10^6 used	**A1**

Question	Answer	Marks
9(a)(i)	Resistor: tick in 2nd box	**B1**
9(a)(ii)	Lamp: tick in 1st box	**B1**
9(b)	(R =) V / I OR (R =) 6.0 / 4.4	**C1**
	1.4 Ω	**A1**
9(c)	Current in lamp = 4.4 A Current in resistor = 4.0 A	**C1**
	Current from supply (= 4.0 + 4.4) = 8.4 A	**A1**
	OR (With 6 V p.d.) R_L = 6 / 4.4 = 1.36 Ω R_R = 6 / 4 = 1.5 Ω Combined resistance = (1.36 × 1.5) / 2.86) = 0.71 Ω	**(C1)**
	Current = 6 / 0.71 = 8.4 A	**(A1)**
9(d)	p.d. across lamp = 4.9 V p.d. across resistor = 6.0 V	**C1**
	Total p.d. (= 4.9 + 6.0) = 10.9 V	**A1**
	OR (With 4 A current) R_L = 5 / 4 = 1.25 Ω R_R = 6 / 4 =1.5 Ω Total R = 2.75 Ω	**(C1)**
	Total p.d. = 2.75 × 4 = 11.0 V	**(A1)**

Question	Answer	Marks
10(a)	Strength of magnetic field / magnet	**B1**
	Speed (of movement of wire)	**B1**
	Length of AB / wire (within field)	**B1**
10(b)(i)	$V_p / V_s = N_p / N_s$ OR (N_s =) 8000 × 12 / 240	**C1**
	400 (turns)	**A1**
10(b)(ii)	Circuit connected to A and B with resistor and diode with correct circuit symbols in series	**B1**

Question	Answer	Marks
11(a)(i)	In box / cupboard with lead walls	**B1**
11(a)(ii)	(Handle) with (long) tongs OR remote-controlled device OR wearing lead gloves OR wearing lead suit	**B1**
11(b)	Col 1: gamma / γ (rays) alpha / α (particles) beta / β (particles)	**B1**
	Col 3: – a few cm or up to 10 cm a few m or up to 10 m	**B1**
	Col 4: thick lead or 30 cm lead or very thick concrete or 3 m concrete – thin aluminium or 2 mm aluminium	**B1**
11(c)(i)	alpha / α (particles or rays)	**B1**
11(c)(ii)	beta / β (particles or rays)	**B1**

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

9439985640

PHYSICS **0625/42**

Paper 4 Theory (Extended) **February/March 2018**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = $10\,m/s^2$).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages.

DC (SC/SW) 149762/5

1 **(a)** Define *acceleration*.

.... [1]

(b) Fig. 1.1 shows the speed-time axes for the graph of the motion of a car.

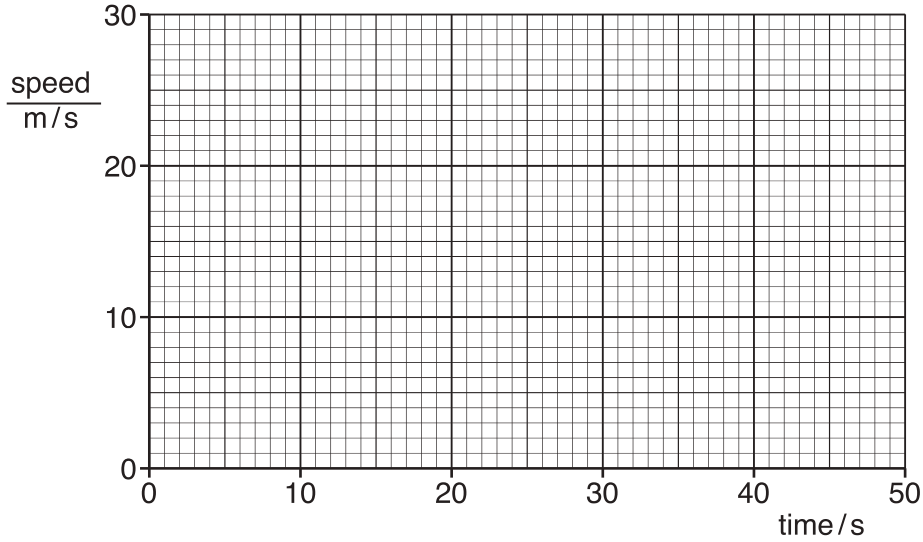


Fig. 1.1

(i) The car starts from rest.

From time = 0 to time = 15 s, the car has a constant acceleration to a speed of 28 m / s.

From time = 15 s to time = 32 s, the car has a constant speed of 28 m / s.

From time = 32 s, the car has a constant deceleration of 2.0 m / s^2 until it comes to rest.

On Fig. 1.1, draw the graph, using the space below for any calculations.

[5]

(ii) From time = 15 s to time = 32 s, the path of the car is part of a circle.

For this motion, state

1. the direction of the resultant force on the car,

....

2. what happens to the velocity of the car.

....

[2]

[Total: 8]

2 **(a)** A force is used to move an object from the Earth's surface to a greater height.

Explain why the gravitational potential energy (g.p.e.) of the object increases.

....

.... [1]

(b) Fig. 2.1 shows a train moving up towards the top of a mountain.

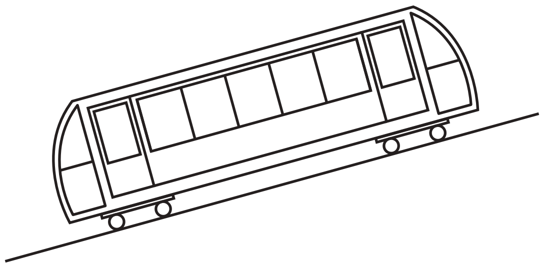


Fig. 2.1

The train transports 80 passengers, each of average mass 65 kg, through a vertical height of 1600 m.

Calculate the increase in the total gravitational potential energy (g.p.e.) of the passengers.

increase in g.p.e. = ... [2]

(c) The engine of the train has a power of 1500 kW. The time taken to reach the top of the mountain is 30 minutes.

Calculate the efficiency of the engine in raising the 80 passengers 1600 m to the top of the mountain.

efficiency = ... [4]

[Total: 7]

3 **(a)** Complete the statement by writing in the blank spaces.

The moment of a force about a pivot is equal to ....

multiplied by.. [1]

(b) Fig. 3.1 shows a horizontal rod of length 2.4 m and weight 160 N. The weight of the rod acts at its centre. The rod is suspended by two vertical ropes X and Y. The tension in each rope is 80 N.

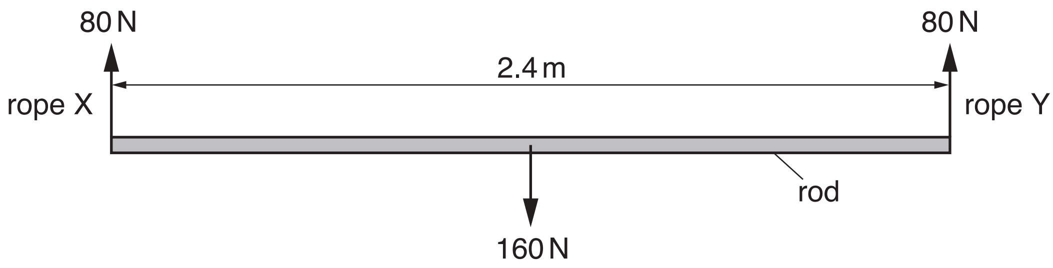


Fig. 3.1

(i) State the name given to the point at which the weight of the rod acts.

.... [1]

(ii) Calculate the mass of the rod.

mass = ... [1]

(iii) The rod is in equilibrium.

Using data from Fig. 3.1, explain why.

....

....

....

....

....

.... [4]

[Total: 7]

4 Fig. 4.1 shows a cold plastic spoon that has just been placed in hot liquid in a cup.

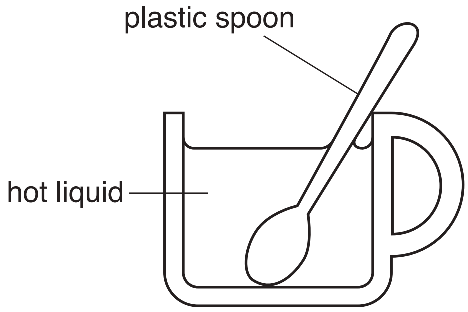


Fig. 4.1

(a) Describe, in terms of molecules, why the temperature of the whole of the spoon increases.

....

....

....

....

.... [3]

(b) The plastic spoon is replaced by a metal spoon.

Describe an additional process by which the temperature of the whole of this spoon increases.

....

....

.... [2]

(c) The cup contains 150 g of liquid of specific heat capacity 4.2 J / (g °C). When the cold spoon is placed into the hot liquid, the temperature of the liquid decreases from 80 °C to 56 °C.

Calculate the loss of thermal energy from the liquid.

energy loss = ... [3]

[Total: 8]

5 **(a)** Fig. 5.1 shows the apparatus used to observe the motion of smoke particles that are in the air in a box.

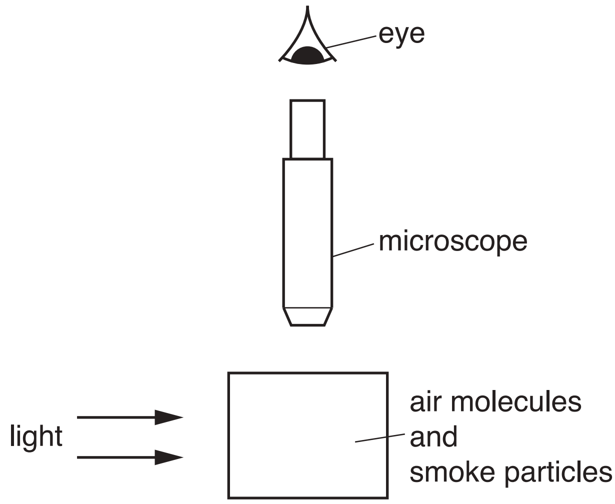
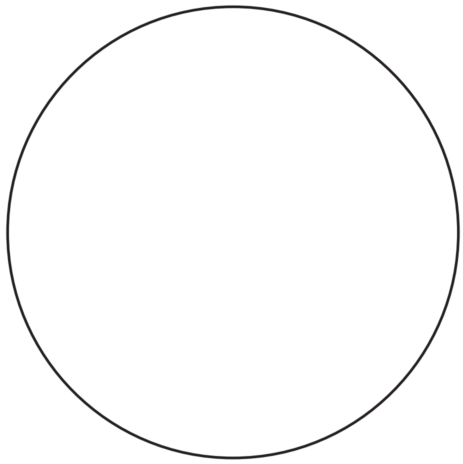


Fig. 5.1

Light from a lamp enters the box through a window in one side of the box. The smoke particles are observed using a microscope fixed above a window in the top of the box.

(i) The motion of a single smoke particle is observed through the microscope.

In the circle shown, sketch the path of this smoke particle.



[1]

(ii) Explain why the smoke particle follows the path that is observed.

....

....

....

.... [3]

(b) A tennis player is practising by hitting a ball many times against a wall.

The ball hits the wall 20 times in 60 s. The average change in momentum for each collision with the wall is 4.2 kg m / s.

Calculate the average force that the ball exerts on the wall.

average force = ... [3]

[Total: 7]

6 **(a)** Fig. 6.1 represents the electromagnetic spectrum.

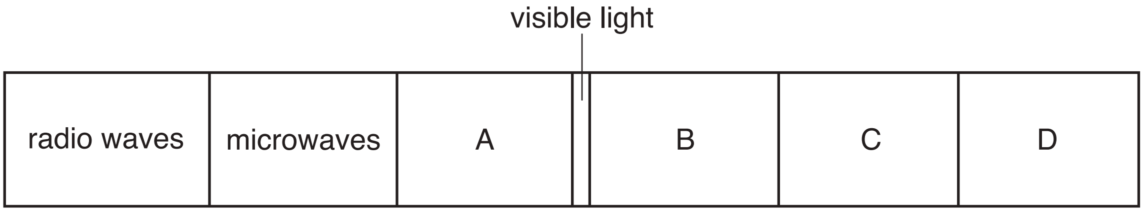


Fig. 6.1

State the radiation in each of the regions represented by A, B, C and D in Fig. 6.1.

A ....

B ....

C ....

D ....

[2]

(b) A source emits visible light.

Fig. 6.2 shows a ray of red light from the source incident on the face XY of a glass prism at point S.

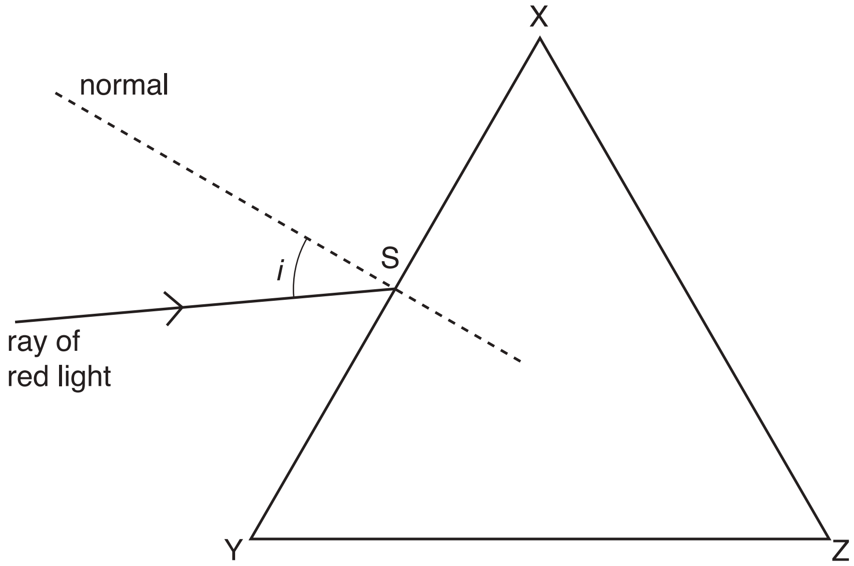


Fig. 6.2

The angle of incidence *i* of the ray is 35°. The refractive index of the glass for red light is 1.5.

(i) Calculate the angle of refraction in the glass at S.

angle of refraction = ... [2]

(ii) On Fig. 6.2, draw the refracted ray at face XY and the ray emerging from face XZ of the prism. Label this ray R. [2]

(iii) A ray of blue light follows the same path as the ray of red light incident on the face XY.

On Fig. 6.2, draw the path of this ray in the prism and emerging from the prism.

Label this ray B. [2]

[Total: 8]

7 **(a)** The speed of a light wave in air is 3.00×10^8 m/s. The refractive index of water is 1.33.

Calculate the speed of the light wave in water.

speed = ... [2]

(b) Fig. 7.1 shows parallel wavefronts of a light wave in air incident on a boundary with a transparent plastic.

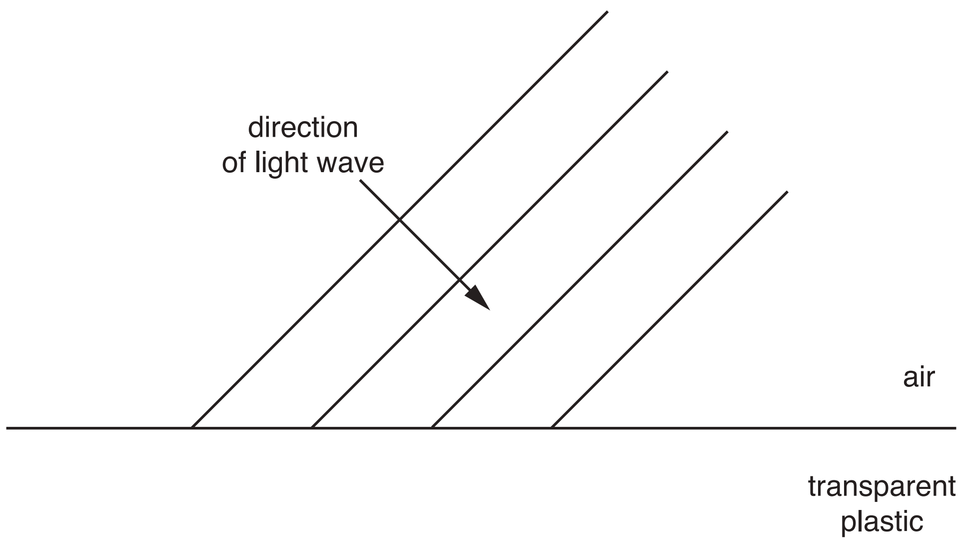


Fig. 7.1

On Fig. 7.1,

(i) draw the positions of the four refracted wavefronts in the plastic, [3]

(ii) draw an arrow to show the direction of travel of the refracted wave, [1]

(iii) label the angle of refraction *r* of the light wave. [1]

[Total: 7]

8 **(a)** The lamp of a car headlight is rated at 12 V, 50 W.

Calculate the current in the lamp when operating normally.

current = ... [2]

(b) A car is driven at night.

In a journey, the total charge that passes through the 12 V battery is 270 kC.

(i) Calculate the electrical energy transferred.

energy = ... [3]

(ii) The fuel used by the car provides 3.6×10^4 J / cm^3.

Calculate the volume of fuel used to provide the energy calculated in **(b)(i)**.

volume = ... [2]

[Total: 7]

9 Fig. 9.1 shows current-potential difference graphs for a resistor and for a lamp.

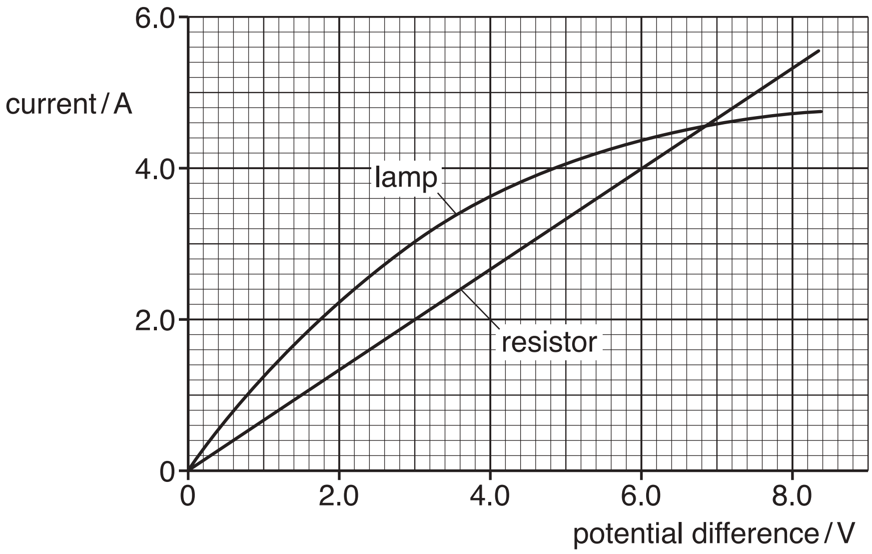


Fig. 9.1

(a) (i) The potential difference (p.d.) applied to the resistor is increased. Tick the box that indicates the effect on the resistance of the resistor.

☐ resistance increases

☐ resistance is constant

☐ resistance decreases

[1]

(ii) The potential difference (p.d.) applied to the lamp is increased. Tick the box that indicates the effect on the resistance of the lamp.

☐ resistance increases

☐ resistance is constant

☐ resistance decreases

[1]

(b) The p.d. across the lamp is 6.0 V. Calculate the resistance of the lamp.

resistance = ... [2]

(c) The lamp and the resistor are connected in **parallel** to a 6.0 V supply.

Calculate the current from the supply.

current = ... [2]

(d) The lamp and the resistor are connected in **series** to another power supply. The current in the circuit is 4.0 A.

Calculate the total p.d. across the lamp and the resistor.

p.d. = ... [2]

[Total: 8]

10 **(a)** Fig. 10.1 shows a straight wire AB placed in the magnetic field between the poles of a magnet. The ends of AB are connected to a galvanometer.

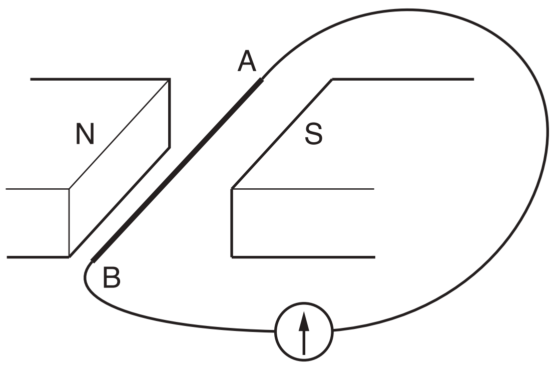


Fig. 10.1

When AB is moved vertically, the needle of the galvanometer shows a deflection.

State **three** factors that affect the size of the deflection.

1 ....

2 ....

3 ....
[3]

(b) Fig. 10.2 shows a transformer.

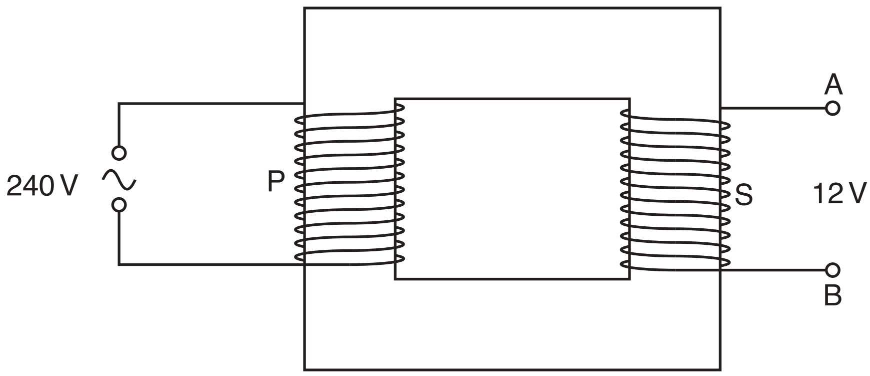


Fig. 10.2

(i) The primary coil P has 8000 turns and an input of 240 V. The secondary coil S has an output of 12 V.

Calculate the number of turns in the secondary coil.

number = ... [2]

(ii) A circuit containing a resistor is connected to the terminals A and B.
A direct current (d.c.) is required in this resistor.

On Fig. 10.2, draw this circuit. [1]

[Total: 6]

11 **(a)** To ensure the safety of workers in laboratories where radioactive sources are used, describe how radioactive materials

(i) should be stored,

....

.... [1]

(ii) should be handled.

....

.... [1]

(b) Complete the table below for three types of emission from radioactive sources.

type of emission	nature	range in air	absorbed by
	electromagnetic radiation	several km	
	helium nucleus		0.2 mm paper
	electron		

[3]

(c) State the type of radiation emitted when

(i) an americium nucleus $\left({}^{241}_{95}\text{Am}\right)$ decays into a neptunium nucleus $\left({}^{237}_{93}\text{Np}\right)$,

.... [1]

(ii) a phosphorus nucleus $\left({}^{32}_{15}\text{P}\right)$ decays into a silicon nucleus $\left({}^{32}_{16}\text{Si}\right)$.

.... [1]

[Total: 7]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/52**

Paper 5 Practical Test **February/March 2018**

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This document consists of **8** printed pages.

DC (SC) 150179/3

CAMBRIDGE International Examinations

Instructions for preparing apparatus

The Supervisor is **not** allowed to consult the Question Paper before the examination. This teacher should, as part of the preparation of the examination requirements, test the apparatus in order to ensure that it is satisfactory.

The Supervisor is asked to give (and attach to the Supervisor's Report form printed on pages 7 and 8) a *brief* description of the apparatus supplied, mentioning any points that are likely to be of importance to the Examiner in marking the answers. The Supervisor should also report any assistance given to candidates. All reports should be signed by the Supervisor.

In addition to the usual equipment of a physics laboratory, each candidate will require the apparatus specified in these Confidential Instructions. If a candidate breaks any of the apparatus, or loses any of the material supplied, the matter should be rectified and a note made in the Supervisor's Report.

Number of sets of apparatus

As a *minimum*, the number of sets of apparatus provided should be $N/3$, where N is the number of candidates (per session). A few spare sets should, preferably, be available to avoid any candidate being delayed when moving to another question.

The order in which a given candidate attempts the four questions is immaterial. It is suggested that candidates spend **about 20 minutes on each of questions 1 to 3, and about 15 minutes on question 4**.

Assistance to candidates

The purpose of the Physics Practical Test is to find out whether the candidates can carry out simple practical work themselves. The Examiners are aware that candidates may sometimes be unable to show their practical ability through failure to understand some point in the theory of the experiment. If an Examiner were present in the laboratory, he/she would be willing to give a hint to enable such a candidate to get on with an experiment. In order to overcome this difficulty, the Supervisor is asked to co-operate with the Examiners to the extent of being ready to give (or allow the physics teacher to give) a hint to a candidate who is unable to proceed.

The following regulations must be strictly adhered to.

(i) No hint may be announced to the candidates as a whole.

(ii) A candidate who is unable to proceed and requires assistance must come up to the Supervisor and state the difficulty. Candidates should be told that the Examiners will be informed of any assistance given in this way.

(iii) A report must be made of any assistance given to the candidate, with the name and candidate number of the candidate.

It is suggested that the following announcement be made to the candidates.

'The Examiners do not want you to waste time through inability to get on with an experiment. Any candidate, therefore, who is unable to get on with the experiment after spending five minutes at it may come to me and ask for help. I shall report to the Examiners any help given in this way, and some marks may be lost for the help given. You may ask me for additional apparatus which you think would improve the accuracy of your experiments, and you should say, on your script, how you use any such apparatus supplied.'

Question 1

Items to be supplied by the Centre (per set of apparatus unless otherwise specified).

(i) Metre rule with a scale graduated in mm. See note 1.

(ii) Triangular block to act as a pivot for the metre rule. This block is to stand on the bench.

(iii) Mass of 20 g, labelled **Q**. The mass must be able to stand on the rule.

Note

1. The metre rule should approximately balance on the pivot, with the scale facing upwards, when the 50 cm mark is over the pivot.

Action at changeover

Check that the apparatus is ready for the next candidate.

Question 2

Items to be supplied by the Centre (per set of apparatus unless otherwise specified)

(i) Two lamps, one 2.5 V, 0.3 A or similar, labelled **X**, and the other 6 V, 0.4 A or similar, labelled **Y**. See note 2.

(ii) Power supply of approximately 2 V to 3 V. See note 3.
Where candidates are provided with a variable power supply, the voltage should be set by the Supervisor and fixed, e.g. taped.

(iii) Switch. The switch may be an integral part of the power supply.

(iv) Sufficient connecting leads to set up the circuit shown in Fig. 2.1, with 4 spare leads.

(v) Ammeter capable of measuring currents up to 1.00 A with a resolution of at least 0.05 A. See note 4.

(vi) Voltmeter capable of measuring up to 3.0 V with a resolution of at least 0.1 V. See note 4.

Notes

1. The circuit is to be set up for candidates as shown in Fig. 2.1. The voltmeter must have leads and terminals that enable it to be connected to different parts of the circuit.

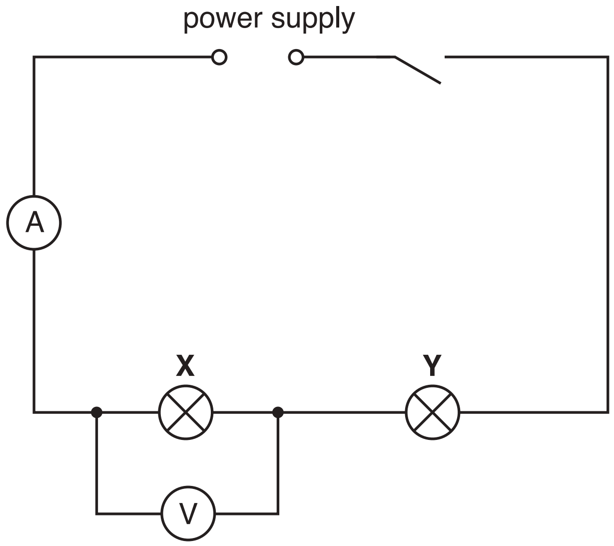

Fig. 2.1

2. The lamps must have suitable terminals so that candidates are able easily and quickly to rearrange the circuit. Spare lamps should be available.

3. If cells are used, they must remain adequately charged throughout the examination. Spare cells must be available.

4. Either analogue or digital meters are suitable. Any variable settings should be set by the Supervisor and fixed, e.g. taped. Spare meters should be available.

Action at changeover

Connect the circuit as shown in Fig. 2.1 and check that the circuit is working.
Switch the circuit off.

Question 3

Items to be supplied by the Centre (per set of apparatus unless otherwise specified).

(i) Thermometer: –10 °C to 110 °C, graduated in 1 °C intervals. See note 1.

(ii) Clamp, boss and stand. See note 1.

(iii) 250 cm^3 beaker. See notes 1 and 2.

(iv) Supply of hot water. See notes 3 and 4.

(v) Stopclock or stopwatch or wall-mounted clock showing seconds. Candidates will be required to take readings at 30-second intervals. They may use their own wristwatches. The question will refer to a stopclock.

(vi) Paper towels to soak up any water spills.

Notes

1. The thermometer, clamp, boss and stand are to be set up for candidates as shown in Fig. 3.1. The thermometer bulb must be well below the 100 cm^3 level of the beaker. Candidates must be able easily and safely to read temperatures up to 100 °C and to move the thermometer in and out of the beaker.

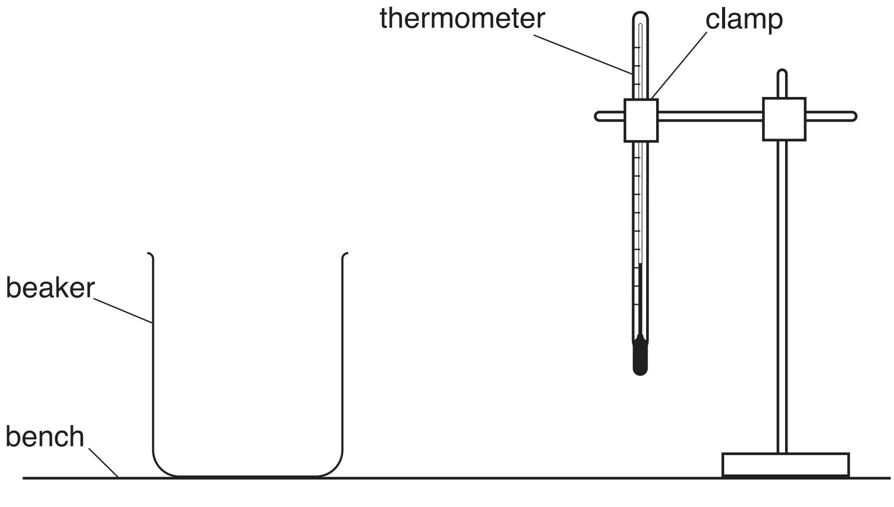

Fig. 3.1

2. If the beaker does not have volume markings, the 200 cm^3 and 100 cm^3 levels must be indicated on the beaker.

3. Hot water is to be available for each candidate throughout the experiment. The hot water should be maintained at an approximately constant temperature between 80 °C and 100 °C. Each candidate will require about 400 cm^3 of hot water in total. They must be able to pour hot water into the beaker safely.

4. Candidates must be warned of the dangers of burns or scalds when using very hot water.

Action at Changeover

Empty the water from the beaker. Check that the apparatus is intact and is arranged as in Fig. 3.1.

Question 4

No apparatus is required for this question.

This form must be completed and returned with the scripts.

SUPERVISOR'S REPORT

General

The Supervisor is required to give details of any difficulties experienced by particular candidates, giving their names and candidate numbers. These should include reference to:

(a) difficulties due to faulty apparatus;

(b) accidents to apparatus or materials;

(c) any other information that is likely to assist the Examiner, especially if this cannot be discovered in the scripts;

(d) any help given to a candidate.

Information required

A plan of workbenches, giving details by candidate number of the places occupied by the candidates for each experiment for each session, must be enclosed with the scripts. The space below can be used for this, or it may be on separate paper.

Information required (cont.)

A list by name and candidate number of candidates requiring help, with details of the help provided.

CENTRE NO. ....

NAME OF CENTRE ....

Declaration (to be signed by the Supervisor)

The preparation of the practical examination has been carried out so as to maintain fully the security of the examination.

SIGNED ....
Supervisor

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/52**

Paper 5 Practical **March 2018**

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Cambridge International is publishing the mark schemes for the March 2018 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks
1(a)	5 b values decreasing	**1**
	all < 43.0 cm <u>and</u> b calculation correct	**1**
1(b)	graph:	
	• axes labelled correct orientation, with quantity and unit	**1**
	• appropriate scales (plots occupying at least ½ grid)	**1**
	• plots all correct to ½ small square <u>and</u> precise plots	**1**
	• well judged line <u>and</u> thin line	**1**
1(c)(i)	G present <u>and</u> triangle method seen on graph	**1**
1(c)(ii)	M_R in range 70 (g) to 400 (g)	**1**
	2 / 3 significant figures and unit	**1**
1(d)	(difficult to see correct mark) and: measure width of mass and add ½ width to mark at edge of mass / mean value of marks at both edges of mass / mark centre line of mass <u>and</u> edge of rule / line up mark through gap in slotted mass	**1**
1(e)	more accurate <u>and</u> errors have less effect (with larger values) / less % uncertainty	**1**

Question	Answer	Marks
2(a)(i)	I_S <1.00 (A)	**1**
2(a)(ii)	V_X and V_Y both <3.00 (V) and $V_X < V_Y$	**1**
2(a)(iii)	V_S within 10% of $(V_X + V_Y)$	**1**
2(a)(iv)	statement matching results	**1**
	justification matching statement with comparative values used e.g. within limits of experimental accuracy	**1**
2(b)	correct calculation of R_1	**1**
	2 / 3 sig figs and unit Ω	**1**
2(c)	lamps in parallel arrangement	**1**
	all circuit elements in correct arrangement and circuit symbols correct	**1**
2(d)(i)	I_P and V_P present and V and A units correct throughout	**1**
2(d)(ii)	$R_2 > R_1$	**1**

Question	Answer	Marks
3(a)	θ for 200 cm^3 decreasing	**1**
3(b)(i)	θ for 100 cm^3 decreasing more quickly	**1**
3(b)(ii)	s, °C, °C all correct	**1**
	30, 60, 90, 120, 150, 180	**1**
3(c)	conclusion matching results	**1**
	justification matching conclusion with correct mention of comparative temperature change over 0 to 180 s	**1**
3(d)(i)	unit °C / s	**1**
3(d)(ii)	correct calculation of x_1 and $x_2 < x_1$	**1**
3(e)	statement matching results with results used in explanation and reference to different starting temperatures for x_1 and x_2	**1**
3(f)	experiment with lid and no insulation	**1**
	experiment with insulation and no lid	**1**

Question	Answer		Marks
4	MP1	**factor:** clear statement of appropriate variable to test	**1**
	MP2	**control variable:** named variable which should be kept constant	**1**
	MP3	**apparatus:** metre rule and any apparatus essential to variable under test	**1**
	MP4	**method:** measure factor under test <u>and</u> drop ball <u>and</u> measure diameter / depth of depression	**1**
	MP5	repeat for new value of variable under test	**1**
	MP6	**additional point:** repeat experiment or each value of factor <u>and</u> average / means of measuring depth / diameter of crater accurately / apparatus for measuring diameter of ball accurately / measure diameter of ball / crater in different places (and take mean) / smooth / flatten sand surface / at least 5 sets of data taken / reliable means of releasing ball / sensible values for factor quoted	**1**
	MP7	**graph:** diameter / depth of depression vs appropriate <u>continuous</u> variable	**1**

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

0725775348

PHYSICS **0625/52**

Paper 5 Practical Test **February/March 2018**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and about 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
3	
4	
Total	

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1 In this experiment, you will determine the mass of a metre rule by a balancing method.

Carry out the following instructions, referring to Fig. 1.1.

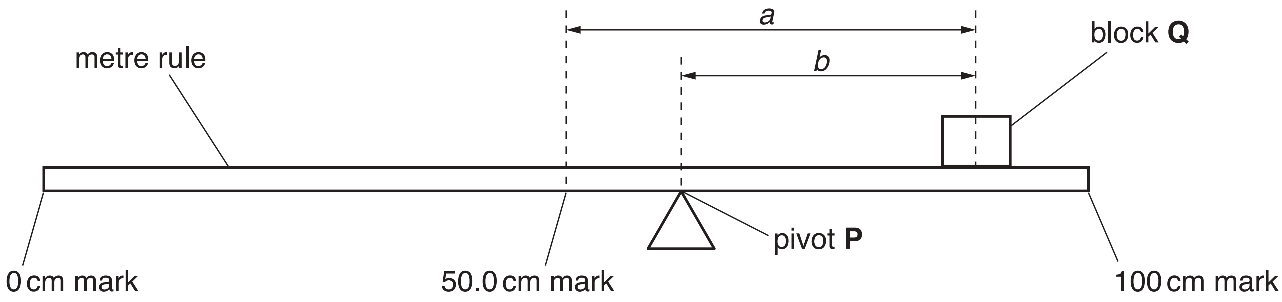

Fig. 1.1

(a) Place the metre rule on the pivot. Place block **Q** on the metre rule with its centre at the 95.0 cm mark. Keep **Q** at the 95.0 cm mark and adjust the position of the metre rule on the pivot until the metre rule is as near to being balanced as possible.

The distance *a* between the centre of **Q** and the 50.0 cm mark has been recorded in Table 1.1.

In the table, record the position of the pivot **P**.

Calculate the distance *b* between the centre of **Q** and the pivot **P**, using the formula

$$b = (\text{position of } \mathbf{Q} - \text{position of } \mathbf{P}).$$

Repeat the procedure for positions of **Q** at the 90.0 cm, 85.0 cm, 80.0 cm and 75.0 cm marks. Record your values for the position of **P** and your values for *b* in the table.

Table 1.1

position of **Q** / cm	*a* / cm	position of **P** / cm	*b* / cm
95.0	45.0		
90.0	40.0		
85.0	35.0		
80.0	30.0		
75.0	25.0		

[2]

(b) Plot a graph of *a*/cm (*y*-axis) against *b*/cm (*x*-axis). You do not need to start your axes at the origin (0,0).

[4]

(c) (i) Determine the gradient G of the graph. Show clearly on the graph how you obtained the necessary information.

G = ... [1]

(ii) Calculate the mass M_R of the metre rule using the equation $M_R = \frac{M}{(G-1)}$,

where M = 20 g. Record the value for M_R to a suitable number of significant figures for this experiment.

M_R = ... [2]

(d) Describe why it is difficult to place the block **Q** at the correct mark on the metre rule each time. Explain how you overcame this difficulty. You may draw a diagram to help your explanation.

....

....

.... [1]

(e) Two students carry out the experiment correctly but with different values for the mass of block **Q**. One student obtains values of *b* that are larger than those obtained by the other student.

State and explain whether the larger values of *b* are likely to produce a more accurate value for the mass of the metre rule.

....

....

.... [1]

[Total: 11]

2 In this experiment, you will investigate a circuit containing different lamps.

The circuit has been set up for you.

Carry out the following instructions, referring to Fig. 2.1.

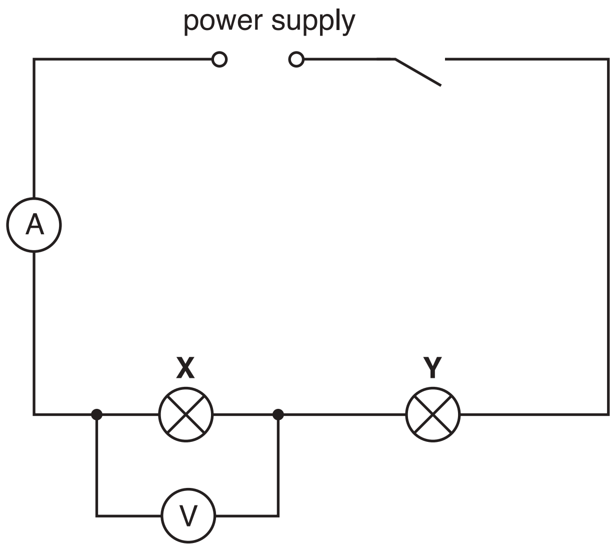

Fig. 2.1

(a) **(i)** Switch on. Record the current I_S in the circuit.

I_S = ... [1]

(ii) Record the potential difference (p.d.) V_X across lamp **X**.

V_X = ...

Disconnect the voltmeter.

Connect the voltmeter to measure the p.d. V_Y across lamp **Y**.
Record V_Y.

V_Y = ...
[1]

(iii) Disconnect the voltmeter.

Connect the voltmeter to measure the p.d. V_S across both lamps **X** and **Y** connected in series.
Record V_S.

V_S = ...[1]

Switch off.

(iv) A student suggests that V_S should be equal to $(V_X + V_Y)$.

State whether your readings support this suggestion. Justify your statement with reference to your results.

statement ....

justification ....

....

.... [2]

(b) Calculate the resistance R_1 of lamp **X**. Use your readings from **(a)(i)** and **(a)(ii)** and the equation $R_1 = \frac{V_X}{I_S}$. Record your answer to a suitable number of significant figures for your experiment.

R_1 = ... [2]

(c) The circuit components are to be rearranged so that

- lamps **X** and **Y** are connected in parallel
- the ammeter measures the current in lamp **X** only
- the voltmeter measures the p.d. across the lamps.

Draw a circuit diagram of this arrangement.

[2]

(d) **(i)** Set up the circuit as described in **(c)**.

Switch on. Measure and record the current I_P in lamp **X** and the p.d. V_P across the lamps.

I_P = ...

V_P = ...
[1]

Switch off.

(ii) Calculate the new resistance R_2 of lamp **X**. Use your readings from **(d)(i)** and the equation $R_2 = \frac{V_P}{I_P}$.

R_2 = ... [1]

[Total: 11]

3 In this experiment, you will investigate how the volume of water affects the rate at which water in a beaker cools.

Carry out the following instructions, referring to Fig. 3.1.

The thermometer must remain in the clamp throughout the experiment.

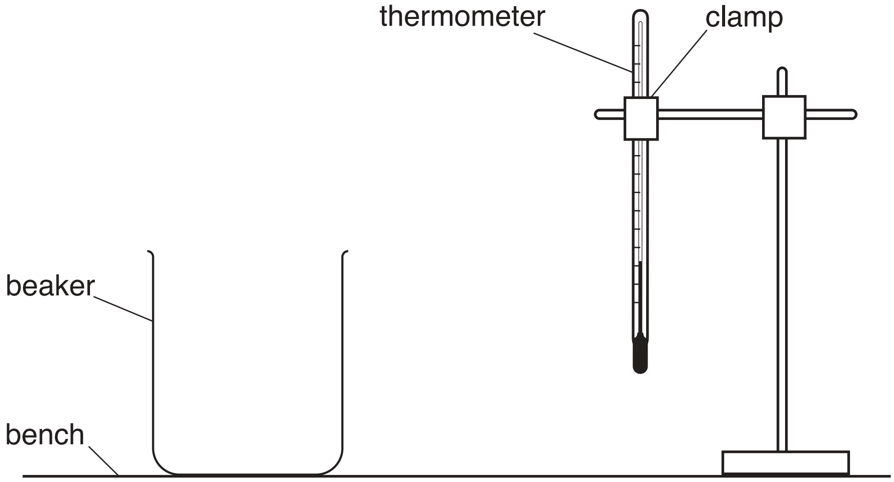

Fig. 3.1

(a) Pour 200 cm^3 of hot water into the beaker.
Place the thermometer in the water.

In the first row of Table 3.1, record the maximum temperature θ of the water and immediately start the stopclock.

Record, in the table, the temperature θ of the water at times t = 30 s, 60 s, 90 s, 120 s, 150 s and 180 s.

Remove the thermometer from the beaker and empty the beaker. [1]

(b) (i) Repeat **(a)**, using 100 cm^3 of hot water in the beaker. [1]

(ii) Complete the headings and the time column in the table. [2]

Table 3.1

	beaker with 200 cm^3 of hot water	beaker with 100 cm^3 of hot water
t/	θ/	θ/
0		

(c) Write a conclusion stating how the volume of water in the beaker affects the rate of cooling of the water. Justify your answer by reference to your results.

....

....

....

....

.... [2]

(d) **(i)** Using your results for 100 cm^3 of water, calculate the average rate of cooling x_1 for the **first** 90 s of the experiment. Use your readings from the table and the equation

$$x_1 = \frac{\theta_0 - \theta_{90}}{t},$$

where t = 90 s and θ_0 and θ_{90} are the temperatures at 0 s and 90 s.
Include the unit for the rate of cooling.

x_1 = ... [1]

(ii) Using your results for 100 cm^3 of water, calculate the average rate of cooling x_2 in the **last** 90 s of the experiment. Use your readings from the table and the equation

$$x_2 = \frac{\theta_{90} - \theta_{180}}{t},$$

where t = 90 s and θ_{90} and θ_{180} are the temperatures at 90 s and 180 s.
Include the unit for the rate of cooling.

x_2 = ... [1]

(e) A student suggests that it is important that the experiments with the two volumes of water should have the same starting temperatures.

State whether your values for x_1 and x_2 support this suggestion. Justify your statement with reference to your results.

statement ....

justification ....

....

.... [1]

(f) Another student wants to investigate whether more thermal energy is lost from the water surface than from the sides of the beakers.

Describe an experiment that could be done to investigate this.

You are **not** required to carry out the experiment.

You may draw a diagram to help your description.

....

....

.... [2]

[Total: 11]

4 A student is investigating the factors that affect the size of the crater (hole) a ball makes when it is dropped into sand.

Plan an experiment which would enable you to investigate one factor which might affect the size of the crater. You are **not** required to carry out the experiment.

The apparatus available includes:

metal balls of different sizes
a tray of sand.

Write a plan for the experiment.

In your plan, you should:

- state which factor is being investigated,
- state the key variables that you would control,
- list any additional apparatus needed,
- explain briefly how you would carry out the experiment including what would be measured and how this would be done,
- state the precautions which should be taken to obtain reliable results,
- suggest a suitable graph which could be drawn from the results.

You may draw a diagram if it helps to explain your plan.

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.... [7]

[Total: 7]

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/62**

Paper 6 Alternative to Practical **March 2018**

MARK SCHEME

Maximum Mark: 40

Published

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GENERIC MARKING PRINCIPLE 1:

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- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks
1(a)	measure width of mass and add ½ width to mark at edge of mass / mean value of marks at both edges of mass / mark centre line of mass <u>and</u> edge of rule / line up mark through gap in slotted mass	**1**
1(b)	method such as: find point which just tips one way move rule to find point which just tips other way	**1**
	balance point is between these where rule tips either way / owtte	**1**
1(c)(i)	graph:	
	• axes labelled correct orientation, with quantity and unit	**1**
	• appropriate scales (plots occupying at least ½ grid)	**1**
	• plots all correct to ½ small square <u>and</u> precise plots	**1**
	• well judged line <u>and</u> thin line	**1**
1(c)(ii)	*G* present <u>and</u> triangle method seen on graph	**1**
1(c)(iii)	M_R in range 100 g to 400 g	**1**
	2 / 3 significant figures and unit	**1**
1(d)	more accurate <u>and</u> errors have less effect (with larger values) / less % uncertainty	**1**

Question	Answer	Marks
2(a)(i)	θ for beaker **A** = 87(.0)(°C) and θ for beaker **B** = 89(.0)(°C)	**1**
2(a)(ii)	s, °C, °C all correct	**1**
	30, 60, 90, 120, 150, 180	**1**
2(b)	one precaution e.g.: read at 90° (to scale) / perpendicularly, stir (before reading) / wait until reading stops rising(at start)	**1**
2(c)	conclusion matching results	**1**
	justification matching conclusion with correct mention of comparative temperature change over 0 to 180 s	**1**
2(d)(i)	unit °C / s	**1**
2(d)(ii)	x_1 = 0.094 / ecf and x_2 = 0.067	**1**
2(e)	statement matching results with results used in explanation and reference to different (starting) temperatures for x_1 and x_2	**1**
2(f)	experiment with lid and no insulation	**1**
	experiment with insulation and no lid	**1**

Question	Answer	Marks
3(a)	correct voltmeter symbol in parallel with lamp **X**	**1**
3(b)	I_S = 0.34 (A)	**1**
3(c)(i)	V_X = 1.2 (V) <u>and</u> V_Y = 1.9 (V)	**1**
3(c)(ii)	V_S present <u>and</u> correct units (A, V) seen in **(b)** and **(c)**	**1**
3(c)(iii)	statement matching results	**1**
	justification matching statement with <u>use of comparative</u> <u>values</u> (e.g. 3.1 and 3.0 are within limits of experimental accuracy)	**1**
3(d)	correct calculation of R_1 (3.5 / ecf)	**1**
3(e)(i)	lamps in parallel arrangement	**1**
	all circuit elements in correct arrangement and all circuit symbols correct	**1**
	resistance increases with temperature	**1**
3(e)(ii)	$R_2 > R_1$ <u>and</u> brighter lamp has higher temperature	**1**

Question		Answer	Marks
4	MP1	**factor:** clear statement of appropriate variable to test	**1**
	MP2	**control variable:** named variable which should be kept constant	**1**
	MP3	**apparatus:** metre rule and any apparatus essential to variable under test	**1**
	MP4	**method:** measure factor under test <u>and</u> drop ball <u>and</u> measure diameter / depth of depression	**1**
	MP5	repeat for new value of variable under test	**1**
	MP6	**additional point:** repeat experiment or each value of factor <u>and</u> average / means of measuring depth / diameter of crater accurately / apparatus for measuring diameter of ball accurately / measure diameter of ball / crater in different places (and take mean) / smooth / flatten sand surface / at least 5 sets of data taken / reliable means of releasing ball / sensible values for factor quoted	**1**
	MP7	**graph:** diameter / depth of depression vs appropriate <u>continuous</u> variable	**1**

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

7917946542

PHYSICS **0625/62**

Paper 6 Alternative to Practical **February/March 2018**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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This document consists of **14** printed pages and **2** blank pages.

DC (NF/SW) 150177/4

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International Examinations

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1 A student is determining the mass of a metre rule by a balancing method.

He is using the apparatus shown in Fig. 1.1.

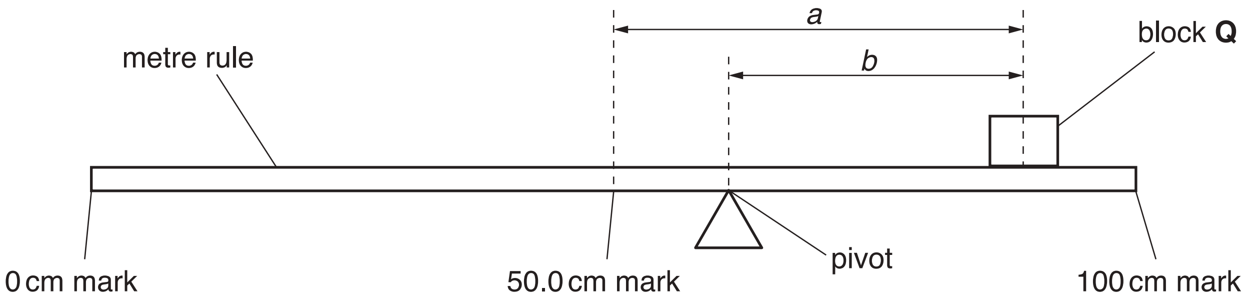

Fig. 1.1

(a) He places the metre rule on the pivot and then places block **Q** with its centre at the 95.0 cm mark.
The student stated that it is difficult to place the mass accurately at the 95.0 cm mark.

Explain how the student could overcome this. You may draw a diagram to help your explanation.

....

....

....[1]

(b) The student keeps block **Q** at the 95.0 cm mark and adjusts the position of the metre rule on the pivot until the metre rule is as near to being balanced as possible.

Describe a method to find the point at which the metre rule is as near to being balanced as possible.

....

....

....

....[2]

(c) The student determines the distance a between the centre of block **Q** and the 50.0 cm mark and also the distance b between the centre of block **Q** and the pivot.

He repeats the procedure for positions of block **Q** at the 90.0 cm, 85.0 cm, 80.0 cm and 75.0 cm marks. His results are shown in Table 1.1.

Table 1.1

position of **Q** / cm	a / cm	b / cm
95.0	45.0	39.0
90.0	40.0	34.3
85.0	35.0	30.0
80.0	30.0	25.2
75.0	25.0	21.4

(i) Plot a graph of a / cm (y-axis) against b / cm (x-axis). You do not need to start your axes at the origin (0, 0).

[4]

(ii) Determine the gradient G of your line. Show clearly on the graph how you obtained the necessary information.

G = ...[1]

(iii) Calculate the mass M_R of the metre rule using the equation $M_R = \dfrac{M}{(G-1)}$,

where M = 20 g. Record the value for M_R to a suitable number of significant figures for this experiment.

M_R = ...[2]

(d) Two students carry out the experiment correctly but with different values for the mass of block **Q**. One student obtains values of *b* that are larger than those obtained by the other student.

State and explain whether the larger values of *b* are likely to produce a more accurate value for the mass of the metre rule.

....

....

....[1]

[Total: 11]

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2 Some students are investigating how the volume of water affects the rate at which water in a beaker cools.

They are using the apparatus shown in Fig. 2.1.

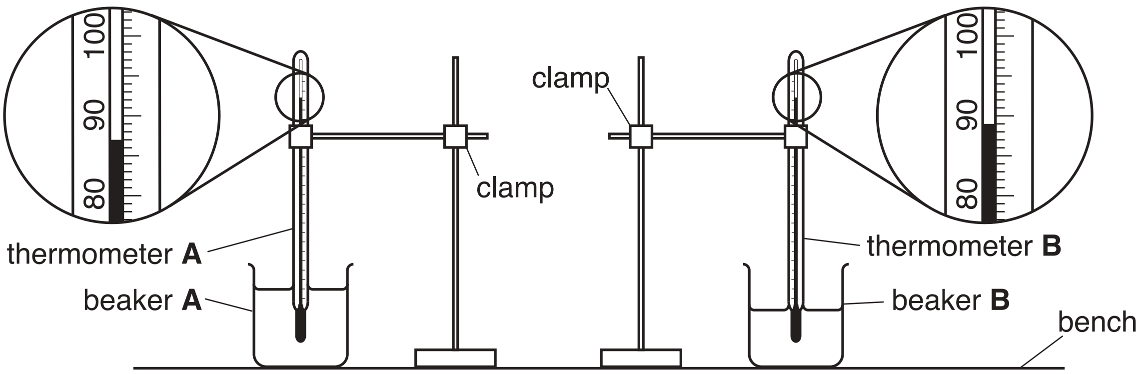

Fig. 2.1

(a) **(i)** 200 cm^3 of hot water is poured into beaker **A** and the initial temperature rises to the value shown on thermometer **A** in Fig. 2.1.

In the first row of Table 2.1, record this temperature θ_A for time $t = 0$.

100 cm^3 of hot water is poured into beaker **B**. The temperature rises to the value shown on thermometer **B** in Fig. 2.1.

In the first row of the table, record this temperature θ_B for time $t = 0$.

[1]

(ii) The temperatures θ_A and θ_B of the water in each experiment at times t = 30 s, 60 s, 90 s, 120 s, 150 s and 180 s are shown in the table.

Complete the headings and the time column in the table. [2]

Table 2.1

	beaker **A** with 200 cm^3 of water	beaker **B** with 100 cm^3 of water
t/	θ_A/	θ_B/
0		
	85.0	86.0
	83.0	83.0
	81.5	80.5
	80.0	78.0
	78.5	76.0
	77.5	74.5

(b) Describe one precaution which should be taken to ensure that the temperature readings in the experiment are as accurate as possible.

....

....[1]

(c) Write a conclusion stating how the volume of water in the beaker affects the rate of cooling of the water. Justify your answer by reference to the results.

....

....

....

....

....[2]

(d) **(i)** Using the results for 100 cm^3 of water, calculate the average rate of cooling x_1 for the **first** 90 s of the experiment. Use the readings from the table and the equation

$$x_1 = \frac{\theta_0 - \theta_{90}}{t},$$

where $t = 90$ s and θ_0 and θ_{90} are the temperatures at time 0 and at time 90 s.
Include the unit for the rate of cooling.

x_1 = ...[1]

(ii) Using the results for 100 cm^3 of water, calculate the average rate of cooling x_2 in the **last** 90 s of the experiment. Use the readings from the table and the equation

$$x_2 = \frac{\theta_{90} - \theta_{180}}{t},$$

where $t = 90$ s and θ_{90} and θ_{180} are the temperatures at time 90 s and at time 180 s.
Include the unit for the rate of cooling.

x_2 = ...[1]

(e) A student suggests that it is important that the experiments with the two volumes of water should have the same starting temperatures.

State whether your values for x_1 and x_2 support this suggestion. Justify your statement with reference to your results.

statement ....

justification ....

....

....
[1]

(f) Another student plans to investigate whether more thermal energy is lost from the water surface than from the sides of the beakers.

Describe an experiment that could be done to investigate this.

You may draw a diagram to help your description.

....

....

....[2]

[Total: 11]

3 A student is investigating a circuit containing different lamps.
She is using the circuit shown in Fig. 3.1.

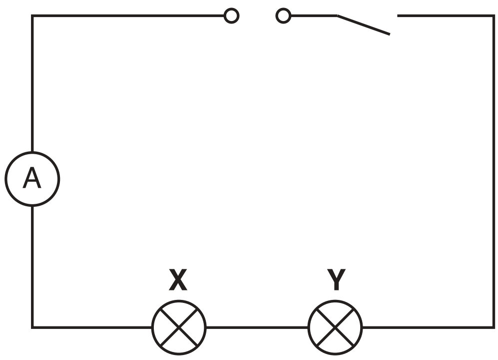

Fig. 3.1

(a) On Fig. 3.1, draw a voltmeter connected so that it measures the potential difference (p.d.) across lamp **X**.

[1]

(b) The student uses the ammeter to measure the current in the circuit.

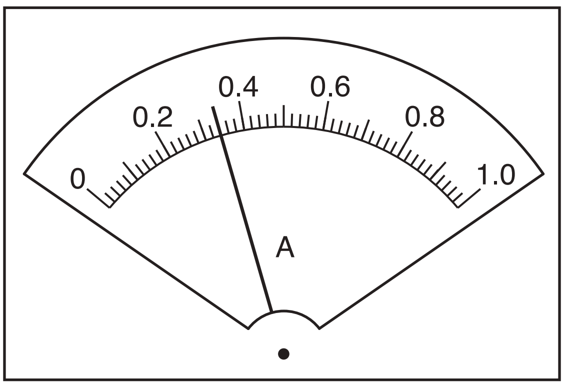

Fig. 3.2

Record the current I_S in the circuit, as shown in Fig. 3.2.

I_S = ...[1]

(c) (i) The student uses the voltmeter to measure the p.d. V_X across lamp **X** and then reconnects the voltmeter to measure the p.d. V_Y across lamp **Y**.

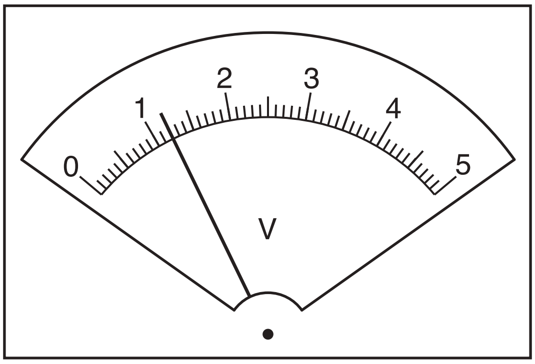

Fig. 3.3

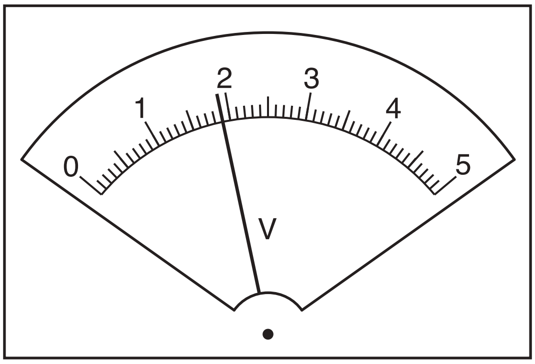

Fig. 3.4

Record the value of the p.d. V_X across lamp **X**, shown in Fig. 3.3.

V_X = ...

Record the value of the p.d. V_Y across lamp **Y**, shown in Fig. 3.4.

V_Y = ...
[1]

(ii) She then measures the p.d. V_S across both lamps in series.

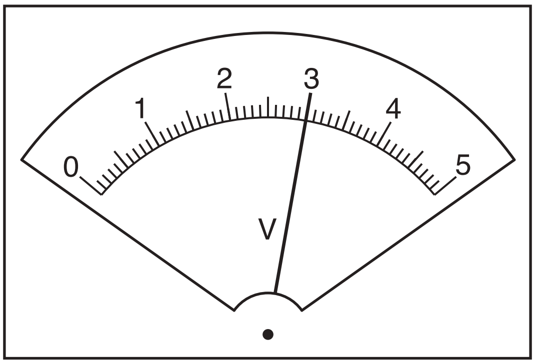

Fig. 3.5

Record the value of the p.d. V_S across both lamps in series, shown in Fig. 3.5.

V_S = ...[1]

(iii) A student suggests that V_S should be equal to $(V_X + V_Y)$.
State whether the readings support this suggestion. Justify your statement with reference to the results.

statement ....

justification ....

....

.... [2]

(d) Calculate the resistance R_1 of lamp **X**. Use the readings from **(b)** and **(c)(i)** and the equation $R_1 = \frac{V_X}{I_S}$.

R_1 = ... Ω [1]

(e) **(i)** The circuit components are to be rearranged so that

- lamps **X** and **Y** are connected in parallel
- the ammeter measures the current in lamp **X** only
- the voltmeter measures the p.d. across the lamps.

Draw a circuit diagram of this arrangement.

[2]

(ii) The student sets up the circuit as described in **(e)(i)**.

She measures and records the current in lamp **X** and the p.d. across the lamps.

She then calculates a new resistance R_2 for lamp **X** in this parallel circuit.

R_2 = ...8.3 Ω..................

The student notices that lamp **X** is very bright in this parallel circuit, but it was dim in the series circuit in **(a)**.

Suggest how temperature affects the resistance of a lamp.
Justify your suggestion by reference to the value of R_1 from **(d)** and the value of R_2.

....

....

....

....

[2]

[Total: 11]

4 A student is investigating the factors that affect the size of the crater (hole) a ball makes when it is dropped into sand.

Plan an experiment which would enable you to investigate one factor which might affect the size of the crater.

The apparatus available includes

metal balls of different sizes
a tray of sand

Write a plan for the experiment.

In your plan you should:

- state which factor is being investigated,
- state the key variables that you would control,
- list any additional apparatus needed,
- explain briefly how you would carry out the experiment including what would be measured and how this would be done,
- state the precautions which should be taken to obtain reliable results,
- suggest a suitable graph which could be drawn from the results.

You may draw a diagram if it helps to explain your plan.

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....[7]

[Total: 7]

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/51**

Paper 5 Practical Test **May/June 2018**

CONFIDENTIAL INSTRUCTIONS

Great care should be taken to ensure that any confidential information given does not reach the candidates either directly or indirectly.

6172001249

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DC (ST/CT) 150766/3

CAMBRIDGE International Examinations

Instructions for preparing apparatus

The Supervisor is **not** allowed to consult the Question Paper before the examination. The teacher should, as part of the preparation of the examination requirements, test the apparatus in order to ensure that it is satisfactory.

The Supervisor is asked to give (and attach to the Supervisor's Report printed on pages 7 and 8) a *brief* description of the apparatus supplied, mentioning any points that are likely to be of importance to the Examiner in marking the answers. The Supervisor should also report any assistance given to candidates. All reports should be signed by the Supervisor.

In addition to the usual equipment of a physics laboratory, each candidate will require the apparatus specified in these Confidential Instructions. If a candidate breaks any of the apparatus, or loses any of the material supplied, the matter should be rectified and a note made in the Supervisor's Report.

Number of sets of apparatus

As a *minimum*, the number of sets of apparatus provided should be $N/3$, where N is the number of candidates (per session). A few spare sets should, preferably, be available to avoid any candidate being delayed when moving to another question.

The order in which a given candidate attempts the four questions is immaterial. It is suggested that candidates spend **about 20 minutes on each of questions 1 to 3, and about 15 minutes on question 4**.

Assistance to candidates

The purpose of the Practical Physics Test is to find out whether the candidates can carry out simple practical work themselves. The Examiners are aware that candidates may sometimes be unable to show their practical ability through failure to understand some point in the theory of the experiment. If an Examiner were present in the laboratory, he/she would be willing to give a hint to enable such a candidate to get on with an experiment. In order to overcome this difficulty, the Supervisor is asked to co-operate with the Examiners to the extent of being ready to give (or allow the physics teacher to give) a hint to a candidate who is unable to proceed.

The following regulations must be strictly adhered to.

(i) No hint may be announced to the candidates as a whole.

(ii) A candidate who is unable to proceed and requires assistance must come up to the Supervisor and state the difficulty. Candidates should be told that the Examiners will be informed of any assistance given in this way.

(iii) A report must be made of any assistance given to a candidate, with the name and candidate number of the candidate.

It is suggested that the following announcement be made to the candidates.

'The Examiners do not want you to waste time through inability to get on with an experiment. Any candidate, therefore, who is unable to get on with the experiment after spending five minutes at it may come to me and ask for help. I shall report to the Examiners any help given in this way, and some marks may be lost for the help given. You may ask me for additional apparatus which you think would improve the accuracy of your experiments, and you should say, on your script, how you use any such apparatus supplied.'

Question 1

Items to be supplied by the Centre (per set of apparatus unless otherwise specified)

(i) Clamp, boss and stand.

(ii) Pendulum bob attached to approximately 110 cm of thin inextensible string.

(iii) Metre rule.

(iv) Stopclock or stopwatch with a minimum precision of 0.1 s. Candidates may use their own wristwatch if suitable.

(v) Split cork or similar device to hold the string of the pendulum between the jaws of the clamp.

Notes

1. The pendulum should be set up for the candidates with length approximately 60 cm from the bottom of the split cork to the bottom of the pendulum bob.

2. Candidates must be able easily to adjust the length of the pendulum up to a length of 100 cm. The pendulum must be able to swing freely at this length.

3. It may be necessary to increase the stability of the clamp stand (for example, using a G-clamp or by placing a weight on the base).

Action at changeover

Arrange the pendulum as described in Note 1.

Question 2

Items to be supplied by the Centre (per set of apparatus unless otherwise specified)

(i) Power supply of approximately 1.5 V – 3 V. Where candidates are provided with a power supply with a variable output voltage, the voltage must be set by the Supervisor and fixed (e.g. taped). See note 2.

(ii) Three resistors of nominal value 4.7 Ω with a power rating of at least 2 W. See note 3.

(iii) Switch. The switch may be an integral part of the power supply.

(iv) Ammeter capable of reading up to 1.00 A with a resolution of at least 0.05 A. See note 4.

(v) Voltmeter capable of measuring the supply p.d. with a resolution of at least 0.1 V. See note 4.

(vi) Sufficient connecting leads to construct the circuit shown in Fig. 2.1.

Notes

1. The circuit is to be connected by the Supervisor as shown in Fig. 2.1.

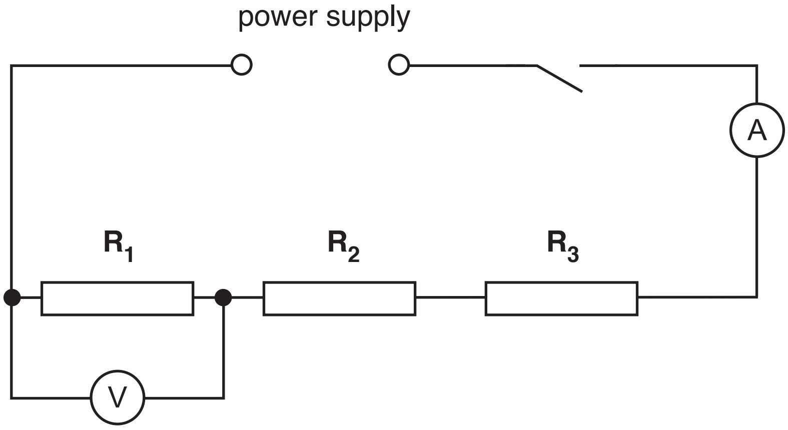

Fig. 2.1

2. If cells are to be used, they must remain adequately charged throughout the examination. Spare cells must be available.

3. The resistors must be labelled $\mathbf{R_1}$, $\mathbf{R_2}$ and $\mathbf{R_3}$. The values of resistance must **not** be visible to the candidates. The resistors must have suitable terminals so that candidates are able easily and quickly to rearrange the circuit.

4. Either analogue or digital meters are suitable. Any variable settings must be set by the Supervisor and fixed (e.g. taped). Spare meters should be available.

Action at changeover

Set up the circuit so that it is arranged as shown in Fig. 2.1.
Check that the circuit works. Switch off.

Question 3

Items to be supplied by the Centre (per set of apparatus unless otherwise specified)

(i) Converging lens, focal length between 14 cm and 16 cm, with a suitable holder.

(ii) Illuminated object with a triangular hole of height 1.5 cm (see Figs. 3.1 and 3.2). The hole is to be covered with thin translucent paper (e.g. tracing paper). See notes 1 and 2.

(iii) Metre rule, calibrated in mm.

(iv) Screen. A white sheet of stiff card approximately 15 cm × 15 cm, fixed to a wooden support is suitable. See Fig. 3.3.

(v) Spare lamps should be available.

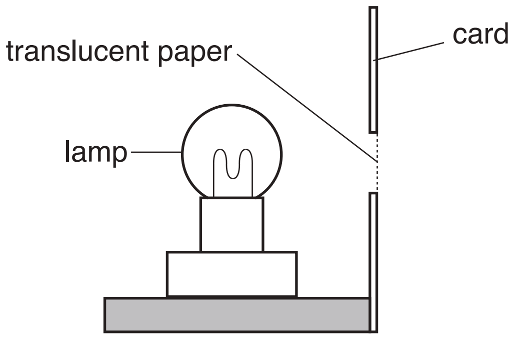

Fig. 3.1

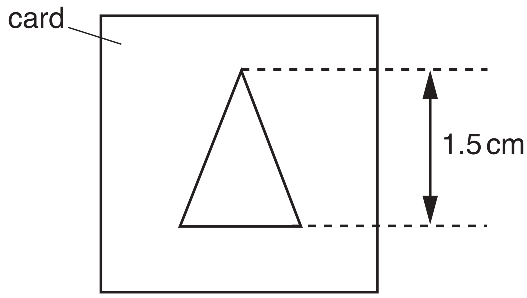

Fig. 3.2

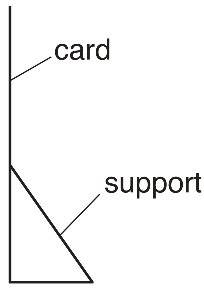

Fig. 3.3

Notes

1. The lamp for the illuminated object should be a low voltage lamp, approximately 24 W or higher power, with a suitable power supply.
2. The centre of the triangular hole, the lamp filament and the centre of the lens in its holder are all to be at the same height above the bench.
3. The apparatus is to be situated away from direct sunlight.

Action at changeover

Check that the apparatus is ready for the next candidate. The apparatus should **not** be left as arranged by a previous candidate.

Question 4

No apparatus is required for this question.

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This form must be completed and returned with the scripts.

SUPERVISOR'S REPORT

General

The Supervisor is required to give details of any difficulties experienced by particular candidates, giving their names and candidate numbers. These should include reference to:

(a) difficulties due to faulty apparatus;

(b) accidents to apparatus or materials;

(c) any other information that is likely to assist the Examiner, especially if this cannot be discovered in the scripts;

(d) any help given to a candidate.

Information required

A plan of workbenches, giving details by candidate number of the places occupied by the candidates for each experiment for each session, must be enclosed with the scripts.

The space below can be used for this, or it may be on separate paper.

Information required (cont.)

A list by name and candidate number of candidates requiring help, with details of the help provided.

CENTRE NO. ....

NAME OF CENTRE ....

Declaration (to be signed by the Supervisor).

The preparation of the practical examination has been carried out so as to maintain fully the security of the examination.

SIGNED ....
Supervisor

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/52**

Paper 5 Practical Test **May/June 2018**

CONFIDENTIAL INSTRUCTIONS

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CAMBRIDGE International Examinations

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Question 1

Items to be supplied by the Centre (per set of apparatus unless otherwise specified)

(i) Plastic or polystyrene drinks cup with a volume of approximately $180\,cm^3$ – $250\,cm^3$.

(ii) 30 cm ruler graduated in mm. Candidates may use their own.

(iii) $250\,cm^3$ or $100\,cm^3$ measuring cylinder.

(iv) A beaker containing approximately $200\,cm^3$ of water at room temperature. See note 1.

(v) Top-pan balance capable of measuring masses up to 200 g to the nearest gram. A balance may be shared between several candidates but the balance must be situated so that it is easily accessible to them.

(vi) Supply of paper towels to mop up any spills of water.

Notes

1. The beaker must be labelled '**W**'.

Action at changeover

Refill the beaker **W**.

Empty the measuring cylinder and plastic cup.

Replace the plastic cup, if necessary.

Question 2

Items to be supplied by the Centre (per set of apparatus unless otherwise specified)

(i) Thermometer, –10 °C to 110 °C, graduated in 1°C intervals.

(ii) 250 cm^3 beaker.

(iii) 100 cm^3 or 250 cm^3 measuring cylinder.

(iv) Stopclock, stopwatch or wall-mounted clock showing seconds. Candidates may use their own wristwatch if suitable. The question will refer to a stopclock.

(v) Supply of hot water. See notes 1 and 2.

(vi) Clamp, boss and stand. See note 3.

(vii) Supply of paper towels to mop up any spills of water.

Notes

1. The hot water is to be supplied for each candidate by the Supervisor. The water should be maintained at a temperature as hot as is reasonably and safely possible. Each candidate will require about 300 cm^3 of hot water.

2. Candidates should be warned of the dangers of burns or scalds when using very hot water.

3. The clamp, boss and stand must be set up for the candidates with the thermometer held in the clamp. The candidates must be able to read temperatures up to 100 °C.

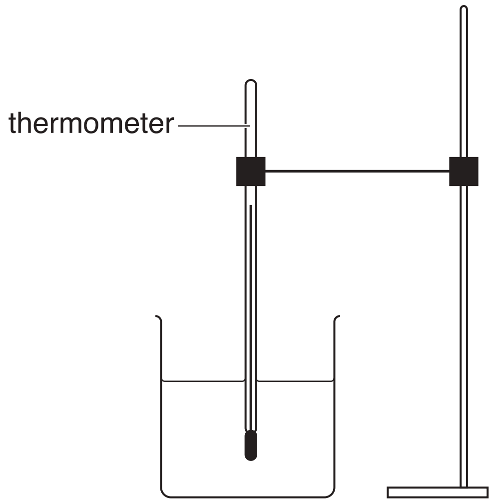

Fig. 2.1

Action at changeover

Empty the beaker and measuring cylinder.

Check the supply of hot water.

Question 3

Items to be supplied by the Centre (per set of apparatus unless otherwise specified)

(i) Converging lens, focal length between 14 cm and 16 cm, with a suitable holder.

(ii) Illuminated object with a triangular hole of height 1.5 cm to 2.0 cm (see Figs. 3.1 and 3.2). The hole is to be covered with thin translucent paper (e.g. tracing paper). See notes 1 and 2.

(iii) Metre rule calibrated in mm.

(iv) Screen. A white sheet of stiff card approximately 15 cm × 15 cm, fixed to a wooden support is suitable. See Fig. 3.3.

(v) Spare lamps should be available.

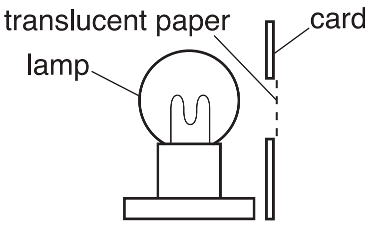

Fig. 3.1

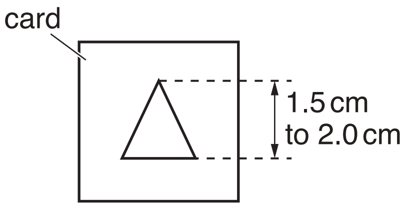

Fig. 3.2

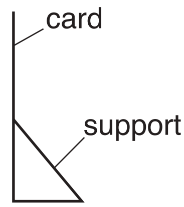

Fig. 3.3

Notes

1. The lamp for the illuminated object should be a low voltage lamp, approximately 24 W or higher power, with a suitable power supply.

2. The centre of the hole which forms the object, the lamp filament and the centre of the lens in its holder are all to be at the same height above the bench.

3. The apparatus is to be situated away from direct sunlight.

Action at changeover

Check that the apparatus is ready for the next candidate.

Question 4

No apparatus is required for this question.

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This form must be completed and returned with the scripts.

SUPERVISOR'S REPORT

General

The Supervisor is required to give details of any difficulties experienced by particular candidates giving their names and candidate numbers. These should include reference to:

(a) difficulties due to faulty apparatus;

(b) accidents to apparatus or materials;

(c) any other information that is likely to assist the Examiner, especially if this cannot be discovered in the scripts;

(d) any help given to a candidate.

Information required

A plan of workbenches, giving details by candidate number of the places occupied by the candidates for each experiment for each session, must be enclosed with the scripts.

The space below can be used for this, or it may be on separate paper.

Information required (cont.)

A list by name and candidate number of candidates requiring help, with details of the help provided.

CENTRE NO. ....

NAME OF CENTRE ....

Declaration (to be signed by the Supervisor)

The preparation of the practical examination has been carried out so as to maintain fully the security of the examination.

SIGNED ....
Supervisor

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/53**

Paper 5 Practical Test **May/June 2018**

CONFIDENTIAL INSTRUCTIONS

Great care should be taken to ensure that any confidential information given does not reach the candidates either directly or indirectly.

If you have any queries regarding these Confidential Instructions, please contact Cambridge stating the Centre number, the nature of the query and the syllabus number quoted above.

e-mail info@cie.org.uk
phone +44 1223 553554
fax +44 1223 553558

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This document consists of **8** printed pages.

DC (ST) 150762/3

Instructions for preparing apparatus

The Supervisor is **not** allowed to consult the Question Paper before the examination. The teacher should, as part of the preparation of the examination requirements, test the apparatus in order to ensure that it is satisfactory.

The Supervisor is asked to give (and attach to the Supervisor's Report printed on pages 7 and 8) a *brief* description of the apparatus supplied, mentioning any points that are likely to be of importance to the Examiner in marking the answers. The Supervisor should also report any assistance given to candidates. All reports should be signed by the Supervisor.

In addition to the usual equipment of a physics laboratory, each candidate will require the apparatus specified in these Confidential Instructions. If a candidate breaks any of the apparatus, or loses any of the material supplied, the matter should be rectified and a note made in the Supervisor's Report.

Number of sets of apparatus

As a *minimum*, the number of sets of apparatus provided should be $N/3$, where N is the number of candidates (per session). A few spare sets should, preferably, be available to avoid any candidate being delayed when moving to another question.

The order in which a given candidate attempts the four questions is immaterial. It is suggested that candidates spend **about 20 minutes on each of questions 1 to 3, and about 15 minutes on question 4**.

Assistance to candidates

The purpose of the Physics Practical Test is to find out whether the candidates can carry out simple practical work themselves. The Examiners are aware that candidates may sometimes be unable to show their practical ability through failure to understand some point in the theory of the experiment. If an Examiner were present in the laboratory, he/she would be willing to give a hint to enable such a candidate to get on with an experiment. In order to overcome this difficulty, the Supervisor is asked to co-operate with the Examiners to the extent of being ready to give (or allow the physics teacher to give) a hint to a candidate who is unable to proceed.

The following regulations must be strictly adhered to.

(i) No hint may be announced to the candidates as a whole.

(ii) A candidate who is unable to proceed and requires assistance must come up to the Supervisor and state the difficulty. Candidates should be told that the Examiners will be informed of any assistance given in this way.

(iii) A report must be made of any assistance given to a candidate, with the name and candidate number of the candidate.

It is suggested that the following announcement be made to the candidates.

'The Examiners do not want you to waste time through inability to get on with an experiment. Any candidate, therefore, who is unable to get on with the experiment after spending five minutes at it may come to me and ask for help. I shall report to the Examiners any help given in this way, and some marks may be lost for the help given. You may ask me for additional apparatus which you think would improve the accuracy of your experiments, and you should say, on your script, how you use any such apparatus supplied.'

Question 1

Items to be supplied by the Centre (per set of apparatus unless otherwise specified)

(i) 250 cm^3 beaker. See notes 1 and 3.

(ii) Two lids to fit the beaker, labelled **A** and **B**. See note 2.

(iii) Thermometer: –10 °C to 110 °C, graduated in 1 °C intervals. See note 1.

(iv) Clamp, boss and stand. See note 1.

(v) Stopclock or stopwatch or wall-mounted clock showing seconds. Candidates will be required to take readings at 30-second intervals. They may use their own wristwatches. The question will refer to a stopclock.

(vi) Supply of hot water. See notes 4 and 5.

(vii) Paper towels to soak up any water spillages.

Notes

1. The thermometer, clamp, boss and stand are to be set up for candidates as shown in Fig. 1.1. The thermometer bulb must be well below the 100 cm^3 level of the beaker.
Candidates must be able easily and safely to read temperatures up to 100 °C and to move the thermometer in and out of the beaker.

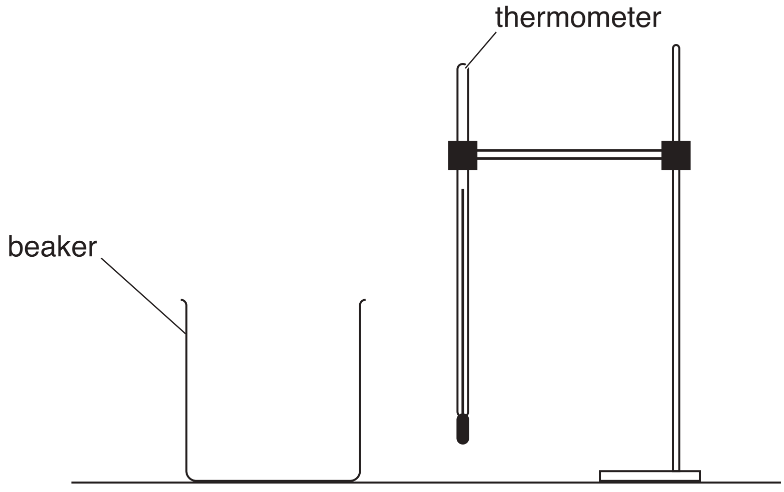

Fig. 1.1

2. Thin cardboard is a suitable material for the lids.
Lid **A** and lid **B** must be cut to shape as shown in Fig. 1.2 and Fig. 1.3. They must each be stable when partly covering the beaker as shown.

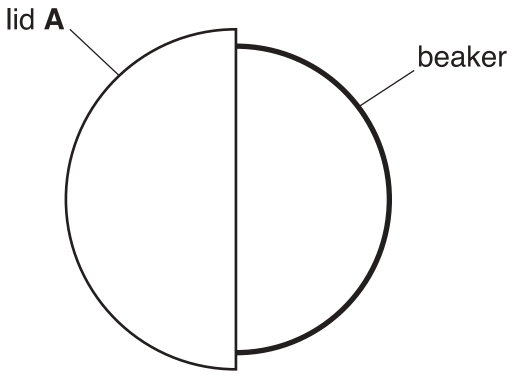

Fig. 1.2

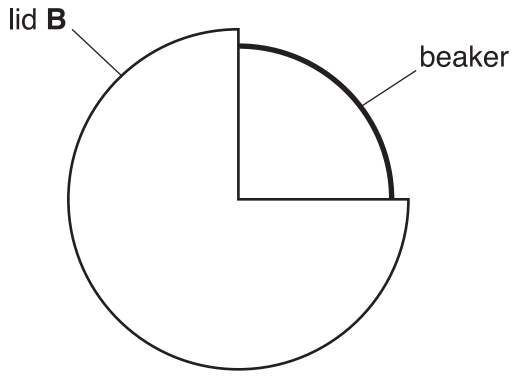

Fig. 1.3

3. If the beaker does not have volume markings, the 100 cm^3 level must be indicated.

4. Hot water is to be available for each candidate throughout the experiment. The hot water should be maintained at an approximately constant temperature between 80 °C and 90 °C. Each candidate will require about 250 cm^3 of hot water in total.
They must be able to pour hot water into the beakers safely. Candidates will need to dispose of hot water during the experiment.

5. Candidates should be warned of the dangers of burns and scalds when using very hot water.

Action at changeover

Empty the water from the beaker. Check that the apparatus is intact and is arranged as in Fig. 1.1.
Spare lids, labelled **A** and **B**, must be available.

Question 2

Items to be supplied by the Centre (per set of apparatus unless otherwise specified)

(i) One 2 W resistor approximately 2 Ω, labelled ‘fixed resistor’. See note 2.

(ii) Three 2 W resistors, approximately 1 Ω, 3 Ω and 10 Ω, labelled **X**, **Y** and **Z** respectively. See notes 1 and 2.

(iii) Power supply of approximately 2 V – 3 V. See note 3.
Where candidates are provided with a variable power supply, the voltage should be set by the Supervisor and fixed, e.g. taped.

(iv) Switch. The switch may be an integral part of the power supply.

(v) Sufficient connecting leads to set up the circuit shown in Fig. 2.1.

(vi) Ammeter capable of measuring currents up to 1.00 A with a resolution of at least 0.05 A . See note 4.

(vii) Voltmeter capable of measuring up to 3.0 V with a resolution of at least 0.1 V . See note 4.

Notes

1. These resistors must have suitable terminals so that candidates are able easily and quickly to connect **X**, **Y** and **Z** into the circuit.

2. The circuit is to be set up for candidates as shown in Fig. 2.1. The fixed resistor is to remain in the circuit during the experiment.

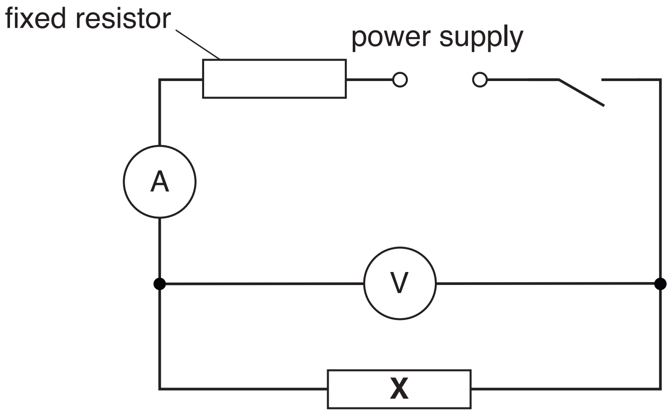

Fig. 2.1

3. If cells are used, they must remain adequately charged throughout the examination. Spare cells must be available.

4. Either analogue or digital meters are suitable. Any variable settings should be set by the Supervisor and fixed, e.g. taped. Spare meters should be available.

Action at changeover

Connect the circuit as shown in Fig. 2.1. Ensure that resistor **X** is connected in the circuit. Check that the circuit is working.
Switch the circuit off.

Question 3

Items to be supplied by the Centre (per set of apparatus unless otherwise specified)

(i) Converging lens of focal length between 14 cm and 16 cm with a suitable holder.

(ii) Metre rule calibrated in mm.

(iii) Illuminated object consisting of rigid card with a triangular hole of height 1.5 cm to 2.0 cm (see Fig. 3.1). The hole is to be covered with thin translucent paper (e.g. tracing paper) secured with adhesive tape. See note 1.

(iv) Plain white screen. A white sheet of stiff card approximately 150 mm × 150 mm, fixed to a wooden support, is suitable (see Fig. 3.2).

(v) 50 cm or 30 cm ruler, graduated in mm. Candidates may use their own.

Notes

1. The lamp used for the illuminated object should be low voltage, 24 W or greater, with a suitable power supply.

2. The lamp filament, the centre of the hole which forms the object and the centre of the lens in its holder must all be the same height above the bench.

3. The apparatus should be situated away from direct sunlight.

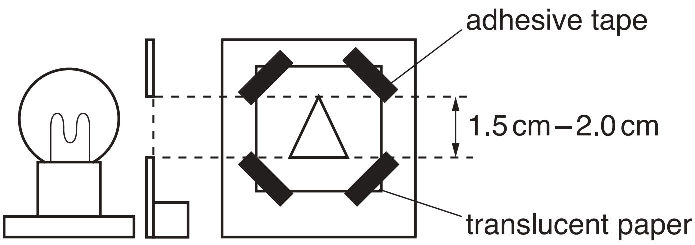

Fig. 3.1

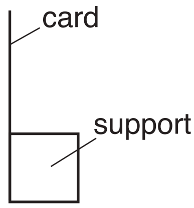

Fig. 3.2

Action at changeover

Check that the apparatus is intact and that the lamp is working.
Replace or re-cover the screen if it has been marked.
Switch off.

Question 4

No apparatus is required for this question.

This form must be completed and returned with the scripts.

SUPERVISOR'S REPORT

General

The Supervisor is required to give details of any difficulties experienced by particular candidates giving their names and candidate numbers. These should include reference to:

(a) difficulties due to faulty apparatus;

(b) accidents to apparatus or materials;

(c) any other information that is likely to assist the Examiner, especially if this cannot be discovered in the scripts;

(d) any help given to a candidate.

Information required

A plan of workbenches, giving details by candidate number of the places occupied by the candidates for each experiment for each session, must be enclosed with the scripts.

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Information required (cont.)

A list by name and candidate number of candidates requiring help, with details of the help provided.

CENTRE NO. ....

NAME OF CENTRE ....

Declaration (to be signed by the Supervisor)

The preparation of the practical examination has been carried out so as to maintain fully the security of the examination.

SIGNED ....
Supervisor

Cambridge Assessment International Education

Grade thresholds – June 2018

Cambridge IGCSE™ Physics (0625)

Grade thresholds taken for Syllabus 0625 (Physics) in the June 2018 examination.

	maximum raw mark available	minimum raw mark required for grade:						
		A	B	C	D	E	F	G
Component 11	40	–	–	23	20	17	15	13
Component 12	40	–	–	25	21	17	15	13
Component 13	40	–	–	24	21	18	15	12
Component 21	40	27	23	20	18	16	14	12
Component 22	40	28	24	20	18	16	13	10
Component 23	40	28	25	22	19	16	13	10
Component 31	80	–	–	47	40	33	26	19
Component 32	80	–	–	41	35	28	20	12
Component 33	80	–	–	43	35	26	19	12
Component 41	80	46	34	22	19	16	13	10
Component 42	80	50	39	29	23	18	14	10
Component 43	80	44	33	23	19	14	10	6
Component 51	40	25	22	19	16	14	11	8
Component 52	40	28	25	23	20	17	14	11
Component 53	40	26	23	20	17	15	12	9
Component 61	40	28	24	21	18	16	12	8
Component 62	40	28	25	22	19	16	13	10
Component 63	40	25	21	18	15	13	10	7

Grade A* does not exist at the level of an individual component.

The maximum total mark for this syllabus, after weighting has been applied, is **200**.

The overall thresholds for the different grades were set as follows.

Option	Combination of Components	A*	A	B	C	D	E	F	G
BX	21, 41, 51	143	121	99	77	67	58	48	38
BY	22, 42, 52	152	131	110	89	76	64	51	38
BZ	23, 43, 53	141	121	101	82	69	57	44	31
CX	21, 41, 61	147	124	101	79	69	60	49	38

Grade thresholds continued
Cambridge IGCSE Physics (0625)

Option	Combination of Components	A*	A	B	C	D	E	F	G
CY	22, 42, 62	153	131	109	88	75	63	50	37
CZ	23, 43, 63	140	120	100	80	67	55	42	29
FX	11, 31, 51	–	–	–	112	96	81	66	51
FY	12, 32, 52	–	–	–	112	95	78	62	46
FZ	13, 33, 53	–	–	–	110	92	75	58	41
GX	11, 31, 61	–	–	–	114	98	83	67	51
GY	12, 32, 62	–	–	–	111	94	77	61	45
GZ	13, 33, 63	–	–	–	108	90	73	56	39

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PHYSICS **0625/11**

Paper 1 Multiple Choice (Core) **May/June 2018**

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination.

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Question	Answer	Marks
1	A	**1**
2	D	**1**
3	C	**1**
4	B	**1**
5	D	**1**
6	C	**1**
7	A	**1**
8	B	**1**
9	D	**1**
10	D	**1**
11	A	**1**
12	C	**1**
13	D	**1**
14	C	**1**
15	A	**1**
16	C	**1**
17	B	**1**
18	B	**1**
19	B	**1**
20	B	**1**
21	A	**1**
22	B	**1**
23	A	**1**
24	A	**1**
25	B	**1**
26	D	**1**
27	C	**1**
28	B	**1**

Question	Answer	Marks
29	A	**1**
30	C	**1**
31	C	**1**
32	D	**1**
33	D	**1**
34	B	**1**
35	C	**1**
36	C	**1**
37	D	**1**
38	D	**1**
39	C	**1**
40	C	**1**

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/12**

Paper 1 Multiple Choice (Core) **May/June 2018**

MARK SCHEME

Maximum Mark: 40

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This document consists of **3** printed pages.

Question	Answer	Marks
1	A	**1**
2	B	**1**
3	C	**1**
4	C	**1**
5	D	**1**
6	A	**1**
7	B	**1**
8	B	**1**
9	D	**1**
10	D	**1**
11	C	**1**
12	B	**1**
13	B	**1**
14	D	**1**
15	D	**1**
16	B	**1**
17	B	**1**
18	D	**1**
19	B	**1**
20	B	**1**
21	C	**1**
22	A	**1**
23	C	**1**
24	B	**1**
25	D	**1**
26	C	**1**
27	B	**1**
28	C	**1**

Question	Answer	Marks
29	C	**1**
30	D	**1**
31	D	**1**
32	D	**1**
33	B	**1**
34	A	**1**
35	A	**1**
36	C	**1**
37	D	**1**
38	B	**1**
39	A	**1**
40	B	**1**

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/13**

Paper 1 Multiple Choice (Core) **May/June 2018**

MARK SCHEME

Maximum Mark: 40

Published

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Question	Answer	Marks
1	A	**1**
2	D	**1**
3	C	**1**
4	B	**1**
5	B	**1**
6	B	**1**
7	D	**1**
8	B	**1**
9	C	**1**
10	B	**1**
11	A	**1**
12	D	**1**
13	B	**1**
14	B	**1**
15	B	**1**
16	C	**1**
17	B	**1**
18	C	**1**
19	B	**1**
20	D	**1**
21	A	**1**
22	A	**1**
23	B	**1**
24	C	**1**
25	D	**1**
26	C	**1**
27	B	**1**
28	C	**1**

Question	Answer	Marks
29	C	**1**
30	B	**1**
31	B	**1**
32	D	**1**
33	B	**1**
34	C	**1**
35	B	**1**
36	C	**1**
37	D	**1**
38	C	**1**
39	A	**1**
40	B	**1**

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/21**

Paper 2 Multiple Choice (Extended) **May/June 2018**

MARK SCHEME

Maximum Mark: 40

Published

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Question	Answer	Marks
1	A	**1**
2	C	**1**
3	D	**1**
4	B	**1**
5	A	**1**
6	A	**1**
7	B	**1**
8	B	**1**
9	C	**1**
10	C	**1**
11	C	**1**
12	C	**1**
13	D	**1**
14	D	**1**
15	B	**1**
16	B	**1**
17	C	**1**
18	B	**1**
19	D	**1**
20	B	**1**
21	A	**1**
22	D	**1**
23	A	**1**
24	D	**1**
25	C	**1**
26	B	**1**
27	C	**1**
28	C	**1**

Question	Answer	Marks
29	D	**1**
30	B	**1**
31	D	**1**
32	B	**1**
33	B	**1**
34	C	**1**
35	A	**1**
36	A	**1**
37	D	**1**
38	D	**1**
39	C	**1**
40	A	**1**

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PHYSICS **0625/22**

Paper 2 Multiple Choice (Extended) **May/June 2018**

MARK SCHEME

Maximum Mark: 40

Published

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Question	Answer	Marks
1	A	**1**
2	C	**1**
3	B	**1**
4	C	**1**
5	D	**1**
6	C	**1**
7	D	**1**
8	B	**1**
9	C	**1**
10	D	**1**
11	D	**1**
12	C	**1**
13	B	**1**
14	D	**1**
15	B	**1**
16	B	**1**
17	B	**1**
18	D	**1**
19	B	**1**
20	D	**1**
21	A	**1**
22	A	**1**
23	A	**1**
24	D	**1**
25	C	**1**
26	B	**1**
27	B	**1**
28	C	**1**

Question	Answer	Marks
29	D	**1**
30	B	**1**
31	D	**1**
32	B	**1**
33	D	**1**
34	A	**1**
35	A	**1**
36	A	**1**
37	D	**1**
38	D	**1**
39	A	**1**
40	A	**1**

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/23**

Paper 2 Multiple Choice (Extended) **May/June 2018**

MARK SCHEME

Maximum Mark: 40

Published

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Question	Answer	Marks
1	A	**1**
2	C	**1**
3	A	**1**
4	B	**1**
5	A	**1**
6	A	**1**
7	B	**1**
8	D	**1**
9	B	**1**
10	B	**1**
11	B	**1**
12	D	**1**
13	B	**1**
14	D	**1**
15	B	**1**
16	C	**1**
17	B	**1**
18	B	**1**
19	B	**1**
20	D	**1**
21	A	**1**
22	A	**1**
23	D	**1**
24	B	**1**
25	C	**1**
26	D	**1**
27	D	**1**
28	C	**1**

Question	Answer	Marks
29	C	**1**
30	C	**1**
31	D	**1**
32	B	**1**
33	A	**1**
34	C	**1**
35	C	**1**
36	C	**1**
37	D	**1**
38	C	**1**
39	D	**1**
40	A	**1**

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Cambridge International General Certificate of Secondary Education

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PHYSICS **0625/31**

Paper 3 Core Theory **May/June 2018**

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks
1(a)	72 (s)	**1**
1(b)	(average speed =) distance ÷ time	**1**
	120 ÷ 54	**1**
	2.2(2) (m / s)	**1**
1(c)	area under line **OR** three areas indicated **OR** (dist =) (av.) speed × time **OR** 1/2 (b + h) × L	**1**
	$\frac{1}{2}\times 3.5\times 4.0$ **OR** 7 (m) seen **OR** 6 × 3.5 OR 21 (m)	**1**
	6 × 3.5 **OR** 21 (m) <u>**AND**</u> {$\frac{1}{2}\times 3.5\times 4.0$ **OR** 7 (m)} **OR** 14 (m)	**1**
	(21 + 14 =) 35 (m)	**1**

Question	Answer	Marks
2(a)(i)	measure mass of empty measuring cylinder/beaker add measured/fixed volume of liquid measure mass of measuring cylinder/beaker and liquid determine mass of liquid (by subtracting mass empty from mass when full) use of D = M/V	**5**
2(a)(ii)	g / cm^3 **OR** kg / m^3	**1**
2(b)(i)	(polythene is) less dense (than water)	**1**
2(b)(ii)	W = m × g in any form **OR** (m =) W ÷ g **OR** 100 g weighs 1 N	**1**
	0.84 ÷ 10 **OR** 100 (g) × 0.84	**1**
	0.084 (kg) **OR** 84 g	**1**

Question	Answer	Marks
3(a)	43.0 + 2.4 = 45.4 (N)	**1**
	(74.2 – 45.4 =) 28.8 (N)	**1**
	upwards	**1**
3(b)		**1**

Question	Answer	Marks
4(a)	Any **four** from: specs/dots (of light) (smoke/air particles) moving (smoke/air particles) randomly (because fast moving) air molecules collide with smoke particles (producing)Brownian motion	**4**
4(b)	evaporate/evaporation	**1**
	high(er) energy/enough energy/fast(er) moving molecules OR molecules with great(er) KE	**1**
	escape (from the water surface)	**1**

Question	Answer	Marks
5(a)	Q S P R	**3**
5(b)	any **one** advantage from: continuous supply/steady supply or reverse argument any **one** disadvantage from: only available in certain areas/thin crust/near geysers or can damage water table OR limited lifespan/rocks can cool	**2**

Question	Answer	Marks
6(a)	(26 – 23 =) 3(°C)	**1**
6(b)	any **three** from: use metal pipe paint black or use black pipe use matt or dull (paint) (place) reflector behind pipe use long(er) pipe use pipe with great(er) surface area slow(er) flow rate (place) glass/(clear) plastic cover over pipe	**3**
6(c)	infra-red (radiation through space/air)	**1**
	conduction <u>through pipe</u>	**1**

Question	Answer	Marks
7(a)(i)	blue between indigo and green	**1**
	yellow between green and orange	**1**
7(a)(ii)	arrow pointing right $\longrightarrow$	**1**
7(b)(i)	ray(s) refracted down at first boundary (air/glass)	**1**
	correct refraction for candidate's ray (in glass prism)	**1**
7(b)(ii)	refraction	**1**

Question	Answer	Marks
8(a)(i)	tape measure	**1**
8(a)(ii)	reflection (of sound)	**1**
8(b)	time for sound to travel to wall and back = 1.0 s	**1**
	340 m in 1.0 s	**1**
	(speed =) 340	**1**
	m / s	**1**

Question	Answer	Marks
9(a)(i)	X-rays between gamma rays and ultraviolet	**1**
	microwaves between infra-red and radio	**1**
9(a)(ii)	ring drawn around radio on Fig.9.1	**1**
9(b)	any **two** from: lead/metal apron (use long) tongs limit (time of) exposure point source away (from you) owtte	**2**

Question	Answer	Marks
10(a)	resistor identified	**1**
10(b)	quantity / unit current NOT amps ignore ammeter / A/amps/amperes	**2**
	quantity / unit potential difference or p.d. or emf / V/volts ignore voltmeter	**2**
10(c)	increasing (length) increases resistance owtte	**1**
	increasing (diameter) decreases resistance owtte	**1**

Question	Answer	Marks
11(a)(i)	cell and switch connected in series with any part of conductor (on Fig.11.1)	**1**
	correct symbols used – (on Fig.11.1)	**1**
11(a)(ii)	circular	**1**
	around conductor/wire	**1**
11(a)(iii)	no change/nothing	**1**
11(b)	conductor/wire between the poles of a magnet	**1**
	opposite poles facing each other	**1**
	current in wire	**1**
	wire moves/Flemings left hand rule indicated	**1**

Question	Answer	Marks
12(a)(i)	α or alpha	**1**
12(a)(ii)	α or alpha	**1**
12(b)(i)	beta or β	**1**
	beta emission would be affected by the thickness of the metal owtte	**1**
12(b)(ii)	(counter) reading higher	**1**
12(b)(iii)	rollers move apart/provide less force/pressure owtte	**1**
12(b)(iv)	38	**1**

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/32**

Paper 3 Core Theory **May/June 2018**

MARK SCHEME

Maximum Mark: 80

Published

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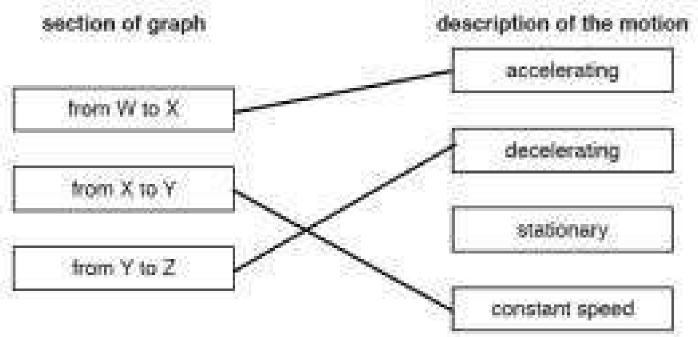
1(a)	 1 mark for each correct line. 2 or more lines from any section loses the mark.	3
1(b)	(distance travelled) = area under graph OR ½ × base × height	1
	½ × 40 × 20	1
	400 (m)	1
1(c)	1st section/WX/from 0 s to 30 s has greater gradient than last (section)/YZ/from 60 s to 100 s	1

Question	Answer	Marks
2(a)	(W =) m × g	**1**
	650 × 8	**1**
	5200 (N)	**1**
2(b)(i)	(volume of log =) 3 × 0.04 = 0.12 (m^3)	**1**
	D = M / V OR (D =) M / V	**1**
	550 (kg / m^3)	**1**
2(b)(ii)	The density of logs is less than density of water owtte.	**1**

Question	Answer	Marks
3(a)(i)	(moment =) force × distance	**1**
	150 × 0.5	**1**
	75	**1**
	N m	**1**
3(a)(ii)	accept any example involving turning forces	**1**
3(b)	increase distance (of force from pivot point)	**1**

Question	Answer	Marks
4(a)(i)	38 (°C)	**1**
4(a)(ii)	2nd box ticked i.e. expansion of liquid	**1**
4(b)	conduction	**1**
4(c)	any **three** from: water is a fluid water molecules gain (kinetic) energy/move faster/further apart water expands/volume increases warm/hot water or molecules rises convection (current created) cooler/cold/water falls/sinks (to be heated again)	**3**
	correct reference to density change of water	**1**

Question	Answer	Marks
5(a)	(focal length =) 5 (cm)	**1**
5(b)(i)	straight line through F and then parallel to PA from centre of lens	**1**
5(b)(ii)	straight line from top of object through centre of lens	**1**
5(b)(iii)	image indicated at point where rays cross	**1**
	arrow drawn inverted on RHS of lens	**1**

Question	Answer	Marks
6(a)	(thermal energy is used) to produce steam	**1**
	steam turns a turbine	**1**
	(turbine) turns a generator	**1**
6(b)	any **two** from: radioactive material/waste produced problems storing waste long half-life of waste/fission products (accidental) leak of nuclear/radioactive material	**2**

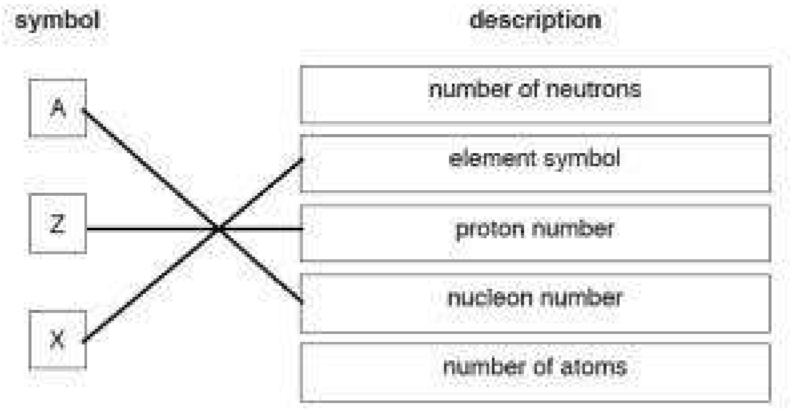
Question	Answer	Marks
7(a)(i)	microwaves	**1**
7(a)(ii)	3.0×10^8 (m / s)	**1**
7(a)(iii)	ultraviolet or X-rays or gamma/γ-rays	**1**
7(b)(i)	X-rays any one from: detecting broken bones/damaged teeth or detecting/treating cancer	**1**
	gamma: any one from: detecting/treating cancer or sterilising (hospital) equipment/food	**1**
7(b)(ii)	any **two** from: ionising radiations/high frequency/high energy (e-m radiation) (may) damage or mutate cells/DNA (may) cause radiation burns	**2**

Question	Answer	Marks
8(a)(i)	vibrates	**1**
8(a)(ii)	longitudinal	**1**
8(a)(iii)	vacuum	**1**
8(b)(i)	1000 (Hz)	**1**
8(b)(ii)	frequency in range 10 001 to 30 000 (Hz)	**1**
8(b)(iii)	lowest frequency heard by humans is 20 Hz	**1**
	(but) elephants can hear frequencies below 20 Hz	**1**
8(b)(iv)	ultrasound	**1**

Question	Answer	Marks
9(a)(i)	top box (electrons) ticked	**1**
9(a)(ii)	12 + 6 seen or 18 (Ω)	**1**
9(a)(iii)	(V =) $I \times R$	**1**
	(V =) $0.50 \times 18(.0)$	**1**
	(V =) 9.0 (V) ecf from **(a)(ii)**	**1**
9(b)	(reading/current) increases	**1**
	(because effective circuit) resistance decreases/resistors in parallel have less resistance	**1**

Question	Answer	Marks
10(a)(i)	second box (The balloon loses electrons) ticked	**1**
10(a)(ii)	positive (charge)	**1**
	like charge(s) repel	**1**
10(b)	circle around copper **AND** silver	**1**

Question	Answer	Marks
11(a)(i)	(Q is the) secondary/output (coil)	**1**
11(a)(ii)	1. (soft–) iron	**1**
	2. core	**1**
11(a)(iii)	magnetic field **OR** e.m.f. **OR** magnet	**1**
	changing **OR** alternating	**1**
11(a)(iv)	EITHER more …**AND** step-down **OR** fewer …**AND** step-up	**1**
11(b)	any **two** from: smaller current (in wires) smaller drop in p.d./voltage (across cables) smaller heating effect less energy wasted/more efficient thinner cables can be used fewer pylons neededl (electricity) can be transmitted over long(er) distances	**2**

Question	Answer	Marks
12(a)	 1 mark for each correct line. 2 or more lines from any section loses the mark.	3
12(b)(i)	18 / 6 or 3 half lives seen or implied	1
	1 / 8 or division by 8	1
	1.5 (mg)	1
12(b)(ii)	any **two** from: high energy/fast-moving electron/negatively charged particle about 2000 times smaller than a proton/neutron	2
12(b)(iii)	any **one** from: new element formed neutron becomes/turns into a proton Z/proton number increases by one neutron number decreases by one	1

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PHYSICS **0625/33**

Paper 3 Core Theory **May/June 2018**

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1(a)	2 : 33 : 65 – 1 : 22 : 15 **OR** 153.65 – 82.15	**1**
	71.50 (s)	**1**
1(b)	4 × 20 **OR** 4000 × 20	**1**
	(average speed =) distance ÷ time	**1**
	80 000 ÷ 1600	**1**
	50 (m / s)	**1**
1(c)(i)	(section) P or from 0 s to 2.5 s	**1**
	(line has) greatest gradient	**1**
1(c)(ii)	dist travelled = area under graph **OR** ½ × b × h	**1**
	½ × 2.5 × 40	**1**
	50 (m)	**1**

Question	Answer	Marks
2(a)	W = m × g	**1**
	50 ÷ 1000 **OR** 0.05 seen	**1**
	0.5 (N)	**1**
2(b)	**any 4** from: fix ruler vertically add weight/hanger to spring fix pin (horizontally) to (top/bottom) of weight hanger pin arranged so near ruler scale ensure load stationary eye level with pin to take reading (of length) determine extension for given load repeat for different loads	**4**

Question	Answer	Marks
3(a)(i)	(D =) m ÷ v in any form	**1**
	120 ÷ 16.0	**1**
	7.50 (g / cm^3)	**1**
3(a)(ii)	10 (m / s^2)	**1**
3(b)(i)	(downward force) weight **AND** (upward force) air resistance/friction/drag	**1**
3(b)(ii)	(1.2 – 0.3 =) 0.9 (N)	**1**

Question	Answer	Marks
4	moment = force × (perp.) distance (from pivot/bracket)	**1**
	25 × 90 or 25 × 0.9	**1**
	2250 or 22.5	**1**
	N cm or N m	**1**

Question	Answer	Marks
5(a)	P = F ÷ A **OR** (F =) P × A in any form	**1**
	20 000 × 0.009	**1**
	1800 (N)	**1**
5(b)	pressure increases	**1**
	any **two** from: molecules move faster/have more ke collide harder/more often (with walls of can) (change in momentum due to) collisions impart(s) force on can walls	**2**

Question	Answer	Marks
6(a)(i)	80 – 56 OR 24(°C)	**1**
6(a)(ii)	20 – 18 or 2(°C)	**1**
6(b)	water hotter (at start)	**1**
	(so) greater temperature difference (between can and surroundings)	**1**
6(c)	(dull) black	**1**
	greater (rate of) loss of thermal energy (from dark colours) **OR** black or it is better radiator/emitter (of thermal energy)	**1**

Question	Answer	Marks
7(a)	(part **A**) radio	**1**
	(part **B**) visible/light	**1**
7(b)	transverse	**1**
7(c)(i)	IR/infra-red	**1**
7(c)(ii)	gamma **OR** γ **OR** X-rays **OR** ultraviolet	**1**

Question	Answer	Marks
8(a)(i)	Longitudinal	**1**
8(a)(ii)	Amplitude	**1**
8(a)(iii)	pitch	**1**
8(b)	frequencies (of sound)	**1**
	above 20 000 Hz	**1**

Question	Answer	Marks
9(a)	Any **two** from: pole of magnet placed on/near steel rod magnet stroked along rod owtte repeat strokes same direction	**2**
9(b)	place pole of rod next to a known magnet	**1**
	like poles repel	**1**
9(c)	accept iron loses magnetism easily owtte or reverse argument	**1**

Question	Answer	Marks
10(a)(i)	<u>variable resistor</u>	**1**
	change the current	**1**
10(a)(ii)	Any **three** from: use low value of current measure (and record) current measure (and record) voltage repeat other values (of I and V) plot graph of pd against current (and find gradient) OR use $V = I \times R$	**3**
10(b)(i)	$V = I \times R$ in any form **OR** $(I =) V \div R$	**1**
	$240 \div 21.8$	**1**
	11.0 (A)	**1**
10(b)(ii)	Answer in range 12 to 15 (A)	**1**

Question	Answer	Marks
11(a)	Correctly-drawn magnetic field around coil	**1**
	lines to start and end near coil/tube	**1**
	field line arrows point towards left hand of coil	**1**
11(b)	<u>electromagnet</u>	**1**
11(c)	(when switch S_1 is closed there is a) current in the coil (of wire)	**1**
	(soft) iron (core) becomes magnetised/magnetic field created	**1**
	soft iron armature attracted (to core)	**1**
	contacts/A and B close/(motor) circuit completed/current in motor circuit	**1**

Question	Answer	Marks
12(a)	neutron	**1**
	electron	**1**
12(b)	upper row: 2 in both	**1**
	lower row: 1 in left box **AND** 3 in right box	**1**
12(c)(i)	weak(ly) penetrating	**1**
12(c)(ii)	Any **two** from: absorbed over a short distance large mass high charge highly ionising cause cell mutation/damage DNA (high risk) of developing cancer	**2**

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS	**0625/41**
Paper 4 Extended Theory	**May/June 2018**
MARK SCHEME	
Maximum Mark: 80	

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Question	Answer	Marks
1(a)	Mention of gradient of graph at t = 30 s **OR** tangent drawn at t = 30 s and triangle drawn	**1**
	Acceleration in range 0.30 to 0.45 m/s^2	**1**
1(b)	Acceleration less/at a slower rate	**1**
	Less driving force **OR** greater resistive force/friction/air resistance/drag	**1**
	Resultant force less	**1**
1(c)	Area under graph	**1**
	Distance = (20 × 40) + (½ × 40 × 10) **OR** ½ × (30 + 20) × 40	**1**
	1000 m	**1**

Question	Answer	Marks
2(a)	Chemical (potential energy)	**1**
2(b)(i)	(E =) m × g × h **OR** 32 × 10 × 2.5	**1**
	800 J	**1**
2(b)(ii)	Output power = E ÷ t **OR** 800 ÷ 5.4 **OR** 148.148 (W)	**1**
	Eff. = output (power) ÷ input (power) **OR** $P_{out} \div P_{in}$ **OR** $E_{out} \div E_{in}$ **OR** output power ÷ 0.65 **OR** 148.148 ÷ 0.65 **OR** 800 ÷ 0.65	**1**
	= 230 W	**1**
2(c)	Advantage: not dependent on weather/wind blowing **OR** always available	**1**
	Disadvantage: polluting **OR** CO_2/SO_2/greenhouse gases emitted **OR** leads to global warming **OR** oil must be transported **OR** not renewable **OR** oil will run out/be used up	**1**

Question	Answer	Marks
3(a)(i)	W = (4.8 × 10 =) 48 N	1
3(a)(ii)	(P =) F ÷ A OR 48 ÷ (0.12 × 0.16)	1
	2500 Pa	1
3(b)	Atmospheric pressure (in addition to liquid pressure)	1
3(c)	P = hdg or in words OR (d =) P ÷ hg OR 2500 ÷ (0.32 × 10)	1
	780 kg / m^3	1
	OR d = M ÷ V = 4.8 ÷ (0.12 × 0.16 × 0.32)	(1)
	780 kg / m^3	(1)

Question	Answer	Marks
4(a)(i)	(Molecules) vibrate	1
4(a)(ii)	random/haphazard/in all directions	1
	Any **one** of: with high speed freely zig-zag in straight lines	1
4(b)	(Molecules) collide with walls (of box) **OR** (Molecules) rebound from walls (of box)	1
	Change of momentum (occurs)	1
	force (on walls) = (total) change of momentum per second	1
	Pressure = (total) force ÷ (total) area (of walls)	1

Question	Answer	Marks
5(a)(i)	Refraction **OR** reflection	**1**
5(a)(ii)	If refraction in **(i)** Change or increase or decrease in speed of wave **OR** change of refractive index **OR**	**1**
	If reflection in **(i)** Mention of surface or boundary	**(1)**
5(b)(i)	2 points both labelled F at 3.5 cm either side of optical centre of lens	**1**
5(b)(ii)	Any **two** of: Paraxial ray from tip of O refracted through farther F/3.5 cm Undeviated ray from tip of O through optical centre of lens Ray from tip of O through nearer F refracted paraxially	**2**
	Image/I drawn from intersection of rays to principal axis with indication that image is inverted	**1**
5(b)(iii)	In range 3.6 to 4.1 cm	**1**
5(b)(iv)	(Image is) real **<u>and</u>** light passes through it **OR** can be projected/seen on a screen **OR** refracted rays cross/meet	**1**

Question	Answer	Marks
6(a)(i)	At least 3 circular wavefronts centred on gap extending to at least half of semicircle	**1**
	Same spacing as incident wavefronts	**1**
6(a)(ii)	At least 3 straight, parallel, wavefronts, approximately same length as width of gap	**1**
	Ends of straight lines curving towards but not reaching barrier	**1**
6(b)	Any **four** of: Diagram to show: labelled barrier, incident straight or curved waves Diagram shows appropriately reflected waves Water surface e.g. tank of water/ripple tank/pond/acceptable alternative How waves are produced: e.g., moving end or length of solid rod dipping into surface **OR** small solid object thrown in. Detail of barrier: made of metal, glass or wood fixed in position How observed: by eye, video, film, stroboscope	**4**

Question	Answer	Marks
7(a)	(Metals) contain free/mobile electrons/delocalised electrons	**1**
7(b)(i)	$R \propto L$ **and** $R \propto 1 \div A$ **OR** $R \propto L \div A$ **OR** $R = 16 \times ½ \div 2$ **OR** $R = 16 \div 4$	**1**
	$4.0\ \Omega$	**1**
7(b)(ii)	$1 \div R = (1 \div R_1) + (1 \div R_2)$ **OR** $R = (R_1 \times R_2) \div (R_1 + R_2)$ **OR** $(1 \div R) = (1 \div 4) + (1 \div 16)$ **OR** $(4 \times 16) \div (4 + 16)$	**1**
	$3.2\ \Omega$	**1**
7(c)(i)	3E or $3 \times E$	**1**
7(c)(ii)	$I_B > I_2 > I_1$ (6th box ticked)	**1**

Question	Answer	Marks
8(a)	(Q =) $mc\Delta\theta$ **OR** $200 \times 4.2 \times 22$	**1**
	18000 J	**1**
8(b)	Q = m × L **OR** (L =) Q ÷ m **OR** 18 480 ÷ 60	**1**
	310 J / g	**1**
8(c)	(Thermal) energy/heat transfers from surroundings **OR** into water	**1**

Question	Answer	Marks
9(a)	Would not be effective **OR** No	**1**
	With current on **OR** the (alternating) current should not be switched off	**1**
	Magnet should be withdrawn from the coil	**1**
	OR Magnet would be alternately magnetised in different directions	**(1)**
	Would remain magnetised in the direction occurring at the moment of switching off	**(1)**
9(b)(i)	Coil turns	**1**
	Clockwise/continuously	**1**
	Current (in coil) reverses every half turn/when coil is in vertical position **OR** force on current in a magnetic field	**1**
9(b)(ii)	**1** × (4 × T)	**1**
	2 × (2 × T)	**1**
	3 × (T ÷ 2)	**1**

Question	Answer	Marks
10(a)	To produce an alternating/changing magnetic field	**1**
	so that current/voltage is induced (continuously) in the secondary coil **OR** secondary circuit	**1**
10(b)(i)	$N_s \div N_p = V_s \div V_p$ in any form **OR** $(N_s =)\ N_p \times V_s \div V_p$ **OR** $8000 \times 6 \div 240$	**1**
	200	**1**
10(b)(ii)	$I_pV_p = I_sV_s$ in any form **OR** $(I_p =)\ I_s \times V_s \div V_p$ **OR** $2.0 \times 6 \div 240$	**1**
	0.050 A	**1**
10(b)(iii)	(Number of lamps =) $2 \div 0.05 = 40$	**1**

Question	Answer	Marks
11(a)	Number of protons = 86 and number of electrons = 86	**1**
	Number of neutrons = 136	**1**
11(b)	$^{218}_{84}Po$	**1**
	$+\ ^{4}_{2}\alpha$	**1**
11(c)	7.6 days = 2 half-lives or evidence of two halvings	**1**
	(number of Rn atoms left = $6.4 \times 10^6 \div 4$ =) 1.6×10^6	**1**
	number of α-particles emitted = $(6.4 \times 10^6 - 1.6 \times 10^6 =)\ 4.8 \times 10^6$	**1**

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PHYSICS **0625/42**

Paper 4 Extended Theory **May/June 2018**

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks
1(a)(i)	**1** straight line from (0,0) to (10,50)	**1**
	2 gradient/slope	**1**
1(a)(ii)	$a = \underline{\Delta}v \div \underline{\Delta}t$ in any form **OR** (a=) $\underline{\Delta}v \div \underline{\Delta}t$ **OR** (a =) (9–5) ÷ 10 **OR** 4 ÷ 10	**1**
	(a =) 0.40 m / s^2	**1**
1(b)(i)	straight line down from any point on y-axis to any speed at 100 s	**1**
	from (0,50) to (100,15)	**1**
1(b)(ii)	uses area <u>under</u> graph **OR** av speed × time **OR** $s=ut + ½ at^2$ **OR** $v^2=u^2 + 2as$	**1**
	100 × (50 + 15) ÷ 2 **OR** 100 × 15 + ½ (100 × 35) **OR** 5000 – ½ × 0.35 × 100^2	**1**
	3300 m	**1**

Question	Answer	Marks
2(a)	average/overall/combined density (of the metal and air contained) less (than density of sea water)	**1**
2(b)	(P =) $h \times \rho \times g$ **OR** (V=) $A \times l$ in any form	**1**
	(P= 1.2 × 1020 × 10 =) 12 000 (Pa) **OR** (V= 0.8 × 1.2 =) 0.96 (m^3)	**1**
	$P = F \div A$ **OR** (F =) $P \times A$ **OR** (W =) $V \times \rho \times g$	**1**
	(F = 12240 × 0.80 =) 9800 N **OR** ($F = W$ =) 9800 N	**1**
2(c)	same numerical answer as **(b)**	**1**
	resultant/net (vertical) force = 0 **OR** downward force = upward force **OR** forces are balanced	**1**

Question	Answer	Marks
3(a)	(KE =) $\frac{1}{2} \times m \times v^2$	**1**
	(KE =) ½ × 9500 × 75^2	**1**
	(KE =) 2.7×10^7 J	**1**
3(b)	$KE = F \times l$ **OR** (F =)$KE \div l$ **OR** (F =) $2.671875 \times 10^7 \times 150$ **OR** $v^2 - u^2 = 2ax$ **OR** (a =) $v^2 - u^2 \div (2 \times x)$ **OR** (a =) $75^2 \div (2 \times 150) = 18.75$	**1**
	(F =) 1.8×10^5 N **OR** ((F =) $m \times a = 9500 \times 18.75$) = 1.8×10^5 N	**1**

Question	Answer	Marks
4(a)(i)	atoms drawn close to each other and in rows	**1**
4(a)(ii)	atoms drawn far apart and randomly positioned	**1**
4(b)(i)	(atoms) vibrate/oscillate	**1**
4(b)(ii)	attractive forces between atoms/molecules (in the rock) **OR** energy/work to separate atoms/molecules	**1**
	force (applied must be large enough) to overcome forces between atoms/molecules **OR** work/energy (large) enough to separate atoms/molecules	**1**
4(c)	helium spreads/diffuses/moves freely/collides with air (molecules)	**1**
	the helium atoms travel in all directions/randomly/at high speed	**1**
	OR helium rises	**(1)**
	helium has low density **OR** He atoms high speed	**(1)**

Question	Answer	Marks
5	diagram shows cans placed near heater	**1**
	put thermometers in water **AND** observe readings	**1**
	good detail e.g. cans equal distances from heater same water volumes/levels thermometers same positions in cans	**1**
	higher thermometer reading in black (painted) can **OR** black (surface) good/best/better absorber	**1**

Question	Answer	Marks
6(a)	frequency 35 000 Hz ringed	**1**
	longitudinal ringed	**1**
6(b)	$v = f\lambda$ **OR** $(\lambda =)\ v \div f$	**1**
	$(\lambda =)\ 3 \times 10^{8} \div 1.3 \times 10^{17}$	**1**
	$(\lambda =)\ 2.3 \times 10^{-9}$ m	**1**
6(c)	X-rays ionising/harmful/dangerous (to humans)	**1**
	Any **one** from: patient rarely exposed low total dose on patient meaningful comment about benefit outweighs danger dentist frequently exposed total dose on dentist would be high if stayed in room	**1**
6(d)	microwaves harmful/dangerous (to humans)	**1**
	microwaves would pass through open door	**1**

Question	Answer	Marks
7(a)	(speed/it) decreases	**1**
	refractive index > 1.0 **OR** sin (*i*) > sin (*r*) **OR** $i > r$ **OR** refraction/bends towards normal **OR** $n_p > n_w$ **OR** sin (*i*) ÷ sin (*r*) = $c_w \div c_p$	**1**
7(b)(i)	paraxial ray refracts through F_2	**1**
	other ray continues undeviated	**1**
7(b)(ii)	candidate's rays from **(b)(i)** traced back to intersection	**1**
	image marked from intersection of candidate's rays to axis	**1**
7(b)(iii)	in range 2.7 cm to 3.3 cm **AND** rays converge to the left of the object	**1**
7(b)(iv)	virtual **AND** light does not pass through image/cannot be projected on to a screen **OR** object distance < f **OR** on left of object	**1**

Question	Answer	Marks
8(a)(i)	variable resistor **OR** rheostat	**1**
8(a)(ii)	voltmeter symbol correctly connected across 20 Ω resistor	**1**
8(b)	$(I =) V \div R$ **OR** 6.0 ÷ 20 **OR** (any value < 6.0) ÷ 20	**1**
	correct calculation of I for V>0 accept point on graph with correct co-ordinates, apart from the origin	**1**
	straight line from (0,0) to (6.0,0.30) tolerance within ½ small square	**1**
8(c)(i)	(combined resistance) less (than the resistance of either/smaller resistor)	**1**
8(c)(ii)	steeper **OR** gradient greater **OR** description of how the line differs (e.g. reaches 0.40 A before V reaches 6.0 V) ignore 2nd line above 1st line	**1**

Question	Answer	Marks
9(a)(i)	forces on AB and CD in opposite (vertical) directions	1
9(a)(ii)	Column 2 increased by factor 3 Box 6	1
	Column 3 increased by factor 3 Box 6	1
	Column 4 decreased by factor 2 Box 3	1
9(b)(i)	deflects **OR** shows I/V/p.d.	1
	returns to zero	1
9(b)(ii)	produces/changes magnetic field	1
	S pole at bottom **OR** magnetic field opposes motion/(magnetic) field of magnet	1

Question	Answer	Marks
10(a)(i)	electrons/–ve charges (in metal) <u>move</u> o.w.t.t.e. to top half/move up	1
10(a)(ii)	more –ve charges in top half than bottom **OR** more +ve charges in bottom half than top NOT if contradiction e.g. more +ve in top and more –ve in top	1
10(a)(iii)	helps (keep plastic sheet in place)/yes	1
	unlike charges attract **OR** attractive force between metal plate and plastic sheet	1
10(b)	**1** both threads angled away from other ball	1
	2 like/same/positive charges <u>repel</u>	1

Question	Answer	Marks
11(a)	^{231}Th	**1**
	$_{90}Th$	**1**
11(b)(i)	splitting of a nucleus into (2) parts/light(er)nucleus	**1**
11(b)(ii)	(fission involves production of) ionising radiation **OR** radiation dangerous/harmful (to humans)	**1**
	(thick concrete walls) absorb/stop the radiation (and so protect workers)	**1**
11(b)(iii)	no CO_2/SO_2/greenhouse gases/acid rain	**1**
	nuclear waste (disposal) **OR** leaks of radioactive material **OR** risk of radiation in case of accident	**1**
11(c)	(52 hours =) 2 half-lives **OR** evidence of 2 halvings	**1**
	(after 52 hours number of thorium atoms left = $4.8 \times 10^9 \div 4$ =) 1.2×10^9 **OR** (number of thorium atoms decayed =) $\frac{3}{4} \times 4.8 \times 10^9$	**1**
	(number of atoms decayed = $4.8 \times 10^9 - 1.2 \times 10^9$) = 3.6×10^9	**1**

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PHYSICS	**0625/43**
Paper 4 Extended Theory	**May/June 2018**
MARK SCHEME	
Maximum Mark: 80	

Published

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Question	Answer	Marks
1(a)	tangent on graph **OR** gradient **OR** (a =) $\Delta v \div \Delta t$ or $(v - u) \div t$	**C1**
	accept gradient increases; **not** gradient decreases	**C1**
	values from tangent or line 13 to 14 m / s^2	**A1**
1(b)(i)	gradient changes **OR** graph is curved	**B1**
1(b)(ii)	mass of space rocket <u>decreases</u> **OR** gravitational field strength decreases	**B1**
1(c)	area under graph **OR** (distance =) <u>average</u> speed × time	**C1**
	4550 × 100 **OR** (4100 + 5000) ÷ 2 × 100	**C1**
	4.5/4.55/4.6 × 10^5 m	**A1**

Question	Answer	Marks
2(a)(i)	(KE =) ½ × m × v^2	**C1**
	½ × 0.020 × 350^2	**C1**
	1200 J	**A1**
2(a)(ii)	(Δh =) $KE \div mg$ **OR** 1200 ÷ (0.020 × 10) **OR** 1225 ÷ (0.020 × 10)	**C1**
	6000/6100 m	**A1**
2(b)(i)	(force of) air resistance acts downwards	**M1**
	adds to gravitational force/resultant force increases/deceleration increases/deceleration > g	**A1**
2(b)(ii)	(kinetic energy) to gravitational potential energy	**B1**
	(kinetic energy) to thermal/internal energy	**B1**

Question	Answer	Marks
3(a)(i)	(p =) $h \times \rho \times g$ or $5.0 \times 1000 \times 10$	**C1**
	50 000 (Pa)	**C1**
	(total pressure = 50 000 + 1.0×10^5 =) 1.5×10^5 Pa	**A1**
3(a)(ii)	1.5×10^5 Pa	**B1**
3(b)	(rises because) density of gas is less than density of **OR** resultant upward force on bubble	**B1**
	(as bubble rises) pressure (of gas in bubble) decreases	**B1**
	(volume of bubble increases because) $p \times V$ = constant **OR** $V \propto 1 \div p$	**B1**

Question	Answer	Marks
4(a)	more energetic molecules escape/evaporate	**B1**
	less energetic molecules remain	**B1**
	average <u>kinetic</u> energy of molecules decreases **OR** temperature depends on <u>kinetic</u> energy	**B1**
4(b)	convection	**B1**
	surface/colder water more dense **OR** contracts	**B1**
	(cold water) sinks **OR** warmer water rises	**B1**
4(c)(i)1	difference between the maximum temperature and minimum temperature it can measure	**B1**
4(c)(i)2	distance moved by the thread per °C **OR** per unit temperature change	**B1**
4(c)(ii)	(range) increases **and** less expansion/increase in volume (of mercury per unit temperature rise)	**B1**

Question	Answer	Marks
5(a)(i)	path shows three or more straight line sections	**B1**
	with sudden changes of direction **and** at least two different lengths	**B1**
5(a)(ii)	air molecules travelling in random (directions)	**B1**
	collide with the smoke particle	**B1**
5(b)	(average) speed of the molecules decreases	**B1**
	molecules collide less often (on the piston and the walls of the cylinder)	**B1**
	smaller momentum change molecules (on collision)	**B1**
	piston now has a greater force on its right-hand side **OR** pressure less than atmospheric	**B1**

Question	Answer	Marks
6(a)	attempt at compressions and rarefactions	**B1**
	at least one compression labelled **and** at least one rarefaction labelled	**B1**
	wavelength **and** labelled λ	**B1**
6(b)(i)	(it/frequency remains) constant	**B1**
6(b)(ii)	(it/wavelength) decreases	**B1**
6(c)	320 to 350 m / s	**B1**

Question	Answer	Marks
7(a)	one side of wave(front) slows down before the other side	**B1**
	wave(front) slews around **OR** bends at boundary	**B1**
	bends towards the normal **OR** bends towards the side that slows first	**B1**
7(b)	(n =) $c \div v$ **OR** $(3.0 \times 0^8) \div (1.9 \times 10^8)$	**C1**
	1.6	**A1**

Question	Answer	Marks
8(a)(i)	straight line from tip of O to tip of I	**B1**
	dotted line/lens marked at 3.0 cm from O	**B1**
8(a)(ii)	Any **one** of: paraxial ray from tip of O refracting at lens to tip of I paraxial ray to I from lens **and** ray from O to meet it at lens	**B1**
8(a)(iii)	(focal length) in range 2.2 cm to 2.6 cm	**B1**
8(a)(iv)	real **and** light pass through it/projected on to screen/rays converge	**B1**
8(b)	(focused rays) set fire to curtain	**B1**

Question	Answer	Marks
9(a)	(R =) $V \div I$ **OR** 12 ÷ 0.15	**C1**
	80 Ω	**A1**
9(b)(i)	increases	**B1**
9(b)(ii)	(voltmeter reading) decreases **OR** less p.d. across variable resistor	**B1**
	more p.d. across 20Ω/fixed resistor	**B1**
9(c)(i)	1.5 J of (electrical) energy supplied in driving charge around the circuit	**B1**
	energy per unit charge **OR** per coulomb	**B1**
9(c)(ii)	8	**B1**

Question	Answer	Marks
10(a)(i)	there is a reading **OR** shows I/V/p.d.	**M1**
	then returns to zero/centre	**A1**
10(a)(ii)	S/south-pole at the right-hand end which attracts the magnet	**B1**
	opposes the change (causing the deflection)	**B1**
10(b)(i)	(turns ratio or $N_P \div N_S$ =) $V_P \div V_S$ **OR** 240 ÷ 12	**C1**
	20 **OR** 20 ÷ 1 **OR** 20:1	**A1**
10(b)(ii)	**diode** underlined	**B1**

Question	Answer	Marks
11(a)(i)	β(-particles)	**B1**
11(a)(ii)	α(-particles)	**B1**
11(a)(iii)	γ(-rays)	**B1**
11(b)(i)	downward <u>curve</u>	**B1**
11(b)(ii)	3 (half-lives identified) **OR** 168 ÷ 56	**C1**
	1 ÷ 8 **OR** 9.0×10^5 (Rn) atoms remain	**C1**
	$(7.2 \times 06 - 9.0 \times 105 =)\ 6.3 \times 10^6$ (α-particles emitted)	**A1**

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PHYSICS **0625/51**

Paper 5 Practical Test **May/June 2018**

MARK SCHEME

Maximum Mark: 40

Published

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Question	Answer	Marks
1(a)(i)	t = 13 to 15 (s)	**1**
1(a)(ii)	$T = t / 10$ (s)	**1**
1(a)(iii)	T^2 correct	**1**
	Unit s^2	**1**
1(a)(iv)	g correct calculation from T^2	**1**
1(b)(i)	New set of values present with t value greater than **(a)(i)**	**1**
1(b)(ii)	g in range 8 to 12(m / s^2)	**1**
	both g *(1(a)(iv) and 1(b)(ii))* values 9 to 11(m / s^2)	**1**
1(c)	Use of additional d values **OR** use a larger d value	**1**
	Count more swings	**1**
1(d)	Any **one** from: Perpendicular viewing of rule Counting beginning with zero (owtte) Use of fiducial mark (owtte) Use of set-square or horizontal rule to aid measurement of d Use rule close to/touching the rule Time taken from centre of swing, (not extremities)	**1**

Question	Answer	Marks
2(a)(i)	V_1 to at least 1 dp and < 4 V	**1**
	I to at least 2 dp and < 1 A	**1**
2(a)(ii)	Correct calculation of R_1	**1**
2(b)(i),(ii)	R_2 present within 10% of R_1	**1**
2(c)(i),(ii)	R_3 present **and** V, A, Ω at least once and not contradicted	**1**
2(c)(iii)	R correct **and** to 2 or 3 significant figures	**1**
2(d)	Statement matches readings (Expect YES)	**1**
	Justification to include the idea of within the limits of experimental accuracy (but accept beyond limits, if ecf allowed for statement matching readings)	**1**
2(e)	3 resistors in parallel	**1**
	Correct variable resistor symbol	**1**
	Other symbols **and** circuit correct	**1**

Question	Answer	Marks
3(a)	Table:	
	First *u* 45 to 51 (cm) and first *v* 19 to 25	**1**
	u values > *v* values	**1**
	uv values correct	**1**
3(b)	Graph:	
	Axes correctly labelled and right way round	**1**
	Suitable scales	**1**
	All plots correct to ½ small square	**1**
	Good line judgement, single, thin, continuous line	**1**
3(c)	Triangle method clearly shown on graph	**1**
	Triangle using at least half of candidate's <u>line</u>	**1**
3(d)	Any **two** from: Finding exact position that gives clearest image Measuring to centre of lens Room too bright/lamp too dim	**2**

Question	Answer	Marks
4	Method to include: Hot water in copper can, time taken for temperature to drop	**1**
	Correct use of at least 3 larger outer containers, separately	**1**
	Some indication that size of air gap is measured	**1**
	Any **two** from: Use of something to cover air gap Use of lid on copper can Same starting temperature Same room temperature Same volume of hot water Use of 'control' with no outer container Inner container standing on an insulator Uniform air gap all round	**2**
	Table with clear columns for temperature and / or time (to match method) and air-gap, with appropriate units	**1**
	Conclusion: Least temperature drop **OR** longest time for temperature to drop shows lowest cooling rate **OR** best insulation **OR** plot temperature against time and least gradient shows lowest cooling rate (ora)	**1**

Additional graph notes:

NOTE: The principle to apply here is 'could I draw a significantly better line, using these points, <u>under examination conditions?</u>' If the answer is definitely 'yes', do not award the mark.

NOTE:
- If candidate's scale consists of actual readings at equal intervals this will produce a perfect straight line! The only marks available in this case are the first (axes right way round and labelled) So maximum 1.
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Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/52**

Paper 5 Practical Test **May/June 2018**

MARK SCHEME

Maximum Mark: 40

Published

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Question	Answer	Marks
1(a)(i)	2 or more measurements	**1**
	D_B correct within ± 2 mm	**1**
1(a)(ii)	D_T correct within ± 2 mm	**1**
1(a)(iii)	*D* correct average	**1**
1(b)(i)	*h* sensible in cm	**1**
1(b)(i),(ii)	*V* correct and *V* / 2 correct	**1**
1(c)(i)	*m* recorded	**1**
1(c)(ii)	ρ to 2/3 significant figures	**1**
	Answer in range 0.9 to 1.3	**1**
	g / cm^3 (or equivalent)	**1**
1(d)	Any **one** from: part (a) drawn circle not exact / thickness of rim or cup part (b) height is not length of side of cup / D^2 increases the inaccuracy in *D* part (c) volume measurements only to nearest 1 or 2 cm^3/mass of cup has been ignored	**1**

Question	Answer	Marks
2(a)	sensible value for θ_R <u>with unit</u>	**1**
2(b)	table: correct *t* values	**1**
	temperatures decreasing	**1**
2(c)	graph:	
	axes correctly labelled and right way round	**1**
	suitable scales	**1**
	all plots correct to ½ small square	**1**
	good line judgement, thin, continuous line	**1**
2(d)	horizontal line at θ_R correctly positioned	**1**
2(e)	any **two** from: higher starting temperature use of metal can instead of beaker lower room temperature/cold water bath use of a fan container with a greater surface area/larger beaker	**2**
2(f)	any **one** from: perpendicular viewing of thermometer wait for thermometer to reach θ_{MAX} before reading not allow thermometer to touch sides of beaker	**1**

Question	Answer	Marks
3(a)(i)	v_1 = 45 to 80 (cm)	**1**
3(a)(ii)	value for f in range 14 to 16 (cm)	**1**
3(b)(i)	v_2 = 25 to 35 (cm)	**1**
3(b)(ii)	f_2 correct calculation	**1**
	within 10% of f_1	**1**
3(c)	f to 2 or 3 significant figures	**1**
	unit seen in **(a)**, **(b)** or **(c)** and not contradicted	**1**
3(d)	at least 3 values suggested	**1**
	new values between 20 cm and 70 cm	**1**
3(e)	any **two** from: use of darkened room/brighter lamp mark position of centre of lens on holder place metre rule on bench/clamp in position) ensure object and (centre of) lens are same height from the bench object <u>and</u> lens <u>and</u> screen perpendicular to bench move screen slowly/back and forth to obtain best image	**2**

Question	Answer	Marks
4	method to include:	
	place truck on ramp and (release)	**1**
	measure distance (travelled) from bottom of ramp	**1**
	repeat with different mass(es) (loaded on the same truck)	**1**
	additional apparatus:	
	(metre) rule(r) / measuring tape	**1**
	variables:	
	height/angle of ramp/number of supporting bricks	**1**
	release position/height above bench	**1**
	table with clear columns for mass, and distance travelled, with appropriate units <u>in the headings of the table</u>	**1**

Additional graph notes:

NOTE: The principle to apply here is 'could I draw a significantly better line, using these points, <u>under examination conditions?</u>' If the answer is definitely 'yes', do not award the mark.

NOTE:
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Paper 5 Practical Test **May/June 2018**

MARK SCHEME

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Question	Answer	Marks
1(a)	θ for beaker **A** decreasing	**1**
1(b)(i)	θ for beaker **B** decreasing more slowly	**1**
1(b)(ii)	s, ºC, ºC all correct	**1**
	30, 60, 90, 120, 150, 180	**1**
1(c)(i)	beaker with lid **A** (has a greater rate of cooling)	**1**
	correct mention of comparative temperature change <u>over 0 to 180s</u>	**1**
1(c)(ii)	any suitable change to <u>apparatus</u> relating to comparison e.g. insulate sides / stand on mat use plastic beaker thicker lid use of fan use wider beaker	**1**
	matching explanation e.g. thermal energy only escapes from surface less transfer of thermal energy by sides / bottom less conduction through lid larger surface area (for evaporation to occur)	**1**
1(d)	straight line	**1**
	through the origin	**1**
1(e)	any **one** appropriate factor e.g. volume of water initial temperature of water (same) lids type / material / size of beaker room temperature / appropriate environmental factor	**1**

Question	Answer	Marks
2(a)	I values, all decreasing <u>and</u> all < 1.00 A	**1**
	V values, all increasing <u>and</u> all < 3.0 V	**1**
	I to 2dp at least <u>and</u> V to 1dp at least	**1**
2(b)	A, V	**1**
2(c)	correct calculations of P	**1**
	P for 3Ω > other P values	**1**
	consistent 2 or consistent 3 significant figures	**1**
2(d)	increases (at first)	**1**
	to a maximum / *then* decreases	**1**
2(e)	any **two** additions from: draw a graph; different / more resistors / values of resistance/greater range of values for resistance; use (at least) 5 sets of values for resistance	**2**

Question	Answer	Marks
3(a)	h_O = 1.0 to 2.5 (cm)	**1**
	h_I decreasing	**1**
3(b)	*N* calculations correct	**1**
3(c)	graph:	
	axes labelled correct orientation, with quantity and unit	**1**
	appropriate scales (plots occupying at least ½ grid)	**1**
	plots all correct to ½ small square and precise plots	**1**
	well judged line and thin line	**1**
3(d)	*G* in range 13.0 to 17.0	**1**
	triangle method seen on graph occupying at least half line	**1**
3(e)	any inherent difficulty e.g. hand/ruler in way of image **OR** screen can move (when measuring)	**1**
	matching improvement to apparatus e.g. use translucent screen and view from behind **OR** fix ruler/grid to screen **OR** clamp screen in place	**1**

Question	Answer	Marks
4	Apparatus: forcemeter, (10 g and 100 g) masses/masses only (if clear they are used to change the mass of the block and as weights to the block via the pulley)	**1**
	Diagram: block, workable means of pulling and measuring force	**1**
	Method (2): measure force required to make block slide/find mass (on pulley) required to make block slide	**1**
	repeat for new value of mass	**1**
	Precautions: any **one** from: same surface to slide on/repeat each measurement and take average / same angle of pulling force	**1**
	Graph: mass on block vs force (needed to slide)	**1**
	Any additional point: at least 5 sets of data taken / keep force horizontal / add mass of block to load / extra precaution	**1**

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/61**

Paper 6 Alternative to Practical **May/June 2018**

MARK SCHEME

Maximum Mark: 40

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Question	Answer	Marks
1(a)	d = 5(.0) (cm)	**1**
1(b)(i)	D = 50 (cm)	**1**
1(b)(ii)	t = 14.06	**1**
1(b)(iii)	T = 1.406 (allow ecf from 1(b)(ii): t/10 (s))	**1**
1(b)(iv)	T^2 = 1.98 or 1.99 (allow ecf from 1(b)(iii))	**1**
1(b)(v)	g = 10.1 (allow ecf from 1(b)(iv))	**1**
1(c)(i)	Unit s^2	**1**
1(c)(ii)	g given to 2 or 3 significant figures	**1**
1(d)	Use of additional d values **OR** use a larger d value	**1**
	Count more swings	**1**
1(e)	Any **one** from: Perpendicular viewing of rule Counting beginning with zero (owtte) Use of fiducial mark (owtte) Use of set-square or horizontal rule to aid measurement of d Use rule close to/touching the bob Time taken from centre of swing, (not extremities) Measure length to top and bottom of bob and average Measure string length and add radius of bob measured with callipers or micrometer	**1**

Question	Answer	Marks
2(a)(i)	EITHER V_1 = 2.2 **OR** I = 0.46 correct	**1**
	Both values correct **<u>and</u>** correct units V and A	**1**
2(a)(ii)	R_1 = 4.78 (Ω) (allow ecf from 2(a)(i))	**1**
2(b)	Statement matches readings (Expect YES)	**1**
	Expect justification to include the idea of within the limits of experimental accuracy (but accept beyond limits, if ecf allowed for statement matching readings)	**1**
2(c)	R = 14.3 **OR** 14.4; 2 or 3 significant figures required	**1**
	Unit Ω	**1**
2(d)	$3V_1$	**1**
2(e)	3 resistors in parallel	**1**
	Correct variable resistor symbol	**1**
	Voltmeter symbol correct **and** circuit correct	**1**

Question	Answer	Marks
3(a)	*uv* values 1065, 1128, 1200, 1283, 1353	**1**
3(b)	Graph: (all marks are still available if *uv* values are wrong) Axes correctly labelled and right way round	**1**
	Suitable scales	**1**
	All plots correct to ½ small square	**1**
	Good line judgement, thin, continuous line	**1**
3(c)	Triangle method clearly shown on graph	**1**
	Triangle using at least half of candidate's <u>line</u>	**1**
3(d)	G in range 14.0 to 16.0	**1**
	f = G to 2 or 3 significant figures	**1**
3(e)	Any **two** from: Finding exact position that gives clearest image Measuring to centre of lens Room too bright/lamp too dim/image too faint	**2**

Question	Answer	Marks
4	Method to include: (Hot) water in copper can, time taken for temperature to drop	**1**
	Correct use of at least 3 larger outer containers, separately	**1**
	Some indication that size of air gap is measured	**1**
	Any **two** from: Use of something to cover air gap Use of lid on copper can Same starting temperature Same room temperature Same volume of hot water Use of 'control' with no outer container Inner container standing on an insulator Uniform air gap all round	**2**
	Table with clear columns for temperature and/or time (to match method) and air-gap, with appropriate units	**1**
	Conclusion: Least temperature drop **OR** longest time for temperature to drop shows lowest cooling rate **OR** best insulation **OR** plot temperature against time and least gradient shows lowest cooling rate (ora)	**1**

Cambridge IGCSE

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Cambridge International General Certificate of Secondary Education

PHYSICS **0625/62**

Paper 6 Alternative to Practical **May/June 2018**

MARK SCHEME

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Question	Answer	Marks
1(a)(i)	2 or more <u>measurements</u> seen	**1**
	D_B = 4.8 ± 0.1 (cm)	**1**
1(a)(ii)	D = 6.<u>0</u> (cm)	**1**
1(b)	1 h = 7.8 (cm) **AND** 2 V = 220(.428) (cm^3)	**1**
1(c)	ρ = 1 / 1.1 / 1.05(…….)	**1**
	2 or 3 significant figures	**1**
	g / cm^3	**1**
1(d)	any **one** from: part **(a)** drawn circle not exact / thickness of rim or cup / thickness of the pencil line part **(b)** difficult to measure the height (in practice) / D^2 increases inaccuracy in D part **(c)** mass of cup has been ignored	**1**
1(e)	diagram showing clearly:	
	line of sight perpendicular to measuring cylinder	**1**
	to the bottom of the meniscus	**1**

Question	Answer	Marks
2(a)	θ_R = 23(.0) (°C)	**1**
2(b)(i)	ensure thermometer / bulb / alcohol / mercury has reached the temperature of the water	**1**
2(b)(ii)	s / seconds, °C	**1**
2(b)(iii)	*t* values 30, 60, 90, 120, 150	**1**
2(b)(iv)	graph:	
	axes correctly labelled and right way round	**1**
	suitable scales (scales must start below θ_R)	**1**
	all plots correct to ½ small square	**1**
	good line judgement, thin, continuous line	**1**
2(c)	<u>horizontal line</u> at θ_R correctly positioned	**1**
2(d)	any **two** from: perpendicular viewing of thermometer stir (before taking temperature reading) don't let the thermometer (bulb) touch the sides / bottom of beaker wait for thermometer to reach θ_{MAX} before reading	**2**
2(e)	any **two** from: higher starting temperature / use hotter water use of metal can instead of beaker / metal bench lower room temperature / cold water bath use of a fan container with a greater surface area / larger beaker	**2**

Question	Answer	Marks
3(a)(i)	v = 5.8(0) (cm) / 58 (mm)	**1**
3(a)(ii)	V = 29(.0) (cm)	**1**
3(a)(iii)	f_1 = 11.8(3673) / 12 (cm)	**1**
3(b)	f_A= 12.0 (cm)	**1**
	2 or 3 significant figures	**1**
3(c)	at least 3 new values suggested	**1**
	all new values between 15 cm and 70 cm with at least 5 cm between each value	**1**
3(d)	any **two** from: use of darkened room / brighter lamp mark position of centre of lens on holder place metre rule on bench / clamp in position ensure object and (centre of) lens are same height (from the bench) object <u>and</u> lens <u>and</u> screen perpendicular to bench move screen slowly / back and forth to obtain best image	**2**

Question	Answer	Marks
4	method to include:	
	place truck on ramp (and release)	**1**
	measure distance (travelled) from bottom of ramp	**1**
	repeat with different mass(es) (loaded on the same truck)	**1**
	additional apparatus:	
	(metre) rule(r) / measuring tape	**1**
	control variables:	
	height / angle of ramp / number of supporting bricks	**1**
	release position / height above bench	**1**
	table with clear columns for mass, and distance travelled, with appropriate units <u>in the headings of the table</u>	**1**

Additional graph notes:

NOTE: The principle to apply here is 'could I draw a significantly better line, using these points, <u>under examination conditions?</u>' If the answer is definitely 'yes', do not award the mark.

NOTE:

– If candidate's scale consists of actual readings at equal intervals this will produce a perfect straight line! The only marks available in this case are the first (axes right way round and labelled) So maximum 1.

– If axes are wrong way round, the other 3 marks are still available.

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/63**

Paper 6 Alternative to Practical **May/June 2018**

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks
1(a)	21(.0) (ºC)	**1**
1(b)	s, ºC, ºC all correct	**1**
	30, 60, 90, 120, 150, 180	**1**
1(c)	appropriate precaution e.g. avoidance of parallax (only if explained) / wait until reading stops rising (at start)	**1**
1(d)(i)	beaker with lid **A** (has a greater rate of cooling)	**1**
	correct mention of comparative temperature change <u>over 0 to 180 s</u>	**1**
1(d)(ii)	any suitable change to <u>apparatus</u> relating to comparison e.g. insulate sides / stand on mat use plastic beaker thicker lid use of fan use wider beaker	**1**
	matching explanation e.g. thermal energy only escapes from surface less transfer of thermal energy by sides / bottom less conduction through lid larger surface area (for evaporation to occur)	**1**
1(e)	straight line	**1**
	through the origin	**1**
1(f)	any appropriate factor e.g. volume of water initial temperature of water (same) lids type / material / size of beaker room temperature / appropriate environmental factor	

Question	Answer	Marks
2(a)	correct voltmeter symbol in parallel with **X**	**1**
2(b)(i)	I = 0.86 (A)	**1**
	V = 0.9 (V)	**1**
2(b)(ii)	Ω	**1**
	A, V	**1**
2(c)	correct calculations of P (0.77 / ecf, 0.94, 0.58(W))	**1**
	consistent 2 or consistent 3 significant figures	**1**
2(d)	increases (at first)	**1**
	to a maximum AND *then* decreases	**1**
2(e)	any 2 additions from: draw a graph; different / more resistors / values of resistance / greater range of values for resistance; use (at least) 5 sets of values for resistance	**2**

Question	Answer	Marks
3(a)	h_O = 1.4 (cm)	**1**
3(b)(i)	h_I = 4.5 (cm)	**1**
3(b)(ii)	N = 0.31 / ecf	**1**
3(c)	graph:	
	axes labelled correct orientation, with quantity and unit	**1**
	appropriate scales (plots occupying at least ½ grid)	**1**
	plots all correct to ½ small square and precise plots	**1**
	well judged line and thin line	**1**
3(d)	G in range 14.0 to 17.0	**1**
	triangle method seen on graph occupying at least half line	**1**
3(e)	any inherent difficulty e.g. hand / ruler in way of image **OR** screen can move (when measuring)	**1**
	matching improvement to <u>apparatus</u> e.g. use translucent screen and view from behind **OR** fix ruler / grid to screen **OR** clamp screen in place	**1**

Question	Answer	Marks
4	Apparatus: forcemeter, (10 g and 100 g) masses / masses only (if clear they are used to change the mass of the block and as weights to the block via the pulley)	**1**
	Diagram: block, workable means of pulling and measuring force	**1**
	Method (2): measure force required to make block slide / find mass (on pulley) required to make block slide	**1**
	repeat for new value of mass	**1**
	Precautions: any **one** from: same surface to slide on / repeat each measurement and take average / same angle of pulling force	**1**
	Graph: mass on block vs force (needed to slide)	**1**
	Any additional point: at least 5 sets of data taken / keep force horizontal / add mass of block to load / extra precaution	**1**

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/11**

Paper 1 Multiple Choice (Core) **May/June 2018**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

8871621324

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

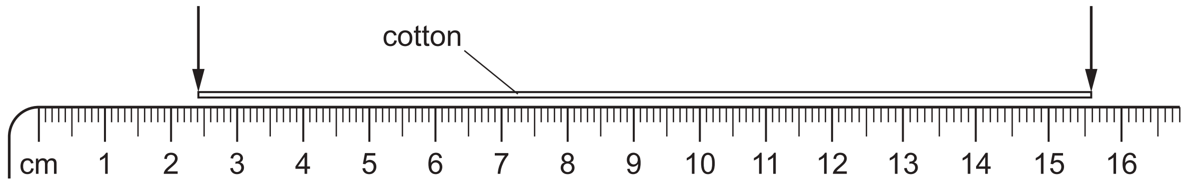
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

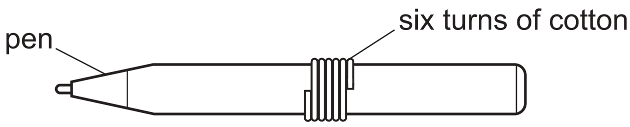
This document consists of **15** printed pages and **1** blank page.

CAMBRIDGE International Examinations

1 A length of cotton is measured between two points on a ruler.



When the length of cotton is wound closely around a pen, it goes round six times.

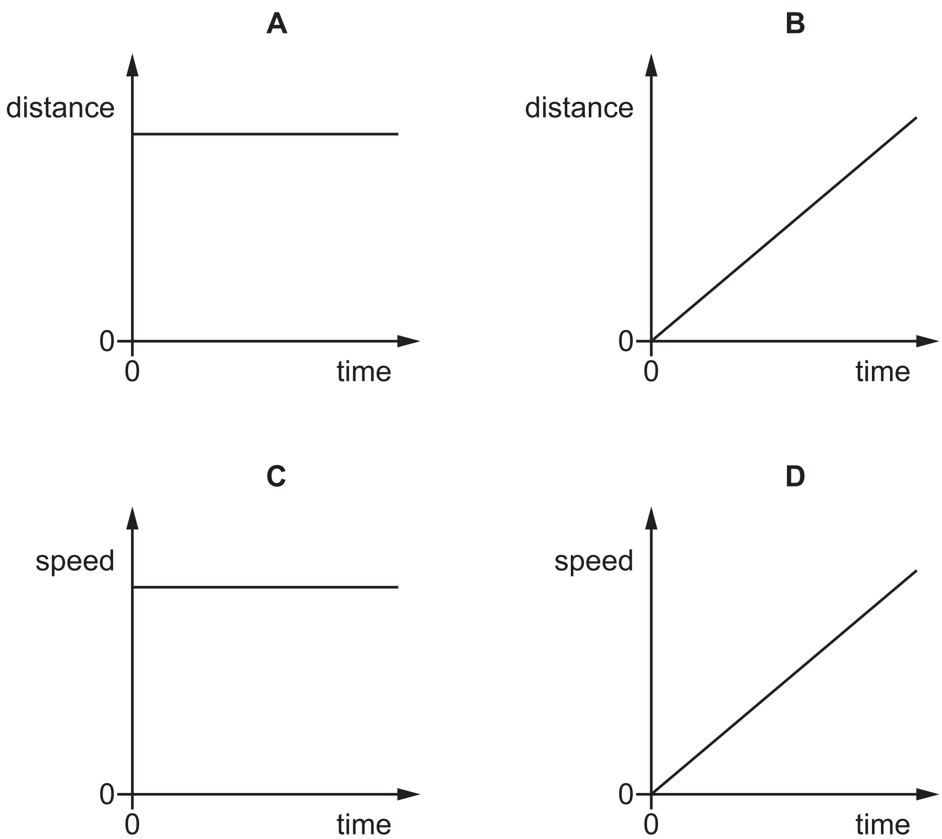


What is the distance once round the pen?

A 2.2 cm **B** 2.6 cm **C** 13.2 cm **D** 15.6 cm

2 A car is moving along a straight, level road, with a constant acceleration.

Which graph shows the motion of the car?



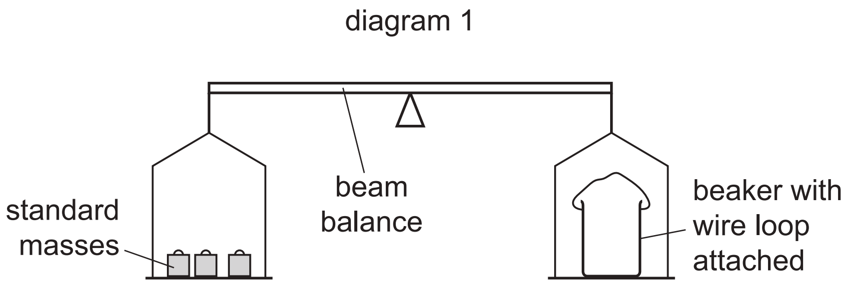
3 A car takes 15 minutes to travel along a road that is 20 km long.

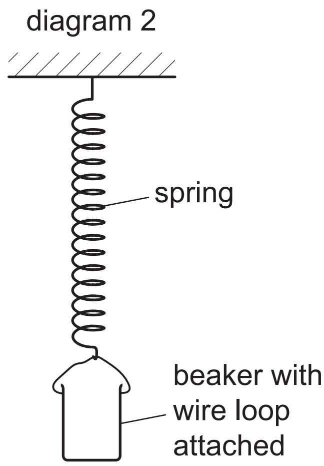
What is the average speed of the car?

A 0.75 km / h **B** 5.0 km / h **C** 80 km / h **D** 300 km / h

4 Diagram 1 shows a beam balance. A beaker with a wire loop balances the standard masses.

The beaker is then removed and hung from a spring. The spring extends by 5.0 cm, as in diagram 2.





The experiment is repeated with the same apparatus on the Moon, where the acceleration of free fall is less than on Earth.

Which statement describes what happens on the Moon?

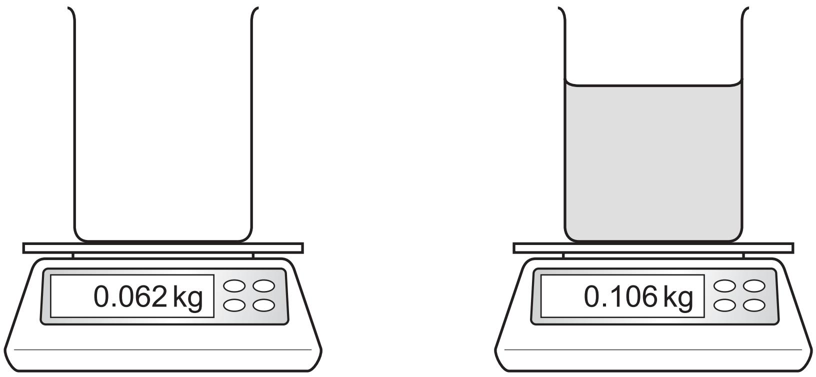
A The beam balance is balanced and the spring extends by 5.0 cm.

B The beam balance is balanced and the spring extends by less than 5.0 cm.

C The right-hand balance pan is higher and the spring extends by 5.0 cm.

D The right-hand balance pan is higher and the spring extends by less than 5.0 cm.

5 An empty beaker is placed on a top-pan balance. Some water is now poured into the beaker.

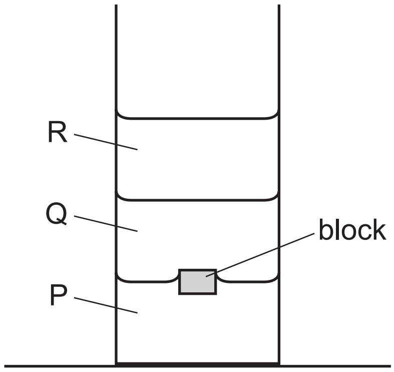


empty beaker　　beaker + water

What is the weight of the water?

A 0.044 kg　　**B** 0.168 kg　　**C** 0.0044 N　　**D** 0.44 N

6 Three liquids P, Q and R have different densities and do not mix. The liquids are placed in a measuring cylinder and allowed to settle. A small block is then dropped into the measuring cylinder and comes to rest, as shown.



Which statement about the density of the block is correct?

A It is equal to the density of Q.

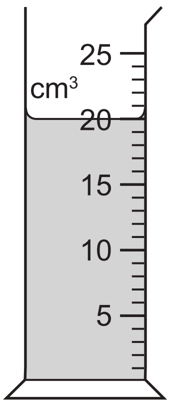
B It is greater than the density of P.

C It is greater than the density of R.

D It is less than the density of Q.

7 The diagram shows some liquid in a measuring cylinder.

The mass of the liquid is 16 g.



What is the density of the liquid?

A 0.80 g / cm^3 **B** 1.25 g / cm^3 **C** 36 g / cm^3 **D** 320 g / cm^3

8 A car is moving in a straight line on a level road. Its engine provides a forward force on the car. A second force of equal size acts on the car due to resistive forces.

Which statement describes what happens?

A The car changes direction.

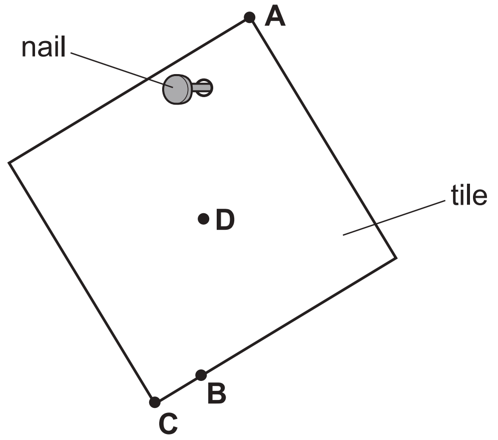
B The car moves at a constant speed.

C The car slows down.

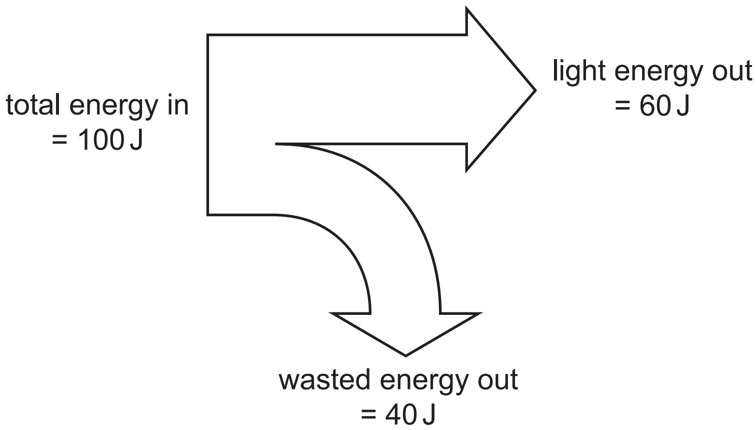
D The car speeds up.

9 A hole is drilled in a square tile. The diagram shows the tile hanging freely on a nail.

Where is the centre of mass of the tile?



10 The diagram shows the energy transferred in a lamp in one second.



Which type of wasted energy is produced by the lamp?

A chemical potential energy

B electrical energy

C gravitational potential energy

D thermal energy

11 Which energy resource is **not** renewable?

A fossil fuel

B sunlight

C tides

D wind

12 A student does work by pulling a box across a horizontal floor.

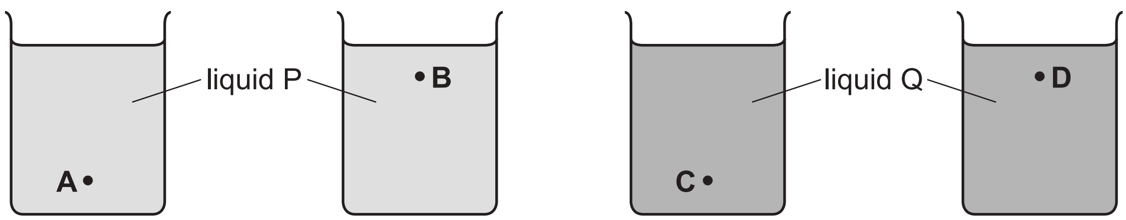
She now pulls a second box along the same floor.

Which row indicates that the student is now doing twice as much work?

	force used to pull box	distance the box is pulled
A	is doubled	is doubled
B	is doubled	is halved
C	stays the same	is doubled
D	stays the same	is halved

13 Four identical beakers are filled with equal volumes of liquids P or Q, as shown. Liquid P is more dense than liquid Q.

At which point is the pressure the least?



14 A woman has a weight of 600 N. She stands on a horizontal floor. The area of her feet in contact with the floor is $0.050\,m^2$.

What is the pressure she exerts on the floor?

A $1.2 \times 10^3\,N/m^2$

B $2.4 \times 10^3\,N/m^2$

C $1.2 \times 10^4\,N/m^2$

D $2.4 \times 10^4\,N/m^2$

15 On a warm day, a carton of fresh milk is covered with a wet cloth.

Why does this help to reduce the temperature of the milk?

A Some water evaporates from the cloth so the remaining water becomes cooler.

B The water has a very high thermal capacity.

C The water insulates the milk from the warm air around it.

D Water is always colder than the air around it.

16 Air is trapped in a cylinder by a piston.

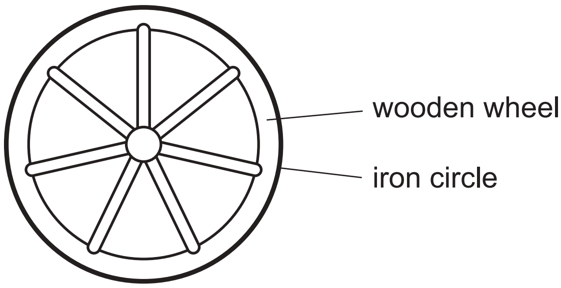
The piston is pushed inwards and the volume of the air is reduced.

The temperature of the trapped air remains constant.

Which row describes how the average speed of the air molecules and the average distance between them changes?

	average speed of molecules	average distance between molecules
A	increases	decreases
B	increases	unchanged
C	unchanged	decreases
D	unchanged	increases

17 A wooden wheel can be strengthened by putting a tight circle of iron around it.



Which action would make it easier to fit the circle over the wood?

A cooling the iron circle

B heating the iron circle

C heating the wooden wheel and cooling the iron circle

D heating the wooden wheel but not heating or cooling the iron circle

18 A student wishes to calibrate a mercury-in-glass thermometer with a °C scale.

Which values should she use for the lower fixed point and for the upper fixed point?

	lower fixed point	upper fixed point
A	melting point of ice	boiling point of mercury
B	melting point of ice	boiling point of water
C	melting point of mercury	boiling point of mercury
D	melting point of mercury	boiling point of water

19 Which row gives the correct name for each change of state shown?

	change of state		
	gas to liquid	liquid to solid	solid to liquid
A	condensation	melting	solidification
B	condensation	solidification	melting
C	evaporation	melting	solidification
D	evaporation	solidification	melting

20 On a cold day, a metal front-door knob X and a similar plastic knob Y are at the same temperature.

Why does X feel cooler to the touch than Y?

A X convects thermal energy better than Y.

B X is a better thermal conductor than Y.

C X is a better insulator than Y.

D X is a better radiator of thermal energy than Y.

21 A liquid is heated and it expands.

How does this lead to the formation of a convection current?

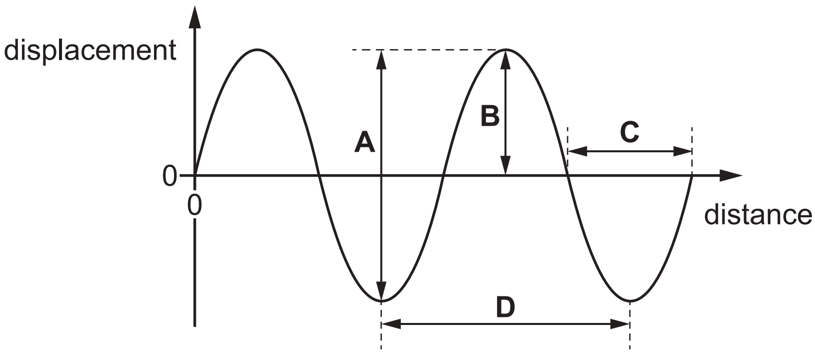
A The density of the heated liquid decreases.

B The density of the heated liquid increases.

C The mass of the heated liquid molecules decreases.

D The mass of the heated liquid molecules increases.

22 Which arrow on the graph shows the amplitude of the wave?



23 In which situation is the wavelength of the wave changed?

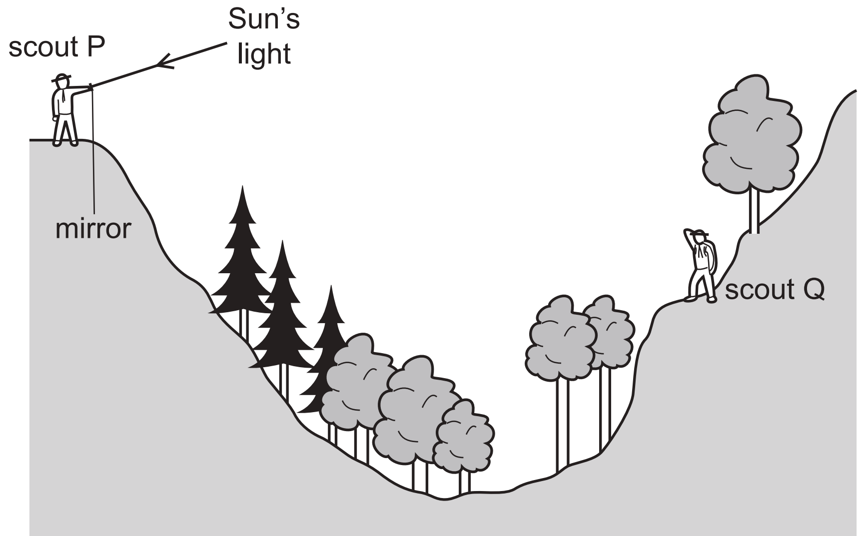
A light from the Sun passing from air into water

B radio waves travelling from an Earth satellite to the Moon

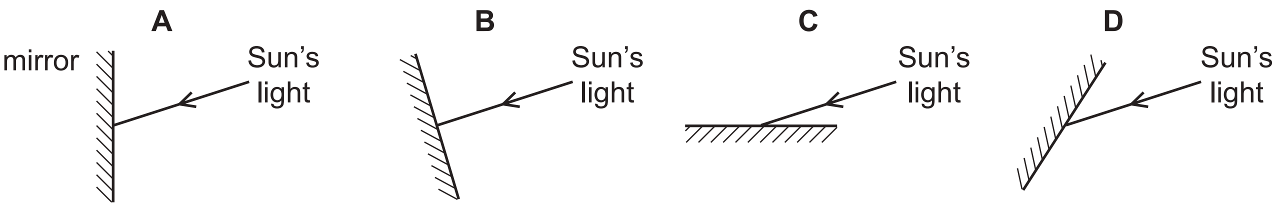
C sound reflecting from a wall

D water waves passing through a narrow gap

24 Scout P signals to scout Q on the other side of a valley by using a mirror to reflect the Sun's light.



Which mirror position allows the Sun's light to be reflected to scout Q?



25 The diagram shows the electromagnetic spectrum. The numbers indicate the approximate wavelength at the boundaries between the various regions of the spectrum.

For a device to be able to make use of electromagnetic radiation, it needs an aerial of approximately the same size as the radiation it is designed to work with.

P	Q	R	S	T	U	V

1 m 10^{-3} m 7×10^{-7} m 4×10^{-7} m 10^{-8} m 10^{-11} m

Which statement is correct?

A A mobile phone uses radiation from region P.

B A television satellite dish uses radiation from region Q.

C The receptor cells in an eye use radiation from region R.

D The remote controller for a television uses radiation from region U.

26 A dolphin has a range of audible frequencies of 150 Hz–150 kHz.

Which range of frequencies can be heard both by humans with good hearing and by dolphins?

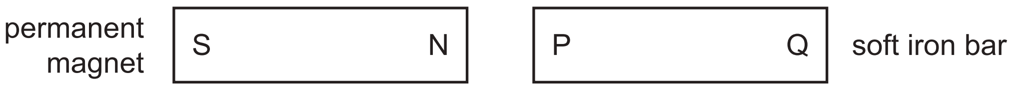
A 20 Hz–150 Hz

B 20 Hz–150 kHz

C 20 kHz–150 kHz

D 150 Hz–20 kHz

27 A permanent magnet is placed close to a bar of soft iron.



What are the polarities of end P and of end Q?

	end P	end Q
A	N	N
B	N	S
C	S	N
D	S	S

28 Which metal is used for the core of an electromagnet?

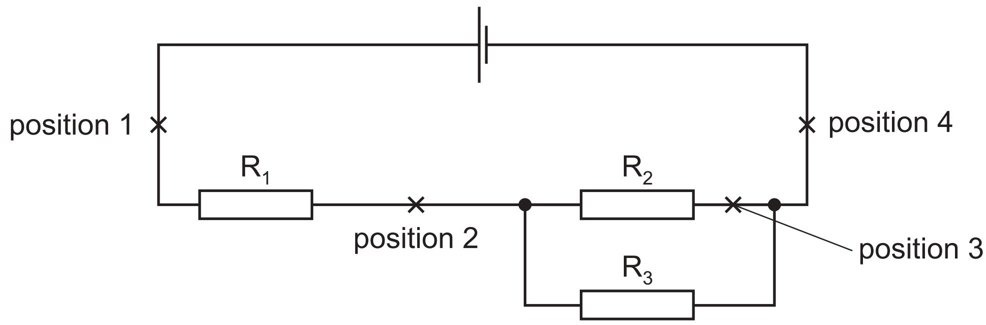
A copper

B iron

C magnesium

D steel

29 The diagram shows a cell connected to three resistors R_1, R_2 and R_3.



A student connects an ammeter first in position 1, then in position 2, 3 and 4 in turn.

In which positions does the ammeter show the current in R_1?

A 1, 2 and 4 **B** 1 and 2 only **C** 3 only **D** 4 only

30 A plastic rod is rubbed with a cloth. The rod becomes positively charged.

What happens to the plastic rod and what is the charge on the cloth?

	plastic rod	charge on cloth
A	gains electrons	negative
B	gains electrons	positive
C	loses electrons	negative
D	loses electrons	positive

31 A student measures the potential difference across a device and the current in the device.

Which calculation gives the resistance of the device?

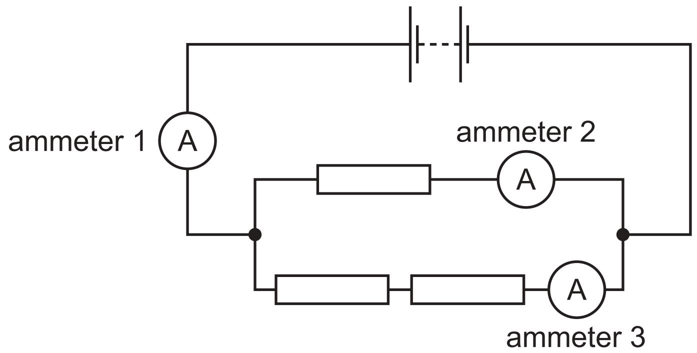
A current + potential difference

B current ÷ potential difference

C potential difference ÷ current

D potential difference × current

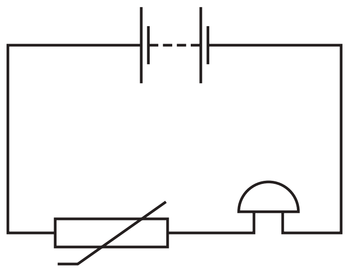
32 The diagram shows three identical resistors, three ammeters and a battery, connected in a circuit.



What is the order of the magnitudes of the readings on the ammeters from smallest to largest?

	smallest	intermediate	largest
A	ammeter 1	ammeter 2	ammeter 3
B	ammeter 1	ammeter 3	ammeter 2
C	ammeter 2	ammeter 3	ammeter 1
D	ammeter 3	ammeter 2	ammeter 1

33 A student sets up this circuit.



What is the purpose of the circuit?

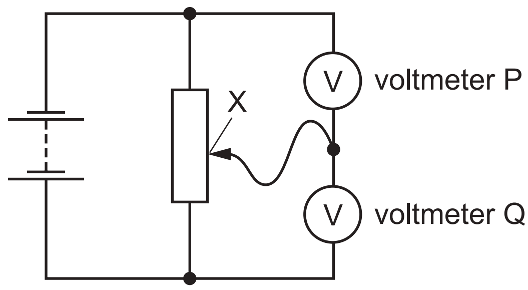
A to allow a lamp to be made dimmer or brighter as required

B to amplify the sound of a voice

C to light a lamp in the dark

D to sound a bell when the temperature rises

34 The diagram shows two voltmeters P and Q connected to a potential divider.



The sliding connection at point X is moved towards the top of the diagram.

What happens to the reading on P and to the reading on Q?

	reading on P	reading on Q
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

35 Which statement about electromagnetic induction is correct?

A A strong magnet that is held stationary near a stationary conductor causes a greater effect than a weak magnet.

B The effect occurs when a magnet and a conductor are both moved with the same speed and in the same direction.

C The effect occurs when a magnet is moved away from a nearby conductor.

D The effect only occurs when a magnet is moved towards a conductor.

36 An electrical device changes the voltage of an electrical supply from 240 V a.c. to 20 V a.c.

What is this device?

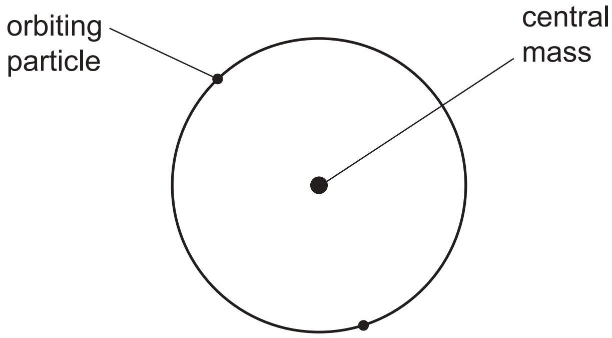
A a generator

B a relay

C a transformer

D a voltmeter

37 In the atomic model, an atom consists of a central mass, orbited by much smaller particles.



What is the name of the central mass and of the orbiting particles?

	central mass	orbiting particles
A	neutron	α-particles
B	neutron	electrons
C	nucleus	α-particles
D	nucleus	electrons

38 A neutral atom of argon-40 ($^{40}_{18}A$) and a neutral atom of potassium-39 ($^{39}_{19}K$) are compared.

Which atom has more electrons, and which atom has more protons?

	more electrons	more protons
A	argon	argon
B	argon	potassium
C	potassium	argon
D	potassium	potassium

39 Which statement about α-particles and β-particles is correct?

A α-particles are less ionising than β-particles.

B α-particles are more penetrating than β-particles.

C α-particles have greater mass than β-particles.

D α-particles have the same charge as β-particles.

40 An explosion in a nuclear reactor spread the isotope caesium-137 across a large area.

Ninety years after the explosion, the quantity of caesium-137 present will be 12.5% of its original level.

What is the half-life of caesium-137?

A 11.25 years **B** 22.5 years **C** 30.0 years **D** 45.0 years

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Cambridge IGCSE

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PHYSICS **0625/12**

Paper 1 Multiple Choice (Core) **May/June 2018**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

0690604720

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
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Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages.

CAMBRIDGE
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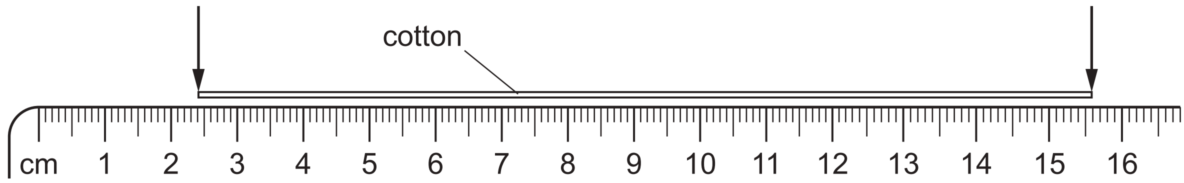
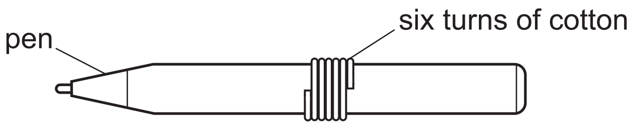
1 A length of cotton is measured between two points on a ruler.



When the length of cotton is wound closely around a pen, it goes round six times.

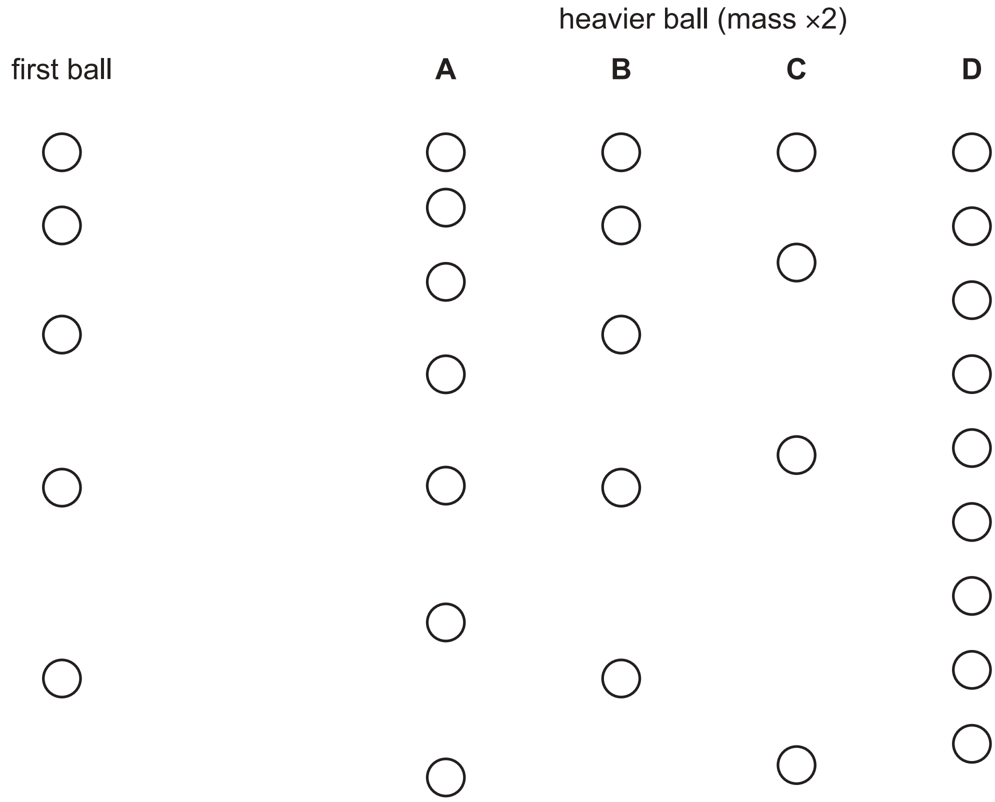


What is the distance once round the pen?

A 2.2 cm **B** 2.6 cm **C** 13.2 cm **D** 15.6 cm

2 A ball is dropped in an evacuated tube. A series of photographs is taken at equal time intervals from the time of release. Another ball of the same size but twice the mass is also dropped in the same evacuated tube and photographed.

Which diagram shows the motion of the heavier ball?



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3 A car takes 15 minutes to travel along a road that is 20 km long.

What is the average speed of the car?

A 0.75 km / h **B** 5.0 km / h **C** 80 km / h **D** 300 km / h

4 Which statement about the mass and the weight of an object is correct?

A They are both affected by changes in the acceleration of free fall.

B They are both forces.

C They have different units.

D Weight is calculated by dividing mass by the acceleration of free fall.

5 Two objects P and Q are placed in a beaker containing a liquid.

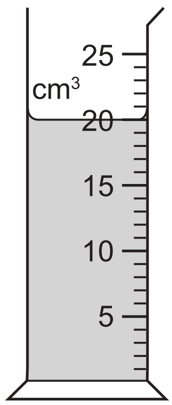
Object P floats in the liquid and object Q sinks.

Which row for the densities of object P, object Q and the liquid is possible?

	density of object P g/cm^3	density of object Q g/cm^3	density of liquid g/cm^3
A	1.2	0.6	0.8
B	1.2	1.4	1.0
C	11.3	8.9	13.6
D	11.3	19.3	13.6

6 The diagram shows some liquid in a measuring cylinder.

The mass of the liquid is 16 g.



What is the density of the liquid?

A 0.80 g/cm^3 **B** 1.25 g/cm^3 **C** 36 g/cm^3 **D** 320 g/cm^3

7 A spacecraft is travelling in space with no resultant force and no resultant moment acting on it.

Which statement about the spacecraft is correct?

A Its direction is changing.

B It is in equilibrium.

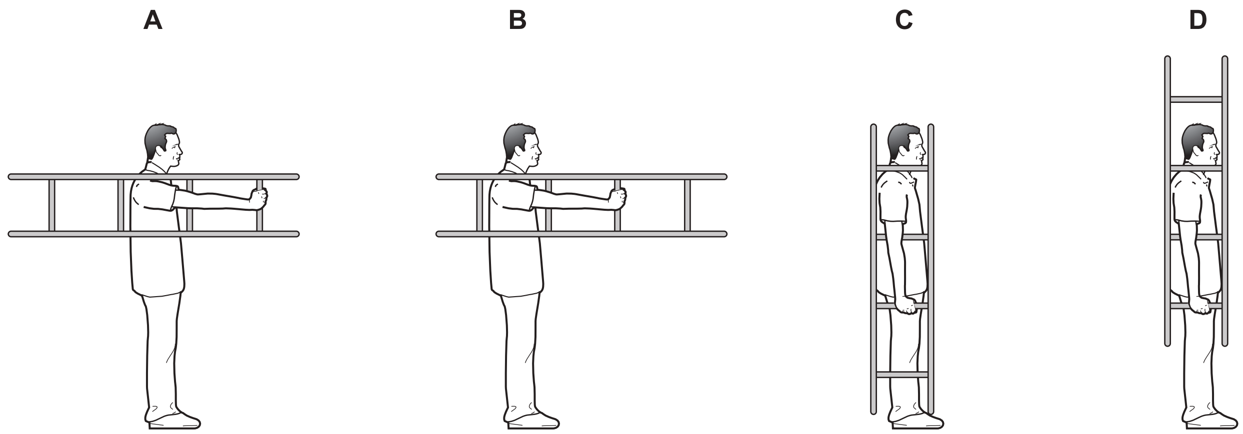
C Its speed is decreasing.

D Its speed is increasing.

8 A man holds a short ladder in four different positions.

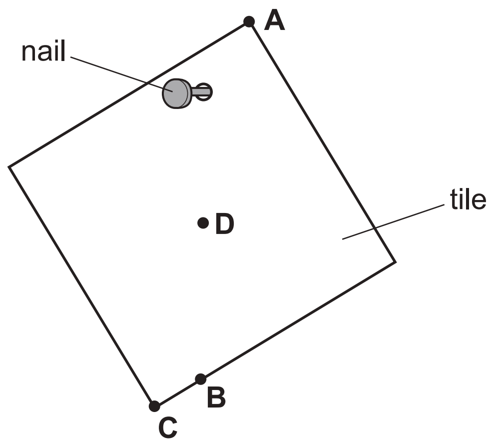
The weight of the ladder causes a moment about the man's shoulder.

In which position is the moment greatest?



9 A hole is drilled in a square tile. The diagram shows the tile hanging freely on a nail.

Where is the centre of mass of the tile?



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10 Which source of energy is renewable?

A coal

B natural gas

C oil

D wind

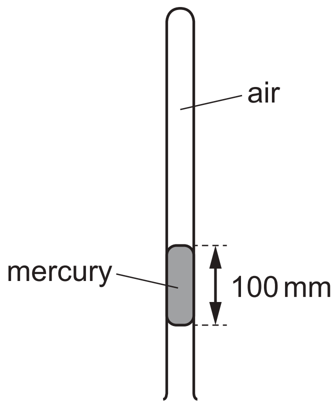
11 A student does work by pulling a box across a horizontal floor.

She now pulls a second box along the same floor.

Which row indicates that the student is now doing twice as much work?

	force used to pull box	distance the box is pulled
A	is doubled	is doubled
B	is doubled	is halved
C	stays the same	is doubled
D	stays the same	is halved

12 Air is trapped in a closed tube by a thread of mercury. The mercury thread is 100 mm long. The tube is held as shown.



Atmospheric pressure is 770 mm Hg.

What is the pressure of the trapped air?

A 100 mm Hg **B** 670 mm Hg **C** 770 mm Hg **D** 870 mm Hg

13 Brownian motion is the random motion of particles due to molecular bombardment.

In which states of matter is Brownian motion observed?

A gases, liquids and solids

B gases and liquids only

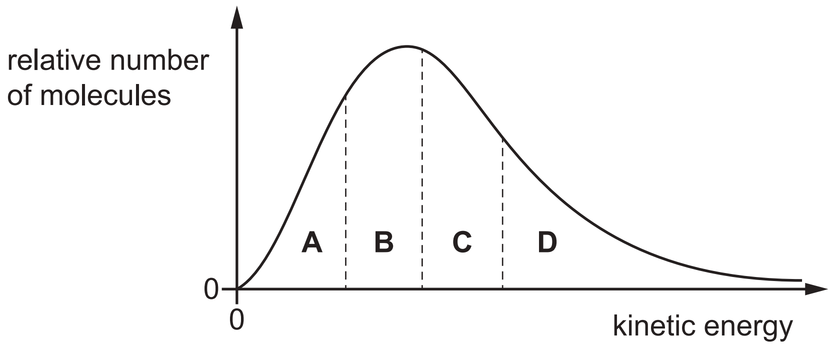
C gases and solids only

D liquids and solids only

14 The diagram shows the relative number of molecules in a liquid that have a given kinetic energy.

The graph is divided into sections so that each section contains the same number of molecules.

From which section does the greatest number of molecules escape from the liquid per unit time?



15 An electric kettle heats some water. The same kettle then heats a different liquid. The temperature of the liquid rises more rapidly than the temperature of the water.

What is a possible explanation of this difference?

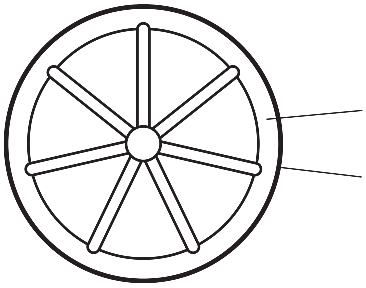
A The liquid condenses on the cooler parts of the kettle less than the water does.

B The liquid expands more than the water as it heats up.

C The liquid has a lower boiling point than the water.

D The liquid has a smaller thermal capacity than the water.

16 A wooden wheel can be strengthened by putting a tight circle of iron around it.



Which action would make it easier to fit the circle over the wood?

A cooling the iron circle

B heating the iron circle

C heating the wooden wheel and cooling the iron circle

D heating the wooden wheel but not heating or cooling the iron circle

17 A student wishes to calibrate a mercury-in-glass thermometer with a °C scale.

Which values should she use for the lower fixed point and for the upper fixed point?

	lower fixed point	upper fixed point
A	melting point of ice	boiling point of mercury
B	melting point of ice	boiling point of water
C	melting point of mercury	boiling point of mercury
D	melting point of mercury	boiling point of water

18 Four thermometers, with their bulbs painted different colours, are placed at equal distances from a radiant heater.

Which thermometer shows the slowest temperature rise when the heater is first switched on?

A matt black

B matt white

C shiny black

D shiny white

19 A tank contains water. Ripples are produced on the surface of the water.

What causes the ripples to refract?

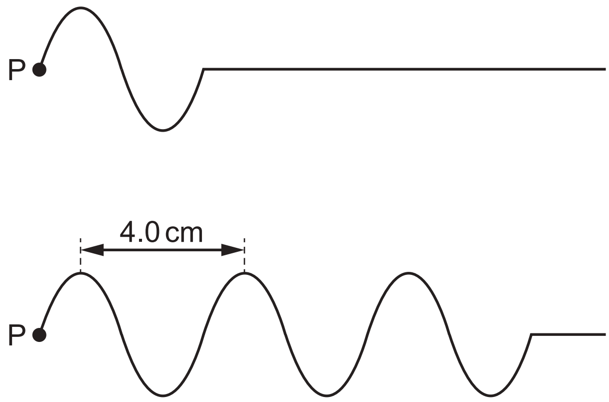
A The cold water in the tank is replaced by warm water.

B The ripples change speed as they move from deep to shallow water.

C The ripples hit the wall of the tank.

D The ripples pass through a narrow gap.

20 The diagrams show a wave on the surface of the water in a tank at times 1.0 s apart. The wave is produced at P and travels to the right.

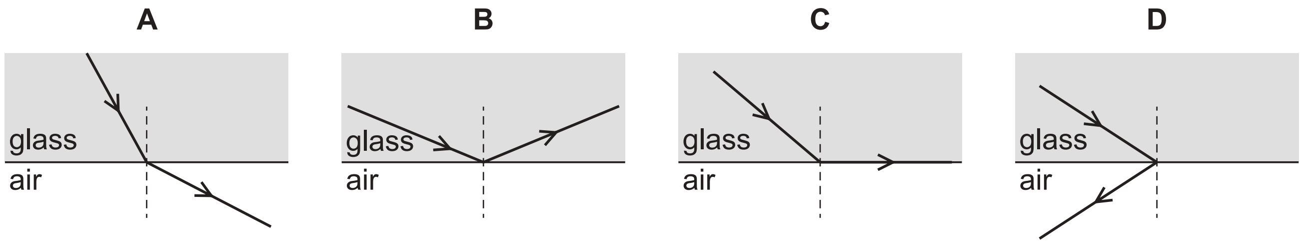


Which row gives the frequency and the speed of this water wave?

	frequency / Hz	speed cm / s
A	2.0	4.0
B	2.0	8.0
C	4.0	4.0
D	4.0	8.0

21 Light passes from glass into air.

Which diagram shows a ray of light incident at the critical angle on the air-glass boundary?



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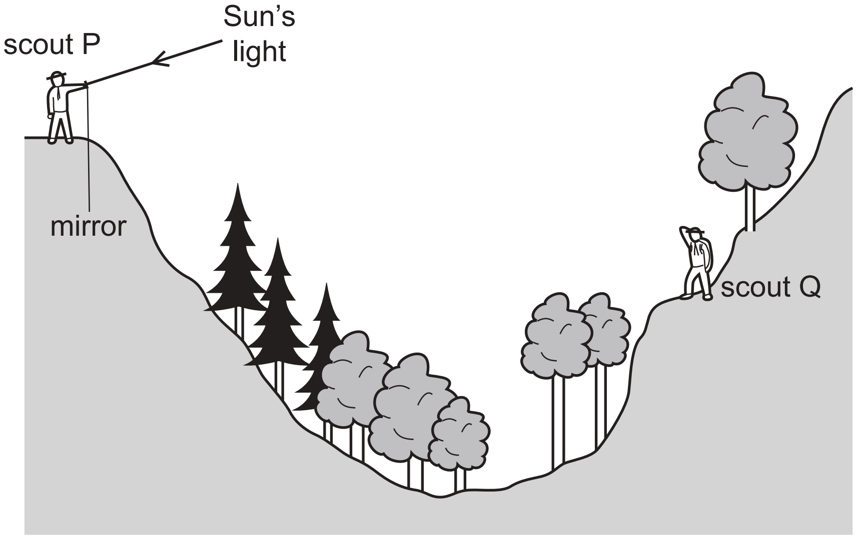
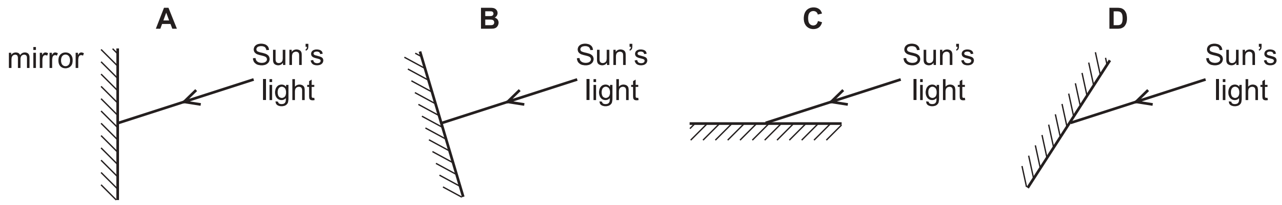
22 Scout P signals to scout Q on the other side of a valley by using a mirror to reflect the Sun's light.



Which mirror position allows the Sun's light to be reflected to scout Q?



23 The table describes white light that passes through a prism and forms a spectrum.

Which row is correct?

	colour refracted the most	colour next to the red
A	red	orange
B	red	yellow
C	violet	orange
D	violet	yellow

24 Where do all types of electromagnetic waves travel at the same speed?

A air

B a vacuum

C glass

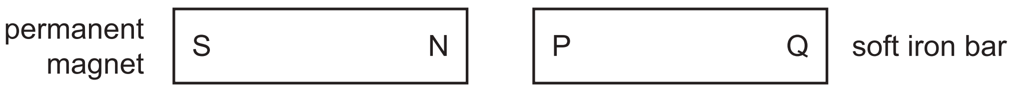
D water

25 A siren is emitting a sound. As time passes, the sound becomes louder and higher pitched.

What is happening to the amplitude and to the frequency of the emitted sound wave?

	amplitude	frequency
A	decreasing	decreasing
B	decreasing	increasing
C	increasing	decreasing
D	increasing	increasing

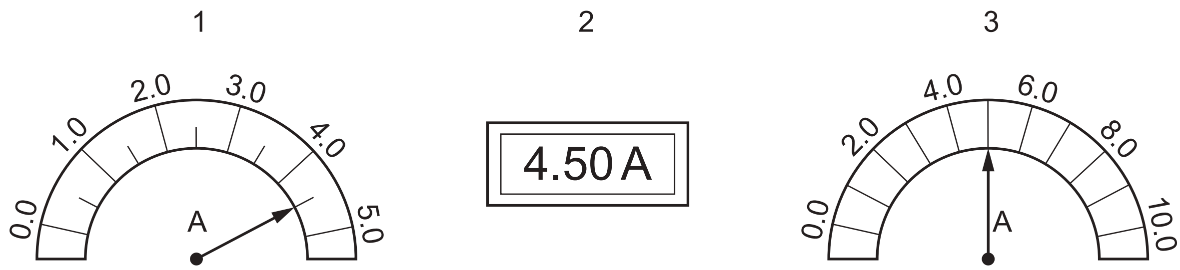
26 A permanent magnet is placed close to a bar of soft iron.



What are the polarities of end P and of end Q?

	end P	end Q
A	N	N
B	N	S
C	S	N
D	S	S

27 The diagrams show three ammeters.



Which ammeters show the same value of current?

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

28 A student measures the potential difference across a device and the current in the device.

Which calculation gives the resistance of the device?

A current + potential difference

B current ÷ potential difference

C potential difference ÷ current

D potential difference × current

29 A lamp is connected across one cell, then across two cells. The potential difference (p.d.) across the lamp and the current in it are measured in each case.

The results are shown.

number of cells	p.d. / V	current / A
1	2.8	0.25
2	5.4	0.40

What is the change in the resistance of the lamp when the number of cells is increased from one to two?

A It decreases by 0.015 Ω.

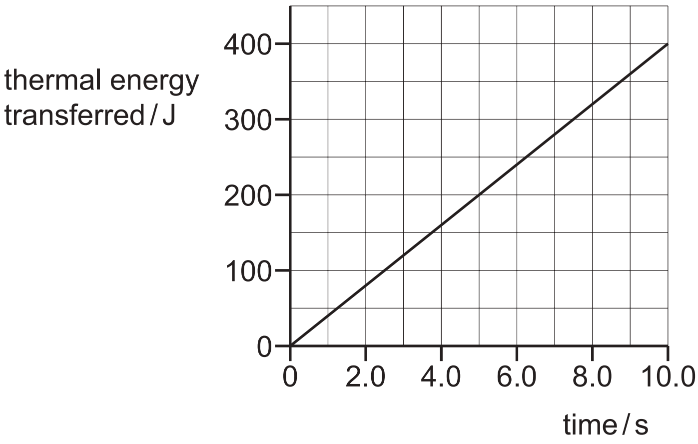
B It increases by 1.5 Ω.

C It increases by 2.3 Ω.

D It increases by 17 Ω.

30 An electrical heater transfers thermal energy to the surroundings.

The graph shows how the amount of thermal energy transferred varies with time.

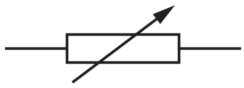


The heater continues to transfer energy at the same rate.

How much thermal energy is transferred by the heater in 5.0 minutes?

A 200 J **B** 400 J **C** 2000 J **D** 12 000 J

31 Which electrical component does the symbol represent?



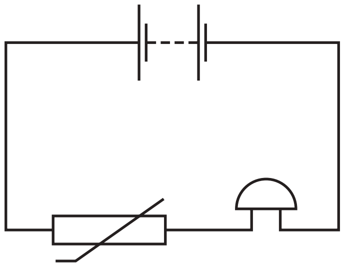
A a fuse

B a relay coil

C a thermistor

D a variable resistor

32 A student sets up this circuit.



What is the purpose of the circuit?

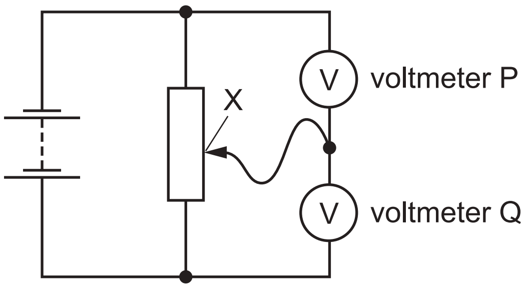
A to allow a lamp to be made dimmer or brighter as required

B to amplify the sound of a voice

C to light a lamp in the dark

D to sound a bell when the temperature rises

33 The diagram shows two voltmeters P and Q connected to a potential divider.



The sliding connection at point X is moved towards the top of the diagram.

What happens to the reading on P and to the reading on Q?

	reading on P	reading on Q
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

34 A simple electric generator induces an electromotive force (e.m.f.).

Which modification would increase the induced e.m.f.?

A Increase the number of turns in the coil of the generator.

B Increase the distance between the magnetic poles.

C Reduce the strength of the magnetic field around the coil.

D Reverse the direction of the magnetic field.

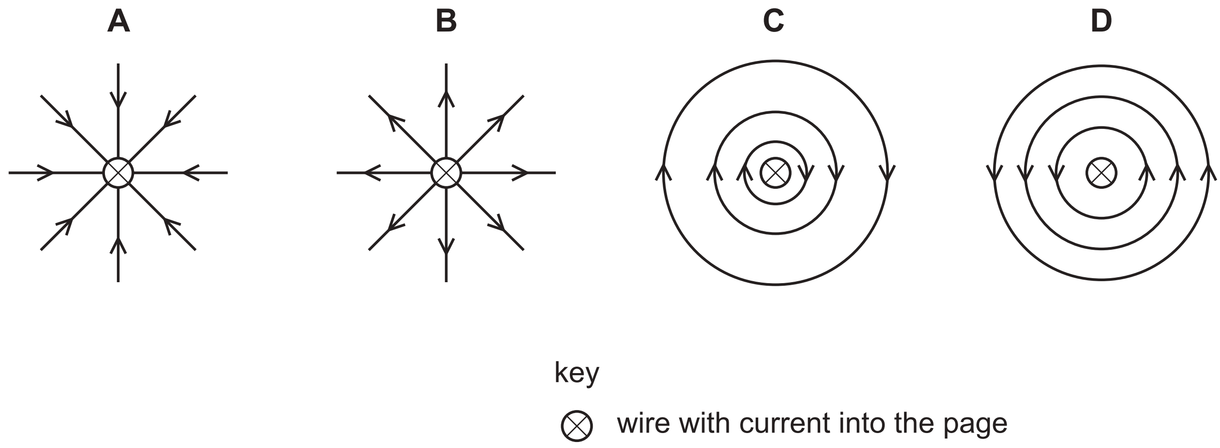
35 A transformer has N_p turns in the primary coil and N_s turns in the secondary coil.

Which row gives the values of N_p and N_s for a transformer that steps up a voltage of 1200 V to 36 000 V?

	N_p	N_s
A	2 000	60 000
B	2 000	600 000
C	60 000	2 000
D	600 000	2 000

36 A straight wire is perpendicular to the paper. It carries a current into the paper.

What is the magnetic field pattern and its direction near the wire?



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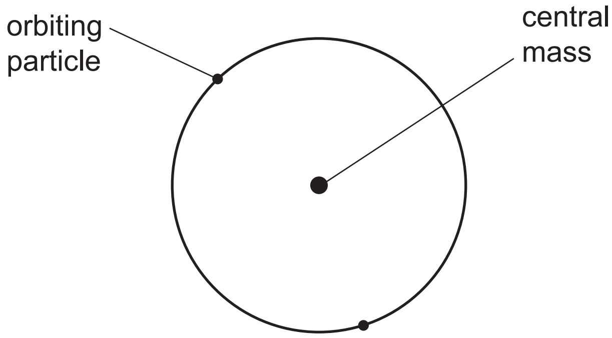
37 In the atomic model, an atom consists of a central mass, orbited by much smaller particles.



What is the name of the central mass and of the orbiting particles?

	central mass	orbiting particles
A	neutron	α-particles
B	neutron	electrons
C	nucleus	α-particles
D	nucleus	electrons

38 The table shows the composition of three different nuclei.

nucleus	number of protons	number of neutrons
X	3	3
Y	3	4
Z	4	3

Which nuclei are isotopes of the same element?

A X, Y and Z **B** X and Y only **C** X and Z only **D** Y and Z only

39 The table compares the penetrating abilities and ionising effects of α-radiation and of γ-radiation.

Which row is correct?

	least penetrating	most ionising
A	α	α
B	α	γ
C	γ	α
D	γ	γ

40 Radioactive materials must be handled in a safe way.

What is **not** a safety procedure?

A Monitor exposure time to radioactive materials.

B Store radioactive materials in cardboard boxes.

C Use tongs to pick up the radioactive source.

D Wear protective clothing.

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/13**

Paper 1 Multiple Choice (Core) **May/June 2018**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

9915199420

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

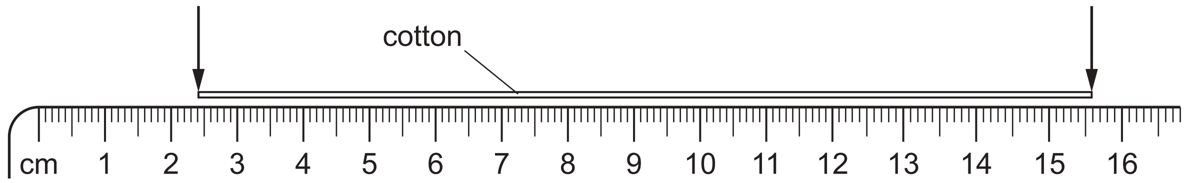
Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

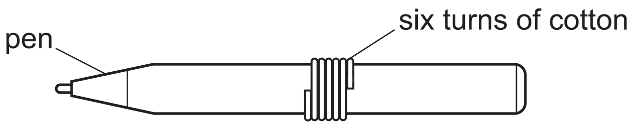
The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages.

1 A length of cotton is measured between two points on a ruler.



When the length of cotton is wound closely around a pen, it goes round six times.



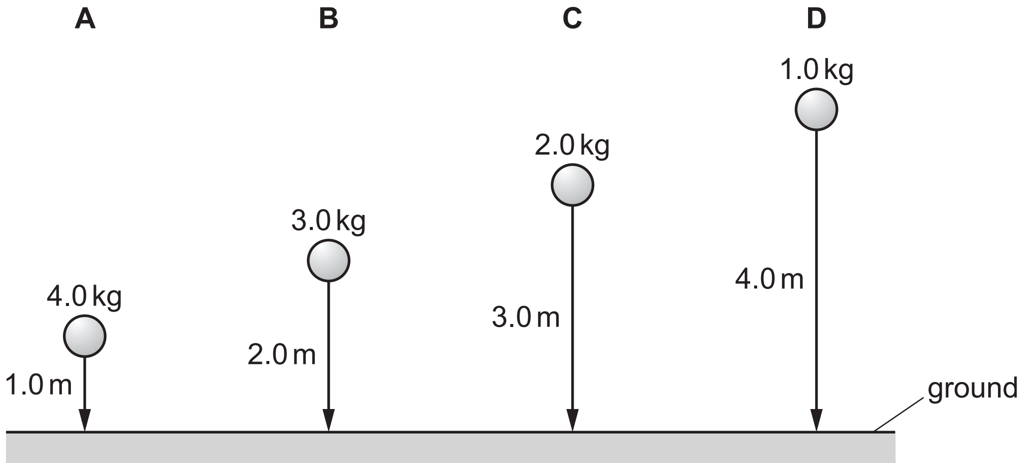
What is the distance once round the pen?

A 2.2 cm **B** 2.6 cm **C** 13.2 cm **D** 15.6 cm

2 Four balls with different masses are dropped from the heights shown.

Air resistance may be ignored.

Which ball has the greatest average speed?



3 A car takes 15 minutes to travel along a road that is 20 km long.

What is the average speed of the car?

A 0.75 km/h **B** 5.0 km/h **C** 80 km/h **D** 300 km/h

4 A person steps onto a bathroom scales.

The bathroom scales records both mass and weight.

Which row shows the readings on the scales?

	mass	weight
A	60 N	600 kg
B	60 kg	600 N
C	600 kg	60 N
D	600 N	60 kg

5 Which properties of an object can be changed by a force?

A direction of motion, mass and speed

B direction of motion, shape and speed

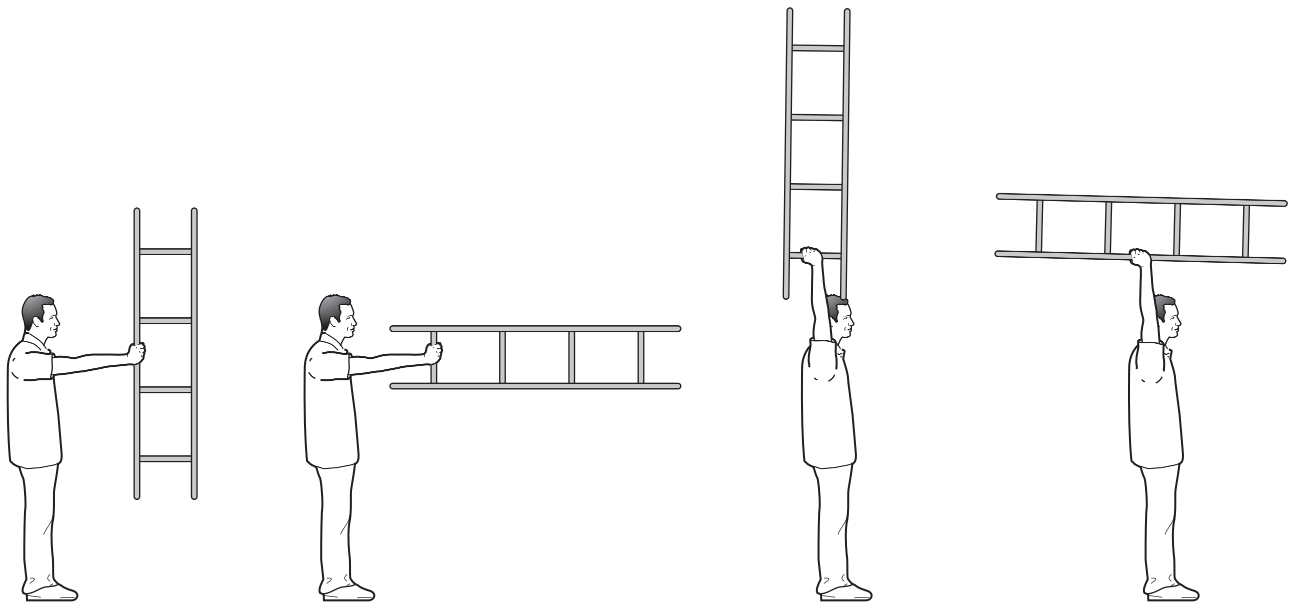
C direction of motion and speed only

D mass, shape and speed

6 A man holds a ladder in four different positions, pivoting around his shoulder.

The weight of the ladder causes a moment about the man's shoulder.

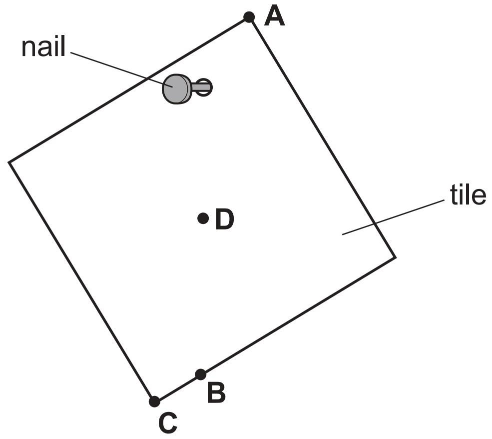
In which position is the moment greatest?



A **B** **C** **D**

7 A hole is drilled in a square tile. The diagram shows the tile hanging freely on a nail.

Where is the centre of mass of the tile?



8 Which method of drying clothes has the least impact on the environment?

A Evaporate the water in them in an electrically heated tumble dryer.

B Hang them on a washing line in direct sunlight.

C Remove the water from them in an electric spin dryer.

D Suspend them close to a coal fire.

9 A student does work by pulling a box across a horizontal floor.

She now pulls a second box along the same floor.

Which row indicates that the student is now doing twice as much work?

	force used to pull box	distance the box is pulled
A	is doubled	is doubled
B	is doubled	is halved
C	stays the same	is doubled
D	stays the same	is halved

10 A simple barometer includes a column of mercury.

Which property of this column of mercury is used to give a measurement of atmospheric pressure?

A its cross-sectional area

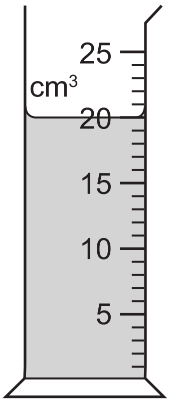
B its height

C its temperature

D its thermal capacity

11 The diagram shows some liquid in a measuring cylinder.

The mass of the liquid is 16 g.



What is the density of the liquid?

A 0.80 g / cm^3 **B** 1.25 g / cm^3 **C** 36 g / cm^3 **D** 320 g / cm^3

12 Brownian motion of particles is observed.

Which statements describe the movement of the particles?

1 The particles all travel along a curved path.

2 The particles move randomly.

3 The particles all travel in the same direction.

A 1 and 3 **B** 1 only **C** 2 and 3 **D** 2 only

13 A pure liquid is left in an open beaker and some of the liquid molecules escape by evaporation.

Which statement about this process is correct?

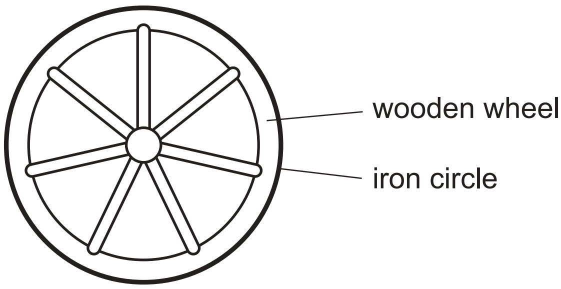
A None of the escaping molecules return to the liquid.

B The escaping molecules are generally the more energetic ones.

C The rate of escape of the molecules can be increased by increasing the depth of the liquid in the beaker.

D The temperature of the remaining liquid is unaffected by the escape of the molecules.

14 A wooden wheel can be strengthened by putting a tight circle of iron around it.



Which action would make it easier to fit the circle over the wood?

A cooling the iron circle

B heating the iron circle

C heating the wooden wheel and cooling the iron circle

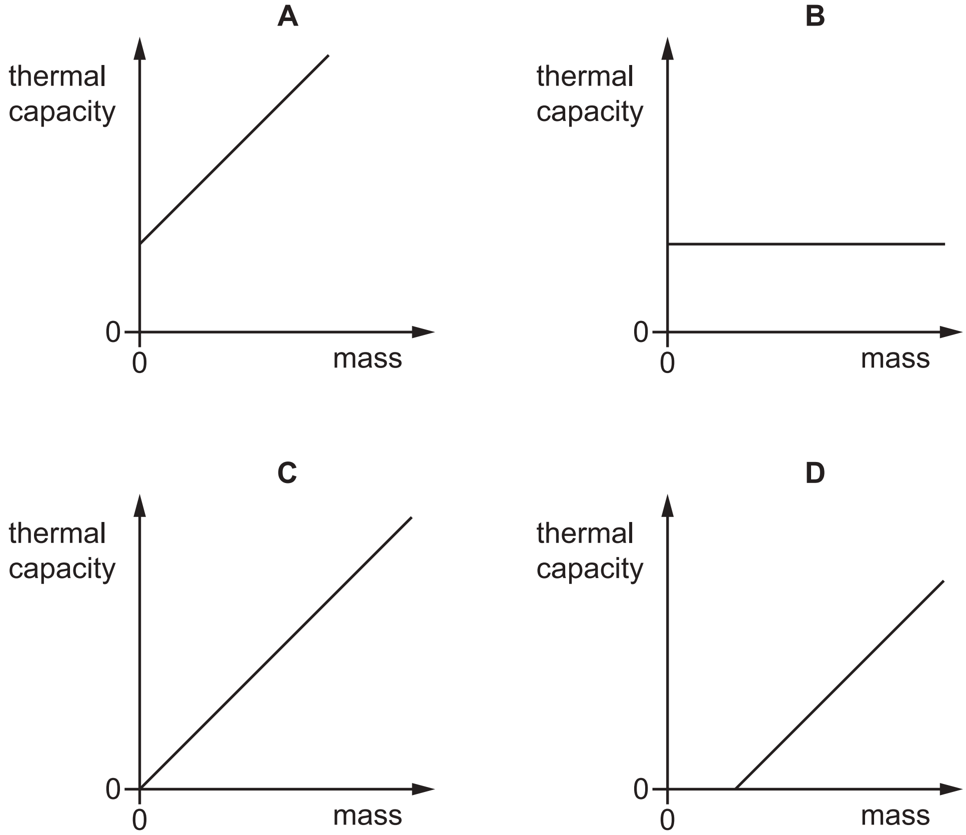
D heating the wooden wheel but not heating or cooling the iron circle

15 A student wishes to calibrate a mercury-in-glass thermometer with a °C scale.

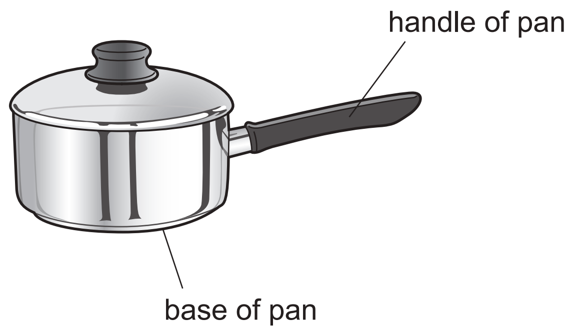
Which values should she use for the lower fixed point and for the upper fixed point?

	lower fixed point	upper fixed point
A	melting point of ice	boiling point of mercury
B	melting point of ice	boiling point of water
C	melting point of mercury	boiling point of mercury
D	melting point of mercury	boiling point of water

16 Which diagram shows how the thermal capacity of a silver object depends on its mass?



17 The diagram shows a pan used for cooking food.



Which row is correct for the materials used to make the base and the handle of the pan?

	base of pan	handle of pan
A	good thermal conductor	good thermal conductor
B	good thermal conductor	poor thermal conductor
C	poor thermal conductor	good thermal conductor
D	poor thermal conductor	poor thermal conductor

18 A saucepan of water is heated from its base on an electric hob.

After five minutes the water near the top of the saucepan is becoming hot.

What is the main process of heat transfer within the water?

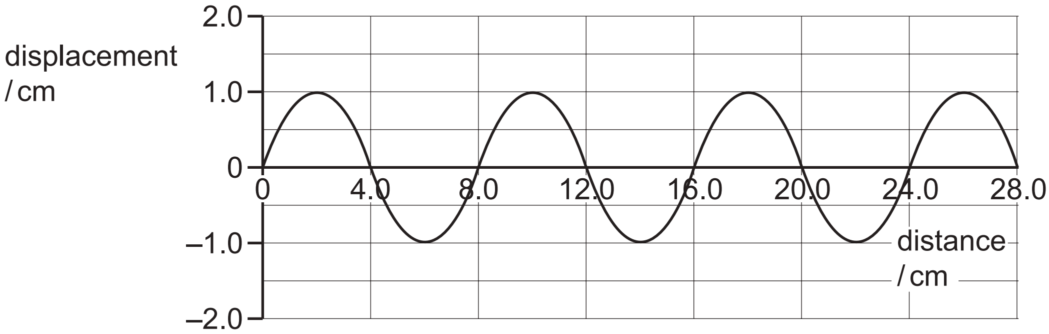
A condensation

B conduction

C convection

D radiation

19 The diagram shows a wave.



Which row is correct?

	amplitude of the wave / cm	wavelength of the wave / cm
A	1.0	4.0
B	1.0	8.0
C	2.0	4.0
D	2.0	8.0

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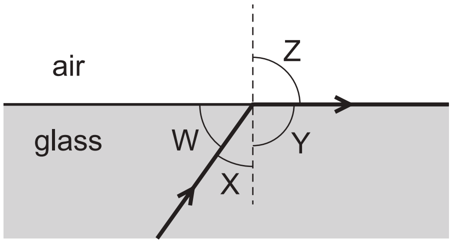
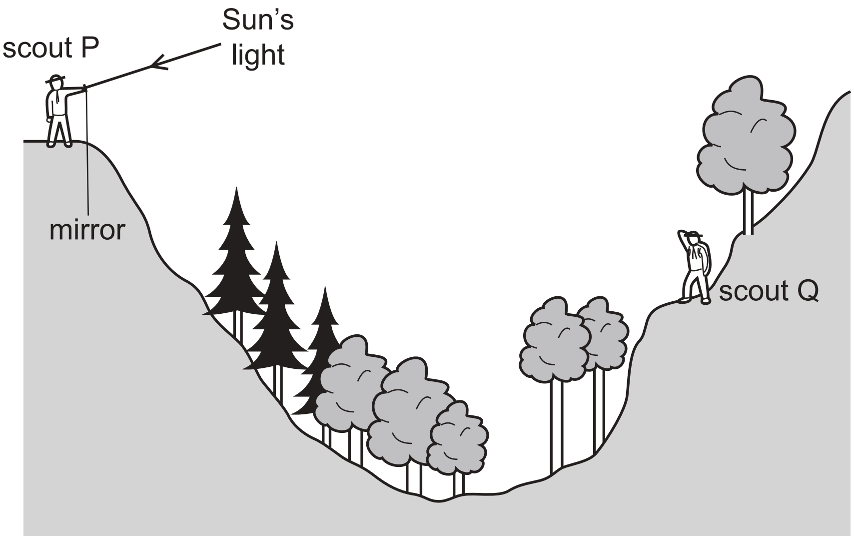
20 The diagram shows a ray of light passing from glass to air, at the critical angle.



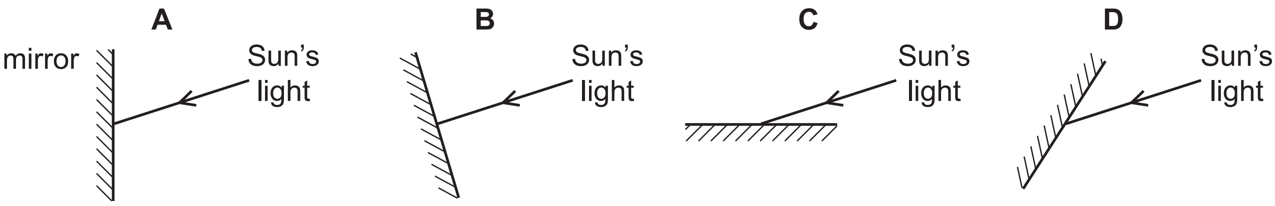
Which angles are the angle of incidence and the angle of refraction?

	angle of incidence	angle of refraction
A	W	Y
B	W	Z
C	X	Y
D	X	Z

21 Scout P signals to scout Q on the other side of a valley by using a mirror to reflect the Sun's light.



Which mirror position allows the Sun's light to be reflected to scout Q?



22 It takes 0.24 seconds for a microwave signal to travel from a transmitting station on Earth to a satellite and then back to the station on Earth. Microwaves travel at 3.0×10^8 m/s.

How far is the transmitting station from the satellite?

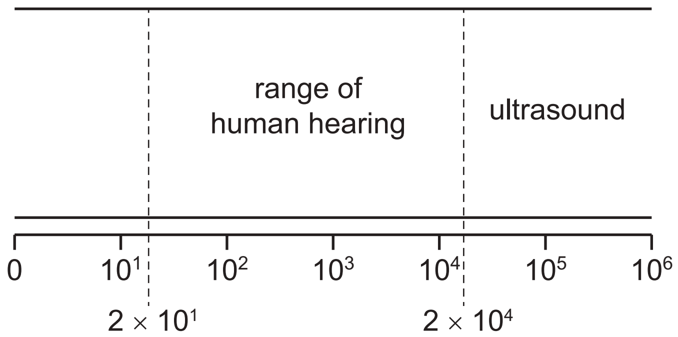
A 36 000 km

B 72 000 km

C 36 000 000 km

D 72 000 000 km

23 The diagram shows the ranges of human hearing and of ultrasound waves.



To which characteristic of sound waves do the numbers on the diagram refer?

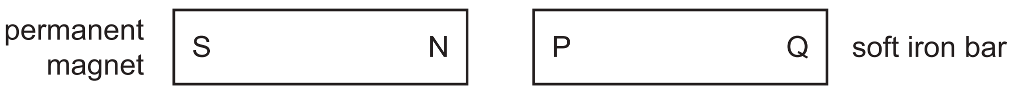
A amplitude in cm

B frequency in Hz

C speed in metres / second

D wavelength in metres

24 A permanent magnet is placed close to a bar of soft iron.



What are the polarities of end P and of end Q?

	end P	end Q
A	N	N
B	N	S
C	S	N
D	S	S

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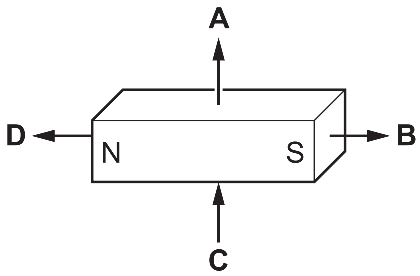
25 The diagram shows a permanent bar magnet placed on a wooden table. A student draws arrows to show the direction of the magnetic field at four points.

Which arrow shows the direction of the magnetic field at that position?



26 Which statement about electric charges is correct?

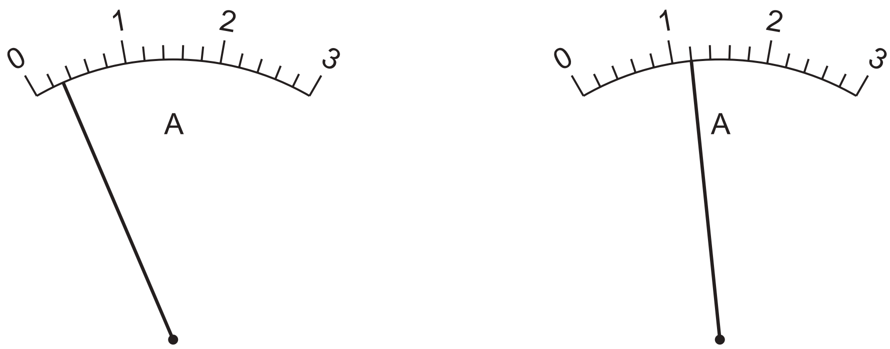
A Like charges attract and unlike charges attract.

B Like charges attract and unlike charges repel.

C Like charges repel and unlike charges attract.

D Like charges repel and unlike charges repel.

27 The diagrams show two readings on the same ammeter. Reading 1 is taken before the ammeter is connected in a circuit. Reading 2 shows the reading when the ammeter is connected in a circuit.



reading 1
not connected in a circuit

reading 2
connected in a circuit

What is the current in the circuit?

A 0.80 A **B** 0.90 A **C** 0.95 A **D** 1.20 A

28 A student measures the potential difference across a device and the current in the device.

Which calculation gives the resistance of the device?

A current + potential difference

B current ÷ potential difference

C potential difference ÷ current

D potential difference × current

29 A battery in an electric circuit is connected to a lamp.

Chemical energy in the battery is transferred to which other types of energy?

A internal energy only

B kinetic energy and sound energy

C light energy and thermal energy

D light energy only

30 Which component is represented by the symbol shown?

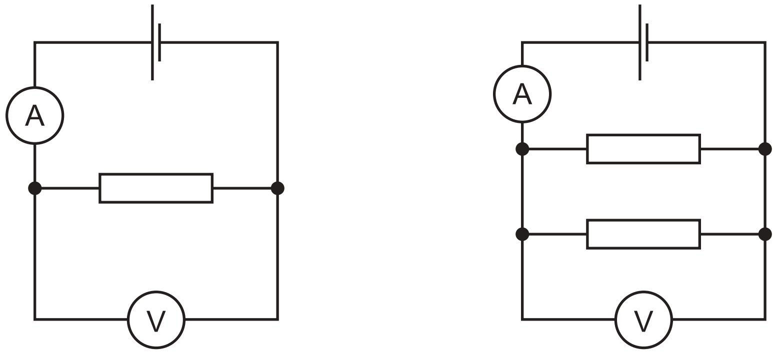
A fixed resistor

B fuse

C thermistor

D variable resistor

31 A student sets up a circuit which she calls circuit 1. She records the value of the current I_1, and calculates the resistance R_1 of the circuit.



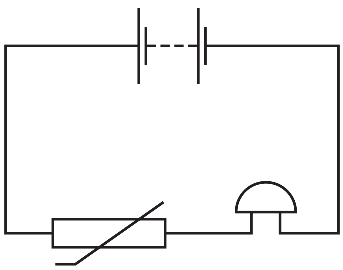
circuit 1 circuit 2

She then connects an identical resistor in parallel with the original resistor. She calls this circuit 2. She records current I_2 and calculates the total resistance R_2 of this circuit.

Which row correctly compares the two currents and the two resistances in the circuits?

	I_2	R_2
A	greater than I_1	greater than R_1
B	greater than I_1	less than R_1
C	less than I_1	greater than R_1
D	less than I_1	less than R_1

32 A student sets up this circuit.



What is the purpose of the circuit?

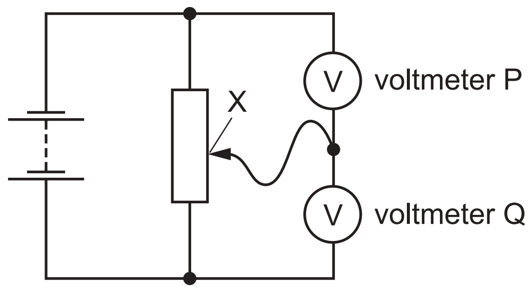
A to allow a lamp to be made dimmer or brighter as required

B to amplify the sound of a voice

C to light a lamp in the dark

D to sound a bell when the temperature rises

33 The diagram shows two voltmeters P and Q connected to a potential divider.

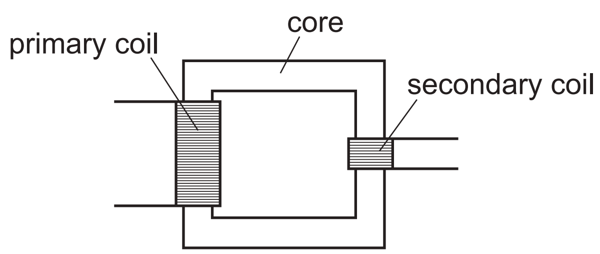


The sliding connection at point X is moved towards the top of the diagram.

What happens to the reading on P and to the reading on Q?

	reading on P	reading on Q
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

34 The diagram shows a transformer.



Which materials are the most suitable for the core and for the coils?

	core material	coil material
A	copper	copper
B	copper	iron
C	iron	copper
D	iron	iron

35 A current-carrying conductor placed in a magnetic field experiences a force.

Which changes result in reversing the direction of the force?

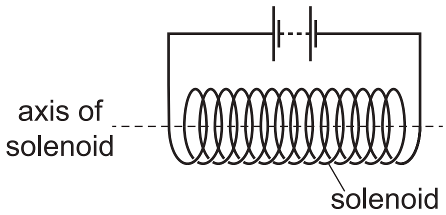
A Decrease the current, keeping the field direction constant.

B Increase the current and reverse the field direction.

C Increase the current, keeping the field direction constant.

D Reverse the current and reverse the field direction.

36 A solenoid is connected to a battery.



Which statement about the magnetic field at the centre of the solenoid is correct?

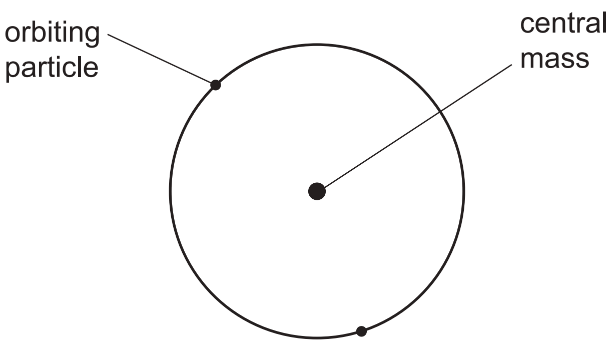
A The magnetic field along the axis is zero.

B The direction of the magnetic field is at an angle of 45° to the axis.

C The direction of the magnetic field is parallel to the axis.

D The direction of the magnetic field is perpendicular to the axis.

37 In the atomic model, an atom consists of a central mass, orbited by much smaller particles.



What is the name of the central mass and of the orbiting particles?

	central mass	orbiting particles
A	neutron	α-particles
B	neutron	electrons
C	nucleus	α-particles
D	nucleus	electrons

38 One isotope of lead is represented by the nuclide symbol $^{214}_{82}Pb$.

How many neutrons and how many protons does one nucleus of this isotope contain?

	number of neutrons	number of protons
A	82	132
B	82	214
C	132	82
D	214	82

39 Three sources of background radiation are listed.

1 cosmic rays

2 medical X-rays

3 radioactive emissions from radon gas from the ground

Which of these sources are naturally occurring?

A 1 and 3 only **B** 1 only **C** 2 and 3 only **D** 2 only

40 The rates of emission from four radioactive sources are measured at 20 minute intervals.

Each row in the table shows the results for one of the radioactive sources.

Which source has the longest half-life?

	rate of emission / emissions per minute		
	time 0	time 20 min	time 40 min
A	120	60	30
B	120	110	101
C	240	60	15
D	240	170	122

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/21**

Paper 2 Multiple Choice (Extended) **May/June 2018**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

7516764361

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

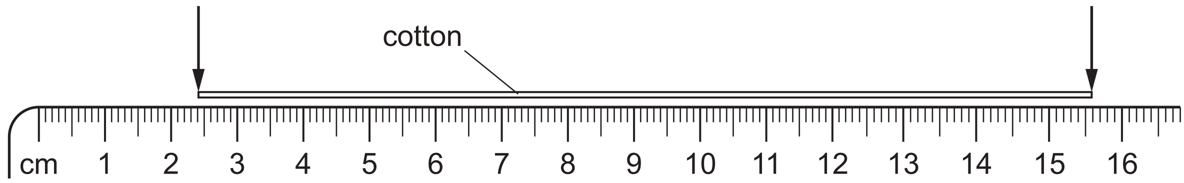
Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

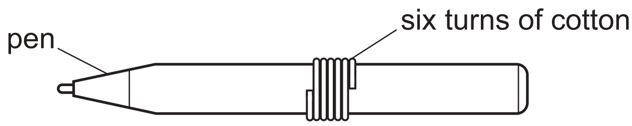
The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **15** printed pages and **1** blank page.

1 A length of cotton is measured between two points on a ruler.



When the length of cotton is wound closely around a pen, it goes round six times.



What is the distance once round the pen?

A 2.2 cm **B** 2.6 cm **C** 13.2 cm **D** 15.6 cm

2 When does an object falling vertically through the air reach terminal velocity?

A when the acceleration of the object becomes negative

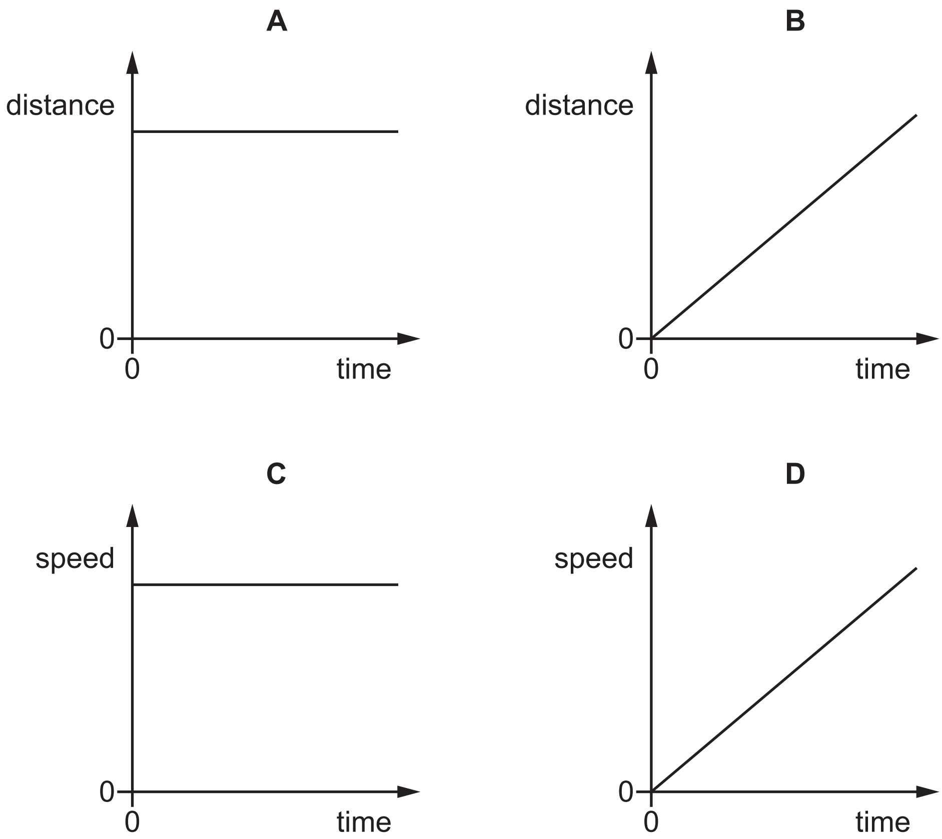
B when the acceleration of the object is equal to *g*

C when the air resistance equals the weight of the object

D when the air resistance is greater than the weight of the object

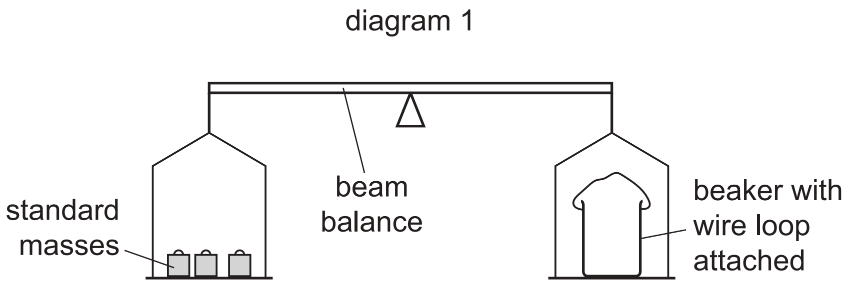
3 A car is moving along a straight, level road, with a constant acceleration.

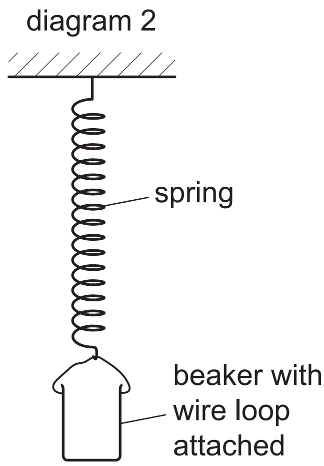
Which graph shows the motion of the car?



4 Diagram 1 shows a beam balance. A beaker with a wire loop balances the standard masses.

The beaker is then removed and hung from a spring. The spring extends by 5.0 cm, as in diagram 2.





The experiment is repeated with the same apparatus on the Moon, where the acceleration of free fall is less than on Earth.

Which statement describes what happens on the Moon?

A The beam balance is balanced and the spring extends by 5.0 cm.

B The beam balance is balanced and the spring extends by less than 5.0 cm.

C The right-hand balance pan is higher and the spring extends by 5.0 cm.

D The right-hand balance pan is higher and the spring extends by less than 5.0 cm.

5 An object always has mass but does not always have weight.

What must be present and acting on the mass for it to have weight?

A a gravitational field

B a set of scales

C displaced water

D friction due to air resistance

6 A force acting on a moving ball causes its motion to change. This force stays constant.

What makes the force produce a greater change in the motion of the ball?

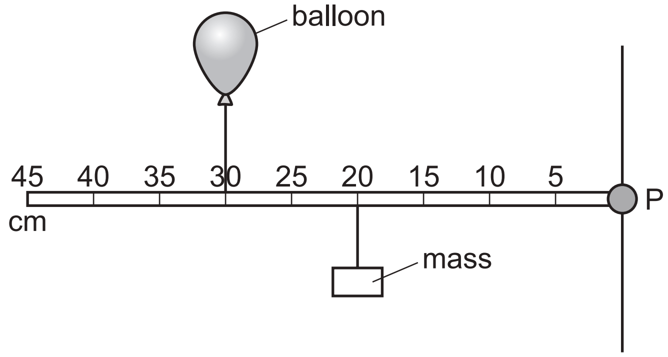
A decreasing the total mass of the ball

B increasing the temperature of the ball

C using a ball with a hollow centre but the same mass

D using a different material for the ball so that it has a lower density but the same mass

7 A balloon and a mass are attached to a rod that is pivoted at P.



The balloon is filled with helium, a gas less dense than air, so that it applies an upward force on the rod.

The rod is horizontal and stationary.

Which action causes the rod to rotate clockwise?

A Move both the balloon and mass 10 cm to the left.

B Move both the balloon and mass 10 cm to the right.

C Move both the balloon and mass to the 25 cm mark.

D Move the balloon to the 20 cm mark and the mass to the 30 cm mark.

8 A car is moving in a straight line on a level road. Its engine provides a forward force on the car. A second force of equal size acts on the car due to resistive forces.

Which statement describes what happens?

A The car changes direction.

B The car moves at a constant speed.

C The car slows down.

D The car speeds up.

9 Which expression gives the momentum of an object?

A mass × acceleration

B mass × gravitational field strength

C mass × velocity

D $\frac{1}{2}$ × mass × (velocity)^2

10 As energy is transferred into different forms, it eventually becomes dissipated.

What does this mean?

A All the energy disappears.

B The energy finally changes into every possible form of energy.

C The energy spreads out among the objects and their surroundings.

D The total amount of energy becomes less.

11 A ball of mass 1.2 kg is dropped from a height of 30 m. As it falls, 25% of its initial gravitational potential energy is transferred to thermal energy.

What is the kinetic energy of the ball just before it hits the ground?

A 27 J **B** 90 J **C** 270 J **D** 360 J

12 A girl hangs by her hands from a bar in the gymnasium. She pulls herself up until her chin is level with the bar.

The mass of the girl is 48 kg.

She pulls herself up through a distance of 0.25 m.

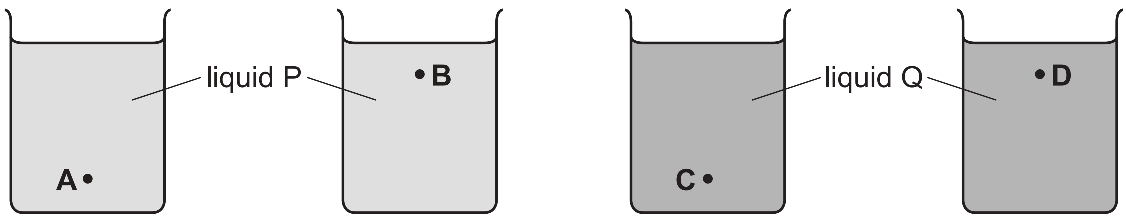
She does this in 2.0 s.

What is the useful power she uses to pull herself up?

A 6.0 W **B** 24 W **C** 60 W **D** 240 W

13 Four identical beakers are filled with equal volumes of liquids P or Q, as shown. Liquid P is more dense than liquid Q.

At which point is the pressure the least?



14 An oil tank has a base of area 2.5 m^2 and is filled with oil to a depth of 1.2 m.

The density of the oil is 800 kg/m^3.

What is the force exerted on the base of the tank due to the oil?

A 960 N **B** 2400 N **C** 9600 N **D** 24 000 N

15 When molecules of a gas rebound from a wall of a container, the wall experiences a pressure.

What is the cause of this pressure?

A the change in energy of the molecules

B the change in momentum of the molecules

C the change in power of the molecules

D the change in speed of the molecules

16 A student wishes to calibrate a mercury-in-glass thermometer with a °C scale.

Which values should she use for the lower fixed point and for the upper fixed point?

	lower fixed point	upper fixed point
A	melting point of ice	boiling point of mercury
B	melting point of ice	boiling point of water
C	melting point of mercury	boiling point of mercury
D	melting point of mercury	boiling point of water

17 Which statements about boiling and about evaporation are both correct?

	boiling	evaporation
A	takes place only at the surface	takes place only at the surface
B	takes place only at the surface	takes place throughout the liquid
C	takes place throughout the liquid	takes place only at the surface
D	takes place throughout the liquid	takes place throughout the liquid

18 On a cold day, a metal front-door knob X and a similar plastic knob Y are at the same temperature.

Why does X feel cooler to the touch than Y?

A X convects thermal energy better than Y.

B X is a better thermal conductor than Y.

C X is a better insulator than Y.

D X is a better radiator of thermal energy than Y.

19 Light travels at a speed of 2.0×10^8 m/s in a glass block.

In the glass, the wavelength of the light is 4.0×10^{-7} m.

What is the frequency of the light?

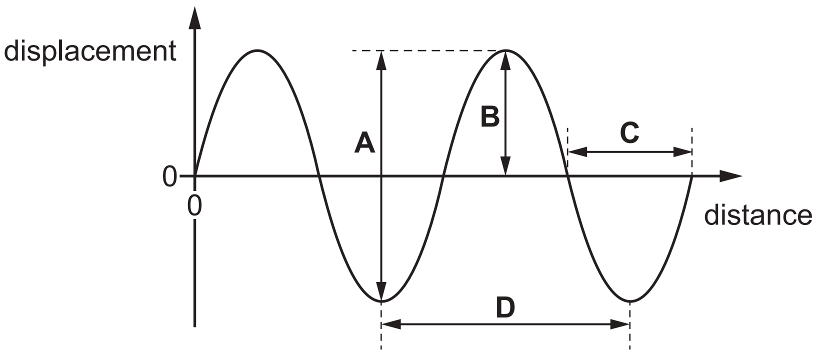
A 2.0×10^{-15} Hz

B 1.3×10^{-2} Hz

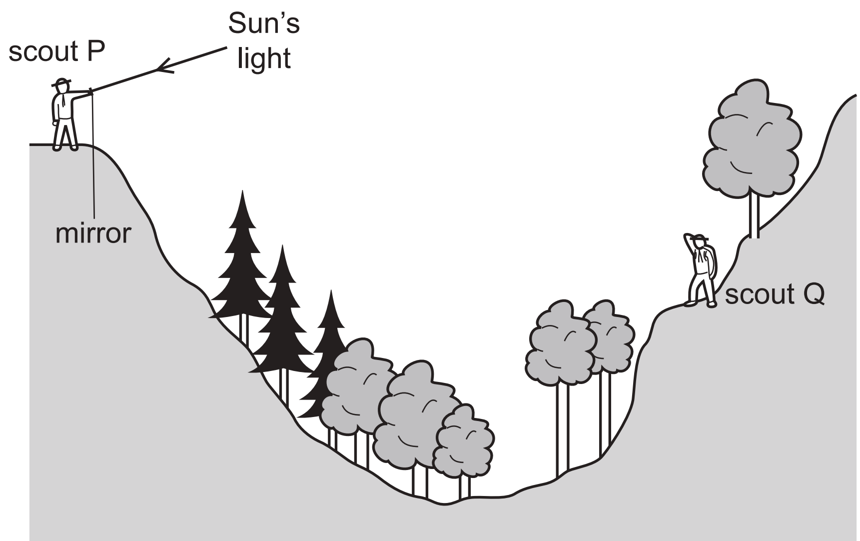
C 80 Hz

D 5.0×10^{14} Hz

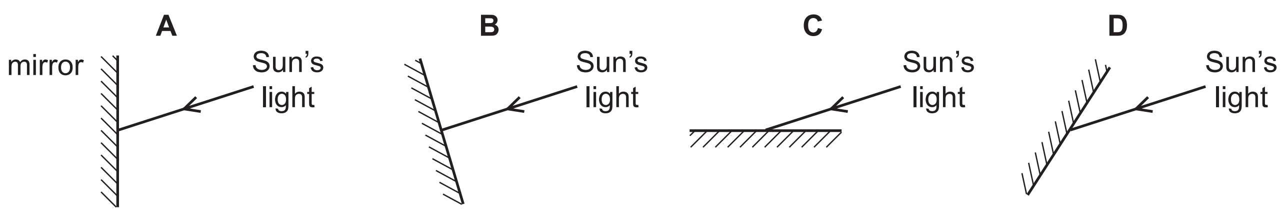
20 Which arrow on the graph shows the amplitude of the wave?



21 Scout P signals to scout Q on the other side of a valley by using a mirror to reflect the Sun's light.



Which mirror position allows the Sun's light to be reflected to scout Q?



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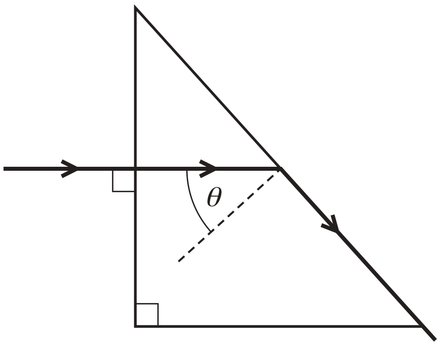
22 A prism is made from transparent plastic. In this plastic, light travels at $0.80\,c$, where c is its speed in air. Light enters one face of the prism at right-angles as shown.



NOT TO SCALE

The light just escapes from the sloping face of the prism.

What is angle θ?

A 37° **B** 39° **C** 51° **D** 53°

23 The Sun emits infra-red radiation and light.

Light from the Sun reaches the Earth in 8 minutes.

Which row gives correct information about the infra-red radiation?

	wavelength of infra-red radiation	time taken for infra-red radiation to reach Earth
A	longer than wavelength of light	8 minutes
B	longer than wavelength of light	much less than 8 minutes
C	shorter than wavelength of light	8 minutes
D	shorter than wavelength of light	much more than 8 minutes

24 A dolphin has a range of audible frequencies of 150 Hz–150 kHz.

Which range of frequencies can be heard both by humans with good hearing and by dolphins?

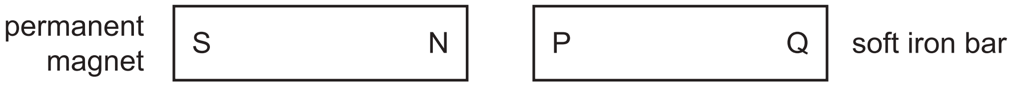
A 20 Hz–150 Hz

B 20 Hz–150 kHz

C 20 kHz–150 kHz

D 150 Hz–20 kHz

25 A permanent magnet is placed close to a bar of soft iron.



What are the polarities of end P and of end Q?

	end P	end Q
A	N	N
B	N	S
C	S	N
D	S	S

26 A steel magnet is placed inside a coil of wire.

Which method is used to demagnetise the magnet?

A connect the coil to an a.c. power supply

B connect the coil to an a.c. power supply and slowly remove the magnet from the coil

C connect the coil to a d.c. power supply

D connect the coil to a d.c. power supply and slowly remove the magnet from the coil

27 The electromotive force (e.m.f.) of a rechargeable battery is 6.0 V.

What does this mean?

A 6.0 J is the maximum energy the battery can provide in 1.0 s.

B 6.0 J is the total energy the battery can provide before it has to be recharged.

C 6.0 J of energy is provided by the battery to drive a charge of 1.0 C around a complete circuit.

D 6.0 J of energy is provided by the battery to drive a current of 1.0 A around a complete circuit.

28 A student measures the potential difference across a device and the current in the device.

Which calculation gives the resistance of the device?

A current + potential difference

B current ÷ potential difference

C potential difference ÷ current

D potential difference × current

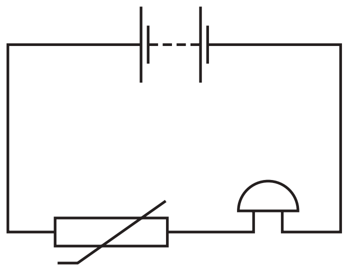
29 A water heater is connected to a 230 V supply and there is a current of 26 A in the heater. It takes 20 minutes to heat the water to the required temperature.

How much energy is supplied by the heater?

A 6.0×10^3 J **B** 1.0×10^4 J **C** 1.2×10^5 J **D** 7.2×10^6 J

30 Which electrical symbol represents a diode?

31 A student sets up this circuit.



What is the purpose of the circuit?

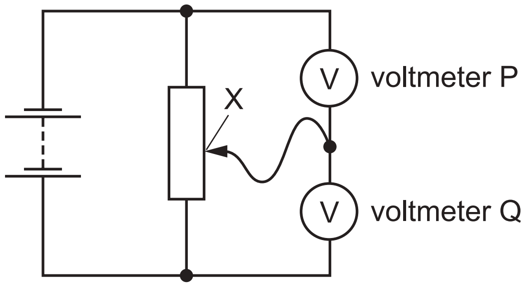
A to allow a lamp to be made dimmer or brighter as required

B to amplify the sound of a voice

C to light a lamp in the dark

D to sound a bell when the temperature rises

32 The diagram shows two voltmeters P and Q connected to a potential divider.

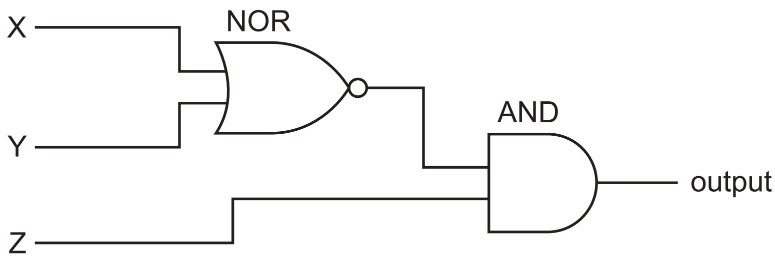


The sliding connection at point X is moved towards the top of the diagram.

What happens to the reading on P and to the reading on Q?

	reading on P	reading on Q
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

33 The diagram represents a digital circuit using a NOR gate and an AND gate.



What is the truth table for this circuit?

A

X	Y	Z	output
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

B

X	Y	Z	output
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0

C

X	Y	Z	output
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

D

X	Y	Z	output
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

34 Which statement about electromagnetic induction is correct?

A A strong magnet that is held stationary near a stationary conductor causes a greater effect than a weak magnet.

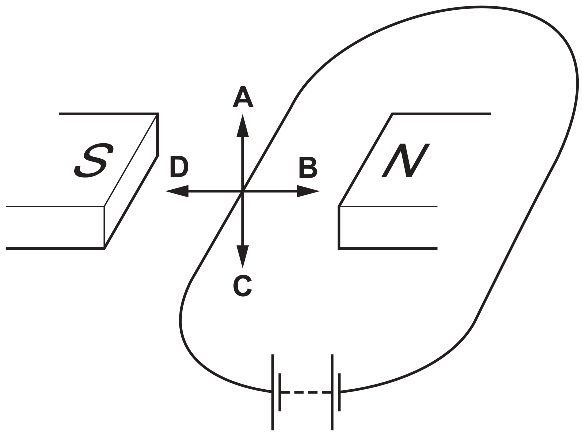
B The effect occurs when a magnet and a conductor are both moved with the same speed and in the same direction.

C The effect occurs when a magnet is moved away from a nearby conductor.

D The effect only occurs when a magnet is moved towards a conductor.

35 The diagram shows a current-carrying conductor in a magnetic field.

Which arrow shows the direction of the force acting on the conductor?



36 Power losses in transmission cables are reduced by increasing the transmission voltage.

What is the explanation for this reduction?

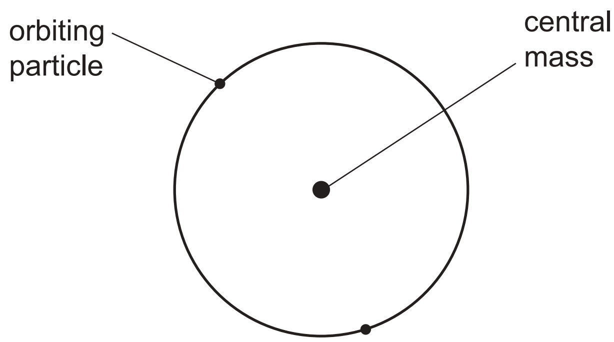
A The current decreases, reducing thermal energy losses.

B The current increases, increasing the flow of charge.

C The resistance of the cable increases, reducing the current.

D The resistance of the cable decreases.

37 In the atomic model, an atom consists of a central mass, orbited by much smaller particles.



What is the name of the central mass and of the orbiting particles?

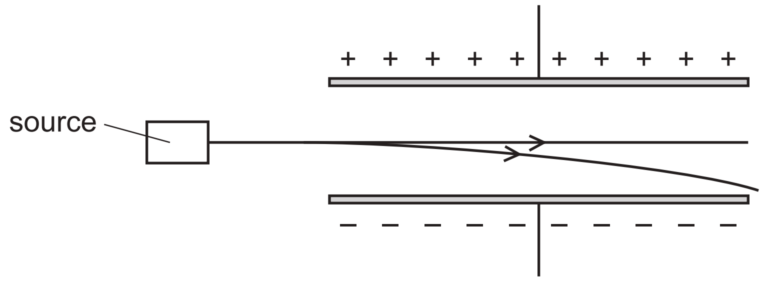
	central mass	orbiting particles
A	neutron	α-particles
B	neutron	electrons
C	nucleus	α-particles
D	nucleus	electrons

38 Nuclear fusion is a reaction that takes place in stars.

Which row describes this reaction?

	action of atomic nuclei	energy
A	an atomic nucleus splits into two or more smaller nuclei	absorbed
B	an atomic nucleus splits into two or more smaller nuclei	released
C	atomic nuclei join together to form a larger nucleus	absorbed
D	atomic nuclei join together to form a larger nucleus	released

39 The diagram shows emissions from a source passing into the electric field between two charged plates.



What is emitted by this source?

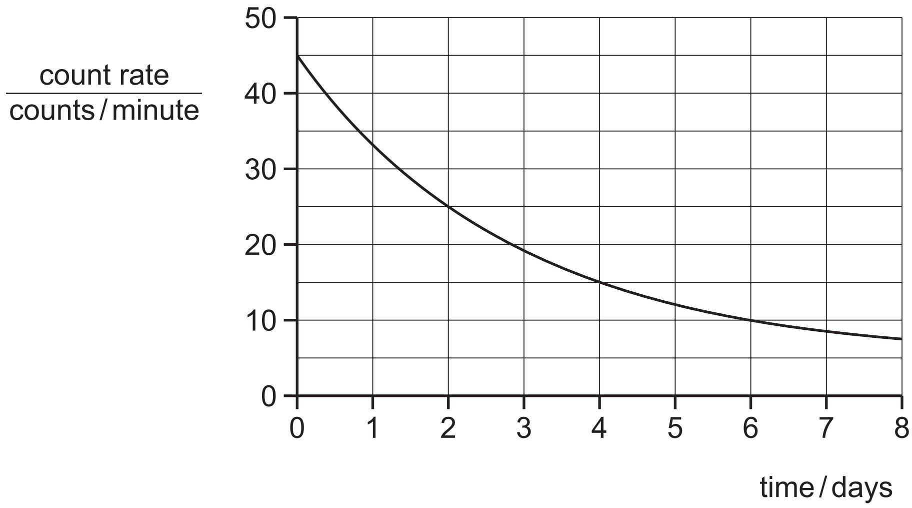
A neutrons and γ-rays only

B α-particles and β-particles only

C α-particles and γ-rays only

D β-particles and γ-rays only

40 The graph shows how the count rate registered by a counter near to a sample of a radioactive isotope changes over a period of a few days. The background count rate is 5 counts per minute.



What is the half-life of the isotope?

A 2.0 days **B** 2.5 days **C** 3.0 days **D** 4.0 days

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Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/22**

Paper 2 Multiple Choice (Extended) **May/June 2018**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

7373168877

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

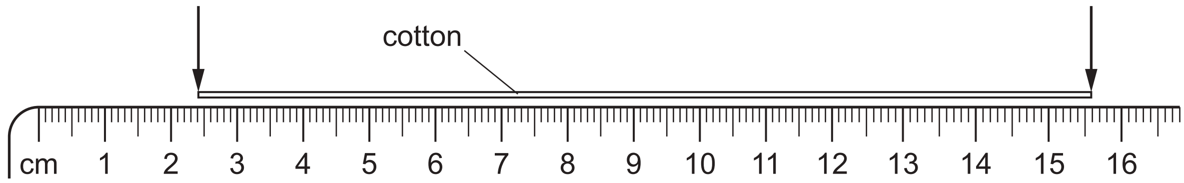
This document consists of **14** printed pages and **2** blank pages.

IB18 06_0625_22/3RP

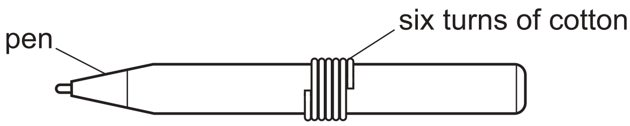
CAMBRIDGE International Examinations

[Turn over

1 A length of cotton is measured between two points on a ruler.



When the length of cotton is wound closely around a pen, it goes round six times.



What is the distance once round the pen?

A 2.2 cm **B** 2.6 cm **C** 13.2 cm **D** 15.6 cm

2 When does an object falling vertically through the air reach terminal velocity?

A when the acceleration of the object becomes negative

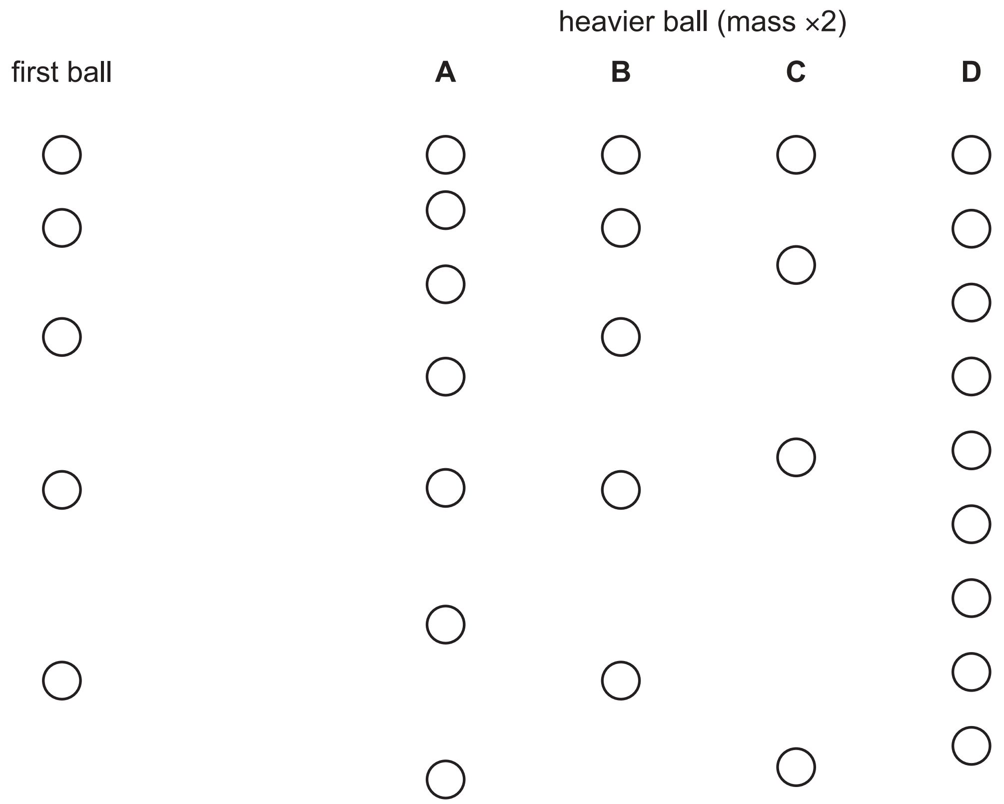
B when the acceleration of the object is equal to g

C when the air resistance equals the weight of the object

D when the air resistance is greater than the weight of the object

3 A ball is dropped in an evacuated tube. A series of photographs is taken at equal time intervals from the time of release. Another ball of the same size but twice the mass is also dropped in the same evacuated tube and photographed.

Which diagram shows the motion of the heavier ball?



4 Which statement about the mass and the weight of an object is correct?

A They are both affected by changes in the acceleration of free fall.

B They are both forces.

C They have different units.

D Weight is calculated by dividing mass by the acceleration of free fall.

5 Which statement about the mass of an object is correct?

A It is equal to the density divided by the volume.

B It is equal to weight multiplied by the gravitational field strength.

C It is the effect of a gravitational field on the object.

D It is the property that resists a change in velocity.

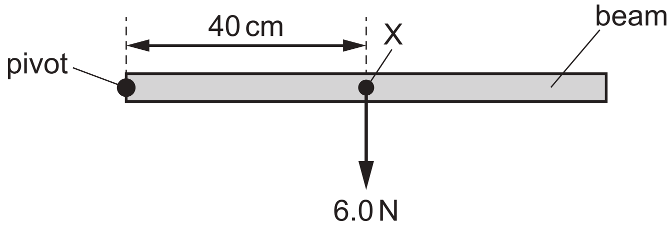
6 An object decelerates from 25.0 m/s to 5.0 m/s in a time of 4.0 s.

It has a mass of 50 kg.

What is the resultant force on the object?

A 0.63 N **B** 10 N **C** 250 N **D** 4000 N

7 A beam is pivoted at one end, as shown.



The beam weighs 6.0 N and its weight acts at a point X, 40 cm from the pivot.

A force of 4.0 N is applied to the beam causing it to balance horizontally.

In which direction and where is the 4.0 N force applied?

A downwards at 20 cm to the left of X

B downwards at 20 cm to the right of X

C upwards at 20 cm to the left of X

D upwards at 20 cm to the right of X

8 A spacecraft is travelling in space with no resultant force and no resultant moment acting on it.

Which statement about the spacecraft is correct?

A Its direction is changing.

B It is in equilibrium.

C Its speed is decreasing.

D Its speed is increasing.

9 A car of mass 1000 kg travelling at 8.0 m/s collides with a lorry of mass 3000 kg that is travelling at 2.0 m/s in the same direction. After colliding, the two vehicles stick together.

What is their speed after the collision?

A 2.0 m/s **B** 2.5 m/s **C** 3.5 m/s **D** 5.0 m/s

10 What is the main process by which energy is released in the Sun?

A α-decay

B β-decay

C nuclear fission

D nuclear fusion

11 The work done W by a force is related to the magnitude F of the force and the distance d moved in the direction of the force.

Which equation for W is correct?

A $W = d \div F$

B $W = d + F$

C $W = F \div d$

D $W = F \times d$

12 A crane on a construction site lifts concrete beams.

The useful work done by the crane is 4000 kJ in a time of 160 s.

What is the useful output power of the crane?

A 0.04 kW **B** 25 W **C** 25 kW **D** 640 kW

13 A submarine is in water of density $1.0 \times 10^3\,kg/m^3$. The submarine changes its depth. This causes the pressure on it to change by 0.10 MPa.

What is the change in depth of the submarine?

A 0.10 m **B** 10 m **C** 100 m **D** 1000 m

14 An oil tank has a base of area $2.5\,m^2$ and is filled with oil to a depth of 1.2 m.

The density of the oil is $800\,kg/m^3$.

What is the force exerted on the base of the tank due to the oil?

A 960 N **B** 2400 N **C** 9600 N **D** 24 000 N

15 When molecules of a gas rebound from a wall of a container, the wall experiences a pressure.

What is the cause of this pressure?

A the change in energy of the molecules

B the change in momentum of the molecules

C the change in power of the molecules

D the change in speed of the molecules

16 A student wishes to calibrate a mercury-in-glass thermometer with a °C scale.

Which values should she use for the lower fixed point and for the upper fixed point?

	lower fixed point	upper fixed point
A	melting point of ice	boiling point of mercury
B	melting point of ice	boiling point of water
C	melting point of mercury	boiling point of mercury
D	melting point of mercury	boiling point of water

17 In an experiment, an object is heated.

The data from the experiment is shown.

- The energy transferred to the object is 3.0 kJ.
- The mass of the object is 2.0 kg.
- The rise in temperature of the object is 10 °C.
- The specific heat capacity of the object is 150 J / (kg °C).

What is the thermal capacity of the object?

A 30 J / °C **B** 300 J / °C **C** 3000 J / °C **D** 9000 J / °C

18 Four thermometers, with their bulbs painted different colours, are placed at equal distances from a radiant heater.

Which thermometer shows the slowest temperature rise when the heater is first switched on?

A matt black

B matt white

C shiny black

D shiny white

19 A tank contains water. Ripples are produced on the surface of the water.

What causes the ripples to refract?

A The cold water in the tank is replaced by warm water.

B The ripples change speed as they move from deep to shallow water.

C The ripples hit the wall of the tank.

D The ripples pass through a narrow gap.

20 Light travels at a speed of 2.0×10^{8} m/s in a glass block.

In the glass, the wavelength of the light is 4.0×10^{-7} m.

What is the frequency of the light?

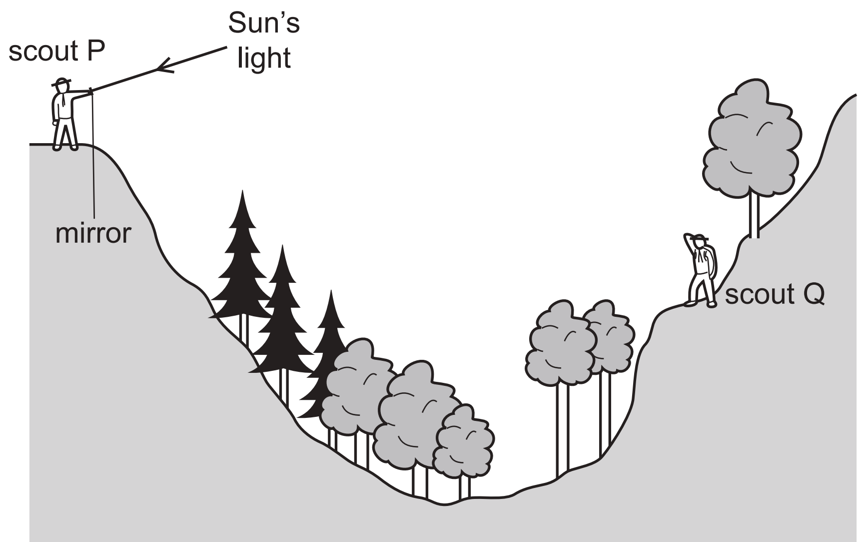
A 2.0×10^{-15} Hz

B 1.3×10^{-2} Hz

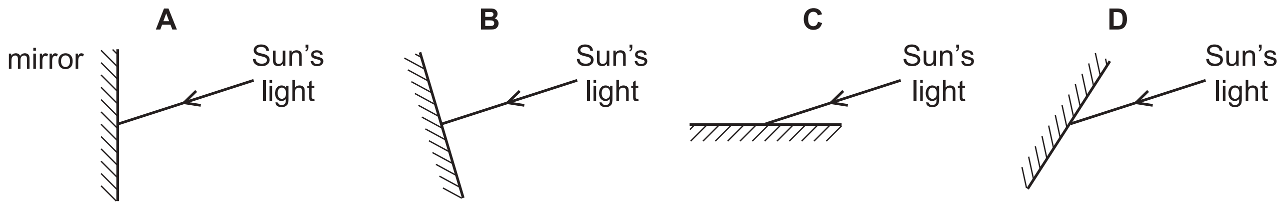
C 80 Hz

D 5.0×10^{14} Hz

21 Scout P signals to scout Q on the other side of a valley by using a mirror to reflect the Sun's light.



Which mirror position allows the Sun's light to be reflected to scout Q?



22 A scientist describes light as being monochromatic.

What does this tell you about the light?

A It has a single frequency.

B It has more than one wavelength.

C It travels at a single speed in a single direction.

D It travels at different speeds in different directions.

23 Which statement is **not** correct?

A The speed of long-wavelength infra-red radiation in a vacuum is greater than that of short-wavelength ultraviolet light.

B The speed of microwaves in air is approximately 3.0×10^8 m/s.

C The speed of γ-rays emitted from a sample of cobalt-60 is 3.0×10^5 km/s.

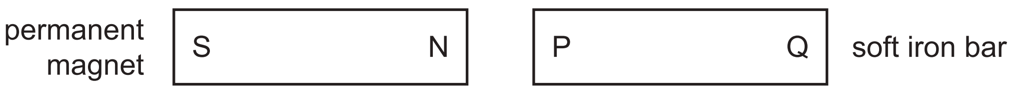
D The X-rays emitted in a supernova explosion reach the Earth at the same time as the visible light emitted.

24 A siren is emitting a sound. As time passes, the sound becomes louder and higher pitched.

What is happening to the amplitude and to the frequency of the emitted sound wave?

	amplitude	frequency
A	decreasing	decreasing
B	decreasing	increasing
C	increasing	decreasing
D	increasing	increasing

25 A permanent magnet is placed close to a bar of soft iron.



What are the polarities of end P and of end Q?

	end P	end Q
A	N	N
B	N	S
C	S	N
D	S	S

26 Which method is used to demagnetise a bar magnet?

A lower it into water

B heat it with a Bunsen burner

C place it in a metal box

D suspend it in a sling

27 What is the electromotive force (e.m.f.) of a cell?

A the amount of charge that passes through the cell per unit time

B the energy gained per unit charge as charge passes through the cell

C the total amount of charge flowing through the cell

D the total energy stored in the cell

28 A student measures the potential difference across a device and the current in the device.

Which calculation gives the resistance of the device?

A current $+$ potential difference

B current $\div$ potential difference

C potential difference $\div$ current

D potential difference $\times$ current

29 A piece of wire is 40 cm long and has a diameter of 2.0 mm.

Its resistance is 0.30 Ω.

Which wire of the same material has a resistance of 0.15 Ω?

	length / cm	diameter / mm
A	20	1.0
B	20	4.0
C	80	1.0
D	80	4.0

30 A diode is used as a rectifier.

What is the purpose of a rectifier?

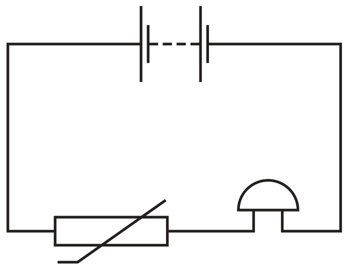
A to allow current to pass in either direction

B to change alternating current into direct current

C to switch off the circuit in case of a large current

D to provide an efficient source of light

31 A student sets up this circuit.



What is the purpose of the circuit?

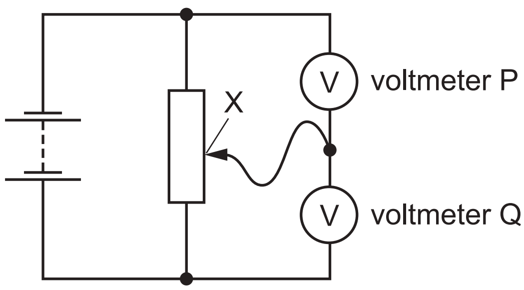
A to allow a lamp to be made dimmer or brighter as required

B to amplify the sound of a voice

C to light a lamp in the dark

D to sound a bell when the temperature rises

32 The diagram shows two voltmeters P and Q connected to a potential divider.

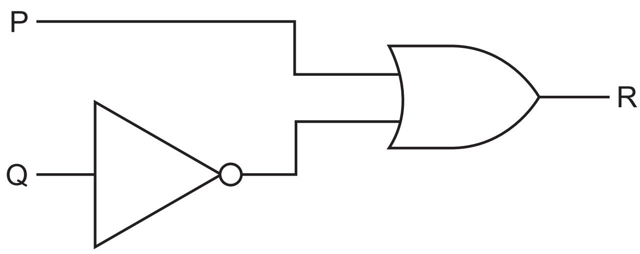


The sliding connection at point X is moved towards the top of the diagram.

What happens to the reading on P and to the reading on Q?

	reading on P	reading on Q
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

33 The circuit shown contains two gates.



Which truth table describes the operation of the circuit?

A

P	Q	R
0	0	0
0	1	1
1	0	1
1	1	1

B

P	Q	R
0	0	0
0	1	0
1	0	1
1	1	1

C

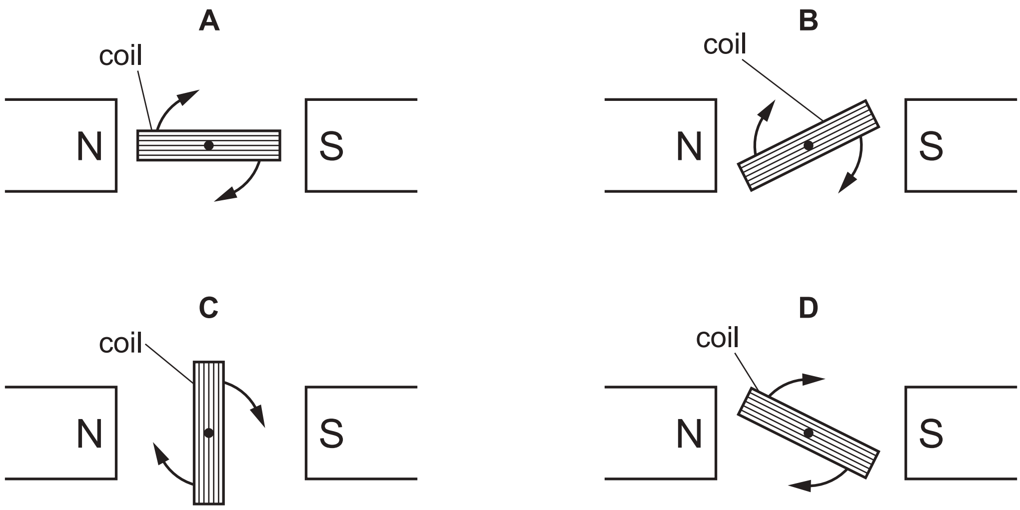
P	Q	R
0	0	1
0	1	0
1	0	0
1	1	0

D

P	Q	R
0	0	1
0	1	0
1	0	1
1	1	1

34 In an a.c. generator, a coil is rotated in a magnetic field and an electromotive force (e.m.f.) is induced in the coil.

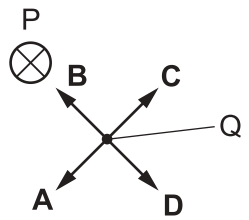
In which position of the coil does the e.m.f. have the largest value?



35 Wire P carries a current directed perpendicularly into the page. A compass is placed at point Q which is close to wire P.

The magnetic field at Q due to the current is very much larger than the magnetic field of the Earth.

In which direction does the North pole of the compass point?

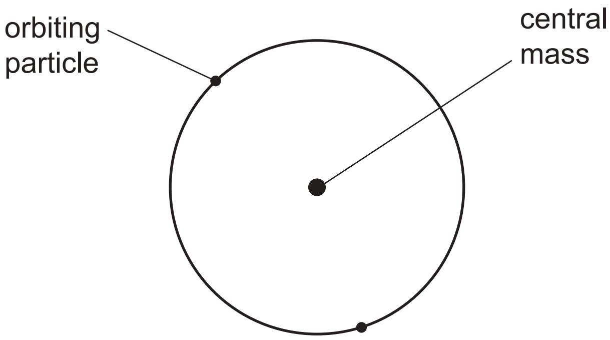


36 A transformer has N_p turns in the primary coil and N_s turns in the secondary coil.

Which row gives the values of N_p and N_s for a transformer that steps up a voltage of 1200 V to 36 000 V?

	N_p	N_s
A	2 000	60 000
B	2 000	600 000
C	60 000	2 000
D	600 000	2 000

37 In the atomic model, an atom consists of a central mass, orbited by much smaller particles.



What is the name of the central mass and of the orbiting particles?

	central mass	orbiting particles
A	neutron	α-particles
B	neutron	electrons
C	nucleus	α-particles
D	nucleus	electrons

38 An isotope of polonium has the nuclide notation $^{218}_{84}Po$.

A nucleus of this isotope decays by emitting an α-particle. A β-particle is then emitted to form nuclide X.

What is the notation for nuclide X?

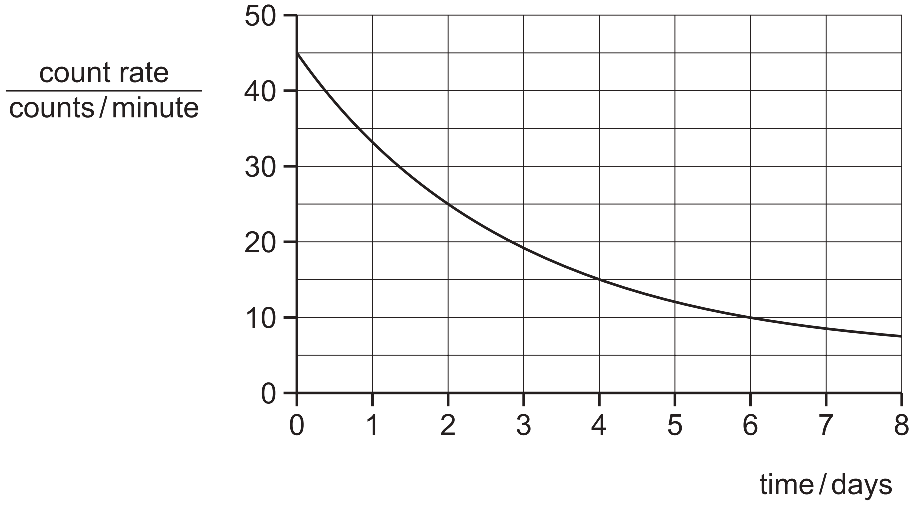
A $^{214}_{81}X$ **B** $^{213}_{82}X$ **C** $^{213}_{83}X$ **D** $^{214}_{83}X$

39 The table compares the penetrating abilities and ionising effects of α-radiation and of γ-radiation.

Which row is correct?

	least penetrating	most ionising
A	α	α
B	α	γ
C	γ	α
D	γ	γ

40 The graph shows how the count rate registered by a counter near to a sample of a radioactive isotope changes over a period of a few days. The background count rate is 5 counts per minute.



What is the half-life of the isotope?

A 2.0 days **B** 2.5 days **C** 3.0 days **D** 4.0 days

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Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/23**

Paper 2 Multiple Choice (Extended) **May/June 2018**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

* 9 5 6 1 1 4 4 9 5 5 *

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

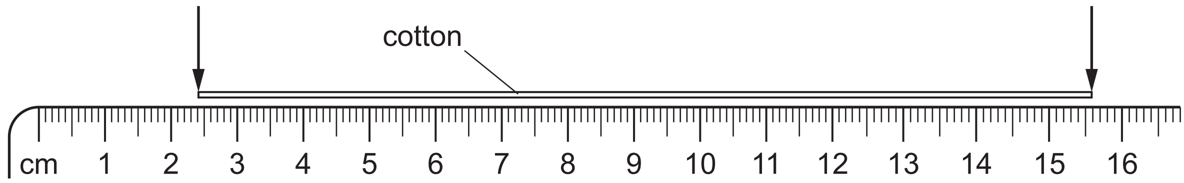
There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

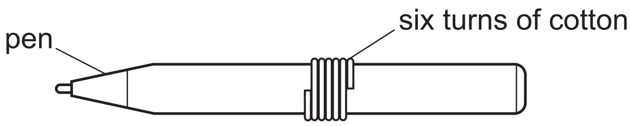
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

IB18 06_0625_23/4RP

1 A length of cotton is measured between two points on a ruler.



When the length of cotton is wound closely around a pen, it goes round six times.



What is the distance once round the pen?

A 2.2 cm **B** 2.6 cm **C** 13.2 cm **D** 15.6 cm

2 When does an object falling vertically through the air reach terminal velocity?

A when the acceleration of the object becomes negative

B when the acceleration of the object is equal to *g*

C when the air resistance equals the weight of the object

D when the air resistance is greater than the weight of the object

3 A sprinter runs a 100 m race in a straight line. The table shows how his speed changes with time for the first 5.0 s of the race.

$\frac{\text{speed}}{\text{m/s}}$	0	1.7	4.1	5.7	6.5	6.8
time / s	0	1.0	2.0	3.0	4.0	5.0

What is the average acceleration of the sprinter between time 2.0 s and time 3.0 s?

A $1.6\,m/s^2$ **B** $1.9\,m/s^2$ **C** $4.1\,m/s^2$ **D** $5.7\,m/s^2$

4 A person steps onto a bathroom scales.

The bathroom scales records both mass and weight.

Which row shows the readings on the scales?

	mass	weight
A	60 N	600 kg
B	60 kg	600 N
C	600 kg	60 N
D	600 N	60 kg

5 An object has a weight of 7600 N in a gravitational field of strength 100 N / kg.

What is the mass of the object?

A 76 kg **B** 760 N **C** 7600 g **D** 76 000 N

6 A load is hung from a steel wire. The load is increased.

The length of the wire increases until the limit of proportionality is reached.

The load is now increased slightly.

What happens?

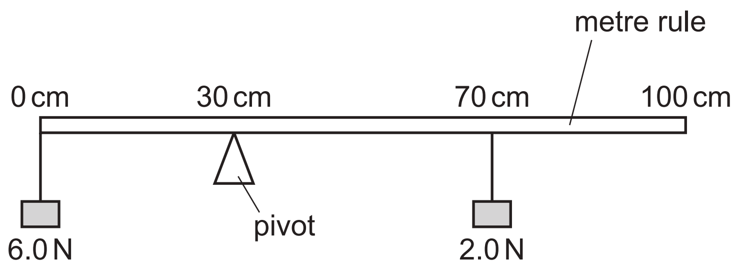
A The extension of the wire increases and the wire no longer obeys Hooke's law.

B The extension of the wire decreases and the wire no longer obeys Hooke's law.

C The extension of the wire increases and it obeys Hooke's law.

D The extension of the wire decreases and it obeys Hooke's law.

7 The diagram shows a uniform metre rule pivoted at the 30 cm mark.



The rule balances when a weight of 6.0 N is hanging from the zero mark and a weight of 2.0 N is hanging from the 70 cm mark.

What is the weight of the rule?

A 2.0 N **B** 5.0 N **C** 6.0 N **D** 13.0 N

8 An astronaut orbits the Earth in a space station.

Which is a vector quantity?

A the mass of the astronaut

B the speed of the satellite

C the temperature inside the satellite

D the weight of the astronaut

9 A visitor to a fairground throws a soft object of mass 0.12 kg at a coconut of mass 0.48 kg. The soft object stops moving when it hits the coconut. In order to dislodge the coconut, it must be made to move at 0.10 m/s.

What is the minimum speed with which the visitor should throw the soft object in order to dislodge the coconut?

A 0.20 m/s

B 0.40 m/s

C 2.0 m/s

D 4.0 m/s

10 An aircraft with a mass of 300 000 kg is flying at an altitude of 2000 m with a speed of 100 m/s.

What is the kinetic energy of the aircraft?

A 1.5×10^4 kJ **B** 1.5×10^6 kJ **C** 3.0×10^6 kJ **D** 6.0×10^6 kJ

11 Which method of drying clothes has the least impact on the environment?

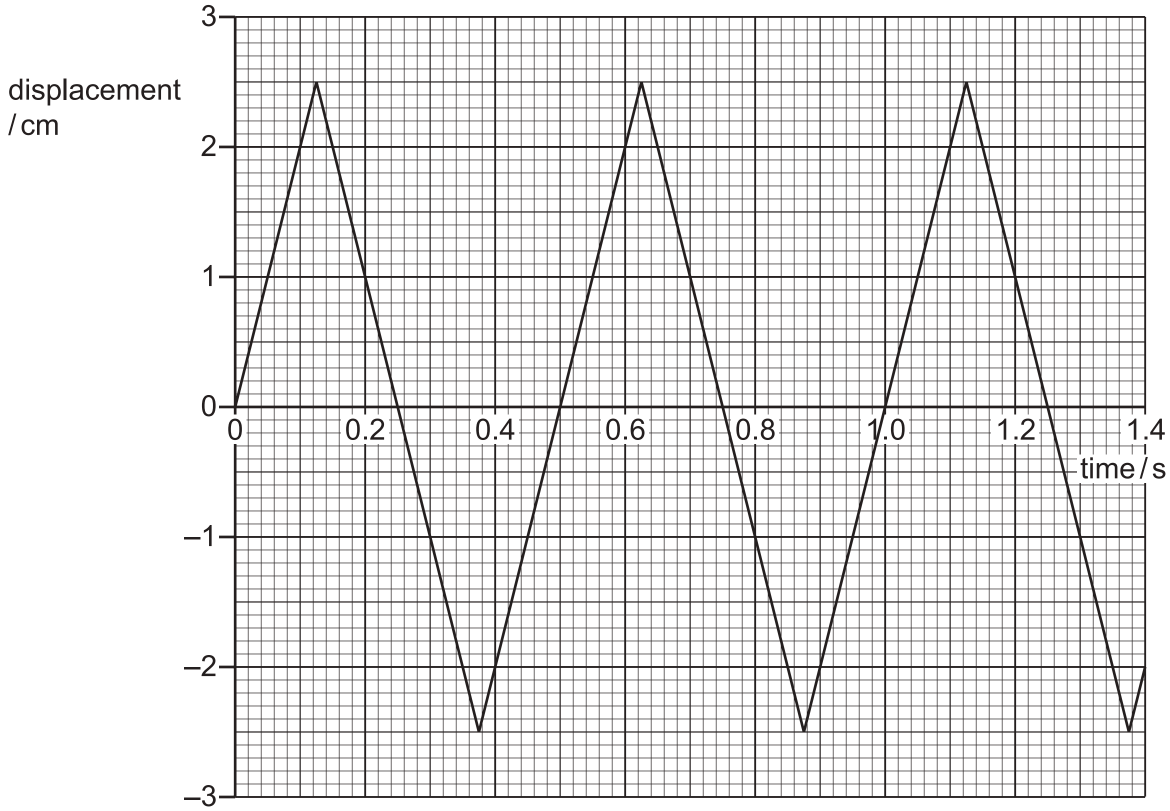
A Evaporate the water in them in an electrically heated tumble dryer.

B Hang them on a washing line in direct sunlight.

C Remove the water from them in an electric spin dryer.

D Suspend them close to a coal fire.

12 The vertical displacement of a mass of 0.20 kg changes with time. The graph shows how this displacement changes.



At which rate does it gain gravitational potential energy as it moves upwards?

A 0.025 W **B** 0.050 W **C** 0.20 W **D** 0.40 W

13 A simple barometer includes a column of mercury.

Which property of this column of mercury is used to give a measurement of atmospheric pressure?

A its cross-sectional area

B its height

C its temperature

D its thermal capacity

14 An oil tank has a base of area 2.5 m^2 and is filled with oil to a depth of 1.2 m.

The density of the oil is 800 kg / m^3.

What is the force exerted on the base of the tank due to the oil?

A 960 N **B** 2400 N **C** 9600 N **D** 24 000 N

15 When molecules of a gas rebound from a wall of a container, the wall experiences a pressure.

What is the cause of this pressure?

A the change in energy of the molecules

B the change in momentum of the molecules

C the change in power of the molecules

D the change in speed of the molecules

16 Two liquid-in-glass thermometers P and Q contain the same volume of mercury and have capillary tubes of the same length.

Thermometer P has a capillary tube with a smaller diameter than thermometer Q.

Which thermometer has the greater range and which has the greater sensitivity?

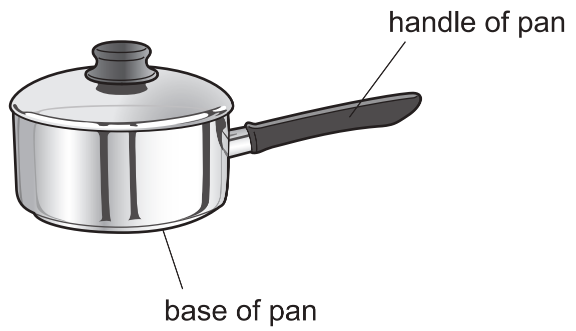
	greater range	greater sensitivity
A	P	P
B	P	Q
C	Q	P
D	Q	Q

17 A student wishes to calibrate a mercury-in-glass thermometer with a °C scale.

Which values should she use for the lower fixed point and for the upper fixed point?

	lower fixed point	upper fixed point
A	melting point of ice	boiling point of mercury
B	melting point of ice	boiling point of water
C	melting point of mercury	boiling point of mercury
D	melting point of mercury	boiling point of water

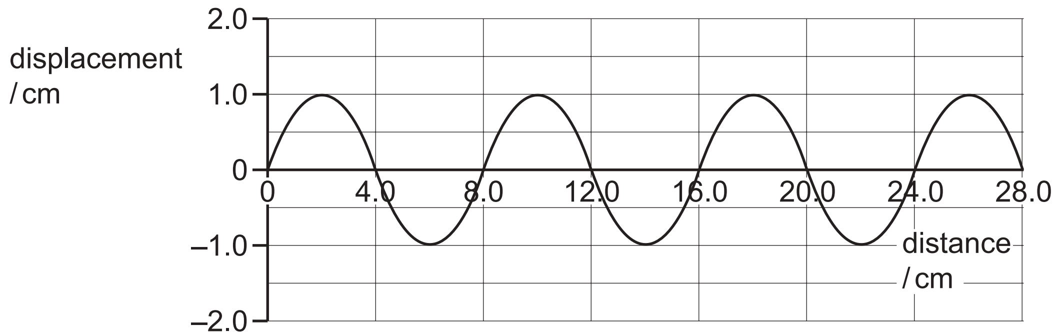
18 The diagram shows a pan used for cooking food.



Which row is correct for the materials used to make the base and the handle of the pan?

	base of pan	handle of pan
A	good thermal conductor	good thermal conductor
B	good thermal conductor	poor thermal conductor
C	poor thermal conductor	good thermal conductor
D	poor thermal conductor	poor thermal conductor

19 The diagram shows a wave.



Which row is correct?

	amplitude of the wave / cm	wavelength of the wave / cm
A	1.0	4.0
B	1.0	8.0
C	2.0	4.0
D	2.0	8.0

20 Light travels at a speed of $2.0 \times 10^{8}\,m/s$ in a glass block.

In the glass, the wavelength of the light is $4.0 \times 10^{-7}\,m$.

What is the frequency of the light?

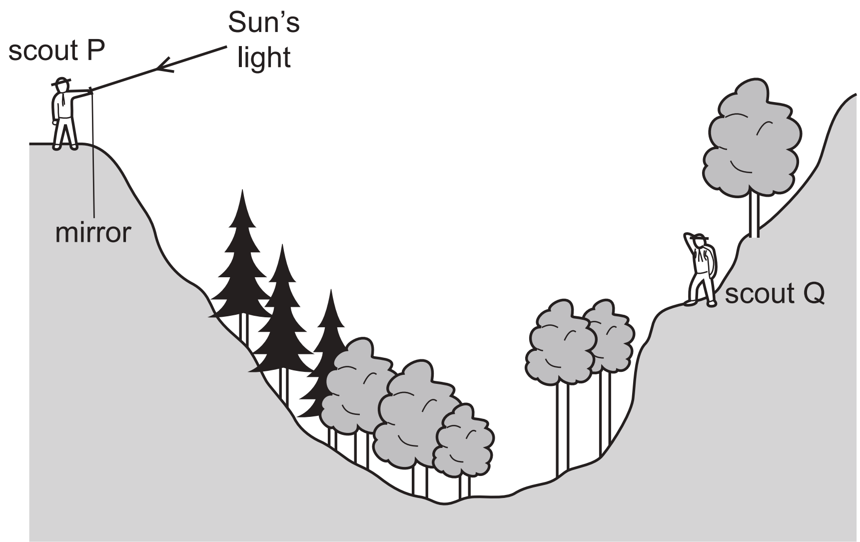
A $2.0 \times 10^{-15}\,Hz$

B $1.3 \times 10^{-2}\,Hz$

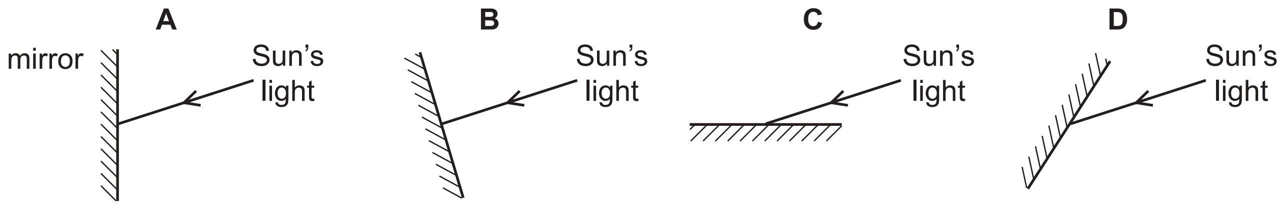
C $80\,Hz$

D $5.0 \times 10^{14}\,Hz$

21 Scout P signals to scout Q on the other side of a valley by using a mirror to reflect the Sun's light.



Which mirror position allows the Sun's light to be reflected to scout Q?

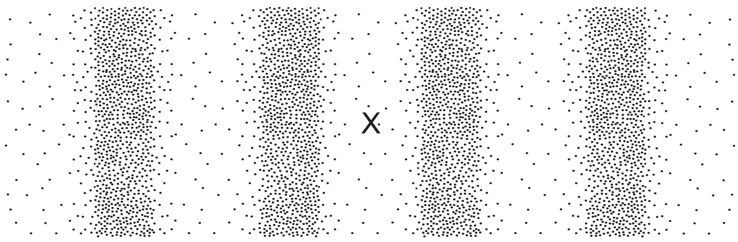


22 Images formed by lenses and mirrors can either be described as real or as virtual.

Which row describes real and virtual images of a point object?

	real images	virtual images
A	formed where light rays meet	an image in a plane mirror is an example of a virtual image
B	formed where light rays meet	can be projected onto a screen
C	formed from where light rays appear to diverge	an image in a plane mirror is an example of a virtual image
D	formed from where light rays appear to diverge	can be projected onto a screen

23 The diagram shows the air molecules in part of a sound wave at a particular moment in time.



Which statement is **not** correct?

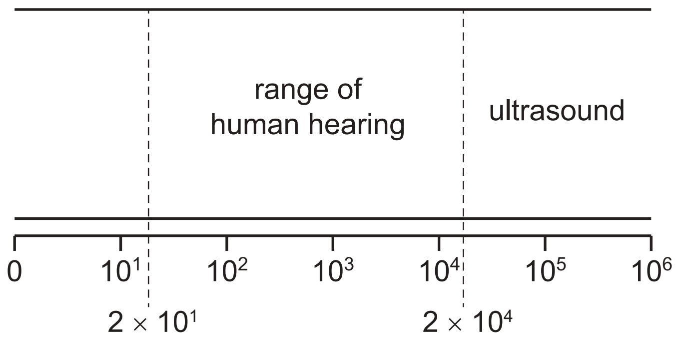
A Earlier, there was compression at X.

B Later, there will be a rarefaction at X.

C This part of the wave is travelling horizontally across the page.

D This part of the wave is travelling towards the top of the page.

24 The diagram shows the ranges of human hearing and of ultrasound waves.



To which characteristic of sound waves do the numbers on the diagram refer?

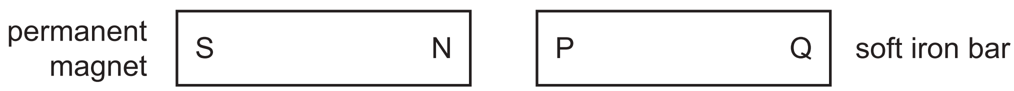
A amplitude in cm

B frequency in Hz

C speed in metres / second

D wavelength in metres

25 A permanent magnet is placed close to a bar of soft iron.



What are the polarities of end P and of end Q?

	end P	end Q
A	N	N
B	N	S
C	S	N
D	S	S

26 Which method is used to demagnetise a magnet?

A cool it in a freezer

B drop it into a beaker of water

C place it inside a coil carrying a direct current

D strike it with a hammer

27 Two power supplies are connected in separate circuits. Both power supplies provide the same magnitude current.

Power supply P has an electromotive force (e.m.f.) of 1.5 V and power supply Q has an e.m.f. of 3.0 V.

Which statements are correct?

1 Source Q supplies twice the charge per unit time.

2 Source Q supplies twice the energy per unit charge.

3 Source Q supplies twice the energy per unit time.

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

28 A student measures the potential difference across a device and the current in the device.

Which calculation gives the resistance of the device?

A current + potential difference

B current ÷ potential difference

C potential difference ÷ current

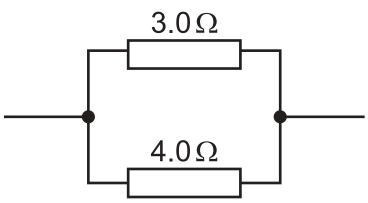
D potential difference × current

29 An electricity meter records that 200 MJ of electrical energy are drawn from the 240 V mains supply in a 24 hour period.

What is the average rate of electrical charge passing through the meter?

A 9.6 C / h **B** 580 C / h **C** 35 kC / h **D** 0.83 MC / h

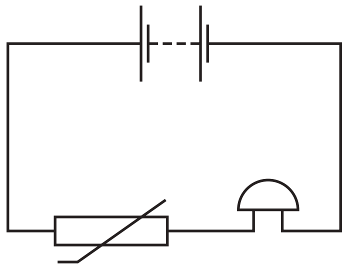
30 A 3.0 Ω resistor is connected in parallel with a 4.0 Ω resistor.



What is the resistance of this combination?

A 0.14 Ω **B** 0.58 Ω **C** 1.7 Ω **D** 7.0 Ω

31 A student sets up this circuit.



What is the purpose of the circuit?

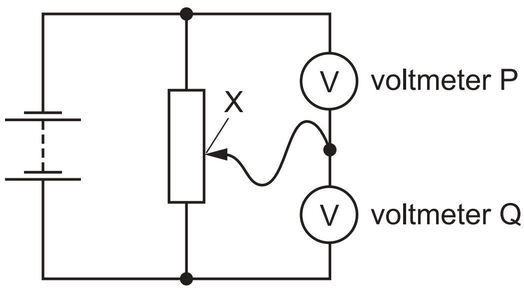
A to allow a lamp to be made dimmer or brighter as required

B to amplify the sound of a voice

C to light a lamp in the dark

D to sound a bell when the temperature rises

32 The diagram shows two voltmeters P and Q connected to a potential divider.



The sliding connection at point X is moved towards the top of the diagram.

What happens to the reading on P and to the reading on Q?

	reading on P	reading on Q
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

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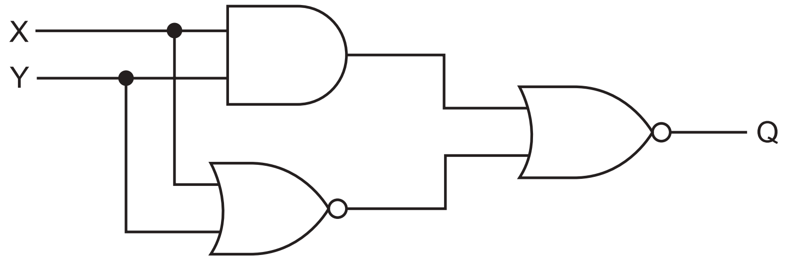
33 The diagram shows a logic circuit with inputs X and Y.



The output is Q.

Which truth table is correct?

A

X	Y	Q
0	0	0
0	1	1
1	0	1
1	1	0

B

X	Y	Q
0	0	1
0	1	0
1	0	0
1	1	1

C

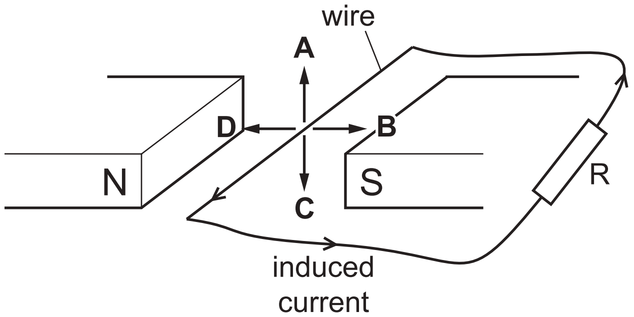
X	Y	Q
0	0	1
0	1	1
1	0	1
1	1	1

D

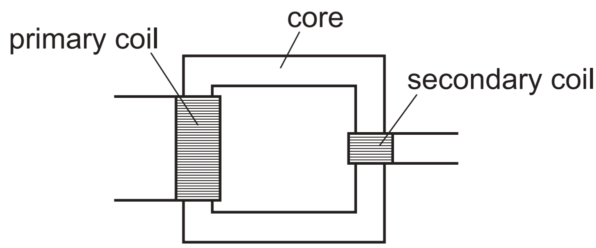
X	Y	Q
0	0	0
0	1	0
1	0	0
1	1	0

34 A wire connected to a resistor is moved in a magnetic field. A current is induced in the direction shown.

In which direction is the wire moved?



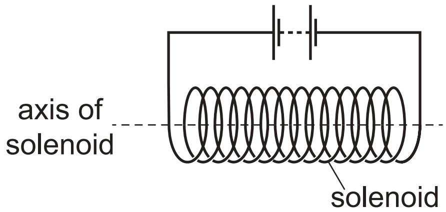
35 The diagram shows a transformer.



Which materials are the most suitable for the core and for the coils?

	core material	coil material
A	copper	copper
B	copper	iron
C	iron	copper
D	iron	iron

36 A solenoid is connected to a battery.



Which statement about the magnetic field at the centre of the solenoid is correct?

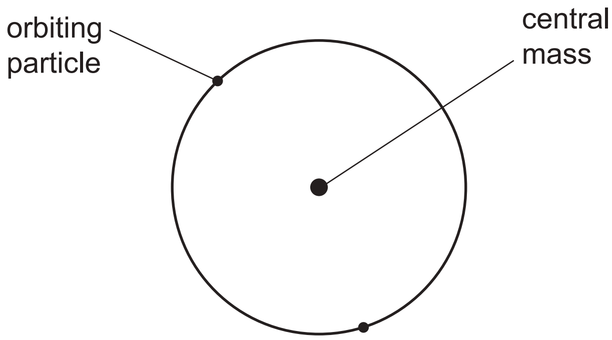
A The magnetic field along the axis is zero.

B The direction of the magnetic field is at an angle of 45° to the axis.

C The direction of the magnetic field is parallel to the axis.

D The direction of the magnetic field is perpendicular to the axis.

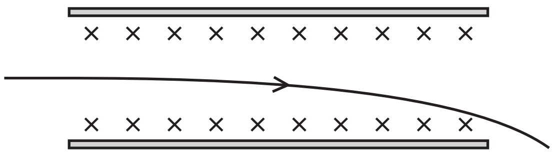
37 In the atomic model, an atom consists of a central mass, orbited by much smaller particles.



What is the name of the central mass and of the orbiting particles?

	central mass	orbiting particles
A	neutron	α-particles
B	neutron	electrons
C	nucleus	α-particles
D	nucleus	electrons

38 The radiation from a radioactive source passes between two metal plates, and is deflected as shown in the diagram. Between the plates there is a magnetic field directed into the plane of the paper, as indicated by the crosses.



Only one type of radiation is present.

Which situation is possible?

A The source emits alpha particles and there is an upwards electric field between the plates.

B The source emits alpha particles and there is no electric field between the plates.

C The source emits beta particles and there is an upwards electric field between the plates.

D The source emits gamma radiation and there is a downwards electric field between the plates.

39 The nucleus of an isotope of nitrogen (N) absorbs a neutron. It then decays into an isotope of carbon (C) and emits x.

$$^{1}_{0}n \; + \; ^{14}_{7}N \; \rightarrow \; ^{14}_{6}C \; + \; x$$

What is x?

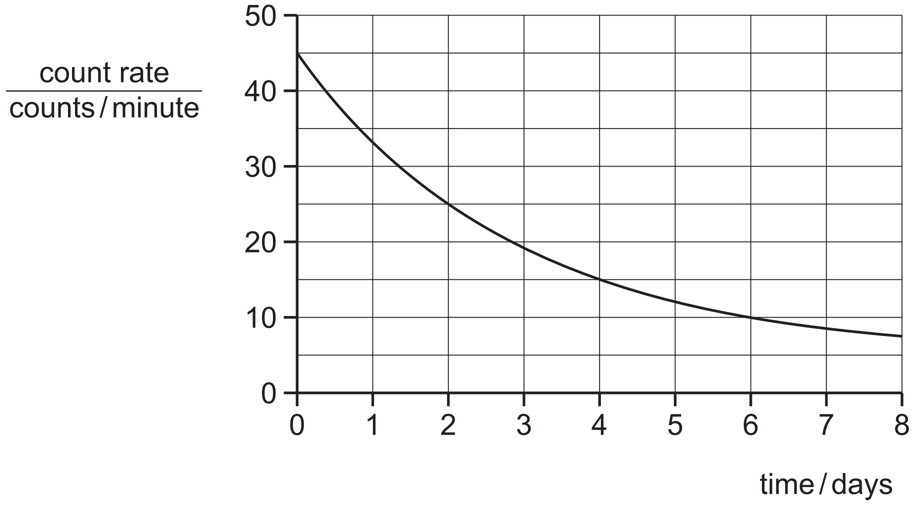
A α-particle

B β-particle

C γ-radiation

D proton

40 The graph shows how the count rate registered by a counter near to a sample of a radioactive isotope changes over a period of a few days. The background count rate is 5 counts per minute.



What is the half-life of the isotope?

A 2.0 days **B** 2.5 days **C** 3.0 days **D** 4.0 days

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CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

1535064344

PHYSICS **0625/31**

Paper 3 Theory (Core) **May/June 2018**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m/s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **19** printed pages and **1** blank page.

DC (LK/CGW) 150265/5

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1 Model trains move along a track passing through two model stations. Students analyse the motion of a train. They start a digital timer as the train starts to move. They record the time that it enters Station A and the time it enters Station B.

Fig. 1.1 shows the time on entering Station A and the time on entering Station B.

time entering Station A

time entering Station B

Fig. 1.1

(a) Calculate the time taken from the train entering Station A to the train entering Station B. State your answer in seconds.

time taken = ... s [1]

(b) A faster train takes 54 s to travel from Station A to Station B. The distance between the stations is 120 m.

Calculate the average speed of this train.

average speed = ... m/s [3]

(c) Fig. 1.2 shows the speed-time graph for a train travelling on a different part of the track.

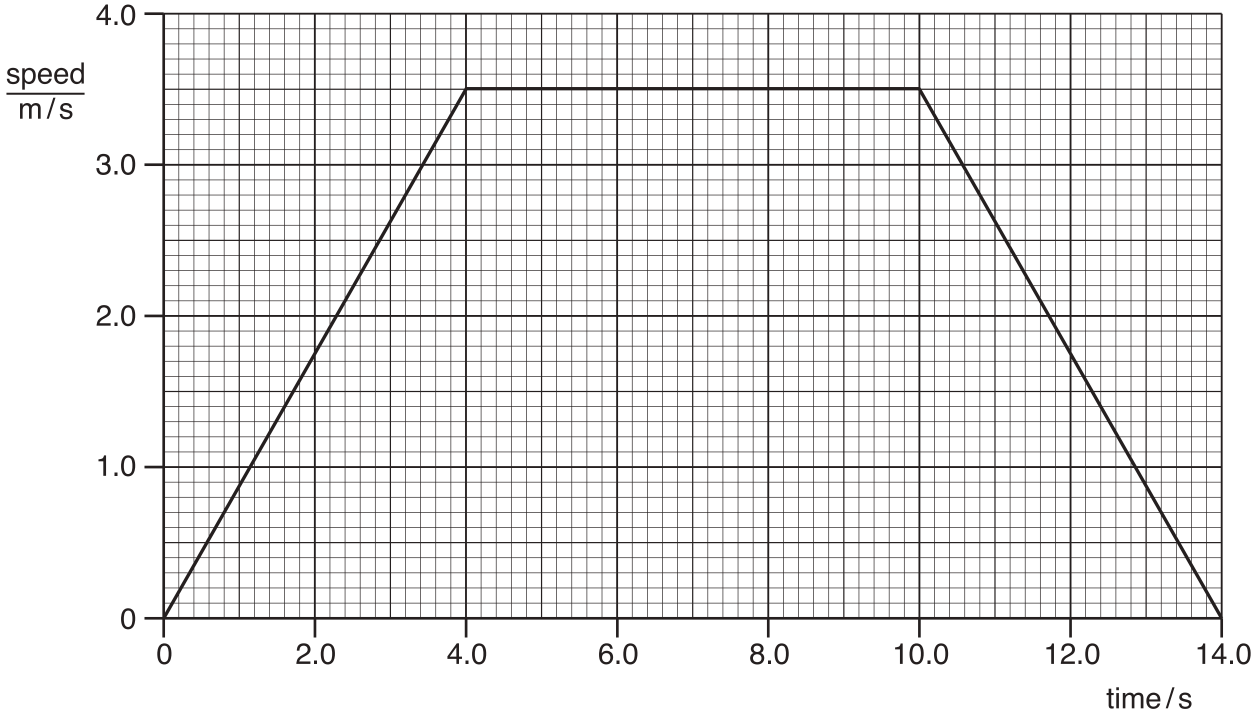


Fig. 1.2

Determine the total distance travelled by the train on this part of the track.

distance = ... m [4]

[Total: 8]

2 A 250 cm^3 beaker containing some liquid is shown in Fig. 2.1.

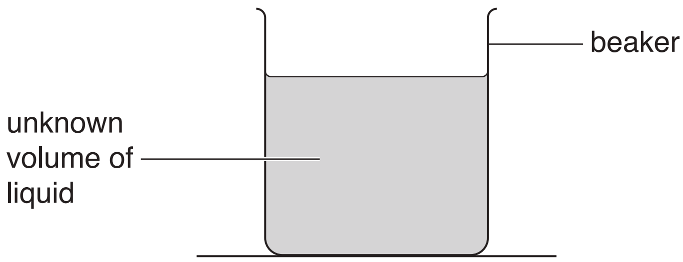


Fig. 2.1

(a) **(i)** A student has a measuring cylinder and a balance.

Describe an experiment to determine the density of the liquid.

....

....

....

....

....

....

....

....[5]

(ii) Suggest the unit of density used by the student.

....[1]

(b) Fig. 2.2 shows a block of polythene.

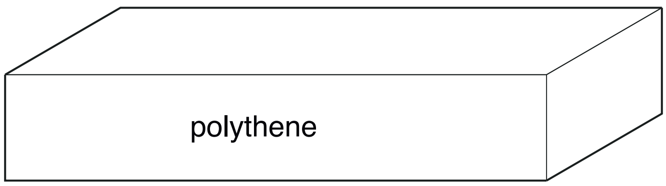


Fig. 2.2

(i) Polythene floats in water. Explain why polythene floats.

....[1]

(ii) The weight of the polythene block is 0.84 N.

Calculate the mass of the block.

mass = ... kg [3]

[Total: 10]

3 (a) Fig. 3.1 shows the vertical forces on a rocket.

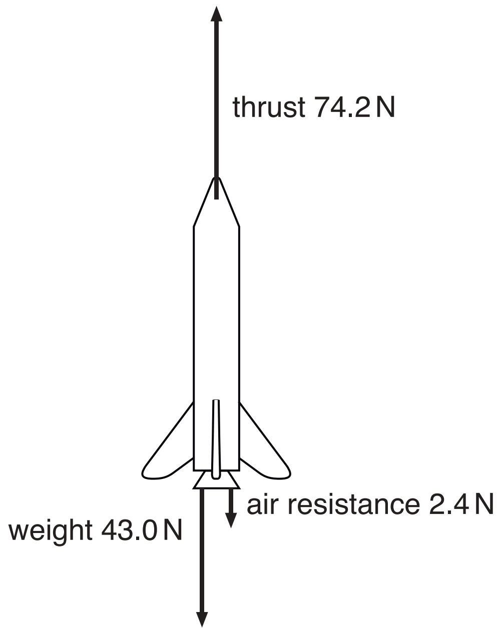


Fig. 3.1

Calculate the resultant force on the rocket.

resultant force = ... N

direction = ...[3]

(b) Fig. 3.2 shows the speed and direction of motion of an object at a point in time.

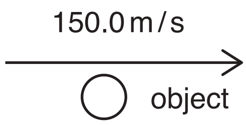


Fig. 3.2

The resultant force on the object is zero for 10 seconds.

Deduce the speed and direction of motion after 5 seconds. Indicate the speed and direction of the object by drawing a **labelled** arrow next to the object in Fig. 3.3.

Fig. 3.3

[1]

[Total: 4]

4 **(a)** Fig. 4.1 shows a smoke cell. The cell contains smoke particles and air molecules. It is lit from the side. A student views the motion of smoke particles in the cell by using a microscope.

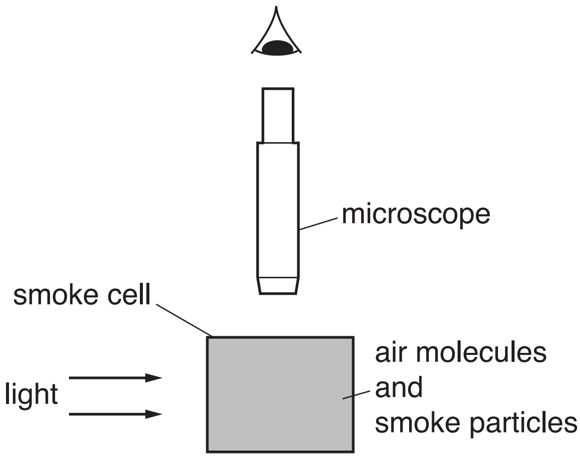


Fig. 4.1

Describe and explain what the student sees when viewing the smoke particles through the microscope.

....

....

....

....

....

....[4]

(b) Drops of water on a warm surface disappear after a short time. State the term used to describe this process. Explain the process, using your ideas about molecules.

name of process ....

explanation ....

....

....

[3]

[Total: 7]

5 Fig. 5.1 shows a geothermal power station. It generates electricity.

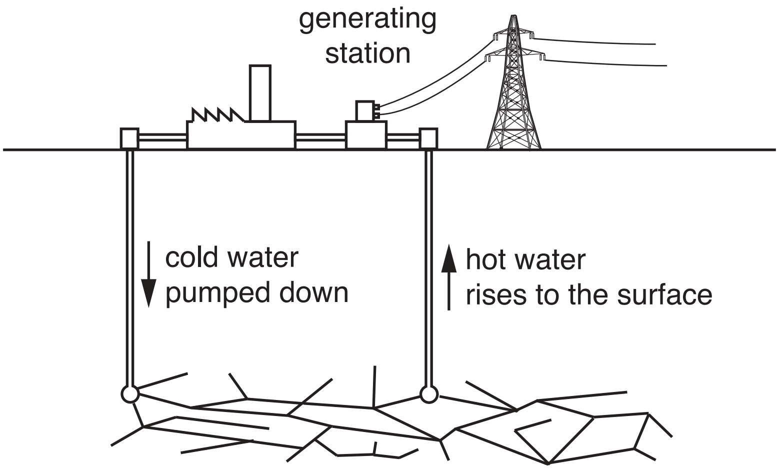


Fig. 5.1

(a) In a geothermal power station, the process of generating electricity includes seven stages. Four of the stages are shown below.

P steam turns a turbine

Q hot underground rocks heat the cold water

R the turbine spins a generator

S hot water rises to the surface

The flow chart in Fig. 5.2 shows the seven stages, but it is incomplete. Complete the flow chart by adding the letters P, Q, R and S in the correct sequence.

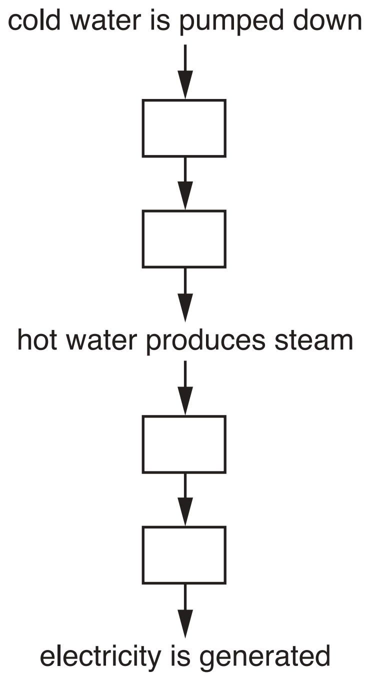


Fig. 5.2

[3]

(b) The cost of electrical energy obtained from a geothermal power station is similar to the cost of electrical energy obtained from wind turbines.

Describe one advantage and one disadvantage of using a geothermal power station to generate electricity compared with using wind turbines.

advantage ....

....

disadvantage ....

....

[2]

[Total: 5]

6 A student constructs a device for absorbing thermal energy from the Sun. Fig. 6.1 shows the device.

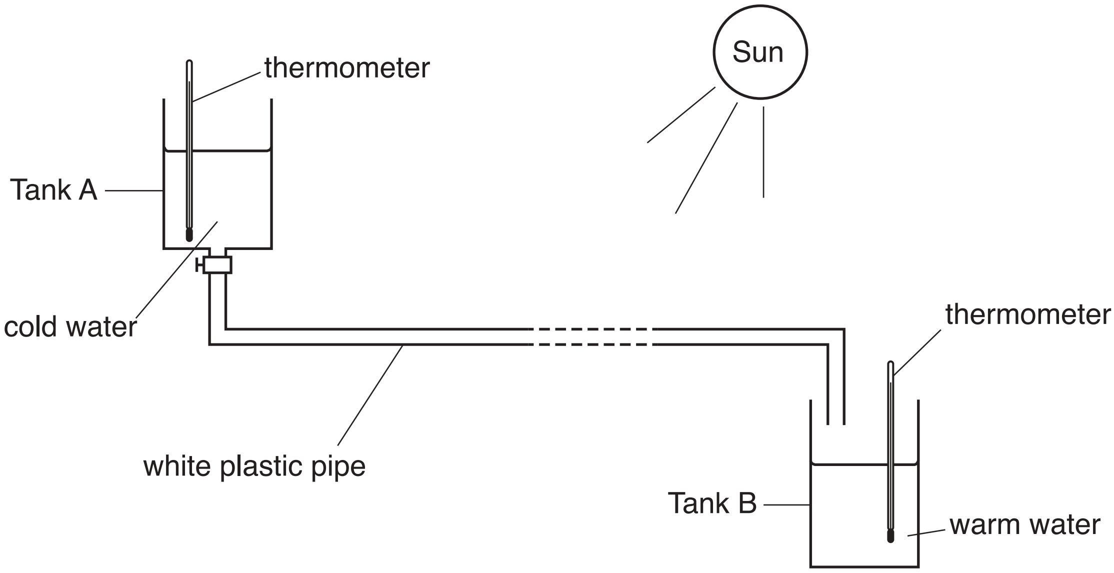
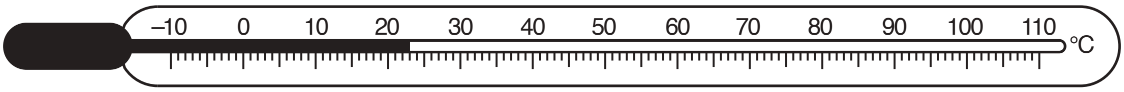


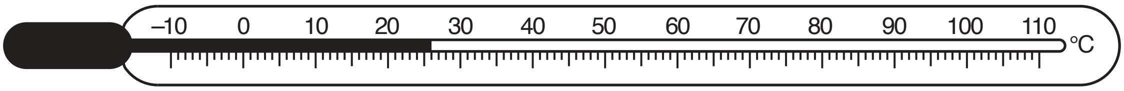
Fig. 6.1

The student places the white plastic pipe in sunlight. The cold water flows slowly from Tank A to Tank B. Energy from the Sun heats the water in the pipe.

Fig. 6.2 shows the temperatures in Tank A and Tank B.



Thermometer showing temperature in Tank A.



Thermometer showing temperature in Tank B.

Fig. 6.2

(a) Determine the rise in temperature of the water.

temperature rise = ... °C [1]

(b) The student wants to increase the thermal energy absorbed by the water in the pipe. Suggest three improvements he can make to increase the thermal energy absorbed.

1 ....

....

2 ....

....

3 ....

....
[3]

(c) Describe how the thermal energy is transferred from the Sun to the water inside the pipe.

....

....[2]

[Total: 6]

7 The spectrum of white light is made up of seven colours.

(a) Fig. 7.1 shows a partially-completed spectrum. Two labels are missing.

violet	indigo		green		orange	red

Fig. 7.1

(i) On Fig. 7.1, write the name of the missing colour in each blank space. [2]

(ii) On Fig. 7.1, indicate the direction of **increasing** wavelength for the spectrum. Draw an arrow in the box below the spectrum of colours. [1]

(b) A ray of red light strikes one face of a triangular glass prism as shown in Fig. 7.2.

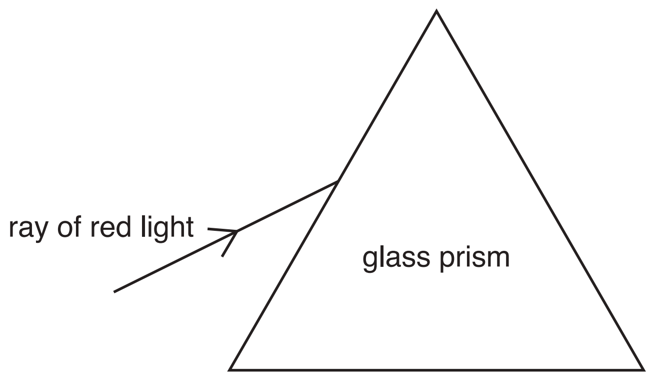


Fig. 7.2

(i) On Fig. 7.2, draw the path of the ray as it travels through the glass prism and enters the air. [2]

(ii) State the term used to describe what happens to the ray of red light as it enters and leaves the prism.

....[1]

[Total: 6]

8 This question is about measuring the speed of sound in air.

A student stands in front of a large wall. She hits a drum and hears an echo. Fig. 8.1 shows the position of the student and the wall.

Fig. 8.1

(a) (i) State the name of a piece of equipment for measuring the distance from the student to the wall.

....[1]

(ii) Explain how sound forms an echo.

....

....[1]

(b) The student hits her drum repeatedly once per second. She walks away from the wall and listens for the echo. When the student is 170 m from the wall she hears the echo from one beat of the drum at the same time as the next beat of the drum.

Use this information to determine the speed of sound. State the unit.

speed = ... [4]

[Total: 6]

9 Fig. 9.1 shows a partially-labelled diagram of the electromagnetic spectrum.

Fig. 9.1

(a) **(i)** On Fig. 9.1, add the names of the missing radiations at **A** and at **B**. [2]

(ii) Indicate the radiation that has the lowest frequency. On Fig. 9.1, draw a ring around the radiation. [1]

(b) State two safety precautions when handling sources that emit gamma radiation.

1 ....

2 ....
[2]

[Total: 5]

10 Fig. 10.1 shows a circuit for determining the resistance of a component.

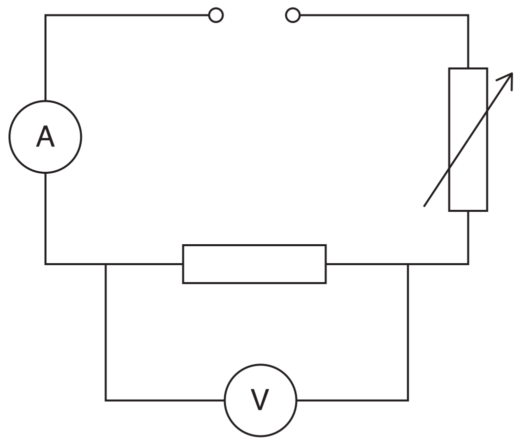


Fig. 10.1

(a) On Fig. 10.1, label the fixed resistor, by writing the letter R. [1]

(b) Two components in Fig. 10.1 measure electrical quantities.

Identify the quantity that each component measures.

Write each quantity and the unit of each quantity in the correct place in Table 10.1.

component	quantity	unit
–(A)–		
–(V)–		

Table 10.1

[4]

(c) A student uses the circuit in Fig. 10.1 to determine the resistance of wires made from the same material.

State how the resistance of a wire is related to its length and its diameter.

length ....

....

diameter ....

....
[2]

[Total: 7]

11 Fig. 11.1 shows a vertical conductor passing through a horizontal piece of card.

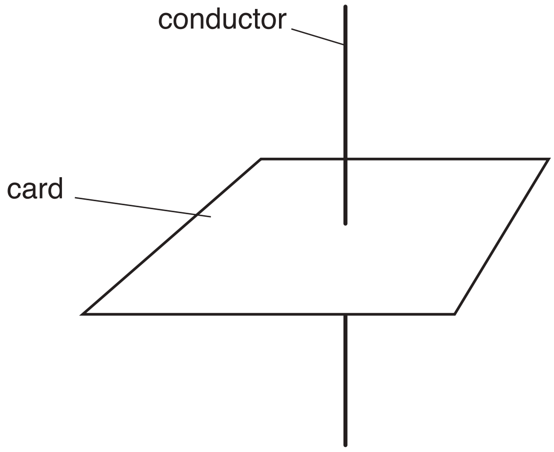


Fig. 11.1

(a) **(i)** On Fig. 11.1, draw a cell and a switch in series with the conductor to form a complete circuit.

Use the correct circuit symbols. [2]

(ii) A student sprinkles iron filings onto the card and closes the switch. There is a current in the conductor. Describe the pattern of the magnetic field seen.

....

....[2]

(iii) The student reverses the direction of the current in the conductor. State the effect, if any, on the pattern he sees.

....[1]

(b) Describe an experiment to show that a force acts on a current-carrying conductor in a magnetic field. Show how to arrange the equipment. Include a diagram in your answer.

....

....

....

....

....

....

....[4]

[Total: 9]

12 Radioactive decay may include the emission of:

α-radiation
β-radiation
γ-radiation

(a) **(i)** From the list, state the type of radiation which has the **greatest** ionising effect.

....[1]

(ii) From the list, state the type of radiation which has the **lowest** penetrating ability.

....[1]

(b) In a factory, rollers press aluminium metal to make thin foil sheets. An automatic system for controlling the thickness of the foil uses a radioactive source. The automatic system changes the gap between the top and bottom roller. Fig. 12.1 shows the equipment.

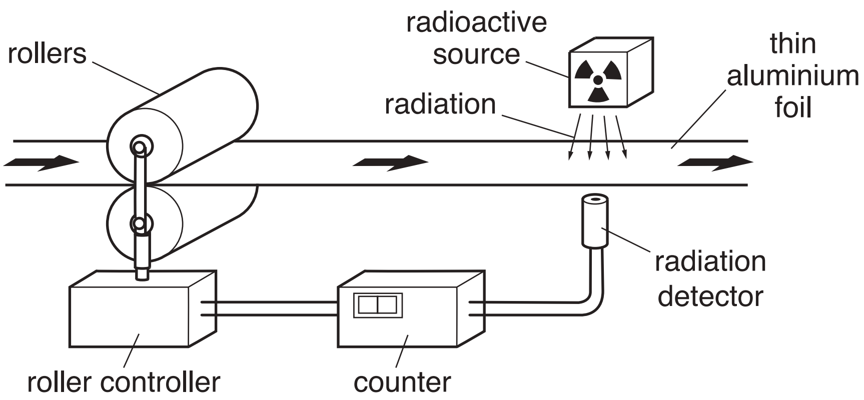


Fig. 12.1

(i) Use your ideas about the properties of radiation to suggest and explain the type of radiation used.

type of radiation ....

explanation ....

....

....

....
[2]

(ii) The aluminium foil passing the radiation detector is too thin. Describe how this fault affects the reading on the counter.

....[1]

(iii) Suggest how the fault in **(b)(ii)** is corrected. State what happens to the rollers.

....[1]

(iv) The source used is strontium-90. A nucleus of strontium-90 can be described as ${}^{90}_{38}\mathrm{Sr}$. State the number of protons in a nucleus of strontium-90.

....[1]

[Total: 7]

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CANDIDATE NAME

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PHYSICS **0625/32**

Paper 3 Theory (Core) **May/June 2018**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m/s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages.

DC (LK/CGW) 150266/5

1 Fig. 1.1 shows the speed-time graph for a car.

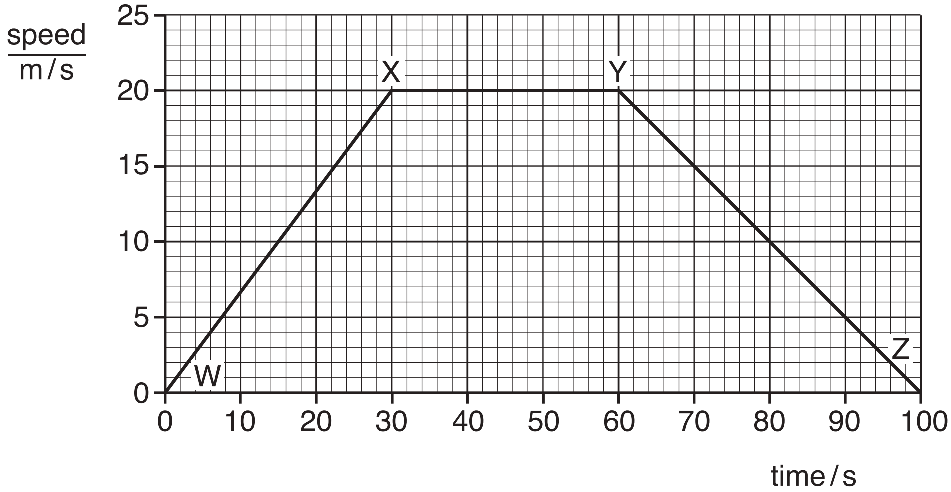

Fig. 1.1

(a) On Fig. 1.1, the labels W, X, Y and Z show the points when the car's motion changed.

On Fig. 1.2, draw a line from each section of the graph to the correct description of the motion.

section of graph	**description of the motion**
	accelerating
from W to X	decelerating
from X to Y	stationary
from Y to Z	constant speed

Fig. 1.2 [3]

(b) Calculate the distance that the car travels between 60 s and 100 s.

distance travelled = ... m [3]

(c) Fig. 1.1 shows that the car's acceleration is greater than its deceleration.

Explain how the graph shows this.

....

....[1]

[Total: 7]

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2 Fig. 2.1 shows a wooden raft. The raft is made from 8 logs.
The logs are all of the same type of wood.

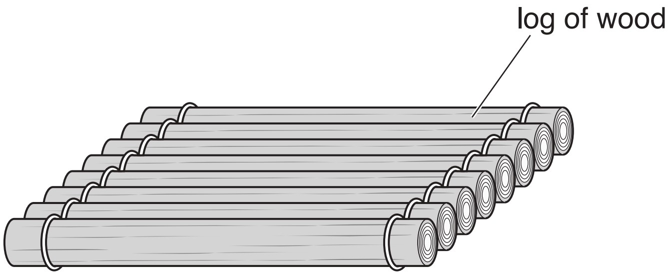

Fig. 2.1

(a) The average mass of each log is 65.0 kg.

Calculate the total weight of the raft.

total weight of the raft = ... N [3]

(b) (i) The mass of one of the logs is 66.0 kg. It is 3.0 m long and has a cross sectional area of $0.040\,m^2$.

Calculate the density of the wood in the log.

density = ... kg/m^3 [3]

(ii) Explain why the log in **(b)(i)** floats on water.

....

....[1]

[Total: 7]

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3 A man uses a metal bar to remove an iron nail from a piece of wood, as shown in Fig. 3.1.

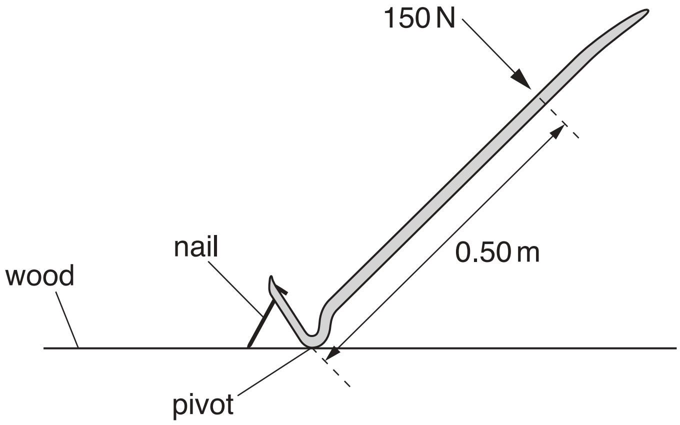

Fig. 3.1

(a) (i) The man applies a force of 150 N at a distance of 0.50 m from the pivot.

Calculate the moment of this force about the pivot. Include a unit.

moment = ...[4]

(ii) The force applied by the man produces a turning effect (moment) about the pivot.

Describe another example of using the turning effect of a force.

....

....[1]

(b) The man tries to use the metal bar to remove another nail from the piece of wood. He applies the same force of 150 N at a distance of 0.50 m from the pivot.

The turning effect produced is not enough to remove this nail from the piece of wood.

Describe how the man can increase the turning effect without increasing the force.

....

....[1]

[Total: 6]

4 A Bunsen burner heats a beaker of water, as shown in Fig. 4.1.

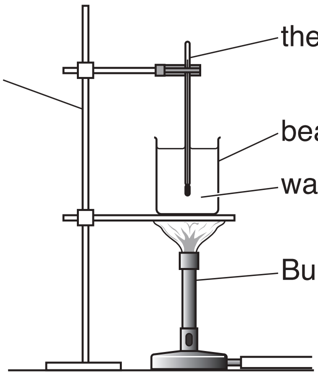

Fig. 4.1

(a) (i) Fig. 4.2 shows the thermometer used in Fig. 4.1.

State the temperature shown on the thermometer.

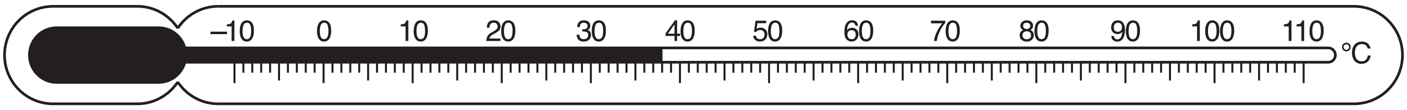

Fig. 4.2

temperature = ... °C [1]

(ii) The thermometer shown in Fig. 4.2 uses a physical property that changes with temperature.

Indicate the measurable property that changes with temperature. Tick **one** box.

☐ expansion of glass

☐ expansion of liquid

☐ colour of liquid

☐ colour of glass [1]

(b) Thermal energy (heat) transfers through the bottom of the beaker to the water.

State the name given to this process.

....[1]

(c) Thermal energy transfers throughout the water in the beaker.

Describe and explain how this happens.

....

....

....

....

....[4]

[Total: 7]

5 Fig. 5.1 represents an object positioned on the principal axis of a thin lens.

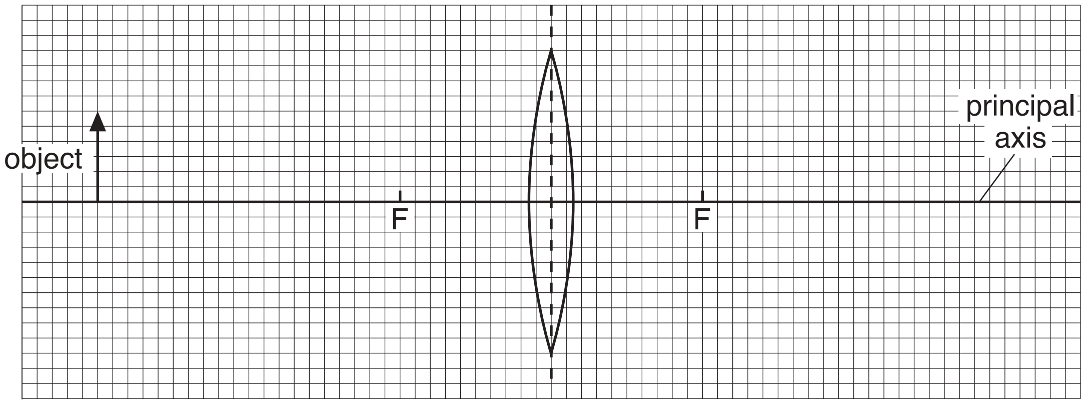

Fig. 5.1

Each small square of the grid represents 0.5 cm. Each principal focus of the lens is labelled F.

(a) Use the grid to determine the focal length of the lens.

focal length = ... cm [1]

(b) **(i)** On Fig. 5.1, draw a ray from the top of the object that passes through a principal focus, then through the lens and beyond it. [1]

(ii) On Fig. 5.1, draw a second ray from the top of the object that passes through the centre of the lens. Continue the path of this ray to the edge of the grid. [1]

(iii) On Fig. 5.1, draw an arrow to show the position and nature of the image produced by the lens. [2]

[Total: 5]

6 Nuclear fission is used in nuclear power stations to release thermal energy.

(a) Describe how the thermal energy is used to generate electricity.

....

....

....

....

....

....[3]

(b) Describe two environmental problems that are due to using nuclear power stations.

1. ....

....

2. ....

....

[2]

[Total: 5]

7 Fig. 7.1 shows some parts of the electromagnetic spectrum.

radio waves		infra-red waves	visible light	ultraviolet waves	X-rays	γ-rays

Fig. 7.1

(a) (i) In Fig. 7.1, one part of the electromagnetic spectrum is not labelled.

State the name of this part.

....[1]

(ii) The speed of visible light waves in a vacuum is 3.0×10^8 m/s.

Suggest a value for the speed of infra-red waves in a vacuum.

speed = ... m/s [1]

(iii) Some parts of the electromagnetic spectrum have a wavelength shorter than that of visible light.

State one example.

....[1]

(b) (i) X-rays and γ-rays are used in hospitals.

Describe one medical use for X-rays and one use for γ-rays.

X-rays ....

....

γ-rays ....

....
[2]

(ii) Explain why γ-rays are dangerous to living things.

....

....

....[2]

[Total: 7]

8 **(a)** Complete the sentences about sound. Use words from the box above each sentence.

(i)

glows	reflects	refracts	vibrates

Sound is produced when a source .... [1]

(ii)

electromagnetic	longitudinal	transverse

Sound waves are .... waves. [1]

(iii)

metal	vacuum	liquid

Sound waves cannot travel through a .... [1]

(b) Humans, elephants, mice and dolphins have different hearing ranges. Fig. 8.1 shows the hearing range for each type of animal.

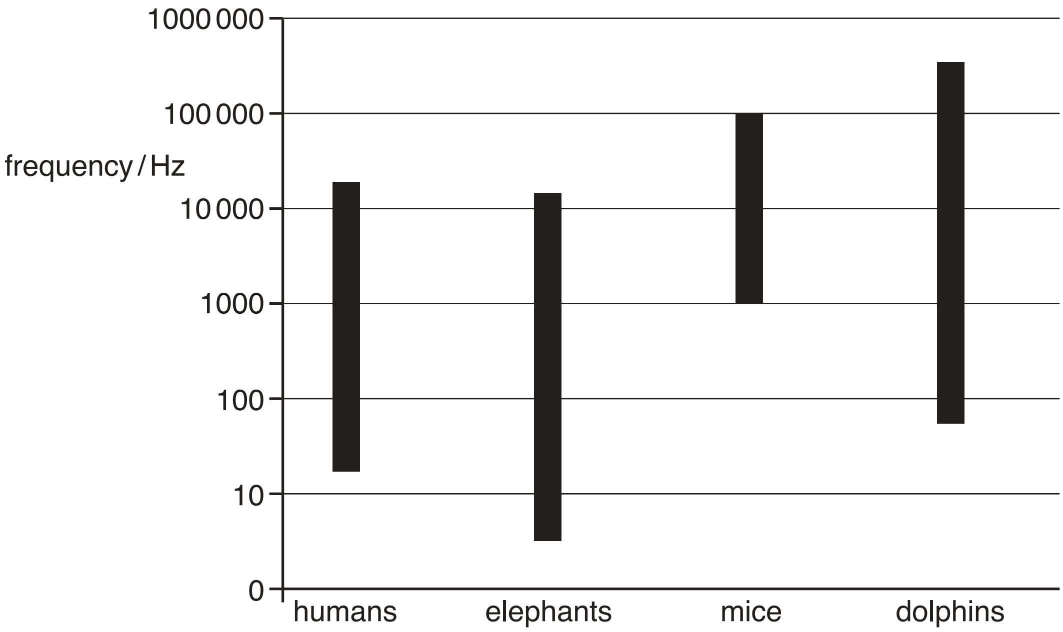

Fig. 8.1

(i) State the lowest frequency of sound that can be heard by mice.

.... Hz [1]

(ii) State the highest frequency of sound that can be heard by elephants.

.... Hz [1]

(iii) Explain how the chart shows that elephants can hear some sounds that humans **cannot** hear.

....

....

....[2]

(iv) State the term given to the high frequencies that dolphins can hear but humans **cannot** hear.

....[1]

[Total: 8]

9 **(a)** Fig. 9.1 shows a simple circuit.

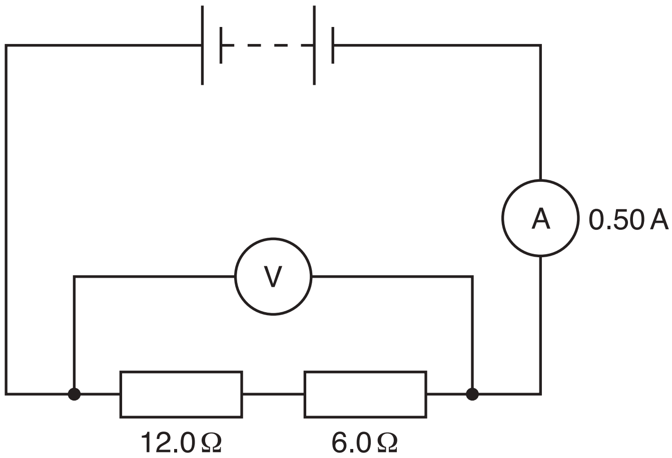

Fig. 9.1

(i) The current in the wires of the circuit is a flow of particles.
Indicate the name of these particles. Tick **one** box.

☐ electrons

☐ atoms

☐ protons [1]

(ii) Calculate the combined resistance of the two resistors.

resistance = ... Ω [1]

(iii) Calculate the potential difference (p.d.) reading that would be shown on the voltmeter.

potential difference (p.d.) = ... V [3]

(b) The circuit is changed.
The two resistors are connected in parallel.

Explain what happens, if anything, to the current reading on the ammeter.

....

....

....[2]

[Total: 7]

10 **(a)** Fig. 10.1 shows a balloon hanging from an insulating thread.

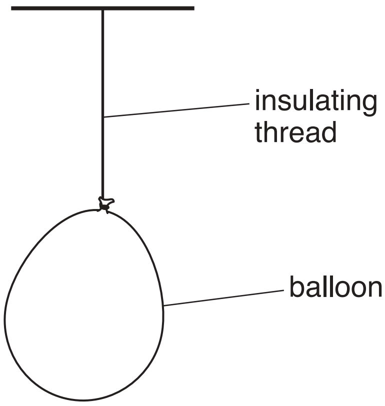

Fig. 10.1

(i) A student gives the balloon a positive charge.

Which statement explains why the balloon becomes positively charged? Tick **one** box.

☐ The balloon gains electrons

☐ The balloon loses electrons

☐ The balloon gains protons

☐ The balloon loses protons [1]

(ii) The student brings a charged rod close to the balloon as shown in Fig. 10.2.

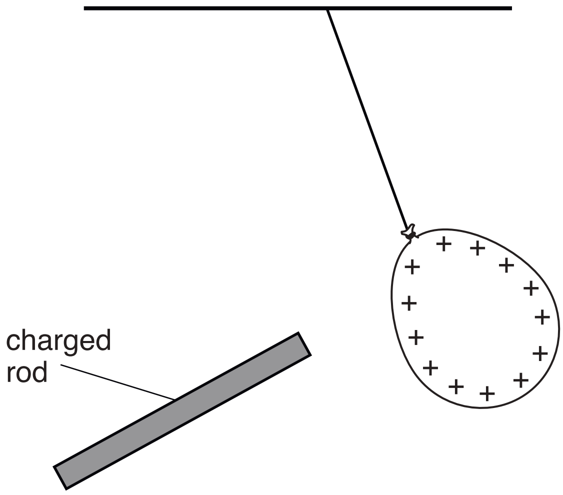

Fig. 10.2

State the type of charge on the rod.

....

Explain your answer.

....

.... [2]

(b) Electrical charges can move easily through some materials.

Draw a circle around each material that charges can move through easily.

copper   plastic   rubber   silver   wood   [1]

[Total: 4]

11 Fig. 11.1 represents a transformer.

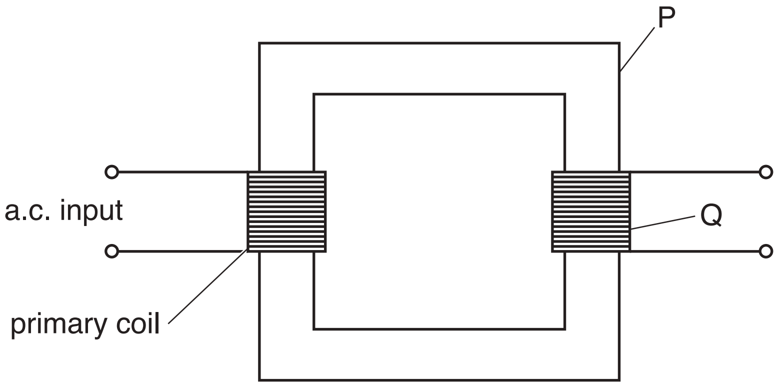

Fig. 11.1

(a) (i) State the name of the part of the transformer labelled Q in Fig. 11.1.

....[1]

(ii) In Fig. 11.1, part P is made from a metal.

1. State the metal used to make part P. ....

2. State the term given to part P. ....

[2]

(iii) There is an alternating current (a.c.) in the primary coil.

Describe what this current produces in part P.

....

....[2]

(iv) Complete the sentence using terms from the box.

more	fewer	step-up	step-down

When there are .... turns in the primary coil than in Q, the device is called a .... transformer. [1]

(b) The high-voltage transmission of electricity uses transformers.

Describe **two** advantages of transmitting electricity at high voltages rather than at low voltages.

1. ....

....

2. ....

....

[2]

[Total: 8]

12 **(a)** The nuclide notation ${}^{A}_{Z}X$ describes the nucleus of one type of atom.

Draw a line from each symbol to the correct description for that symbol.

symbol	**description**
A	number of neutrons
	element symbol
Z	proton number
	nucleon number
X	number of atoms

[3]

(b) **(i)** One radioactive isotope has a half-life of 6.0 years.
A sample of this isotope has a mass of 12 mg.

Calculate the mass of this isotope that remains in the sample after 18 years.

mass remaining = ... mg [3]

(ii) The sample decays by emitting a β-particle.

Describe the nature of a β-particle.

....

....[2]

(iii) Describe how the nucleus of the isotope changes due to the emission of a β-particle.

....

....[1]

[Total: 9]

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | | CANDIDATE NUMBER | | | | |

5561498289

PHYSICS **0625/33**

Paper 3 Theory (Core) **May/June 2018**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages.

DC (LK/CGW) 150267/3

CAMBRIDGE International Examinations

1 A student watches a car race around a track. He uses a stopwatch to measure the time for the car to make one lap of the track.

(a) The student forgets to reset the stopwatch at the start of the race. Fig. 1.1 shows the time on the stopwatch at the start and the time after going around the track once.

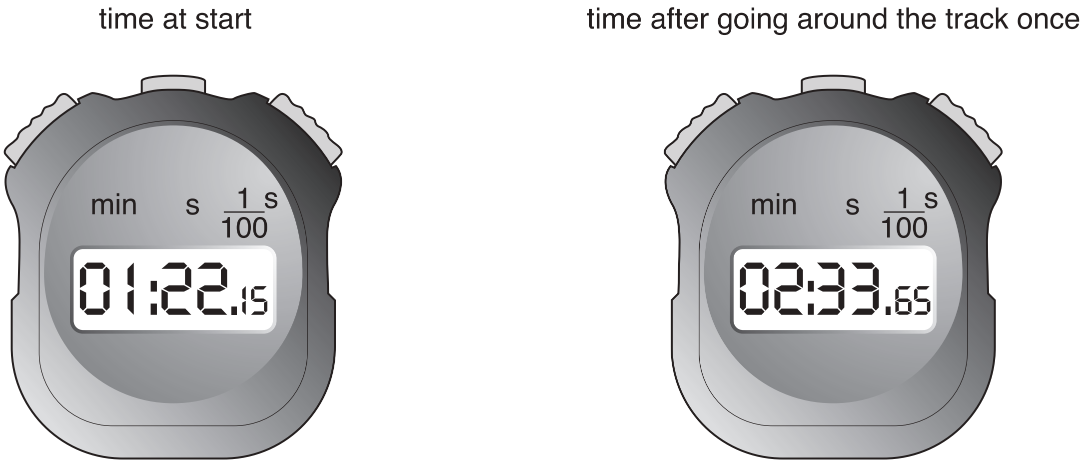

Fig. 1.1

Calculate the time the car takes to go around the track once, in seconds.

time = ... s [2]

(b) The length of the track is 4.0 km. The car goes around the track 20 times. The car takes 26 minutes and 40 seconds to complete the 20 laps.

Calculate the average speed of the car in m/s.

average speed = ... m/s [4]

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(c) Fig. 1.2 shows a speed-time graph for the car during part of the race.

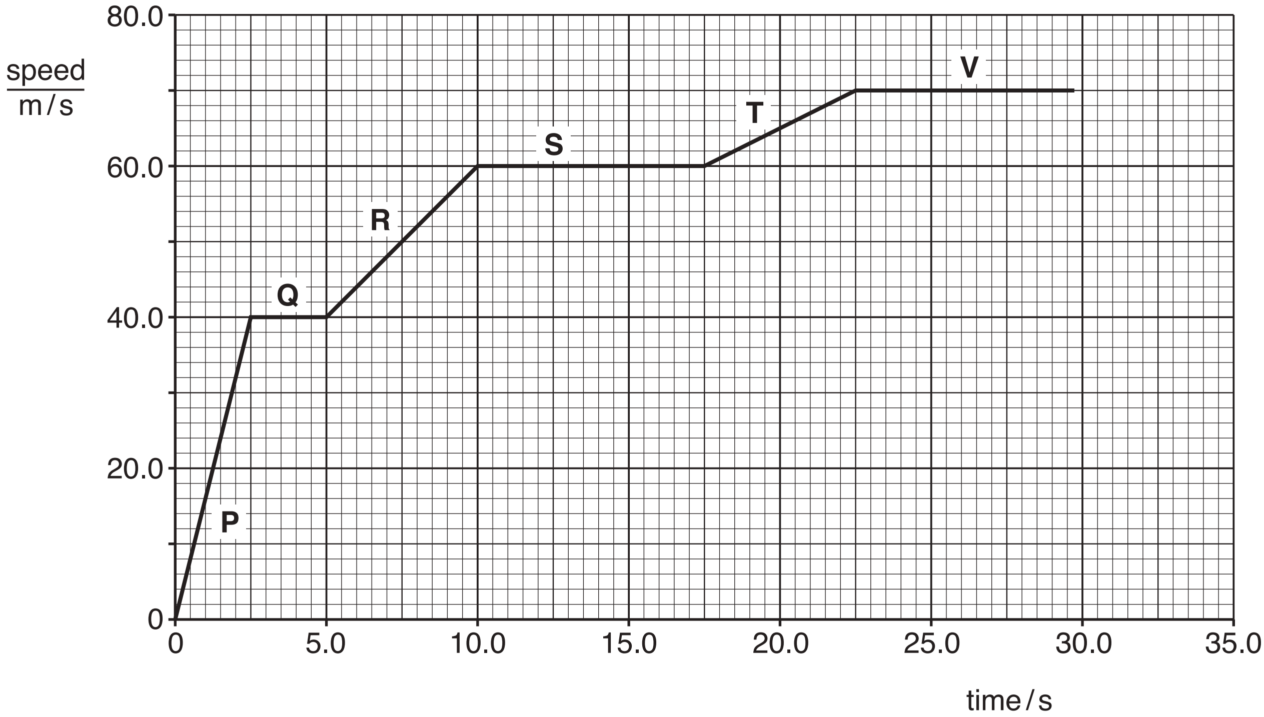

Fig. 1.2

(i) State the section of the graph that shows the greatest acceleration.

....

Explain your answer.

.... [2]

(ii) Calculate the distance travelled by the car during the first 2.5 seconds.

distance = ... m [3]

[Total: 11]

2 A student is using some 50 g masses.

(a) Calculate the weight of one 50 g mass.

weight of 50 g mass = ... N [3]

(b) The student uses the 50 g masses as loads to stretch a spring.

Fig. 2.1 shows the apparatus the student uses to obtain readings for a load-extension graph.

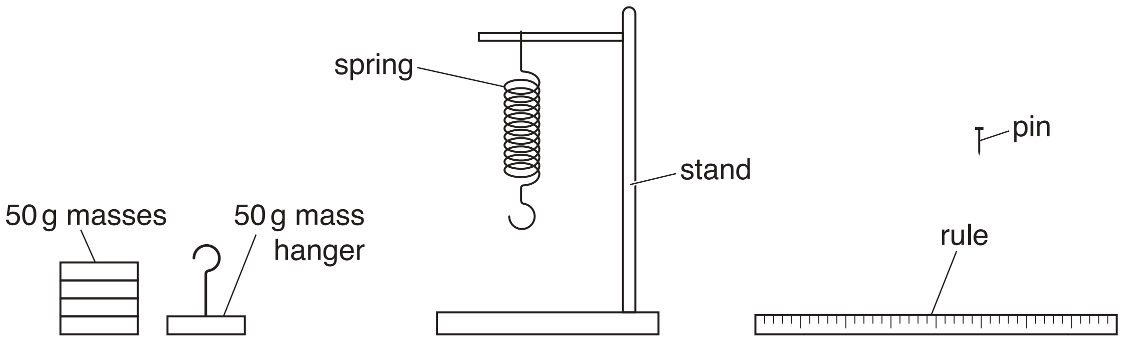

Fig. 2.1 (NOT to scale)

Describe how the student could use the apparatus and ensure that the readings are accurate.

....

....

....

....

....

....

....

....

....

....[4]

[Total: 7]

3 **(a)** The mass of a small steel ball is 120 g. The volume of the ball is 16.0 cm^3.

(i) Calculate the density of the steel ball.

density = ... g/cm^3 [3]

(ii) The ball falls to the ground from rest. At a time of 0.2 s after it started to fall, its acceleration is 10 m/s^2.

State the acceleration of the ball at a time of 0.1 s after it started to fall.

....[1]

(b) Fig. 3.1 shows the vertical forces that act on a large plastic ball as it is falling.

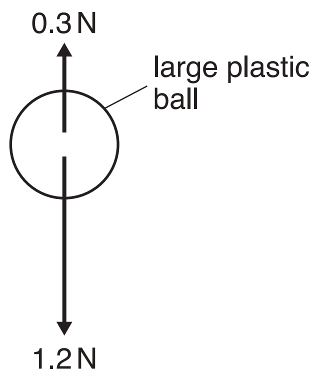

Fig. 3.1 (not to scale)

(i) State the name given to each of the forces shown in Fig. 3.1.

1. ....

2. ....
[1]

(ii) Calculate the size of the resultant force on the ball.

resultant force = ... N [1]

[Total: 6]

4 A lamp is attached to a wall, as shown in Fig. 4.1.

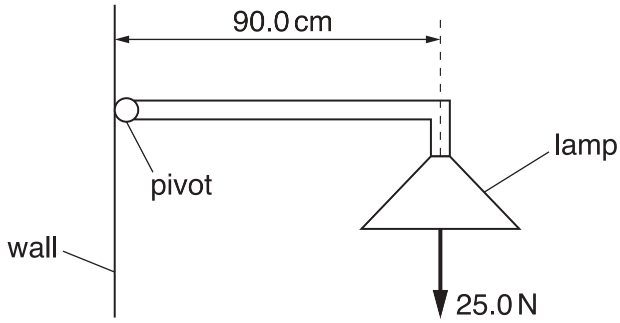

Fig. 4.1

Calculate the moment of the lamp about the pivot. Give the unit.

moment = ... [4]

[Total: 4]

5 **(a)** Fig. 5.1 shows a metal can containing air. The can is sealed with a lid.

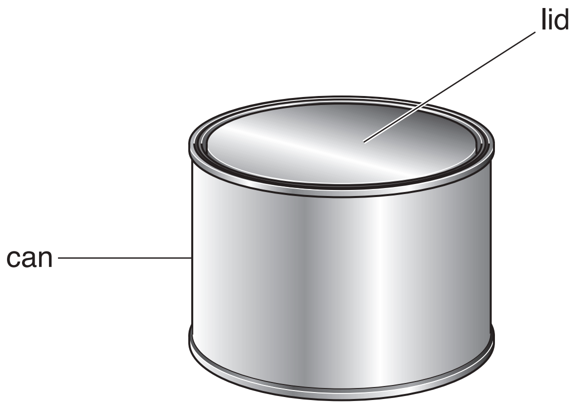

Fig. 5.1

The air in the can exerts a pressure of 20 000 N / m^2 on the lid. The area of the can lid is 0.09 m^2.

Calculate the force on the lid due to the air in the can.

force = ... N [3]

(b) The air in the can becomes warmer.

State and explain what happens to the pressure of the air in the can. Use your ideas about gas molecules.

....

....

....

....

....

....

....[3]

[Total: 6]

6 A student investigates the thermal energy lost from two metal cans, X and Y. The cans are identical apart from their outside colour.

The student pours the same volume of hot water into each can and seals each can. The student records the temperature of the water in each can at regular time intervals for a period of 35 minutes.

The equipment is shown in Fig. 6.1.

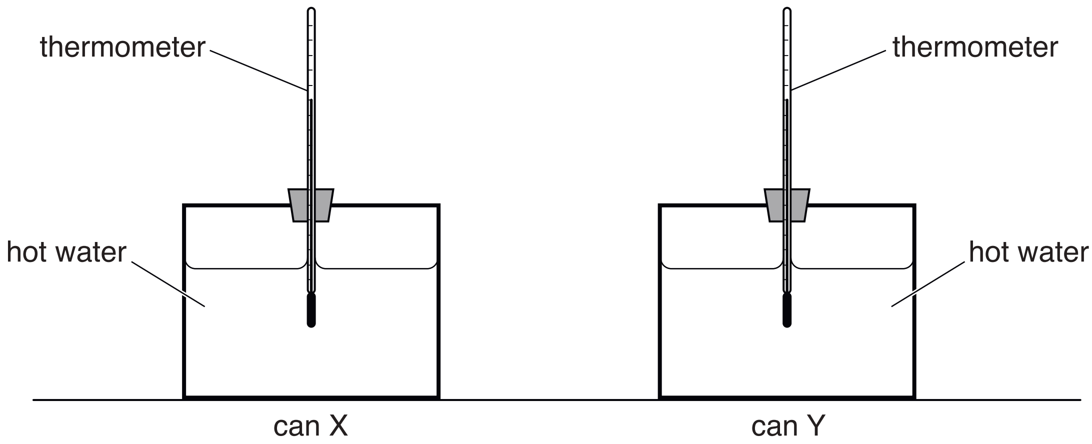

Fig. 6.1

Fig. 6.2 is a graph of the results from the investigation.

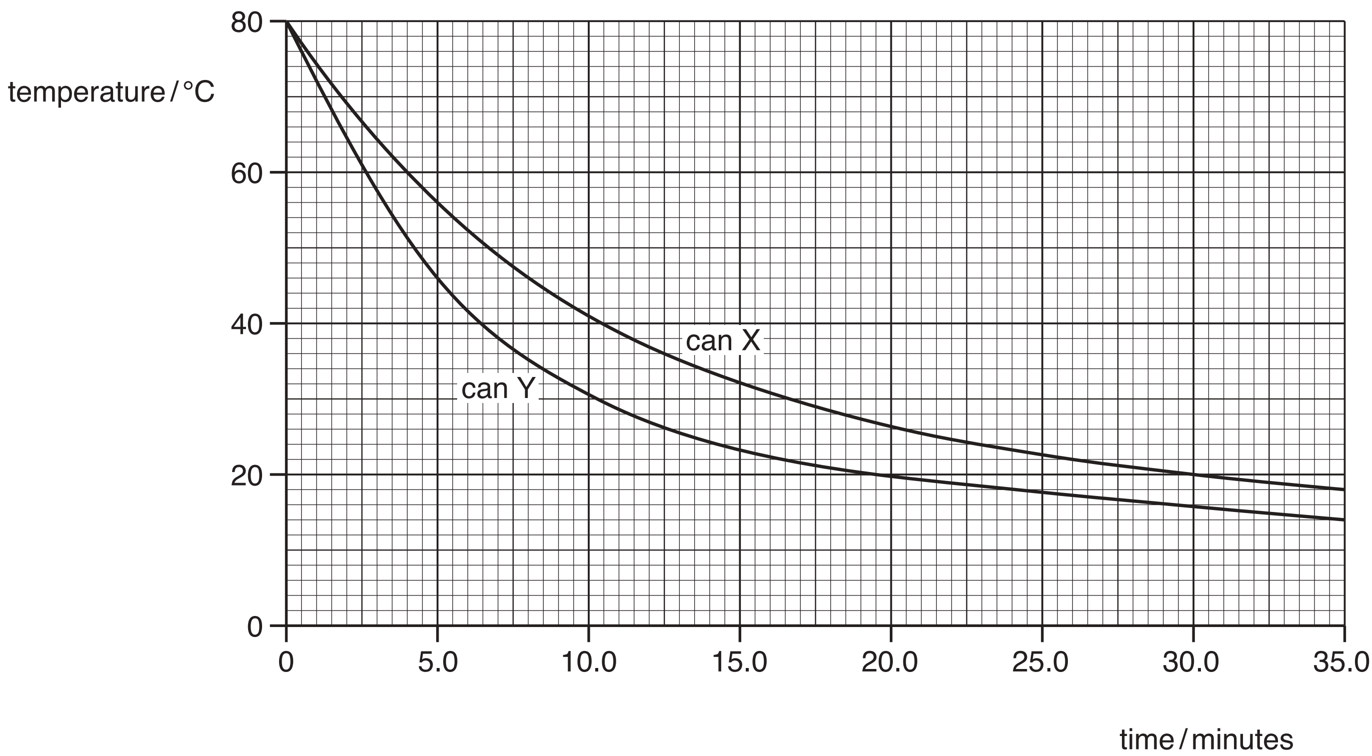

Fig. 6.2

(a) For can X, use Fig. 6.2 to determine the drop in temperature of the water

(i) in the first five minutes

....[1]

(ii) in the last five minutes.

....[1]

(b) Explain why the water cools at a greater rate during the first five minutes of the experiment, compared with the last five minutes.

....

....

....[2]

(c) The outside of one can is dull black and the outside of the other is shiny white.

State the colour of can Y. ....

Explain your answer.

....

....

....

[2]

[Total: 6]

7 Fig. 7.1 shows an incomplete diagram of the electromagnetic spectrum.

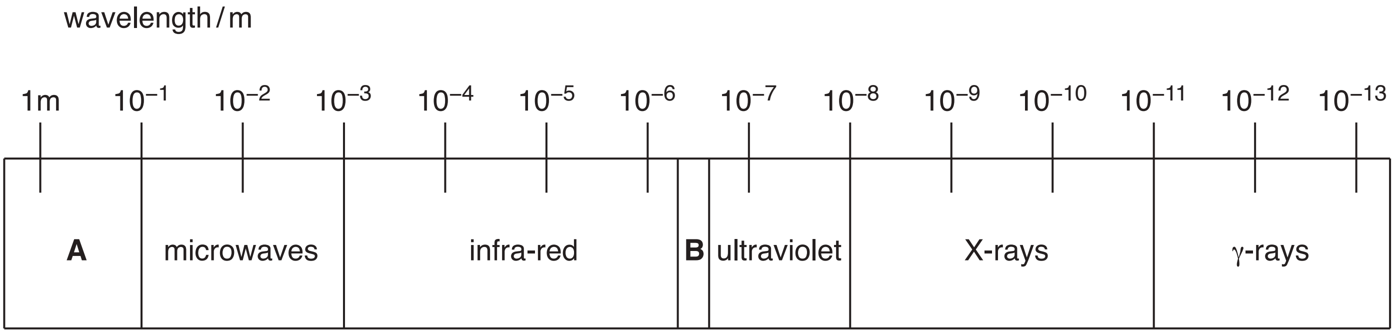

Fig. 7.1

(a) **(i)** In Fig. 7.1, section **A** and section **B** of the electromagnetic spectrum are not labelled.

State the names of these parts.

A ....

B ....
[2]

(ii) An electromagnetic wave has a wavelength of 1.0×10^{-9} m. Use Fig. 7.1 to identify the type of electromagnetic wave.

....[1]

(b) All electromagnetic waves travel at the same speed in a vacuum.

State one other property that is the same for all electromagnetic waves.

....[1]

(c) For each purpose, state one type of electromagnetic radiation that can be used.

(i) remote controllers for televisions

....[1]

(ii) killing bacterial cells

....[1]

[Total: 6]

8 **(a)** The boxes contain words about waves.

Complete each sentence. Choose a term from each box.

(i)

an electromagnetic	a longitudinal	a transverse

Sound travels as .... wave. [1]

(ii)

amplitude	pitch	speed	wavelength

A loud sound has a large .... [1]

(iii)

amplitude	pitch	speed	wavelength

A student listens to two sounds. The sound with the higher frequency has a higher

.... [1]

(b) Explain what is meant by the term *ultrasound*.

....

....[2]

[Total: 5]

9 A student magnetises a steel rod by using a permanent magnet.

(a) Describe a method that the student could use. You may draw a diagram to help you.

....

....

....[2]

(b) Explain how the student could test that the steel rod has been magnetised.

....

....

....

....[2]

(c) Magnets can be made from soft iron or from steel.

State **one** difference between the magnetic properties of soft iron and steel.

....

....

....[1]

[Total: 5]

10 **(a)** Fig. 10.1 shows an electrical circuit.

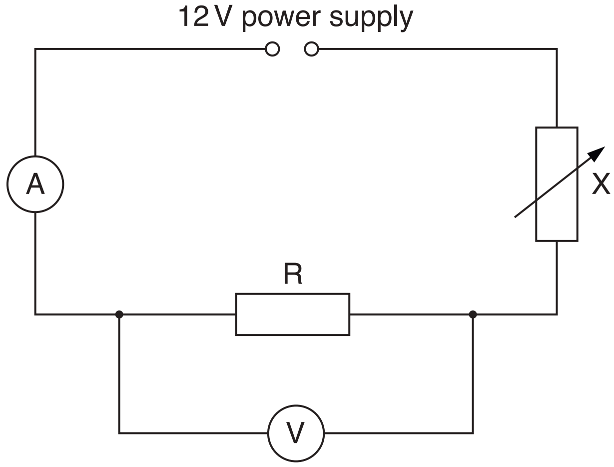

Fig. 10.1

(i) State the name for the component labelled X and state its function in this circuit.

name for component ....

function ....

.... [2]

(ii) Describe how the circuit shown in Fig. 10.1 could be used to find the resistance of the fixed resistor R.

....

....

....

....

....[3]

(b) An electrical heater has a resistance of 21.8 Ω when connected to a 240 V mains supply.

(i) Calculate the current in the heater.

current = ... A [3]

(ii) Suggest a rating for the fuse to be fitted to the mains plug for the heater.

fuse rating = ... A [1]

[Total: 9]

11 Fig. 11.1 shows a coil (solenoid) wrapped around a plastic tube. There is a current in the coil. The arrows show the direction of the current in the coil.

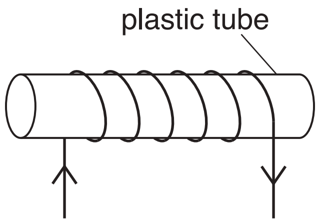

Fig. 11.1

(a) On Fig. 11.1, draw the pattern of the magnetic field lines around the coil.
Add arrows to show the direction of the magnetic field. [3]

(b) A long soft iron bar is placed inside the plastic tube. There is a current in the coil. This forms a device. State the name of the device.

....[1]

(c) Fig. 11.2 shows a relay operated by switch S.

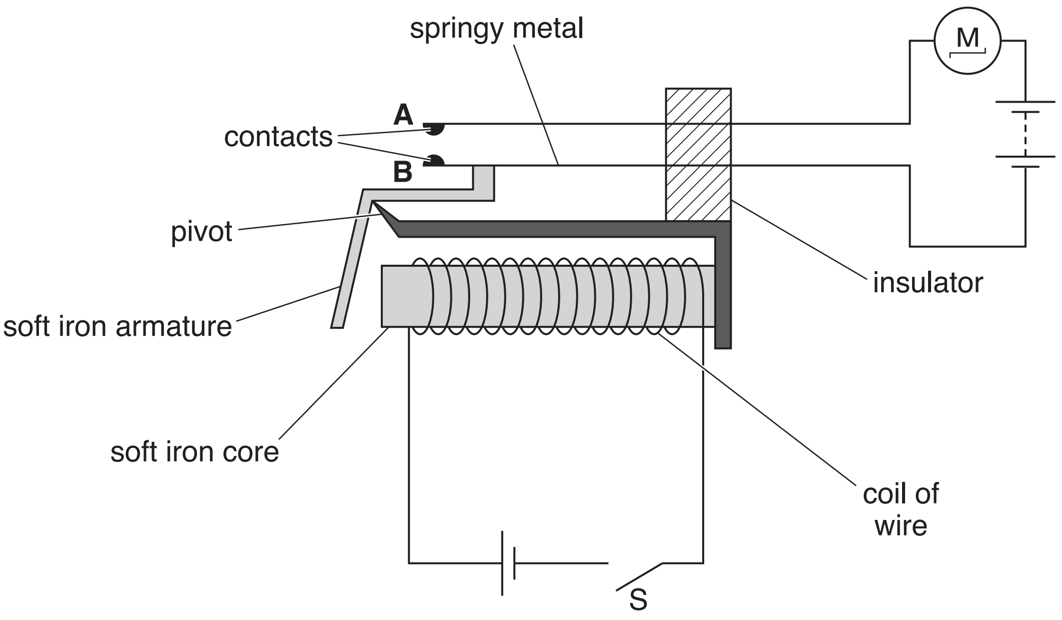

Fig. 11.2

Using Fig. 11.2, describe how closing the switch, S, causes the electric motor to operate.

....

....

....

....

....

....

....[4]

[Total: 8]

12 **(a)** Fig. 12.1 shows a diagram to represent a helium atom, and an incomplete key.

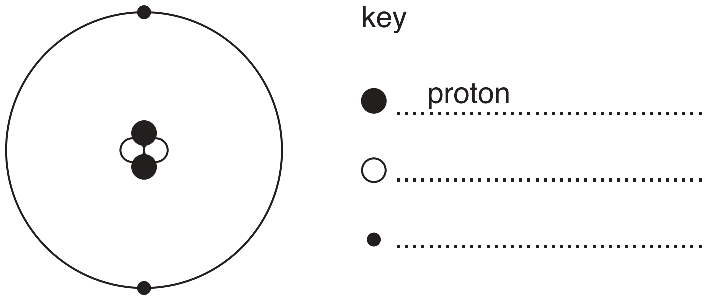

Fig. 12.1

Complete the key in Fig. 12.1. State the name of each particle. [2]

(b) The table in Fig. 12.2 compares two isotopes of helium.

	${}^{3}_{2}\mathrm{He}$	${}^{5}_{2}\mathrm{He}$
number of protons		
number of neutrons		

Fig. 12.2

For each isotope, write the number of protons and the number of neutrons in the correct places in the table. [2]

(c) The nucleus of the helium atom in **(a)** is the same as an α-particle.

(i) Describe the penetrating ability of α-particles.

....

....[1]

(ii) Explain why it is dangerous to swallow a source that emits α-particles.

....

....

....

....[2]

[Total: 7]

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

5498152391

PHYSICS **0625/41**

Paper 4 Theory (Extended) **May/June 2018**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m/s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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1 Fig. 1.1 shows the speed-time graph for a vehicle accelerating from rest.

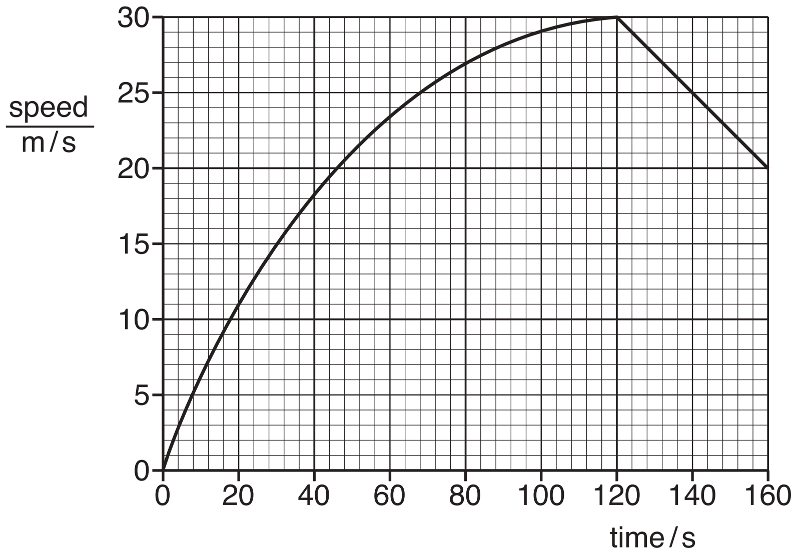

Fig. 1.1

(a) Calculate the acceleration of the vehicle at time = 30 s.

acceleration = ...[2]

(b) Without further calculation, state how the acceleration at time = 100 s compares to the acceleration at time = 10 s. Suggest, in terms of force, a reason why any change has taken place.

....

....

....[3]

(c) Determine the distance travelled by the vehicle between time = 120 s and time = 160 s.

distance = ...[3]

[Total: 8]

2 Fig. 2.1 shows a fork-lift truck lifting a box.

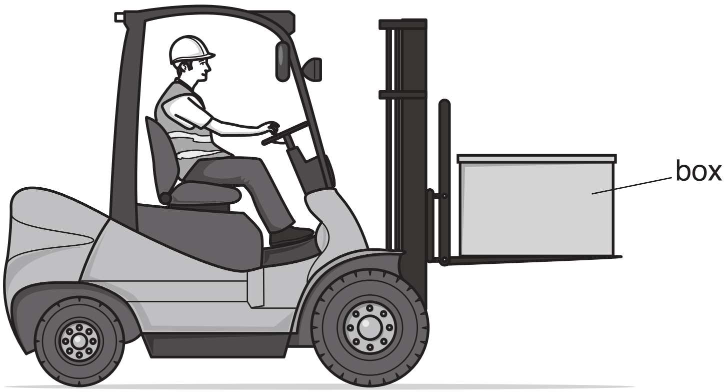

Fig. 2.1

The electric motor that drives the lifting mechanism is powered by batteries.

(a) State the form of the energy stored in the batteries.

....[1]

(b) The lifting mechanism raises a box of mass 32 kg through a vertical distance of 2.5 m in 5.4 s.

(i) Calculate the gravitational potential energy gained by the box.

gravitational potential energy = ...[2]

(ii) The efficiency of the lifting mechanism is 0.65 (65%).

Calculate the input power to the lifting mechanism.

input power = ...[3]

(c) The batteries are recharged from a mains voltage supply that is generated in an oil-fired power station.

By comparison with a wind farm, state one advantage and one disadvantage of running a power station using oil.

advantage ....

....

disadvantage ....

....[2]

[Total: 8]

3 A rectangular container has a base of dimensions 0.12 m × 0.16 m. The container is filled with a liquid. The mass of the liquid in the container is 4.8 kg.

(a) Calculate

(i) the weight of liquid in the container,

weight = ... [1]

(ii) the pressure due to the liquid on the base of the container.

pressure = ... [2]

(b) Explain why the total pressure on the base of the container is greater than the value calculated in **(a)(ii)**.

....

.... [1]

(c) The depth of liquid in the container is 0.32 m.

Calculate the density of the liquid.

density = ... [2]

[Total: 6]

4 **(a)** Describe the movement of the molecules in

(i) a solid,

....

....[1]

(ii) a gas.

....

....[2]

(b) A closed box contains gas molecules.

Explain, in terms of momentum, how the molecules exert a pressure on the walls of the box.

....

....

....

....

....

....[4]

[Total: 7]

5 **(a)** A ray of light in air is incident on a glass block. The light changes direction.

State

(i) the name of this effect,

....[1]

(ii) the cause of this effect.

....[1]

(b) Fig. 5.1, drawn to full scale, shows a thin converging lens of focal length 3.5 cm.

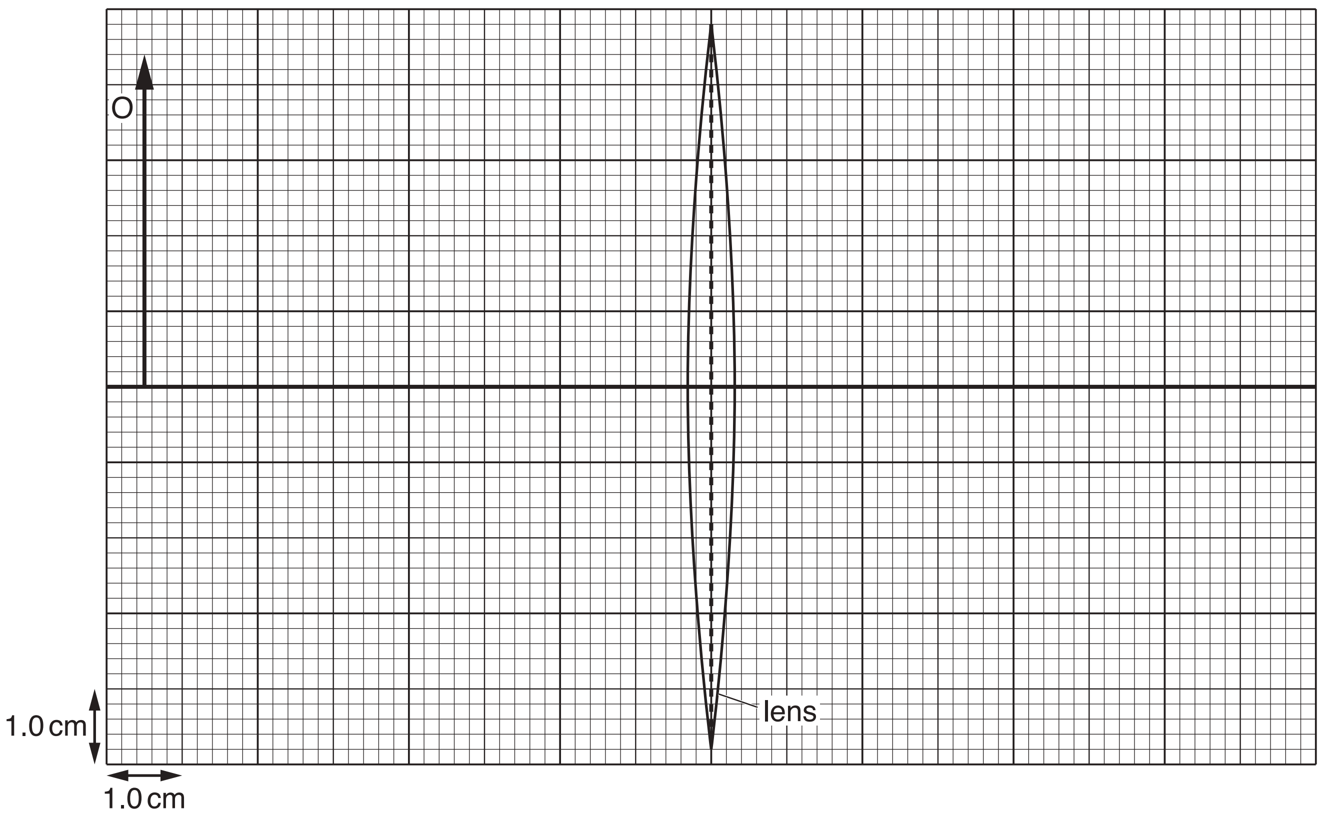

Fig. 5.1

(i) On Fig. 5.1, mark each of the two principal focuses and label each with the letter F. [1]

(ii) An object O of height 4.4 cm is placed a distance of 7.5 cm from the lens.

On Fig. 5.1, draw rays from the tip of the object O to locate the image. Draw and label the image. [3]

(iii) Determine the height of the image.

height of the image = ...[1]

(iv) State and explain whether the image is real or virtual.

....

....[1]

[Total: 8]

6 **(a)** Fig. 6.1 shows wavefronts approaching a gap in a barrier.

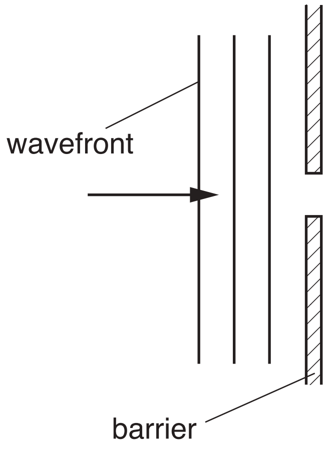

Fig. 6.1

(i) On Fig. 6.1, draw **three** wavefronts to the right of the barrier. [2]

(ii) Fig. 6.2 shows the gap in the barrier increased to five times the gap in Fig. 6.1.

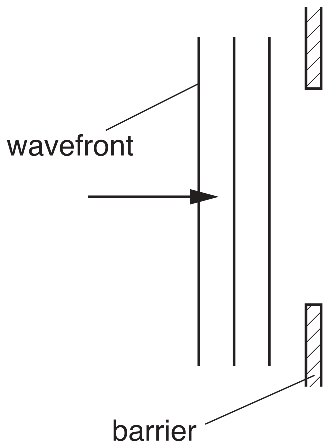

Fig. 6.2

On Fig. 6.2, draw **three** wavefronts to the right of the barrier. [2]

(b) Describe, with a labelled diagram, an experiment using water waves that shows the reflection of wavefronts that occur at a straight barrier.

....

....

....

....

....

....[4]

[Total: 8]

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7 **(a)** State, in terms of their structure, why metals are good conductors of electricity.

....

....[1]

(b) A cylindrical metal wire W_1, of length l and cross-sectional area A, has a resistance of $16\,\Omega$.

A second cylindrical wire W_2 having length $\frac{l}{2}$ and cross-sectional area $2A$, is made from the same metal.

Determine

(i) the resistance of W_2,

resistance of W_2 = ...[2]

(ii) the effective resistance of W_1 and W_2 when connected in parallel.

resistance of parallel pair = ...[2]

(c) The parallel pair of resistors in **(b)(ii)** is connected to a battery that is made from three cells in series, each of electromotive force (e.m.f.) E. There is a current in each resistor.

(i) State the e.m.f. of the battery.

....[1]

(ii) The current in the battery is I_B, the current in W_1 is I_1 and the current in W_2 is I_2.

Place a tick (✓) in **one** box to indicate how these three currents are related.

☐ $I_1 > I_2 > I_B$

☐ $I_1 > I_B > I_2$

☐ $I_2 > I_1 > I_B$

☐ $I_2 > I_B > I_1$

☐ $I_B > I_1 > I_2$

☐ $I_B > I_2 > I_1$

☐ $I_1 = I_2 = I_B$

[1]

[Total: 7]

8 In a laboratory at normal room temperature, 200 g of water is poured into a beaker. A thermometer placed in the water has a reading of 22 °C.

Small pieces of ice at 0 °C are added to the water one by one. The mixture is stirred after each addition until the ice has melted. This process is continued until the temperature recorded by the thermometer is 0 °C.

The total mass of ice added to the water is found to be 60 g.

(a) The specific heat capacity of water is 4.2 J/(g °C).

Calculate the thermal energy lost by the water originally in the beaker.

thermal energy = ... [2]

(b) Assume that all the thermal energy lost by the water originally in the beaker is transferred to the ice.

Calculate the specific latent heat of fusion of ice.

specific latent heat of fusion of ice = ... [2]

(c) Suggest a reason for any inaccuracy in the value of the specific latent heat of fusion of ice calculated in **(b)**. Assume the temperature readings and the values for the mass of the water and the mass of the ice are accurate.

....

.... [1]

[Total: 5]

9 **(a)** A student wants to demagnetise a permanent bar magnet. She suggests these steps:

1. Place the magnet in a long coil.
2. Switch on a large alternating current in the coil.
3. Switch off the current.
4. Remove the bar from the coil.

State and explain whether the steps will always be able to demagnetise the magnet.

....

....

....

....[3]

(b) **(i)** Fig. 9.1 shows a coil supplied with current using a split-ring commutator.

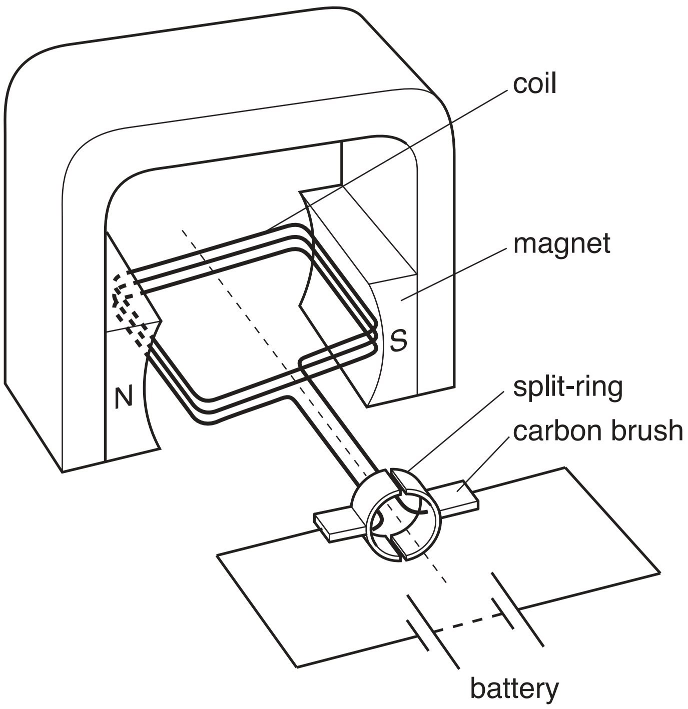

Fig. 9.1

State and explain any motion of the coil.

....

....

....

....

....[3]

(ii) The coil in Fig. 9.1 consists of three turns of wire. The magnetic field strength of the magnet is *M*. With a current of 2.0A in the coil, the coil experiences a turning effect *T*.

The first row of Table 9.1 shows this data.

Table 9.1

number of turns	current in the coil / A	magnetic field strength	turning effect
3	2.0	M	T
3	8.0	M	
6	2.0	M	
3	2.0	$\frac{M}{2}$	

Complete Table 9.1 to give the turning effect for the changes made to the arrangement shown in Fig. 9.1. Choose your answers from the box.

$\frac{T}{8}$	$\frac{T}{4}$	$\frac{T}{2}$	T	$2T$	$4T$	$8T$

[3]

[Total: 9]

10 **(a)** Explain why the voltage of the supply to the primary coil of a transformer must be alternating.

....

....

....

....[2]

(b) Fig. 10.1 shows a transformer.

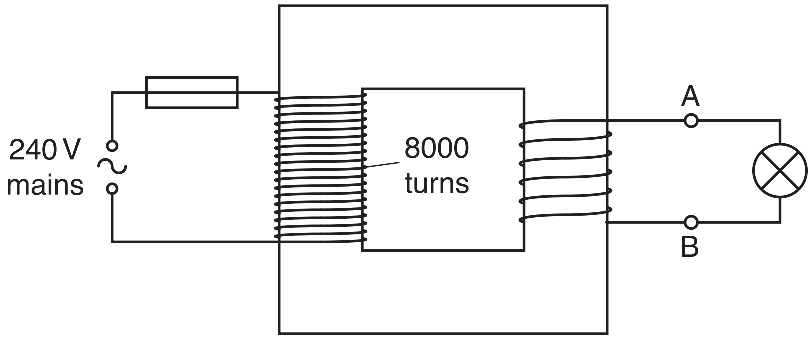

Fig. 10.1

There are 8000 turns in the primary coil of the transformer. The primary coil is connected to a 240 V mains supply. A 6.0 V lamp connected to the secondary coil operates at full brightness.

(i) Calculate the number of turns in the secondary coil,

number of turns = ...[2]

(ii) The current in the lamp is 2.0 A. The transformer operates with 100% efficiency.

Calculate the current in the primary circuit.

current = ...[2]

(iii) The primary circuit contains a 2 A fuse.

Calculate the maximum number of lamps, identical to the lamp in **(ii)**, that can be connected in parallel in the secondary circuit without blowing the fuse.

number of lamps = ...[1]

[Total: 7]

11 Radon-222 is radioactive. It can be represented as ${}^{222}_{86}\text{Rn}$.

(a) For a neutral atom of radon-222, state

1. the number of protons, ...

2. the number of neutrons, ...

3. the number of electrons. ....

[2]

(b) A radon-222 nucleus decays by α-particle emission to a polonium (Po) nucleus.

Complete the equation for the decay of radon-222.

$${}^{222}_{86}\text{Rn} \rightarrow$$ [2]

(c) Radon-222 has a half-life of 3.8 days.

At a certain time, a sample contains 6.4×10^6 radon nuclei.

Calculate the number of α-particles emitted by the radon nuclei in the following 7.6 days.

number = ...[3]

[Total: 7]

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Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME		
CENTRE NUMBER		CANDIDATE NUMBER

0939772161

PHYSICS **0625/42**

Paper 4 Theory (Extended) **May/June 2018**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m/s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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[Turn over

1 **(a)** Fig. 1.1 shows the axes of a distance-time graph for an object moving in a straight line.

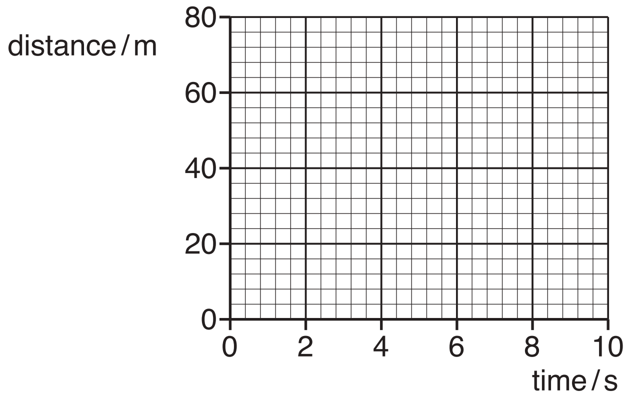


Fig. 1.1

(i) **1.** On Fig. 1.1, draw between time = 0 and time = 10 s, the graph for an object moving with a constant speed of 5.0 m / s. Start your graph at distance = 0 m.

2. State the property of the graph that represents speed.

....
[2]

(ii) Between time = 10 s and time = 20 s the object accelerates. The speed at time = 20 s is 9.0 m / s.

Calculate the average acceleration between time = 10 s and time = 20 s.

acceleration = ...[2]

(b) Fig. 1.2 shows the axes of a speed-time graph for a different object.

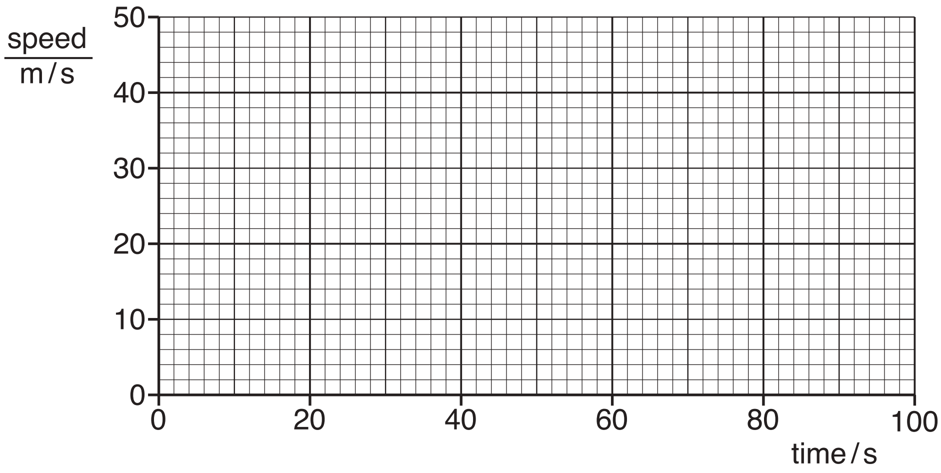


Fig. 1.2

(i) The object has an initial speed of 50 m/s and decelerates uniformly at $0.35\,m/s^2$ for 100 s.

On Fig. 1.2, draw the graph to represent the motion of the object. [2]

(ii) Calculate the distance travelled by the object from time = 0 to time = 100 s.

distance = ... [3]

[Total: 9]

2 Fig. 2.1 shows a hollow metal cylinder containing air, floating in the sea.

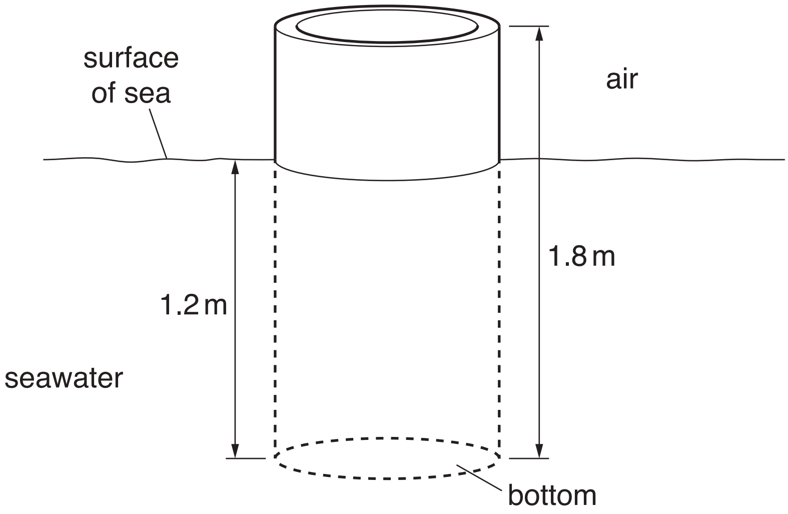


Fig. 2.1

(a) The density of the metal used to make the cylinder is greater than the density of seawater.

Explain why the cylinder floats.

....

....[1]

(b) The cylinder has a length of 1.8 m. It floats with 1.2 m submerged in the sea. The bottom of the cylinder has an area of cross-section of $0.80\,m^2$.

The density of seawater is $1020\,kg/m^3$. Calculate the force exerted on the bottom of the cylinder due to the depth of the seawater.

force = ...[4]

(c) Deduce the weight of the cylinder. Explain your answer.

weight = ...

explanation ....

....

[2]

[Total: 7]

3 Fig. 3.1 shows an aircraft on the deck of an aircraft carrier.

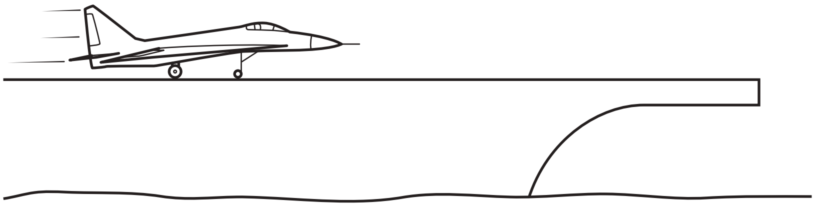


Fig. 3.1

The aircraft accelerates from rest along the deck. At take-off, the aircraft has a speed of 75 m/s. The mass of the aircraft is 9500 kg.

(a) Calculate the kinetic energy of the aircraft at take-off.

kinetic energy = ... [3]

(b) On an aircraft carrier, a catapult provides an accelerating force on the aircraft. The catapult provides a constant force for a distance of 150 m along the deck.

Calculate the resultant force on the aircraft as it accelerates. Assume that all of the kinetic energy at take-off is from the work done on the aircraft by the catapult.

force = ... [2]

[Total: 5]

4 **(a)** Fig. 4.1 represents an atom.

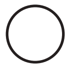
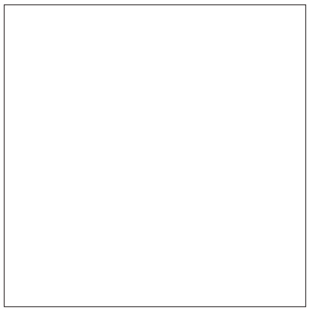


Fig. 4.1

Representing atoms by circles approximately the same size as in Fig. 4.1, sketch

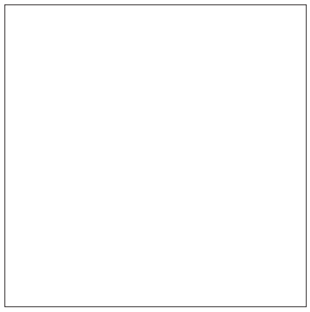
(i) on Fig. 4.2, the arrangement of atoms in a crystalline solid, [1]

(ii) on Fig. 4.3, the arrangement of atoms in a gas. [1]



solid

Fig. 4.2



gas

Fig. 4.3

(b) **(i)** Describe the motion of the atoms in a solid.

....[1]

(ii) A sculptor makes a statue from a block of crystalline rock using a cutting tool. Explain why he must apply a large force to the tool to remove a small piece of rock.

....

....[2]

(c) A helium-filled balloon in the room of a house suddenly bursts.

State and explain, in terms of atoms, what happens to the helium from the balloon after the balloon has burst.

....

....

....[2]

[Total: 7]

5 A student wants to investigate good and bad absorbers of thermal radiation. She has the apparatus shown in Fig. 5.1, a supply of cold water and a metre rule.

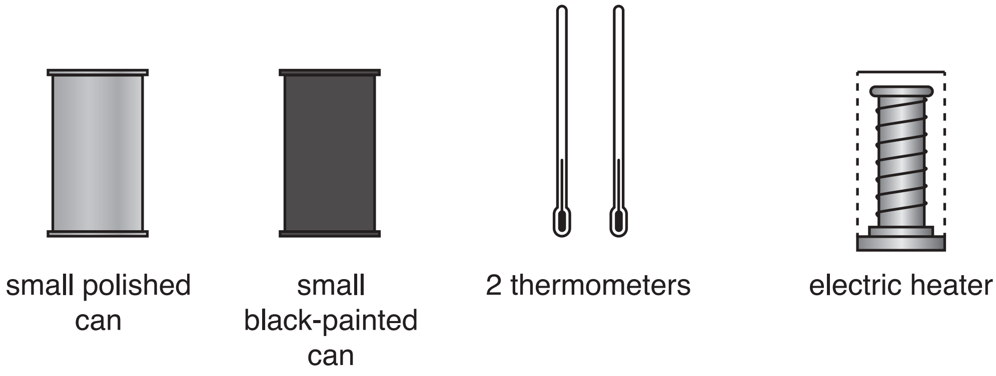


Fig. 5.1

Explain how the student could use the apparatus she has available to carry out her investigation. Describe the results she would expect to obtain. Draw a diagram of the set-up.

....

....

....

....

....

....

....

....[4]

[Total: 4]

6 **(a)** Circle **two** of the following that apply to an ultrasound wave travelling in air.

frequency 3.5 Hz   frequency 350 Hz   frequency 35 000 Hz   longitudinal

transverse   speed 1.5 m/s   speed 1.5×10^3 m/s   speed 1.5×10^6 m/s

[2]

(b) Calculate the wavelength in a vacuum of X-rays of frequency 1.3×10^{17} Hz.

wavelength = ...[3]

(c) A dentist takes an X-ray photograph of a patient's teeth. Explain why it is safe for the patient to be close to the source of X-rays, but the dentist must stand away from the source.

....

....

....

....[2]

(d) State, with a reason, why microwave ovens are designed only to work with the door closed.

....

....

....[2]

[Total: 9]

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7 **(a)** Fig. 7.1 shows a ray of light in water that is incident on a submerged, transparent plastic block.

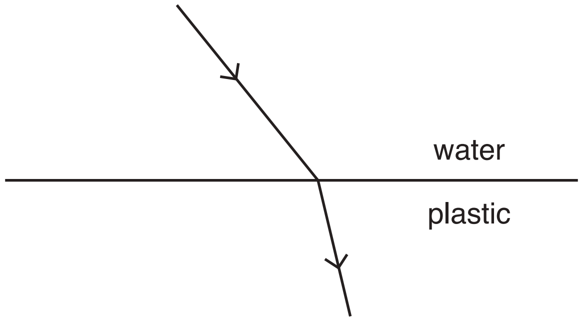

Fig. 7.1

State what happens to the speed of light as it enters the plastic block. Explain your answer.

....

....

....[2]

(b) Fig. 7.2 shows the two principal focuses F_1 and F_2 of a thin converging lens.

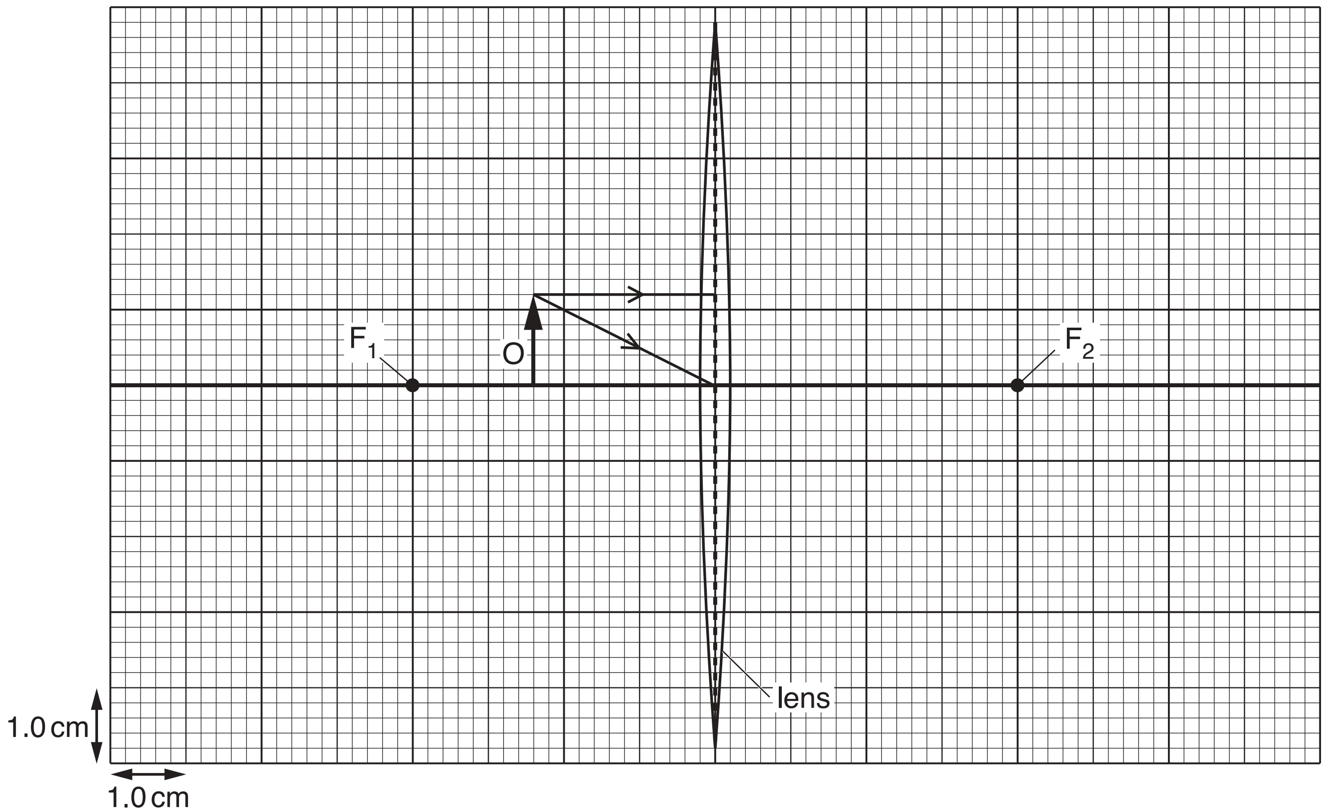

Fig. 7.2

Fig. 7.2 also shows an object O of height 1.2 cm placed close to the lens. Two rays from the tip of the object O are incident on the lens.

(i) On Fig. 7.2, continue the paths of these two rays for a further distance of at least 5 cm. [2]

(ii) Using your answer to **(b)(i)**, find and mark on Fig. 7.2 the image I of object O and label this image. [2]

(iii) Determine the height of image I.

height = ...[1]

(iv) State and explain whether I is a real image or a virtual image.

....

....[1]

[Total: 8]

8 Fig. 8.1 shows a circuit that contains a battery of electromotive force (e.m.f.) 6.0 V, an ammeter, a 20 Ω resistor and component X.

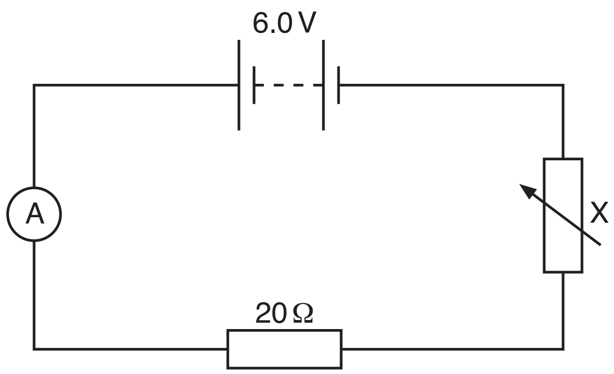

Fig. 8.1

(a) **(i)** State the name of component X.

....[1]

(ii) The potential difference (p.d.) across the 20 Ω resistor is measured with a voltmeter.

On Fig. 8.1, draw the symbol for this voltmeter connected to the circuit. [1]

(b) The p.d. across the 20 Ω resistor is varied from zero to 6.0 V. For each value of p.d. a corresponding current is measured.

On Fig. 8.2, draw a line to indicate how the current measured by the ammeter depends on the p.d. across the 20 Ω resistor.

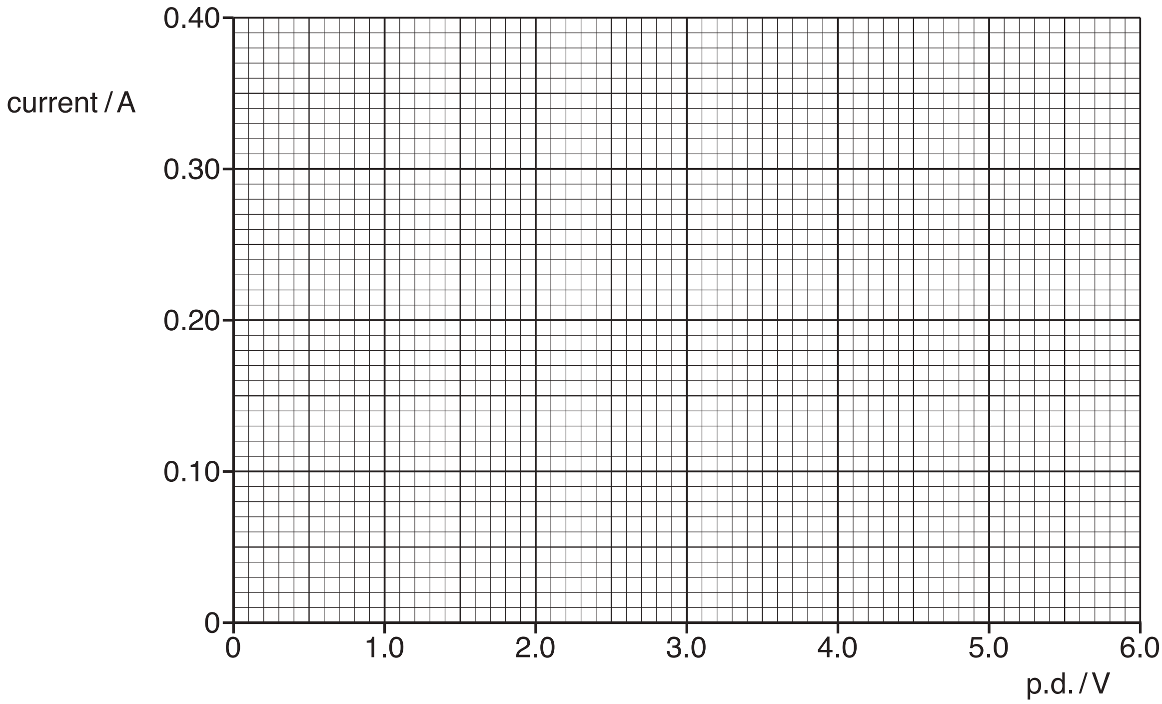

Fig. 8.2

[3]

(c) A second resistor is connected into the circuit in parallel with the 20 Ω resistor.

(i) State how the combined resistance of the two resistors in parallel compares with the resistance of each of the resistors on its own.

....

....[1]

(ii) The p.d. across the two parallel resistors is changed and the current in the battery for each value of the p.d. is measured. A second line could be drawn on Fig. 8.2 to indicate how the current measured by the ammeter depends on the p.d. across the two resistors in parallel.

State how the second line differs from the original line. You are **not** expected to draw this second line.

....

....[1]

[Total: 7]

9 (a) Fig. 9.1 shows a coil ABCD with two turns. The coil is in a magnetic field.

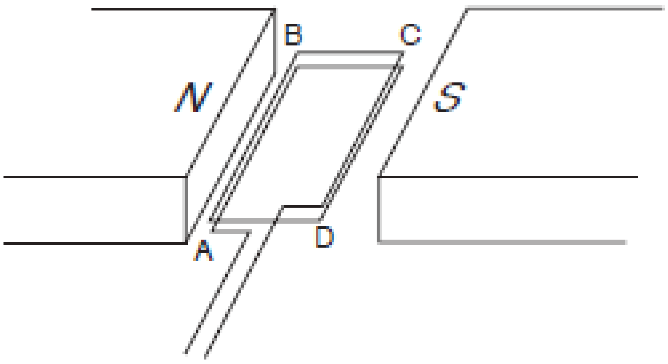

Fig. 9.1

When there is a current in the coil, the coil experiences a turning effect.

(i) Explain why there is a turning effect.

....

....

....[1]

(ii) The value of the current is 3A. Place **one** tick in each column of the table to indicate how the turning effect changes with the change described.

turning effect	number of turns on coil increased to six	current increased to 9A	strength of magnetic field decreased by a factor of 2
decreased by factor of 4			
decreased by factor of 3			
decreased by factor of 2			
no change			
increased by factor of 2			
increased by factor of 3			
increased by factor of 4			

[3]

(b) Fig. 9.2 shows a magnet held just below a vertical coil connected to a galvanometer.

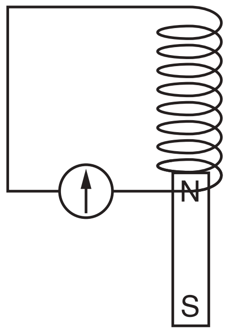

Fig. 9.2

The magnet is released.

(i) State any effect on the galvanometer.

....

....

....[2]

(ii) State any effect on the magnetic field produced by the coil.

....

....

....[2]

[Total: 8]

10 (a) An uncharged conducting metal plate rests on insulating supports. Fig. 10.1 shows the plate and a positively charged insulating plastic sheet placed on top of the metal plate.

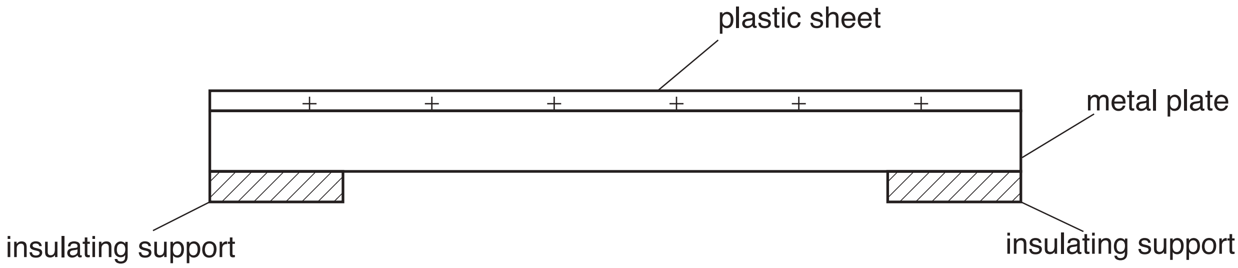

Fig. 10.1

(i) Describe any flow of charge that takes place when the plastic sheet is placed onto the metal plate.

....

....[1]

(ii) On Fig. 10.1, draw how charges are now arranged within the metal plate. [1]

(iii) State and explain if this arrangement of charge helps to keep the plastic sheet in place.

....

....

....

....[2]

(b) Fig. 10.2 shows two uncharged conducting spheres suspended on insulating threads.

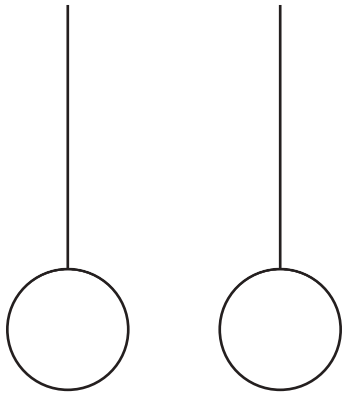

Fig. 10.2

1. The spheres are now both given positive charges. On Fig. 10.2, draw a possible position of each sphere and thread.

2. Explain the positions you have drawn.

....

....
[2]

[Total: 6]

11 **(a)** A radioactive nucleus of uranium-235 decays to a nucleus of thorium and emits an α-particle. Complete the equation.

$$^{235}_{92}\mathrm{U} \longrightarrow \;^{\cdots\cdots}_{\cdots\cdots}\mathrm{Th} + \;^{4}_{2}\alpha$$

[2]

(b) A nucleus of uranium-235 undergoes nuclear fission in a reactor.

(i) State what is meant by *nuclear fission*.

....

....

....[1]

(ii) Suggest why a nuclear reactor is surrounded by thick concrete walls.

....

....

....

....[2]

(iii) State one environmental advantage and one environmental disadvantage of using a fission reactor to generate electrical energy in a power station.

advantage ....

....

disadvantage ....

....

[2]

(c) The thorium produced by the decay in **(a)** is also radioactive and has a half-life of 26 hours. At a certain time, a pure sample of this isotope initially contains 4.8×10^9 atoms.

Calculate the number of atoms of this sample that decay in the following 52 hours.

number = ...[3]

[Total: 10]

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Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

5718291804

PHYSICS **0625/43**

Paper 4 Theory (Extended) **May/June 2018**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **15** printed pages and **1** blank page.

DC (LEG/SG) 152968/4

CAMBRIDGE
International Examinations

1 There is no atmosphere on the Moon.

A space probe is launched from the surface of the Moon. Fig. 1.1 shows the speed-time graph of the space probe.

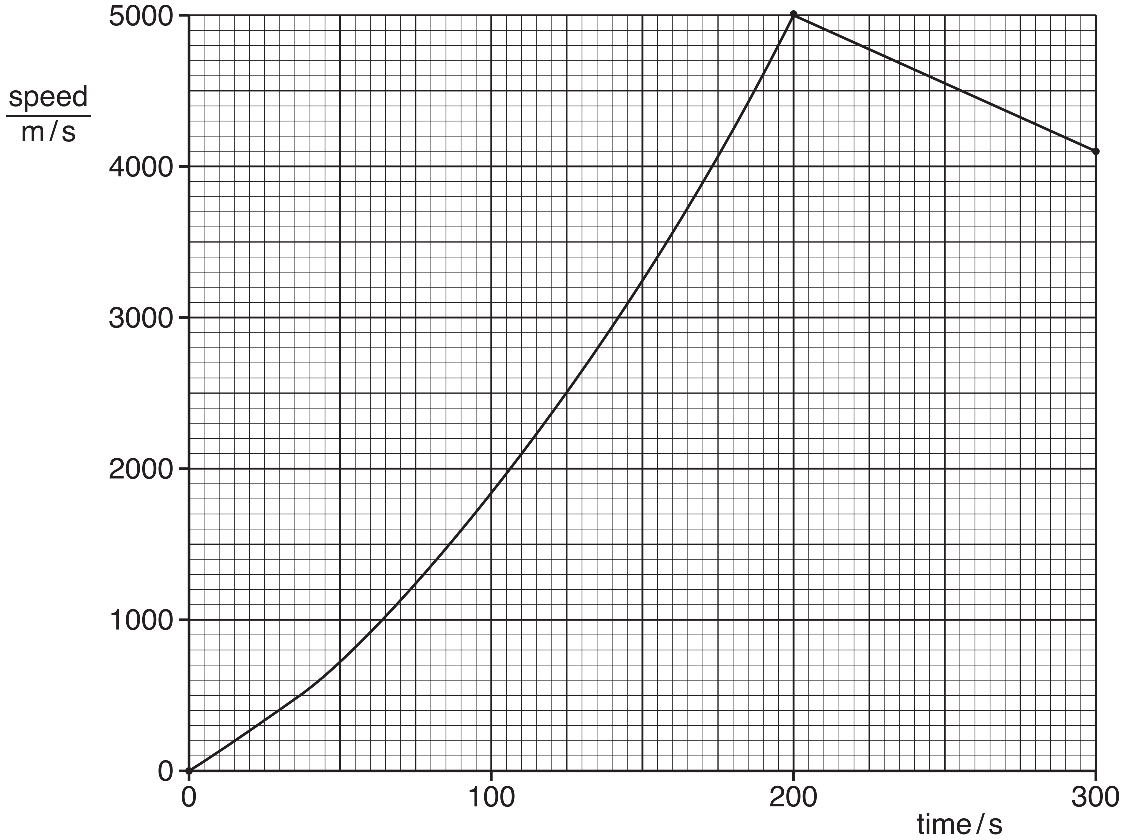

Fig. 1.1

(a) Determine the acceleration of the space probe at time = 0.

acceleration = ... [3]

(b) Between time = 0 and time = 150 s, the acceleration of the space probe changes.

(i) Without calculation, state how the graph shows this.

....

.... [1]

(ii) During this time, the thrust exerted on the space probe by the motor remains constant.

State one possible reason why the acceleration changes in the way shown by Fig. 1.1.

....

....[1]

(c) Calculate the distance travelled by the space probe from time = 200 s to time = 300 s.

distance = ...[3]

[Total: 8]

2 A rifle fires a bullet of mass 0.020 kg vertically upwards through the air. As it leaves the rifle, the speed of the bullet is 350 m/s.

(a) Calculate

(i) the kinetic energy of the bullet as it leaves the rifle,

kinetic energy = ...[3]

(ii) the maximum possible height that the bullet can reach.

maximum height = ...[2]

(b) The actual height reached by the bullet is less than the value calculated in **(a)(ii)**.

(i) Explain, in terms of the forces acting on the bullet, why this is so.

....

....

....[2]

(ii) As the bullet rises through the air, its kinetic energy decreases.

State what happens to this energy.

....

....

....[2]

[Total: 9]

3 On a particular day, the atmospheric pressure is 1.0×10^5 Pa. A bubble of gas forms at a point 5.0 m below the surface of a lake. The density of water is 1000 kg / m^3.

(a) Determine

(i) the total pressure at a depth of 5.0 m in the water,

pressure = ...[3]

(ii) the pressure of the gas in the bubble.

pressure = ...[1]

(b) As the bubble rises to the surface, the mass of gas in the bubble stays constant. The temperature of the water in the lake is the same throughout.

Explain why the bubble rises to the surface and why its volume increases as it rises.

....

....

....

....

....

....[3]

[Total: 7]

4 A beaker contains some water at room temperature. A student places a mercury-in-glass thermometer in the water with the bulb of the thermometer just beneath the surface of the water.

Fig. 4.1 shows the arrangement.

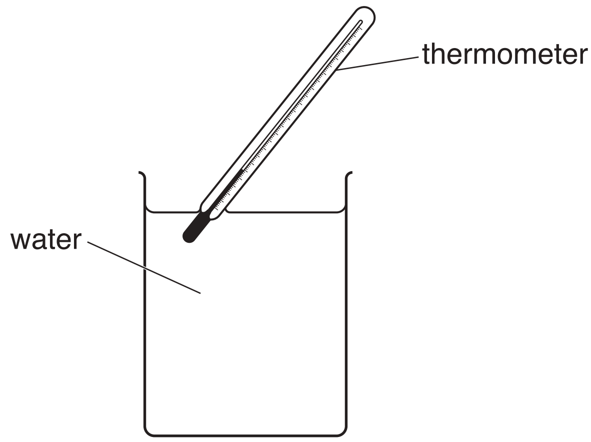

Fig. 4.1

The student uses an electric fan to blow air across the open top of the beaker. She notices that the reading on the thermometer begins to decrease.

(a) Explain, in terms of water molecules, why the temperature of the water at the surface begins to decrease.

....

....

....

....

....[3]

(b) The student places the thermometer near the bottom of the beaker. The electric fan continues to blow air across the top of the beaker. After some time, the student observes that the temperature of the water at the bottom of the beaker is decreasing.

State the name of the thermal transfer method causing this and explain what is happening in the water.

....

....

....

....

....[3]

(c) The thermometer used in this experiment has a small range and a large sensitivity.

(i) State what is meant by

1. *range*,

....

....[1]

2. *sensitivity*.

....

....[1]

(ii) State and explain the effect on the range of the thermometer of using a smaller bulb that contains less mercury.

....

....[1]

[Total: 9]

5 **(a)** A microscope that produces a very high magnification is used to observe the Brownian motion of smoke particles in air.

Fig. 5.1(a) shows the apparatus used with the microscope. Fig. 5.1(b) represents the view through the microscope and shows one of the smoke particles being observed.

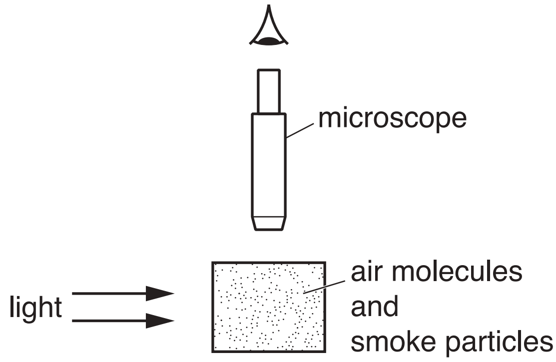

Fig. 5.1(a)

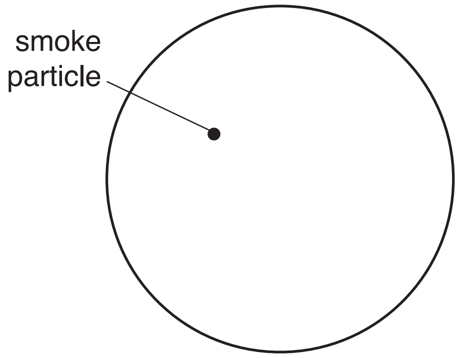

Fig. 5.1(b)

(i) On Fig. 5.1(b), draw a possible path for the smoke particle. [2]

(ii) Describe how air molecules cause the smoke particle to follow the observed path.

....

....

....

....[2]

(b) Fig. 5.2 shows a volume of gas in a cylinder.

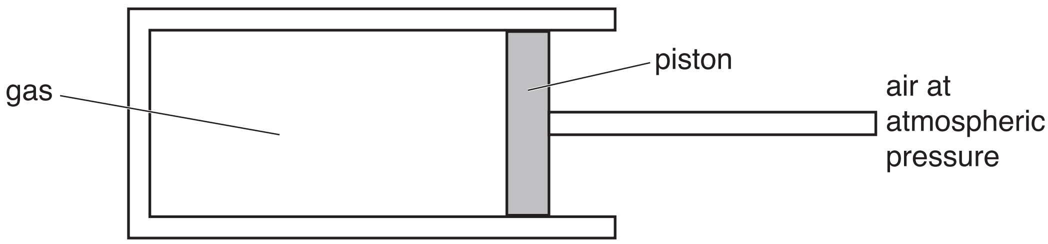

Fig. 5.2

The piston in the cylinder is free to move. The piston moves to the left when the temperature of the gas is decreased.

Explain, in terms of the molecules of the gas, why this happens.

....

....

....

....

....[4]

[Total: 8]

6 Sound is a longitudinal wave.

(a) Sketch a representation of a longitudinal wave. On your sketch

- indicate and label a distance to show the wavelength,
- mark and label the centre of one compression,
- mark and label the centre of one rarefaction.

[3]

(b) A longitudinal wave passes from one medium into another medium. The speed of the wave is slower in the second medium.

State what happens to

(i) the frequency of the wave,

....[1]

(ii) the wavelength of the wave.

....[1]

(c) State a typical value for the speed of sound in air.

....[1]

[Total: 6]

7 **(a)** A ray of light travelling in air strikes a glass block at an angle of 30° to the normal. The light slows down as it enters the glass block.

State and explain, in terms of wavefronts, what happens to the light.

....

....

....

....[3]

(b) The speed of light in this block of glass is 1.9×10^8 m/s.

Calculate the refractive index of the glass.

refractive index = ...[2]

[Total: 5]

8 **(a)** A thin converging lens is used to produce an image I of object O.

Fig. 8.1 shows O, I and the screen on which the image is produced.

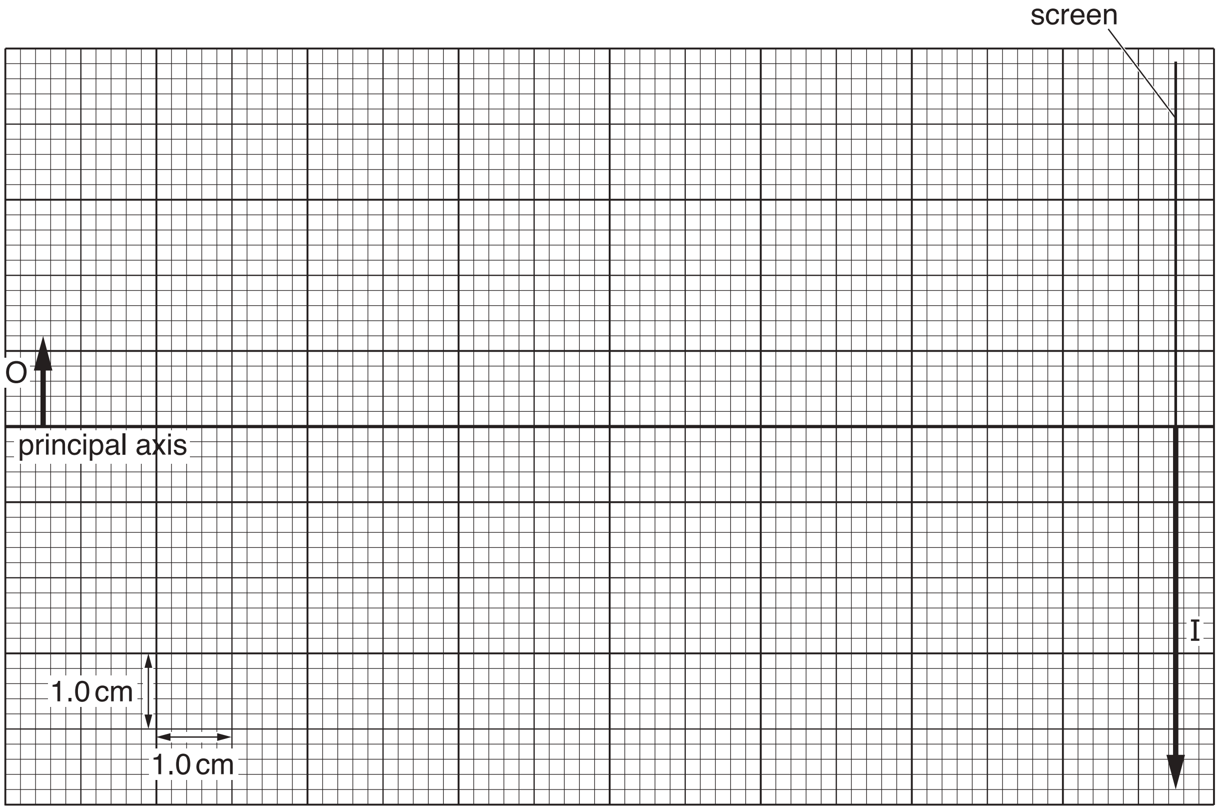

Fig. 8.1

(i) On Fig. 8.1, draw a straight line to represent a ray from the tip of the arrowhead of O to the tip of the arrowhead of I. Draw a vertical dotted line to indicate the position of the lens. This dotted line must extend above and below the principal axis. [2]

(ii) Draw a second ray from the tip of the object O to the tip of image I. This ray should pass through a principle focus. Label the principle focus, F. [1]

(iii) Determine the focal length of the lens.

focal length = ...[1]

(iv) Image I is further from the lens than object O is from the lens. Image I is described as enlarged and inverted.

State and explain one other characteristic of I.

....

....[1]

(b) Fig. 8.2 shows a spherical fishbowl, full of water, by a window. A black curtain hangs behind the fishbowl.

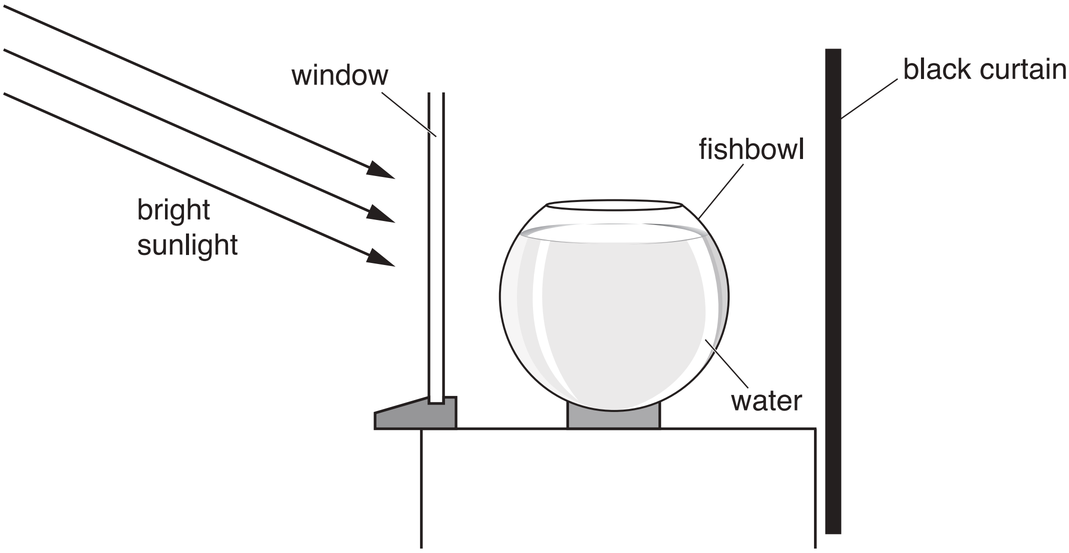

Fig. 8.2

When full of water, the fishbowl can act as a converging lens.

Suggest one possible hazard of leaving the fishbowl next to the window in bright sunlight.

....

....[1]

[Total: 6]

9 Fig. 9.1 shows a circuit that includes a battery of electromotive force (e.m.f.) 12 V.

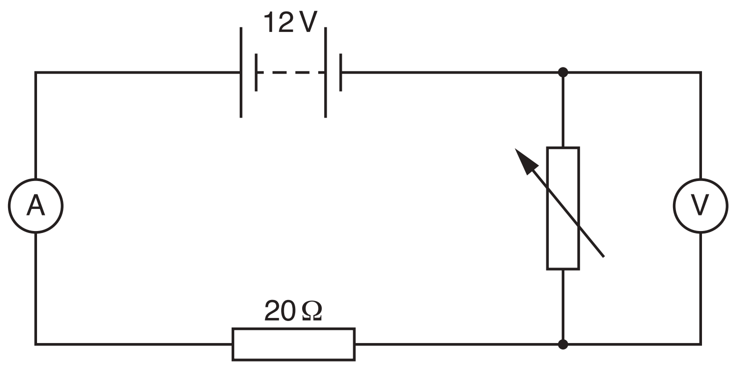

Fig. 9.1

The reading on the ammeter is 0.15 A.

(a) Calculate the resistance of the circuit.

resistance = ...[2]

(b) The variable resistor is adjusted so that its resistance decreases.

(i) State what happens to the reading on the ammeter.

....[1]

(ii) State and explain what happens to the reading on the voltmeter.

....

....

....[2]

(c) The battery is formed from cells of electromotive force (e.m.f.) 1.5 V.

(i) Explain, in terms of electrical energy, what is meant by an *electromotive force* (*e.m.f.*) *of 1.5 V*.

....

....[2]

(ii) State how many 1.5 V cells are connected in series to form the battery.

....[1]

[Total: 8]

10 **(a)** A bar magnet is held with its N-pole just inside one end of a coil.

Fig. 10.1 shows the coil connected to a galvanometer that has the zero mark in the centre of the scale.

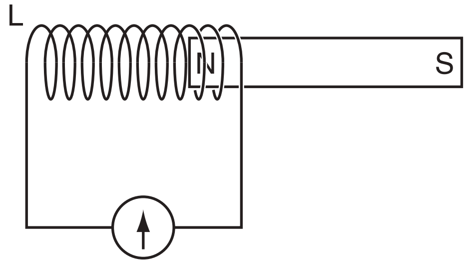

Fig. 10.1

The magnet is pulled horizontally to the right at a constant speed through a large distance.

(i) State what happens to the galvanometer reading as time passes.

....

....

....[2]

(ii) As the magnet moves, an N-pole is produced at the left-hand end L of the coil.

Explain why the pole at L is an N-pole.

....

....

....[2]

(b) A transformer has N_P turns on the primary coil and N_S turns on the secondary coil. The transformer is used in a school laboratory as a 12 V alternating current (a.c.) supply. The transformer is powered from the 240 V a.c. mains supply.

(i) Determine the turns ratio N_P / N_S of the transformer.

N_P / N_S = ...[2]

(ii) The laboratory 12 V a.c. supply is rectified to produce a direct current (d.c.) supply.

Underline the component that the rectification circuit must include.

AND gate **diode** **NOT gate** **potentiometer** **thermistor**

[1]

Need a home tutor? Visit smiletutor.sg [Total: 7]

11 (a) State the type of radioactive emission that causes

(i) the proton number of a nuclide to increase by 1,

....[1]

(ii) the nucleon number of a nuclide to decrease by 4,

....[1]

(iii) no change in the proton number and no change in the nucleon number of a nuclide.

....[1]

(b) The isotope radon-220 is radioactive and it decays by α-particle emission.

(i) Fig. 11.1 shows a beam of α-particles entering the electric field between two charged plates.

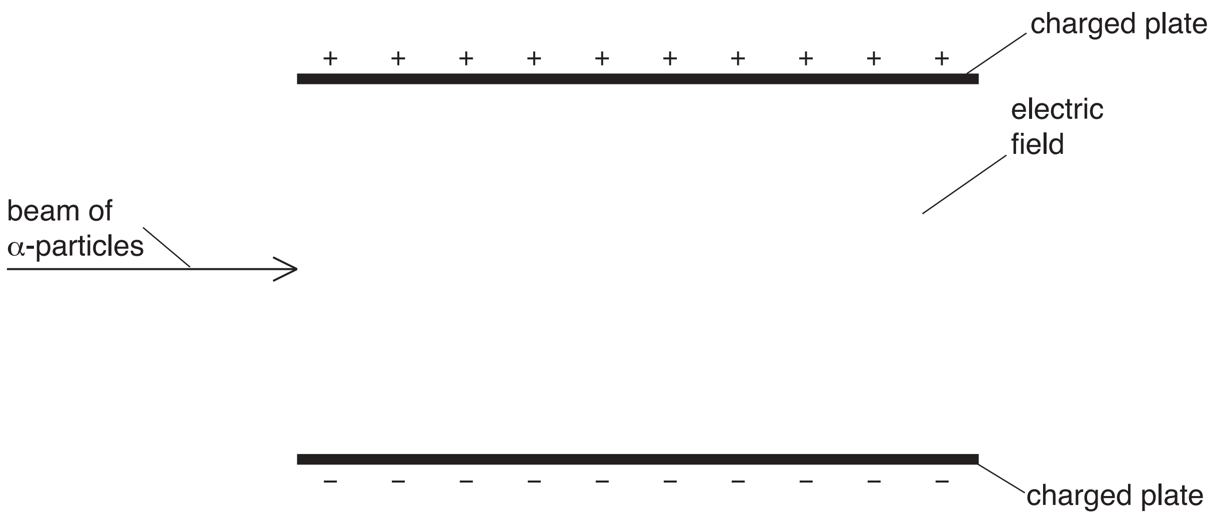

Fig. 11.1

On Fig. 11.1, sketch the path that the beam of α-particles follows in the electric field. [1]

(ii) The half-life of radon-220 is 56 s.

A sample of this isotope contains 7.2×10^6 atoms.

Predict the number of α-particles that the radon-220 in the sample emits in the next 168 s.

number of α-particles emitted = ...[3]

[Total: 7]

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Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

6269455228

PHYSICS **0625/51**

Paper 5 Practical Test **May/June 2018**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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1	
2	
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Total	

This document consists of **10** printed pages and **2** blank pages.

DC (ST/CT) 150765/5

1 In this experiment, you will determine the acceleration of free fall g using a pendulum. Carry out the following instructions, referring to Fig. 1.1 and Fig. 1.2.

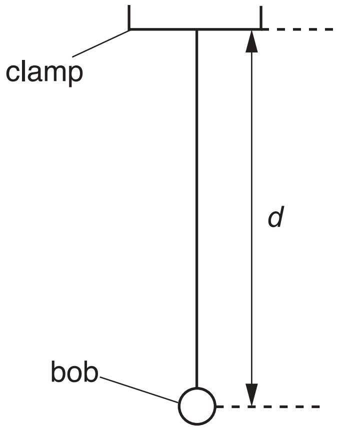

Fig. 1.1

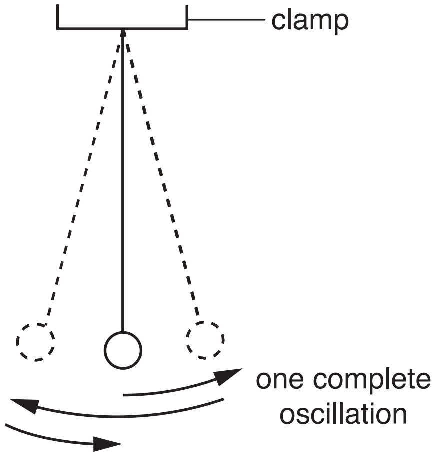

Fig. 1.2

A pendulum has been set up for you as shown in Fig. 1.1.

(a) Adjust the length of the pendulum until the distance d measured to the centre of the bob is 50.0 cm.

Displace the bob slightly and release it so that it swings. Fig. 1.2 shows one complete oscillation of the pendulum.

(i) Measure the time t for 10 complete oscillations.

t = ... [1]

(ii) Calculate the period T of the pendulum. The period is the time for one complete oscillation.

T = ... [1]

(iii) Calculate T^2.

T^2 = ... [2]

(iv) Calculate the acceleration of free fall g using the equation $g = \frac{20}{T^2}$.

g = ... [1]

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(b) Adjust the pendulum until the distance *d* measured to the centre of the bob is 100.0 cm.

(i) Repeat the procedure in **(a)(i)**, **(a)(ii)** and **(a)(iii)**.

t = ...

T = ...

T^2 = ...
[1]

(ii) Calculate the acceleration of free fall g using the equation $g = \frac{40}{T^2}$.

g = ...
[2]

(c) A student states that repeating the experiment improves the reliability of the value obtained for g.

Suggest **two** changes that you would make to improve the reliability. The stopwatch cannot be changed.

1. ....

....

2. ....

....

[2]

(d) State **one** precaution that you took in this experiment in order to obtain accurate readings.

....

....[1]

[Total: 11]

2 In this experiment, you will investigate resistance.

The circuit shown in Fig. 2.1 has been set up for you.

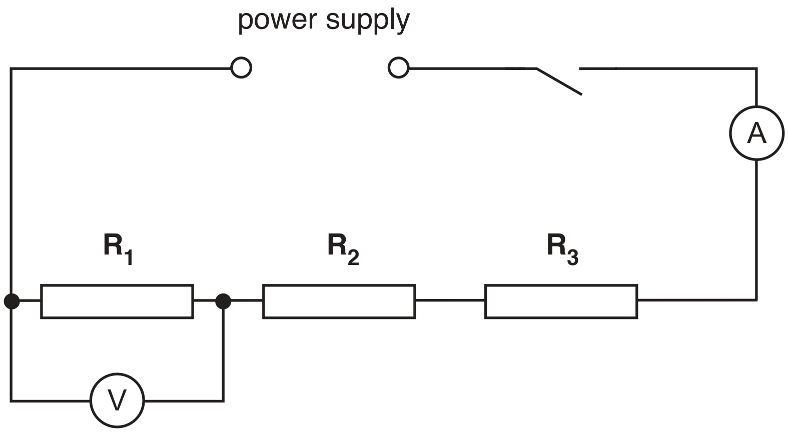

Fig. 2.1

(a) (i) Switch on. Measure and record the potential difference V_1 across the resistor $\mathbf{R_1}$ and the current I in the circuit. Switch off.

V_1 = ...

I = ...
[2]

(ii) Calculate the resistance of the resistor $\mathbf{R_1}$ using the equation $R_1 = \frac{V_1}{I}$.

R_1 = ... [1]

(b) Disconnect the voltmeter.

Connect the voltmeter across the resistor $\mathbf{R_2}$. Switch on.

(i) Measure and record the potential difference V_2 across the resistor $\mathbf{R_2}$. Switch off.

V_2 = ...

(ii) Calculate the resistance of the resistor $\mathbf{R_2}$ using the equation $R_2 = \frac{V_2}{I}$.

R_2 = ... [1]

(c) Disconnect the voltmeter.

Connect the voltmeter across the resistor $\mathbf{R_3}$. Switch on.

(i) Measure and record the potential difference V_3 across the resistor $\mathbf{R_3}$. Switch off.

V_3 = ...

(ii) Calculate the resistance of the resistor $\mathbf{R_3}$ using the equation $R_3 = \frac{V_3}{I}$.

R_3 = ... [1]

(iii) Calculate the resistance R of resistors $\mathbf{R_1}$, $\mathbf{R_2}$ and $\mathbf{R_3}$ connected in series, using the equation $R = R_1 + R_2 + R_3$. Give your answer to a suitable number of significant figures for this experiment.

R = ... [1]

(d) State whether your results suggest that the three resistors have the same value of resistance. Justify your statement by reference to your results.

statement ....

justification ....

....

....
[2]

(e) Complete the circuit diagram in Fig. 2.2 to show:

- the three resistors connected in parallel
- the voltmeter connected to measure the potential difference across the resistors
- a variable resistor connected to control the current in all three resistors.

You are **not** required to set up this circuit.

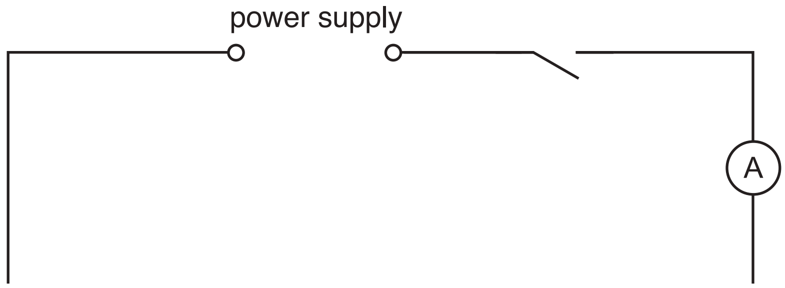

Fig. 2.2

[3]

[Total: 11]

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3 In this experiment, you will determine the focal length f of a lens.

Carry out the following instructions referring to Fig. 3.1.

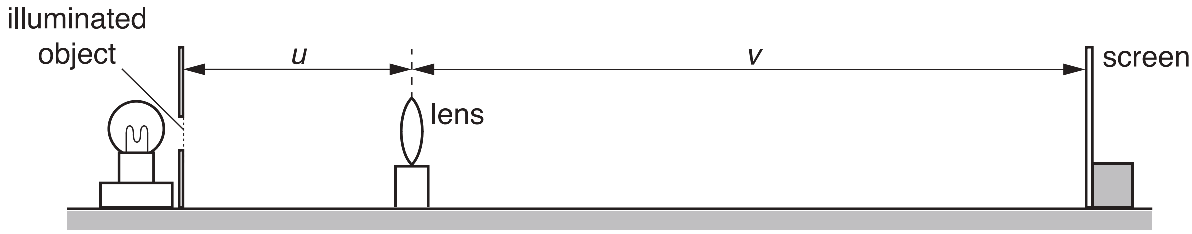

Fig. 3.1

(a) • Place the screen a distance D = 70.0 cm from the illuminated object.

• Place the lens between the object and the screen so that the lens is very close to the screen.

• Move the lens slowly away from the screen until a clearly focused image is formed on the screen.

(i) • Measure, and record in Table 3.1, the distance u between the centre of the lens and the illuminated object.

• Measure, and record in the table, the distance v between the centre of the lens and the screen.

(ii) Calculate the product uv. Record your answer in the table.

(iii) Repeat the procedure using values for D of 75.0 cm, 80.0 cm, 85.0 cm and 90.0 cm.

Table 3.1

D/cm	u/cm	v/cm	uv/cm^2
70.0			
75.0			
80.0			
85.0			
90.0			

[3]

(b) Plot a graph of uv/cm^2 (y-axis) against D/cm (x-axis). You do **not** need to start your axes at the origin (0,0).

[4]

(c) The focal length f of the lens is numerically equal to the gradient of the line.

Determine the gradient G of the line. Show clearly on the graph how you obtained the necessary information.

G = ...[2]

(d) Suggest **two** difficulties in this experiment when trying to obtain accurate readings.

1. ....

....

2. ....

....

[2]

[Total: 11]

4 A student is investigating the effect of double-walled insulation on the rate of cooling of hot water in a copper container. The student places the copper container inside a larger metal container. He is investigating the effect of the size of the air gap between the copper container and larger metal containers.

Plan an experiment to investigate the effect of the size of the air gap between the copper container and larger metal containers on the rate of cooling of hot water.

The following apparatus is available:

a copper container

a number of metal containers of different diameters (all larger than the copper container)

a thermometer

a stopwatch

a measuring cylinder

a supply of hot water.

You can also use other apparatus and materials that are usually available in a school laboratory.

You are **not** required to carry out this investigation.

In your plan, you should:

- explain briefly how you would carry out the investigation
- state the key variables that you would control
- draw a table, or tables, with column headings, to show how you would display your readings (you are not required to enter any readings in the table)
- explain how you would use your readings to reach a conclusion.

You may draw a diagram if it helps your explanation.

....

....

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....

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....

....

....

....

....[7]

[Total: 7]

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Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

8353946662

PHYSICS **0625/52**

Paper 5 Practical Test **May/June 2018**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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DC (LEG/CGW) 150763/5

1 In this experiment, you will determine the density of water.

Carry out the following instructions, referring to Fig. 1.1.

You are provided with a plastic drinks cup.

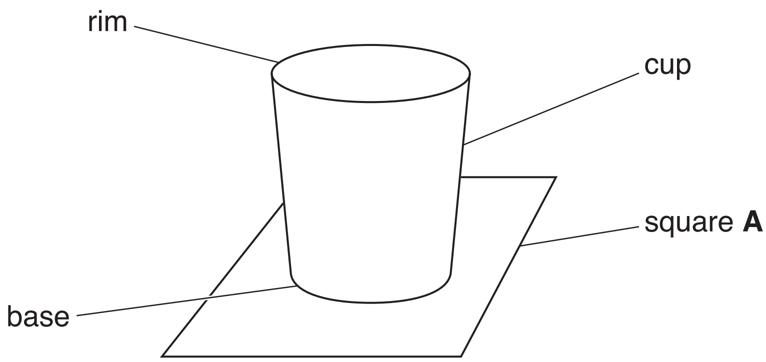

Fig. 1.1

(a) **(i)** Place the cup, with the base at the bottom, in square **A** on this page. Draw carefully around the base of the cup. Remove the cup from the paper. Take measurements from your drawing to determine an accurate value for the diameter D_B of the base of the cup.

Square **A**

D_B = ... cm [2]

(ii) Place the cup, with the rim at the bottom, in square **B** on this page. Draw carefully around the rim of the cup.

Remove the cup from the paper. Take measurements from your drawing to determine the diameter D_T of the rim of the cup.

Square **B**

D_T = ... cm [1]

(iii) Calculate the average diameter D of the cup using the equation $D = \frac{D_B + D_T}{2}$.

D = ... cm [1]

(b) **(i)** Measure the vertical height h of the cup.

h = ... cm [1]

(ii) 1. Calculate the volume V of the cup using the equation $V = 0.785 D^2 h$.

V = ... cm^3

2. Calculate $V/2$.

$V/2$ = ... cm^3
[1]

(c) You are provided with water in beaker **W**.

Pour a volume $V/2$ of water into the measuring cylinder. Pour this water into the cup.

(i) Use the balance provided to measure the mass m of the cup containing the water.

m = ... g [1]

(ii) Determine the density ρ of water using the equation $\rho = \frac{2m}{V}$.

Give your answer to a suitable number of significant figures for this experiment. Include the unit.

ρ = ... [3]

(d) A student carries out all the instructions for this experiment with care, but his value for the density of water ρ is not equal to the expected value.

Suggest, with a reason, a part of the procedure, **(a)**, **(b)** or **(c)** that could give an unreliable result.

part ....

reason ....

....
[1]

[Total: 11]

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2 In this experiment, you will investigate the cooling of water.

Carry out the following instructions referring to Fig. 2.1.

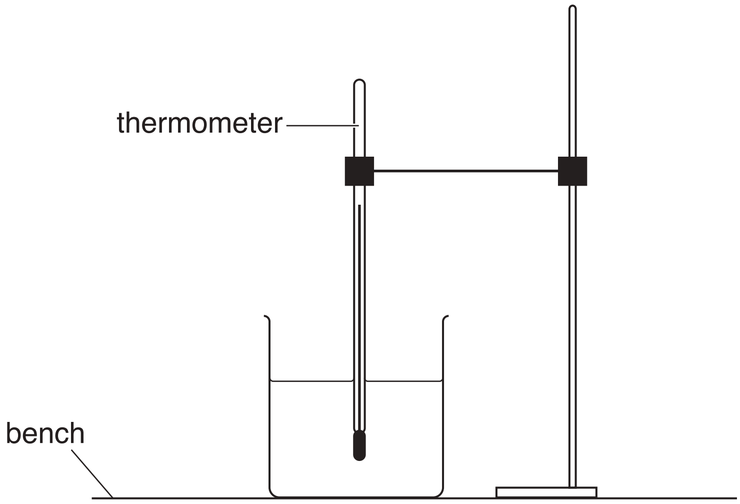


Fig. 2.1

(a) Use the thermometer to measure room temperature θ_R.

θ_R = ... [1]

(b) Pour 200 cm^3 of hot water into the beaker. Place the thermometer in the beaker of hot water.

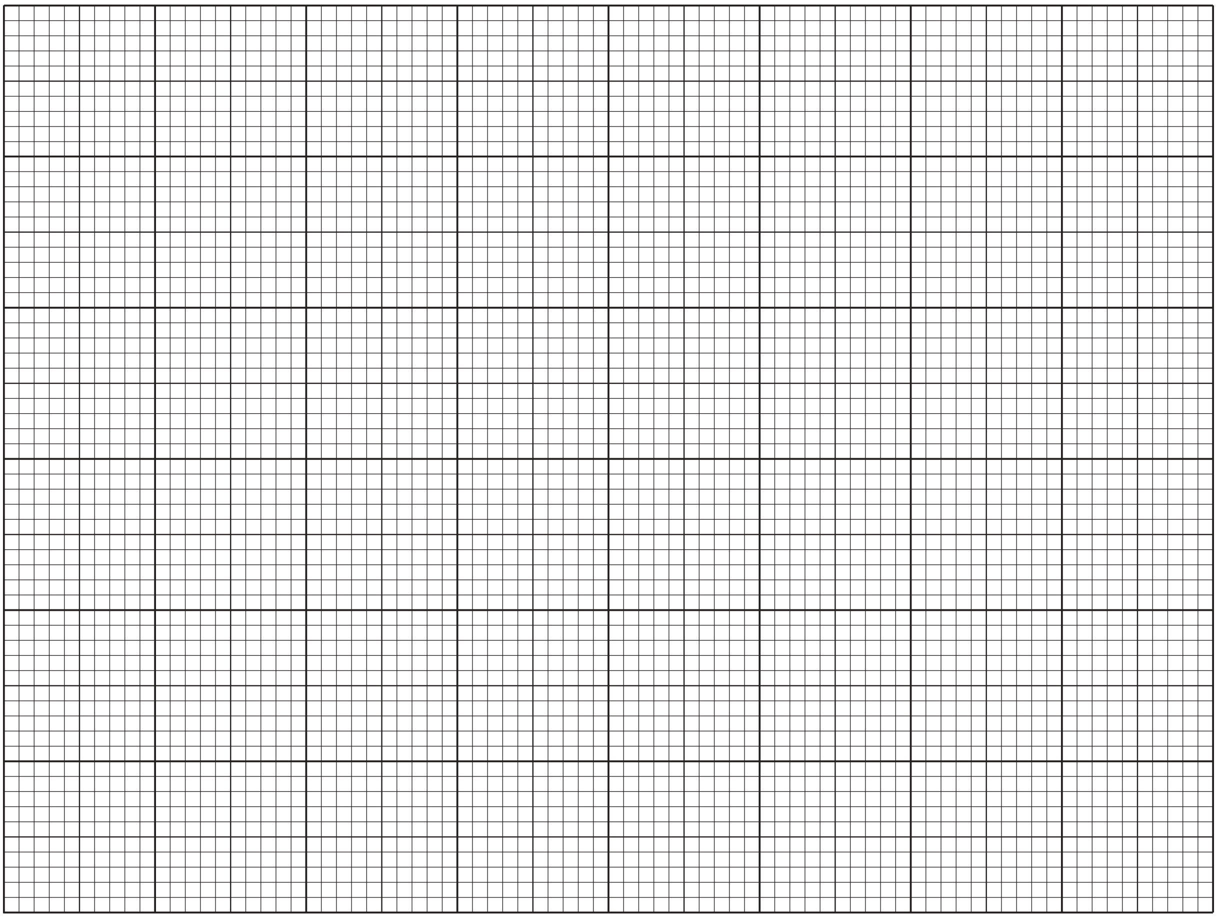
- Record in Table 2.1 the temperature θ of the hot water at time t = 0 s. Immediately start the stopclock.
- After 30 s, measure the temperature θ shown on the thermometer. Record the time t = 30 s and the temperature reading in the table.
- Continue recording the time and temperature readings every 30 s until you have six sets of readings.

[2]

Table 2.1

t / s	θ / °C
0	

(c) Plot a graph of θ/°C (y-axis) against t/s (x-axis). You do **not** need to start the y-axis at the origin (0,0) but the value of room temperature θ_R must be marked on the y-axis.



[4]

(d) Draw a horizontal line across the graph grid to show the value of room temperature θ_R during the experiment. [1]

(e) A student plans to repeat the experiment using the same thermometer and the same volume of water. Suggest **two** changes to the apparatus or the procedure that would increase the rate of cooling of the water.

1. ....

....

2. ....

....

[2]

(f) State **one** precaution that you took in order to record accurate readings.

....

....[1]

[Total: 11]

3 In this experiment, you will determine the focal length f of a lens.

Carry out the following instructions referring to Fig. 3.1.

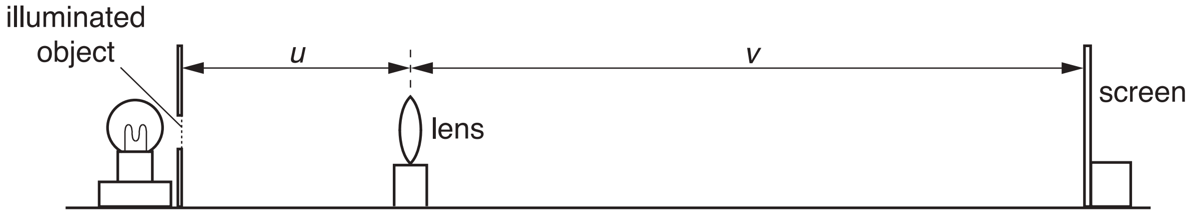


Fig. 3.1

(a) • Place the screen about 100 cm from the illuminated object.

• Place the lens between the object and the screen so that the centre of the lens is at a distance u_1 = 20.0 cm from the object.

• Adjust the position of the screen until a clearly focused image is formed on the screen.

(i) Measure the distance v_1 between the centre of the lens and the screen.

v_1 = ... [1]

(ii) Calculate the focal length f_1 of the lens using the equation $f_1 = \dfrac{u_1 v_1}{(u_1 + v_1)}$.

f_1 = ... [1]

(b) **(i)** Repeat the procedure in **(a)**, placing the lens between the object and the screen so that the centre of the lens is at a distance u_2 = 30.0 cm from the object.

v_2 = ... [1]

(ii) Calculate the focal length f_2 of the lens using the equation $f_2 = \dfrac{u_2 v_2}{(u_2 + v_2)}$.

f_2 = ... [2]

(c) Calculate the average value of the focal length f of the lens, using the two results from parts **(a)** and **(b)**. Give your answer to a suitable number of significant figures for this experiment.

f = ... [2]

(d) The student states that taking more measurements improves the reliability of the value obtained for *f*.

Suggest additional values for *u* that you would use.

....

....

....[2]

(e) State **two** precautions that should be taken in this experiment to obtain accurate readings.

1. ....

....

2. ....

....
[2]

[Total: 11]

4 A student is investigating whether the distance that a toy truck will travel along a horizontal floor, before stopping, depends on its mass.

The following apparatus is available to the student:

a ramp
blocks to support the ramp as shown in Fig. 4.1
toy truck
a selection of masses
other standard apparatus from the physics laboratory.

Plan an experiment to investigate whether the distance that the toy truck will travel along a horizontal floor, before stopping, depends on its mass.

You are **not** required to carry out this investigation.

In your plan, you should:

- explain briefly how you would carry out the investigation
- state any apparatus that you would use that is not included in the list above
- state the key variables that you would control
- draw a table, or tables, with column headings to show how you would display your readings (you are **not** required to enter any readings in the table).

You may add to the diagram in Fig. 4.1 to help your description.

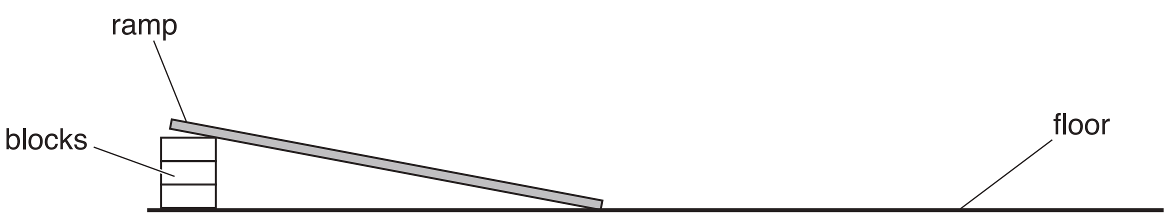


Fig. 4.1

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....[7]

[Total: 7]

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Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

6034350790

PHYSICS **0625/53**

Paper 5 Practical Test **May/June 2018**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
3	
4	
Total	

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **10** printed pages and **2** blank pages.

DC (ST/JG) 150761/5

CAMBRIDGE International Examinations

1 In this experiment, you will investigate how partly covering the surface of the water in a beaker affects the rate at which the water cools.

Carry out the following instructions, referring to Fig. 1.1.

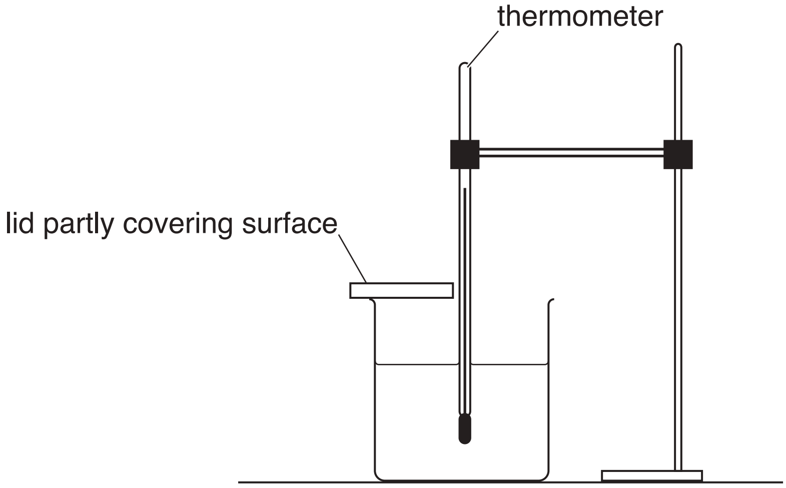

Fig. 1.1

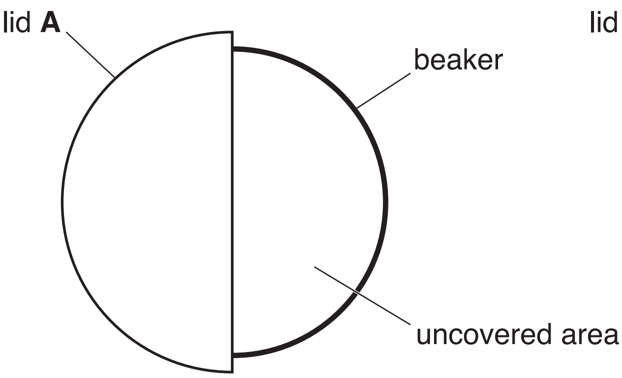

Fig. 1.2

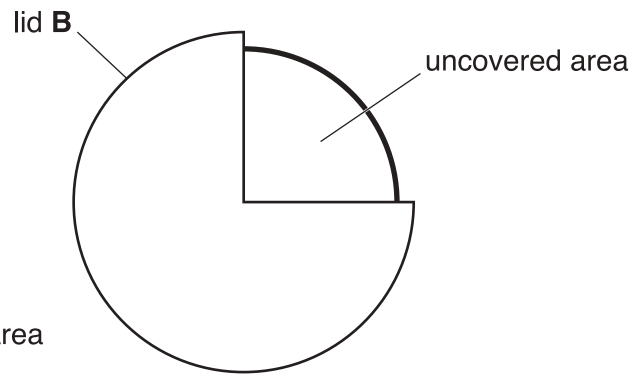

Fig. 1.3

(a)
- Pour 100 cm^3 of hot water into the beaker and cover half of it with lid **A** as shown in Fig. 1.2. This leaves 50 % of the water surface uncovered.
- Place the thermometer into the hot water and record, in the first row of Table 1.1, the temperature θ of the water at time $t = 0$. Immediately start the stopclock.
- Record, in the table, the temperature θ of the water at times t = 30 s, 60 s, 90 s, 120 s, 150 s and 180 s.
- Pour the water out of the beaker.

[1]

(b) **(i)** Repeat **(a)**, using lid **B** instead of lid **A** to cover more of the beaker as shown in Fig. 1.3. This leaves only 25% of the water surface uncovered. [1]

(ii) Complete the headings and the time *t* column in the table. [2]

Table 1.1

	beaker with lid **A**	beaker with lid **B**
t /	θ /	θ /
0		

(c) **(i)** Write a conclusion to this experiment, stating for which lid the cooling rate is greater. Explain your answer by reference to your results.

....

....

....

....[2]

(ii) Suggest a change to the **apparatus** that could produce a greater difference between the rates of cooling for lid **A** and lid **B**.
Explain why the change might produce a greater difference.

change ....

....

explanation ....

....
[2]

(d) A student thinks that the cooling rate is directly proportional to the percentage of the surface area uncovered. He wants to draw a graph of cooling rate against the percentage of uncovered area to investigate this.

Describe how his graph line will show whether the cooling rate and the percentage of surface area uncovered are directly proportional.

....

....[2]

(e) Students in other countries are carrying out the same experiment.

Suggest a factor that they should keep the same if they are to obtain similar readings.

....

....[1]

[Total: 11]

2 In this experiment, you will investigate a circuit containing resistors.

The circuit has been set up for you.
The fixed resistor must remain connected throughout the experiment.
Resistor **X** has a resistance $R = 1\,\Omega$.

Carry out the following instructions, referring to Fig. 2.1.

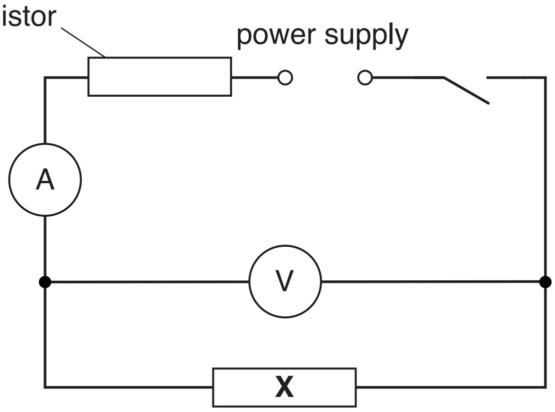

Fig. 2.1

(a) • Switch on.
Measure, and record in Table 2.1, the value of the current I in the circuit and the value of the potential difference V across resistor **X**.
Switch off.

• Replace resistor **X** with resistor **Y** of value $R = 3\,\Omega$.
Repeat the above procedure.

• Replace resistor **Y** with resistor **Z** of value $R = 10\,\Omega$.
Repeat the above procedure.

[3]

Table 2.1

Resistor	R/Ω	$I/$	$V/$
X	1		
Y	3		
Z	10		

(b) Add appropriate units to the column headings in the table. [1]

(c) Calculate the power P supplied to each of the resistors **X**, **Y** and **Z**.
Use your readings from **(a)** and the equation $P = I \times V$.
Give your answers to a suitable number of significant figures.

Power P supplied to resistor **X** = ... W

Power P supplied to resistor **Y** = ... W

Power P supplied to resistor **Z** = ... W
[3]

(d) Describe how the value of the power P changes as R increases.

....

....

....[2]

(e) A student wishes to investigate the relationship between P and R in more detail.
Suggest **two** modifications to the procedure that will enable him to do this.

1. ....

....

2. ....

....
[2]

[Total: 11]

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3 In this experiment, you will investigate the image produced by a converging lens.

Carry out the following instructions, referring to Fig. 3.1.

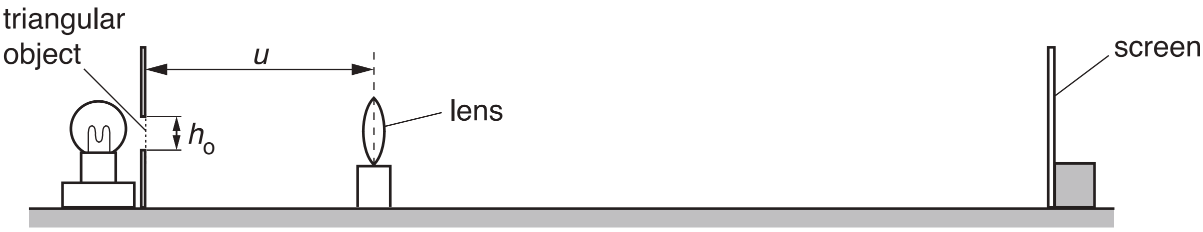

Fig. 3.1

(a)
- Measure and record the height h_o of the triangular object.

h_o = ... cm

- Switch on the lamp.
- Set the distance between the triangular object and the lens, u, to 30.0 cm. Move the screen until a clear focused image of the triangular object is seen. Measure, and record in Table 3.1, the height h_I of the image.
- Repeat the procedure for u values of 35.0 cm, 40.0 cm, 45.0 cm and 50.0 cm.
- Switch off the lamp.

Table 3.1

u/cm	h_I/cm	N
30.0		
35.0		
40.0		
45.0		
50.0		

[2]

(b) For each distance u, calculate, and record in the table, a value N using your results from **(a)** and the equation $N = \frac{h_o}{h_I}$. [1]

(c) Plot a graph of u/cm (y-axis) against N (x-axis). You do not need to start your axes at the origin (0,0).

[4]

(d) Determine the gradient G of the graph.
Show clearly on the graph how you obtained the necessary information.

G = ...[2]

(e) Describe **one** difficulty that might be experienced when measuring the height of the image h_I.
Suggest an improvement to the apparatus to overcome this difficulty.

difficulty ....

....

improvement ....

....
[2]

[Total: 11]

4 A student is investigating the force needed to **just** slide a block across a surface.

Plan an experiment which will enable him to investigate how the force needed varies with the mass of the block.

The apparatus available includes:

a light, flat wooden block fitted with a hook as shown in Fig. 4.1

a pulley which can be clamped to a bench.

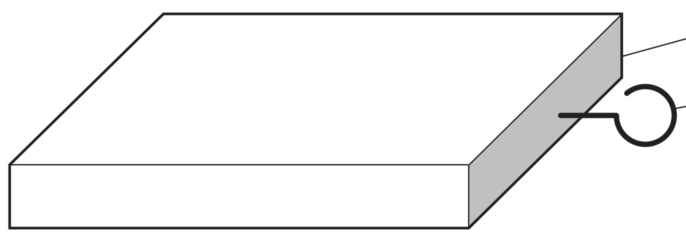

Fig. 4.1

In your plan, you should:

- list any additional apparatus needed
- draw a clearly labelled diagram of how the apparatus will be arranged
- give brief instructions for carrying out the experiment
- describe any precautions which should be taken to ensure reliable results
- suggest a graph which could be drawn.

You are **not** required to carry out the experiment.

....[7]

[Total: 7]

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Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

PHYSICS **0625/61**

Paper 6 Alternative to Practical **May/June 2018**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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DC (SC/CGW) 150894/5

CAMBRIDGE International Examinations

[Turn over

1 A student is determining the acceleration of free fall g using a pendulum. Fig. 1.1 shows the pendulum. Fig. 1.2 shows one complete oscillation of the pendulum.

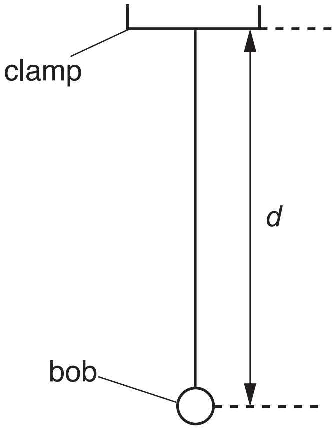

Fig. 1.1

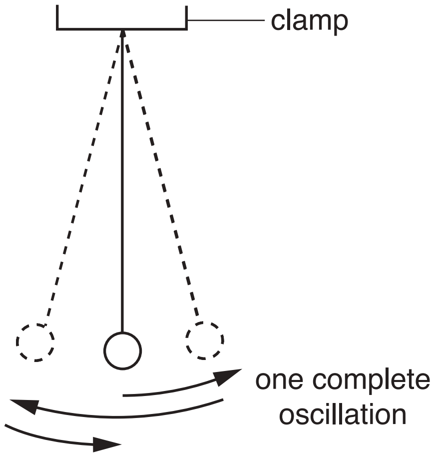

Fig. 1.2

(a) On Fig. 1.1, measure the distance d.

d = ... cm [1]

(b) Fig. 1.1 is drawn $1/10^{th}$ actual size.

(i) Calculate the actual distance D from the bottom of the clamp to the centre of the bob.

D = ... cm [1]

The student displaces the bob slightly and releases it so that it swings. He measures the time t for 10 complete oscillations. The time t is shown on the stopwatch in Fig. 1.3.

Fig. 1.3

(ii) Write down the time t shown in Fig. 1.3.

t = ... [1]

(iii) Calculate the period T of the pendulum. The period is the time for one complete oscillation.

T = ... [1]

(iv) Calculate T^2.

T^2 = ... [1]

(v) Calculate the acceleration of free fall g using the equation $g = \frac{20}{T^2}$.

g = ... [1]

(c) The student adjusts the pendulum until the distance D measured to the centre of the bob is 100.0 cm.

He repeats the procedure and obtains another value of T^2.

T^2 = ...3.94..........................

(i) On the dotted line above, write the unit for T^2. [1]

(ii) Calculate the acceleration of free fall g using the equation $g = \frac{40}{T^2}$ and the value of T^2 from **(c)**. Give your answer to a suitable number of significant figures for this experiment.

g = ... [1]

(d) Another student states that repeating the experiment improves the reliability of the value obtained for g.

Suggest **two** changes that you would make to improve the reliability. The stopwatch cannot be changed.

1. ....

....

2. ....

....
[2]

(e) State **one** precaution that you would take in this experiment in order to obtain accurate readings.

....

.... [1]

[Total: 11]

2 A student is investigating resistance.

She uses the circuit shown in Fig. 2.1.

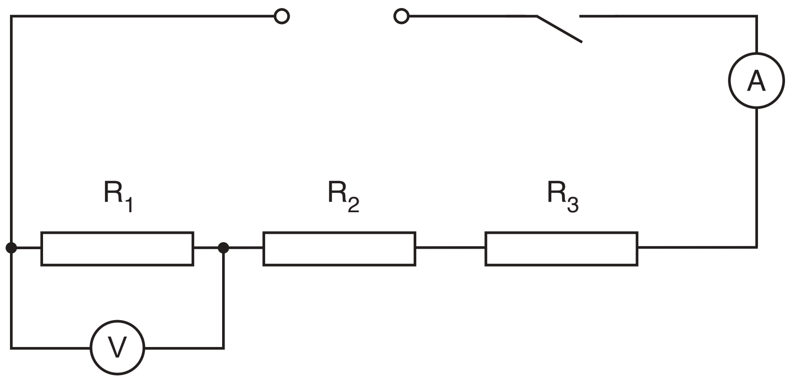

Fig. 2.1

(a) She measures the potential difference V_1 across the resistor R_1 and the current I in the circuit.

Figs. 2.2 and 2.3 show the voltmeter and ammeter readings.

(i) Write down the readings shown on the meters in Figs. 2.2 and 2.3.

V_1 = ...

I = ... [2]

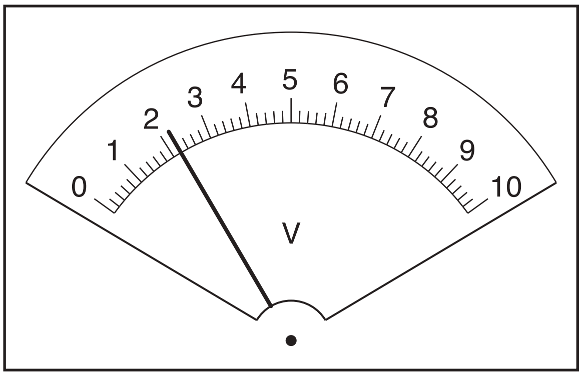

Fig. 2.2

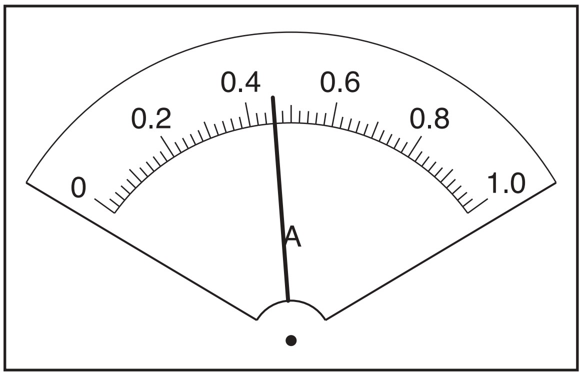

Fig. 2.3

(ii) Calculate the resistance of the resistor R_1 using the equation $R_1 = \frac{V_1}{I}$.

R_1 = ... [1]

(b) The student measures the potential difference across each resistor in turn. She calculates values for the resistance R_2 and R_3 of the resistor R_2 and of the resistor R_3. She records her values as:

R_2 = ...4.75 Ω..............

R_3 = ...4.81 Ω..............

State whether the results suggest that the three resistors have the same value of resistance. Justify your statement by reference to the results.

statement ....

justification ....

....

....
[2]

(c) Calculate the combined resistance R of resistors R_1, R_2 and R_3 connected in series, using the equation $R = R_1 + R_2 + R_3$. Give your answer to a suitable number of significant figures for this experiment.

R = ... [2]

(d) The student checks her result by connecting the voltmeter across all three resistors connected in series. Tick the potential difference reading you would expect to be closest to the reading she obtains.

☐ $\frac{V_1}{3}$

☐ V_1

☐ $3V_1$

[1]

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(e) Complete the circuit diagram in Fig. 2.4 to show

- the three resistors connected in parallel
- the voltmeter connected to measure the potential difference across the resistors
- a variable resistor connected to control the current in all three resistors.

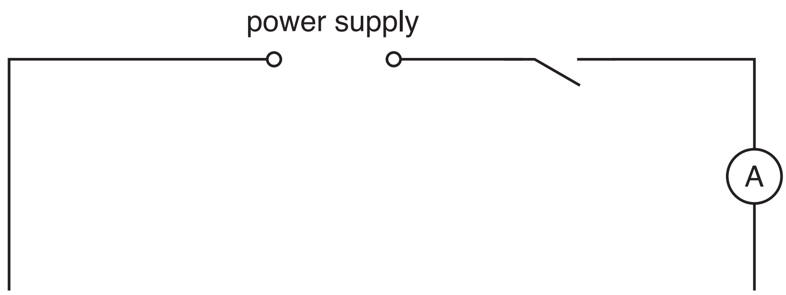

Fig. 2.4

[3]

[Total: 11]

Question 3 starts on the next page.

3 A student is determining the focal length f of a lens.

Fig. 3.1 shows the apparatus.

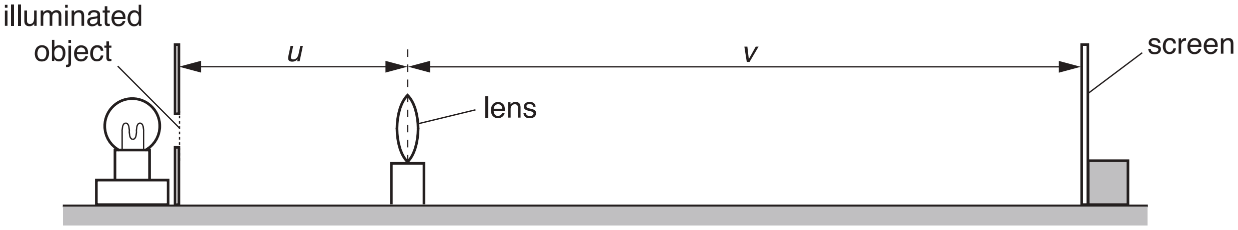

Fig. 3.1

(a) The student places the screen a distance D = 70.0 cm from the illuminated object.

He places the lens close to the screen and moves the lens slowly away from the screen until a clearly focused image is formed on the screen.

He measures the distance u between the centre of the lens and the illuminated object.

He measures the distance v between the centre of the lens and the screen.

He repeats the procedure using values for D of 75.0 cm, 80.0 cm, 85.0 cm and 90.0 cm.

The readings are shown in Table 3.1.

Calculate, and record in Table 3.1, uv for each value of D.

Table 3.1

D/cm	u/cm	v/cm	uv/cm^2
70.0	22.0	48.4	
75.0	20.7	54.5	
80.0	20.0	60.0	
85.0	19.5	65.8	
90.0	19.0	71.2	

[1]

(b) Plot a graph of uv/cm^2 (y-axis) against D/cm (x-axis). You do **not** need to start your axes at the origin (0,0).

[4]

(c) Determine the gradient G of the line. Show clearly on the graph how you obtained the necessary information.

G = ... [2]

(d) The focal length f of the lens is numerically equal to the gradient G of the graph. Write down a value for the focal length f of the lens. Give your answer to a suitable number of significant figures for this experiment.

f = ... [2]

(e) Suggest **two** difficulties in this experiment when trying to obtain accurate readings.

1. ....

....

2. ....

....

[2]

[Total: 11]

4 A student is investigating the effect of double-walled insulation on the rate of cooling of hot water in a copper container. The student places the copper container inside a larger metal container. He is investigating the effect of the size of the air gap between the copper container and larger metal containers.

Plan an experiment to investigate the effect of the size of the air gap between the copper container and larger metal containers on the rate of cooling of hot water.

The following apparatus is available:

a copper container
a number of metal containers of different diameters (all larger than the copper container)
a thermometer
a stopwatch
a measuring cylinder
a supply of hot water.

You can also use other apparatus and materials that are usually available in a school laboratory.

In your plan, you should:

- explain briefly how you would carry out the investigation
- state the key variables that you would control
- draw a table, or tables, with column headings, to show how you would display your readings (you are not required to enter any readings in the table)
- explain how you would use your readings to reach a conclusion.

You may draw a diagram if it helps your explanation.

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....[7]

[Total: 7]

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Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

4322915781

PHYSICS **0625/62**

Paper 6 Alternative to Practical **May/June 2018**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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DC (SC/CGW) 150895/6

CAMBRIDGE International Examinations

1 A student is determining the density of water. She is provided with a plastic cup, shown in Fig. 1.1.

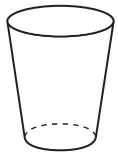

Fig. 1.1

(a) She draws around the base of the cup. Her drawing is shown in Fig. 1.2.

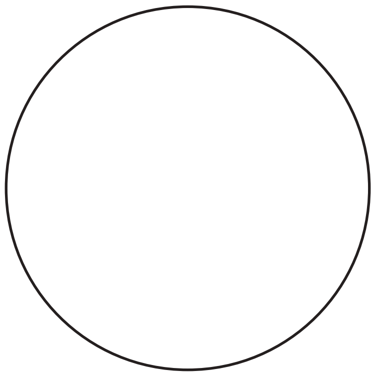

Fig. 1.2

(i) From Fig. 1.2, take and record measurements to determine an accurate value for the diameter D_B of the base of the cup.

D_B = ... cm [2]

(ii) The student places the cup upside down and draws around the rim of the cup.
She determines the diameter D_T of the rim of the cup.

D_T = ...7.2 cm..............................

Calculate the average diameter D of the cup using the equation $D = \frac{D_B + D_T}{2}$.

D = ... cm [1]

(b) **1.** On Fig. 1.3, measure the vertical height *h* of the cup.

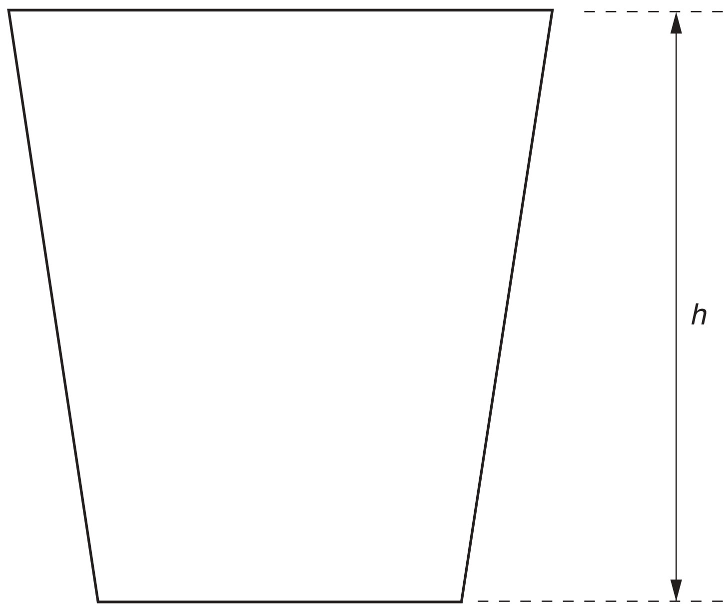

Fig. 1.3

h = ... cm

2. Calculate the volume V of the cup using the equation $V = 0.785\,D^2 h$.

V = ... cm^3
[1]

(c) The student fills the cup with water. The mass of the cup with the water is shown in Fig. 1.4.

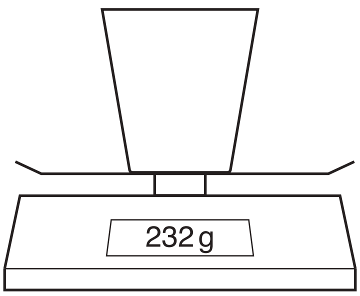

Fig. 1.4

Determine the density ρ of water using the equation $\rho = \dfrac{m}{V}$ and your value from **(b)2**.

Give your answer to a suitable number of significant figures for this experiment. Include the unit.

ρ = ... [3]

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(d) Suggest, with a reason, a part of the procedure **(a)**, **(b)** or **(c)** that could give an unreliable result for the density of water.

part ....

reason ....

.... [1]

(e) The student pours the water from the cup into a measuring cylinder.

Draw a diagram to show water in a measuring cylinder. Show clearly the meniscus and the line of sight the student should use to obtain an accurate value for the volume of the water.

[2]

[Total: 10]

2 A student is investigating the cooling of water.

Fig. 2.1 shows the apparatus used.

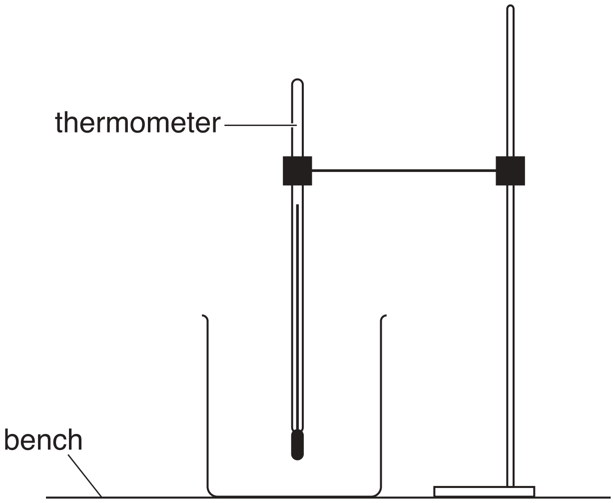


Fig. 2.1

(a) The thermometer in Fig. 2.2 shows room temperature θ_R at the beginning of the experiment. Record θ_R.

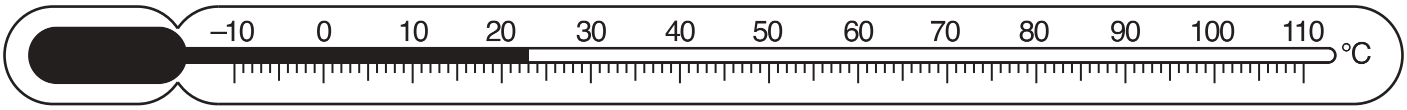


Fig. 2.2

θ_R = ... [1]

(b) The student pours 200 cm^3 of hot water into the beaker.

He records the temperature θ_H of the hot water at time t = 0 and immediately starts a stopclock.

He continues recording the temperature readings every 30 s. The readings are shown in Table 2.1.

(i) Explain why the student should wait a few seconds after placing the thermometer in the hot water before taking the first temperature reading.

....

.... [1]

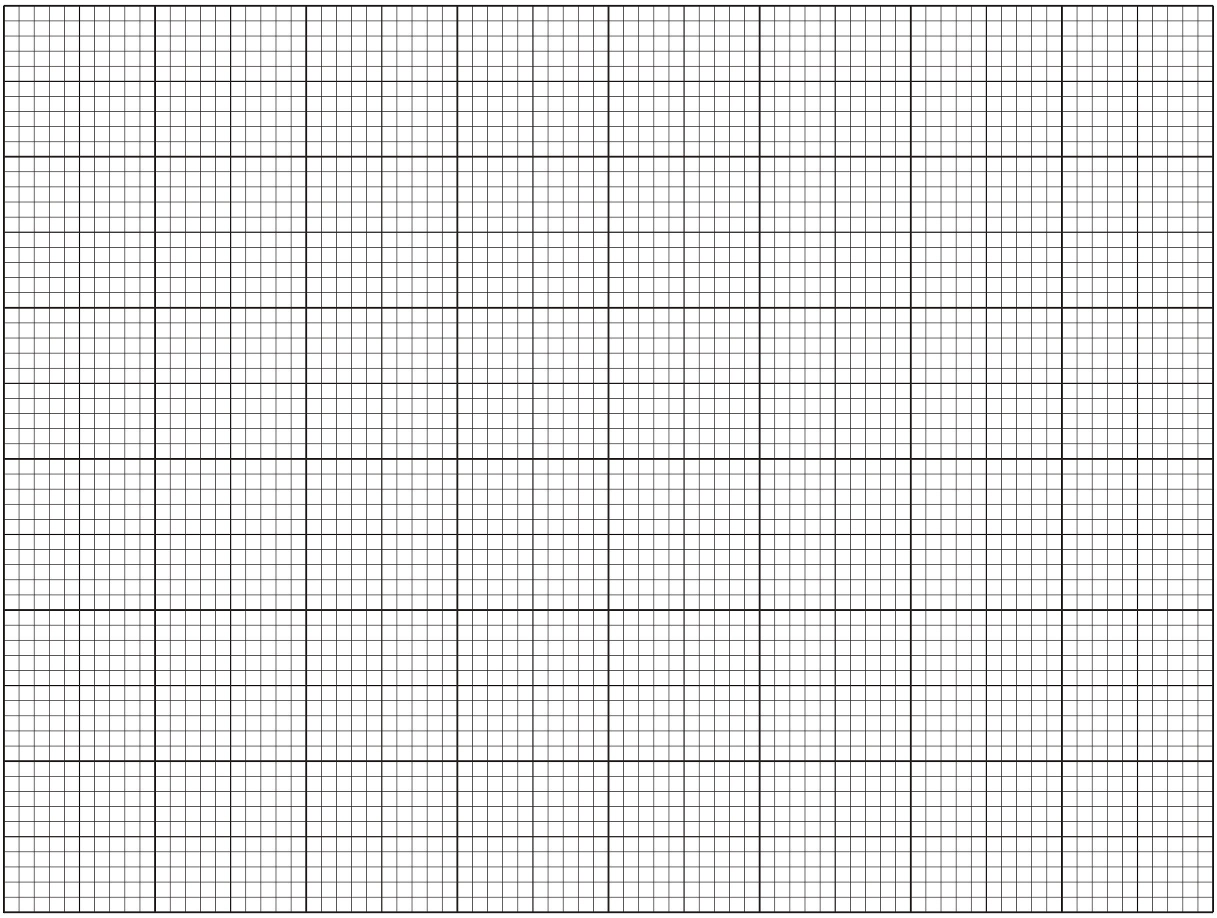
(ii) Complete the column headings in Table 2.1. [1]

(iii) Complete the time column in Table 2.1. [1]

Table 2.1

t /	θ /
0	70
	60
	52
	49
	46
	43

(iv) Plot a graph of θ/°C (y-axis) against t/s (x-axis). You do **not** need to start the y-axis at the origin (0,0) but the value of room temperature θ_R must be marked on the y-axis.



[4]

(c) Draw a horizontal line across the graph grid to indicate the value of room temperature θ_R, as shown by the thermometer in Fig. 2.2. [1]

(d) State **two** precautions that you would take in order to obtain accurate readings in this experiment.

1. ....

....

2. ....

....
[2]

(e) A student plans to repeat the experiment using the same thermometer and the same volume of water.

Suggest **two** changes to the apparatus or the procedure that would **increase** the rate of cooling of the water.

1. ....

....

2. ....

....
[2]

[Total: 13]

3 A student is determining the focal length of a lens.

Fig. 3.1 shows the apparatus used.

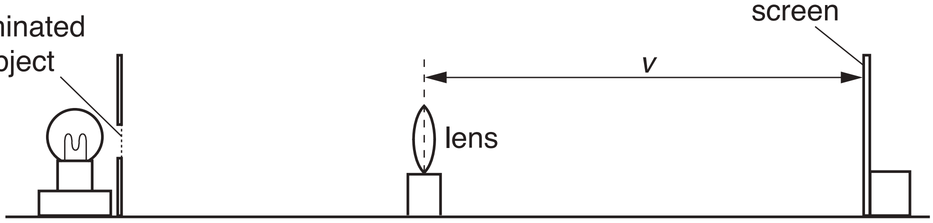


Fig. 3.1

(a) The student adjusts the position of the screen until a clearly focused image is formed on the screen.

(i) On Fig. 3.1, measure the distance v between the centre of the lens and the screen.

v = ... [1]

(ii) Fig. 3.1 is drawn 1/5th actual size.

Calculate V, the actual distance from the lens to the screen

V = ... [1]

(iii) With a clearly focused image formed on the screen, the actual distance from the centre of the lens to the illuminated object, U is 20.0 cm.

Calculate the focal length f_1 of the lens using the equation $f_1 = \dfrac{UV}{(U + V)}$.

f_1 = ... [2]

(b) The student repeats the procedure in **(a)**, using a different distance U. She obtains another value for the focal length f_2.

f_2 = ...12.2 cm..........................

Calculate the average value f_A of the focal length of the lens, using f_2 and your value for f_1 in **(a)(iii)**. Give your answer to a suitable number of significant figures for this experiment.

f_A = ... [2]

(c) The student states that taking more measurements improves the reliability of the value obtained for f_A.

Suggest additional values for U that you would use.

....

....

.... [2]

(d) State **two** precautions that you would take in this experiment to obtain accurate readings.

1. ....

....

2. ....

....
[2]

[Total: 10]

4 A student is investigating whether the distance that a toy truck will travel along a horizontal floor, before stopping, depends on its mass.

The following apparatus is available to the student:

a ramp
blocks to support the ramp as shown in Fig. 4.1
toy truck
a selection of masses
other standard apparatus from the physics laboratory.

Plan an experiment to investigate whether the distance that the toy truck will travel along a horizontal floor, before stopping, depends on its mass.

In your plan, you should:

- explain briefly how you would carry out the investigation
- state any apparatus that you would use that is not included in the list above
- state the key variables that you would control
- draw a table, or tables, with column headings to show how you would display your readings (you are **not** required to enter any readings in the table).

You may add to the diagram in Fig. 4.1 to help your description.

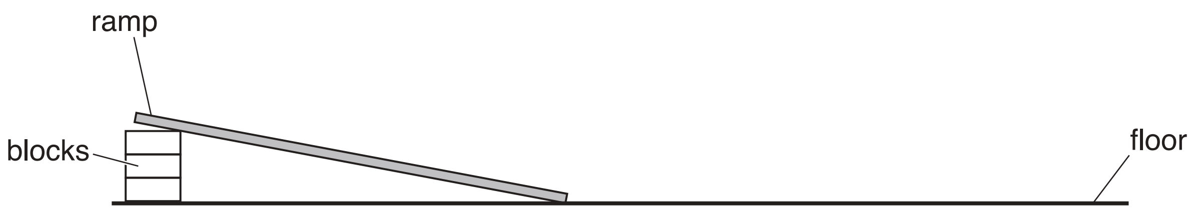


Fig. 4.1

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....[7]

[Total: 7]

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Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME		
CENTRE NUMBER		CANDIDATE NUMBER

6072737399

PHYSICS **0625/63**

Paper 6 Alternative to Practical **May/June 2018**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **11** printed pages and **1** blank page.

DC (SC/CGW) 150896/6

CAMBRIDGE
International Examinations

[Turn over

1 A student is investigating how partly covering the surface of the water in a beaker affects the rate at which the water cools.

The apparatus used is shown in Fig. 1.1.

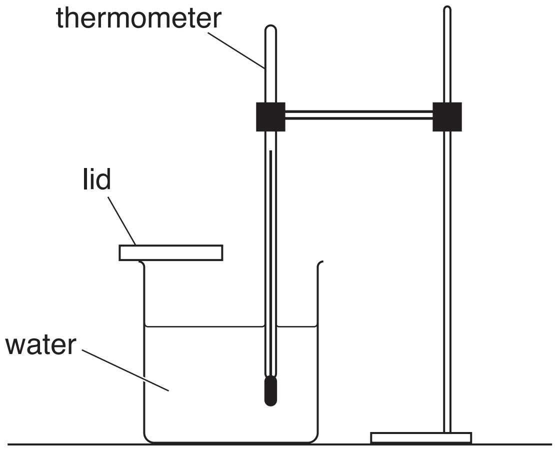

Fig. 1.1

(a)

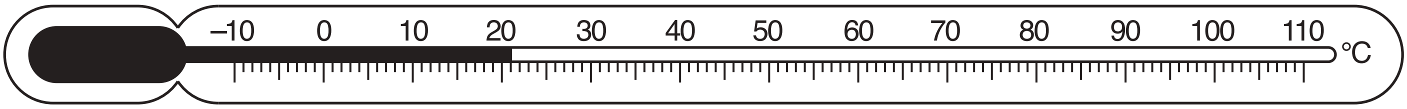

Fig. 1.2

Record the room temperature θ_R, shown on the thermometer in Fig. 1.2.

θ_R = ... [1]

(b) The student pours 100 cm^3 of hot water into a beaker. She places lid **A** on the beaker. This leaves half of the water surface uncovered, as shown in Fig. 1.3.
She records the temperature of the water in the beaker and immediately starts a stopclock.
She records the temperature θ of the water every 30 s. Her readings are shown in Table 1.1.
She repeats the procedure using lid **B**. This leaves a quarter of the water surface uncovered, as shown in Fig. 1.4.

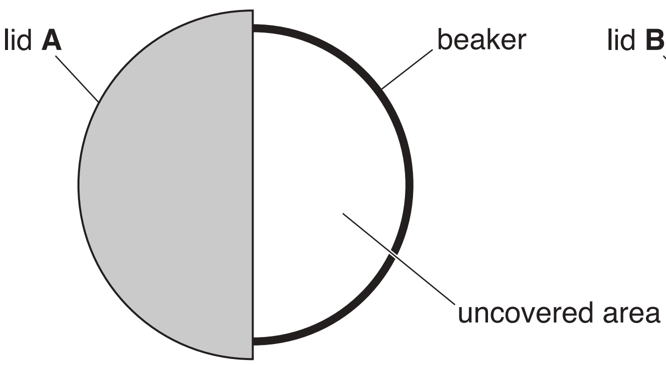

Fig. 1.3

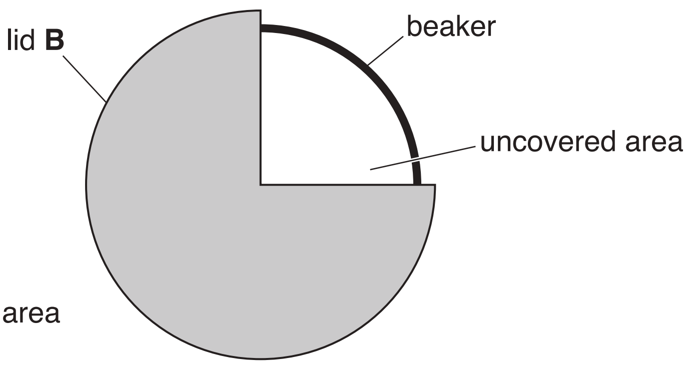

Fig. 1.4

Complete the headings and the time t column in Table 1.1. [2]

Table 1.1

	beaker with lid **A**	beaker with lid **B**
t /	θ /	θ /
0	80.0	81.0
	77.0	79.0
	74.5	77.5
	72.5	76.0
	70.5	75.0
	69.0	74.0
	68.0	73.5

(c) Describe a precaution that should be taken to ensure that the temperature readings are as accurate as possible in the experiment.

....

.... [1]

(d) **(i)** Write a conclusion to this experiment, stating for which lid the rate of cooling is greater. Explain your answer by reference to the results.

....

....

....

.... [2]

(ii) Suggest a change to the **apparatus** that could produce a greater difference between the rates of cooling for lid **A** and lid **B**.

Explain why the change might produce a greater difference.

change ....

....

explanation ....

....

[2]

(e) A student suggests that the rate of cooling is directly proportional to the percentage of the uncovered surface area. He wants to draw a graph of cooling rate against the percentage of uncovered area to investigate this.

Describe how his graph line will show whether the rate of cooling and the percentage of uncovered surface area are directly proportional.

....

.... [2]

(f) Students in other countries carry out the same experiment.

Suggest **one** factor that they should keep the same if they are to obtain similar readings.

....

.... [1]

[Total: 11]

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2 A student is investigating a circuit containing resistors.

He is using the circuit shown in Fig. 2.1.
Resistor **X** has a resistance $R = 1\,\Omega$.

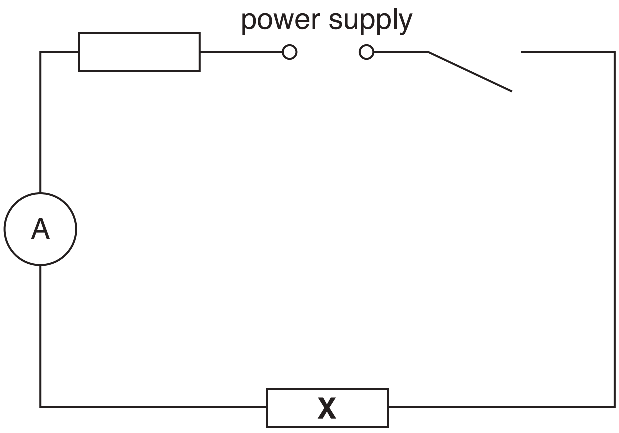

Fig. 2.1

(a) On Fig. 2.1, draw a voltmeter connected so that it measures the potential difference (p.d.) across resistor **X**. [1]

(b) The student uses the ammeter to measure the current in the circuit and uses the voltmeter to measure the potential difference (p.d.) across resistor **X**. The readings are shown in Fig. 2.2 and Fig. 2.3.

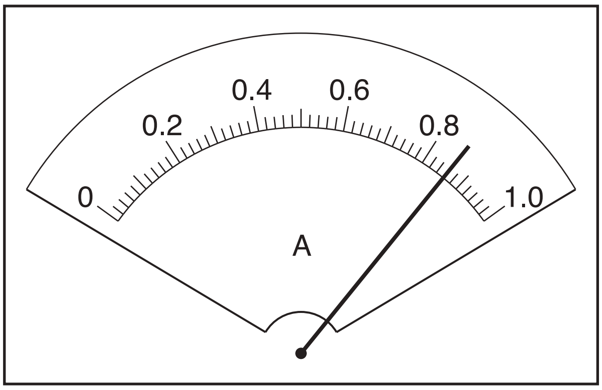

Fig. 2.2

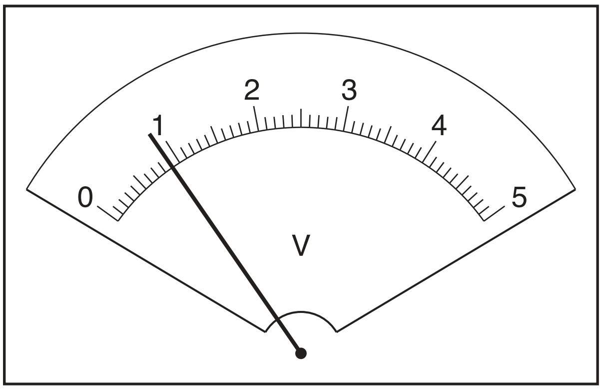

Fig. 2.3

(i) The student repeats the procedure using resistors **Y** and **Z**.
His readings are shown in Table 2.1.

Record, in Table 2.1, the value of the current I in the circuit and the value of the potential difference (p.d.) V across resistor **X** shown in Fig. 2.2 and Fig. 2.3.

Table 2.1

resistor	R /	I /	V /
X	1		
Y	3	0.55	1.7
Z	10	0.24	2.4

[2]

(ii) Add units to the column headings in Table 2.1. [2]

(c) Calculate the power P supplied to each of the resistors **X**, **Y** and **Z**.

Use the readings from Table 2.1 and the equation $P = I \times V$.
Give your answers to a suitable number of significant figures.

power P supplied to resistor **X** = ... W

power P supplied to resistor **Y** = ... W

power P supplied to resistor **Z** = ... W
[2]

(d) Describe how the value of the power P changes as R increases.

....

....

.... [2]

(e) Another student plans to investigate the relationship between P and R in more detail.
Suggest **two** modifications to the procedure that will enable her to do this.

1. ....

....

2. ....

....
[2]

[Total: 11]

3 A student is investigating the image produced by a converging lens.

She is using the apparatus shown in Fig. 3.1.

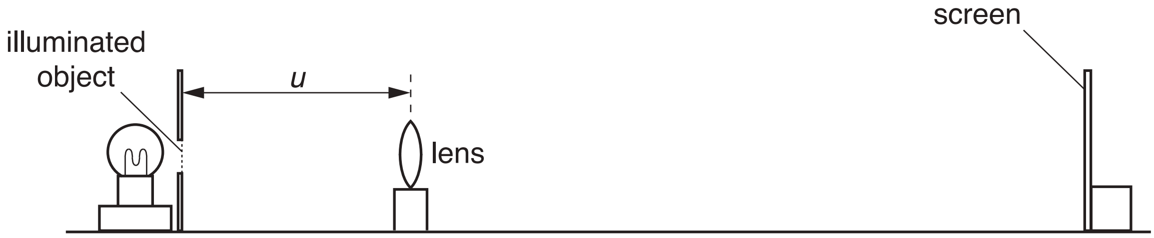

Fig. 3.1

(a) The illuminated object consists of a triangular-shaped hole in a piece of card. Fig. 3.2 shows, full size, the illuminated object. Measure and record the height h_o of the triangular-shaped hole.

h_o = ... cm [1]

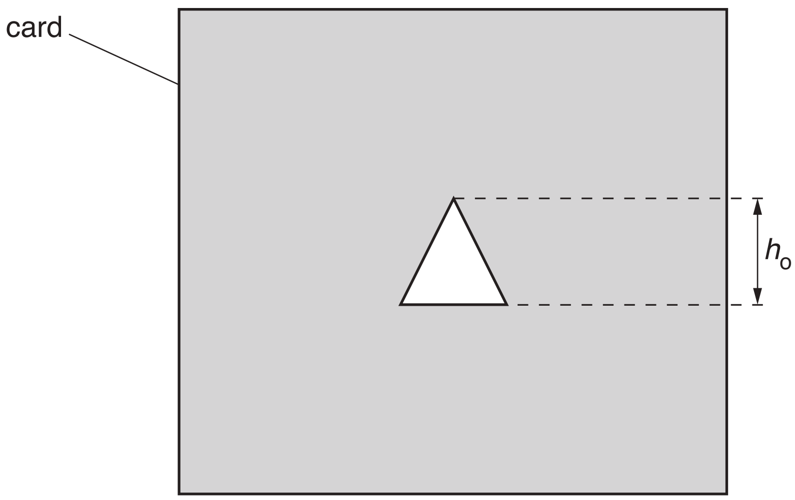

Fig. 3.2

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(b) The distance u between the triangular object and the centre of the lens is set to 20.0 cm. The screen is moved until a focused image of the illuminated object is seen, as shown in Fig. 3.3.

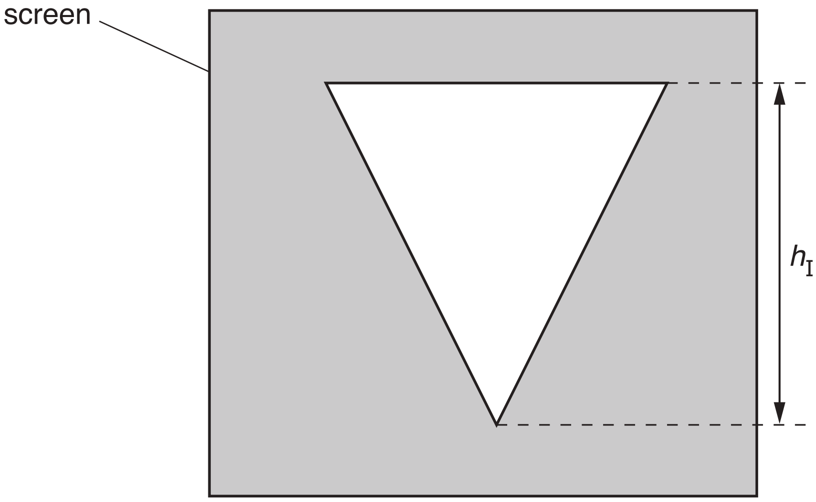


Fig. 3.3

The student repeats the procedure for u values of 30.0 cm, 40.0 cm, 50.0 cm and 60.0 cm. Her results are shown in Table 3.1.

(i) Measure and record in the first row of Table 3.1, the height h_I of the image. [1]

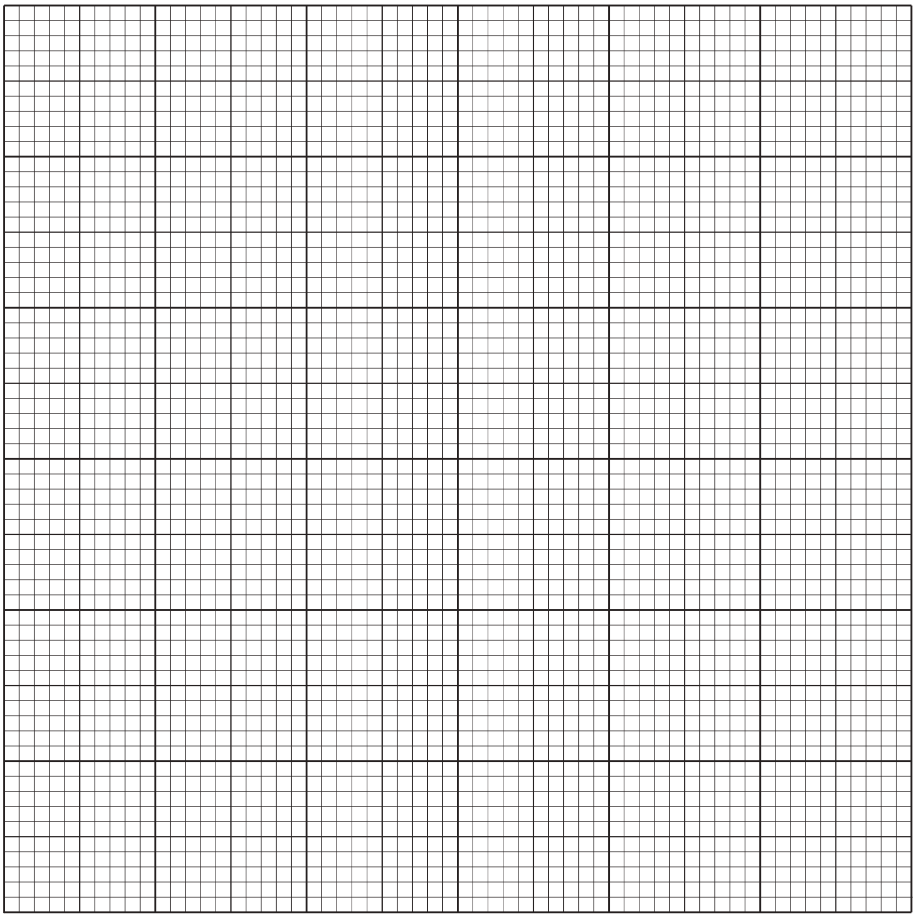
(ii) Calculate, and record in the table, a value N using your measurements for h_o and h_I and the equation $N = \frac{h_o}{h_I}$.

Table 3.1

u/cm	h_I/cm	N
20.0		
30.0	1.5	0.93
40.0	0.9	1.6
50.0	0.6	2.3
60.0	0.5	2.8

[1]

(c) Plot a graph of u/cm (y-axis) against N (x-axis). You do not have to start your graph at the origin (0, 0).



[4]

(d) Determine the gradient G of the graph.
Show clearly on the graph how you obtained the necessary information.

G = ... [2]

(e) Describe **one** difficulty that might be experienced when measuring the height of the image h_I. Suggest an improvement to the apparatus to overcome this difficulty.

difficulty ....

....

improvement ....

....
[2]

[Total: 11]

4 A student is investigating the force needed to **just** slide a block across a surface.

Plan an experiment that will enable him to investigate how the force needed varies with the mass of the block.

The apparatus available includes:

a light, flat wooden block with a hook fitted as shown in Fig. 4.1

a pulley which can be clamped to a bench.

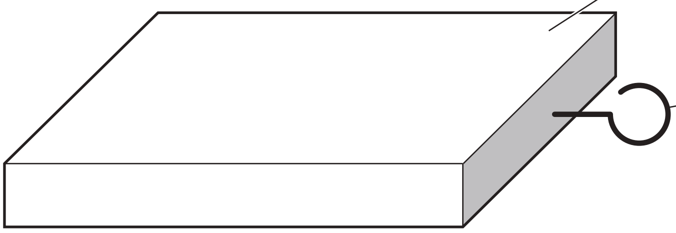


Fig. 4.1

In your plan, you should:

- list any additional apparatus needed
- draw a clearly labelled diagram of how the apparatus will be arranged
- give brief instructions for carrying out the experiment
- describe any precautions which should be taken to ensure reliable results
- suggest a graph which could be drawn.

....

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.... [7]

[Total: 7]

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/52**

Paper 5 Practical Test **February/March 2019**

CONFIDENTIAL INSTRUCTIONS

* 8 4 4 2 6 7 3 7 4 7 *

This document gives details of how to prepare for and administer the practical exam.

The information in this document and the identity of any materials supplied by Cambridge International are confidential and must NOT reach candidates either directly or indirectly.

The supervisor must complete the report at the end of this document and return it with the scripts.

If you have any queries regarding these confidential instructions, contact Cambridge International stating the centre number, the syllabus and component number and the nature of the query.

email info@cambridgeinternational.org
phone +44 1223 553554
fax +44 1223 553558

This document consists of **8** printed pages.

DC (KN) 168082/3

Cambridge Assessment International Education

General information about practical exams

Centres must follow the guidance on science practical exams given in the *Cambridge Handbook*.

Safety

Supervisors must follow national and local regulations relating to safety and first aid.

Only those procedures described in the question paper should be attempted.

Supervisors must inform candidates that materials and apparatus used in the exam should be treated with caution. Suitable eye protection should be used where necessary.

Before the exam

- The packets containing the question papers must **not** be opened before the exam.
- It is assumed that standard school laboratory facilities, as indicated in the *Guide to Planning Practical Science*, will be available.
- Spare materials and apparatus for the tasks set must be available for candidates, if required.

During the exam

- It must be made clear to candidates at the start of the exam that they may request spare materials and apparatus for the tasks set.
- Where specified, the supervisor **must** perform the experiments and record the results as instructed. This must be done **out of sight** of the candidates, using the same materials and apparatus as the candidates.
- Any assistance provided to candidates must be recorded in the supervisor's report.
- If any materials or apparatus need to be replaced, for example, in the event of breakage or loss, this must be recorded in the supervisor's report.

After the exam

- The supervisor must complete a report for each practical session held and each laboratory used.
- Each packet of scripts returned to Cambridge International must contain the following items:
    - the scripts of the candidates specified on the bar code label provided
    - the supervisor's results relevant to these candidates
    - the supervisor's reports relevant to these candidates
    - seating plans for each practical session, referring to each candidate by candidate number
    - the attendance register.

Specific information for this practical exam

Question 1

Items to be supplied by the Centre (per set of apparatus unless otherwise specified).

(i) Sheet of plain A4 paper (*per candidate*) with a hole in one corner so that it can be tied into the Question Paper.

(ii) Plane mirror, mounted so that it is perpendicular to the bench.

(iii) Screen, capable of standing upright. See note 1.

(iv) Lamp, low voltage, 24 W or greater, with a suitable power supply. See note 2.

(v) Protractor. Candidates may use their own.

(vi) 30 cm ruler, graduated in mm. Candidates may use their own.

(vii) String or treasury tag (*per candidate*) to tie the ray-trace sheet, (as in **(i)**), into the Question Paper.

Notes

1. A sheet of stiff card or thin wood approximately 70 mm × 70 mm, fixed to a wooden support, is suitable. The screen must have a slit, a minimum of 35 mm long and 1 mm to 2 mm wide.

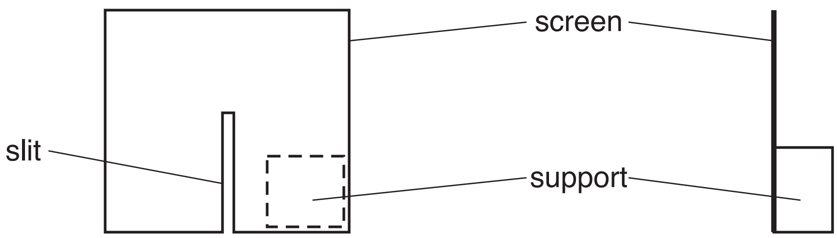

Fig. 1.1

2. The lamp, set behind the screen must be capable of projecting a ray of light at least 20 cm long, across the surface of the paper, before and after reflection by the upright plane mirror.

3. The apparatus should be situated so that the candidates can easily see the ray.

4. Spare sheets of paper, (as in **(i)**), must be available.

Action at changeover

Supply a sheet of plain A4 paper, (as in **(i)**), and string or treasury tag, (as in **(vii)**).
Check that the lamp is working.

Question 2

Items to be supplied by the Centre (per set of apparatus unless otherwise specified).

(i) Thermometer: –10 °C to 110 °C, graduated in 1 °C intervals. See note 1.

(ii) Clamp, boss and stand. See note 1.

(iii) Two 250 cm^3 beakers, labelled **A** and **B**. See notes 1 and 2.

(iv) Insulation material to cover the sides of beaker **A** as shown in Fig. 2.1.

(v) Lid for beaker **B** as shown in Fig. 2.1, with a hole for the thermometer. Rigid card or thin wood are suitable.

(vi) Measuring cylinder: 100 cm^3 or 250 cm^3.

(vii) Supply of hot water. See notes 3 and 4.

(viii) Stopclock or stopwatch or wall-mounted clock showing seconds. Candidates will be required to take readings at 30-second intervals. They may use their own wristwatches.
The question will refer to a stopclock.

(ix) Paper towels to soak up any water spills.

Notes

1. The thermometer, clamp, boss and stand are to be set up for candidates as shown in Fig. 2.1. The thermometer bulb must be well below the 100 cm^3 level of the beakers.
Candidates must be able easily and safely to read temperatures up to 90 °C and to move the thermometer in and out of the beakers.

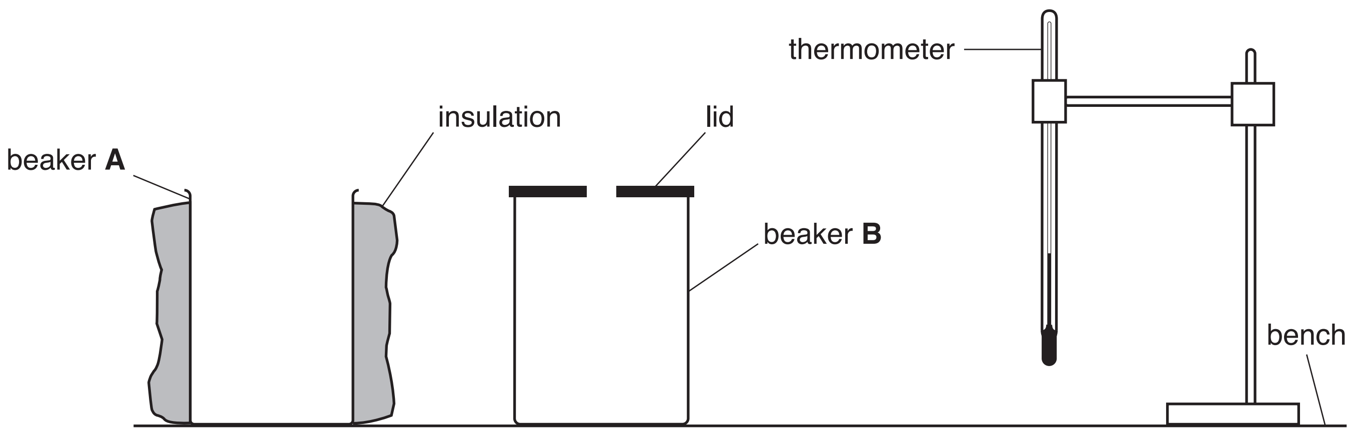

Fig. 2.1

2. The beakers are to be provided to candidates with the insulation and lid fitted as shown in Fig. 2.1.

3. Hot water is to be available for each candidate throughout the experiment. The hot water should be maintained at an approximately constant temperature between 80 °C and 90 °C. Each candidate will require about 300 cm^3 of hot water in total.
They must be able to pour hot water into the measuring cylinder and beakers safely.

4. Candidates must be warned of the dangers of burns or scalds when using hot water.

Action at Changeover

Empty the water from the beakers and measuring cylinder. Check that the apparatus is intact and is arranged as in Fig. 2.1.
Ensure that the insulation is dry and replace if necessary.

Question 3

Items to be supplied by the Centre (per set of apparatus unless otherwise specified)

(i) A resistance wire approximately 1 m in length, labelled **resistance wire**. 32 swg (0.274 mm diameter) constantan (Eureka) or any other wire with a resistance of approximately 8 Ω / m is suitable. See note 1.

(ii) Metre rule, graduated in mm. See note 1.

(iii) Crocodile clip.

(iv) Power supply of approximately 2 to 3 V. See note 3.
Where candidates are provided with a variable power supply, the voltage should be set by the Supervisor and fixed, e.g. taped.

(v) Switch. The switch may be an integral part of the power supply.

(vi) Sufficient connecting leads to set up the circuit shown in Fig. 3.1.

(vii) Ammeter capable of measuring currents up to 1.00 A with a minimum resolution of 0.05 A. See note 4.

(viii) Voltmeter capable of measuring up to 3.0 V with a minimum resolution of 0.1 V. See note 4.

(ix) Spare leads and crocodile clips.

Notes

1. The wire is to be fixed to the metre rule in such a way as to allow candidates to connect a crocodile clip to points between the 35 cm and 95 cm marks. Alternatively, a potentiometer fitted with an appropriate wire is suitable. Transparent tape must be used to tape over the wire between the 0.0 cm and 35.0 cm marks to prevent connection to this section.

2. The circuit is to be set up for candidates as shown in Fig. 3.1, with the crocodile clip not connected to the wire.

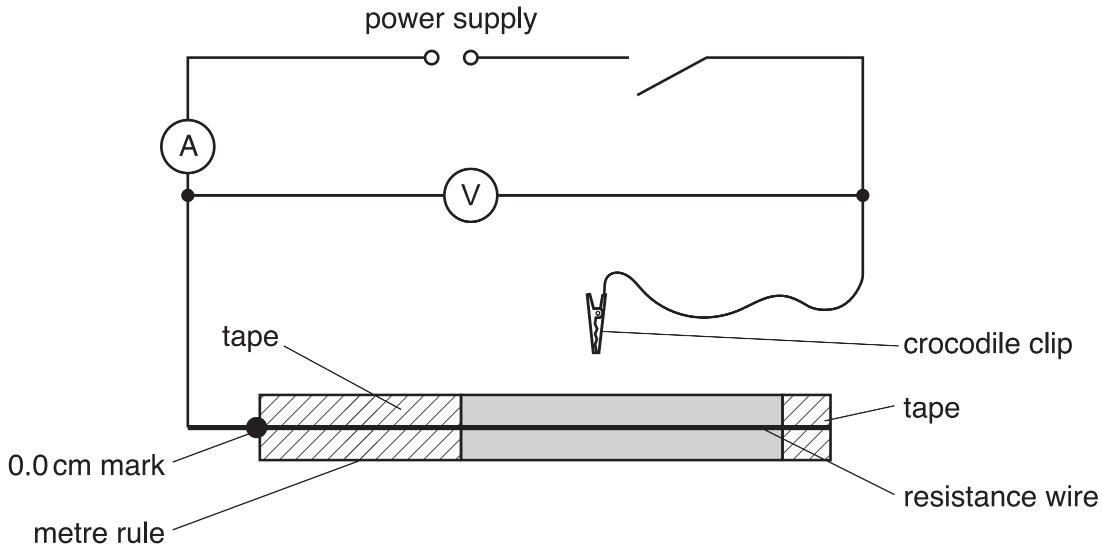

Fig. 3.1

3. If cells are used, they must remain adequately charged throughout the examination. Spare cells must be available.

4. Either analogue or digital meters are suitable. Any variable settings should be set by the Supervisor and fixed, e.g. taped. Spare meters must be available.

Action at changeover

Ensure that the circuit is connected as shown in Fig. 3.1. Check that the circuit is working.
Disconnect the crocodile clip from the resistance wire and ensure that the circuit is switched off.

Question 4

No apparatus is required for this question.

Supervisor's report

Syllabus and component number					/		

Centre number					

Centre name ....

Time of the practical session ....

Laboratory name/number ....

Give details of any difficulties experienced by the centre or by candidates (include the relevant candidate names and candidate numbers).

You must include:

- any difficulties experienced by the centre in the preparation of materials
- any difficulties experienced by candidates, e.g. due to faulty materials or apparatus
- any specific assistance given to candidates.

Declaration

1 Each packet that I am returning to Cambridge International contains the following items:

- ☐ the scripts of the candidates specified on the bar code label provided
- ☐ the supervisor's results relevant to these candidates
- ☐ the supervisor's reports relevant to these candidates
- ☐ seating plans for each practical session, referring to each candidate by candidate number
- ☐ the attendance register

2 Where the practical exam has taken place in more than one practical session, I have clearly labelled the supervisor's results, supervisor's reports and seating plans with the time and laboratory name/number for each practical session.

3 I have included details of difficulties relating to each practical session experienced by the centre or by candidates.

4 I have reported any other adverse circumstances affecting candidates, e.g. illness, bereavement or temporary injury, directly to Cambridge International on a *special consideration form*.

Signed .... (supervisor)

Name (in block capitals) ....

PHYSICS

Paper 0625/12
Multiple Choice (Core)

Question Number	*Key*	*Question Number*	*Key*
1	**B**	21	**B**
2	**C**	22	**C**
3	**C**	23	**A**
4	**A**	24	**C**
5	**B**	25	**C**
6	**D**	26	**A**
7	**A**	27	**C**
8	**C**	28	**D**
9	**D**	29	**B**
10	**B**	30	**A**
11	**D**	31	**A**
12	**D**	32	**C**
13	**B**	33	**B**
14	**A**	34	**B**
15	**B**	35	**B**
16	**C**	36	**D**
17	**D**	37	**B**
18	**D**	38	**C**
19	**B**	39	**A**
20	**C**	40	**B**

General comments

It is important that candidates read the questions carefully and work through the options in a logical manner. Candidates would benefit from working on problems where solutions are only found after more than one stage in the calculations.

Although there were some strong candidates, it was clear that many candidates had a poor understanding of even the most basic concepts. Most candidates answered **Questions 3**, **6**, **14**, **17**, **22**, and **35** very well. **Questions 12**, **15**, **25**, **26**, **34** and **39** were more challenging for many candidates.

Comments on specific questions

Question 5

Many candidates failed to read the question properly and simply subtracted the mass of the half full bottle of oil from the mass of the full bottle of oil.

Question 10

Many candidates appeared to link the term ‘hydroelectric’ with steam, with many choosing this option. This showed that the majority of candidates did not understand the process of electricity generation from nuclear fuel.

Question 12

Most candidates did not understand the principles involved in this experiment. The key was the least popular choice, and all three other options were considerably more popular.

Question 15

Almost all candidates recognised that when the tape measure was hotter it expanded and that the distance between the divisions on it moved further apart. However, a large majority of these candidates thought that the reading would increase when measuring the distance between two posts.

Question 20

Few candidates understood the term ‘wavefront’. Some candidates confused the term with ‘wavelength’. The most frequently chosen option was the arrow showing the direction of travel of the wave.

Question 24

Each option was chosen in almost equal proportions. Clearly, candidates were not aware of the properties of microwaves or of the fact that all electromagnetic radiations travel at the same speed in a vacuum.

Question 25

Very few candidates realised that the sound had to travel from the boat to the sea bed and back again, making 2000 m in total.

Question 26

It was clear that very few candidates had seen the experiment in which a steel rod (which has been carefully demagnetised) is placed parallel to the Earth’s magnetic field and is hammered. Before hammering, the rod will not attract small pieces of demagnetised iron (e.g. pins), but afterwards it will pick them up.

Question 27

Most candidates recognised that that repulsion meant that a rod is magnetised and many of those who recognised this realised that both rods must be magnetised for this to happen.

Question 32

This question was challenging for many candidates but stronger candidates were able to answer correctly.

Question 34

Most candidates incorrectly assumed that a battery is needed to induce an electromotive force (e.m.f.). However, stronger candidates recognised the basic concept that background count rate needs to be subtracted from the recorded count rate in order to find the count rate due to the course.

PHYSICS

Paper 0625/22
Multiple Choice (Extended)

Question Number	*Key*	*Question Number*	*Key*
1	**D**	21	**C**
2	**C**	22	**C**
3	**C**	23	**D**
4	**A**	24	**A**
5	**B**	25	**D**
6	**D**	26	**B**
7	**C**	27	**C**
8	**B**	28	**C**
9	**B**	29	**B**
10	**A**	30	**B**
11	**C**	31	**A**
12	**B**	32	**C**
13	**C**	33	**A**
14	**B**	34	**A**
15	**D**	35	**B**
16	**D**	36	**A**
17	**C**	37	**D**
18	**C**	38	**C**
19	**D**	39	**A**
20	**C**	40	**C**

General comments

There were some very strong performances which showed that the syllabus had been fully covered in detail and that candidates had an in-depth understanding of the material. Candidates answered **Questions 3**, **6**, **14**, **33**, **37**, and **38** particularly well. **Questions 2**, **9**, **12**, **20**, **23**, **27** and **30** were more challenging for some candidates.

Comments on specific questions

Question 2

Although the majority of candidates answered this correctly, a significant number thought that deceleration meant that the rate of change of speed was decreasing. Candidates who looked at the phrase carefully saw that the 'rate of change of speed' is the acceleration (or deceleration) and that the phrase referred to the change in the acceleration not the change in speed.

Question 9

The physics of circular motion was challenging for many candidates. Only stronger candidates recognised that an object travelling at a constant speed in a circle is not in equilibrium and has a resultant force towards the centre of the circle acting on it. The most common incorrect answer was **D**, and candidates did not recognise that the downward force of gravity is equal to the upward forces of friction and buoyancy.

Question 20

This question showed whether candidates really understood the cooling of bodies with different coloured surfaces. Although the majority of candidates got the correct answer, there was a significant number who thought that the can with the black surface would cool more slowly than the can with the shiny silver surface.

Question 23

The major confusion in this question was caused by a lack of understanding of the term ‘refractive index’ of a material. The refractive index refers to the ratio of the speed of light in a vacuum to the speed in the material which is approximately equal to the ratio of the speed of light in air to the speed in the material. In this case the light is travelling in the opposite direction (from the material into the air).

Question 27

Most candidates thought that starting the stopwatch on the first clap and stopping it on the eleventh clap meant that the sound had travelled to and from the wall eleven times, not the correct ten times.

Question 30

Many candidates were able to answer the question correctly but other candidates clearly did not understand the term ‘electromotive force’. The most common error was to confuse e.m.f. with potential difference. However, almost the same proportion confused it with current.

PHYSICS

Paper 0625/32
Core Theory

Key messages

- In calculations, candidates must set out and explain their working correctly. When a candidate gives a wrong final answer and working is shown, it is often possible for partial credit to be awarded for any parts that are correct.
- Candidates should ensure they are clear and precise when answering questions requiring a description or explanation.
- It is important that candidates read the questions carefully in order to understand exactly what is being asked.

General comments

Many candidates were well prepared for this paper. Most candidates knew the equations used in the paper well but a significant number struggled to recall the equation for balanced moments in **Question 4(c)**. Often candidates were able to apply their knowledge and understanding to fairly standard situations. On occasions, when asked to apply their knowledge to a new situation, some candidates became confused and showed a lack of breadth of understanding. Stronger candidates were able to think through the possibilities and could apply their knowledge when the question asked for suggestions to explain new situations. Less successful candidates found difficulty in applying their knowledge to new situations and did not show the stages in their working.

The questions on conservation of energy, moments, convection, electrostatics and explaining half-life were generally more challenging for many candidates. There were a significant number of candidates who either did not read the questions carefully, or gave answers that were related to the topic being tested, but did not answer the question in enough detail to receive credit.

The English language ability of the majority of the candidates was adequate for the demands of this paper.

Comments on specific questions

Question 1

(a) The vast majority of candidates answered this correctly. Weaker candidates were equally distracted by the options of volume and weight.

(b) Most candidates answered this question correctly. The most common error was dividing by 1000 instead of multiplying by 1000.

(c) The majority of candidates gained at least partial credit. A common error was to omit or to give the wrong unit. Weaker candidates simply gave the combined mass.

Question 2

(a) Only the strongest candidates answered this question fully correctly but many gained at least partial credit. The most common error was misinterpreting the times in the description of the journey.

(b) The majority of candidates answered this correctly but weaker candidates attempted to use incorrect equations such as distance = speed ÷ time.

Question 3

(a) (i) Most candidates answered this question well. A common incorrect response was resultant force, or simply downwards force.

(ii) The majority of candidates answered this correctly. A common error was to multiply the force by 10 to give 40 N.

(b) Most candidates correctly calculated the resultant force. Weaker candidates added the forces instead of subtracting.

(c) (i) Many candidates correctly stated the principle of conservation of energy, but a significant number of candidates were unable to recall this principle.

(ii) Only the strongest candidates answered this fully correctly. A significant number of candidates attempted to answer the question by describing the forces acting on the load.

Question 4

(a) (i) Most candidates only ticked one box, with only stronger candidates identifying both force and distance.

(ii) The majority of candidates identified the joule as the unit for work done, but weaker candidates were attracted equally to all of the incorrect options.

(b) The majority of candidates only ticked one box, with only stronger candidates identifying both energy transferred and time.

(c) This question proved challenging to many candidates. Only stronger candidates equated moments to give the correct answer. The most common error was to attempt a cross multiplication, giving an answer of 20 000 N.

(d) (i) The majority of candidates answered this correctly.

(ii) Only stronger candidates answered this question correctly. The most common error was to give a vague description about the centre of mass of the bricks moving, but not to state that it had moved closer to the pivot.

Question 5

(a) The majority of candidates gained full credit. A common error was to give just ‘light’ as the source of energy, rather than the Sun.

(b) (i) Most candidates gained at least partial credit, but there were many vague responses such as ‘easy to assemble’ which were not precise enough to gain credit.

(ii) Most candidates gained credit for this question but vague responses such as ‘expensive’ could not be credited.

(c) Almost all candidates answered this correctly.

Question 6

(a) (i) Many candidates failed to apply their knowledge and understanding of convection to the situation of the electric oven.

(ii) Only stronger candidates gained full credit. Many candidates incorrectly described particles expanding and particles becoming less dense.

(iii) Almost all candidates gained credit for this question.

(b) The majority of candidates suggested suitable positions for the smoke detector in the kitchen. A common error was to state that it should be placed near a window.

Question 7

The majority of candidates scored at least partial credit on this question. A common error was to link very high frequency sounds to amplitude.

Question 8

(a) The majority of candidates gained full credit. A common error was to transpose infrared and microwaves. Weaker candidates used names such as 'ultrasound' in parts of the spectrum.

(b) Most candidates gave a suitable use for ultraviolet radiation. Weaker candidates seemed to mistake ultraviolet for ultrasound when stating a use.

Question 9

(a) The vast majority of candidates correctly identified the circuits.

(b) The majority of candidates were able to give one or two disadvantages of the series circuit.

(c) There were many well drawn circuits with switches correctly drawn in both arms of the parallel circuit. Weaker candidates usually failed to add a switch to turn lamp X on and off.

(d) The majority of candidates gained full credit by correctly identifying the effect on the lamps of the different switch positions.

Question 10

(a) Most candidates answered this correctly. The most common error was to only identify one conductor and one insulator.

(b) Many candidates gained partial credit by describing how to give the polythene strip a negative charge, but then failed to explain that the negative charge was the result of electrons moving onto the polythene strip.

(c) Many candidates gained partial credit by describing how a positively charged object would attract a negative charge on the polythene strip. Only stronger candidates gave a full description in terms of repulsion between the negatively charged strip and a negatively charged object.

Question 11

(a) The operation of the electromagnetic relay was well understood.

(b) Most candidates recognised iron as the material used as the core to an electromagnet, but only stronger candidates were able to explain that it is used because it can be magnetised and demagnetised easily.

Question 12

(a) The majority of candidates answered this question fully correctly. The most common error was in calculations of the numbers of neutrons and protons in the nucleus.

(b) (i) Many candidates gained full credit here. The most common error was to draw a straight line from the count rate axis to the time axis.

(ii) Only the strongest candidates gained full credit for this question. Many candidates seemed to think that if the half-life of astatine-210 was eight hours, the astatine-210 would have completely disappeared after 16 hours.

PHYSICS

Paper 0625/42
Extended Theory

Key messages

- Candidates should record the formulae to be used in answering a question carefully, taking care not to transpose part of the formulae.
- Candidates should be reminded to include the correct unit in their final answer to questions.

General comments

The strongest candidates demonstrated very thorough knowledge in most aspects of the paper. Most other candidates performed well and all candidates were able to show their knowledge of the subject in answering the questions on this paper.

Comments on specific questions

Question 1

(a) References to speed or velocity were both acceptable in answering this question. A common error was to simply describe acceleration as an increase in speed rather than to define it as rate of change of speed. Some candidates wrote ‘change of speed per unit time’ and this was credited. However, ‘change of speed over time’ could not be credited as the amount of time was not specified. The formula (v – u)/t was accepted.

(b) (i) There were many completely correct answers relating to all three sections of the graph. Statements referring simply to motion rather than speed were too vague. Some candidates clearly interpreted the graph as referring to speed or velocity, rather than distance against time and thus failed to recognise the constant speed section of the graph.

(ii) **1** Most candidates successfully used average speed = total distance / total time and gave the correct answer.

2 Far fewer candidates correctly found the maximum speed. Many candidates did not realise that they needed to find the gradient of the straight section of the graph. Others used the correct approach but misread data from the graph

Question 2

(a) Several possible advantages and disadvantages were accepted. Many candidates referred to ‘no pollution’ as an advantage without specifying a type of pollution such as ‘of air’ or ‘of water’. Some candidates gave ‘cheap’ or ‘expensive’ as an advantage but needed to expand on what aspect was expensive (e.g. to set up or build) or cheap (e.g. because no fuel is needed).

(b) (i) **1** Many correct answers were seen. A small minority of answers showed mistakes in using the formula relating density, mass and volume.

2 Most candidates stated and used the formula for kinetic energy correctly. However, a significant number failed to square the speed when using the numbers.

(ii) Only the strongest candidates answered this question correctly. Candidates could not be awarded credit for vague answers mentioning friction or air resistance or heat generated. Answers that were credited referred to air passing through the turbine without striking the turbine blades.

Question 3

(a) Most candidates could identify acceleration and deceleration or equivalent statements as effects of a force. However, fewer could also identify change of direction.

(b) This question proved challenging for many candidates. However, many candidates gained partial credit for the scale used and, less often, for showing the *T* forces at right angles to each other on a vector diagram.

Question 4

(a) (i) A few candidates stated that the space S above the mercury contained air.

(ii) Most candidates used the appropriate formula and calculated *h* correctly.

(iii) Many candidates identified that the vertical would not change, but very few could give an acceptable explanation stating that in the formula $P = hdg$, h is measured vertically.

(b) Only the very strongest candidates answered this question correctly. Most candidates attempted an explanation in terms of differences in the diameter of the tube, or a change in pressure from one part of the room to another.

Question 5

(a) This was usually answered correctly, but some candidates did not include the unit.

(b) (i) **1** The idea of the requirement for uniform expansion was usually expressed adequately.

2 Rather than referring specifically to the capillary tube having a uniform bore, many candidates referred to ‘it’, or ‘the thermometer’, and so could not be awarded credit.

(ii) In general, candidates chose to mention the capillary tube needing to be wider or the bulb needing to be smaller.

(iii) Many candidates successfully identified the need for a narrower capillary tube or a larger bulb.

(c) (i) Many of the diagrams of a thermocouple thermometer drawn by candidates lacked important details. The meter shown was often not identified by an appropriate symbol or a name. Labels for the metals of the wires were frequently confused or missing. However, credit was frequently awarded for showing the labelling wires of two different metals meeting at a junction.

(ii) Most candidates were able to suggest a reason for using a thermocouple thermometer rather than a liquid-in-glass one.

Question 6

(a) Most candidates identified convection as the main process for transferring thermal energy.

(b) (i) Many candidates completed the two stages of the calculation of the time needed. However, in some cases the conversion of kW to W was not carried out.

(ii) Choices of reasons for the time being greater than the value calculated in **(i)** were often vaguely described or lacked the required detail. Some choices, such as wrong readings or faults in the heater, could not be credited.

Question 7

(a) This was nearly always answered correctly.

(b) Most candidates gained at least partial credit for this question but very few gained full credit. The greater force of attraction between solid molecules than between gas molecules was seen in most answers. The fact that it is therefore easier to increase the separation of gas molecules was almost always missed.

(c) Boyle's law was often applied correctly to find the expanded volume of the gas. Only stronger candidates subtracted of the volume of gas left in the cylinder.

Question 8

(a) (i) Most candidates gained partial credit for showing the refracted wavefronts parallel to each other and meeting the incident wavefronts at the boundary. Fewer drew the wavefronts at an acceptable angle to the boundary.

(ii) Many candidates correctly drew an arrow perpendicular to the refracted wavefronts and pointing in the correct direction. Most of the others drew their arrows on the wavefronts themselves.

(iii) Some candidates correctly marked the acute angles between the wavefronts and the boundary. Others treated the refracted wavefronts as rays and usually marked the wrong angles.

(b) In spite of quoting a correct formula, the wrong transposition of this formula led to a number of candidates calculating a speed greater than the speed of light. A number of candidates omitted a unit for the speed.

Question 9

(a) Some candidates did not calculate the resistance correctly. Any wrong values were usually the result of misreading data from the graph.

(b) More candidates ticked the wrong box for the resistor than for the thermistor. There were cases of candidates ticking two boxes on one line of the table which meant they could not be awarded credit.

(c) (i) In situations where resistors in parallel are concerned, there was an automatic reaction on the part of many candidates to calculate their combined resistance. Mistakes in using the formula led to a considerable number of wrong values for the resistance and therefore of the current. Those candidates with better understanding followed the straightforward route of adding the two equal currents in the two components.

(ii) Most candidates wrote down a correct formula and calculated the transferred energy correctly.

Question 10

(a) Only the strongest candidates answered this question fully correctly. Other candidates sometimes did not recognise that for a given power, a large voltage produces a low current, and some suggested that high resistance is the cause of low current. Some candidates omitted the fact that low current causes low thermal energy generation or low power loss. In some cases there was no mention that low current means that thinner or lighter or cheaper transmission cables would be needed or that fewer, lighter or cheaper pylons would suffice.

(b) (i) Most candidates were able to use the correct formula and could calculate the number of turns in the secondary coil. However, some candidates incorrectly copied the numbers given in the question.

(ii) A small minority of candidates quoted steel or copper as a suitable material.

Question 11

(a) (i) The decay equation was correctly completed by a large majority of candidates.

(ii) Many correct values for the count-rate were seen. There were sometimes cases of multiplying by two twice rather than dividing, or dividing by two once instead of twice.

(b) Most candidates stated two correct ways in which the emissions differed.

PHYSICS

Paper 0625/52
Practical

Key messages

- Candidates need to have had a thorough grounding in practical work during the course, including reflection and discussion on the precautions taken to improve reliability.
- Candidates should read questions carefully and draw conclusions from the results obtained rather than from theoretical considerations.
- Numerical answers should be expressed clearly, to the appropriate number of significant figures and with a correct unit, where applicable. These techniques will be tested at some point in the paper.
- Candidates should be ready to apply their practical knowledge to designing an investigation. Papers will contain a planning question which can be answered by developing a solution from standard experimental techniques.

General comments

The aim of the examination is to enable candidates to display their knowledge and understanding of practical physics techniques, including the following:
- plotting graphs
- tabulating readings
- manipulating data to obtain results
- drawing conclusions
- dealing with possible sources of error
- controlling variables
- handling practical apparatus and making accurate measurements
- choosing the most suitable apparatus.

It is assumed that, as far as possible, the IGCSE course will be taught so that candidates undertake regular practical work as an integral part of their study of physics.

Questions on experimental techniques were answered much more effectively by candidates who showed evidence of having regular experience of similar practical work. This was demonstrated in the practical details given by some candidates in **Questions 1(g)** and **1(h)**.

There will be questions in which candidates will be asked to devise approaches to investigations which may or may not be familiar to them. Candidates are able to answer these by carefully reading the brief and with logical application of good experimental practice. A number of candidates showed good practical knowledge when answering **Question 2(d)**, **3(f)** and **4**.

Comments on specific questions

Question 1

Most candidates were able to obtain satisfactory data from the ray-trace in order to plot the graph.

(a) to **(d)** Many candidates showed good skills in constructing the diagram, using small crosses as far from point **N** as possible. Others were less precise with thick pencil lines.

(e) Most candidates obtained a set of values within the expected range and expressed to the nearest mm. Where this was not the case, it was generally because of measuring line **NH** rather than **LH**.

(f) There were many well-drawn, accurate graphs with clearly labelled axes. Scales were usually chosen sensibly. Only a few candidates used impractical scales which almost always meant they had difficulty in plotting some points.

Plotting was mostly careful and many candidates indicating the plots with fine crosses. Small dots were acceptable but were often obscured when the line was drawn through them. The large dots used by some candidates were not acceptable as the intended value could not be determined clearly. A sharp pencil should be used for the plots and for the line so that accurate drawing may be achieved and errors easily corrected.

Many candidates produced a well-judged curve as indicated by their accurate plots. However, some candidates joined points together or tried to fit a straight line to them.

A very small number of candidates equally spaced the *a* values from the table on the vertical axis, producing an inconsistent scale and made errors in the scale and also in the plots as their positions could not be determined correctly.

(g) Many candidates answered well and discussed the difficulty of achieving precision with a ray of finite, possibly increasing width or the large effect on the value of *a* by small variations in angle θ. The difficulty in placing the mirror's reflecting surface on line **EF** was also mentioned. However, some candidates incorrectly quoted examples of poor practical procedure, despite the reference in the question to the experiment having been carried out carefully.

(h) This question was about the reliability of data and the most common correct answers referred to repeating readings and calculating average values or taking further values of θ. A few candidates suggested that the same values of θ could be measured below line **NL** and averages calculated from the resulting *a* values.

Question 2

Many candidates were able to carry out this practical well and only the supplementary questions proved difficult for some candidates.

(a) and **(b)** Most candidates obtained a clear, continuous fall in temperature in both beakers, showing a difference between the beaker with insulation and the beaker with a lid. Only a few recorded room temperature as θ_0 or did not wait for the temperature to reach a maximum value before starting the timing. Some candidates did not include the unit marks when completing the table.

(c) Many candidates produced good conclusions based on the readings in the table. Where the expected pattern between the beakers was not obtained, a number of candidates concluded from theory rather than their experimental work and could not be credited.

Justifications correctly based on the difference in temperature change over the full 180 s of the experiment were frequently seen.

(d) Many candidates realised that an additional experiment without insulation or lid, or with both, could be used as a comparison with the results from beaker **A** or beaker **B** in order to show the effect of each of these factors individually.

(e) Many candidates recognised the importance of keeping the initial temperature the same but fewer were able to relate that to the lower cooling rate produced by a lower starting temperature or the converse for a higher starting temperature. Only a few candidates gave good responses regarding the use of cooling rates at different temperatures from beaker **A** readings.

Where constant temperature changes had been obtained over each 30 s period, it was expected that candidates would state that uniform initial temperatures were not important as differences apparently did not affect cooling rates. This was only seen in responses from stronger candidates.

Question 3

Many candidates produced strong responses to this question and a good deal of careful practical work was seen.

(a) There was a lot of good practical skill shown with many candidates obtaining good readings and recording them well. However, some candidates expressed the potential difference values to less than 1 decimal place and the current values to less than 2 decimal places.

(b) The majority of candidates completed the column headings correctly. Some omitted the units with only a small number giving incorrect units.

(c) Accurate calculation was generally seen with good attention paid to correct rounding. Some sets of R values were expressed to an inconsistent number of significant figures.

The quality of practical work behind many responses was evident in the correlation between the values of resistance per unit length.

(d) The most usual method of calculating R_{25} was to multiply one R / l value by 25 cm. Some candidates took a more rigorous approach by first calculating an average value of R / l. Other candidates used proportion from an R value, with some doing this for each length and finishing with an average. All of these methods were credited.

(e) Few candidates recognised the difficulty of achieving a precise contact with a crocodile clip or measuring an accurate length in these circumstances. Many talked of the heating effect of current but this would be the same for all students carrying out the experiment and did not explain differences.

The difficulty of interpolating meter readings between marked values was rarely mentioned.

(f) The most straightforward answers to this question involved reproducing **Fig. 3.1** with a variable resistor connected in series in the upper section of the circuit.

Many candidates were able to draw an accurate symbol for a variable resistor. Some, however, showed it connected in such a way that the voltmeter would measure the potential difference across the variable resistor as well as the resistance wire. Other candidates omitted the voltmeter or the variable connection of the crocodile clip.

Question 4

Stronger candidates answered this question well. The question required the design to be developed from a standard experiment rather than being a practical that was likely to have been experienced in this form. However, it was possible to obtain credit for aspects of good practice and planning.

The strongest responses showed a logical approach, structured as suggested by the bullet points in the question, with concise sentences which communicated ideas well. Weaker candidates sometimes missed straightforward points as planning was not approached in a sequential way.

Most candidates were able to identify the need for a stopwatch or metre rule to measure the dependent variable such as time for a number of oscillations or amplitude at a particular point in the process.

It was expected that the apparatus would be modified by fixing the card to the rod to provide air resistance as the pendulum moved. Few candidates suggested this and instead most talked about waving the card to create an air stream. This gained credit only if it was described as being done as the pendulum swung towards the card. When swinging away from the card, the action would assist the pendulum rather than resist its motion.

A number of candidates ignored the use of the card and gained credit by suggesting variations to the shape of the bob to provide different amounts of air resistance. However, it was difficult to suggest an independent variable in this case.

It was important that candidates described the steps of the experiment rather than just implying the release of the pendulum and measurement of the dependent variable. It was also necessary to state that it should be repeated with a different value of independent variable such as the area of the card.

The length of the pendulum or mass of the bob were generally identified as control variables. Constant angle of release was common and was accepted, even if too large.

Many well thought-out tables were seen, containing clear columns for readings of independent and dependent variables, with appropriate units. Some candidates omitted units or gave units to variables which had not been measured as part of the described method (e.g. N for air resistance).

A comment on the analysis of results was expected. The most straightforward responses suggested that if a change in the independent variable produced a change in the measured dependent variable, this showed that air resistance affected the swing of the pendulum. Many candidates incorrectly predicted a conclusion instead, often quoting theory to support this.

Mention of a graph, with suitable axes clearly stated was sufficient to gain credit for analysis. Candidates needed to recognise that the use of a bar chart was not appropriate for a continuous variable such as area of card or period of oscillation.

Many candidates gained credit for an additional point, suggesting a means of ensuring a reliable experiment.

Some of the most common responses stipulated the timing of a number of oscillations before calculating a mean for each value or taking at least five sets of data. Other candidates mentioned further examples of good practice such as releasing the bob from a small angle or the use of a fiducial mark to aid counting of oscillations.

PHYSICS

Paper 0625/62
Alternative to Practical

Key messages

- Candidates need to have had a thorough grounding in practical work during the course, including reflection and discussion on the precautions taken to improve reliability.
- Candidates should read questions carefully and draw conclusions from results rather than from theoretical considerations.
- Numerical answers should be expressed clearly, to the appropriate number of significant figures and with a correct unit, where applicable. These techniques will be tested at some point in the paper.
- Candidates should be ready to apply their practical knowledge to designing an investigation. Papers will contain a planning question which can be answered by developing a solution from standard experimental techniques.

General comments

The aim of the examination is to enable candidates to display their knowledge and understanding of practical physics techniques, including the following:
- plotting graphs
- tabulating readings
- manipulating data to obtain results
- drawing conclusions
- dealing with possible sources of error
- controlling variables
- handling practical apparatus and making accurate measurements
- choosing the most suitable apparatus.

It is assumed that, as far as possible, the IGCSE course will be taught so that candidates undertake regular practical work as an integral part of their study of physics. This examination should not be seen as suggesting that the course can be fully and effectively taught without practical work. Some of the skills involved in experimental work, including graph plotting and tabulation of readings, can be practised without doing experiments. However, there are parts of this examination in which the candidates are asked to answer from their own practical experience.

Questions on experimental techniques were answered much more effectively by candidates who showed evidence of having regular experience of similar practical work. This was demonstrated in the practical details given by some candidates in **Questions 1(b)**, **1(e)** and **1(f)**.

It is expected that numerical answers will be expressed to a number of significant figures which is appropriate to the data given in the question. A set of similar values should be expressed to a consistent number of significant figures. This was demonstrated in many good responses to **Question 3(c)**.

There will be questions in which candidates will be asked to devise approaches to investigations which may or may not be familiar to them. Candidates are able to answer these by carefully reading the brief and with logical application of good experimental practice. A number of candidates showed good practical knowledge when answering **Questions 2(d)**, **3(f)** and **4**.

Comments on specific questions

Question 1

Most candidates were able to complete the ray-trace and graph successfully.

(a) The majority of candidates measured the angle θ accurately and were able to draw a good normal line.

(b) Many candidates recognised that **P** was not at a suitable distance for ray-tracing, giving the appropriate reason that it was too close to **N**. Many gave the acceptable minimum distance of 5 cm but it should be noted that **P** should be as far from **N** as possible for the accurate ray-tracing.

(c) Many candidates showed good skills in completing the diagram and recorded an accurate value for *a*. Use of thick pencil lines or lack of precision had a significant detrimental effect on the value obtained.

(d) There were many well-drawn, accurate graphs with clearly labelled axes. Scales were usually chosen sensibly. Only a few candidates used impractical scales which almost always meant they had difficulty in plotting some points.

Plotting was mostly careful and many candidates indicated the plots with fine crosses. Small dots were acceptable but were often obscured when the line was drawn through them. The large dots used by some candidates were not acceptable as the intended value could not be determined clearly. A sharp pencil should be used for the plots and for the line so that accurate drawing may be achieved and errors easily corrected.

Many candidates produced a well-judged curve as indicated by their accurate plots. However, some candidates joined points together or tried to fit a straight line to them.

A very small number of candidates equally spaced the *a* values from the table on the vertical axis, producing an inconsistent scale and made errors in the scale and also in the plots as their positions could not be determined correctly.

(e) Many candidates answered well and discussed the difficulty of achieving precision with a ray of finite, possibly increasing width or the large effect on the value of *a* by small variations in angle θ. The difficulty in placing the mirror's reflecting surface on line **EF** was also mentioned. However, some candidates incorrectly quoted examples of poor practical procedure, despite the reference in the question to the experiment having been carried out carefully.

(f) This question was about the reliability of data and the most common correct answers referred to repeating readings and calculating average values or taking further values of θ.

Question 2

Many candidates were able to deal well with questions on the basic practical and only the supplementary questions proved difficult for some candidates.

(a) The room temperature was usually read correctly.

(b) Most candidates completed the time column correctly. Units were generally correct but in some cases units were omitted.

(c) Many candidates produced good conclusions based on the readings in the table. Justifications correctly based on the difference in temperature change over the full 180 s of the experiment were frequently seen.

(d) Many candidates realised that an additional experiment without insulation or lid, or with both, could be used as a comparison with the results from beaker **A** or beaker **B** in order to show the effect of each of these factors individually.

(e) Most candidates calculated the average cooling rate correctly, expressing it to the expected 2 significant figures, and many gave the correct unit of °C / s.

Many candidates recognised the importance of keeping the initial temperature the same but fewer were able to relate that to the lower cooling rate produced by a lower starting temperature or the converse for a higher starting temperature. Only a few candidates gave good responses regarding the use of cooling rates at different temperatures from beaker **A** readings.

Question 3

Many candidates produced strong responses to this question.

(a) Many candidates drew the correct voltmeter symbol connected across terminals **P** and **Q.** Only a few showed it connected in series or in parallel to the resistance wire itself. Most candidates read the values of V and I correctly.

(b) Most candidates completed the column headings correctly. Some omitted the units with only a very small number giving incorrect units.

(c) Accurate calculation was generally seen with good attention paid to correct rounding. Most sets of R values were expressed to a consistent number of significant figures. Most candidates also correctly produced values of resistance per unit length.

(d) The most usual method of calculating R_{25} was to multiply an R / l value by 25 cm. Other candidates used proportion from an R value. Each of these methods was credited.

(e) Few candidates recognised the difficulty of achieving a precise contact with a crocodile clip or measuring an accurate length in these circumstances. Many talked of the heating effect of current but this would be the same for all students carrying out the experiment and did not explain differences.

The difficulty of interpolating meter readings between marked values was rarely mentioned.

(f) The most straightforward answers to this question involved reproducing **Fig. 3.1** with a variable resistor connected in series above terminals **P** or **Q**.

Many candidates were able to draw an accurate symbol for a variable resistor. Some, however, showed it connected in such a way that the voltmeter would measure the potential difference across the variable resistor as well as the resistance wire. Other candidates omitted the voltmeter or the variable connection of the crocodile clip.

Question 4

Stronger candidates answered this question well. The question required the design to be developed from a standard experiment rather than being a practical that was likely to have been experienced in this form. However, it was possible to obtain credit for aspects of good practice and planning.

The strongest responses showed a logical approach, structured as suggested by the bullet points in the question, with concise sentences which communicated ideas well. Weaker candidates sometimes missed straightforward points as planning was not approached in a sequential way.

Most candidates were able to identify the need for a stopwatch or metre rule to measure the dependent variable such as time for a number of oscillations or amplitude at a particular point in the process.

It was expected that the apparatus would be modified by fixing the card to the rod to provide air resistance as the pendulum moved. Few candidates suggested this and instead most talked about waving the card to create an air stream. This gained credit only if it was described as being done as the pendulum swung towards the card. When swinging away from the card, the action would assist the pendulum rather than resist its motion.

A number of candidates ignored the use of the card and gained credit by suggesting variations to the shape of the bob to provide different amounts of air resistance. However, it was difficult to suggest an independent variable in this case.

It was important that candidates described the steps of the experiment rather than just implying the release of the pendulum and measurement of the dependent variable. It was also necessary to state that it should be repeated with a different value of independent variable such as the area of the card.

The length of the pendulum or mass of the bob were generally identified as control variables. Constant angle of release was common and was accepted, even if too large.

Many well thought-out tables were seen, containing clear columns for readings of independent and dependent variables, with appropriate units. Some omitted units or gave units to variables which had not been measured as part of the described method (e.g. N for air resistance).

A comment on the analysis of results was expected. The most straightforward responses suggested that if a change in the independent variable produced a change in the measured dependent variable, this showed that air resistance affected the swing of the pendulum. Many incorrectly predicted a conclusion instead, often quoting theory to support this.

Mention of a graph, with suitable axes clearly stated was sufficient to gain credit for analysis. Candidates needed to recognise that the use of a bar chart was not appropriate for a continuous variable such as area of card or period of oscillation.

Many candidates gained credit for an additional point, suggesting a means of ensuring a reliable experiment.

Some of the most common responses stipulated the timing of a number of oscillations before calculating a mean for each value or taking at least five sets of data. Other candidates mentioned further examples of good practice such as releasing the bob from a small angle or the use of a fiducial mark to aid counting of oscillations.

Grade thresholds – March 2019

Cambridge IGCSE™ Physics (0625)

Grade thresholds taken for Syllabus 0625 (Physics) in the March 2019 examination.

		minimum raw mark required for grade:						
	maximum raw mark available	A	B	C	D	E	F	G
Component 12	40	–	–	24	22	19	16	13
Component 22	40	28	25	22	19	16	14	12
Component 32	80	–	–	51	43	35	26	18
Component 42	80	50	41	33	28	22	16	10
Component 52	40	23	21	19	17	15	13	11
Component 62	40	23	21	19	17	15	13	11

Grade A* does not exist at the level of an individual component.

The maximum total mark for this syllabus, after weighting has been applied, is **200**.

The overall thresholds for the different grades were set as follows.

Option	Combination of Components	A*	A	B	C	D	E	F	G
BY	22, 42, 52	146	128	110	93	80	67	54	41
CY	22, 42, 62	146	128	110	93	80	67	54	41
FY	12, 32, 52	–	–	–	119	103	87	70	53
GY	12, 32, 62	–	–	–	119	103	87	70	53

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS	**0625/12**
Paper 1 Multiple Choice (Core)	**March 2019**
MARK SCHEME	
Maximum Mark: 40	

Published

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Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Cambridge International is publishing the mark schemes for the March 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **3** printed pages.

Question	Answer	Marks
1	B	**1**
2	C	**1**
3	C	**1**
4	A	**1**
5	B	**1**
6	D	**1**
7	A	**1**
8	C	**1**
9	D	**1**
10	B	**1**
11	D	**1**
12	D	**1**
13	B	**1**
14	A	**1**
15	B	**1**
16	C	**1**
17	D	**1**
18	D	**1**
19	B	**1**
20	C	**1**
21	B	**1**
22	C	**1**
23	A	**1**
24	C	**1**
25	C	**1**
26	A	**1**
27	C	**1**
28	D	**1**

Question	Answer	Marks
29	B	**1**
30	A	**1**
31	A	**1**
32	C	**1**
33	B	**1**
34	B	**1**
35	B	**1**
36	D	**1**
37	B	**1**
38	C	**1**
39	A	**1**
40	B	**1**

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/22**

Paper 2 Multiple Choice (Extended) **March 2019**

MARK SCHEME

Maximum Mark: 40

Published

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This document consists of **3** printed pages.

Question	Answer	Marks
1	D	**1**
2	C	**1**
3	C	**1**
4	A	**1**
5	B	**1**
6	D	**1**
7	C	**1**
8	B	**1**
9	B	**1**
10	A	**1**
11	C	**1**
12	B	**1**
13	C	**1**
14	B	**1**
15	D	**1**
16	D	**1**
17	C	**1**
18	C	**1**
19	D	**1**
20	C	**1**
21	C	**1**
22	C	**1**
23	D	**1**
24	A	**1**
25	D	**1**
26	B	**1**
27	C	**1**
28	C	**1**

Question	Answer	Marks
29	B	**1**
30	B	**1**
31	A	**1**
32	C	**1**
33	A	**1**
34	A	**1**
35	B	**1**
36	A	**1**
37	D	**1**
38	C	**1**
39	A	**1**
40	C	**1**

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/32**

Paper 3 Core Theory **March 2019**

MARK SCHEME

Maximum Mark: 80

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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Cambridge International is publishing the mark schemes for the March 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **9** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks
1(a)	top box ticked: density	**B1**
1(b)	2500 (g)	**B1**
1(c)	W = mg in any form	**C1**
	(2.5 + 1.0 + 0.5) = 4	**C1**
	40	**A1**
	N or newtons	**B1**

Question	Answer	Marks
2(a)	line starts from 0 on y-axis straight diagonal line to 10 m / s line parallel to time axis straight diagonal line to x-axis at greater time (from horizontal section) line drawn to time axis at (85, 0)	**B5**
2(b)	speed = distance ÷ time in any form OR (distance =) speed × time	**C1**
	7.5 × 150	**C1**
	1125 (m)	**A1**

Question	Answer	Marks
3(a)(i)	gravity **OR** weight	**B1**
3(a)(ii)	4.0 (N)	**B1**

Question	Answer	Marks
3(b)	4.8 (N)	**B1**
	Up(wards)	**B1**
3(c)(i)	energy cannot be created or destroyed (but can be transformed)	**B1**
3(c)(ii)	PE / KE / elastic energy of load / spring decreases / is transformed	**B1**
	Any one from: to thermal energy (which is) dissipated (to surroundings)	**B1**

Question	Answer	Marks
4(a)(i)	tick in top two boxes: distance **AND** force	**B1**
4(a)(ii)	first word circled: joule	**B1**
4(b)	tick in top AND bottom boxes: energy transferred **AND** time	**B1**
4(c)	clockwise moment = anticlockwise moment	**C1**
	$1.5 \times 30\,000 = 1 \times$ (load)	**C1**
	(load =) 45 000 (N)	**A1**
4(d)(i)	centre of mass in centre of load	**B1**
4(d)(ii)	centre of mass (moves) closer to pivot (point)	**B1**

Question	Answer	Marks
5(a)	sun(light)	**B1**
	electrical	**B1**
5(b)(i)	Any two from: uses a renewable source of energy no cost for source of energy no polluting / greenhouse gases OR no carbon dioxide produced easy to erect and dismantle conserves fossil fuels	**B2**
5(b)(ii)	Any ONE from: does not work at night need large area of land (for sufficient output)	**B1**
5(c)	idea that (panel can) follow the sun as it moves across the sky OR will absorb more energy OR transfer energy / work more efficiently	**B1**

Question	Answer	Marks
6(a)(i)	arrow upwards from heating element	**B1**
	arrow across top **OR** down on opposite side	**B1**
6(a)(ii)	warm air expands	**B1**
	(air) becomes less dense	**B1**
	(air) rises	**B1**
6(a)(iii)	radiation	**B1**
6(b)	on ceiling	**B1**

Question	Answer	Marks
7	change in direction of light when entering a medium – refraction very high frequency sounds – ultrasound a glass prism producing a spectrum – dispersion light spreading after passing through a narrow gap – diffraction sound reflecting from a wall – echo	**B5**

Question	Answer	Marks
8(a)	In order from left to right: γ / gamma (rays) X-rays infrared (rays / waves) microwaves	**B4**
8(b)	sun beds **OR** security marking	**B1**

Question	Answer	Marks
9(a)	(Fig. 9.1 is a) parallel (circuit)	**B1**
	(Fig. 9.2 is a) series (circuit)	**B1**
9(b)	Any two from: lamps less bright if one lamp breaks the other does not light lamps cannot be switched independently	**B2**
9(c)	two correct switch symbols	**B1**
	switch on each branch	**B1**

Question	Answer	Marks
9(d)	(K W) on	**B1**
	(J W) off	**B1**
	(J Z) on	**B1**

Question	Answer	Marks
10(a)	clamp **AND** nail to conductor **AND** stirrup **AND** thread to insulator	**B1**
10(b)	rubbed with a cloth	**B1**
	electrons transfer to polythene / from cloth	**B1**
10(c)	(bring) a negatively charged rod / strip / object near	**B1**
	repulsion	**B1**

Question	Answer	Marks
11(a)	T P (S) R Q	**B3**
11(b)	(soft) iron	**B1**
	(forms a) <u>temporary</u> magnet	**B1**

Question	Answer	Marks
12(a)	(neutron) – 125 – neutral	**B2**
	proton(s) – 85 – (positive)	**B2**
12(b)(i)	curve of negative gradient, gradient decreasing	**B1**
	curve with negative gradient starts on y axis	**B1**
12(b)(ii)	0.125 (kg) (remaining)	**C1**
	two half-lives indicated	**C1**
	16 hours	**A1**

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/42**

Paper 4 Extended Theory **March 2019**

MARK SCHEME

Maximum Mark: 80

Published

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- marks are not deducted for omissions
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GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer		Marks
1(a)	Rate of change of speed OR change of speed / time OR $\Delta v / t$ OR $(v – u) / t$		B1
1(b)(i)	**1**	Acceleration OR increasing speed OR going faster	B1
	2	Constant speed OR steady speed	B1
	3	Deceleration OR decreasing speed OR slowing down	B1
1(b)(ii)	**1**	Total distance / total time OR 300 / 40	C1
		7.5 m / s	A1
	2	Change of distance / change of time OR (250 – 70) / (30 – 15) OR 180 / 15	C1
		12 m / s	A1

Question	Answer		Marks
2(a)	<u>Advantage</u>: No fossil fuel used OR No fuel costs OR No pollution of air / water OR No polluting gases OR is a renewable energy source OR doesn't contribute to global warming / greenhouse effect		B1
	<u>Disadvantage</u>: Wind not always blowing OR causes noise pollution OR causes visual pollution OR is danger to wildlife OR is expensive to build		B1
2(b)(i)	**1**	d = m / V in any form, symbols or words OR $24\,000 \times 1.3$	C1
		31 000 kg	A1
	2	KE = ½ mv^2 OR $½ \times 31\,200 \times 16^2$	C1
		4.0×10^6 J	A1

Question	Answer	Marks
2(b)(ii)	Speed of air not reduced to zero (in passing through turbine) OR some air passes through blade area without change of speed OR without hitting blades OR not all k.e. of air transfers to blades OR air retains some of its k.e. OR friction in bearings of blades	**B1**

Question	Answer	Marks
3(a)	Accelerate or increase speed OR Decelerate or decrease speed OR Change speed	**B1**
	Change direction OR causes rotation	**B1**
3(b)	Sensible scale stated	**B1**
	T vectors, labelled T or with arrow, both of same length, drawn at right angles (any orientation)	**B1**
	Triangle or parallelogram completed using candidate's T vectors	**B1**
	Correct orientation vector diagram with 360 N vector vertical	**B1**
	T value stated: 250 or 260 N	**B1**

Question	Answer	Marks
4(a)(i)	Vacuum OR nothing OR mercury vapour	**B1**
4(a)(ii)	$P = h\rho g$ in any form OR ($h =$) $P/\rho g$ OR $1.02 \times 10^5 / (13600 \times 10)$	**C1**
	0.75 m	**A1**

Question	Answer	Marks
4(a)(iii)	Same vertical height (of mercury)	**M1**
	Pressure due to column of liquid depends on vertical height OR in formula P = hρg, h is vertical height OR the pressure remains constant because ρ and g don't change, nor does h.	**A1**
4(b)	Air is present in the space labelled S OR above the mercury in the tube	**M1**
	This air exerts a (downward) pressure on the mercury	**A1**

Question	Answer	Marks
5(a)	0 °C and 100 °C	**B1**
5(b)(i)	**1** Has uniform / linear expansion OR Has equal expansion for each degree of temperature rise	**B1**
	2 Has <u>capillary</u> / <u>tube</u> of constant cross-sectional area / diameter / radius / bore / width / thickness	**B1**
5(b)(ii)	(Compared with thermometer B) A has a <u>capillary</u> / <u>tube</u> of greater cross-section / diameter / radius / width OR A contains a liquid with less expansion per degree / unit temp. rise OR A is longer than B OR A has a smaller bulb	**B1**
5(b)(iii)	(Compared with thermometer D) C (has capillary / tube that is) narrower / of smaller cross-section / thinner OR has a larger bulb OR bulb containing more liquid OR contains a liquid with greater expansion per degree / unit temp. rise OR contains alcohol instead of mercury	**B1**

Question	Answer	Marks
5(c)(i)	Diagram to show: Three wires labelled e.g. copper, iron, copper or with symbols for metals OR metal A, metal B, metal A	**B1**
	One junction between different metals	**B1**
	Connections to voltmeter / ammeter / galvanometer identified by V, A, G, mV, mA or arrow in a circle	**B1**
5(c)(ii)	Measurement of: a (very) high or (very) low temperature OR a rapidly varying temperature OR a high range of temperature If values given, more than 300 °C; less than –200 °C	**B1**

Question	Answer	Marks
6(a)	Convection	**B1**
6(b)(i)	(E =) $mc\Delta\theta$ OR $65 \times 720 \times 7$	**C1**
	3.3×10^5 (J)	**C1**
	P = E / t in any form OR (t=) E / P OR $3.3 \times 10^6 / 1.5 \times 10^3$	**C1**
	220 s	**A1**
6(b)(ii)	Two of: The heater warms walls, floor, ceiling, windows, furniture / objects. Thermal energy conducted through walls, floor, ceiling, windows (to exterior) Thermal energy used to raise temperature of air entering room via draughts / openings	**B2**

Question	Answer	Marks
7(a)	**1.** Solid to liquid	**B1**
	2. Liquid to gas / vapour	**B1**
7(b)	(Neighbouring) molecules of solid have (strong) forces of attraction between them OR Gas molecules have no / weak forces of attraction between them	**B1**
	Easier to increase separation of gas molecules (than solid molecules) (gas expands more easily so) gas molecules move farther apart	**B1**
7(c)	PV = constant OR $P_1V_1 = P_2V_2$ OR $0.012 \times 1.8 \times 10^6 = V_2 \times 1.0 \times 10^5$	**C1**
	$V_2 = 0.216\,m^3$ OR $0.22\,m^3$	**A1**
	(Volume of escaped gas = 0.22 – 0.012 =) $0.21\,m^3$	**B1**

Question	Answer	Marks
8(a)(i)	Wavefronts in the air: Parallel to each other	**B1**
	Make a larger angle with the boundary than wavefronts in ice and from top left to bottom right	**B1**
	At least one wavefront meets a wavefront in ice at the boundary	**B1**
8(a)(ii)	Arrows at right angles to wavefronts pointing away from boundary	**B1**
8(a)(iii)	Acute angle between any wavefront in ice and boundary marked *i* Acute angle between any wavefront in air and boundary marked *r*	**B1**
	OR In ice, normal at boundary and ray perpendicular to any wavefront both drawn. Angle between normal and ray in ice marked *i.* In air, normal at boundary and ray perpendicular to any wavefront both drawn. Angle between normal and ray in air marked *r.*	**(B1)**

Question	Answer	Marks
8(b)	n = speed in air / speed in ice OR $n = V_{AIR} / V_{ICE}$ OR $(V_{ICE}) = V_{AIR} / n$ OR $3.0 \times 10^8 / 1.3$	**C1**
	2.3×10^8 m/s	**A1**

Question	Answer	Marks
9(a)	I = V/R in any form OR (R=) V/I OR 7.0/4.6	**C1**
	1.5 Ω	**A1**
9(b)	Resistor: resistance is constant	**B1**
	Thermistor: resistance decreases	**B1**
9(c)(i)	4.6 + 4.6	**C1**
	9.2 A	**A1**
	OR Combined resistance = $(1.52^2 / (1.52 + 1.52) =)$ 0.76 Ω	**(C1)**
	(I =) 7.0 / 0.76 = 9.2 A	**(A1)**
9(c)(ii)	(E =) IVt OR in words OR $9.2 \times 7 \times 5 \times 60$	**C1**
	19000 J	**A1**

Question	Answer	Marks
10(a)	If voltage is (very) high, current is (very) low **NOT** if resistance is low	**B1**
	(If current is low,)thermal energy generated / power loss is low	**B1**
	(If current is low:) thinner / lighter / cheaper transmission cables / cables with less resistance / cheaper pylons can be used / cheaper	**B1**
10(b)(i)	$V_p / V_s = N_p / N_s$ in any form OR (N_s =) $N_p V_s / V_p$ OR $4000 \times 9 / 120$	**C1**
	(N_s =) 300	**A1**
10(b)(ii)	Iron or soft iron	**B1**

Question	Answer	Marks
11(a)(i)	Nucleon number for Pt: 194	**B1**
	Proton number for Pt: 78	**B1**
	Symbol for beta particle: $^{0}_{-1}\beta$	**B1**
11(a)(ii)	After 1 half-life / 19 hrs, count rate = 1100 / 2 = 550 counts / min	**C1**
	After 2 half-lives / 38 hrs, count rate = 550 / 2 = 275 counts / min	**A1**
	OR 38 hrs = 2 half-lives	**(C1)**
	After 38 hrs / 2 half-lives, count rate = 1100 / 4 = 275 counts / min	**(A1)**

Question	Answer		Marks
11(b)	Two of:		B2
	<u>γ-emission</u>	<u>β-emission</u>	
	electromagnetic radiation / travels at the speed of light	particles / electrons	
	uncharged	(negatively) charged	
	no mass	has mass	
	long range in air	shorter range in air	
	stopped by many cm of lead / very penetrating	stopped by a few mm of aluminium	
	low ionisation (of air)	higher ionisation (of air)	
	leaves proton number unchanged	proton number changes	
	not deflected in electric / magnetic field	deflected in electric / magnetic field	

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/52**

Paper 5 Practical **March 2019**

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Cambridge International is publishing the mark schemes for the March 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **8** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks
1(a)	**AB**, **CD** and normal correct	**1**
1(b)	$\theta = 5° \pm 1°$	**1**
1(c)	**GN** $\geqslant$ 5.0 cm	**1**
1(d)	all lines present, correct and neat	**1**
1(e)	5 correct values of *a*, increasing	**1**
1(f)	**graph:** • axes labelled with quantity and unit	**1**
	• appropriate scales (plots occupying at least ½ grid)	**1**
	• plots all correct to ½ small square <u>and</u> precise plots	**1**
	• well judged line <u>and</u> thin continuous line	**1**
1(g)	any suitable reason e.g.: ray has finite thickness – (difficult to mark position of ray precisely), reflecting surface of mirror at rear, inaccuracies have more effect for smaller angles, small variations in mirror angle have significant effect on '*a*'	**1**
1(h)	reflect ray below **NL** at same angles <u>and</u> take averages	**1**

Question	Answer	Marks
2(a)	θ for beaker **A** decreasing	**1**
2(b)(i)	θ for **B** decreasing and recorded to at least 1 °C	**1**
	decreasing more slowly	**1**
2(b)(ii)	s, °C, °C all correct	**1**
	30, 60, 90, 120, 150, 180	**1**
2(c)	conclusion matching results	**1**
	correct mention of comparative temperature change over 180 s, supporting conclusion	**1**
2(d)	additional experiment with both insulation and lid / neither insulation nor lid	**1**
	compare result of (previous) experiment with additional / only one factor changed in (each) comparison	**1**
2(e)	statement matching results	**1**
	comparison of temperature difference over first 30 s and last 30 s	**1**

Question	Answer	Marks
3(a)	V <3.00 (V)	**1**
	I <1.50 (A) <u>and</u> increasing	**1**
	V all to 1dp at least <u>and</u> I all to 2dp at least	**1**
3(b)	correct units: V, A	**1**
3(c)(i)	correct calculations of R	**1**
	consistent 2 or consistent 3 sig. figs.	**1**
3(c)(ii)	correct calculations or R / l	**1**
3(d)	R_{25} in range 1 Ω to 3 Ω <u>and</u> clear method seen e.g. proportion from other value(s) of R or use of R / l value(s)	**1**
3(e)	any **one** from: difficult to judge position of crocodile clip, difficult to measure wire to nearest mm, contact between wire and crocodile clip not precise, difficult to interpolate readings on meters between marks	**1**
3(f)	correct symbol for variable resistor	**1**
	in series and with all circuit elements in correct arrangement	**1**

Question	Answer	Marks
4	**MP1** **apparatus:** means of measuring dependent variable (e.g. stop watch / rule / protractor)	1
	MP2 **method** (one from): workable means of providing air resistance (e.g. fix card to rod / bob), allow pendulum to swing, suitable measurement (e.g. period, amplitude)	1
	MP3 repeat for different value of independent variable (e.g. area of card)	1
	MP4 **control variable** (one from): length of pendulum, angle of release, mass of bob	1
	MP5 **table:** suitable clear format with column headings and units	1
	MP6 **analysis:** compare readings to see if change in air resistance produces change in dependent variable (e.g. change in area of card changes period) / plot graph	1

Question	Answer	Marks
4	**MP7** **additional point** (one from): time 10 oscillations / swings (and calculate period), small angle of swing, at least 5 sets of data taken, repeat each measurement <u>and</u> take average, adjust mass of pendulum to compensate for changing mass of card, repeat with different length of pendulum / mass of bob, length measured to centre of bob / centre of gravity of pendulum, use of fiducial aid	**1**

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/62**

Paper 6 Alternative to Practical **March 2019**

MARK SCHEME

Maximum Mark: 40

Published

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Generic Marking Principles

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GENERIC MARKING PRINCIPLE 1: Marks must be awarded in line with: • the specific content of the mark scheme or the generic level descriptors for the question • the specific skills defined in the mark scheme or in the generic level descriptors for the question • the standard of response required by a candidate as exemplified by the standardisation scripts.
GENERIC MARKING PRINCIPLE 2: Marks awarded are always **whole marks** (not half marks, or other fractions).
GENERIC MARKING PRINCIPLE 3: Marks must be awarded **positively**: • marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate • marks are awarded when candidates clearly demonstrate what they know and can do • marks are not deducted for errors • marks are not deducted for omissions • answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.
GENERIC MARKING PRINCIPLE 4: Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks
1(a)(i)	θ = 23(°)±1°	**1**
1(a)(ii)	normal correct	**1**
1(b)	not at a suitable distance and should be far (as possible) from **N**	**1**
1(c)	all lines present, neat and labelled correctly	**1**
	a = 10.2 (cm) ± 0.1 (cm)	**1**
1(d)	**graph:** • axes labelled with quantity and unit	**1**
	• appropriate scales (plots occupying at least ½ grid)	**1**
	• plots all correct to ½ small square, precise plots	**1**
	• well judged line and thin continuous line	**1**
1(e)	any suitable reason e.g.: ray has finite thickness – (difficult to mark position of ray precisely), reflecting surface of mirror at rear, inaccuracies have more effect for smaller angles, small variations in mirror angle have significant effect on '*a*'	**1**
1(f)	reflect ray below **NL** at same angles and take averages	**1**

Question	Answer	Marks
2(a)	θ_R = 23 (°C)	**1**
2(b)	s, °C, °C all correct	**1**
	30, 60, 90, 120, 150, 180	**1**
2(c)	lid is more effective	**1**
	correct mention of comparative temperature change over 180 s, supporting conclusion	**1**
2(d)	additional experiment with both insulation and lid / neither insulation nor lid	**1**
	compare result of (previous) experiment with additional / only one factor changed in (each) comparison	**1**
2(e)(i)	x_A = 0.081	**1**
	°C / s	**1**
2(e)(ii)	cooling more rapid at higher temperatures	**1**
	comparison of temperature difference over first 30 s and last 30 s supporting statement	**1**

Question	Answer	Marks
3(a)(i)	correct voltmeter symbol in parallel with **P** and **Q**	**1**
3(a)(ii)	V = 2.6 (V)	**1**
	I = 0.36 (A)	**1**
3(b)	correct units: V, A	**1**
3(c)(i)	correct calculations of R	**1**
	consistent 2 or consistent 3 sig. figs.	**1**
3(c)(ii)	correct calculations or R / l	**1**
3(d)	R_{25} = 2.0 (Ω) <u>and</u> clear method seen e.g. proportion from other value(s) of R or use of R / l value(s)	**1**
3(e)	any **one** from: difficult to judge position of crocodile clip, difficult to measure wire to nearest mm, contact between wire and crocodile clip not precise, difficult to interpolate readings on meters between marks	**1**
3(f)	correct symbol for variable resistor	**1**
	in series and with all circuit elements in correct arrangement	**1**

Question	Answer	Marks
4	**MP1** **apparatus:** means of measuring dependent variable (e.g. stop watch / rule / protractor)	**1**
	MP2 **method** (one from): workable means of providing air resistance (e.g. fix card to rod / bob), allow pendulum to swing, suitable measurement (e.g. period, amplitude)	**1**
	MP3 repeat for different value of independent variable (e.g. area of card)	**1**
	MP4 **control variable** (one from): length of pendulum, angle of release, mass of bob	**1**
	MP5 **table:** suitable clear format with column headings and units	**1**
	MP6 **analysis:** compare readings to see if change in air resistance produces change in dependent variable (e.g. change in area of card changes period) / plot graph	**1**

Question	Answer	Marks
4	**MP7** **additional point** (one from): time 10 oscillations / swings (and calculate period), small angle of swing, at least 5 sets of data taken, repeat each measurement <u>and</u> take average, adjust mass of pendulum to compensate for changing mass of card, repeat with different length of pendulum / mass of bob, length measured to centre of bob / centre of gravity of pendulum, use of fiducial aid	**1**

Cambridge Assessment International Education
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PHYSICS **0625/12**

Paper 1 Multiple Choice (Core) **February/March 2019**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

2318147385

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m/s^2).

This document consists of **16** printed pages.

IB19 03_0625_12/3RP

1 Water drips from a tap into a measuring cylinder.

The table shows the volume of water in the cylinder every minute for four minutes.

time / minutes	volume of water / cm^3
0	0
1.0	27
2.0	57
3.0	83
4.0	112

What is the average volume of water collected in the cylinder each minute?

A $22\,cm^3$ **B** $28\,cm^3$ **C** $56\,cm^3$ **D** $57\,cm^3$

2 An object is moving with uniform deceleration.

Which statement describes its motion?

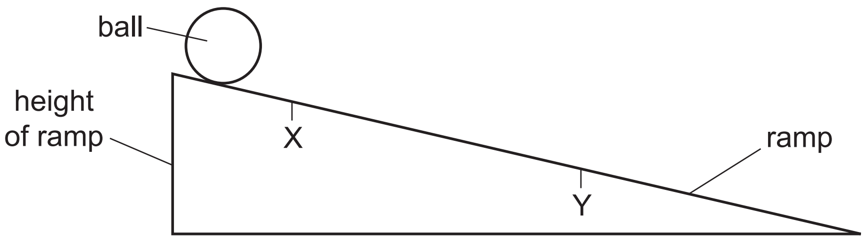
A Its rate of change of speed is decreasing.

B Its speed is constant.

C Its speed is decreasing.

D Its speed is increasing.

3 A ball rolls down a ramp. The time it takes to move from X to Y is measured.



Which other quantity must be measured in order to calculate the average speed of the ball between point X and point Y?

A angle of slope

B diameter of ball

C distance between X and Y

D height of ramp

4 An astronaut in a space station orbits above the Earth.

In the space station, the acceleration due to gravity is $7.5\,m/s^2$.

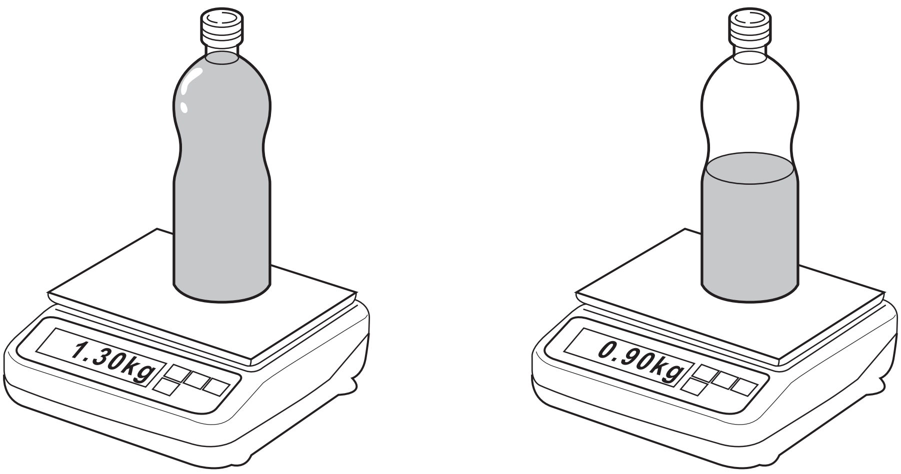
On Earth, the acceleration due to gravity is $10\,m/s^2$.

Which statement about the astronaut's mass and weight in the space station is correct?

	mass of astronaut	weight of astronaut
A	same as on the Earth	less than on the Earth
B	same as on the Earth	greater than on the Earth
C	lower than on the Earth	less than on the Earth
D	lower than on the Earth	greater than on the Earth

5 The mass of a full bottle of cooking oil is 1.30 kg.

When exactly half of the oil has been used, the mass of the bottle plus the remaining oil is 0.90 kg.



What is the mass of the empty bottle?

A 0.40 kg **B** 0.50 kg **C** 0.65 kg **D** 0.80 kg

6 A solid ball has a volume of $4.0\,cm^3$. The density of the ball is $1.6\,g/cm^3$.

What is the mass of the ball?

A 0.4 g **B** 2.5 g **C** 4.0 g **D** 6.4 g

7 Which property of an object **cannot** be changed by applying forces?

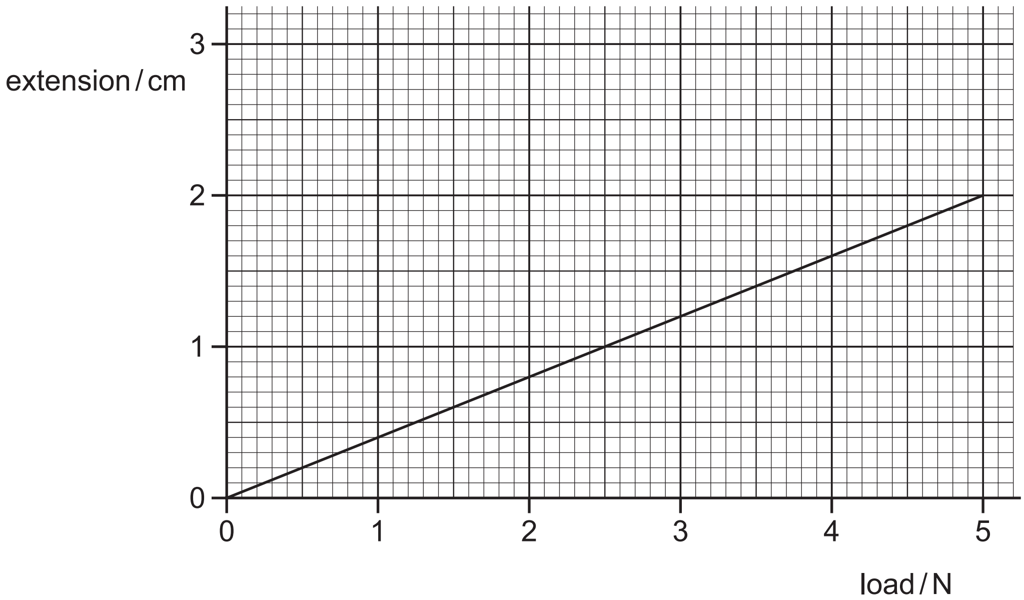
A mass

B shape

C speed

D volume

8 The extension / load graph for a spring is shown. The unstretched length of the spring is 15.0 cm.

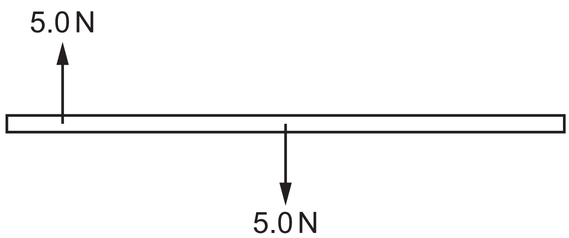


When an object of unknown weight is suspended on the spring, the length of the spring is 16.4 cm.

What is the weight of the object?

A 0.55 N **B** 0.67 N **C** 3.5 N **D** 4.1 N

9 The diagram shows a wooden beam with two forces acting on it.



Which way will the beam move?

A accelerate up the page

B accelerate down the page

C turn anticlockwise

D turn clockwise

10 Which source of energy uses the production of steam to generate electrical energy?

A hydroelectric

B nuclear

C tides

D waves

11 What is the unit of power?

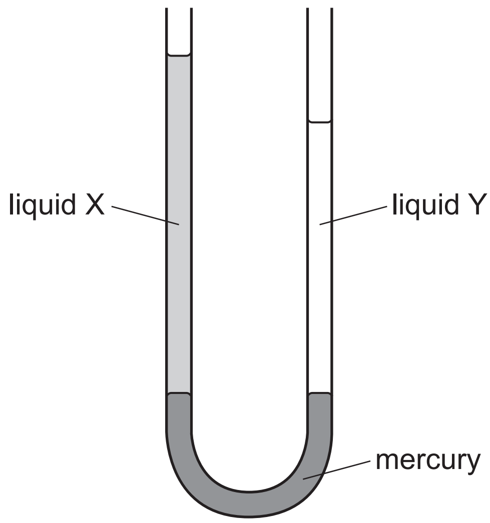
A joule

B newton

C pascal

D watt

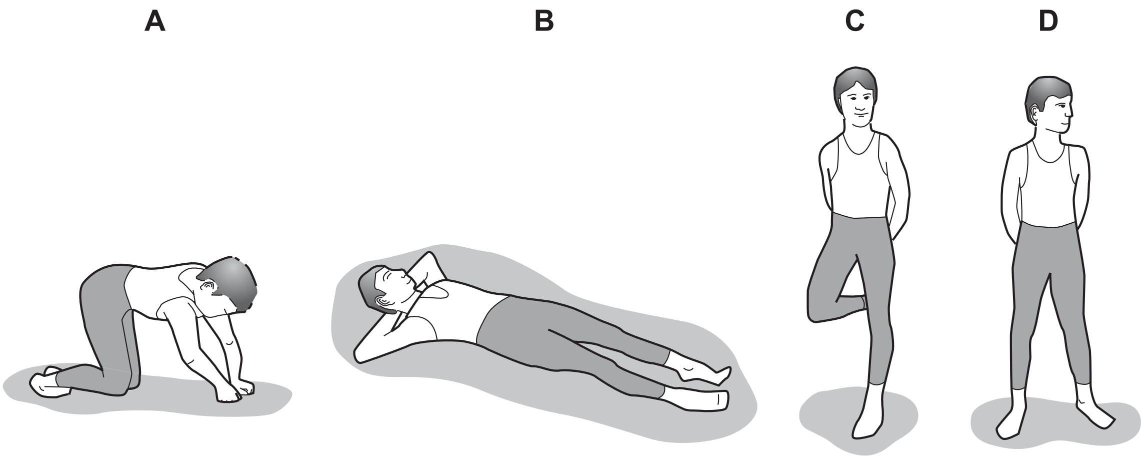
12 The diagram shows a U-tube manometer containing three liquids: mercury, liquid X and liquid Y. Neither liquid X or liquid Y mixes with mercury.



Which row compares the pressure exerted by liquid X and by liquid Y on the mercury, and the density of liquid X and the density of liquid Y?

	pressure exerted by X and by Y on the mercury	densities of X and of Y
A	pressure of X is greater than Y	density of X is greater than Y
B	pressure of Y is greater than X	density of Y is greater than X
C	pressure of X and of Y is the same	density of X is greater than Y
D	pressure of X and of Y is the same	density of Y is greater than X

13 Which diagram shows an athlete exerting least pressure on the ground?



14 A car tyre runs over a nail which makes a hole in it. The air in the tyre leaks out.

Why does the air leave the tyre?

A The pressure inside the tyre is greater than the pressure outside.

B The pressure inside the tyre is less than the pressure outside.

C The temperature inside the tyre is greater than the temperature outside.

D The temperature inside the tyre is less than the temperature outside.

15 On a cold day, a metal measuring tape graduated in millimetres is used to measure the distance between two fence posts. The measuring tape reads 3.000 m.

On a much hotter day, the metal measuring tape is used to measure the length of the same distance again. The metal measuring tape has a higher temperature than the ground. The temperature of the ground remains constant.

Which statement is correct?

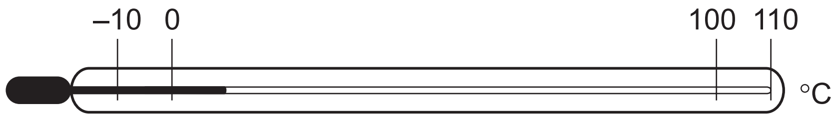
A The measuring tape reads less than 3.000 m because the graduations are closer together.

B The measuring tape reads less than 3.000 m because the graduations are further apart.

C The measuring tape reads more than 3.000 m because the graduations are closer together.

D The measuring tape reads more than 3.000 m because the graduations are further apart.

16 A thermometer has graduations which start at –10 °C and end at 110 °C.



What is the lower fixed point and what is the upper fixed point of the Celsius scale?

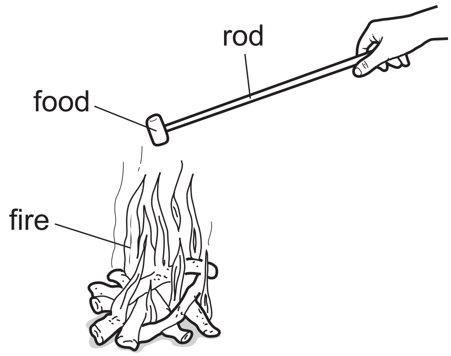
	lower fixed point / °C	upper fixed point / °C
A	–10	100
B	–10	110
C	0	100
D	0	110

17 Which row describes the process of melting?

	initial state	final state	change in temperature?
A	liquid	gas	yes
B	liquid	solid	no
C	solid	gas	yes
D	solid	liquid	no

18 Four campers are warming their food on a fire.

They use different rods, each of the same dimensions, to hold their food near the fire.



Which material is the best choice to prevent their hands from getting too hot?

A aluminium

B copper

C steel

D wood

19 A beaker of water is heated and thermal energy travels through the water by convection.

What happens to the density of the water when it is heated and how does the water move?

A The density decreases and the heated water moves downwards.

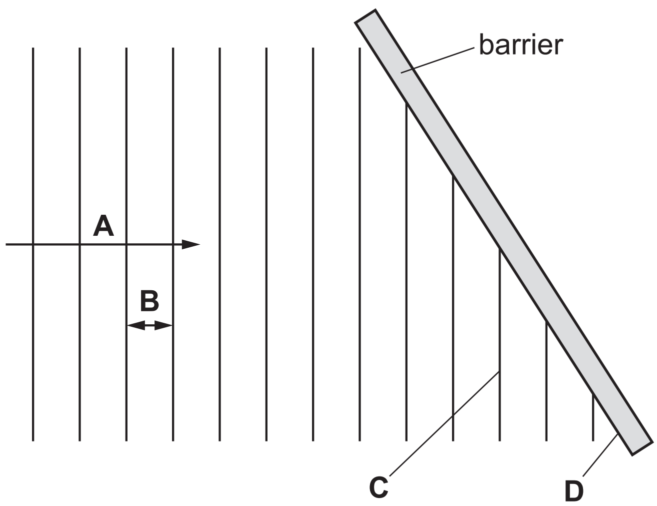
B The density decreases and the heated water moves upwards.

C The density increases and the heated water moves downwards.

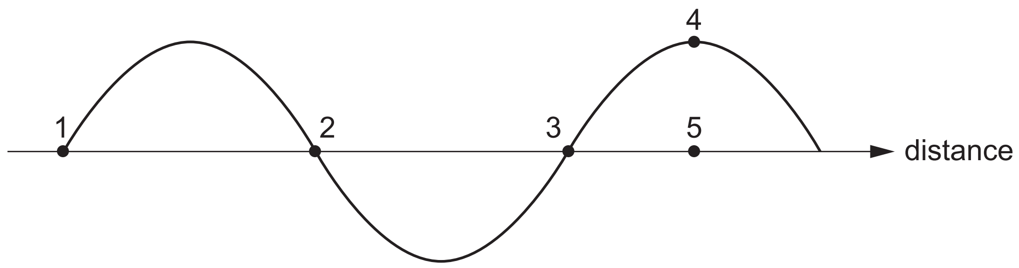
D The density increases and the heated water moves upwards.

20 The diagram shows a wave before it reflects from a barrier.

Which labelled section of the diagram represents a wavefront?



21 The diagram shows a transverse wave.



Which distance is equal to one wavelength?

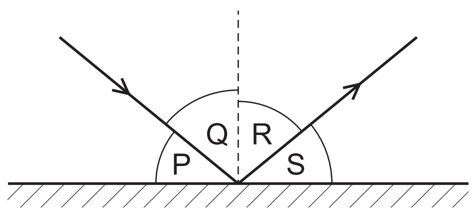
A the distance between points 1 and 2

B the distance between points 1 and 3

C the distance between points 2 and 3

D the distance between points 4 and 5

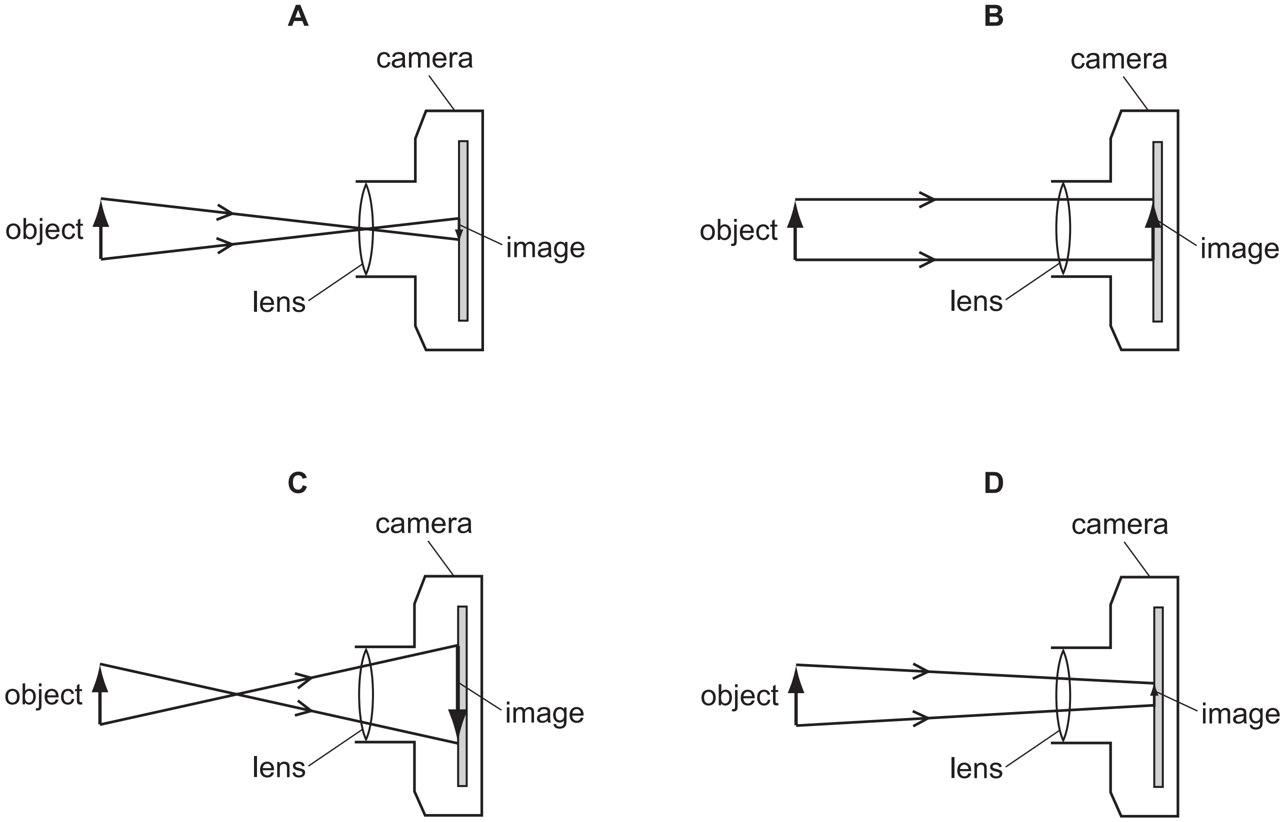
22 A ray of light is reflected by a plane mirror.



Which row shows the angle of incidence and the angle of reflection?

	angle of incidence	angle of reflection
A	P	Q
B	P	S
C	Q	R
D	R	S

23 Which diagram correctly represents rays of light passing through a converging lens in a camera?



24 Which statement about microwaves is correct?

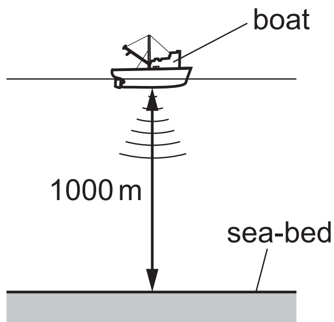
A Microwaves are longitudinal waves.

B The frequencies of microwaves are greater than the frequencies of visible light.

C The speed of microwaves in a vacuum is equal to the speed of visible light in a vacuum.

D The wavelengths of microwaves are smaller than the wavelengths of infra-red.

25 A pulse of sound is produced at the bottom of a boat. The sound travels through the water and is reflected from the sea-bed. The sound reaches the boat again after 1.3 s. The sea-bed is 1000 m below the boat.



Using this information, what is the speed of sound in the water?

A 770 m/s　**B** 1300 m/s　**C** 1500 m/s　**D** 2600 m/s

26 Which action will **not** magnetise a rod?

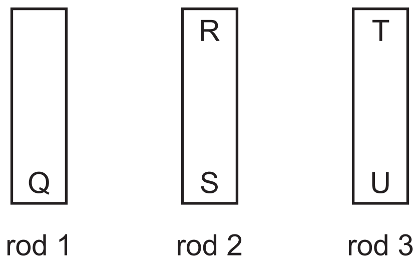
A placing a copper rod inside a coil carrying a direct current

B stroking a steel rod with a permanent magnet

C hammering a steel rod aligned with the Earth's magnetic field

D placing a soft-iron rod close to a permanent magnet

27 The ends of three metal rods are tested by holding end Q of rod 1 close to the others in turn.



The results are as follows.

End Q attracts end R.

End Q attracts end S.

End Q attracts end T.

End Q repels end U.

Which of the metal rods is a magnet?

A rod 1 only

B rod 1 and rod 2

C rod 1 and rod 3

D rod 3 only

28 Which statement about a voltmeter is correct?

A A voltmeter measures the current in a component and is connected in series with the component.

B A voltmeter measures the current in a component and is connected in parallel with the component.

C A voltmeter measures the potential difference (p.d.) across a component and is connected in series with the component.

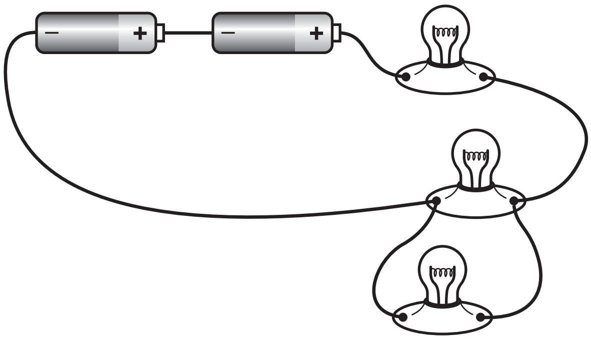
D A voltmeter measures the potential difference (p.d.) across a component and is connected in parallel with the component.

29 Four wires are made from the same metal.

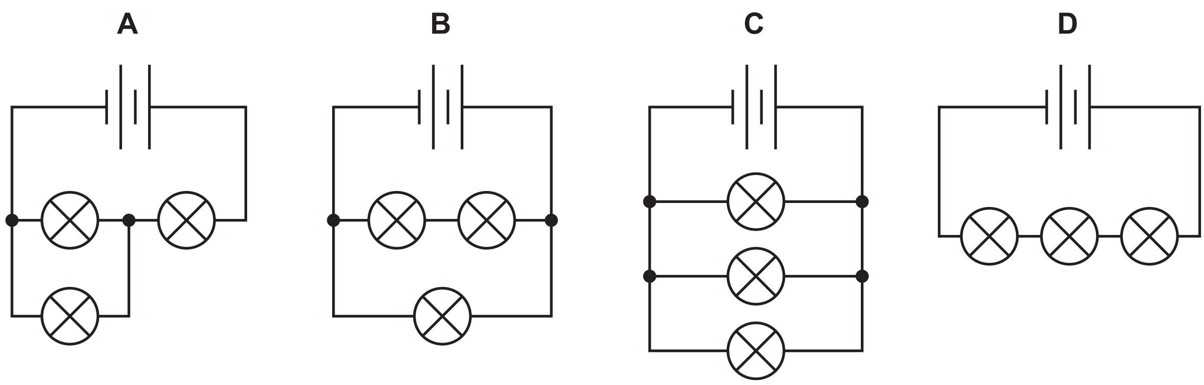
Which wire has the lowest resistance?

	length of wire / cm	diameter of wire / mm
A	20	0.20
B	20	0.40
C	40	0.20
D	40	0.40

30 A student sets up a circuit containing a battery of two cells and three lamps, as shown.

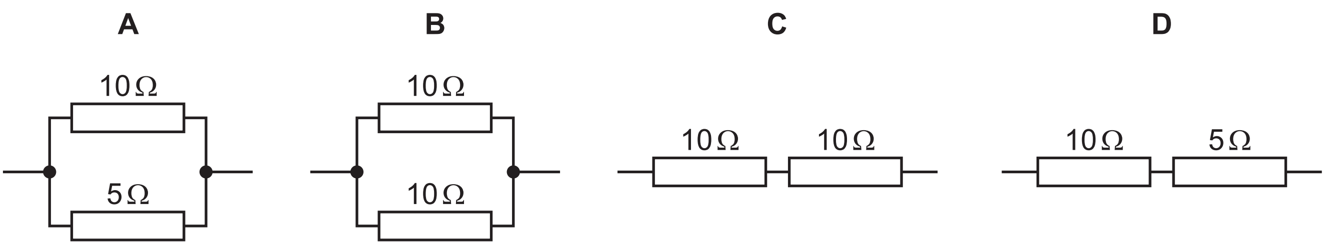


What is the circuit diagram for this arrangement?

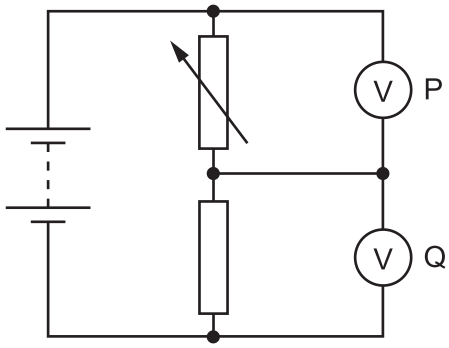


31 The diagrams show different resistor arrangements.

Which arrangement has the smallest combined resistance?



32 The diagram shows a potential divider circuit.



The resistance of the variable resistor is increased.

Which row shows what happens to the reading on voltmeter P and on voltmeter Q?

	reading on voltmeter P	reading on voltmeter Q
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

33 The current in a kettle is 10 A and the kettle is protected by a 13 A fuse.

The owner of the kettle replaces the 13 A fuse with a 3 A fuse.

What happens when the kettle is switched on?

A The fuse melts and the kettle might be damaged.

B The fuse melts and the kettle is undamaged.

C The fuse does not melt and the kettle works correctly.

D The fuse does not melt but the kettle fails to work.

34 A student wishes to demonstrate electromagnetic induction.

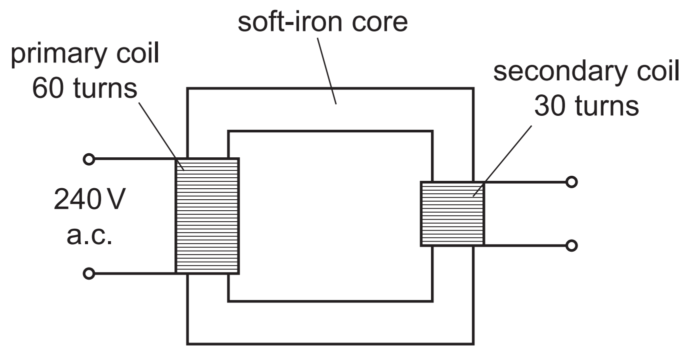
He has a magnet and connecting wires.

Which other apparatus does he need?

	voltmeter	battery
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key
✓ = needed
✗ = not needed

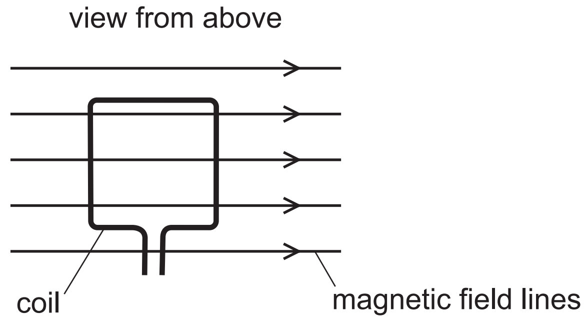
35 The diagram shows a transformer connected to a 240 V a.c. supply.



What is the potential difference across the secondary coil of the transformer?

A 30 V **B** 120 V **C** 240 V **D** 480 V

36 A current-carrying coil is placed in a magnetic field.



Which effect does the coil experience?

A a change in shape

B a change in weight

C a resultant force

D a turning effect

37 Which statement about the structure of an atom is correct?

A Negative electrons surround a neutral nucleus.

B Negative electrons surround a positive nucleus.

C Positive electrons surround a neutral nucleus.

D Positive electrons surround a negative nucleus.

38 What are isotopes of an element?

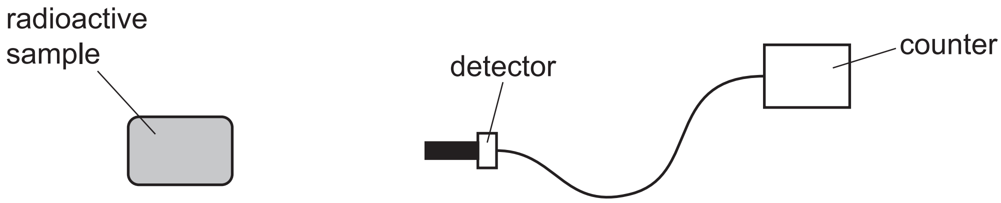
A atoms of a different element with a different number of neutrons

B atoms of a different element with a different number of protons

C atoms of the same element with a different number of neutrons

D atoms of the same element with a different number of protons

39 A student measures the level of radiation emitted by a radioactive sample.



The table shows the readings she records on the counter over a short period of time.

counter reading / counts per minute	106	96	98	100

The sample is removed and the counter then shows a background radiation reading of 4 counts per minute.

What is the best estimate for the average count rate due to the radioactive sample?

A 96 counts per minute

B 98 counts per minute

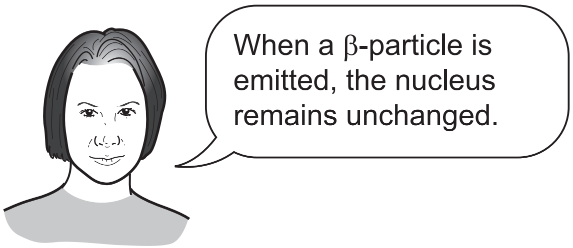
C 100 counts per minute

D 104 counts per minute

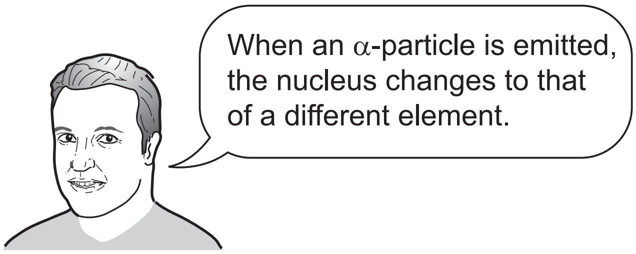
40 Four students are discussing ideas about radioactive decay.

Which student's statement is correct?

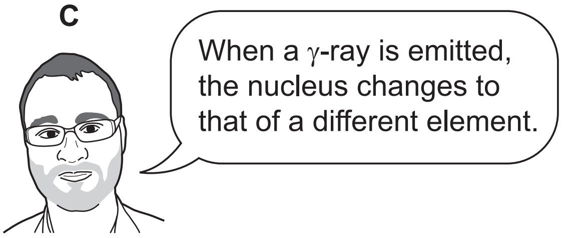
A



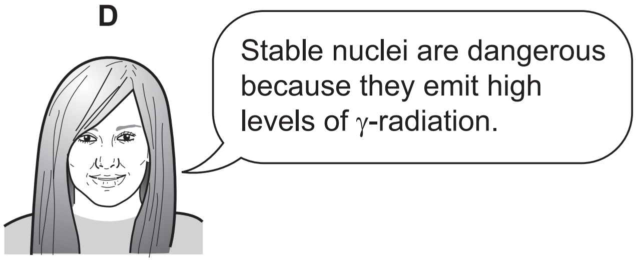
B



C



D



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PHYSICS **0625/22**

Paper 2 Multiple Choice (Extended) **February/March 2019**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

1358010994

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

This document consists of **15** printed pages and **1** blank page.

IB19 03_0625_22/3RP

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1 Which row shows the best choice of measuring instruments to obtain accurate values for the distances shown?

	diameter of wire	height of bench	length of laboratory
A	measuring tape	measuring tape	micrometer screw gauge
B	metre rule	micrometer screw gauge	measuring tape
C	micrometer screw gauge	measuring tape	metre rule
D	micrometer screw gauge	metre rule	measuring tape

2 An object is moving with uniform deceleration.

Which statement describes its motion?

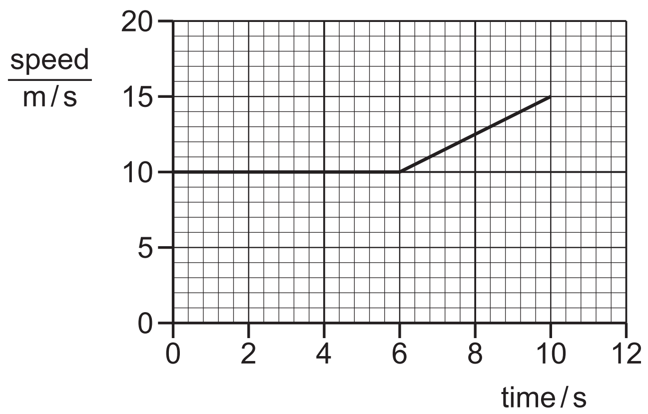
A Its rate of change of speed is decreasing.

B Its speed is constant.

C Its speed is decreasing.

D Its speed is increasing.

3 The graph shows how the speed of a car varies during part of its journey.



What is the value of the car's acceleration between 6 s and 10 s?

A 0.50 m/s^2 **B** 0.80 m/s^2 **C** 1.25 m/s^2 **D** 1.50 m/s^2

4 The gravitational field strength on the Moon is less than on the Earth.

Which of these is **different** when done on the Moon compared with when done on the Earth?

A the gravitational potential energy gained by a stone lifted through the same vertical height

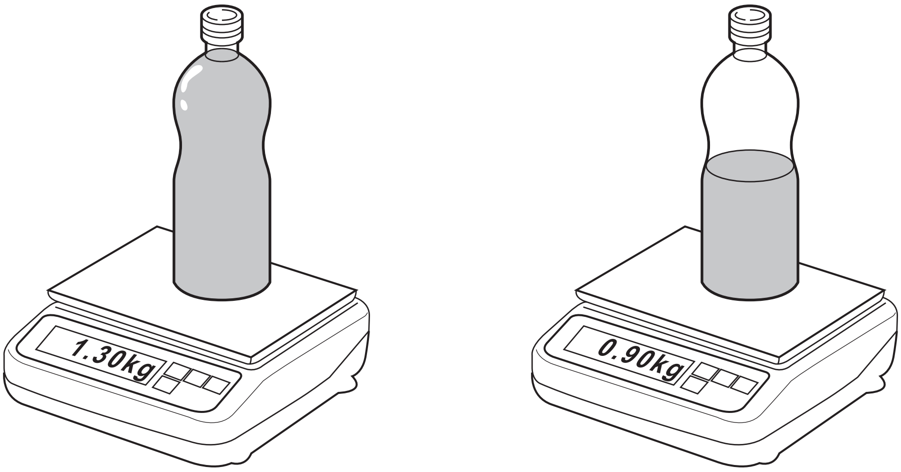
B the kinetic energy gained by a ball when hit with the same force for the same period of time

C the momentum gained by a bullet when fired from the same gun

D the work done in accelerating a stone from rest to the same speed

5 The mass of a full bottle of cooking oil is 1.30 kg.

When exactly half of the oil has been used, the mass of the bottle plus the remaining oil is 0.90 kg.



What is the mass of the empty bottle?

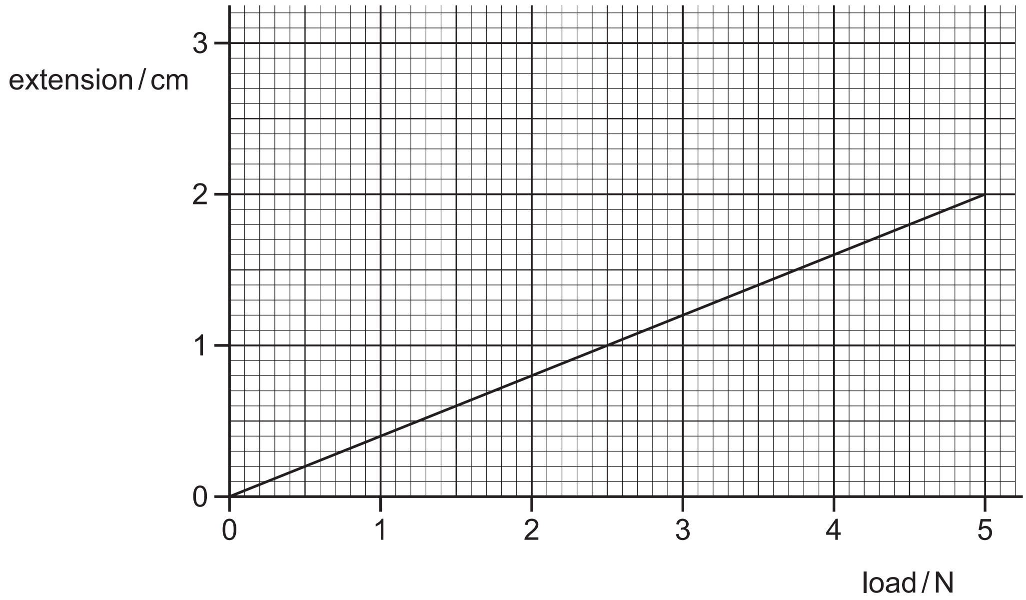
A 0.40 kg **B** 0.50 kg **C** 0.65 kg **D** 0.80 kg

6 A solid ball has a volume of $4.0\,cm^3$. The density of the ball is $1.6\,g/cm^3$.

What is the mass of the ball?

A 0.4 g **B** 2.5 g **C** 4.0 g **D** 6.4 g

7 The extension / load graph for a spring is shown. The unstretched length of the spring is 15.0 cm.



When an object of unknown weight is suspended on the spring, the length of the spring is 16.4 cm.

What is the weight of the object?

A 0.55 N **B** 0.67 N **C** 3.5 N **D** 4.1 N

8 A box of mass 2.0 kg is pulled across the floor by a force of 6.0 N.

The frictional force acting on the box is 1.0 N.

What is the acceleration of the box?

A $0.40\,\text{m/s}^2$ **B** $2.5\,\text{m/s}^2$ **C** $3.0\,\text{m/s}^2$ **D** $3.5\,\text{m/s}^2$

9 Which moving body has a resultant force acting on it?

A a diver rising vertically through water at constant speed

B an aircraft circling an airport at constant speed

C a train going up a straight incline at constant speed

D a parachutist descending vertically at terminal velocity

10 A constant force acts on a body causing the momentum of the body to increase.

Which expression relates the force to the momentum and the time taken?

A force = $\dfrac{\text{change in momentum}}{\text{time taken}}$

B force = $\dfrac{\text{momentum}}{\text{time taken}}$

C force = change in momentum × time taken

D force = momentum × time taken

11 A car of mass 1500 kg has a speed of 20 m/s. It accelerates until its speed is 25 m/s.

What is the increase in the kinetic energy of the car?

A 19 kJ **B** 38 kJ **C** 170 kJ **D** 340 kJ

12 Which source of energy uses the production of steam to generate electrical energy?

A hydroelectric

B nuclear

C tides

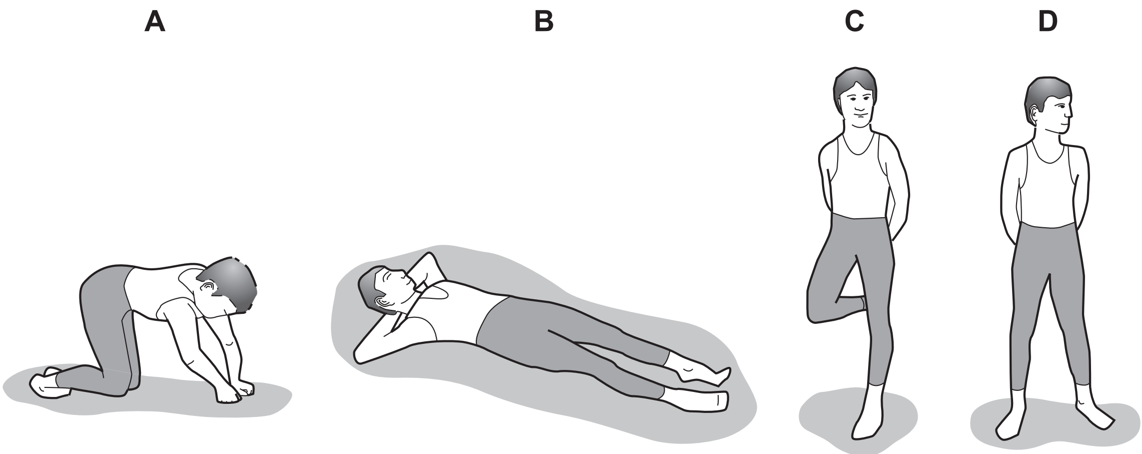
D waves

13 A car, travelling on a straight horizontal road, has 1.6 MJ of kinetic energy. It accelerates for 20 s until it has 2.5 MJ of kinetic energy.

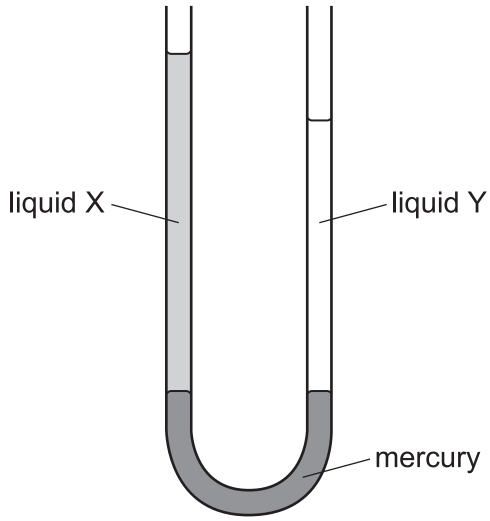
What is the average power output used to increase the kinetic energy of the car?

A 45 W **B** 205 W **C** 45 kW **D** 205 kW

14 Which diagram shows an athlete exerting least pressure on the ground?



15 The diagram shows a U-tube manometer containing three liquids: mercury, liquid X and liquid Y. Neither liquid X or liquid Y mixes with mercury.



Which row compares the pressure exerted by liquid X and by liquid Y on the mercury, and the density of liquid X and the density of liquid Y?

	pressure exerted by X and by Y on the mercury	densities of X and of Y
A	pressure of X is greater than Y	density of X is greater than Y
B	pressure of Y is greater than X	density of Y is greater than X
C	pressure of X and of Y is the same	density of X is greater than Y
D	pressure of X and of Y is the same	density of Y is greater than X

16 Gas molecules exert a pressure when they collide with the walls of a container.

Which statement is correct?

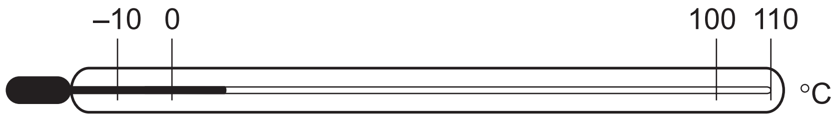
A They experience a change in force which exerts a pressure equal to momentum × area on the walls.

B They experience a change in force which exerts a pressure equal to $\frac{\text{momentum}}{\text{area}}$ on the walls.

C They experience a change in momentum which exerts a pressure equal to force × area on the walls.

D They experience a change in momentum which exerts a pressure equal to $\frac{\text{force}}{\text{area}}$ on the walls.

17 A thermometer has graduations which start at –10 °C and end at 110 °C.



What is the lower fixed point and what is the upper fixed point of the Celsius scale?

	lower fixed point / °C	upper fixed point / °C
A	–10	100
B	–10	110
C	0	100
D	0	110

18 A 1 kg block of aluminium requires more thermal energy to raise its temperature by 1 °C than a 1 kg block of copper requires.

Why is this?

A Aluminium is a better conductor of thermal energy than copper.

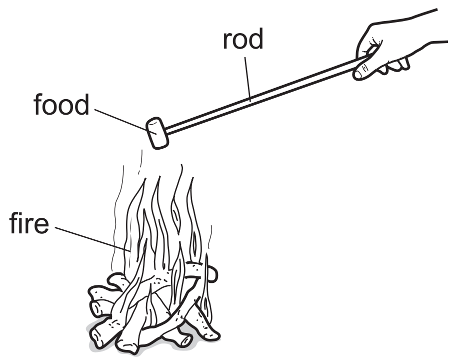
B Aluminium is a poorer conductor of thermal energy than copper.

C Aluminium has a higher specific heat capacity than copper.

D Aluminium has a lower specific heat capacity than copper.

19 Four campers are warming their food on a fire.

They use different rods, each of the same dimensions, to hold their food near the fire.



Which material is the best choice to prevent their hands from getting too hot?

A aluminium

B copper

C steel

D wood

20 Two metal cans are identical, except that one has a shiny silver outer surface and the other has a dull black outer surface. They each have 300 g of water at 80 °C sealed inside them. They are both in a vacuum, in the darkness of outer space.

How does the temperature of the water in each one change?

A Neither one will cool down.

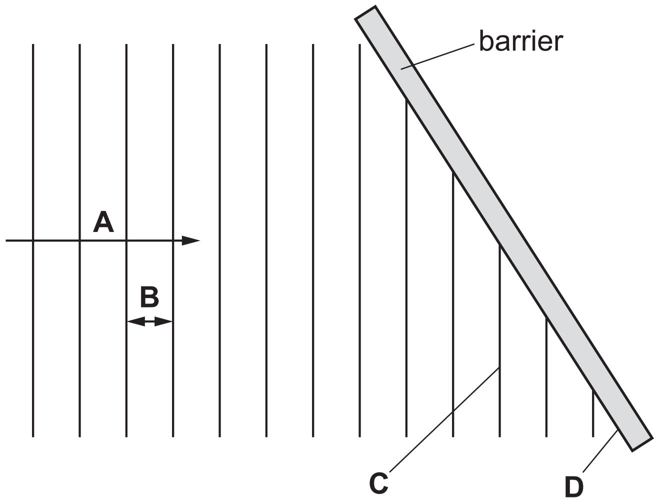
B The water in the black can cools more slowly than that in the shiny can.

C The water in the shiny can cools more slowly than that in the black can.

D They both cool down at the same rate.

21 The diagram shows a wave before it reflects from a barrier.

Which labelled section of the diagram represents a wavefront?

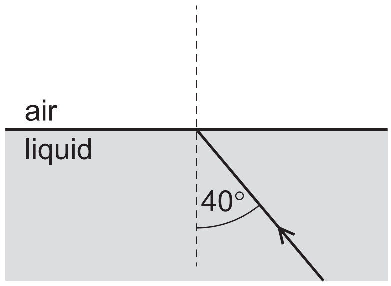


22 A vibrating object produces ripples on the surface of a liquid. The object completes 20 vibrations every second. The spacing of the ripples, from one crest to the next, is 3.0 cm.

What is the speed of the ripples?

A 0.15 cm / s **B** 6.7 cm / s **C** 60 cm / s **D** 120 cm / s

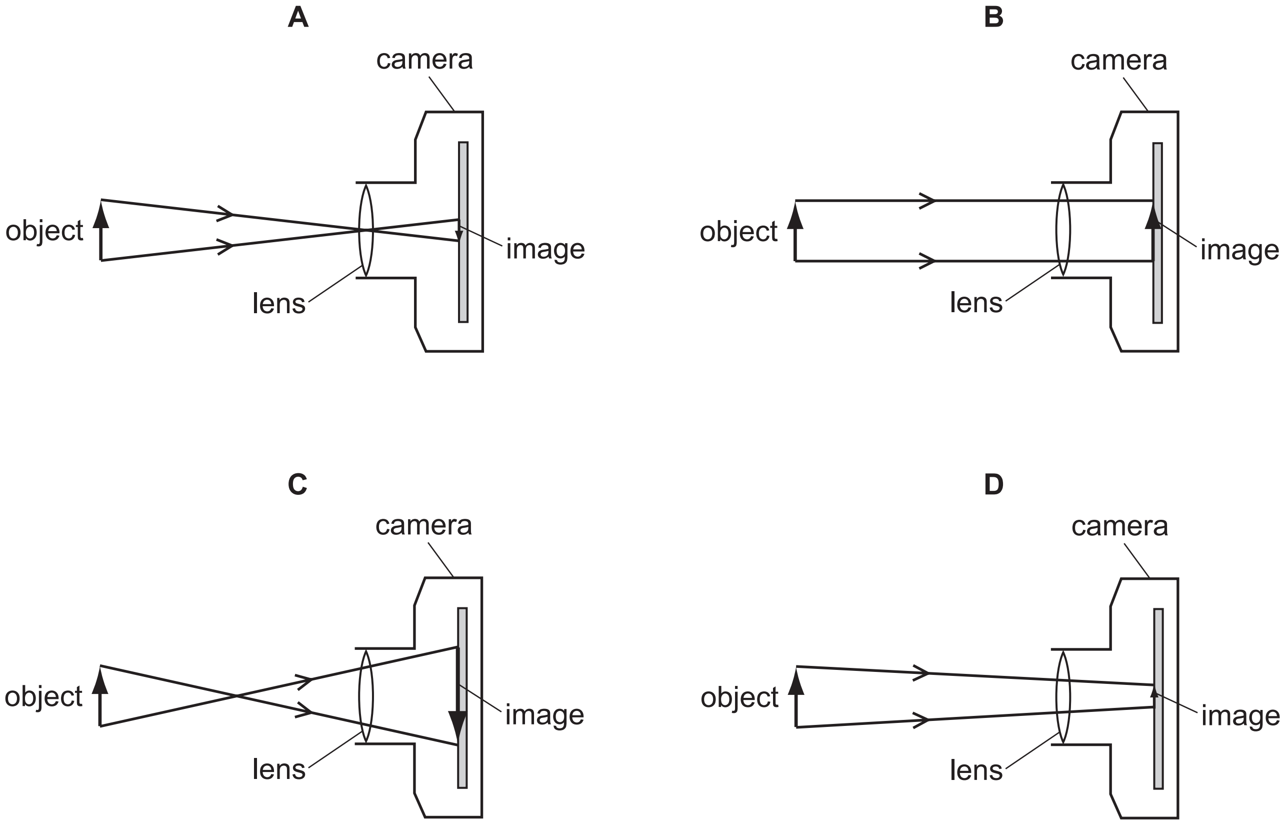
23 A narrow beam of light is travelling through a transparent liquid. It meets the surface as shown, at an angle of incidence of 40°. The refractive index of the liquid is 1.5.



What is the angle of refraction as the light enters the air?

A 25° **B** 27° **C** 60° **D** 75°

24 Which diagram correctly represents rays of light passing through a converging lens in a camera?



25 What is the speed of X-rays in a vacuum and in air?

	in a vacuum	in air
A	3.0×10^6 m/s	2.0×10^6 m/s
B	3.0×10^6 m/s	3.0×10^6 m/s
C	3.0×10^8 m/s	2.0×10^8 m/s
D	3.0×10^8 m/s	3.0×10^8 m/s

26 A sound wave passes a point. The air pressure at that point increases and then decreases 300 times every second.

Which descriptions apply to this sound wave?

	the type of wave motion	the frequency of the sound
A	longitudinal	outside human hearing range
B	longitudinal	within human hearing range
C	transverse	outside human hearing range
D	transverse	within human hearing range

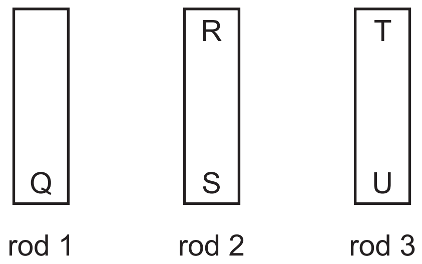
27 A boy stands 150 m from a wall. He claps and when he hears the echo, he immediately claps again. He continues this for some time.

Another student has a stop-watch. She starts the watch on the first clap and stops it on the eleventh clap. The watch reads 10.0 s.

Which value do her measurements give for the speed of sound in air?

A 150 m / s **B** 170 m / s **C** 300 m / s **D** 330 m / s

28 The ends of three metal rods are tested by holding end Q of rod 1 close to the others in turn.



The results are as follows.

End Q attracts end R.

End Q attracts end S.

End Q attracts end T.

End Q repels end U.

Which of the metal rods is a magnet?

A rod 1 only

B rod 1 and rod 2

C rod 1 and rod 3

D rod 3 only

29 A metal sphere is charged by induction. There are four stages W, X, Y and Z in this process.

W a charged rod is brought near to the sphere

X the sphere is earthed

Y the charged rod is taken away from the sphere

Z the earth connection is removed

In which order are the four stages carried out?

A W → X → Y → Z

B W → X → Z → Y

C Z → W → X → Y

D X → Z → W → Y

30 Which electrical quantity is defined in terms of the energy supplied in driving charge round a complete circuit?

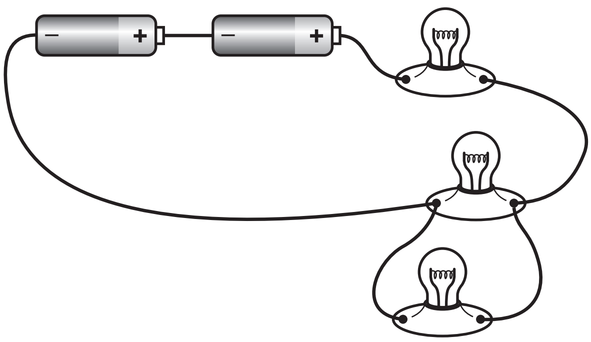
A current

B electromotive force

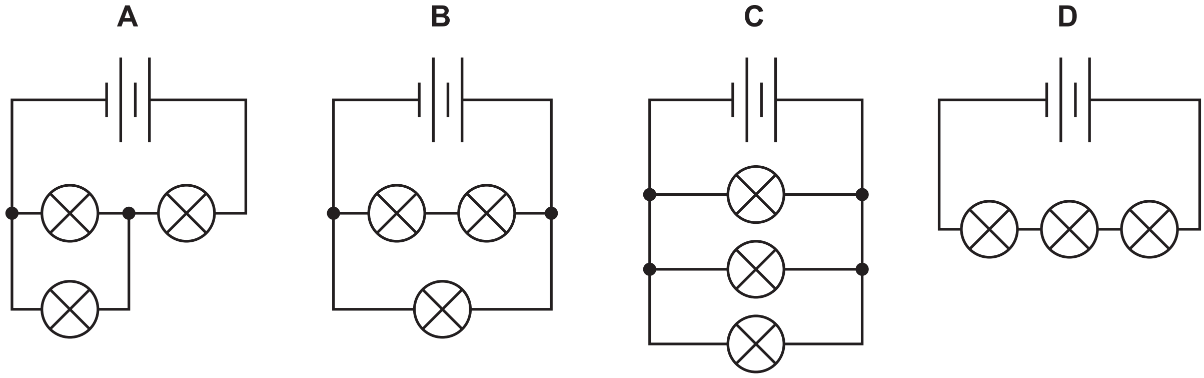
C potential difference

D power

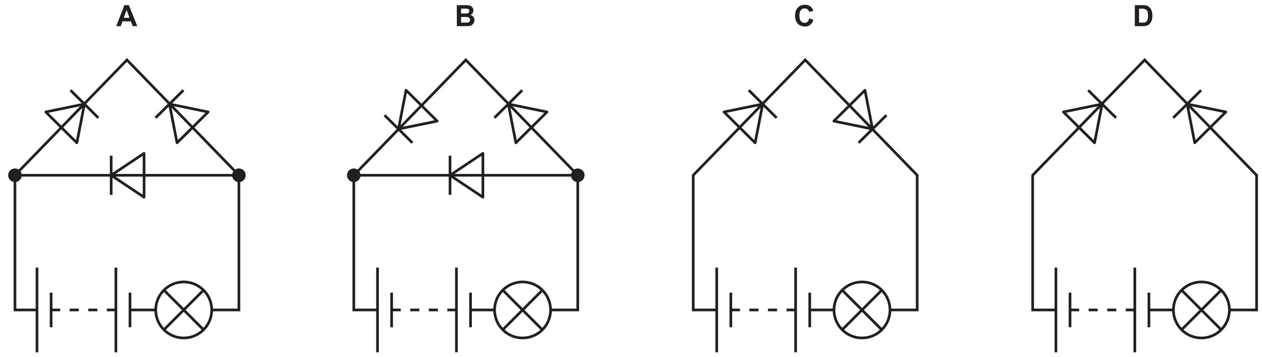
31 A student sets up a circuit containing a battery of two cells and three lamps, as shown.



What is the circuit diagram for this arrangement?

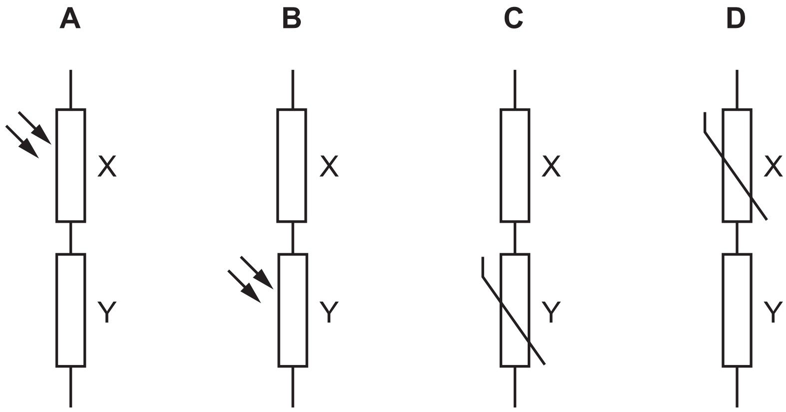


32 In which circuit does the lamp light?



33 Each potential divider is placed in a circuit with a power supply.

Which potential divider makes the potential difference across component Y increase when the light intensity increases?



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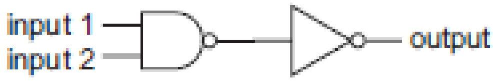
34 There are two inputs to the combination of logic gates shown, and one output.



Which truth table represents the action of this combination of gates?

A

input 1	input 2	output
0	0	0
0	1	0
1	0	0
1	1	1

B

input 1	input 2	output
0	0	0
0	1	1
1	0	1
1	1	1

C

input 1	input 2	output
0	0	1
0	1	1
1	0	1
1	1	0

D

input 1	input 2	output
0	0	1
0	1	0
1	0	0
1	1	0

35 The current in a kettle is 10 A and the kettle is protected by a 13 A fuse.

The owner of the kettle replaces the 13 A fuse with a 3 A fuse.

What happens when the kettle is switched on?

A The fuse melts and the kettle might be damaged.

B The fuse melts and the kettle is undamaged.

C The fuse does not melt and the kettle works correctly.

D The fuse does not melt but the kettle fails to work.

36 Which statement about the direction of a magnetic field at a point is correct?

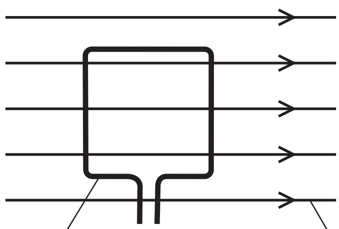
A It is the direction of the force on a north pole placed at that point.

B It is the direction of the force on a south pole placed at that point.

C It is the direction of the force on a positive charge placed at that point.

D It is the direction of the force on a negative charge placed at that point.

37 A current-carrying coil is placed in a magnetic field.



Which effect does the coil experience?

A a change in shape

B a change in weight

C a resultant force

D a turning effect

38 What are isotopes of an element?

A atoms of a different element with a different number of neutrons

B atoms of a different element with a different number of protons

C atoms of the same element with a different number of neutrons

D atoms of the same element with a different number of protons

39 A radioactive isotope of carbon ^{14}C decays by beta emission to give an isotope of nitrogen ^{14}N and a beta particle. The equation for the reaction is shown.

$$^{14}_{X}C \rightarrow {}^{14}_{7}N + {}^{0}_{Y}\beta$$

What is the value of X and of Y?

	X	Y
A	6	–1
B	6	1
C	8	–1
D	8	1

40 A beta particle is a fast moving electron.

Which statement explains how beta particles are emitted from an atom?

A An electron is emitted as a beta particle from an inner electron shell of the atom.

B An electron is emitted as a beta particle from an outer electron shell of the atom.

C A neutron changes into a proton and a beta particle is emitted from the nucleus.

D A proton changes into a neutron and a beta particle is emitted from the nucleus.

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CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

6422375003

PHYSICS **0625/32**

Paper 3 Theory (Core) **February/March 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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PHYSICS **0625/32**

Paper 3 Theory (Core) **February/March 2019**

1 hour 15 minutes

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ERRATUM NOTICE
TO BE OPENED ON THE DAY OF THE EXAMINATION

FOR THE ATTENTION OF THE EXAMINATIONS OFFICER AND INVIGILATOR

TO BE GIVEN TO CANDIDATES WITH THE QUESTION PAPER

Turn to **page 9.**

Question 6(a) reads:

Fig. 6.1 shows a cross-section of the inside of an electric oven.

Question 6(a) should read:

Fig. 6.1 is a diagram of the inside of an electric oven. The diagram shows a side view of the oven.

Cambridge Assessment International Education

1 Fig. 1.1 shows a set of masses made from the same material.

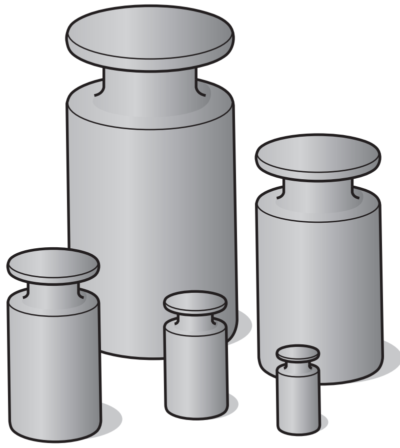


Fig. 1.1

(a) Identify the quantity that is the same for all the masses.

Tick **one** box.

☐ density

☐ volume

☐ weight [1]

(b) The largest mass is 2.5 kg.

State the number of grams in 2.5 kg.

2.5 kg = ... g [1]

(c) The three largest masses are 2.5 kg, 1.0 kg and 0.5 kg.

Calculate the combined **weight** of these three masses. Include the unit.

weight = ... [4]

[Total: 6]

2 Fig. 2.1 shows students getting onto a school bus.

Fig. 2.1

(a) A student describes part of the journey.

The bus accelerates from rest at a constant rate for 10 s. It reaches a maximum speed of 10 m/s.

The bus maintains a constant speed of 10 m/s for 60 s.

The bus then decelerates at a constant rate for 15 s, until it stops.

On Fig. 2.2, draw the speed-time graph for this part of the journey made by the bus.

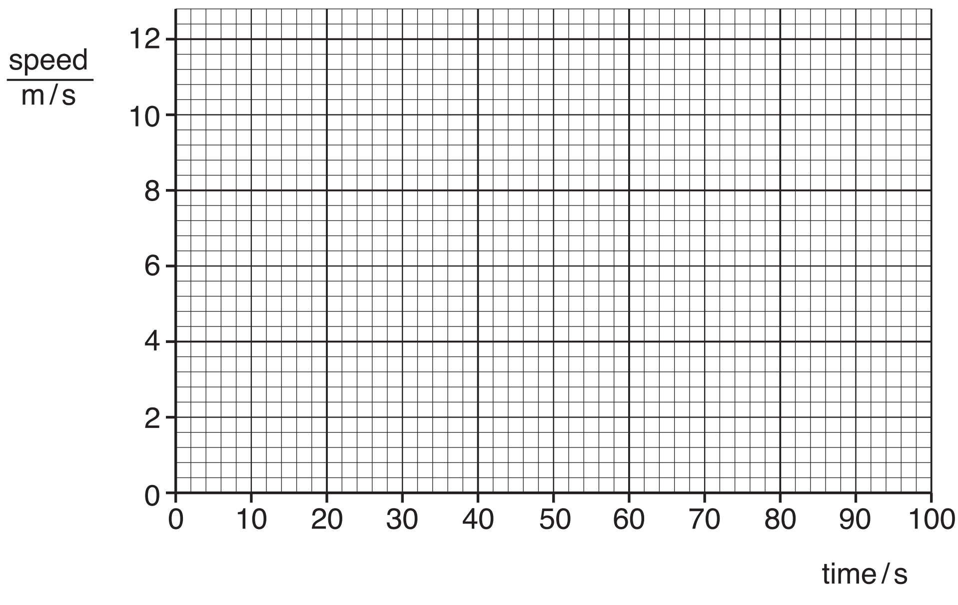


Fig. 2.2 [5]

(b) On another part of the journey, the average speed of the bus is 7.5 m/s.

Calculate the distance the bus travels in 150 s.

distance = ... m [3]

[Total: 8]

3 A load is attached to a spring, as shown in Fig. 3.1. Two arrows indicate the vertical forces acting on the load. The spring and the load are stationary.

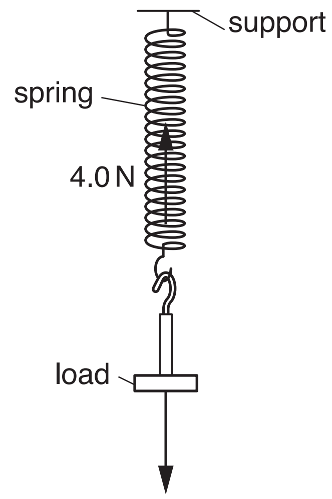


Fig. 3.1

(a) **(i)** State the name of the force acting vertically downwards.

.... [1]

(ii) The vertical force that acts upwards is 4.0 N.

State the value of the force acting vertically downwards.

force = ... N [1]

(b) The load is pulled downwards and then released. The load moves up and down.

Fig. 3.2 represents the vertical forces acting on the load at some time after it is released.

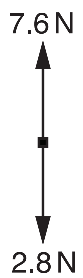


Fig. 3.2

Calculate the resultant force on the load and state its direction.

resultant force = ... N

direction = ...

[2]

(c) **(i)** State the principle of conservation of energy.

....

.... [1]

(ii) Eventually the load stops moving up and down.

Describe and explain why the load stops moving. Use your ideas about conservation of energy.

....

....

....

.... [2]

[Total: 7]

4 Fig. 4.1 shows a truck lifting a heavy load.

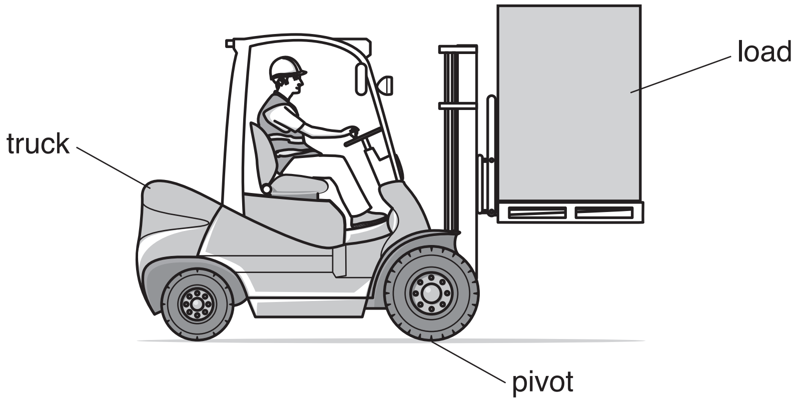


Fig. 4.1

(a) **(i)** The truck is stationary. Identify the quantities that determine the work done as it lifts the load.

Tick the box next to each correct quantity.

☐ distance

☐ force

☐ time [1]

(ii) Draw a ring around the unit for work done from the list.

joule newton pascal watt [1]

(b) Identify the quantities that determine the power of the truck.

Tick the box next to each correct quantity.

☐ energy transferred

☐ temperature

☐ time [1]

(c) The truck has a pivot near the front wheel. Fig. 4.2 represents the pivot and the vertical forces acting on the truck.

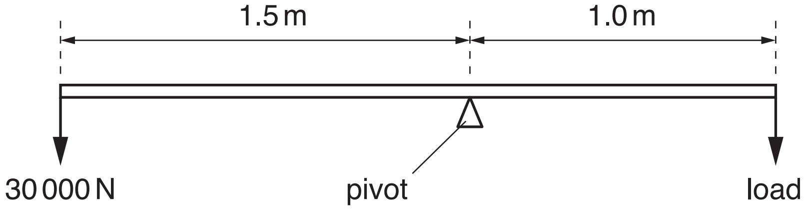


Fig. 4.2

The truck is in equilibrium.

Calculate the load.

load = ... N [3]

(d) Fig. 4.3 shows another truck lifting a pile of identical bricks.

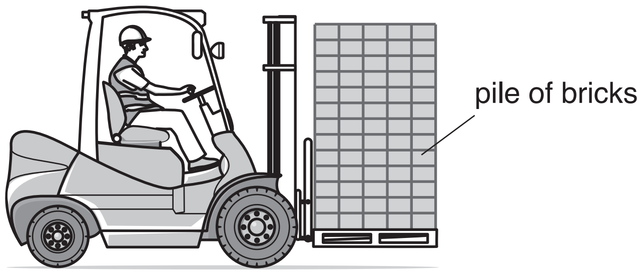


Fig. 4.3

(i) On Fig. 4.3, draw a cross to indicate the centre of mass of the pile of bricks. [1]

(ii) The truck can tilt the pile of bricks backwards, as shown in Fig. 4.4.

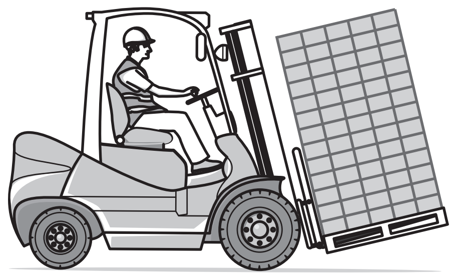


Fig. 4.4

Explain how tilting the pile of bricks backwards makes the truck more stable.

....

....

....

.... [1]

[Total: 8]

5 Fig. 5.1 shows part of a solar farm. The solar panels tilt and rotate.

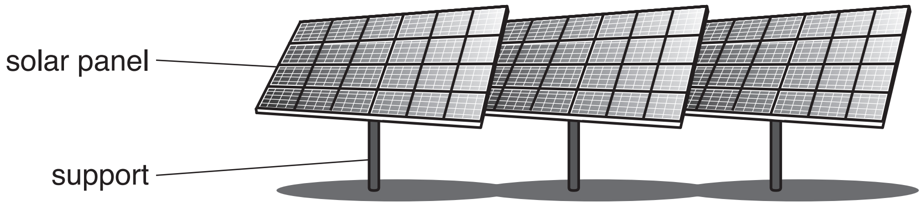


Fig. 5.1

(a) The solar farm converts energy from a source into a different, useful form of energy.

State the energy source and the useful form of energy.

source ....

useful form of energy ....
[2]

(b) Solar farms have advantages and disadvantages.

(i) State **two** advantages of a solar farm.

1. ....

2. ....
[2]

(ii) State **one** disadvantage of a solar farm.

.... [1]

(c) Suggest why it is useful that the panels can tilt and rotate.

....

.... [1]

[Total: 6]

6 **(a)** Fig. 6.1 shows a cross-section of the inside of an electric oven.

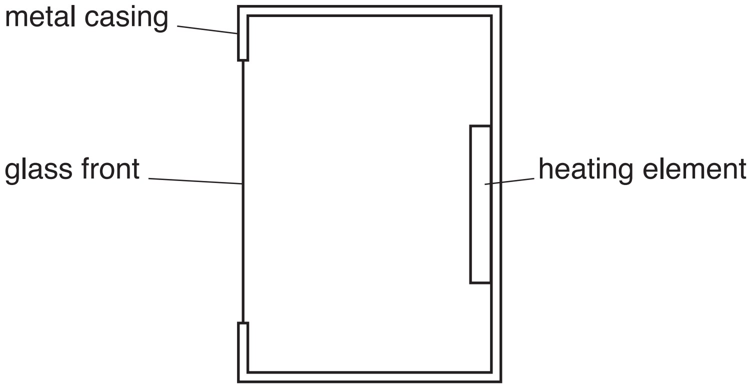


Fig. 6.1

The heater is switched on.

(i) On Fig. 6.1, draw two arrows to show how thermal energy moves throughout the oven by convection. [2]

(ii) Explain how thermal energy moves throughout the oven by convection. Use your ideas about density and expansion.

....

....

....

.... [3]

(iii) Use a word from the box to complete the sentence.

conduction	expansion	insulation	radiation

Thermal energy travels at the speed of light by .... [1]

(b) The oven is in a kitchen that is fitted with a smoke detector.

Warm, moving air can carry smoke particles.

Suggest the best position for the smoke detector in the kitchen.

.... [1]

[Total: 7]

7 Light and sound both travel as waves.

Draw a line from each statement to the correct term that describes it. One has been done for you.

statement	**term**
change in direction of light when entering a medium	amplitude
very high frequency sounds	dispersion
a glass prism producing a spectrum	diffraction
light spreading after passing through a narrow gap	echo
sound reflecting from a wall	longitudinal
seven colours of light	refraction
	spectrum
	ultrasound

[5]

[Total: 5]

8 **(a)** Fig. 8.1 shows an incomplete diagram of the electromagnetic spectrum.

		ultraviolet	visible light			radio waves

← higher frequency　　　　　　　　longer wavelength →

Fig. 8.1

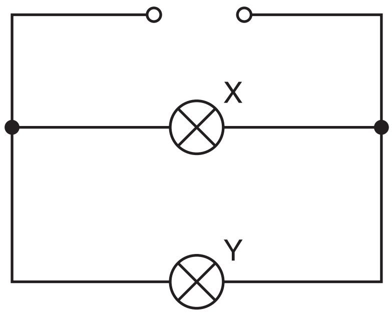
Complete Fig. 8.1 with the names of the missing types of radiation in the correct boxes. [4]

(b) State **one** use for ultraviolet radiation.

.... [1]

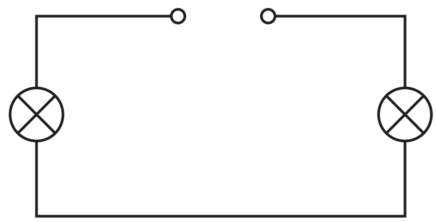
[Total: 5]

9 Fig. 9.1 and Fig. 9.2 each show an electrical circuit. Each circuit has two lamps connected to an electrical supply.



.... circuit

Fig. 9.1



.... circuit

Fig. 9.2

(a) State the term used to describe each electrical circuit. Write the term under each circuit. [2]

(b) State **two** disadvantages of the circuit in Fig. 9.2.

1. ....

2. ....

[2]

(c) Redraw the circuit in Fig. 9.1 with switches that will turn lamps X and Y on and off independently of each other.

[2]

(d) Fig. 9.3 shows another circuit.

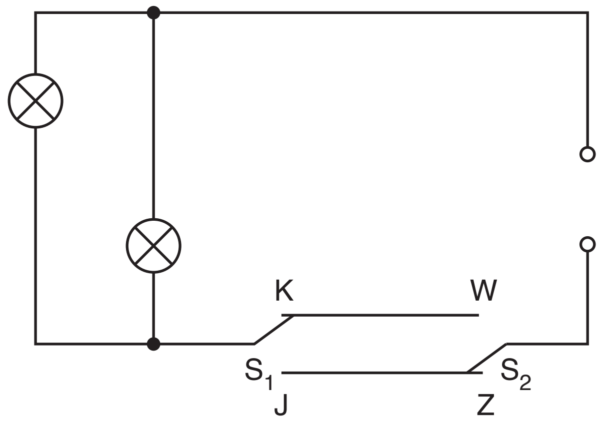


Fig. 9.3

The lamps can be turned on and off using two different switches S_1 and S_2.

Complete the table stating when the lamps are on or off. The first one has been done for you.

switch positions		lamps on or off
S_1	S_2	
K	Z	off
K	W	
J	W	
J	Z	

[3]

[Total: 9]

10 Fig. 10.1 shows the apparatus for an experiment on electrostatics.

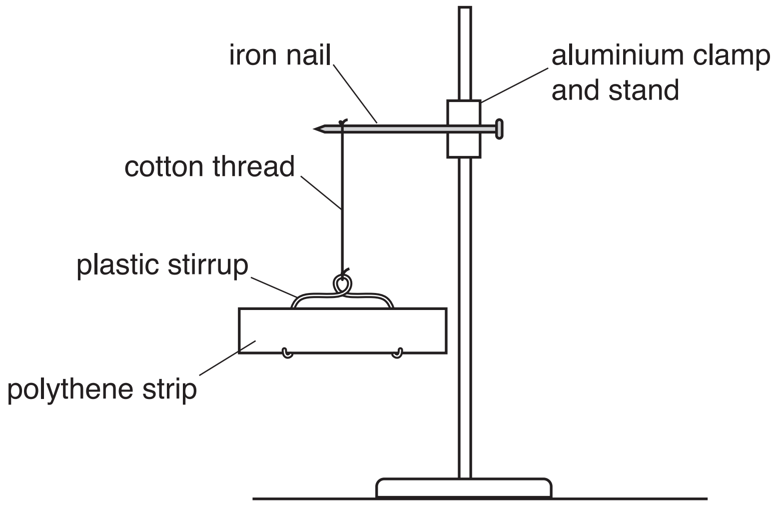


Fig. 10.1

(a) Identify the pieces of equipment that are electrical conductors and those that are electrical insulators. Draw a line from each piece of equipment to the correct box.

aluminium clamp and stand	
plastic stirrup	conductor
iron nail	insulator
cotton thread	

[1]

(b) State and explain how the polythene strip can be given a negative charge.

....

....

.... [2]

(c) Describe how the apparatus in Fig. 10.1 could be used to demonstrate that the polythene strip has a negative charge.

....

....

.... [2]

[Total: 5]

11 Fig. 11.1 shows a relay.

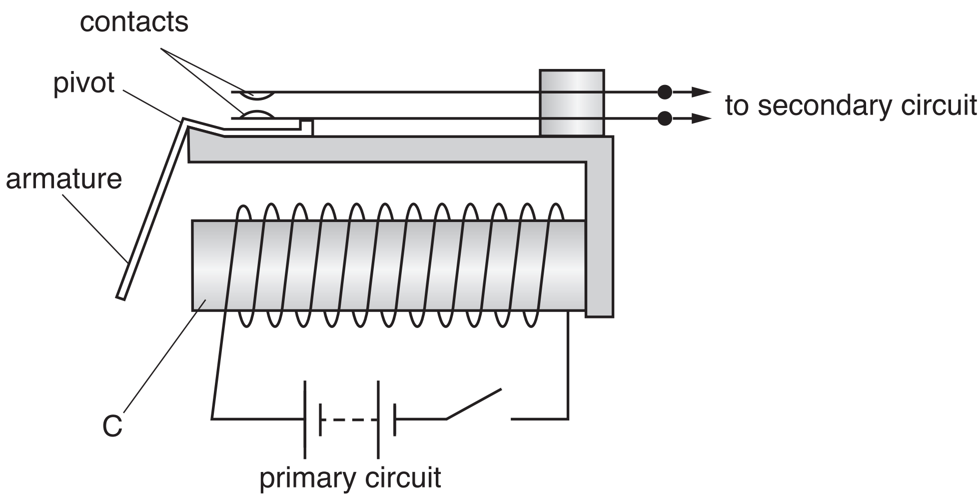


Fig. 11.1

(a) The statements describe the action of a relay. They are **not** in the correct order.

P Current in the coil creates an electromagnet.

Q Secondary circuit is completed.

R Armature pivots, closing the contacts.

S Part C attracts the armature.

T The switch in the primary circuit is closed.

Place the statements in the correct order. One has been done for you.

		S		

[3]

(b) Fig. 11.1 includes the part labelled C, which is made from a metal.

State the name of the metal and explain why this metal is used in the electromagnet.

metal ....

explanation ....

....
[2]

[Total: 5]

12 Astatine-210 is a radioactive material. The nucleus of astatine can be represented by the symbol shown.

$$^{210}_{85}\mathrm{At}$$

(a) Complete the table to describe the nucleus of astatine-210.

type of particle	number of particles	charge on particle
neutron		
		positive

[4]

(b) Astatine-210 has a half-life of 8 hours.

(i) The count rate of a sample of astatine-210 is measured over 24 hours.

On Fig. 12.1, sketch a line to show how the count rate changes over the 24 hours.

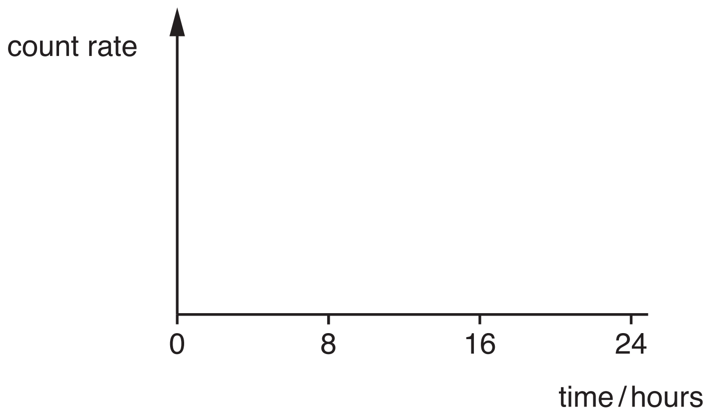


Fig. 12.1

[2]

(ii) The mass of a sample of astatine-210 is 0.500 kg.

Calculate how long it takes for 0.375 kg of the sample to decay.

decay time = ... hours [3]

[Total: 9]

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

6092531240

PHYSICS **0625/42**

Paper 4 Theory (Extended) **February/March 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m/s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

DC (ST/CT) 167383/5

Cambridge Assessment International Education

1 **(a)** Define *acceleration*.

.... [1]

(b) Fig. 1.1 shows the distance-time graph for the journey of a cyclist.

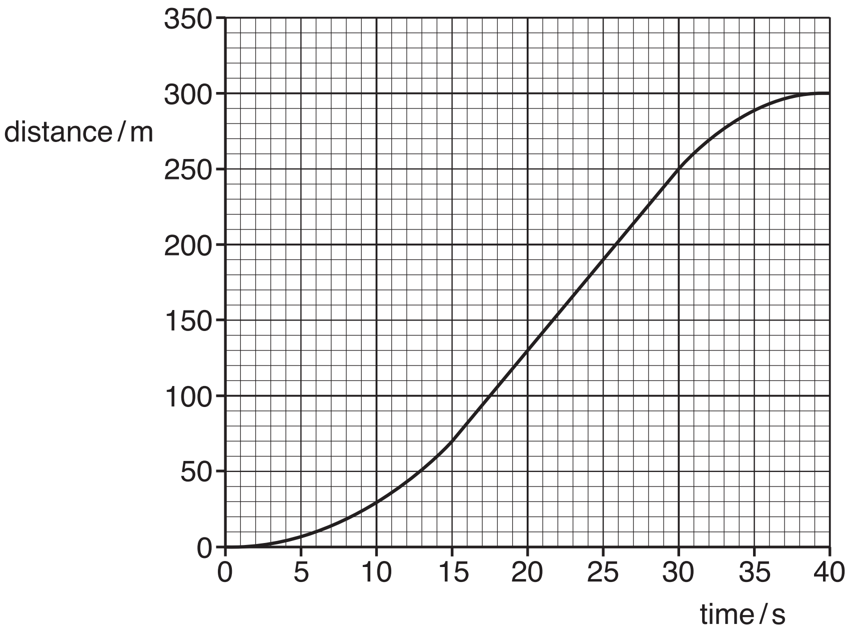


Fig. 1.1

(i) Describe the motion of the cyclist in the time between:

1. time = 0 and time = 15 s

....

2. time = 15 s and time = 30 s

....

3. time = 30 s and time = 40 s.

....

[3]

(ii) Calculate, for the 40 s journey:

1. the average speed

average speed = ... [2]

2. the maximum speed.

maximum speed = ... [2]

[Total: 8]

2 **(a)** State **one** advantage and one disadvantage of using a wind turbine as a source of electrical energy.

advantage ....

disadvantage ....
[2]

(b) Fig. 2.1 shows a wind turbine.

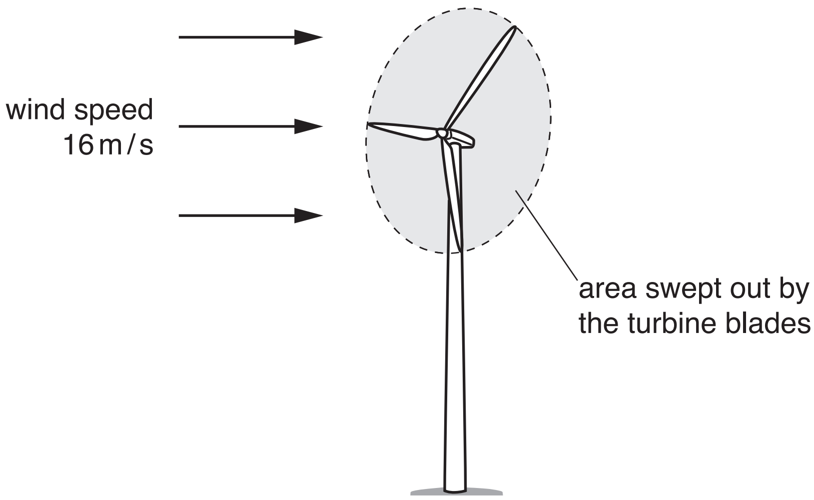


Fig. 2.1

(i) The wind blows at a speed of 16 m/s towards the turbine blades. In one second, a volume of 24 000 m^3 of air passes through the circular area swept out by the blades. The density of air is 1.3 kg/m^3.

Calculate:

1. the mass of air that passes through the circular area swept out by the blades in 1.0 s

mass = ... [2]

2. the kinetic energy of the mass of air that passes through the area swept out by the blades.

kinetic energy = ... [2]

(ii) Suggest why some of the kinetic energy of the air that passes through the circular area swept out by the blades is **not** converted into electrical energy.

....

.... [1]

[Total: 7]

3 **(a)** An object is moving in a straight line at constant speed.

State **three** ways in which a force may change the motion of the object.

1 ....

2 ....

3 ....
[2]

(b) Fig. 3.1 shows an object suspended from two ropes. The weight of the object is 360 N. The magnitude of the tension in each rope is T.

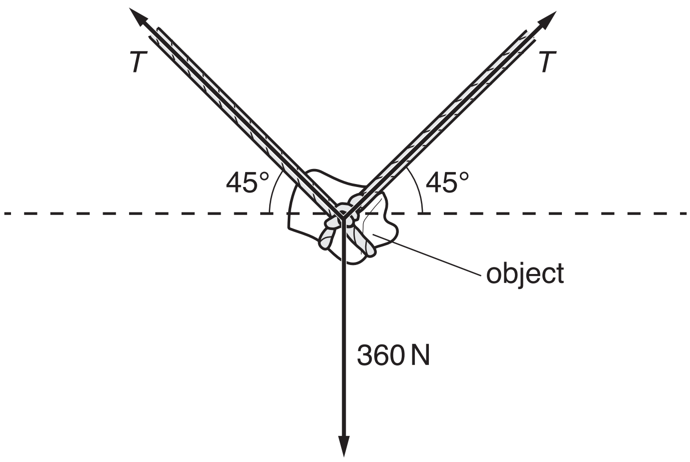


Fig. 3.1

In the space below, determine the tension T by drawing a vector diagram of the forces acting on the object.

State the scale you have used.

scale ....

T = ...
[5]

[Total: 7]

4 **(a)** Fig. 4.1 shows a mercury barometer. The tube containing the mercury is vertical.

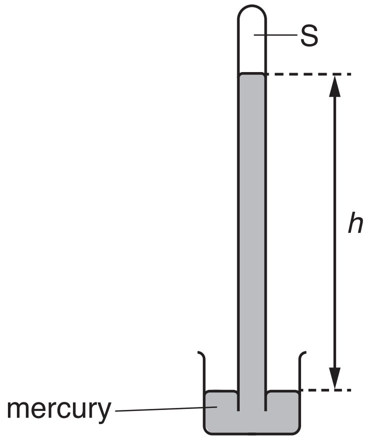


Fig. 4.1

(i) The height h indicates a value of the atmospheric pressure.

State what is contained in the space labelled S.

.... [1]

(ii) On a particular day the atmospheric pressure is 1.02×10^5 Pa. The density of mercury is 13 600 kg / m^3.

Calculate the value of h indicated by the barometer.

h = ... [2]

(iii) The tube containing mercury is now tilted so that it makes an angle of 10° with the vertical. After tilting, there continues to be a space above the mercury in the tube.

State and explain whether the vertical height of mercury in the tube is smaller, the same, or greater than the value calculated in **(a)(ii)**.

....

....

.... [2]

(b) Another mercury barometer in the same room at the same time shows a lower value of h than the barometer in **(a)**.

Suggest and explain a reason for the lower value.

....

....

.... [2]

[Total: 7]

5 **(a)** State the values of the *fixed points* of a temperature scale.

.... [1]

(b) **(i)** The graduations on a liquid-in-glass thermometer are equally spaced.

For the equal spacing of the graduations to be correct, state:

1. an assumption that is made about the liquid in the thermometer

....

2. an assumption that is made about the structure of the thermometer.

....
[2]

(ii) Liquid-in-glass thermometer A has a greater range than liquid-in-glass thermometer B.

State **one** way the design of thermometer A is different from thermometer B.

....

.... [1]

(iii) Liquid-in-glass thermometer C has a greater sensitivity than liquid-in-glass thermometer D.

State **one** way the design of thermometer C is different from thermometer D.

....

.... [1]

(c) **(i)** In the space provided, draw a labelled diagram of a thermocouple thermometer.

[3]

(ii) Suggest when a thermocouple thermometer is more suitable than a liquid-in-glass thermometer.

....

.... [1]

[Total: 9]

6 An electrical heater is placed on the floor of a room in a house. The heater is switched on.

(a) State the main process by which thermal energy is transferred to the air in all parts of the room.

.... [1]

(b) The heater has a power of 1.5 kW. The air in the room has a mass of 65 kg. The specific heat capacity of air is 720 J/(kg °C).

(i) Calculate the time it takes for this heater to raise the temperature of the air in the room from 8.0 °C to 15.0 °C.

time = ... [4]

(ii) State **two** reasons why the time calculated in **(b)(i)** is smaller than the actual time taken to raise the temperature of the air in the room from 8.0 °C to 15.0 °C.

1 ....

....

2 ....

....
[2]

[Total: 7]

7 **(a)** In Fig. 7.1, the small circles represent molecules. The arrows refer to the change of state from the arrangement of molecules on the left to the arrangement of molecules on the right.

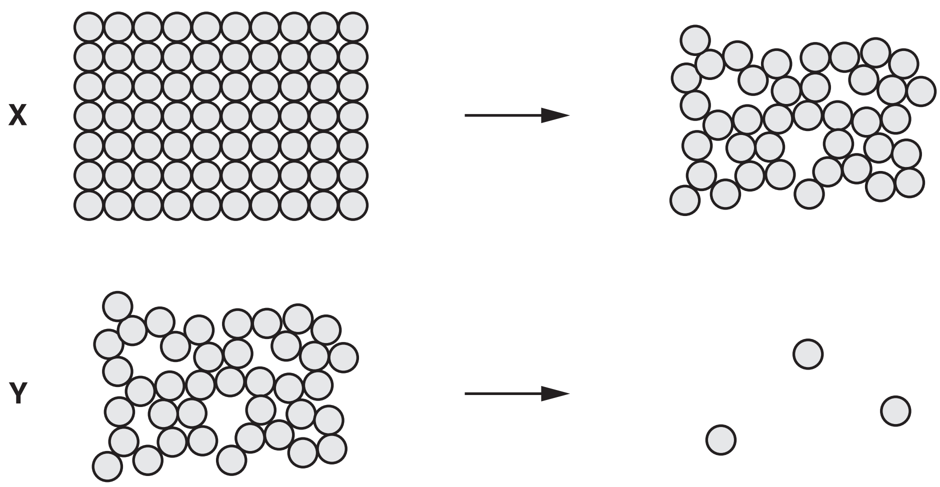


Fig. 7.1

Complete the following by writing solid, liquid or gas in each of the blank spaces.

1. Change of state **X** is from .... to ....

2. Change of state **Y** is from .... to ....

[2]

(b) Explain, in terms of the forces between their molecules, why gases expand more than solids when they undergo the same rise in temperature.

....

....

....

.... [2]

(c) A cylinder of volume $0.012\,m^3$ contains a compressed gas at a pressure of $1.8 \times 10^6\,Pa$.
A valve is opened and all the compressed gas escapes from the cylinder into the atmosphere.

The temperature of the gas does not change.

Calculate the volume that the **escaped** gas occupies at the atmospheric pressure of $1.0 \times 10^5\,Pa$.

volume = ... [3]

[Total: 7]

8 Fig. 8.1 shows parallel wavefronts of a light wave in ice. The wavefronts are incident on a boundary with air.

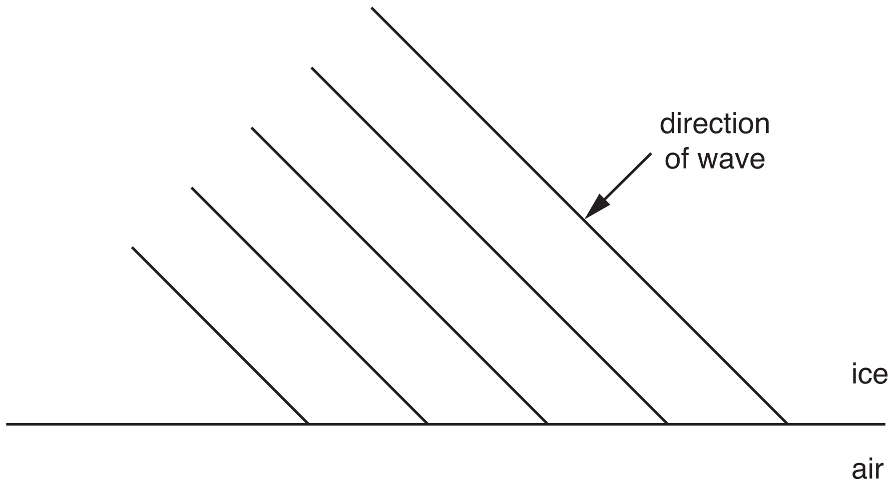


Fig. 8.1

The speed of the light wave in air is 3.0×10^8 m/s. The refractive index of the ice is 1.3.

(a) On Fig. 8.1:

(i) draw the wavefronts of the wave that passes into the air [3]

(ii) draw arrows to show the direction of travel of the refracted wave [1]

(iii) label the angle of incidence *i* and the angle of refraction *r*. [1]

(b) Calculate the speed of the light wave in the ice.

speed = ... [2]

[Total: 7]

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9 Fig. 9.1 shows current-potential difference (p.d.) graphs for a resistor and for a thermistor.

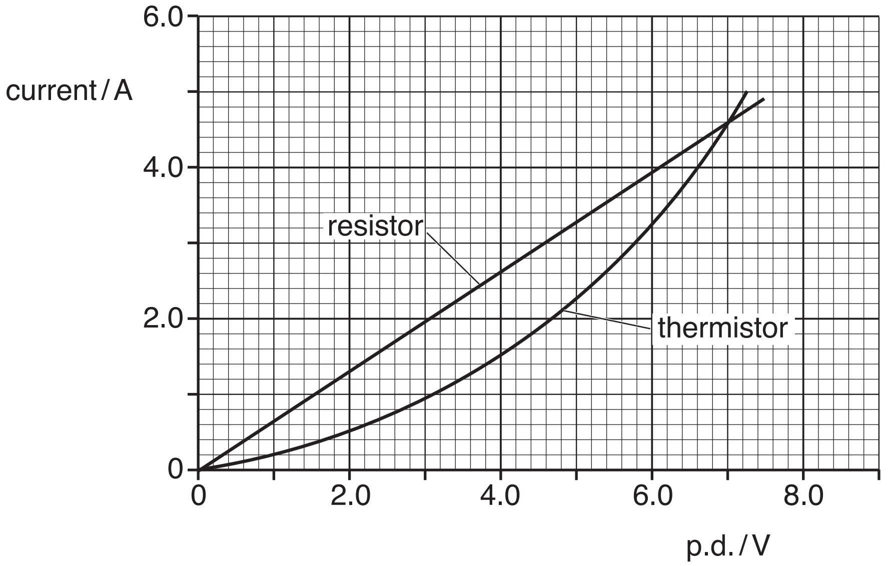

Fig. 9.1

(a) Calculate the resistance of the thermistor when the p.d. across it is 7.0 V.

resistance = ... [2]

(b) In Table 9.1, tick the boxes that indicate the effect on the resistances of the resistor and of the thermistor when the p.d. across them is increased from 0 to 7.0 V.

Table 9.1

component	resistance increases	resistance is constant	resistance decreases
resistor			
thermistor			

[2]

(c) The thermistor and the resistor are connected in **parallel** to a 7.0 V supply.

Calculate:

(i) the current from the supply

current = ... [2]

(ii) the energy transferred from the supply in 5.0 minutes.

energy = ... [2]

[Total: 8]

10 **(a)** The electrical energy produced by a power station is transmitted over long distances at a very high voltage.

Explain why a very high voltage is used.

....

....

....

....

....

.... [3]

(b) Fig. 10.1 represents a transformer.

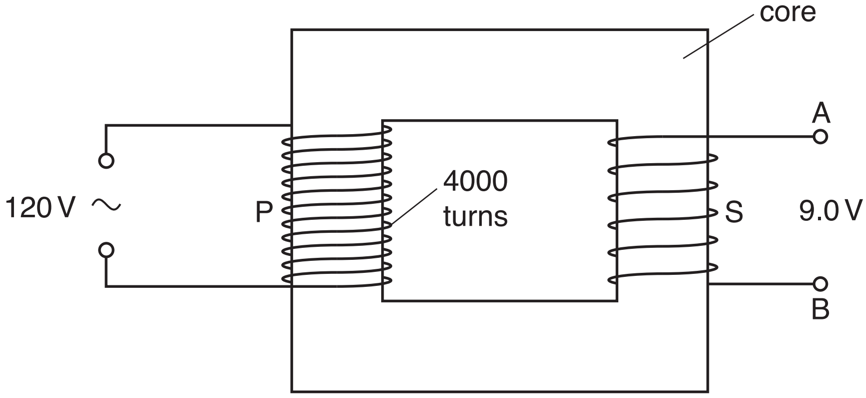

Fig. 10.1

(i) The primary coil P has 4000 turns and an input of 120 V. The secondary coil S has an output of 9.0 V.

Calculate the number of turns in the secondary coil.

number = ... [2]

(ii) State a suitable material for the core of the transformer.

.... [1]

[Total: 6]

11 **(a)** **(i)** One isotope of iridium-194 is represented by

$$^{194}_{77}\text{Ir}$$

This isotope decays by β-emission to a stable isotope of platinum (Pt).

Complete the nuclide equation for this decay.

$$^{194}_{77}\text{Ir} \rightarrow \,^{\cdots\cdots}_{\cdots\cdots}\text{Pt} + \,^{\cdots\cdots}_{\cdots\cdots}\beta$$

[3]

(ii) The half-life of iridium-194 is 19 hours. A sample of iridium-194 has an initial count-rate of 1100 counts / min.

Calculate the count-rate from this sample after 38 hours.

count-rate = ... [2]

(b) State **two** ways in which γ-emission differs from β-emission.

1 ....

2 ....

[2]

[Total: 7]

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Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

1574295149

PHYSICS **0625/52**

Paper 5 Practical Test **February/March 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and about 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
3	
4	
Total	

This document consists of **12** printed pages.

1 In this experiment, you will investigate the reflection of light by a plane mirror.

Carry out the following instructions, using the separate ray-trace sheet provided.
You may refer to Fig. 1.1 for guidance.

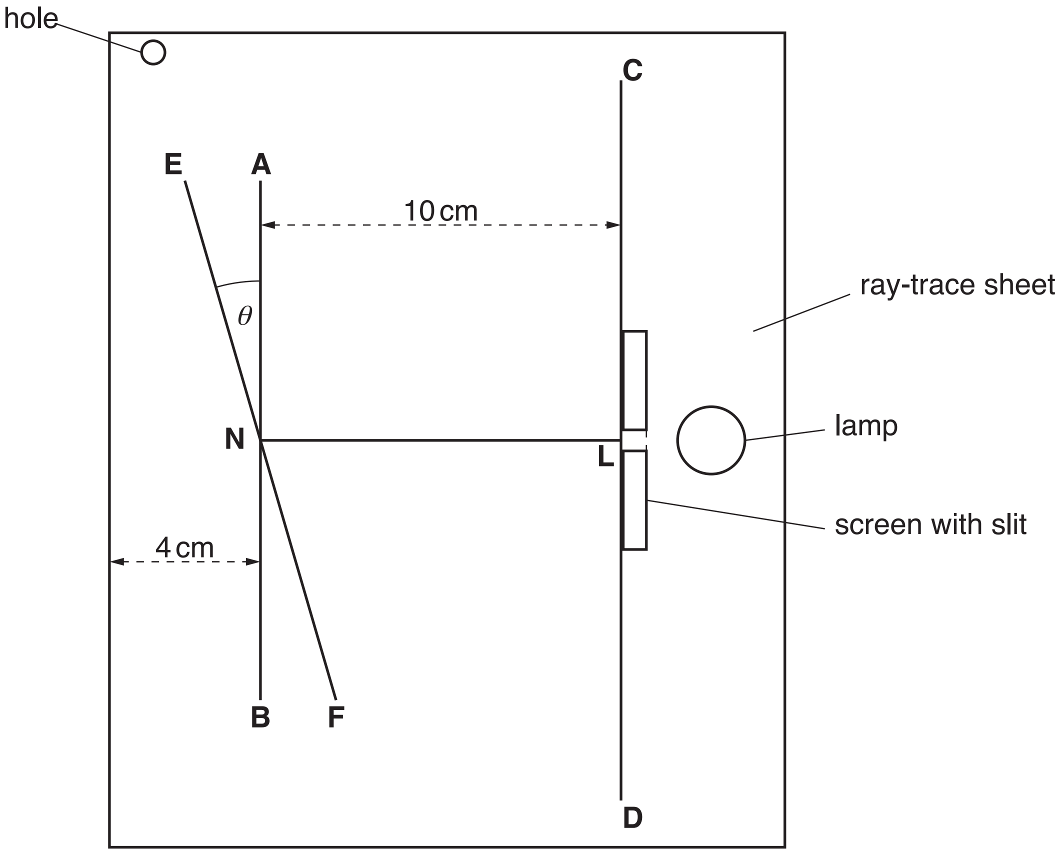

Fig. 1.1

(a)
- Draw a line **AB** 4 cm from the edge of the ray-trace sheet and in the middle of the paper, as shown in Fig. 1.1.
- Draw a line **CD** parallel to line **AB** and 10 cm from it.
- Draw a normal to line **AB** at a point **N** in the centre of line **AB**. Point **N** must be an equal distance from the top and bottom of the sheet.
- Extend the normal to line **CD** and label the point at which it crosses line **CD** with the letter **L**.

[1]

(b) Draw a line **EF**, through point **N**, as shown in Fig. 1.1 and at an angle $\theta = 5°$. [1]

(c)
- Place the plane mirror on line **EF** with the reflecting surface facing to the right.
- Place the screen with a slit on line **CD** and arrange the lamp so a ray of light shines along line **LN**.
- Mark the ray that is reflected from the mirror, using a small cross at a suitable distance from point **N**. Label this cross **G**.
- Remove the mirror, screen and lamp from the ray-trace sheet.

[1]

(d)
- Draw a line joining point **N** and point **G**. Extend this line until it meets line **CD**.
- Label the point at which line **NG** meets line **CD** with the letter **H**.
- Measure, and record in Table 1.1, the length *a* of line **LH**.

[1]

(e) Repeat **(b)**, **(c)** and **(d)** for values of θ = 10°, 15°, 20° and 25°.

Table 1.1

θ/°	*a*/cm
5	
10	
15	
20	
25	

[1]

(f) Plot a graph of *a*/cm (*y*-axis) against θ/° (*x*-axis).

[4]

(g) Suggest a possible source of inaccuracy in this experiment, even if it is carried out carefully.

....

.... [1]

(h) A student wishes to check if his values for *a* are reliable.

Suggest how he could extend the experiment, using the same apparatus, to check the reliability of his results.

You are **not** required to carry out this extended experiment.

....

....

.... [1]

[Total: 11]

Tie your ray-trace sheet into this question paper between pages 2 and 3.

2 In this experiment, you will investigate how the use of a lid or insulation affects the rate of cooling of hot water in a beaker.

Carry out the following instructions, referring to Fig. 2.1.

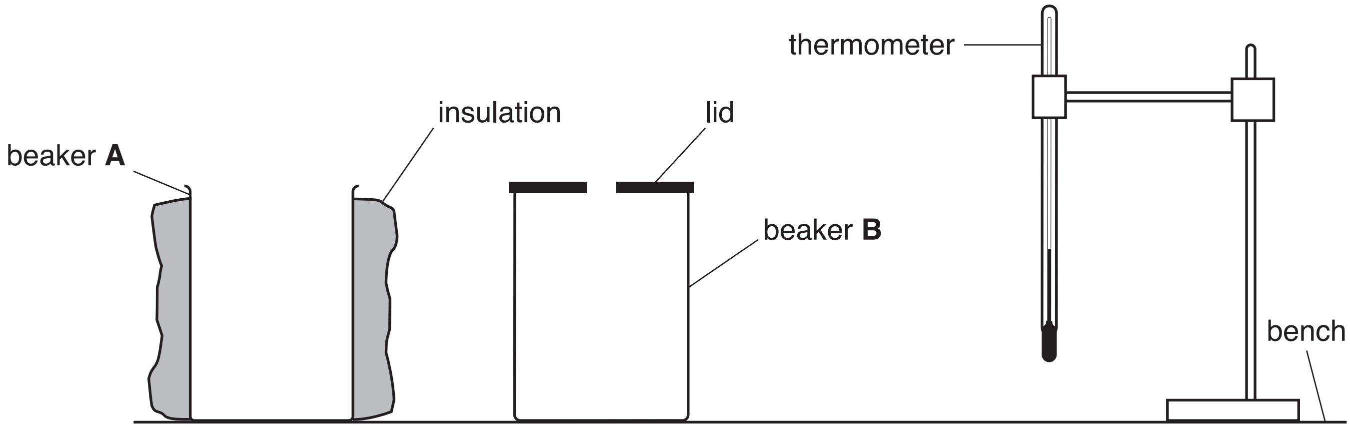

Fig. 2.1

(a) The thermometer must remain in the clamp throughout the experiment.

- Use the measuring cylinder to pour 100 cm^3 of hot water into beaker **A**.
- Place the thermometer in the water in beaker **A**.
- In the first row of Table 2.1, record the temperature θ of the water at time t = 0 and immediately start the stopclock.
- Record, in Table 2.1, the temperature θ of the water at times t = 30 s, 60 s, 90 s, 120 s, 150 s and 180 s.
- Remove the thermometer from the beaker. [1]

(b) **(i)** Repeat **(a)** for beaker **B**. Ensure that the lid is removed before pouring the hot water into the beaker. Replace the lid immediately after pouring. [2]

(ii) Complete the headings and the time column in the table. [2]

Table 2.1

	beaker **A** with insulation only	beaker **B** with a lid only
t /	θ/	θ/
0		

(c) Write a conclusion stating whether the insulation or the lid is more effective in reducing the cooling rate of the water in the beakers in this experiment.

Justify your answer by reference to your results.

....

....

....

.... [2]

(d) A student thinks that the experiment does not show how effective insulation is on its own or how effective a lid is on its own.

Suggest an additional experiment which could be used to show how effective a lid or insulation is on its own.

Explain how the additional results could be used.

You are **not** required to carry out this experiment.

additional experiment ....

....

....

explanation ....

....

....

[2]

(e) Students in another school are carrying out this experiment using equipment which is identical to yours.

State whether it is important for the students to make the initial temperature of the water the same as yours if they are to obtain average cooling rates that are the same as yours. Assume that the room temperature is the same in each case.

Use values from your results for beaker **A** in Table 2.1 to justify if this factor should be controlled.

statement ....

....

explanation ....

....

.... [2]

[Total: 11]

3 In this experiment, you will investigate a resistance wire.
The circuit has been set up for you.

Carry out the following instructions, referring to Fig. 3.1.

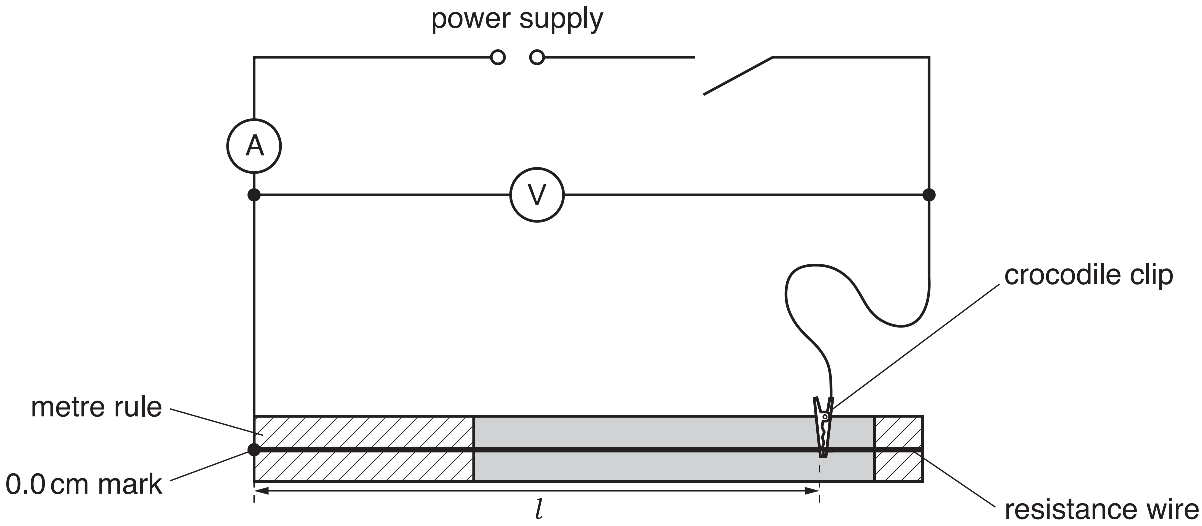

Fig. 3.1

(a)
- Connect the crocodile clip to a length $l = 90.0\,\text{cm}$ of the resistance wire.
- Switch on.
- Record, in Table 3.1, the value of potential difference (p.d.) V and current I for the wire.
- Switch off.
- Move the crocodile clip and repeat the procedure for lengths of resistance wire $l = 60.0\,\text{cm}$ and $l = 40.0\,\text{cm}$.

[3]

(b) Complete the column headings in Table 3.1. [1]

Table 3.1

l/cm	V/	I/	R/Ω	$\frac{R}{l} \Big/ \frac{\Omega}{\text{cm}}$

(c) (i) Calculate, and record in Table 3.1, the resistance R of each length l of the wire.
Use your readings from the table and the equation $R = \frac{V}{I}$.

[2]

(ii) Calculate, and record in Table 3.1, the value of $\frac{R}{l}$ for each wire.

[1]

(d) Use your results in Table 3.1 to calculate the resistance R_{25} of a 25.0 cm length of the resistance wire.

Show your working.

You must **not** carry out an experiment to measure this value.

R_{25} = ... Ω [1]

(e) Suggest **one** reason why different students, carrying out the experiment carefully with the same equipment, may **not** obtain identical results.

....

....

.... [1]

(f) A student finds that, during the experiment, the wire becomes hot because of a high current. He decides to use a variable resistor to prevent this.

Complete the circuit in Fig. 3.2 to show a variable resistor used for this purpose in the experiment.

You are **not** required to carry out this experiment.

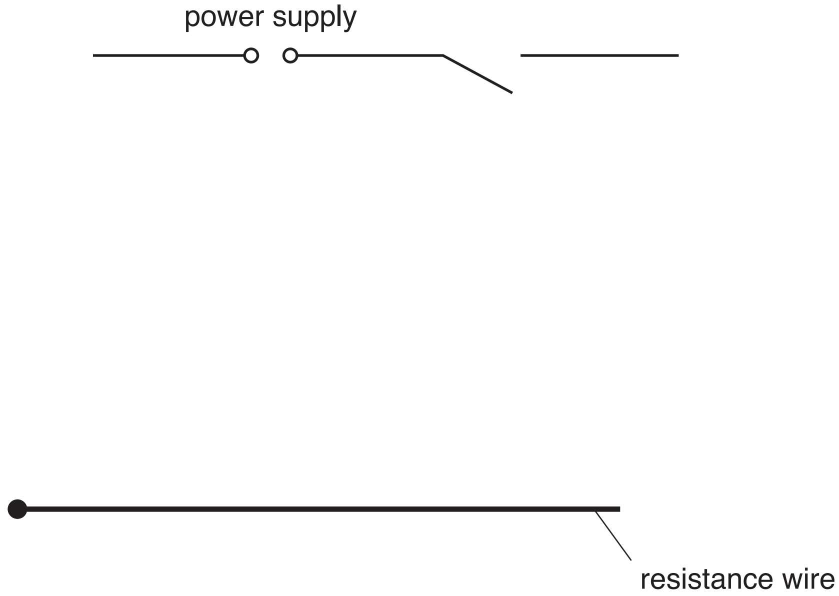

Fig. 3.2

[2]

[Total: 11]

4 A student wants to investigate the effect of air resistance on the swing of a pendulum.

Plan an experiment which will enable him to investigate how air resistance changes the way in which a pendulum swings.

You are **not** required to carry out the experiment.

The apparatus available includes:

a light wooden rod, approximately 80 cm long with a hole at one end, through which a nail will fit
a piece of modelling clay to act as a pendulum bob, as shown in Fig. 4.1
a sheet of thick card which will provide the air resistance when the pendulum swings.

In your plan, you should:

- list any additional apparatus needed
- explain briefly how you would carry out the experiment including exactly which measurements should be taken
- state the key variables that you would control
- draw a table, or tables, with column headings, to show how you would display your readings (you are **not** required to enter any readings in the table)
- explain how you would use your readings to reach a conclusion.

You may add to Fig. 4.1 or draw an additional diagram if it helps to explain your plan.

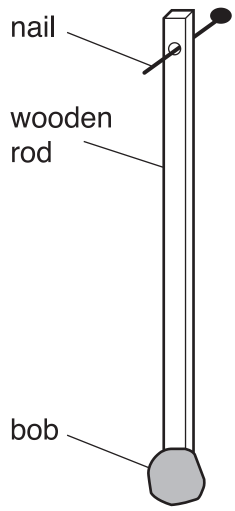

Fig. 4.1

....

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....

....

[7]

[Total: 7]

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

9499791551

PHYSICS **0625/62**

Paper 6 Alternative to Practical **February/March 2019**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **12** printed pages.

1 A student is investigating the reflection of light by a plane mirror.

Fig. 1.1 shows his ray-trace sheet at full size.

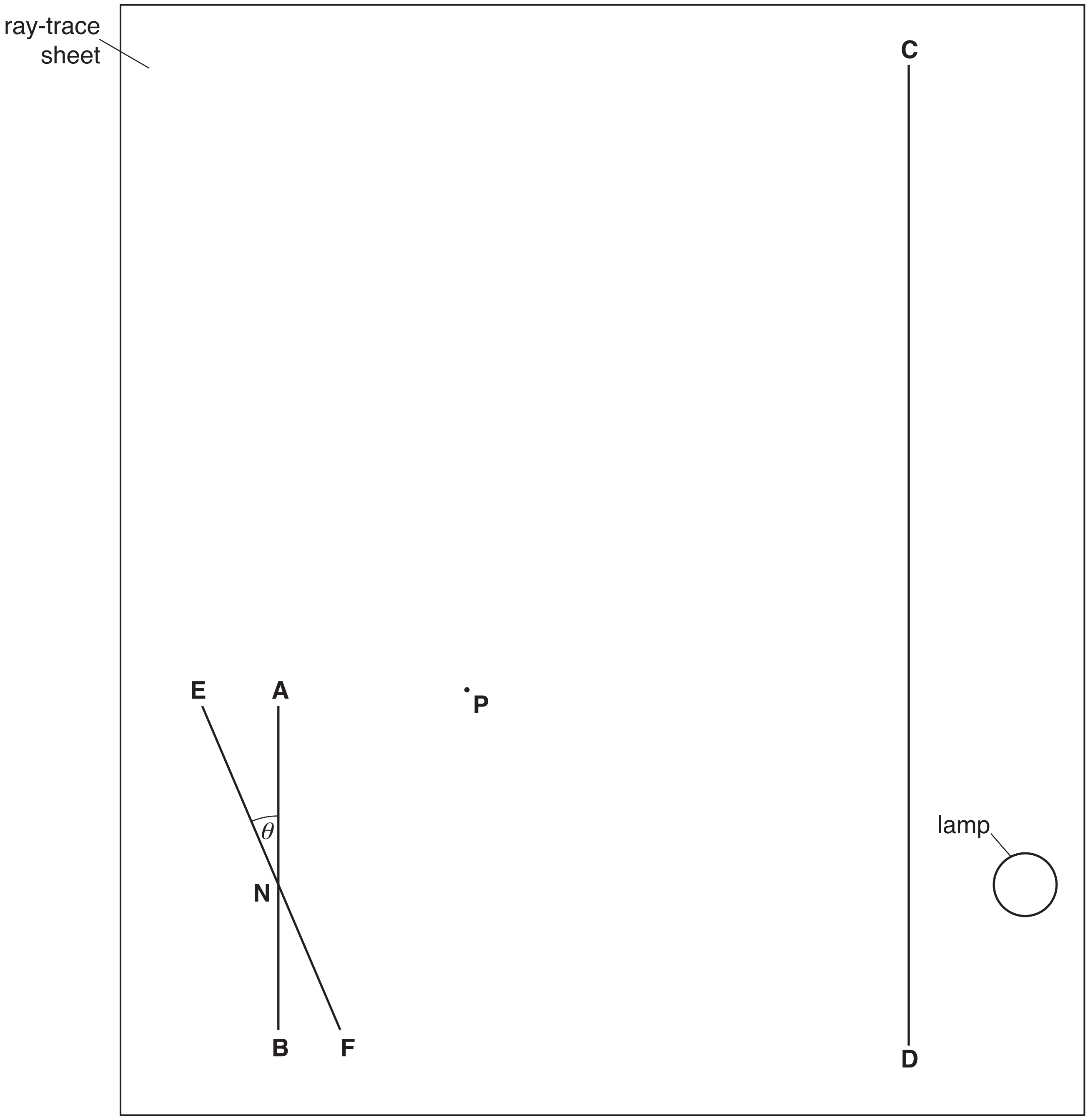

Fig. 1.1

(a) The student carries out an initial experiment.
He draws lines **AB** and **CD** as shown in Fig. 1.1.
He then draws a line **EF** through a point **N** as shown in Fig. 1.1 and at an angle θ to line **AB**.

(i) Measure the angle θ.

θ = ... [1]

(ii) Draw a normal to line **AB** at point **N** and extend the normal to line **CD**. Label the point at which the normal crosses line **CD** with the letter **L**. [1]

(b) The student places a plane mirror on line **EF** and a screen with a 2 mm slit on line **CD**. He arranges the screen so that a ray of light shines along line **LN**.
The ray reflected from the mirror passes through point **P**.

State and explain whether point **P**, shown on Fig. 1.1, is at a suitable distance from point **N** for this investigation.

statement ....

explanation ....
[1]

(c)
- Draw a line joining point **N** and point **P**. Extend this line until it meets line **CD**.
- Label the point at which this line meets line **CD** with the letter **G**.
- Measure the length *a* of line **LG**.

a = ... cm [2]

(d) The student repeats the procedure for values of θ = 25°, 20°, 15°, 10° and 5°.
His values for *a* are shown in Table 1.1.

Table 1.1

θ / °	a / cm
25	12.2
20	8.3
15	5.7
10	3.6
5	1.8

Use the values from Table 1.1 to plot a graph of a/cm (y-axis) against θ/° (x-axis).

[4]

(e) Suggest a possible source of inaccuracy in this experiment, even if it is carried out carefully.

....

.... [1]

(f) A student wishes to check if his values for *a* are reliable.

Suggest how he could improve the experiment, using the same apparatus, to check the reliability of his results.

....

....

.... [1]

[Total: 11]

2 Students are investigating how the use of a lid or insulation affects the rate of cooling of hot water in a beaker. They use the apparatus shown in Fig. 2.1.

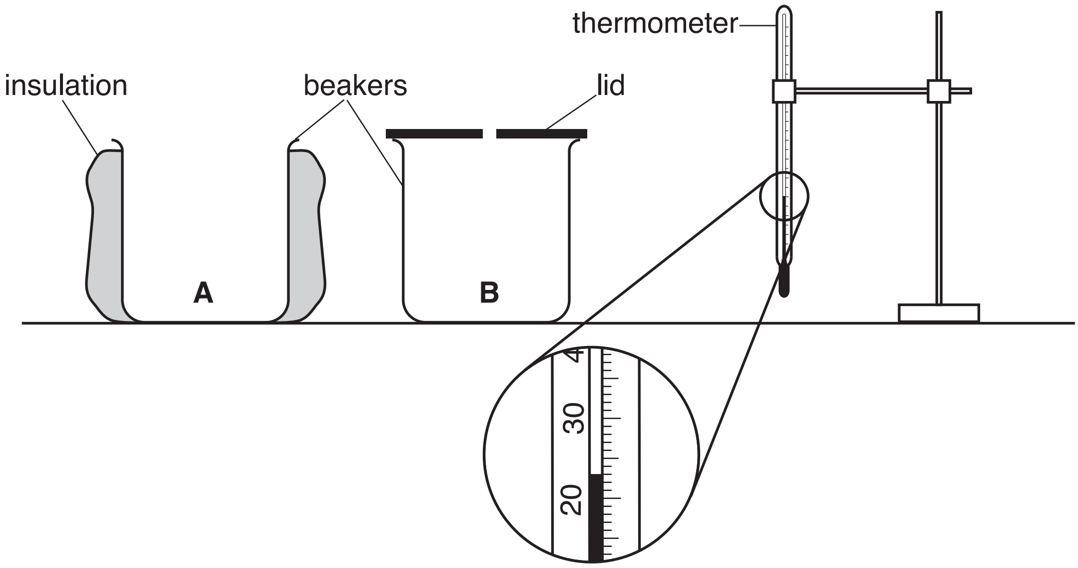

Fig. 2.1

(a) Record the room temperature θ_R shown on the thermometer in Fig. 2.1.

θ_R = ... [1]

(b)
- $100\,cm^3$ of hot water is poured into beaker **A** and the initial temperature θ is recorded in Table 2.1.
- The temperature θ of the water at times t = 30 s, 60 s, 90 s, 120 s, 150 s and 180 s are shown in Table 2.1.
- This process is repeated for beaker **B**.

Complete the headings and the time column in Table 2.1. [2]

Table 2.1

	beaker **A** with insulation	beaker **B** with a lid
t/	θ/	θ/
0	83.0	86.0
	79.0	84.0
	75.5	82.5
	73.0	81.0
	71.0	80.0
	69.5	79.0
	68.5	78.5

(c) Write a conclusion stating whether the insulation or the lid is more effective in reducing the cooling rate of the water in the beakers in this experiment.

Justify your answer by reference to the results.

....

....

....

.... [2]

(d) One student thinks that the experiment does not show how effective insulation is on its own or how effective a lid is on its own.

Suggest an additional experiment which could be used to show how effective a lid or insulation is.

Explain how the additional results could be used.

additional experiment ....

....

....

explanation ....

....

....
[2]

(e) **(i)** Calculate $x_{\mathbf{A}}$, the average cooling rate for beaker **A** over the whole experiment. Use the readings for beaker **A** from Table 2.1 and the equation

$$x_{\mathbf{A}} = \frac{\theta_0 - \theta_{180}}{T}$$

where $T = 180\,\text{s}$ and θ_0 and θ_{180} are the temperatures at time $t = 0$ and time $t = 180\,\text{s}$. Include the unit for the cooling rate.

$x_{\mathbf{A}}$ = ... [2]

(ii) Students in another school are carrying out this experiment using identical equipment.

State why they should make the initial temperature of the water the same as in this experiment if they are to obtain average cooling rates that are the same as in Table 2.1. Assume that the room temperature is the same in each case.

Use the results from beaker **A** to explain why this factor should be controlled.

statement ....

....

explanation ....

....

....
[2]

[Total: 11]

3 A student is investigating a resistance wire. She uses the circuit shown in Fig. 3.1.

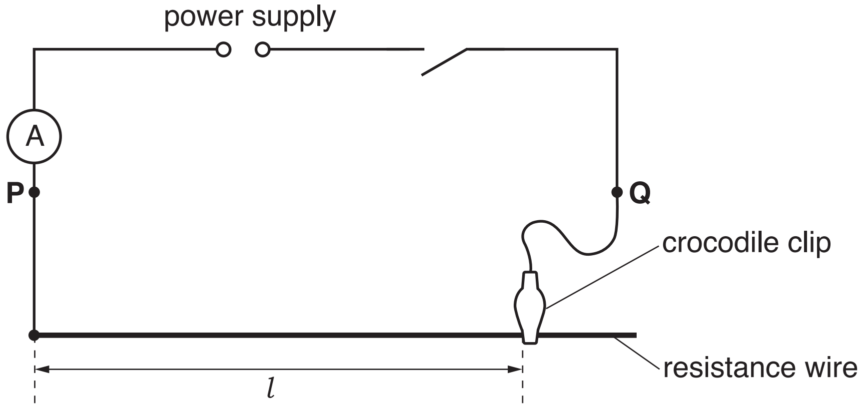

Fig. 3.1

(a) (i) On Fig. 3.1, draw a voltmeter connected to measure the potential difference V across terminals **P** and **Q**. [1]

(ii) The student connects the crocodile clip to a length l = 90.0 cm of the resistance wire and measures the potential difference V across terminals **P** and **Q** and the current I in the circuit.

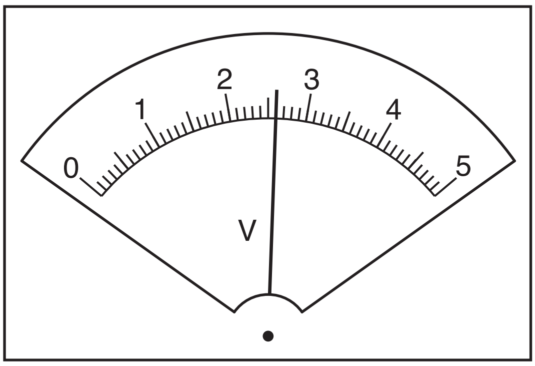

Fig. 3.2

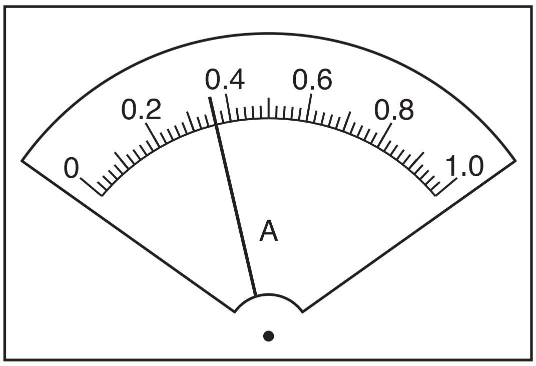

Fig. 3.3

Read, and record in Table 3.1, the values of V and I shown on the meters in Fig. 3.2 and Fig. 3.3. [2]

(b) The student then connects the crocodile clip to lengths l = 60.0 cm and l = 40.0 cm of the resistance wire. She measures the potential difference V across terminals **P** and **Q** and the current I in the circuit. Her readings are shown in Table 3.1.

Complete the column headings in Table 3.1. [1]

Table 3.1

l/cm	V/	I/	R/Ω	$\frac{R}{l} \Big/ \frac{\Omega}{\text{cm}}$
90.0				
60.0	2.5	0.52		
40.0	2.3	0.71		

(c) (i) Calculate, and record in Table 3.1, the resistance R of each length l of the wire. Use the readings from Table 3.1 and the equation $R = \frac{V}{I}$.

[2]

(ii) Calculate, and record in Table 3.1, the value of $\frac{R}{l}$ for each length of the wire.

[1]

(d) Use your results in Table 3.1 to calculate the resistance R_{25} of a 25.0 cm length of the resistance wire.
Show your working.

R_{25} = ... Ω [1]

(e) Suggest **one** reason why different students, carrying out the experiment carefully with the same equipment, may **not** obtain identical results.

....

....

.... [1]

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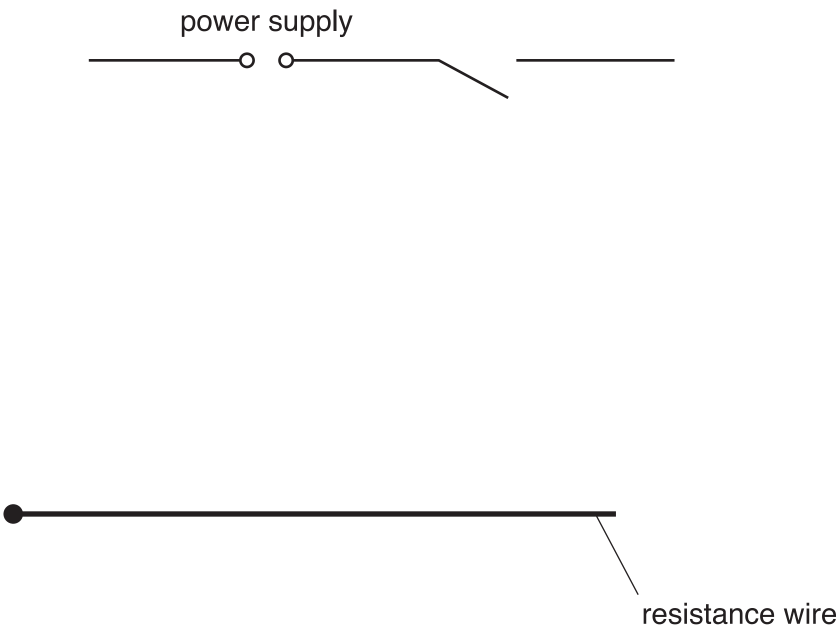
(f) The student finds that, during the experiment, the wire becomes hot because of a high current.

She decides to use a variable resistor to prevent this.

Complete the circuit in Fig. 3.4 to show a variable resistor used for this purpose in the experiment.



[2]

Fig. 3.4

[Total: 11]

4 A student wants to investigate the effect of air resistance on the swing of a pendulum.

Plan an experiment which will enable him to investigate how air resistance changes the way in which a pendulum swings.

The apparatus available includes:

a light wooden rod, approximately 80 cm long with a hole at one end, through which a nail will fit
a piece of modelling clay to act as a pendulum bob, as shown in Fig. 4.1
a sheet of thick card which will provide the air resistance when the pendulum swings.

In your plan, you should:

- list any additional apparatus needed
- explain briefly how you would carry out the experiment including exactly which measurements should be taken
- state the key variables that you would control
- draw a table, or tables, with column headings, to show how you would display your readings (you are **not** required to enter any readings in the table)
- explain how you would use your readings to reach a conclusion.

You may add to Fig. 4.1 or draw an additional diagram if it helps to explain your plan.

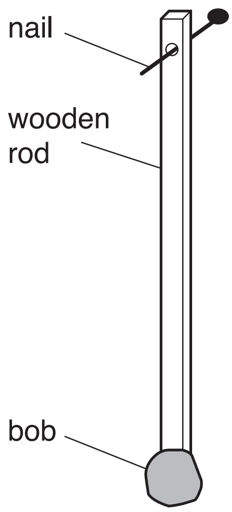


Fig. 4.1

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.... [7]

[Total: 7]

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/51**

Paper 5 Practical Test **May/June 2019**

CONFIDENTIAL INSTRUCTIONS

This document gives details of how to prepare for and administer the practical exam.

The information in this document and the identity of any materials supplied by Cambridge International are confidential and must NOT reach candidates either directly or indirectly.

The supervisor must complete the report at the end of this document and return it with the scripts.

If you have any queries regarding these confidential instructions, contact Cambridge International stating the centre number, the syllabus and component number and the nature of the query.

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This document consists of **8** printed pages.

DC (KN/FC) 171385/3

Cambridge Assessment International Education

General information about practical exams

Centres must follow the guidance on science practical exams given in the *Cambridge Handbook*.

Safety

Supervisors must follow national and local regulations relating to safety and first aid.

Only those procedures described in the question paper should be attempted.

Supervisors must inform candidates that materials and apparatus used in the exam should be treated with caution. Suitable eye protection should be used where necessary.

Before the exam

- The packets containing the question papers must **not** be opened before the exam.
- It is assumed that standard school laboratory facilities, as indicated in the *Guide to Planning Practical Science*, will be available.
- Spare materials and apparatus for the tasks set must be available for candidates, if required.

During the exam

- It must be made clear to candidates at the start of the exam that they may request spare materials and apparatus for the tasks set.
- Where specified, the supervisor **must** perform the experiments and record the results as instructed. This must be done **out of sight** of the candidates, using the same materials and apparatus as the candidates.
- Any assistance provided to candidates must be recorded in the supervisor's report.
- If any materials or apparatus need to be replaced, for example, in the event of breakage or loss, this must be recorded in the supervisor's report.

After the exam

- The supervisor must complete a report for each practical session held and each laboratory used.
- Each packet of scripts returned to Cambridge International must contain the following items:
  - the scripts of the candidates specified on the bar code label provided
  - the supervisor's results relevant to these candidates
  - the supervisor's reports relevant to these candidates
  - seating plans for each practical session, referring to each candidate by candidate number
  - the attendance register.

Specific information for this practical exam

Question 1

Items to be supplied by the Centre (per set of apparatus unless otherwise specified)

(i) Metre rule, with a mm scale. See note 1.

(ii) Triangular block to act as a pivot for the metre rule. This block is to stand on the bench.

(iii) A 100 g mass, labelled P. See notes 2 and 3.

(iv) Access to one balance (electronic or otherwise) capable of measuring to the nearest gram and capable of measuring masses up to 200 g.

Notes

1. If the metre rule has two scales in opposite directions, one scale must be taped over.

2. Any suitable mass that can rest on the metre rule can be used.

3. The value of the mass or weight of P must **not** be visible to the candidates.

Action at changeover

Remove the mass P from the metre rule.

Remove the metre rule from the pivot.

Check that the apparatus is ready for the next candidate.

Question 2

Items to be supplied by the Centre (per set of apparatus unless otherwise specified)

(i) Power supply of approximately 1.5 V – 3 V. Where candidates are provided with a power supply with a variable output voltage, the voltage must be set by the Supervisor and fixed (e.g. taped). See note 2.

(ii) Switch. The switch may be an integral part of the power supply.

(iii) Ammeter capable of reading up to 1.00 A with a resolution of at least 0.05 A. See note 3.

(iv) Voltmeter capable of measuring the supply p.d. with a resolution of at least 0.1 V. See note 3.

(v) Approximately 105 cm of straight, bare constantan (Eureka) wire, diameter 0.45 mm (26 swg) or 0.38 mm (28 swg) or 0.32 mm (30 swg), taped to a metre rule only between the 3 cm and 7 cm marks and between the 93 cm and 97 cm marks. The end of the wire at the zero end of the metre rule is to be labelled B. See note 4.

(vi) Two suitable terminals (e.g. crocodile clips) attached to the constantan wire at the ends of the metre rule so that connections can be made to the circuit shown in Fig. 2.1.

(vii) Sliding contact, labelled ‘C’. This may be a jockey or a small screwdriver connected to a lead by means of a crocodile clip.

(viii) Sufficient connecting leads to set up the circuit shown in Fig. 2.1.

(ix) Metre rule, with a mm scale. See note 5.

Notes

1. The circuit is to be set up for the candidates as shown in Fig. 2.1 and Fig. 2.2.

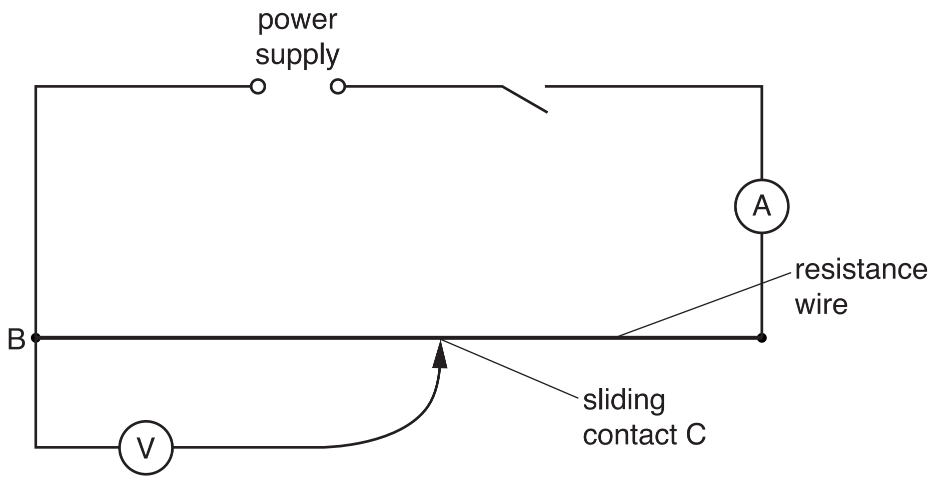

Fig. 2.1

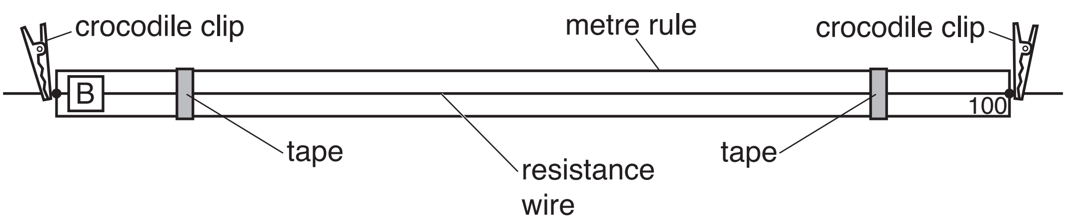

Fig. 2.2

2. If cells are to be used, they must remain adequately charged throughout the examination. Spare cells should be available.

3. Either analogue or digital meters are suitable. Any variable settings should be set by the Supervisor and fixed (e.g. taped). Spare meters should be available.

4. The wire must be attached to the metre rule as shown in Fig. 2.2.

5. If the metre rule has two scales in opposite directions, one scale must be taped over.

Action at changeover

Check that the circuit is arranged as shown in Fig. 2.1.

Check that the circuit works. Switch off.

Question 3

Items to be supplied by the Centre (per set of apparatus, unless otherwise specified)

(i) Thermometer, –10°C to 110°C, graduated in 1°C intervals.

(ii) 250 cm^3 beaker labelled A.

(iii) Metal can labelled B. See note 1.

(iv) Two lids cut from stiff card. Each lid must have a hole in the centre just large enough to accept the thermometer. See note 2.

(v) 100 cm^3 or 250 cm^3 measuring cylinder.

(vi) Stopclock or stopwatch or wall-mounted clock showing seconds. Candidates will be required to take readings at 30-second intervals. Candidates may use their own wristwatches. The question will refer to a stopclock.

(vii) Supply of hot water. See notes 3 and 5.

(viii) Clamp, boss and stand. See note 4.

(ix) Supply of paper towels to mop up any spills of water.

Notes

1. The can must be similar in size to the beaker and capable of holding 250 cm^3 of hot water. The outside of the can must be painted matt black.

2. The card must be sufficiently thick to act as a rigid lid. Each lid must be sufficiently large to cover the top of the beaker or the top of the can completely.

3. The hot water is to be supplied for each candidate by the Supervisor. The water should be maintained at a temperature as hot as is reasonably and safely possible. Each candidate will require about 600 cm^3 of hot water.

4. The clamp, boss and stand must be set up for the candidates with the thermometer held in the clamp. The thermometer bulb must be well below the 200 cm^3 level of the beaker and the can.

5. Candidates should be warned of the dangers of burns or scalds when using hot water.
6. Spare lids must be available.

Action at changeover

Empty the beaker, can and measuring cylinder.

Check the lids and replace if damaged or wet.

Check the supply of hot water.

Question 4

No apparatus is required for this question.

Supervisor's report

Syllabus and component number					/		

Centre number					

Centre name ....

Time of the practical session ....

Laboratory name/number ....

Give details of any difficulties experienced by the centre or by candidates (include the relevant candidate names and candidate numbers).

You must include:

- any difficulties experienced by the centre in the preparation of materials
- any difficulties experienced by candidates, e.g. due to faulty materials or apparatus
- any specific assistance given to candidates.

Declaration

1 Each packet that I am returning to Cambridge International contains the following items:

- ☐ the scripts of the candidates specified on the bar code label provided
- ☐ the supervisor's results relevant to these candidates
- ☐ the supervisor's reports relevant to these candidates
- ☐ seating plans for each practical session, referring to each candidate by candidate number
- ☐ the attendance register

2 Where the practical exam has taken place in more than one practical session, I have clearly labelled the supervisor's results, supervisor's reports and seating plans with the time and laboratory name/number for each practical session.

3 I have included details of difficulties relating to each practical session experienced by the centre or by candidates.

4 I have reported any other adverse circumstances affecting candidates, e.g. illness, bereavement or temporary injury, directly to Cambridge International on a *special consideration form*.

Signed .... (supervisor)

Name (in block capitals) ....

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/52**

Paper 5 Practical Test **May/June 2019**

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Cambridge Assessment International Education

[Turn over

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Supervisors must follow national and local regulations relating to safety and first aid.

Only those procedures described in the question paper should be attempted.

Supervisors must inform candidates that materials and apparatus used in the exam should be treated with caution. Suitable eye protection should be used where necessary.

Before the exam

- The packets containing the question papers must **not** be opened before the exam.
- It is assumed that standard school laboratory facilities, as indicated in the *Guide to Planning Practical Science*, will be available.
- Spare materials and apparatus for the tasks set must be available for candidates, if required.

During the exam

- It must be made clear to candidates at the start of the exam that they may request spare materials and apparatus for the tasks set.
- Where specified, the supervisor **must** perform the experiments and record the results as instructed. This must be done **out of sight** of the candidates, using the same materials and apparatus as the candidates.
- Any assistance provided to candidates must be recorded in the supervisor's report.
- If any materials or apparatus need to be replaced, for example, in the event of breakage or loss, this must be recorded in the supervisor's report.

After the exam

- The supervisor must complete a report for each practical session held and each laboratory used.
- Each packet of scripts returned to Cambridge International must contain the following items:
  - the scripts of the candidates specified on the bar code label provided
  - the supervisor's results relevant to these candidates
  - the supervisor's reports relevant to these candidates
  - seating plans for each practical session, referring to each candidate by candidate number
  - the attendance register.

Specific information for this practical exam

Question 1

Items to be supplied by the Centre (per set of apparatus unless otherwise specified)

(i) Metre rule, with a mm scale. See note 1.

(ii) Triangular block to act as a pivot for the metre rule. This block is to stand on the bench.

(iii) 100 g mass labelled **P**. See note 2.

(iv) 80 g mass labelled **Q**. See note 2.

Notes

1. The metre rule should approximately balance on the pivot when the 50 cm mark is over the pivot.
2. The masses must have a regular shape with a flat base so that they can be placed on the rule. Laboratory masses or cubes of modelling clay are suitable.

Action at changeover

Check that the apparatus is ready for the next candidate.

Question 2

Items to be supplied by the Centre (per set of apparatus unless otherwise specified)

(i) Thermometer, –10 °C to 110 °C, graduated in 1 °C intervals.

(ii) 250 cm^3 beaker labelled **A**.

(iii) 250 cm^3 beaker labelled **B**.

(iv) A lid cut from card large enough to completely cover the top of beaker **A**. The lid must have a hole in the centre just large enough to accept the thermometer. See note 1.

(v) A rectangular piece of the same card as in **(iv)**, the same size as the lid. This piece of card will act as a mat for Beaker **B**. See note 2.

(vi) 100 cm^3 or 250 cm^3 measuring cylinder.

(vii) Stopclock or stopwatch or wall-mounted clock showing seconds. Candidates will be required to take readings at 30-second intervals. Candidates may use their own wristwatches.

The question will refer to a stopclock.

(viii) Supply of hot water. See notes 3 and 5.

(ix) Clamp, boss and stand. See note 4.

(x) Supply of paper towels to mop up any spills of water.

Notes

1. The card must be sufficiently thick to act as a rigid lid for beaker **A**.

2. Beaker **B** must be placed on the mat.

3. The hot water is to be supplied for each candidate by the Supervisor. The water should be maintained at a temperature as hot as is reasonably and safely possible. Each candidate will require about 600 cm^3 of hot water.

4. The clamp, boss and stand must be set up for the candidates with the thermometer held in the clamp. The thermometer bulb must be at a height well below the 200 cm^3 level of the beaker.

5. Candidates should be warned of the dangers of burns or scalds when using very hot water.

6. Spare lids, for beaker **A** and spare pieces of card for beaker **B** must be available.

Action at changeover

Empty the beakers and measuring cylinder.

Check the lid for beaker **A** and the card for beaker **B** and replace if damaged or wet.

Check the supply of hot water.

Question 3

Items to be supplied by the Centre (per set of apparatus unless otherwise specified)

(i) Power supply of approximately 1.5 V – 3 V. Where candidates are provided with a power supply with a variable output voltage, the voltage must be set by the Supervisor and fixed (e.g. taped). See note 2.

(ii) Two resistors of nominal value 4.7 Ω with a power rating of at least 2 W. See note 3.

(iii) A lamp in a suitable holder. Any low voltage lamp will suffice, provided that it glows when connected as shown in Fig. 3.1.

(iv) Switch. The switch may be an integral part of the power supply.

(v) Ammeter capable of reading up to 1.00 A with a resolution of at least 0.05 A. See note 4.

(vi) Voltmeter capable of measuring the supply p.d. with a resolution of at least 0.1 V. See note 4.

(vii) Sufficient connecting leads to construct the circuit shown in Fig. 3.1, with two additional leads.

Notes

1. The circuit is to be connected by the Supervisor as shown in Fig. 3.1.

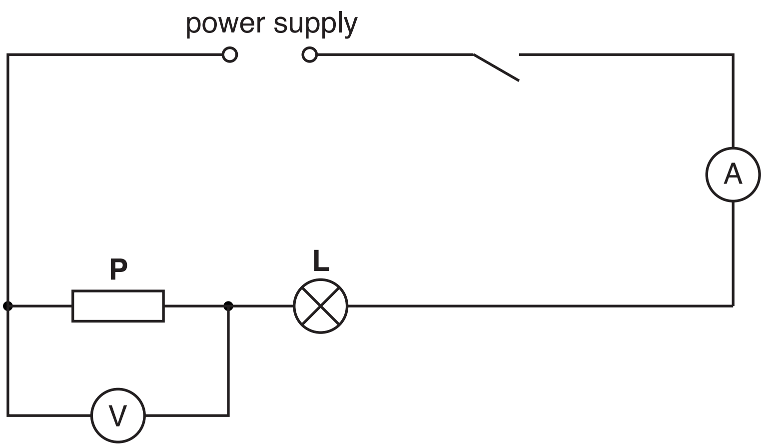

Fig. 3.1

2. If cells are to be used, they must remain adequately charged throughout the examination. Spare cells must be available.

3. The resistors must be labelled **P** and **Q**. The values of resistance must not be visible to the candidates. The resistors and the lamp must have suitable terminals so that candidates are able easily and quickly to rearrange the circuit.

4. Either analogue or digital meters are suitable. Any variable settings must be set by the Supervisor and fixed (e.g. taped). Spare meters should be available.

Action at changeover

Set up the circuit so that it is arranged as shown in Fig. 3.1.

Check that the circuit works. Switch off.

Question 4

No apparatus is required for this question.

Supervisor's report

Syllabus and component number | | | | / | |

Centre number | | | | |

Centre name ....

Time of the practical session ....

Laboratory name/number ....

Give details of any difficulties experienced by the centre or by candidates (include the relevant candidate names and candidate numbers).

You must include:

- any difficulties experienced by the centre in the preparation of materials
- any difficulties experienced by candidates, e.g. due to faulty materials or apparatus
- any specific assistance given to candidates.

Declaration

1 Each packet that I am returning to Cambridge International contains the following items:

- ☐ the scripts of the candidates specified on the bar code label provided
- ☐ the supervisor's results relevant to these candidates
- ☐ the supervisor's reports relevant to these candidates
- ☐ seating plans for each practical session, referring to each candidate by candidate number
- ☐ the attendance register

2 Where the practical exam has taken place in more than one practical session, I have clearly labelled the supervisor's results, supervisor's reports and seating plans with the time and laboratory name/number for each practical session.

3 I have included details of difficulties relating to each practical session experienced by the centre or by candidates.

4 I have reported any other adverse circumstances affecting candidates, e.g. illness, bereavement or temporary injury, directly to Cambridge International on a *special consideration form*.

Signed .... (supervisor)

Name (in block capitals) ....

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/53**

Paper 5 Practical Test **May/June 2019**

CONFIDENTIAL INSTRUCTIONS

5212896717

This document gives details of how to prepare for and administer the practical exam.

The information in this document and the identity of any materials supplied by Cambridge International are confidential and must NOT reach candidates either directly or indirectly.

The supervisor must complete the report at the end of this document and return it with the scripts.

If you have any queries regarding these confidential instructions, contact Cambridge International stating the centre number, the syllabus and component number and the nature of the query.

email info@cambridgeinternational.org
phone +44 1223 553554
fax +44 1223 553558

This document consists of **8** printed pages.

DC (NF/CGW) 171389/3

Cambridge Assessment International Education

General information about practical exams

Centres must follow the guidance on science practical exams given in the *Cambridge Handbook*.

Safety

Supervisors must follow national and local regulations relating to safety and first aid.

Only those procedures described in the question paper should be attempted.

Supervisors must inform candidates that materials and apparatus used in the exam should be treated with caution. Suitable eye protection should be used where necessary.

Before the exam

- The packets containing the question papers must **not** be opened before the exam.
- It is assumed that standard school laboratory facilities, as indicated in the *Guide to Planning Practical Science*, will be available.
- Spare materials and apparatus for the tasks set must be available for candidates, if required.

During the exam

- It must be made clear to candidates at the start of the exam that they may request spare materials and apparatus for the tasks set.
- Where specified, the supervisor **must** perform the experiments and record the results as instructed. This must be done **out of sight** of the candidates, using the same materials and apparatus as the candidates.
- Any assistance provided to candidates must be recorded in the supervisor's report.
- If any materials or apparatus need to be replaced, for example, in the event of breakage or loss, this must be recorded in the supervisor's report.

After the exam

- The supervisor must complete a report for each practical session held and each laboratory used.
- Each packet of scripts returned to Cambridge International must contain the following items:
    - the scripts of the candidates specified on the bar code label provided
    - the supervisor's results relevant to these candidates
    - the supervisor's reports relevant to these candidates
    - seating plans for each practical session, referring to each candidate by candidate number
    - the attendance register.

Specific information for this practical exam

Question 1

Items to be supplied by the Centre (per set of apparatus unless otherwise specified).

(i) Metre rule with a scale graduated in mm. See note 1.

(ii) Triangular block to act as a pivot for the metre rule. This block is to stand on the bench.

(iii) Object of mass = 200 g, labelled M. See note 2.

(iv) Object of mass = 100 g, labelled U. See note 2.

Notes

1. The metre rule should approximately balance on the pivot, with the scale facing upwards, when the 50.0 cm mark is over the pivot.

2. The objects must be of regular shape and be able to stand on the rule.
Two 100 g stacking masses taped together would be suitable for M.
Candidates must not be able to identify the mass of U. A cube shaped piece of modelling clay or a mass of less than 100 g covered in modelling clay would be suitable for U.

Action at changeover

Check that the apparatus is ready for the next candidate.

Question 2

Items to be supplied by the Centre (per set of apparatus unless otherwise specified).

(i) Two thermometers: –10°C to 110°C, graduated in 1°C intervals. See note 1.

(ii) Clamp, boss and stand. See note 1.

(iii) 400 cm^3 beaker. See notes 1 and 2.

(iv) Boiling tube of capacity approximately 70 cm^3 or greater. See note 1.

(v) 100 cm^3 measuring cylinder. Larger measuring cylinders are suitable provided that candidates can measure volume to a precision of at least 10 cm^3.

(vi) Supply of hot water. See notes 3 & 4.

(vii) Supply of cold water at room temperature. See note 5.

(viii) Stopclock or stopwatch or wall-mounted clock showing seconds. Candidates will be required to take readings at 30-second intervals. They may use their own wristwatches.
The question will refer to a stopclock.

(ix) Paper towels to soak up any water spills.

Notes

1. The apparatus is to be set up for candidates as shown in Fig. 2.1. The boiling tube must be a small distance above the base of the beaker.
Candidates must be able easily and safely to read temperatures up to 100°C and to move the boiling tube into the beaker.

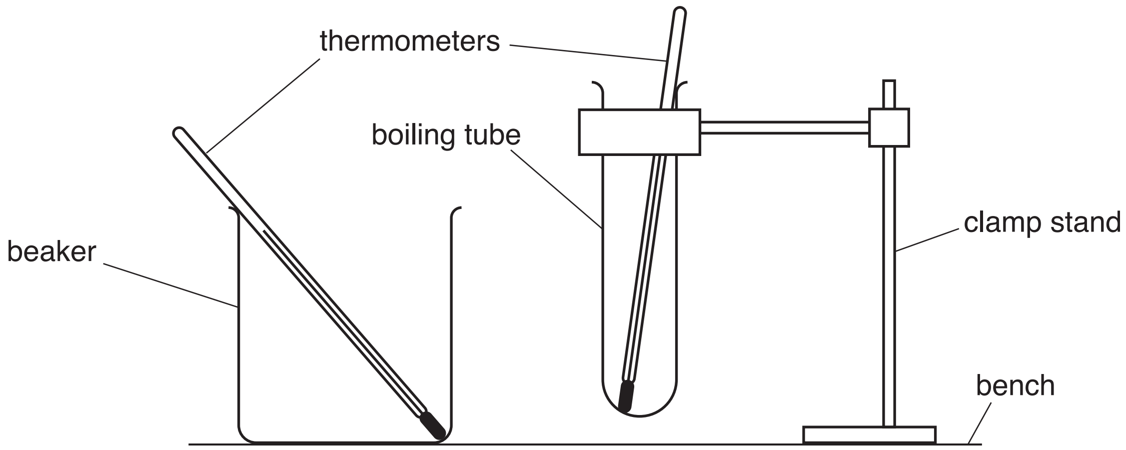

Fig. 2.1

2. If the beaker does not have volume markings, the 300 cm^3 level must be marked or a suitable additional measuring cylinder supplied.

3. Hot water is to be available for each candidate throughout the experiment. The hot water should be maintained at an approximately constant temperature between 80°C and 100°C. Each candidate will require about 400 cm^3 of hot water in total.
   They must be able to pour hot water into the beaker safely.

4. Candidates must be warned of the dangers of burns or scalds when using very hot water.

5. Each candidate will require about 100 cm^3 of cold water.

Action at Changeover

Empty the water from the beaker and boiling tube.
Check that the apparatus is intact and is arranged as in Fig. 2.1.

Question 3

Items to be supplied by the Centre (per set of apparatus unless otherwise specified).

(i) Three 3 W resistors, one 5 Ω, labelled X, one 10 Ω, labelled Y, and another 10 Ω, labelled Z. Candidates must not be able to identify resistance values. See note 2.

(ii) Power supply of approximately 2 V–3 V. See note 3.
Where candidates are provided with a variable power supply, the voltage should be set by the Supervisor and fixed, e.g. taped.

(iii) Switch. The switch may be an integral part of the power supply.

(iv) Sufficient connecting leads to set up the circuit shown in Fig. 3.1, with 4 spare leads.

(v) Ammeter capable of measuring currents up to 2.00 A with a resolution of at least 0.05 A . See note 4.

(vi) Voltmeter capable of measuring up to 3.0 V with a resolution of at least 0.1 V. See note 4.

Notes

1. The circuit is to be set up for candidates as shown in Fig. 3.1. The voltmeter must have leads and terminals that enable it to be connected to different parts of the circuit.

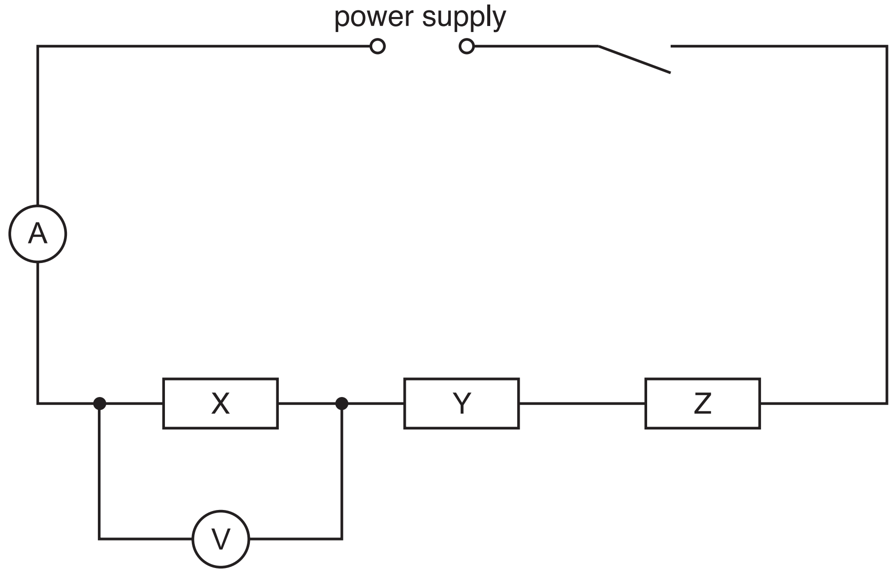

Fig. 3.1

2. The resistors must have suitable terminals so that candidates are able easily and quickly to rearrange the circuit. Spare resistors should be available.

3. If cells are used, they must remain adequately charged throughout the examination. Spare cells must be available.

4. Either analogue or digital meters are suitable. Any variable settings should be set by the Supervisor and fixed, e.g. taped. Spare meters should be available.

Action at changeover

Connect the circuit as shown in Fig. 3.1 and check that the circuit is working.
Switch the circuit off.

Question 4

No apparatus is required for this question.

Supervisor's report

Syllabus and component number | | | | | / | |

Centre number | | | | | |

Centre name ....

Time of the practical session ....

Laboratory name/number ....

Give details of any difficulties experienced by the centre or by candidates (include the relevant candidate names and candidate numbers).

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- any specific assistance given to candidates.

Declaration

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- ☐ the supervisor's reports relevant to these candidates
- ☐ seating plans for each practical session, referring to each candidate by candidate number
- ☐ the attendance register

2 Where the practical exam has taken place in more than one practical session, I have clearly labelled the supervisor's results, supervisor's reports and seating plans with the time and laboratory name/number for each practical session.

3 I have included details of difficulties relating to each practical session experienced by the centre or by candidates.

4 I have reported any other adverse circumstances affecting candidates, e.g. illness, bereavement or temporary injury, directly to Cambridge International on a *special consideration form*.

Signed .... (supervisor)

Name (in block capitals) ....

Cambridge Assessment International Education

Grade thresholds – June 2019

Cambridge IGCSE™ Physics (0625)

Grade thresholds taken for Syllabus 0625 (Physics) in the June 2019 examination.

		minimum raw mark required for grade:						
	maximum raw mark available	A	B	C	D	E	F	G
Component 11	40	–	–	24	21	19	17	15
Component 12	40	–	–	22	19	16	14	12
Component 13	40	–	–	27	24	21	18	15
Component 21	40	24	21	18	17	15	13	11
Component 22	40	27	23	20	18	16	14	12
Component 23	40	29	27	24	21	18	15	13
Component 31	80	–	–	47	42	35	28	22
Component 32	80	–	–	44	37	31	24	17
Component 33	80	–	–	46	38	29	21	13
Component 41	80	40	30	18	16	13	10	7
Component 42	80	50	39	27	22	17	13	9
Component 43	80	51	40	30	26	21	17	13
Component 51	40	23	20	18	16	14	12	10
Component 52	40	26	23	20	17	14	11	8
Component 53	40	25	22	19	16	14	11	8
Component 61	40	25	21	18	15	13	10	7
Component 62	40	28	25	22	19	16	13	10
Component 63	40	22	19	17	14	12	10	8

Grade A* does not exist at the level of an individual component.

The maximum total mark for this syllabus, after weighting has been applied, is **200**.

The overall thresholds for the different grades were set as follows.

Option	Combination of Components	A*	A	B	C	D	E	F	G
BX	21, 41, 51	130	109	88	68	60	53	44	35
BY	22, 42, 52	152	129	106	84	71	59	48	37
BZ	23, 43, 53	152	132	112	93	80	67	55	43
CX	21, 41, 61	133	111	89	68	60	52	42	32

Grade thresholds continued

Cambridge IGCSE Physics (0625)

Option	Combination of Components	A*	A	B	C	D	E	F	G
CY	22, 42, 62	154	131	108	86	73	61	50	39
CZ	23, 43, 63	148	129	110	91	78	65	54	43
FX	11, 31, 51	–	–	–	113	99	86	73	60
FY	12, 32, 52	–	–	–	108	92	77	62	47
FZ	13, 33, 53	–	–	–	117	99	82	64	46
GX	11, 31, 61	–	–	–	113	99	85	71	57
GY	12, 32, 62	–	–	–	110	94	79	64	49
GZ	13, 33, 63	–	–	–	115	97	80	63	46

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/11**

Paper 1 Multiple Choice (Core) **May/June 2019**

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

Question	Answer	Marks
1	A	**1**
2	A	**1**
3	D	**1**
4	A	**1**
5	C	**1**
6	C	**1**
7	D	**1**
8	D	**1**
9	A	**1**
10	C	**1**
11	D	**1**
12	A	**1**
13	C	**1**
14	A	**1**
15	B	**1**
16	A	**1**
17	A	**1**
18	A	**1**
19	D	**1**
20	B	**1**
21	D	**1**
22	B	**1**
23	B	**1**
24	B	**1**
25	B	**1**
26	B	**1**
27	D	**1**
28	D	**1**

Question	Answer	Marks
29	B	**1**
30	D	**1**
31	B	**1**
32	C	**1**
33	B	**1**
34	B	**1**
35	D	**1**
36	B	**1**
37	D	**1**
38	A	**1**
39	B	**1**
40	D	**1**

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS	**0625/12**
Paper 1 Multiple Choice (Core)	**May/June 2019**
MARK SCHEME	
Maximum Mark: 40	

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Question	Answer	Marks
1	A	**1**
2	C	**1**
3	D	**1**
4	D	**1**
5	A	**1**
6	C	**1**
7	C	**1**
8	D	**1**
9	A	**1**
10	C	**1**
11	B	**1**
12	A	**1**
13	C	**1**
14	D	**1**
15	B	**1**
16	A	**1**
17	A	**1**
18	A	**1**
19	B	**1**
20	D	**1**
21	A	**1**
22	B	**1**
23	D	**1**
24	B	**1**
25	B	**1**
26	B	**1**
27	A	**1**
28	B	**1**

Question	Answer	Marks
29	B	**1**
30	D	**1**
31	B	**1**
32	A	**1**
33	B	**1**
34	B	**1**
35	D	**1**
36	C	**1**
37	A	**1**
38	C	**1**
39	C	**1**
40	D	**1**

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/13**

Paper 1 Multiple Choice (Core) **May/June 2019**

MARK SCHEME

Maximum Mark: 40

Published

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This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **3** printed pages.

Question	Answer	Marks
1	C	**1**
2	D	**1**
3	D	**1**
4	C	**1**
5	B	**1**
6	C	**1**
7	D	**1**
8	D	**1**
9	A	**1**
10	C	**1**
11	B	**1**
12	A	**1**
13	C	**1**
14	C	**1**
15	C	**1**
16	D	**1**
17	A	**1**
18	D	**1**
19	A	**1**
20	B	**1**
21	D	**1**
22	B	**1**
23	C	**1**
24	C	**1**
25	B	**1**
26	B	**1**
27	A	**1**
28	B	**1**

Question	Answer	Marks
29	B	**1**
30	D	**1**
31	A	**1**
32	C	**1**
33	C	**1**
34	B	**1**
35	C	**1**
36	C	**1**
37	B	**1**
38	D	**1**
39	B	**1**
40	D	**1**

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/21**

Paper 2 Multiple Choice (Extended) **May/June 2019**

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

Question	Answer	Marks
1	C	**1**
2	C	**1**
3	D	**1**
4	C	**1**
5	C	**1**
6	D	**1**
7	D	**1**
8	C	**1**
9	C	**1**
10	B	**1**
11	C	**1**
12	A	**1**
13	C	**1**
14	A	**1**
15	A	**1**
16	B	**1**
17	D	**1**
18	B	**1**
19	B	**1**
20	C	**1**
21	B	**1**
22	D	**1**
23	D	**1**
24	B	**1**
25	A	**1**
26	D	**1**
27	D	**1**
28	B	**1**

Question	Answer	Marks
29	C	**1**
30	B	**1**
31	B	**1**
32	A	**1**
33	B	**1**
34	C	**1**
35	D	**1**
36	C	**1**
37	D	**1**
38	C	**1**
39	B	**1**
40	B	**1**

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/22**

Paper 2 Multiple Choice (Extended) **May/June 2019**

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Cambridge International is publishing the mark schemes for the May/June 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

Question	Answer	Marks
1	C	1
2	C	1
3	D	1
4	D	1
5	C	1
6	B	1
7	B	1
8	C	1
9	C	1
10	C	1
11	A	1
12	D	1
13	C	1
14	A	1
15	A	1
16	B	1
17	B	1
18	B	1
19	D	1
20	C	1
21	D	1
22	B	1
23	D	1
24	B	1
25	A	1
26	B	1
27	D	1
28	B	1

Question	Answer	Marks
29	A	**1**
30	A	**1**
31	B	**1**
32	D	**1**
33	C	**1**
34	A	**1**
35	D	**1**
36	A	**1**
37	B	**1**
38	C	**1**
39	B	**1**
40	C	**1**

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/23**

Paper 2 Multiple Choice (Extended) **May/June 2019**

MARK SCHEME

Maximum Mark: 40

Published

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This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

Question	Answer	Marks
1	C	**1**
2	D	**1**
3	D	**1**
4	D	**1**
5	C	**1**
6	D	**1**
7	D	**1**
8	B	**1**
9	B	**1**
10	A	**1**
11	C	**1**
12	B	**1**
13	C	**1**
14	D	**1**
15	A	**1**
16	B	**1**
17	D	**1**
18	B	**1**
19	C	**1**
20	A	**1**
21	D	**1**
22	B	**1**
23	D	**1**
24	B	**1**
25	A	**1**
26	B	**1**
27	D	**1**
28	B	**1**

Question	Answer	Marks
29	C	**1**
30	C	**1**
31	B	**1**
32	C	**1**
33	C	**1**
34	B	**1**
35	C	**1**
36	C	**1**
37	A	**1**
38	D	**1**
39	B	**1**
40	A	**1**

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS	**0625/31**
Paper 3 Core Theory	**May/June 2019**
MARK SCHEME	
Maximum Mark: 80	

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Question	Answer	Marks
1(a)(i)	balance	**B1**
1(a)(ii)	density = mass ÷ volume in any form	**C1**
	1260 ÷ 150	**C1**
	8.4	**A1**
	g / cm^3	**B1**
1(a)(iii)	1.26 (kg)	**B1**
1(b)	W = mg in any form	**C1**
	0.25 × 10	**C1**
	2.5 (N)	**A1**
	Both lines have 2.5 (N)	**B1**

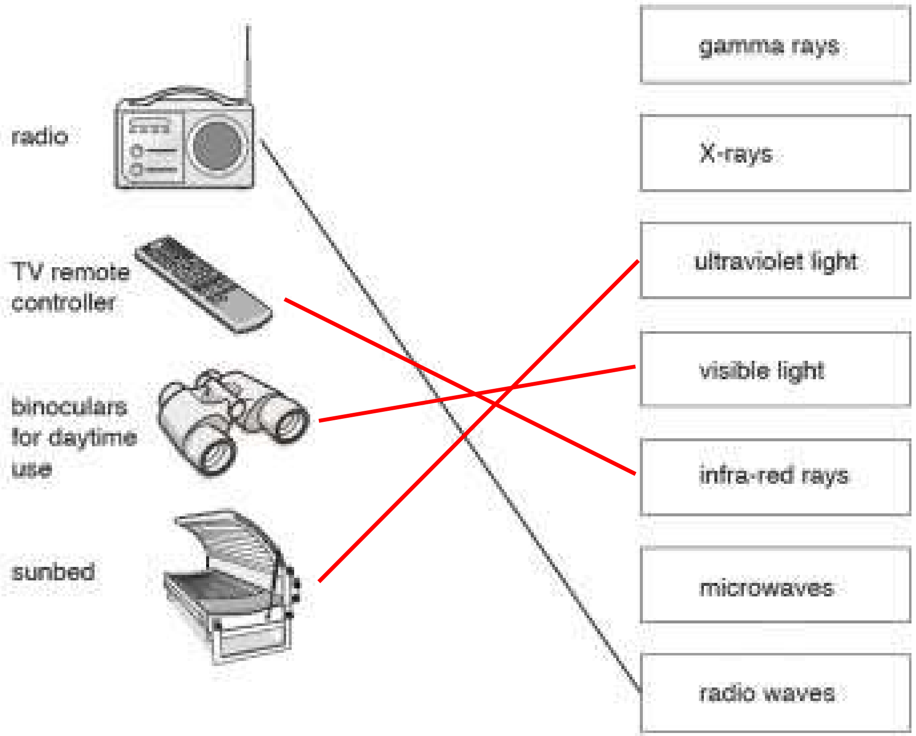
Question	Answer	Marks
2(a)	<u>moment</u>	**B1**
2(b)(i)	(sum of) clockwise moment(s) = (sum of) anticlockwise moment(s)	**C1**
	1.2 × 400 = 0.3 × F	**C1**
	1600 (N)	**A1**
2(b)(ii)	use a longer lever **OR** pivot closer to log / force F	**B1**

Question	Answer	Marks
3(a)	67 (cm)	**C1**
	(67 ÷ 5 =) 13.4 (cm)	**A1**
3(b)	C 1st ; A 2nd;	**B1**
	D 4th; E 5th	**B1**
3(c)	speed = distance ÷ time in any form OR (t =) distance ÷ speed	**C1**
	11 ÷ 16	**C1**
	0.69 (s)	**A1**

Question	Answer	Marks
4(a)(i)	Pressure = force ÷ area in any form	**C1**
	50 ÷ 1.8	**C1**
	28 (N / cm^2)	**A1**
4(a)(ii)	In range 13 500 to 15 000 (N / cm^2)	**B1**
4(b)(i)	(mercury) barometer	**B1**
4(b)(ii)	vacuum **OR** nothing	**B1**
4(b)(iii)	a value less than 760 mm (Hg) and > 0 mm (Hg)	**B1**

Question	Answer	Marks
5(a)(i)	It will be used up / cannot be replaced (easily) owtte	**B1**
5(a)(ii)	nuclear AND oil	**B1**
5(b)	**Advantages– any two from** easy to store less atmospheric pollution than other fossil fuels cheaper than other fossil fuels concentrated energy source large reserves can respond to demand reliable **Disadvantages – any two from** (produces / releases) carbon dioxide (waste gases produce) acid rain (waste gases produced) contribute to global warming non-renewable danger of explosion danger of carbon monoxide poisoning long pipelines needed (from some gas fields)	**B4**

Question	Answer	Marks
6(a)	0 AND 100 correctly labelled	**M1**
	36	**A1**
6(b)(i)	Melting	**B1**
	Any one of: molecules gain energy molecule (begin to) break (some) bonds arrangement becomes irregular or arrangement changes	**B1**
6(b)(ii)	boiling	**B1**
	Any one of: molecules break (all) bonds molecules move (more) freely molecules become widely separated or far apart	**B1**

Question	Answer	Marks
7(a)		**B1**
		B1
		B1
7(b)(i)	infrared **OR** microwaves **OR** radio waves	**B1**
7(b)(ii)	speed	**B1**

Question	Answer	Marks
8(a)(i)	electrons in 1st space	**B1**
	cloth in 2nd space	**B1**
8(a)(ii)	<u>negative</u>	**B1**
8(a)(iii)	like charges repel (each other)	**B1**
8(b)(i)	ring around copper	**B1**
8(b)(ii)	(earth wire must be good electrical) conductor	**B1**

Question	Answer	Marks
9(a)	(position) R	**B1**
9(b)	V = IR in any form	**C1**
	(R =) 6.0 ÷ 0.5 OR 6.0 = 0.5 × R	**C1**
	(R=) 12	**A1**
	Ω or ohms	**B1**
9(c)	both lamps have correct p.d. OR voltage (across them)	**B1**
	if one lamp fails the other is still lit	**B1**

Question	Answer	Marks
10(a)	thermistor	**B1**
10(b)(i)	low (brightness) OR off	**M1**
	pd or voltage (across lamp) is zero or almost zero	**A1**
10(b)(ii)	(brightness / it) increases	**B1**
	p.d. / voltage (across lamp) increases	**B1**
10(b)(iii)	lamp blows / fuses (when p.d. too high)	**B1**

Question	Answer	Marks
11(a)	(diagram) A	**B1**
11(b)(i)	connect coil to (centre zero) meter	**B1**
	move magnet in OR / AND out of coil	**B1**
	(observe) deflection on meter	**B1**
11(b)(ii)	**any two from:** use stronger magnet move magnet faster more turns on coil OR use more than 100 turns	**B2**
11(c)	(generator produces) alternating current OR direction of current keeps changing	**B1**

Question	Answer	Marks
12(a)	positive	**B1**
	positive	**B1**
	negative	**B1**
12(b)(i)	88	**B1**
12(b)(ii)	138	**B1**
12(b)(iii)	$^{223}_{88}Ra$	**B1**
12(c)	3 half lives (until 1.0 mg remains)	**C1**
	(3 × 1600) = 4800 (years)	**A1**

Cambridge IGCSE

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PHYSICS	**0625/32**
Paper 3 Core Theory	**May/June 2019**
MARK SCHEME	
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Question	Answer	Marks
1(a)	A accelerating (uniformly) / speeding up	**B1**
	B steady/constant/uniform speed	**B1**
	C deceleration (non-uniform) / slowing down	**B1**
	D at rest / stopped/stationary / not moving	**B1**
1(b)	distance = area under graph OR area = ½ × base × height	**C1**
	0.5 × 3.5 × 5	**C1**
	8.75 (m)	**A1**

Question	Answer	Marks
2(a)	(678 – 318 =) 360 (g)	**B1**
2(b)(i)	160 (cm^3)	**B1**
2(b)(ii)	400 (cm^3)	**B1**
2(b)(iii)	D = m/v in any form	**C1**
	360 ÷ 400	**C1**
	0.9 (g/cm^3)	**A1**

Question	Answer	Marks
3(a)(i)	2.77 – 2.22 OR 0.55	**B1**
	1.1(0) (s)	**B1**
3(a)(ii)	any four from: (idea of) use of fiducial mark start watch as pendulum passes fiducial mark OR when pendulum released count large number (must be >=10) of swings stop watch as pendulum passes marker OR starting point divide total time by the number of swings timing to centre of swing	**B4**
3(b)	1 0.4(J)	**B1**
	2 0 or zero or no (J)	**B1**

Question	Answer	Marks
4(a)(i)	expand or increase in size/volume increase in pressure decrease in density	**B1**
4(a)(ii)	any 3 from: density (of air) is less molecules move faster/have more (kinetic) energy more collisions (per second) collisions with surface OR balloon (owtte) more force (in collisions) molecules move (further) apart	**B3**

Question	Answer	Marks
4(b)	P = F/A in any form	**C1**
	30 ÷ 12	**C1**
	2.5	**A1**
	N/cm^2	**B1**

Question	Answer	Marks
5(a)	F then H	**B1**
	G then E	**B1**
5(b)(i)	**1** 100 (W)	**B1**
	2 500 (W)	**B1**
5 (b)(ii)	less power OR energy used (by LED)	**B1**
	less CO_2 OR greenhouse gases OR global warming	**B1**

Question	Answer	Marks
6(a)(i)	normal	**B1**
6(a)(ii)	(angle of) incidence	**B1**
6(a)(iii)	double(s)	**B1**
6(b)(i)	principal focus	**B1**
6(b)(ii)	inverted diminished	**B2**

Question	Answer	Marks
7(a)	solid: molecules closely packed OR fixed positions OR can only vibrate	**B1**
	liquid: molecules loosely packed OR (more) random (arrangement)	**B1**
	gas: molecules widely spaced OR further apart than in liquid	**B1**
7(b)(i)	<u>evaporation</u>	**B1**
7(b)(ii)	Any 3 from: more energetic/faster molecules escape from the surface OR liquid (net/average) energy of remaining molecules is lower less (average) energy (gives) lower temperature molecules gain energy (from surroundings) speed of molecules increases	**B3**

Question	Answer	Marks
8(a)(i)	poles correctly labelled 	**B1**
8 (a)(ii)	Any two from iron bar becomes induced magnet with S pole nearest to (N pole of) magnet opposite poles attract	**B2**
8(b)(i)	ends of coil connected to power supply OR battery OR cell	**B1**
8(b)(ii)	can be switched on/off OR magnetised/demagnetised (easily)	**B1**

Question	Answer	Marks
9(a)	(rule) rubbed with a cloth owtte	**B1**
	electrons or negative charges move	**B1**
	on to the cloth OR from / off the ruler	**B1**
9(b)(i)	positive	**B1**
9(b)(ii)	same charges repel	**B1**

Question	Answer	Marks
10(a)	ammeter symbol	**B1**
	ammeter in series (with power supply)	**B1**
	voltmeter symbol	**B1**
	voltmeter in parallel (with lamps/power supply)	**B1**
	two lamps in parallel	**B1**
10(b)	(brightness) stays the same	**B1**
	current (in working lamp) stays the same	**B1**

Question	Answer	Marks
11(a)	step-down (transformer)	**B1**
11(b)	(soft) iron	**B1**
	forms a temporary magnet	**B1**
11(c)(i)	$V_p/V_s = N_p/N_s$ **OR** ratio used	**C1**
	240 × (125 ÷ 5000)	**C1**
	(PQ =) 6 (V)	**A1**
11(c)(ii)	(PR =) 12 (V) / double the value in **(c)(i)** (PQ)	**B1**
	twice as many turns between P and R (as P and Q)	**B1**

Question	Answer	Marks
12(a)(i)	unpredictable owtte	**B1**
12(b)	From top to bottom of table alpha: HIGH LOW	**B1**
	beta: MEDIUM MEDIUM	**B1**
	gamma: LOW HIGH	**B1**
12(c)	protons	**B1**
	neutrons	**B1**
	2 of each drawn/labelled AND no electrons	**B1**

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Question	Answer	Marks
1(a)	(A =) lead, (B=) iron, (C=) aluminium	**B1**
1(b)	density = mass ÷ volume in any form (V =) M/d	**C1**
	200 ÷ 8.4	**C1**
	24 (cm^3)	**A1**
1(c)	add water to measuring cylinder/note the volume of water added	**B1**
	lower/immerse metal object into water	**B1**
	note new volume of water owtte	**B1**
	subtract new volume from initial volume/determine difference in volumes	**B1**

Question	Answer	Marks
2(a)(i)	10 (km)	**B1**
2(a)(ii)	1.5 (hours)	**B1**
2(a)(iii)	speed = distance ÷ time in any form	**C1**
	10 ÷ 1.5	**C1**
	6.7 (km/h) accept 6.67 (km/h)	**A1**
2(b)(i)	4:30 (pm) **OR** 16:30	**B1**
2(b)(ii)	30 (minutes)	**B1**
2(b)(iii)	smaller gradient **OR** less steep slope owtte	**B1**

Question	Answer	Marks
3(a)	0.35 (m)	**B1**
	0.025 (m)	**B1**
3(b)	(weight =) mass × gravity in any form	**C1**
	50 × 10 OR (20 × 10) + (30 × 10)	**C1**
	500 (N)	**A1**
3(c)	moment = force × distance from pivot	**C1**
	140 × 1.3	**C1**
	180	**A1**
	Nm	**B1**

Question	Answer	Marks
4(a)	centre of cone nearer base than apex	**B1**
	centre of sphere	**B1**
4(b)	any three from: centre of mass is higher surface (area in contact with table) is smaller (so a) small displacement causes toppling (because with a small displacement the) vertical line through centre of mass is outside the base owtte	**B3**

Question	Answer	Marks
5(a)	A (at end of sentence)	**B1**
	B (at end of sentence)	**B1**
5(b)(i)	energy cannot be created or destroyed	**B1**
	but can be transformed/changed (from one form to another)	**B1**
5(b)(ii)	Energy losses as heat **or** sound (to surroundings)	**B1**

Question	Answer	Marks
6(a)(i)	conduction **OR** radiation	**B1**
6(a)(ii)	conduction	**B1**
6(a)(iii)	convection	**B1**
6(b)(i)	any THREE from: hot water in each can same volume of water in each can/same temperature thermometer/radiation detector placed near can or seen on labelled diagram thermometer/radiation detector at same distance from each can measure temperature (change) on each thermometer	**B3**
6(b)(ii)	bigger / faster temperature change from better emitter	**B1**

Question	Answer	Marks
7(a)	Any one from: angle of incidence is greater than the critical angle light is travelling from a(n optically) more dense medium to(wards an optically) less dense medium (at a large angle)	**B1**
7(b)(i)	dispersion	**B1**
7(b)(ii)	From A to B: red, orange, yellow, green, blue, indigo, violet	**B1**
7(c)	correct name for any part of em spectrum other than visible light	**M1**
	correct use of named part of em spectrum	**A1**

Question	Answer	Marks
8(a)(i)	(principal) axis ignore X-axis	**B1**
8(a)(ii)	F marked near intersection of ray and principle axis	**B1**
8(b)(i)	Either: ray from top of object towards centre of lens	**B1**
	continues from centre and crosses initial ray	**B1**
	OR 1st ray through F on left of lens (needs to be added by candidate)	**(B1)**
	2nd ray parallel to principle axis and crosses initial ray	**(B1)**
8(b)(ii)	inverted arrow drawn from axis to point where rays cross	**B1**
8(b)(iii)	diminished circled	**B1**
	inverted circled	**B1**

Question	Answer	Marks
9(a)(i)	variable resistor	**B1**
9(a)(ii)	connect material in gap/between X and Y	**B1**
	if reading on ammeter material is a(n electrical) conductor	**B1**
9(a)(iii)	**BOTH** copper **AND** gold ticked i.e. **2nd** and **4th** boxes	**B1**
9(b)(i)	<u>voltmeter</u>	**B1**
9(b)(ii)	$V = IR$ OR $(R =)\ V/I$	**C1**
	= 6.0 ÷ 0.	**C1**
	= 30 (Ω)	**A1**

Question	Answer	Marks
10(a)	any 3 from: earth wire is connected to metal case earth wire has low resistance large current in earth wire fuse in live wire fuse (heats up and) melts this disconnects case/computer/circuit from supply (and so protects user)	**B3**
10(b)	$(V_p / V_s) = (N_p / N_s)$ in any form	**C1**
	240 / 12 = 3000 / Ns OR Ns = 3000 × (12/240) OR Ns = 3000 / 20	**C1**
	150 (turns)	**A1**

Question	Answer		Marks
11(a)	1 mark for each correct column		
	(type of radiation):	**gamma** in top box **beta** in bottom box	**B1**
	charge:	**–1** (in bottom box)	**B1**
	mass:	**4** (in middle box)	**B1**
	nature:	**electron** (in bottom box)	**B1**
11(b)	line on graph from 4500 to curve **OR** from 8000 and 4000		**C1**
	line on graph from curve to 23 minutes **OR** from curve to 4 minutes AND 27 minutes		**C1**
	23(minutes)		**A1**

Question	Answer	Marks
12(a)	pointer deflects to the left	**B1**
	(then pointer) returns to zero reading	**B1**
12(b)	any three from: (magnet has a) magnetic field conductor/coil cuts magnetic field (this) induces or produces emf/voltage/p.d. in the conductor/coil (so reading on meter) no cutting of field when far from coil (so no reading on meter)	**B3**

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PHYSICS	**0625/41**
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Maximum Mark: 80	

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Question	Answer	Marks
1(a)	change of velocity per unit time **OR** $\dfrac{v-u}{t}$	**B1**
1(b)	line starts at origin **and** is asymptotic to *x*-axis	**B1**
	increasing gradient initially **and** no decrease	**B1**
	constant **and** clearly positive gradient finally	**B1**
1(c)(i)	no external forces **OR** isolated system	**B1**
	sum of momenta / (total) momentum remains constant	**B1**
1(c)(ii)	rocket <u>gains</u> (upward) momentum	**B1**
	(ejected) gas <u>gains</u> equal (quantity of) momentum in opposite direction **OR** momentum of gas <u>decreases</u> by equal amount	**B1**

Question	Answer	Marks
2(a)	(W =) mg **OR** $3.4 \times 10^3 \times 10$	**C1**
	3.4×10^4 N	**A1**
2(b)(i)	moment = Fx in any form **OR** (moment) = Fx **OR** 0.50 (seen)	**C1**
	$3.4 \times 10^4 \times (1.8 - 1.3)$ **OR** $3.4 \times 10^4 \times 0.50$	**C1**
	1.7×10^4 N m	**A1**
2(b)(ii)	1. (the point) where (all) the mass can be considered to be concentrated	**B1**
	2. $1.7 \times 10^4 / (1.3 + 0.70)$ **OR** $1.7 \times 10^4 / (2.0)$	**C1**
	8.5×10^3 N	**A1**
2(c)	(moment / it) increases	**B1**
	perpendicular distance (between P and line of action of) W increases	**B1**

Question	Answer	Marks
3(a)	(air) molecules / they move / collide	**B1**
	(air) molecules / they collide with cube / (upper) surface (of cube) / wall	**B1**
	impulse exerted (on surface) **OR** momentum change (of molecules)	**B1**
3(b)(i)	$p = h\rho g$ in any form **OR** (p =) $h\rho g$ **OR** $0.028 \times 1500 \times 10$	**C1**
	420 Pa	**A1**
3(b)(ii)	$F = pA$ in any form words, symbols or numbers **OR** (F =) pA **OR** 420×4.0^2 **OR** 420×0.040^2 **OR** 420×16 **OR** $420 \times 1.6 \times 10^{-3}$	**C1**
	0.67 N	**A1**
3(c)(i)	$W = Fd$ in any form words, symbols or numbers **OR** (W =) Fd **OR** 0.67×0.034	**C1**
	0.023	**A1**
3(c)(ii)	lifting liquid as well **OR** friction between liquid and container / pipe	**B1**

Question	Answer	Marks
4(a)(i)	$E = mc\,(\Delta)T$ in any form words, symbols or numbers **OR** ($E =$) $mc\,(\Delta)T$ **OR** $0.23 \times 0.72 \times 550$	**C1**
	91 J	**A1**
4(a)(ii)	1. $t = E / P$ in any form words, symbols or numbers **OR** ($t =$) E / P **or** 91 / 2.4	**C1**
	38 s	**A1**
	2. (thermal) energy is used to increase the temperature of / lost to cylinder / piston / heater / surroundings	**B1**
4(b)(i)	it / piston moves to the <u>right</u> / <u>away</u> <u>from</u> <u>heater</u> **OR** <u>accelerates</u> (to right)	**M1**
	pressure (of gas) greater / pressure greater (on left) / <u>resultant</u> force to right	**A1**
4(b)(ii)	$V_2 = p_1V_1 / p_2$ in any form **OR** ($V_2 =$) p_1V_1 / p_2 **OR** $2.9 \times 10^5 \times 1.9 \times 10^{-4} / 1.0 \times 10^5$	**C1**
	$5.5 \times 10^{-4}\ m^3$	**A1**

Question	Answer	Marks
5(a)(i)	any **two** from: occurs throughout the liquid **OR** bubbles formed occurs at one temperature / boiling point does not produce cooling **OR** unaffected by draught / surface area / humidity	**B2**
5(a)(ii)	(more) energetic molecules escape (from the liquid) **OR** molecules gain energy and escape **OR** molecules overcome intermolecular forces / break bonds	**B1**
	average speed decreases **OR** molecules with less (kinetic) energy left behind	**B1**
	temperature of liquid decreases	**B1**
	(thermal) energy conducted / gained from skin / body **OR** (thermal) energy lost by skin / body	**B1**
5(b)	molecules touching **OR** no space between molecules	**B1**
	large (repulsive / intermolecular) forces (when moved closer)	**B1**

Question	Answer	Marks
6(a)	idea of one side of wavefront enters / hits solid first **OR** wavefront does not all hit the solid all at once;	**B1**
	idea of this side slowed down first **OR** this side delayed relative to other side	**B1**
	angle of wave(front) changes **OR** different parts of wavefront delayed by different amounts	**B1**
6(b)(i)	$n = \dfrac{\sin i}{\sin r}$ in any form **OR** $n_1 \sin\theta_1 = n_2 \sin\theta_2$ **OR** $1.3 = \dfrac{\sin 67°}{\sin r}$ **OR** $(r =)\sin^{-1}(\sin 67° / 1.3)$ **OR** $\sin^{-1}(0.71)$	**C1**
	45°	**A1**
6(b)(ii)	$v_{ts} = c / n$ in any form **OR** $(v_{ts} =)\ c / n$ **OR** $3.0 \times 10^8 / 1.3$	**C1**
	2.3×10^8 **OR** $3.0 \times 10^8 / 1.3$	**C1**
	$\lambda = v / f$ in any form **OR** $(\lambda =)\ v / f$ **OR** $2.3 \times 10^8 / 5.7 \times 10^{14}$ **OR** $3.0 \times 10^8 / (1.3 \times 5.7 \times 10^{14})$	**C1**
	4.0×10^{-7} m	**A1**
	OR (alternative approach)	
	$\lambda = v / f$ in any form **OR** $(\lambda =)\ v / f$ **OR** $3.0 \times 10^8 / 5.7 \times 10^{14}$	**C1**
	5.3×10^{-7} **OR** $3.0 \times 10^8 / 5.7 \times 10^{14}$	**C1**
	$\lambda_g = \lambda_a / n$ in any form **OR** $(\lambda_g =)\ \lambda_a / n$ **OR** $5.3 \times 10^{-7} / 1.3$ **OR** $3.0 \times 10^8 / (1.3 \times 5.7 \times 10^{14})$	**C1**
	4.0×10^{-7} m	**A1**

Question	Answer	Marks
7(a)	thermistor **c.a.o.**	**B1**
7(b)(i)	$V_X = V_{30}$	**B1**
7(b)(ii)	$V_X = E - V_{20}$ in any form	**B1**
7(c)(i)	$1/R_1 + 1/R_2 = 1/R_{tot}$ **OR** $(R_{tot} =)\ R_1 R_2 / (R_1 + R_2)$ **OR** $1/15 + 1/30 = 1/R_{tot}$ **OR** $(15 \times 30) / (15 + 30)$	**C1**
	10 (Ω) **OR** 10 + 20	**C1**
	30 Ω	**A1**
7(c)(ii)	$I = V / R$ in any form **OR** $(I =)\ V / R$ **OR** 6.0 / 30	**C1**
	0.20 A	**A1**
7(d)	resistance <u>of</u> <u>X</u> decreases	**B1**
	ammeter reading / it increases **and** (total) resistance (of circuit) decreases / more voltage across 20 Ω resistor	**B1**

<table>
<tr><th>Question</th><th colspan="3">Answer</th><th>Marks</th></tr>
<tr><td rowspan="3">8(a)(i)</td><td colspan="3">magnetic field mentioned</td><td>**B1**</td></tr>
<tr><td colspan="3">coil / wire cuts (magnetic) field **OR** changing (magnetic) field (through coil)</td><td>**B1**</td></tr>
<tr><td colspan="3">e.m.f. / voltage induced **OR** produced by electromagnetic induction</td><td>**B1**</td></tr>
<tr><td>8(a)(ii)</td><td colspan="3">(plane of coil) horizontal **OR** in position shown in diagram
coil cutting magnetic field the fastest</td><td>**B1**
B1</td></tr>
<tr><td rowspan="3">8(b)</td><td>current in coil</td><td rowspan="3">**OR**</td><td>energy supplied to / lost from lamp</td><td>**B1**</td></tr>
<tr><td>current in (magnetic) field experiences a force</td><td>student must do more work / supply more energy / more energy needed</td><td>**B1**</td></tr>
<tr><td>opposes the change causing it</td><td>greater force to do more work</td><td>**B1**</td></tr>
</table>

Question	Answer	Marks
9(a)(i)	**mark both explanation and deduction together**	
	nucleus is very small	**B1**
	very few α-particles hit or pass near to a nucleus	**B1**
9(a)(ii)	**mark both explanation and deduction together**	
	<u>nucleus</u> is charged	**B1**
	(charged) α-particles experience a force	**B1**
9(a)(iii)	**mark both explanation and deduction together**	
	centre / (small) part of atom **OR** nucleus includes most of the mass of the atom / is (very) dense	**B1**
	(α-particles move and) nucleus stays still	**B1**
9(b)	any **two** from: opposite direction (much) smaller deflection undergo deflections of similar magnitude	**B2**

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/42**

Paper 4 Extended Theory **May/June 2019**

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks
1(a)	(A and B) decreasing acceleration	**B1**
	(B and C) moving forwards at constant speed	**B1**
	(C and D) constant acceleration	**B1**
1(b)	(average) speed = distance/time OR $v = s/t$ in any form OR (s =) (average) speed × time OR $v \times t$ OR area under graph stated or used	**C1**
	(s =) 23 × 2/60	**C1**
	0.77 km round candidates response to 2 sfs	**A1**
1(c)	horizontal line starting at t = 2.0 min AND at speed = 0 for 1 minute	**B1**
	line of constant positive gradient starting at t >= 2.0 min NOT wrong labels X OR Y	**B1**
	for 30 seconds line continuously rising	**B1**

Question	Answer	Marks
2(a)	(Δ) p=mv in any form OR ((Δ)p=) mv OR 0.8 × 0.72	**C1**
	(Δp=) 0.58 kg m/s	**A1**
2(b)	Ft= Δp in any form OR (F=) Δp/t OR 0.58/6	**B1**
	(F=) 0.096 N accept rounding if 0.096 seen	**B1**

Question	Answer	Marks
2(c)	Statement: (acceleration is) to right/backward	**B1**
	Explanation: force (from water OR on model) to right /backwards OR acceleration in same direction as force (from water OR on model)	**B1**
2(d)	(acceleration) more (when empty)	**B1**
	mass less (and force is constant)	**B1**
	meaningful reference to F=ma / Newton's 2nd law / change in momentum	**B1**

Question	Answer	Marks
3(a)	light	**B1**
3(b)(i)	no air pollution/CO_2/acid rain/greenhouse gases/global warming/harmful gases OR no damage from mining/drilling	**B1**
	visual pollution/use of land/pollution during manufacture	**B1**
3(b)(ii)	yes/renewable AND nothing used up o.w.t.t.e.	**B1**
3(c)	(P_i =1.2 × 2.8 × 260 =) 870 (W)	**C1**
	(P_o = 2.5 × 86 =) 220 (W)	**C1**
	(efficiency =){P_o/P_i} × 100 in any form OR {P_o/P_i} × 100	**C1**
	(efficiency = {220/870} × 100 =) 25 (%)	**A1**

Question	Answer	Marks
4(a)	pressure increases	**B1**
	any **two** from : • molecules travel shorter (average) distance between collisions with walls NOT molecules change speed • molecules hit walls more often OR more collisions (per unit area) with walls • {greater force OR greater (rate of) change of momentum of molecules} per unit area on walls	**B2**
4(b)	1st box **gas**	**B1**
	2nd box **solid**	**B1**

Question	Answer	Marks
5(a)(i)	boiling	**B1**
5(a)(ii)	evaporation	**B1**
5(b)(i)	E=mcΔT in any form OR (E=) mcΔT OR (E=) 2.7 $\times$ 900 $\times$ 18	**C1**
	44 000 (J)	**A1**
	E=Pt in any form OR (P=) E/t OR (P=) 43 740/150	**C1**
	(P=) 290 W	**A1**
5(b)(ii)	lagging/insulation/named insulator (around/on block)	**M1**
	reduction of thermal energy/heat losses	**A1**

Question	Answer	Marks
6(a)(i)	refraction	**B1**
6(a)(ii)	(waves move) faster (in region B) OR slower in region A	**B1**
6(b)	at least one complete cycle with half the amplitude	**B1**
	at least one complete cycle shorter time period	**B1**
6(c)(i)	sound travels faster in steel/metal/solid/the rail (than in air)	**B1**
6(c)(ii)	$v = f\lambda$ in any form OR (λ =) v/f OR (λ =) 5800/1100	**C1**
	(λ =) 5.3 m	**A1**

Question	Answer	Marks
7(a)	both rays straight to left of lens AND top ray bends clockwise AND bottom ray bends anti-clockwise	**B1**
	both rays converge to meet on the centreline at the screen	**B1**
7(b)	both rays straight to left of lens AND top ray bends clockwise less than in **(a)** AND bottom ray bends anti-clockwise less than in **(a)**	**B1**
	both rays converge and/would meet beyond screen	**B1**
7(c)(i)	object closer to lens than one focal length	**B1**
7(c)(ii)	(image) same side (of lens as object) OR image further from lens (than object)	**B1**

Question	Answer	Marks
7(c)(iii)	1 from 3 of : (image) enlarged/magnified, upright / goes up, virtual	**B1**
	all 3: (image) enlarged, upright, virtual	**B1**

Question	Answer	Marks
8(a)	bring (charged) rod close to sphere / touching sphere	**B1**
	earth sphere or equivalent	**B1**
	remove earth (connection) AND keep rod close to sphere (until earth removed) o.w.t.t.e.	**B1**
8(b)	light emitting diode OR LED	**B1**
8(c)	correct labelling of I/P and O/P, all I/P numbers correct in any order	**B1**
	all 4 rows of numbers correct, in any order	**B1**
8(d)	column D correct	**B1**
	1st two rows of E correct	**B1**
	2nd two rows of E correct	**B1**

Question	Answer	Marks
9(a)	place magnet in coil	B1
	EITHER	
	(gradually) withdraw magnet…	B1
	…with ac (in coil) switched on	B1
	OR	
	reduce current…	(B1)
	…to zero	(B1)
9(b)(i)	keeps coil rotating (in the same direction) o.w.t.t.e.	B1
	by changing direction of current (in the coil)	B1
	every half cycle/180 degrees	B1
9(b)(ii)	(coil rotates) faster	B1

Question	Answer	Marks
10(a)	$1/R_p = 1/R_1 + 1/R_2$ OR $(R_p =)\ 1/(1/R_1 + 1/R_2)$ OR $(R_p =)\ R_1R_2/(R_1 + R_2)$ OR $(0.2 \times 0.3)/\ (0.2 + 0.3)$ OR 0.6×0.2	C1
	$(R_p =)\ 0.12\ (\Omega)$	C1
	$(R_t = 0.12\,\Omega + 0.20\,\Omega =)\ 0.32\,\Omega$	A1
10(b)	Statement : resistance of lamp increases	M1
	Explanation : temperature of lamp increases	A1

Question	Answer	Marks
11(a)	${}^{222}_{86}Rn$ on L side of equation	**B1**
	${}^{218}_{84}Po$ on R side of equation	**B1**
	${}^{4}_{2}\alpha$ on R side of equation	**B1**
11(b)	mention of 2 half-lives OR mention or use of two halvings of 100% NOT 5700 ÷ 2 OR 14 ÷ 2	**C1**
	11 000 (years)	**A1**

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/43**

Paper 4 Extended Theory **May/June 2019**

MARK SCHEME

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Question	Answer	Marks
1(a)(i)	constant velocity / speed	**B1**
1(a)(ii)	deceleration / negative acceleration	**B1**
1(a)(iii)	Stationary	**B1**
1(b)	v = gradient OR $\frac{\text{distance}}{\text{time}}$ OR $\frac{160}{100}$ OR evidence of use of gradient	**C1**
	(v =) 1.6 m/s	**A1**
1(c)	line curves upwards with increasing gradient NOT vertical	**B1**

Question	Answer	Marks
2(a)	KE = 1/2 mv^2 in any form OR (KE) = $1/2 \times 1.2 \text{ x } 10^6 \times 0.04^2$	**C1**
	(KE =) 960 J	**A1**

Question	Answer	Marks
2(b)	EITHER	
	(change in momentum) = *mv* OR (change in momentum) = $1.2 \times 10^6 \times 0.04$	**C1**
	(=) 4.8×10^4 (kg m/s)	**C1**
	change in momentum = Ft in any form	**C1**
	(Force = $4.8 \times 10^4 / 0.3$ =) 1.6×10^5 N	**A1**
	OR	
	a = (v-u)/t = 0.04/0.3	**(C1)**
	= 0.13 (m/s^2)	**(C1)**
	F = ma	**(C1)**
	(Force = $1.2 \times 10^6 \times 0.13$ =) 1.6×10^5 N	**(A1)**
2(c)	Work done or KE transferred = Fd in any form	**C1**
	(distance = $960 / 1.6 \times 10^5$ =) 6.0×10^{-3} m OR 0.006 m OR 0.60 cm	**A1**
2(d)	smaller force (on dock/ship) because increases time of collision OR increased distance of collision (on the dock/ship)	**B1**

Question	Answer	Marks
3(a)	(p) = ρgh in any form OR (p=) 1030 × 10 × 3.0 × 10^3	**C1**
	3.1 × 10^7 Pa	**A1**
3(b)(i)	$v = d/t$ OR $v = 2d/t$ in any form	**C1**
	$1500 = \dfrac{2d}{0.50}$ OR 2d = 1500 × 0.50	**C1**
	380 m	**A1**
3(b)(ii)	distance smaller (first box ticked) AND speed of sound lower (in air than liquid)	**B1**

Question	Answer	Marks
4(a)	Any two from: bubbles form OR occurs throughout liquid only occurs at one temperature/boiling point does not produce cooling OR not affected by surface area / humidity / draught OR does not lower KE of molecules left in the liquid.	**B2**
4(b)	$E = Pt$ in any form OR (E) = 370 × 240	**C1**
	= 89 000 (J)	**A1**
	$E = mc\Delta T$ in any form	**C1**
	(temperature increase =) 89 000 / {5.0 × 420} =) 42 °C	**A1**

Question	Answer	Marks
5(a)	any mention of <u>radiation/infra-red radiation</u> wrt silvered surfaces	**B1**
	silvered surfaces are poor emitters / poor absorbers / (good) reflectors	**B1**
	glass is a poor conductor OR glass reduces thermal energy / heat gain by conduction	**B1**
	vacuum prevents thermal energy / heat gain by conduction OR convection	**B1**
	stopper reduces thermal energy / heat gain by convection	**B1**
5(b)	any suitable insulator e.g. cork, plastic, rubber	**B1**

Question	Answer	Marks
6(a)(i)	diffraction	**B1**
6(a)(ii)	wave on left half the wavelength of waves in Fig 6.1	**B1**
	both wavelengths on right same wavelength as on left	**B1**
	much less spreading than in Fig 6.1	**B1**
6(b)	3 numbers correct	**B1**
	all 5 numbers correct (Correct answer: 1, 4, 5, 3, 2)	**B1**
6(c)(i)	3.0×10^8 m/s	**B1**
6(c)(ii)	$v = f\lambda$ in any form OR ($\lambda = v/f$)	**C1**
	96×10^6 seen	**C1**
	$(\lambda = \dfrac{3.0\times10^8}{96\times10^6} =)$ 3.1 m	**A1**

Question	Answer	Marks
7(a)	40°	**B1**
7(b)	n = 1.3 OR seen in calculation	**C1**
	sin *i* / sin *r* = *n* in any form OR sin 40 / sin*r* = *n* sin *i* / sin *r* = 1 / *n*	**C1**
	(sin *r* = 1.3 × sin 40°) (r =) 57°	**A1**

Question	Answer	Marks
8(a)	$P = VI$ in any form	**C1**
	I (= $\frac{700}{240}$) = 2.9 A	**A1**
8(b)	13 A fuse	**B1**
	any **two** out of: 2.9 + 7.5 SEEN if too low it would break / blow / melt when the appliances are operating normally if fuse too high wouldn't break / blow until current was too high which would be dangerous (to people /wires /appliance)	**B2**
8(c)	(Resistance inversely proportional to area so) resistance of thicker wire is lower	**B1**
	Fuse will melt at higher current	**B1**
	because heating effect = $I^2 R$ OR less heating effect (for same current) owtte	**B1**
8(d)(i)	Any **two** renewable sources of energy from: solar, wind, water, hydroelectric, waves, tidal, geothermal	**B2**
8(d)(ii)	Any relevant disadvantage for one of their <u>correct</u> answers to **(d)(i)** e.g.: Energy for wind / waves / Sun not always available Cost of building wind turbines or tidal barrages or hydroelectric dams Wind turbines affect the scenery of some areas Solar (farms) use (agricultural) land / takes up a lot of space	**B1**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>9(a)</td><td>light dependent resistor OR LDR</td><td>B1</td></tr>
<tr><td rowspan="3">9(b)</td><td><table><tr><td>Input 1</td><td>Input 2</td><td>Output</td></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></table></td><td></td></tr>
<tr><td>2 input columns and one output column AND 4 correct rows of input</td><td>B1</td></tr>
<tr><td>All 4 rows with correct, in any order</td><td>B1</td></tr>
<tr><td rowspan="4">9(c)</td><td>D E
1 1
1 1
0 0
0 1</td><td></td></tr>
<tr><td>all D correct</td><td>B1</td></tr>
<tr><td>first 2 rows of E correct</td><td>B1</td></tr>
<tr><td>last 2 rows of E correct</td><td>B1</td></tr>
<tr><td>9(d)</td><td>conductors have free / delocalised electrons / electrons which move (freely) (electrons in insulators don't move or are fixed)</td><td>B1</td></tr>
</table>

Question	Answer	Marks
10(a)	Correct shape of graph showing one rotation	**B1**
	Graph starts from maximum voltage (positive or negative) (labelled horizontal)	**B1**
	Graph passes through zero twice, labelled 1 / 4 and 3 / 4 revolution	**B1**
10(b)	induced e.m.f. caused by coil cutting magnetic field OR coil moving in magnetic field	**B1**
10(c)	slip rings	**B1**
	(provide) continuous connection while coil rotating	**B1**
10(d)	Any two of: increase strength of magnetic field increase speed of rotation of the coil increase numbers of turns of coil	**B2**

Question	Answer	Marks
11(a)	${}^{241}_{95}\mathrm{Am} \rightarrow {}^{4}_{2}\alpha + {}^{237}_{93}\mathrm{Np}$	
	Am on L with correct proton no	**B1**
	Am on L with correct nucleon no	**B1**
	alpha symbol on R with correct proton and nucleon no	**B1**
	Np on R with correct proton and nucleon no.	**B1**
11(b)(i)	current decreases / is stopped AND alpha particles absorbed (by smoke) owtte	**B1**
11(b)(ii)	Any **two** from: alpha particles highly ionizing / more ionising than beta particles or gamma rays alpha particles short range (in air) safer to use alpha because they do not travel out of smoke detector	**B2**

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/51**

Paper 5 Practical Test **May/June 2019**

MARK SCHEME

Maximum Mark: 40

Published

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Question	Answer	Marks
1(a)	*a* values decreasing all < 25 cm	**1**
	b values decreasing	**1**
	all values in cm	**1**
1(b)	Graph:	
	Axes correctly labelled with quantity and unit and right way round	**1**
	Suitable scales	**1**
	All plots correct to ½ small square	**1**
	Good line judgement, thin, continuous line	**1**
1(c)	triangle method indicated on graph	**1**
1(d)	Correct calculation, to 2 or 3 significant figures	**1**
1(e)	Difficulty in achieving exact balance OR difficulty in judging centre of P OR load easily slips OR less than sharp pivot point	**1**
1(f)	Mass value / 100 = $G \pm 10\%$	**1**

Question	Answer	Marks
2(a)(i)	I to at least 2 decimal places and < 1 A	**1**
2(a)(ii)	All V to at least 1 decimal place and < 3 V	**1**
	V values increasing	**1**
	V/I correct	**1**
	V/I consistent 2 significant figures or consistent 3 significant figures	**1**
2(b)(i)	Box ticked to match results	**1**
2(b)(ii)	Justification to match results	**1**
2(c)	Correct calculation	**1**
	2 or 3 significant figures	**1**
	Unit Ω	**1**
2(d)	Keep current low OR switch off between readings	**1**

Question	Answer	Marks
3(a)	Sensible value for room temperature with unit °C	**1**
3(b)	Correct times in both tables 0, 30, 60, 90, 120, 150	**1**
	Temperatures decreasing in Table 3.1	**1**
	Consistent significant figures for temperatures in both tables	**1**
3(c)	Decreasing temperatures in Table 3.2	**1**
	Overall temperature decrease no greater than in Table 3.1	**1**
3(d)(i)	Correct box ticked to match readings	**1**
3(d)(ii)	Justification to match temperature readings	**1**
	Reference to same time	**1**
3(e)	Use a black painted beaker and black painted can	**1**
	Use a shiny can and unpainted beaker (or put foil round the beaker)	**1**

Question	Answer		Marks
4	**MP1**	Apparatus: forcemeter or pulley and weights arrangement	**1**
	MP2	Pull box up slope. Measure force and distance moved	**1**
	MP3	Repeat with different masses	**1**
	MP4	Key variable: angle of slope (or height of blocks, owtte)	**1**
	MP5	Key variable: Distance moved	**1**
	MP6	Table with columns for force and mass with correct units	**1**
	MP7	Calculate work done and compare with mass. OR, if there is a work done column in the table, compare work done with mass OR plot a graph of work done against mass	**1**

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS	**0625/52**
Paper 5 Practical Test	**May/June 2019**
MARK SCHEME	
Maximum Mark: 40	

Published

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Question	Answer	Marks
1(a)	*a* values decreasing	**1**
	b values decreasing, all values in cm	**1**
1(b)	graph:	
	axes correctly labelled and right way round	**1**
	suitable scales – must start from (0,0)	**1**
	all plots correct to ½ small square	**1**
	good line judgement, thin, continuous line	**1**
1(c)	triangle method used and <u>seen on graph</u>	**1**
	triangle at least half of candidate's line	**1**
1(d)	intercept correct to ½ small square	**1**
1(e)	width = 2.0 to 4.0 cm with correct unit	**1**
1(f)	difficulty: achieving exact balance/keeping the pivot in the same position/locating the centre of load Q/load(s) slipping/load obscuring readings on the rule	**1**

Question	Answer	Marks
2(a)	sensible value for room temperature with unit ºC	**1**
2(b)	correct times in both tables	**1**
	temperatures decreasing in Table 2.1	**1**
	consistent significant figures for temperatures in both tables	**1**
2(c)	decreasing temperatures in Table 2.2	**1**
	overall temperature decrease the same or greater than in Table 2.1	**1**
2(d)(i)	correct box ticked to match readings	**1**
2(d)(ii)	justification to match temperature readings	**1**
	reference to same time	**1**
2(e)	any one from: higher room temperature lower <u>starting</u>/initial temperature thicker/better insulation	**1**
2(f)	perpendicular viewing of thermometer/view (reading) at eye level/stir the water/thermometer not touching the sides of the beaker/wait for the temperature to stop rising (initially)	**1**

Question	Answer	Marks
3(a)(i)	V to at least 1 decimal place and < 3 V	**1**
	I to at least 2 decimal places and < 1 A	**1**
3(a)(ii)	R_1 correct	**1**
3(b)	V_2 present R_2 correct	**1**
3(c)	V_3 and I_2 present, R_3 and R_1 same $\pm$ 10%	**1**
3(d)	V_4 present and unit Ω	**1**
3(e)	statement to match results	**1**
	justification to match results	**1**
3(f)	correct symbols with resistors and lamp in parallel	**1**
	only one voltmeter used and correctly positioned	**1**
3(g)	variable resistor	**1**

Question	Answer	Marks
4	**Apparatus** **MP1** diagram showing object, lens, screen/image in correct order	**1**
	MP2 *u* and *v* correctly labelled on diagram	**1**
	Method **MP3** measure/record *u* and *v* and lens thickness *t*	**1**
	MP4 repeat with a different lens	**1**
	MP5 method of obtaining a sharp image by <u>moving</u> object, lens or screen….	**1**
	Measuring lens thickness **MP6** use of blocks either side of lens (and measure distance)	**1**
	Table **MP7** table with columns for *u*, *v* and *t* with correct units	**1**

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS	**0625/53**
Paper 5 Practical Test	**May/June 2019**
MARK SCHEME	
Maximum Mark: 40	

Published

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Question	Answer	Marks
1(a)	5 *b* values decreasing	**1**
	all < 75.0 cm <u>and</u> recorded to at least 1 dp	**1**
1(b)	graph:	
	axes labelled correct orientation, with quantity and unit	**1**
	appropriate scales (plots occupying at least ½ grid)	**1**
	plots all correct to less than ½ small square and precise plots	**1**
	well-judged line <u>and</u> thin line	**1**
1(c)(i)	*G* present <u>and</u> triangle method seen on graph	**1**
1(c)(ii)	M_U in range 70.0 to 130.0 (g)	**1**
	2/3 sig figs and unit	**1**
1(d)	(difficult to see centre of block) and valid method, e.g. • (measure width of block and) add ½ width to 5.0 cm to find position for edge of block • mean value of marks at both edges of mass • mark centre line of mass and align with mark on rule	**1**
1(e)	move block back and forth to find the point of balance / owtte	**1**

Question	Answer	Marks
2(a)	sensible value for θ_R	**1**
2(b)	θ_C increasing	**1**
	θ_H decreasing	**1**
	θ_H decreasing more slowly than θ_C increasing	**1**
2(c)	s, °C, °C, °C – all correct	**1**
	30, 60, 90, 120, 150, 180	**1**
2(d)(i)	between θ_H at 180 s and halfway between θ_H and θ_C at 180 s	**1**
	justification with reference to hot and cold water trends	**1**
2(d)(ii)	θ_R / room temperature	**1**
2(e)	any **two** from: • thinner walls on tube • metal tube • bung/lid on tube • insulate sides of beaker/lid on beaker • higher <u>initial</u> hot water temperature • lower <u>initial</u> cold water temperature • increase volume of hot water • decrease volume of cold water • stirring	**2**

Question	Answer	Marks
3(a)	$3V_X \approx V_{XY}$ <u>and</u> recorded to at least 1 dp <u>and</u> < 4.0 V	**1**
3(b)	$I_X \approx I_{XY}$ <u>and</u> recorded to at least 2 dp <u>and</u> < 1.00 A	**1**
3(c)(i)	A, V, Ω	**1**
3(c)(ii)	statement matching results <u>and</u> 'currents the same within limits of experimental accuracy' / owtte	**1**
3(d)(i)	correct calculations of R	**1**
	consistent 2 or consistent 3 sig figs	**1**
3(d)(ii)	R_Y and R_Z both within 10% of 10 (Ω)	**1**
3(e)	3 resistors in parallel arrangement <u>and</u> circuit symbols correct	**1**
	voltmeter and ammeter in correct arrangement <u>and</u> circuit symbols correct	**1**
3(f)	I_P and V_P present	**1**
	$R_P < R_X$	**1**

Question	Answer	Marks
4	**MP1 Apparatus** metre rule / measuring tape	**1**
	MP2 Method drop ball from measured height measure height of bounce repeat for different height of release	**1**
	MP3 Precaution any one from: • repeat (for each height of release) <u>and</u> average • measure to same part of ball each time • measure height of bounce at eye level • release without throwing/impeding • use of video (for height of bounce)	**1**
	MP4 Control variable any one from: • same (diameter/mass/material) ball • type of floor covering	**1**
	MP5 Table columns for release height and bounce height and <u>units</u>	**1**
	MP6 Analysis any one from: • suitable analysis of readings • draw a suitable graph of drop height against bounce height	**1**
	MP7 Additional point any one from: • additional control variable • at least 5 sets of data taken • repeat experiment for different diameter of ball/floor covering • automatic release to eliminate differences	**1**

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PHYSICS **0625/61**

Paper 6 Alternative to Practical **May/June 2019**

MARK SCHEME

Maximum Mark: 40

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Question	Answer	Marks
1(a)	Graph:	
	Axes correctly labelled with quantity and unit and right way round	**1**
	Suitable scales	**1**
	All plots correct to ½ small square	**1**
	Good line judgement, thin, continuous line	**1**
1(b)	triangle method indicated <u>on graph</u>	**1**
	triangle at least half of candidate's line	**1**
1(c)	Correct calculation	**1**
	2 or 3 significant figures and unit N	**1**
1(d)	Difficulty in achieving exact balance OR difficulty in judging centre of P OR load easily slips OR top of pivot not a sharp edge	**1**
1(e)	113	**1**
1(f)(i)	1.13	**1**
1(f)(ii)	Statement and explanation to match results. Expect Yes, because values are close, owtte	**1**

Question	Answer	Marks
2(a)(i)	I = 0.47(A)	**1**
2(b)(i)	V/l 0.025 0.023 0.027 0.026 0.024	**1**
2(b)(ii)	V/l consistent 2 significant figures or consistent 3 significant figures	**1**
	V/cm	**1**
2(c)	Box 1 ticked	**1**
	Values are close OR values are within the limits of experimental accuracy	**1**
2(d)	5.1(1)	**1**
	2 or 3 significant figures	**1**
	Unit Ω	**1**
2(e)	Keep current low OR switch off between readings	**1**
2(f)	Correct symbol	**1**

Question	Answer	Marks
3(a)	24 (°C)	**1**
3(b)(i)	s, °C seen and not contradicted	**1**
3(b)(ii)	Third box ticked to match readings	**1**
	Pairs of readings 94(°C), 89(°C) and 93 (°C), 87 (°C) quoted. OR differences 5(°C) and 6(°C) quoted	**1**
	Difference is only 1(°C) OR difference is small. owtte	**1**
3(c)(i)	Use a black painted beaker (and black painted can)	**1**
	Use a shiny can (and unpainted beaker)	**1**
3(c)(ii)	Any two from: Room temperature Volume of water Same starting temperature (of water)	**2**
3(d)	Perpendicular viewing of the thermometer OR stirring OR thermometer not touching beaker.	**1**

Question	Answer		Marks
4	**MP1**	Apparatus: Forcemeter/Newtonmeter or pulley and weights arrangement	**1**
	MP2	Method: Pull box up slope, measure force and measure distance moved	**1**
	MP3	Method: Repeat with different masses	**1**
	MP4	Variable: Angle of slope or height of blocks	**1**
	MP5	Variable: Distance moved	**1**
	MP6	Table to include columns for mass and force, both with unit (g or kg for mass and N for force)	**1**
	MP7	Calculate work done and compare with mass. OR Compare work done with mass (if there is a work done column in the table). OR Plot graph of work done against mass	**1**

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PHYSICS **0625/62**

Paper 6 Alternative to Practical **May/June 2019**

MARK SCHEME

Maximum Mark: 40

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Question	Answer	Marks
1(a)	centre of mass/gravity not in centre (however expressed)	**1**
1(b)	graph:	
	axes correctly labelled and right way round	**1**
	suitable scales starting from (0,0)	**1**
	all plots correct to less than ½ small square	**1**
	good line judgement, thin, continuous line	**1**
1(c)	triangle method used and <u>seen on graph</u>	**1**
	triangle at least half of distance between extreme plotted points i.e. $\Delta a \geqslant 10$	**1**
1(d)	intercept correct to ½ small square – if graph not extrapolated, use the ruler tool	**1**
1(e)	width 2.5(0) cm / 25 mm with correct unit	**1**
1(f)	statement to match results	**1**
	justification to match statement and include idea of within (or beyond) limits of experimental accuracy	**1**
1(g)	difficulty in achieving exact balance/keeping the pivot in the same position/locating the centre of load (Q)/load(s) slipping/load obscuring readings on rule	**1**

Question	Answer	Marks
2(a)	22(.0) (ºC)	**1**
2(b)(i)	s, ºC seen in both tables	**1**
2(b)(ii)	third box ticked to match readings	**1**
2(b)(iii)	quoting temperatures from the table in the same time	**1**
2(c)	any one from: higher room temperature lower starting/initial temperature insulation	**1**
2(d)	perpendicular viewing of thermometer/view (reading) at eye level/stir the water/thermometer not touching the sides of the beaker/wait for the temperature to stop rising (initially)	**1**
2(e)	any two from: room temperature/stated environmental condition starting/initial temperature of the (hot) water volume/mass/amount of water same beaker total time for experiment	**2**
2(f)	third box ticked	**1**

Question	Answer	Marks
3(a)	3.6(0) (V) 0.3(0) (A)	**1** **1**
3(b)	12 (Ω)	**1**
3(c)	8 and unit Ω	**1**
3(d)(i)	11/11.3/11.29 (Ω)	**1**
3(d)(ii)	statement to match results justification to match results (with <u>idea</u> of within or beyond limits of experimental accuracy <u>explained</u>)	**1** **1**
3(e)	brightness/intensity of lamp <u>changes</u>	**1**
3(f)	correct symbols with resistors and lamp in parallel <u>one</u> voltmeter correctly positioned – accept across power supply	**1** **1**
3(g)	variable resistor	**1**

Question	Answer	Marks
4	**Apparatus** **MP1** diagram showing object, lens, screen/image in correct order	**1**
	MP2 *u* and *v* correctly labelled on diagram	**1**
	Method **MP3** measure/record/calculate *u* and *v* and lens thickness *t*	**1**
	MP4 repeat with a different lens	**1**
	MP5 method of obtaining a sharp image by <u>moving</u> object, lens or screen….	**1**
	Measuring lens thickness **MP6** use of blocks either side of lens (and measure distance)	**1**
	Table **MP7** table with columns for *u*, *v* and *t* with correct units	**1**

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/63**

Paper 6 Alternative to Practical **May/June 2019**

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks
1(a)	(difficult to see centre of block) and valid method, e.g. • (measure width of block and) add ½ width to 5.0 cm to find position for edge of block • mean value of marks at both edges of mass • mark centre line of mass and align with mark on rule	**1**
1(b)(i)	move block back and forth to find the point of balance / owtte	**1**
1(b)(ii)	graph:	
	axes labelled correct orientation, with quantity and unit	**1**
	appropriate scales (plots occupying at least ½ grid)	**1**
	plots all correct to less than ½ small square and precise plots	**1**
	well-judged line <u>and</u> thin line	**1**
1(c)(i)	*G* present <u>and</u> triangle method seen on graph	**1**
1(c)(ii)	M_U in range 61.0 to 81.0 (g)	**1**
	2/3 sig figs and unit	**1**
1(d)	*a* and *b* are proportional	**1**
	b/*a* constant within limits of experimental accuracy / owtte	**1**

Question	Answer	Marks
2(a)	21 (°C)	**1**
2(b)(i)	s, °C, °C, °C all correct	**1**
	30, 60, 90, 120, 150, 180	**1**
2(b)(ii)	any one from: • place stop-clock <u>and</u> thermometers so seen easily • keep eyes at level to thermometer scales • use an audible 30 s alarm • read temperatures alternately every 15 s • use of data logger	**1**
2(c)	greater temperature difference causes greater (rate of) heating	**1**
	comparison of temperature changes during same period in first half and in second half of experiment	**1**
2(d)(i)	within range 64 to 72 (°C) inclusive	**1**
	justification with reference to hot and cold water trends	**1**
2(d)(ii)	21 (°C) / room temperature	**1**
2(e)	any **two** from: • thinner walls on tube • metal tube • bung/lid on tube • insulate sides of beaker/lid on beaker • higher <u>initial</u> hot water temperature • lower <u>initial</u> cold water temperature • increase volume of hot water • decrease volume of cold water • stirring	**2**

Question	Answer	Marks
3(a)	correct voltmeter symbol in parallel with **X**	**1**
3(b)	I = 0.22 (A)	**1**
	V = 1.1 (V)	**1**
	A, V, Ω	**1**
3(c)	statement matching results <u>and</u> 'currents the same within limits of experimental accuracy' / owtte	**1**
3(d)(i)	R values 5.0/ecf, 14(.3478), 24/(23.8095) (Ω)	**1**
	consistent 2 or consistent 3 sig figs	**1**
3(d)(ii)	R_Y = 9.0 (Ω) <u>and</u> R_Z = 10 (Ω)	**1**
3(e)(i)	3 resistors in parallel arrangement <u>and</u> circuit symbols correct	**1**
	voltmeter and ammeter in correct arrangement <u>and</u> circuit symbols correct	**1**
3(e)(ii)	$10R_P = R_S$	**1**

Question	Answer	Marks
4	**MP1 Apparatus** metre rule / measuring tape	**1**
	MP2 Method drop ball from measured height measure height of bounce repeat for different height of release	**1**
	MP3 Precaution any one from: • repeat (for each height of release) <u>and</u> average • measure to same part of ball each time • measure height of bounce at eye level • release without throwing/impeding • use of video (for height of bounce)	**1**
	MP4 Control variable any one from: • same (diameter/mass/material) ball • type of floor covering	**1**
	MP5 Table columns for release height and bounce height and <u>units</u>	**1**
	MP6 Analysis any one from: • suitable analysis of readings • draw a suitable graph of drop height against bounce height	**1**
	MP7 Additional point any one from: • additional control variable • at least 5 sets of data taken • repeat experiment for different diameter of ball/floor covering • automatic release to eliminate differences	**1**

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/11**

Paper 1 Multiple Choice (Core) **May/June 2019**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

1585078804

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **19** printed pages and **1** blank page.

1 A digital stop-clock measures time in minutes and seconds.

The stop-clock reads 00:50 when it is started (i.e. 00 minutes 50 seconds).

It reads 02:10 when it is stopped.

What is the shortest possible time that has elapsed between starting and stopping the stop-clock?

A 1 minute 20 seconds

B 2 minutes 00 seconds

C 2 minutes 10 seconds

D 3 minutes 00 seconds

2 A long-distance runner wishes to calculate her average speed for a race.

Which calculation should she use?

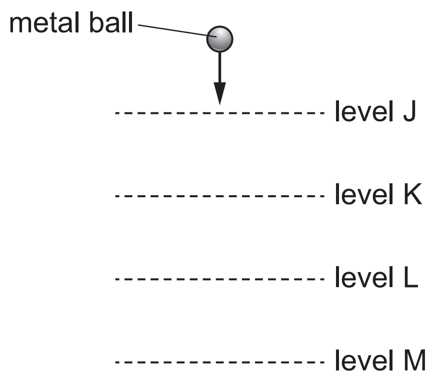
A average speed = $\frac{\text{total distance}}{\text{total time}}$

B average speed = total distance $\times$ total time

C average speed = $\frac{\text{total time}}{\text{total distance}}$

D average speed = total distance + total time

3 A heavy metal ball falls vertically downwards through air past four equally spaced levels J, K, L and M.



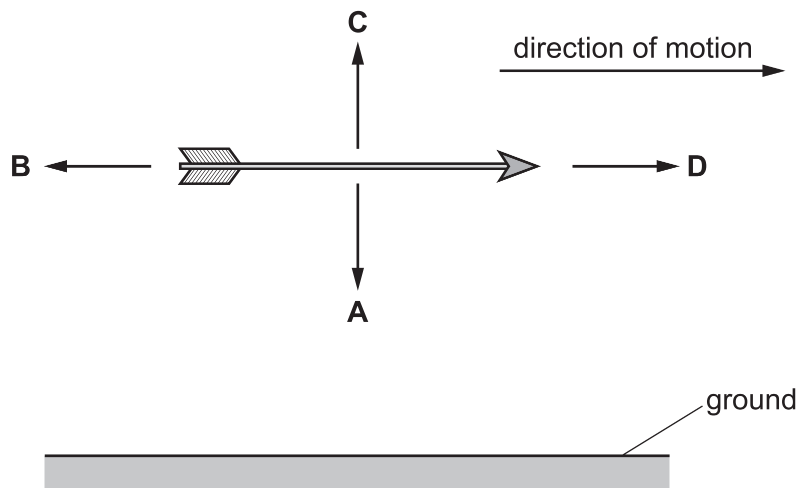
The times taken to fall from one level to the next are measured.

Where is the speed of the ball greatest and which time is shortest?

	speed is greatest between	time is shortest between
A	J and K	J and K
B	J and K	L and M
C	L and M	J and K
D	L and M	L and M

4 An arrow travels horizontally in a straight line at constant speed.

In which direction does the weight act?



5 Two rectangular blocks consist of different materials.

Four different methods are suggested to compare the two masses.

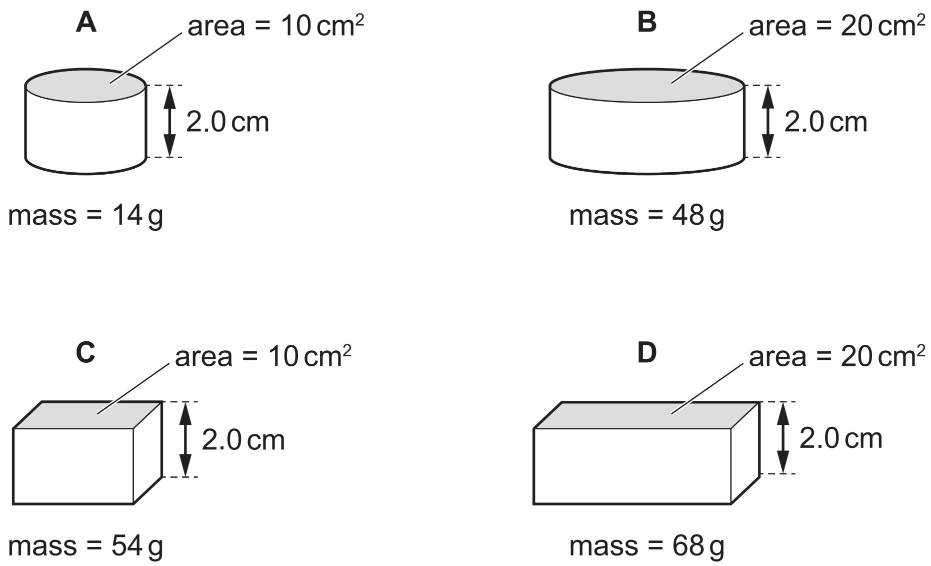
1. Compare the accelerations with which they fall freely.
2. Compare the values of their lengths × breadths × heights.
3. Hang each in turn from the same spring. Compare the extensions.
4. Place one in the right-hand pan of a beam balance and the other in the left-hand pan.

Which methods give a comparison of the two masses?

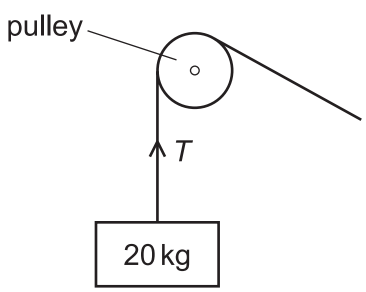
A 1, 2 and 3 **B** 1 and 2 only **C** 3 and 4 only **D** 4 only

6 The diagrams show four solid blocks with their dimensions and masses.

Which block has the greatest density?



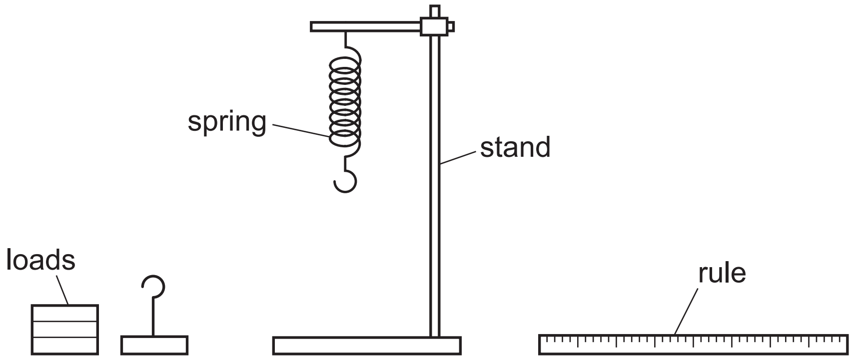
7 A mass of 20 kg is held stationary by a rope passing over a frictionless pulley.



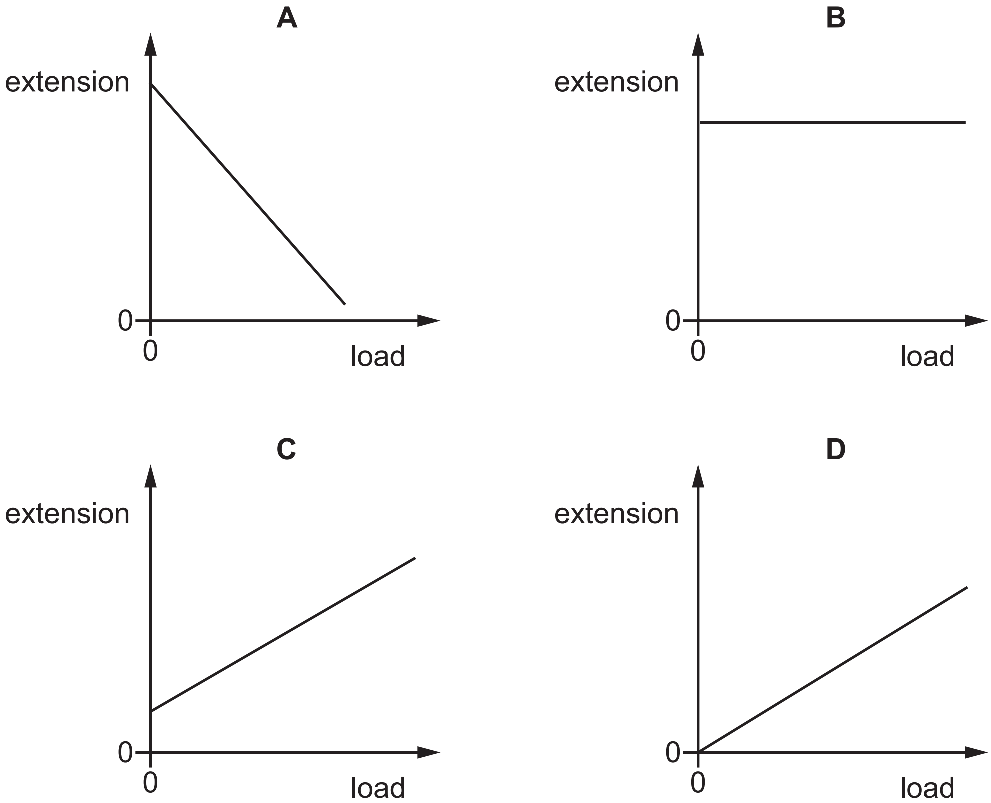
What is the tension *T* in the rope?

A 10 kg **B** 20 kg **C** 100 N **D** 200 N

8 A spring is suspended from a stand. Loads are added and the extensions are measured.



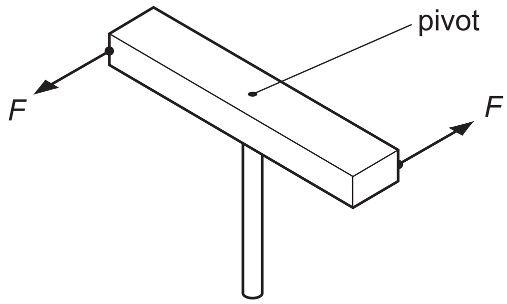
Which graph shows the result of plotting extension against load?



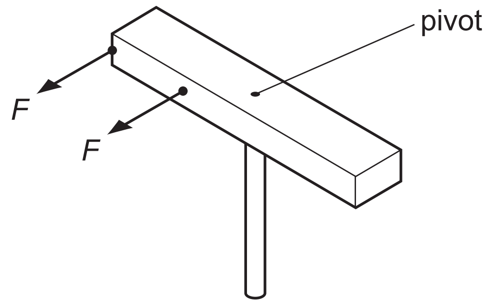
9 A wooden bar is pivoted at its centre so that it can rotate freely. Two equal forces F are applied to the bar.

In which diagram is the turning effect greatest?

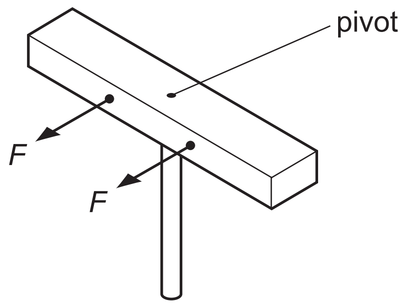
A



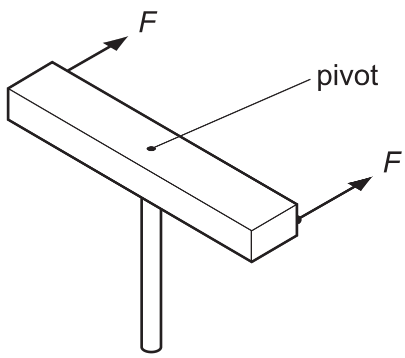
B



C



D



10 A machine is very efficient.

What does this mean?

A It produces a large amount of power.

B It uses very little energy.

C It wastes very little energy.

D It works very quickly.

11 An object is lifted vertically by a motor.

In which example is the power produced the greatest?

A lifting it a shorter distance in a longer time

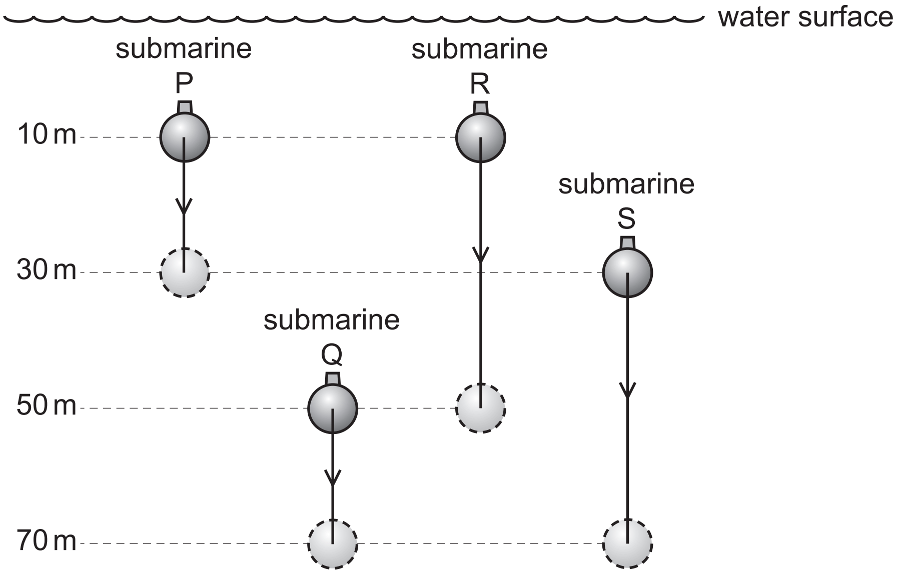
B lifting it the same distance in a longer time

C lifting it a shorter distance in the same time

D lifting it the same distance in a shorter time

12 Four identical submarines P, Q, R and S are lowered from one depth to another in water of a constant density.

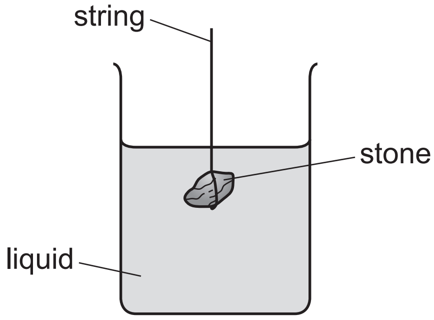
The initial and final depths of each submarine are shown in the diagram.



Which row is correct for the difference in pressure from the initial to final depth of each submarine?

	least change in pressure	greatest change in pressure
A	submarines P and Q	submarines R and S
B	submarines P and Q	submarine R only
C	submarine P only	submarines R and S
D	submarine P only	submarine R only

13 The diagram shows a stone suspended on a string under the surface of a liquid. The stone experiences a pressure caused by the liquid.



What would increase the pressure on the stone?

A decreasing the surface area of the stone

B increasing the mass of the stone

C lowering the stone deeper into the liquid

D using a liquid with a lower density

14 Why can a gas be compressed easily into a smaller volume?

A The molecules are far apart.

B The molecules do not attract each other.

C The molecules move randomly.

D The volume of each molecule can be reduced.

15 When a liquid evaporates, some molecules escape. The temperature of the remaining liquid changes.

What is the effect on the temperature and from where do the molecules escape?

	temperature of liquid	molecules escape from
A	decreases	everywhere within the liquid
B	decreases	the surface only
C	increases	everywhere within the liquid
D	increases	the surface only

16 What happens when a metal block is heated?

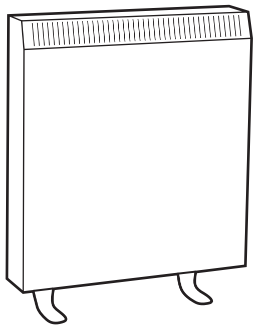
A Its breadth, height and length all increase.

B Its width increases only.

C Its height increases only.

D Its length increases only.

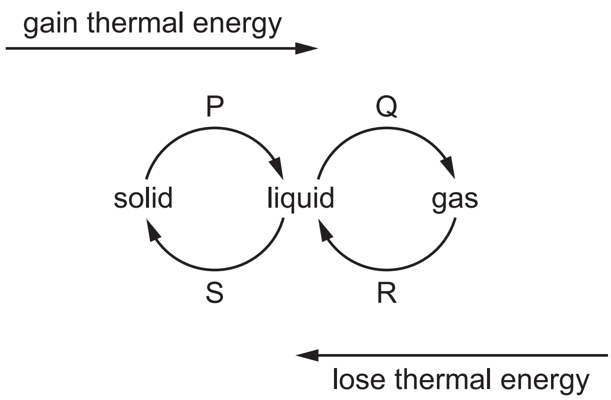
17 A night storage heater contains a large block of material that is heated electrically during the night. During the day the block cools down, releasing thermal energy into the room.



Which thermal capacity and which night-time temperature increase will cause the most energy to be stored by the block?

	thermal capacity of block	night-time temperature increase
A	large	large
B	large	small
C	small	large
D	small	small

18 The diagram shows the changes of state P, Q, R and S that occur in solids, liquids and gases when they gain or lose thermal energy.



What is the name of change R?

A condensation

B solidification

C boiling

D melting

19 In which does thermal conduction **not** occur?

A a gas

B a liquid

C a solid

D a vacuum

20 The metal surface of a kettle is hot.

What happens to the cool air outside the kettle when it comes into contact with the hot kettle?

A The density of the air decreases and the air falls.

B The density of the air decreases and the air rises.

C The density of the air increases and the air falls.

D The density of the air increases and the air rises.

21 Ultrasound is used in a hospital to scan a patient. Ultrasound refracts at the boundary between muscle and bone because it travels at a greater speed in bone.

Which change takes place when the ultrasound travels from muscle into bone?

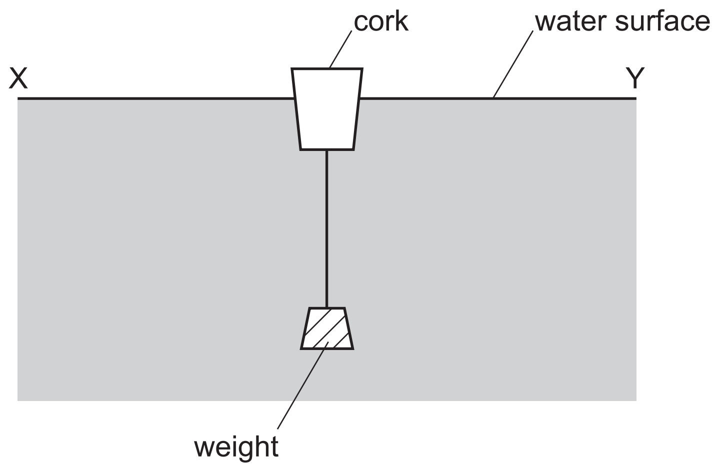
A The frequency of the wave decreases.

B The frequency of the wave increases.

C The wavelength of the wave decreases.

D The wavelength of the wave increases.

22 The diagram shows a cork with a weight attached so that the cork floats upright in water.



Transverse waves travel across the water from X to Y.

In which direction do the waves make the cork move?

A $\rightarrow \leftarrow$ right and left

B $\uparrow\downarrow$ up and down

C $\rightarrow$ only to the right

D $\leftarrow$ only to the left

23 An object is placed 30 cm in front of a plane mirror.

Which statement describes the image of the object?

A The image is the same size and 30 cm from the object.

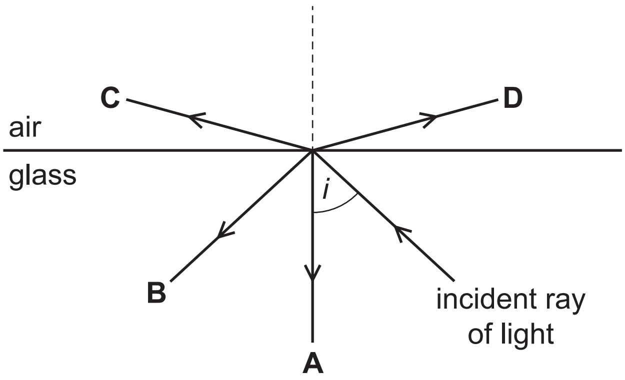
B The image is the same size and 60 cm from the object.

C The image is smaller and 30 cm from the object.

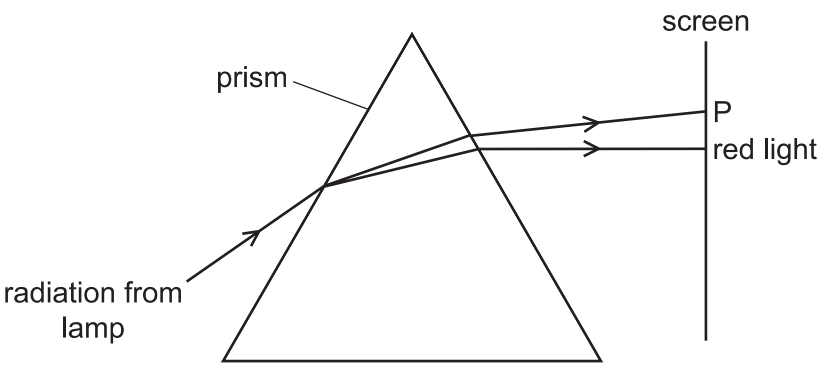
D The image is smaller and 60 cm from the object.

24 The diagram shows light incident at a glass-air boundary. The angle of incidence *i* of the ray is greater than the critical angle.

Which line shows the path of the light after it meets the boundary?



25 The diagram shows radiation from a lamp passing through a prism.



Which type of radiation is found at P?

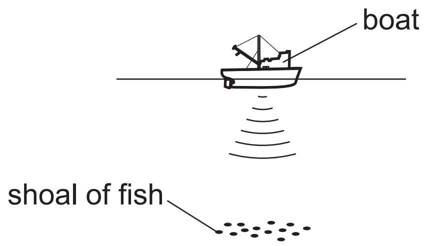
A γ-rays

B infrared

C ultraviolet

D X-rays

26 A pulse of sound is produced at the bottom of a boat. The sound travels through the water and is reflected from a shoal of fish. The sound reaches the boat again after 1.2 s. The speed of sound in the water is 1500 m / s.



How far below the bottom of the boat is the shoal of fish?

A 450 m **B** 900 m **C** 1800 m **D** 3600 m

27 Which range is approximately correct for the audio frequencies that can be detected by a healthy human ear?

A 2 Hz to 2000 Hz

B 2 Hz to 20 000 Hz

C 20 Hz to 2000 Hz

D 20 Hz to 20 000 Hz

28 Why is soft iron used for the core of an electromagnet?

A Soft iron easily becomes a permanent magnet.

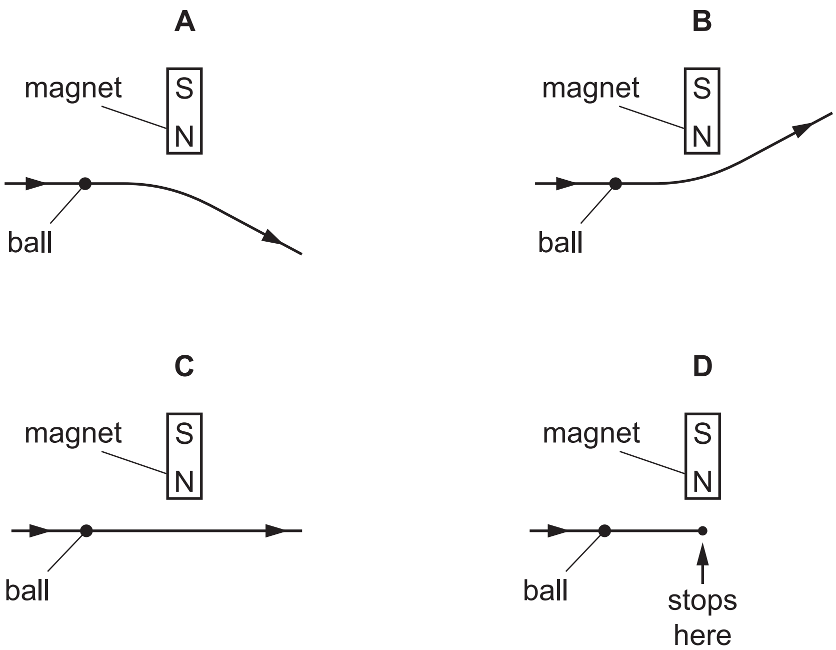
B Soft iron is a good electrical conductor.

C Soft iron is a poor thermal conductor.

D Soft iron loses its magnetism when the current in the coil is switched off.

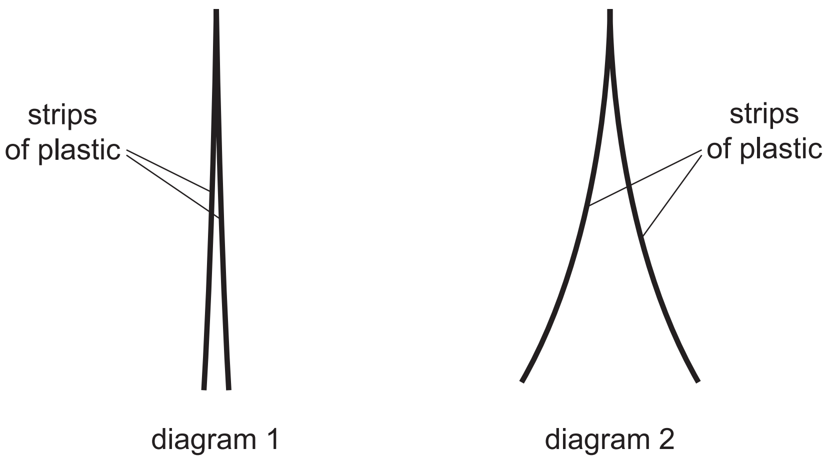
29 An iron ball on a horizontal wooden table rolls near the north pole of a bar magnet which is lying on the table.

Which diagram shows the most likely path of the ball, as seen from above the table?



30 Diagram 1 shows two thin, uncharged strips of plastic.

Diagram 2 shows the same strips after they have been rubbed with a dry cloth.



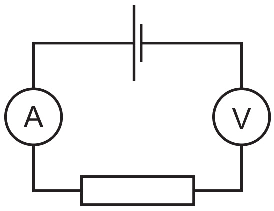
Which row describes the charge on the strips after rubbing, and the force between the strips after rubbing?

	charge on strips	force between strips
A	opposite	attraction
B	opposite	repulsion
C	the same	attraction
D	the same	repulsion

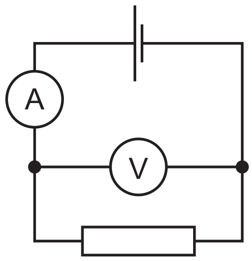
31 A voltmeter and an ammeter are used to measure the resistance of a resistor.

Which diagram shows the voltmeter and the ammeter correctly connected?

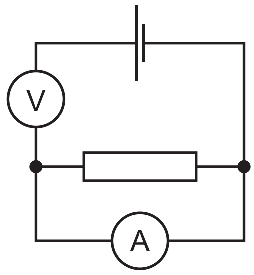
A



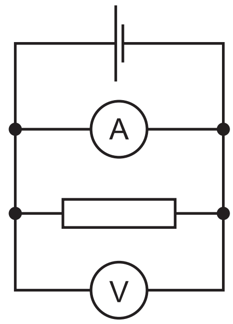
B



C



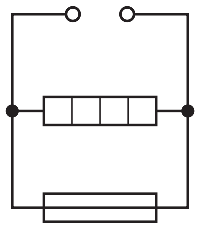
D



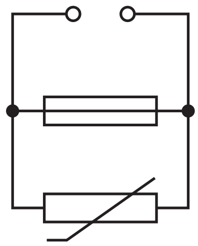
32 A student sets up four circuits.

In which circuit is there a heater in series with a fuse?

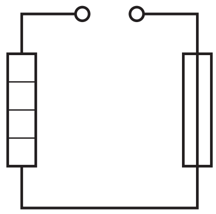
A



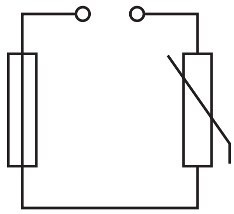
B



C



D



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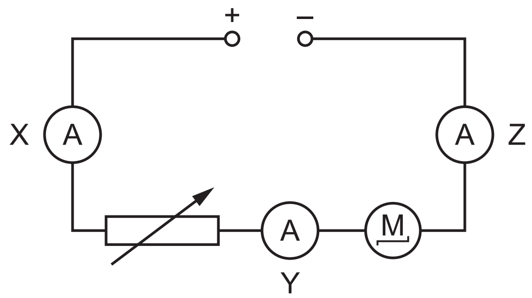
33 The diagram shows a circuit containing a d.c. power supply, a motor and a variable resistor.

Three ammeters X, Y and Z show the current in different parts of the circuit.



The reading on X is 4.0 A.

Which statement is correct?

A The readings on Y and Z are both less than 4.0 A.

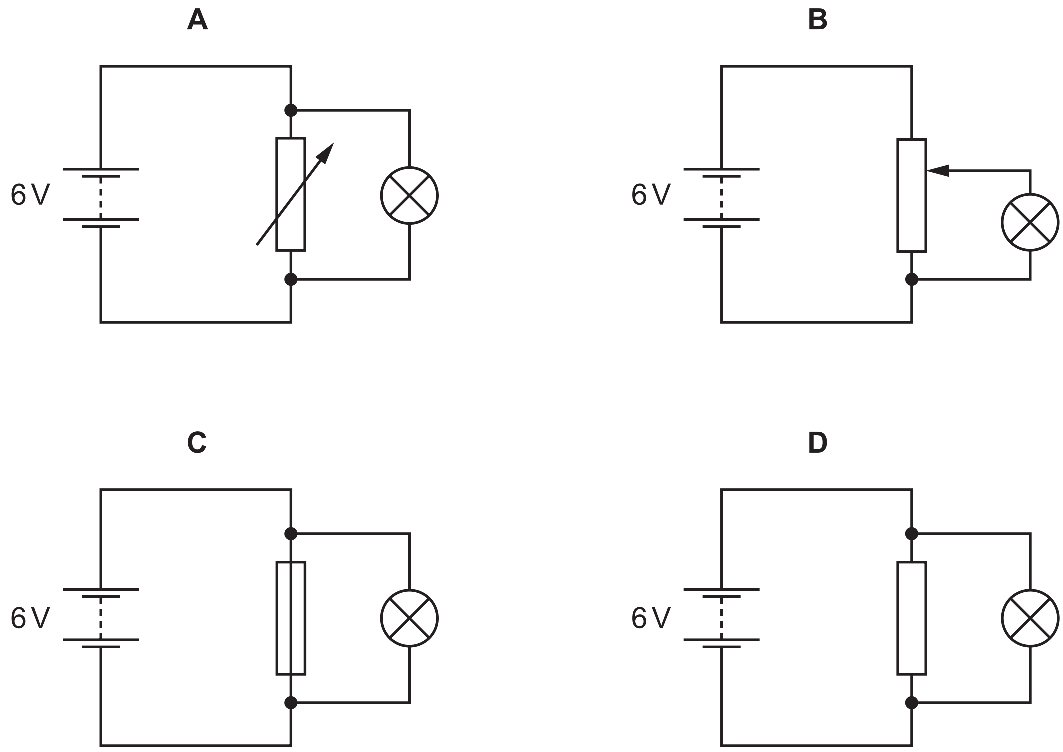
B The readings on Y and Z are both equal to 4.0 A.

C The readings on Y and Z are both greater than 4.0 A.

D The reading on Z is zero.

34 A lamp is to be connected in a circuit so that the potential difference (p.d.) across it can be varied from 0 to 6 V.

Which circuit would be most suitable?



35 An electric heater is plugged into the mains supply using a fused plug.

The current in the heater is 10 A.

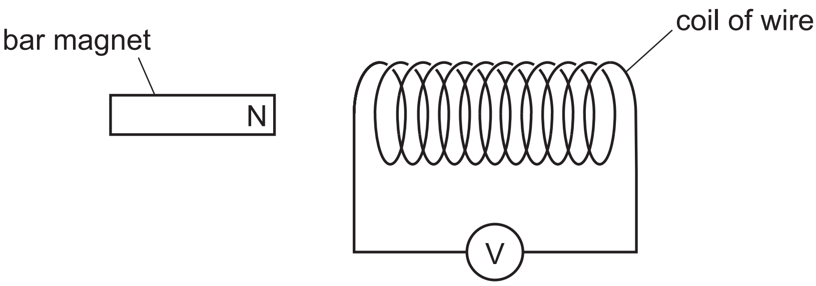
The cable attached to the heater is rated at 15 A.

The fuses available are rated at 1 A, 3 A, 5 A and 13 A.

Which fuse should be used?

A 1 A **B** 3 A **C** 5 A **D** 13 A

36 A bar magnet is held near a coil of wire. The coil is connected to a sensitive voltmeter.



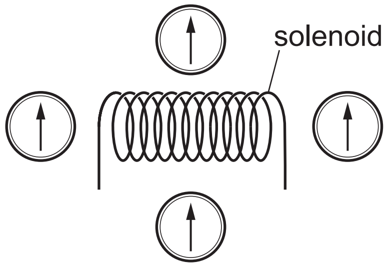
The N-pole of the magnet is moved quickly towards the coil. The voltmeter shows a reading of +10 mV.

The N-pole of the magnet is then moved slowly away from the same end of the coil. The reading on the voltmeter is observed.

Which voltmeter reading is possible?

A –15 mV **B** –5 mV **C** 0 mV **D** +5 mV

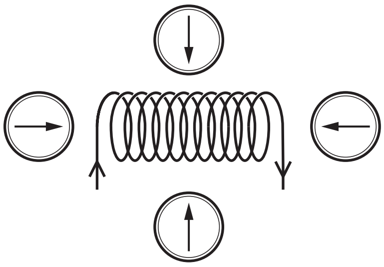
37 Four small compasses are placed around a solenoid.



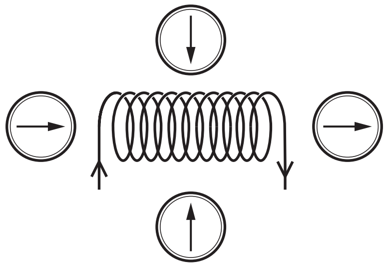
A current is now switched on in the solenoid.

Which diagram shows possible new directions of the compass needles?

A



B



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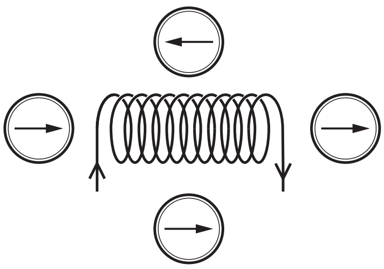

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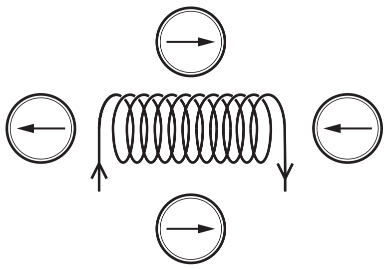


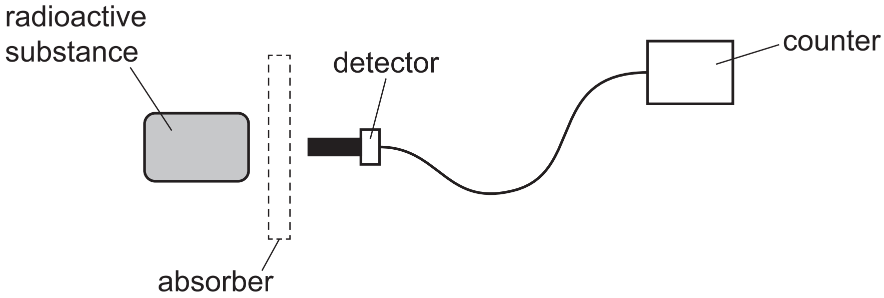
38 Four nuclides are represented below.

$^{6}_{3}E \qquad ^{7}_{3}G \qquad ^{6}_{4}L \qquad ^{7}_{5}M$

Which pair of nuclides are isotopes of the same element?

A E and G **B** E and L **C** G and L **D** G and M

39 A student measures the level of radiation emitted from a radioactive substance. He places a detector very close to the substance. He puts different absorbers between the radioactive substance and the detector.



The student's results are shown. These results are corrected for background radiation.

absorber	counter reading / counts per minute
none	95
thin paper	52
few mm of aluminium	52
several cm of lead	12

Which types of radiation are being emitted by the substance?

A α-particles and β-particles only

B α-particles and γ-rays only

C β-particles and γ-rays only

D α-particles, β-particles and γ-rays

40 The nuclei of the atoms in a substance are changing randomly and emitting radiation.

What is happening to the substance?

A It is undergoing electromagnetic induction.

B It is undergoing magnetisation.

C It is undergoing solidification.

D It is undergoing radioactive decay.

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Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/12**

Paper 1 Multiple Choice (Core) **May/June 2019**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

MODIFIED LANGUAGE

4935266364

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m/s^2).

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **20** printed pages.

IB09 06_0625_12_ML/RP

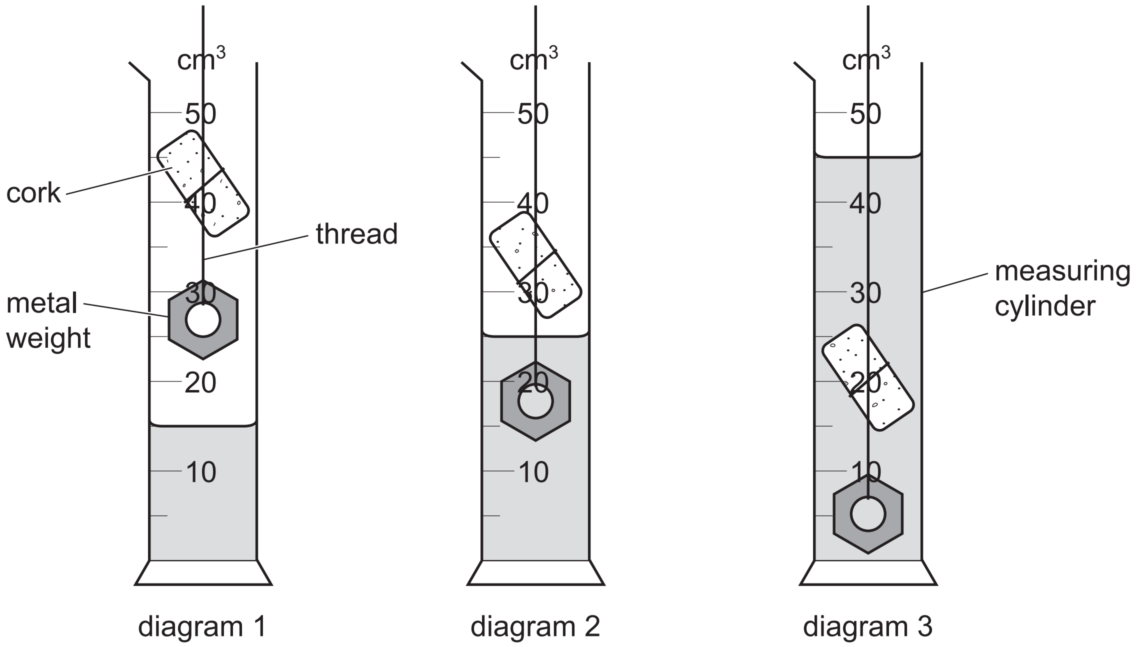
Cambridge Assessment International Education

[Turn over

1 Diagram 1 shows a measuring cylinder containing water. A metal weight with a cork attached by a thread is held above the water.

Diagram 2 shows the apparatus after the weight has been lowered into the water.

Diagram 3 shows the apparatus after the weight and the cork have been submerged.



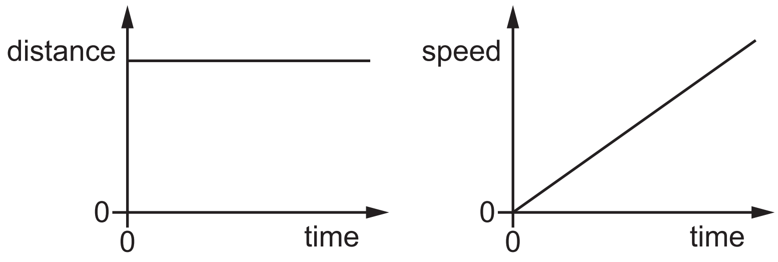
What is the volume of the cork?

A $20\,cm^3$ **B** $30\,cm^3$ **C** $45\,cm^3$ **D** $70\,cm^3$

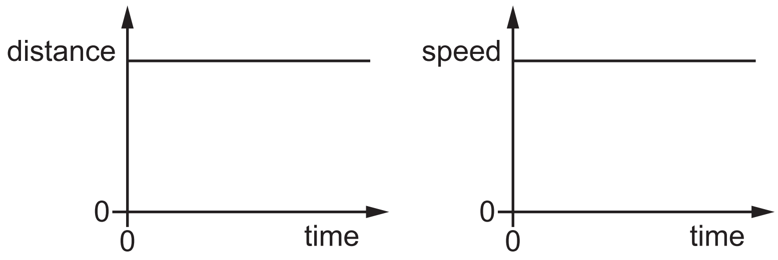
2 A car travels at constant speed.

Which pair of graphs show how the distance travelled by the car **and** how the car's speed vary with time?

A



B



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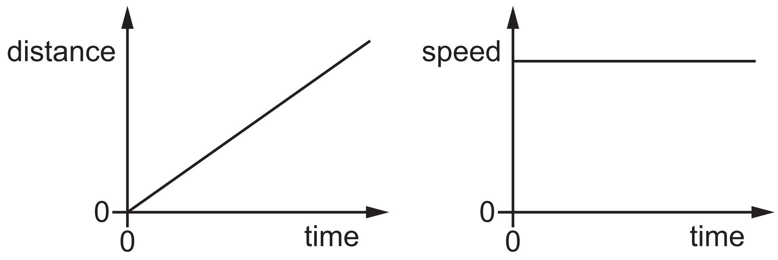
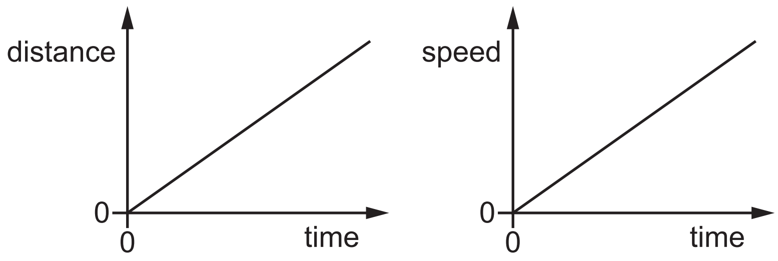
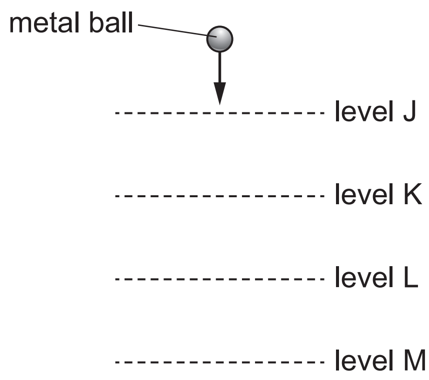


D



3 A heavy metal ball falls vertically downwards through air past four equally spaced levels J, K, L and M.



The times taken to fall from one level to the next are measured.

Where is the speed of the ball greatest and which time is shortest?

	speed is greatest between	time is shortest between
A	J and K	J and K
B	J and K	L and M
C	L and M	J and K
D	L and M	L and M

4 Which row contains two correct statements about the mass and the weight of an object?

	mass of an object	weight of an object
A	is measured using a measuring cylinder	is measured using a balance
B	is the gravitational force exerted on the object	is the amount of matter in the object
C	is measured in newtons	is measured in kilograms
D	is the same everywhere	can vary from place to place

5 The table gives approximate values of the acceleration due to gravity and the atmospheric pressure on three planets.

	Earth	Venus	Mars
acceleration due to gravity / m/s^2	10	9	4
atmospheric pressure / kPa	100	9000	1

A body has a mass of 10 kg on Earth.

Which statement about the weight of the body is correct?

A The weight is greatest on Earth.

B The weight is greatest on Mars.

C The weight is greatest on Venus.

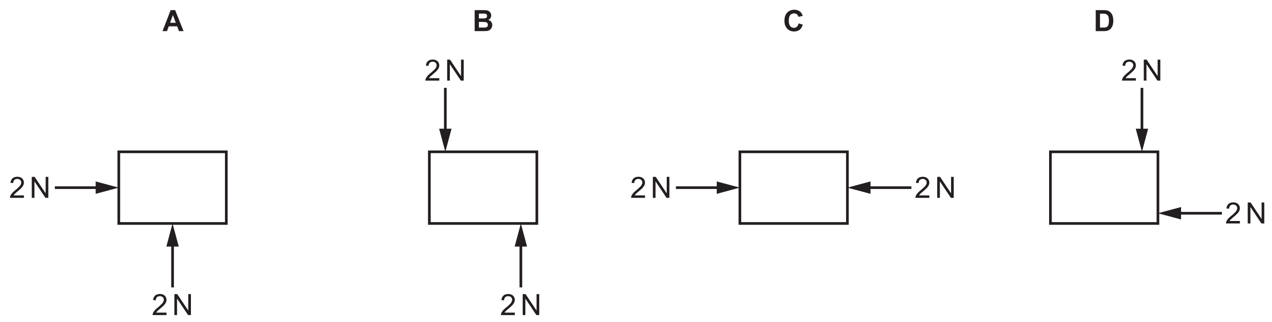
D The weight is the same on each planet.

6 A metal has a density of $8.0\,g/cm^3$. A solid cube of mass 1.0 kg is made from this metal.

How long is each side of the cube?

A 0.50 cm **B** 2.0 cm **C** 5.0 cm **D** 42 cm

7 Which object is in equilibrium?



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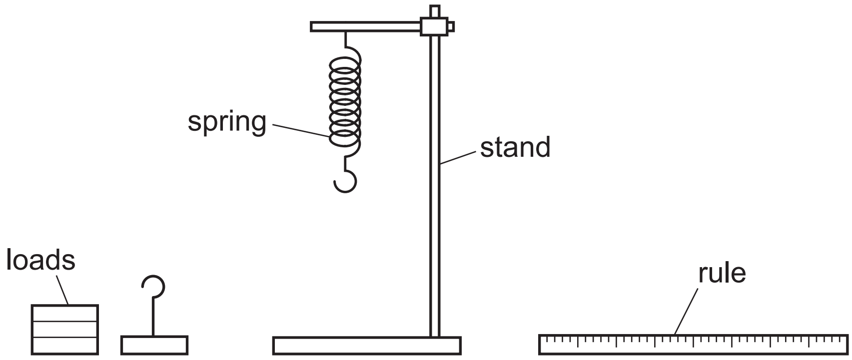
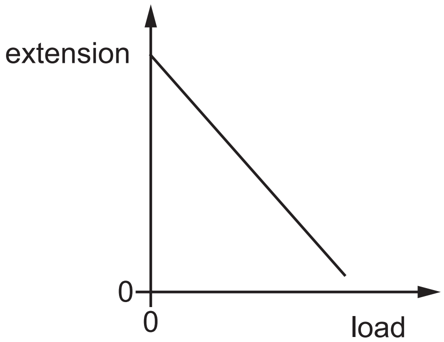
8 A spring is suspended from a stand. Loads are added and the extensions are measured.



Which graph shows the result of plotting extension against load?

A



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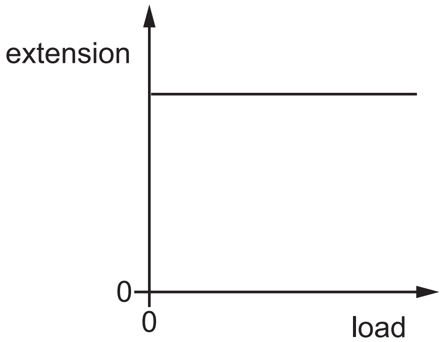

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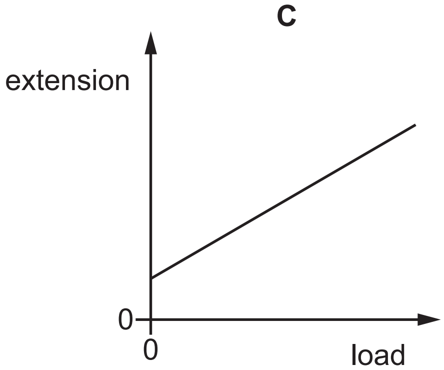
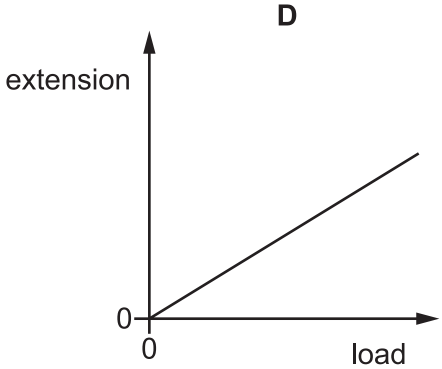
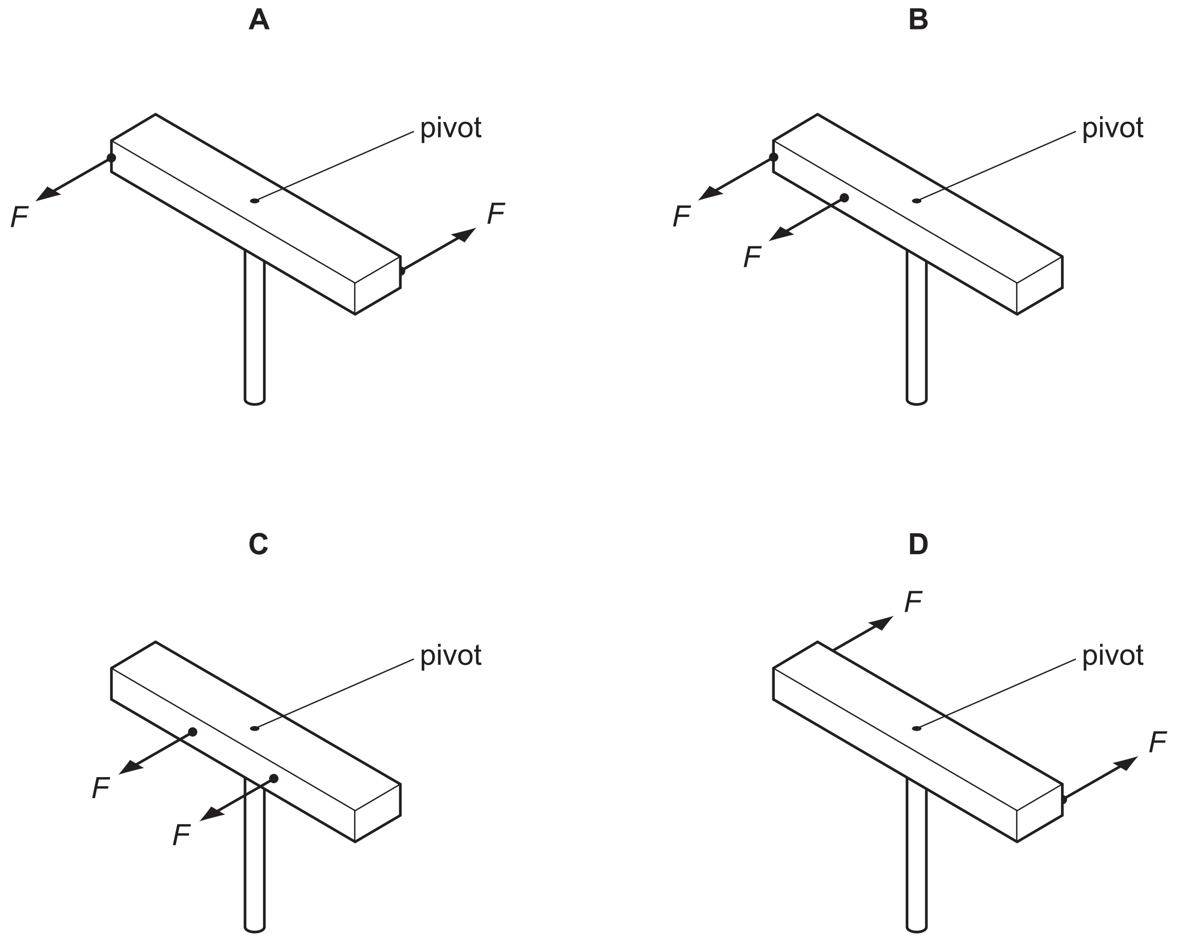


D



9 A wooden bar is pivoted at its centre so that it can rotate freely. Two equal forces F are applied to the bar.

In which diagram is the turning effect greatest?



10 A machine is very efficient.

What does this mean?

A It produces a large amount of power.

B It uses very little energy.

C It wastes very little energy.

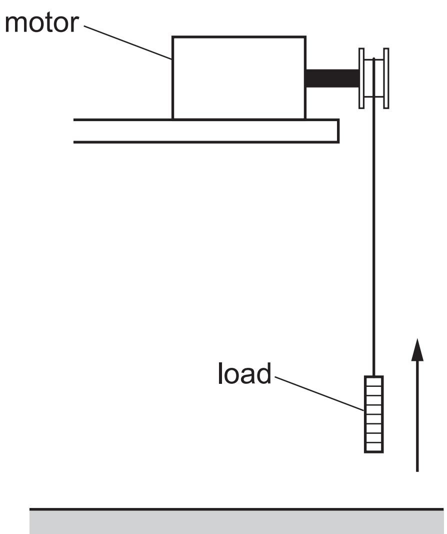
D It works very quickly.

11 An object falls under gravity.

What happens to the gravitational potential energy and to the kinetic energy of the object?

	gravitational potential energy	kinetic energy
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

12 A student is testing four different electric motors. He measures the time it takes for a motor to lift either a heavy load or a light load through a height of 1 metre.



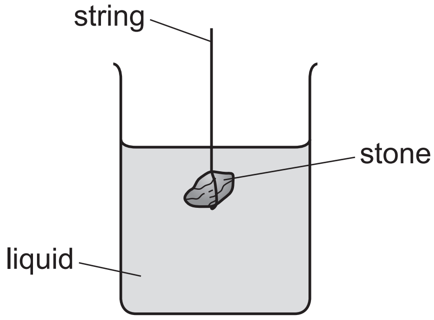
He makes a similar measurement for the other three motors.

The table shows his results.

Which motor produces the most power?

	load	time taken / s
A	heavy	12
B	heavy	16
C	light	12
D	light	16

13 The diagram shows a stone suspended on a string under the surface of a liquid. The stone experiences a pressure caused by the liquid.



What would increase the pressure on the stone?

A decreasing the surface area of the stone

B increasing the mass of the stone

C lowering the stone deeper into the liquid

D using a liquid with a lower density

14 A sample of mercury is heated.

In which states of matter will its volume increase as its temperature rises?

A gas only

B liquid and gas only

C solid and liquid only

D solid, liquid and gas

15 When water evaporates, what escapes from the surface of the water?

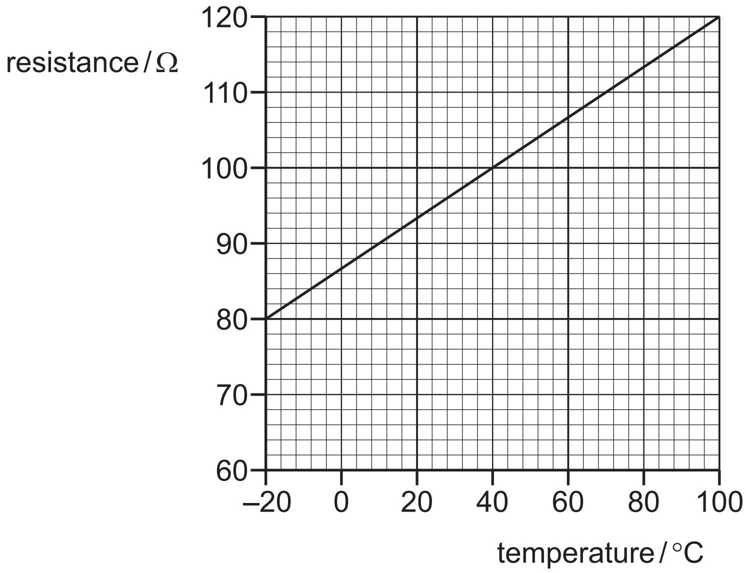
A individual atoms

B individual molecules

C individual protons

D tiny drops of water

16 The resistance of a resistor varies linearly with temperature as shown on the graph.



Which statement is correct?

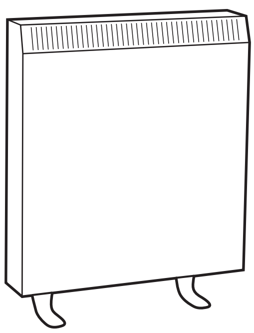
A When immersed in boiling water, the resistance is 120 Ω.

B The resistance at the lower fixed point is 80 Ω.

C When the resistance is 100 Ω the temperature is 120 °C.

D The resistor can only be used at temperatures between 0 °C and 100 °C.

17 A night storage heater contains a large block of material that is heated electrically during the night. During the day the block cools down, releasing thermal energy into the room.



Which thermal capacity and which night-time temperature increase will cause the most energy to be stored by the block?

	thermal capacity of block	night-time temperature increase
A	large	large
B	large	small
C	small	large
D	small	small

18 Which row describes the process of condensation?

	change of state	separation of molecules
A	gas to liquid	decreases
B	gas to liquid	increases
C	liquid to gas	decreases
D	liquid to gas	increases

19 The metal surface of a kettle is hot.

What happens to the cool air outside the kettle when it comes into contact with the hot kettle?

A The density of the air decreases and the air falls.

B The density of the air decreases and the air rises.

C The density of the air increases and the air falls.

D The density of the air increases and the air rises.

20 Vacuum flasks usually have silvered walls that help to keep the contents of the flask hot.

Why are the walls silvered?

A to absorb thermal energy from the air around the flask

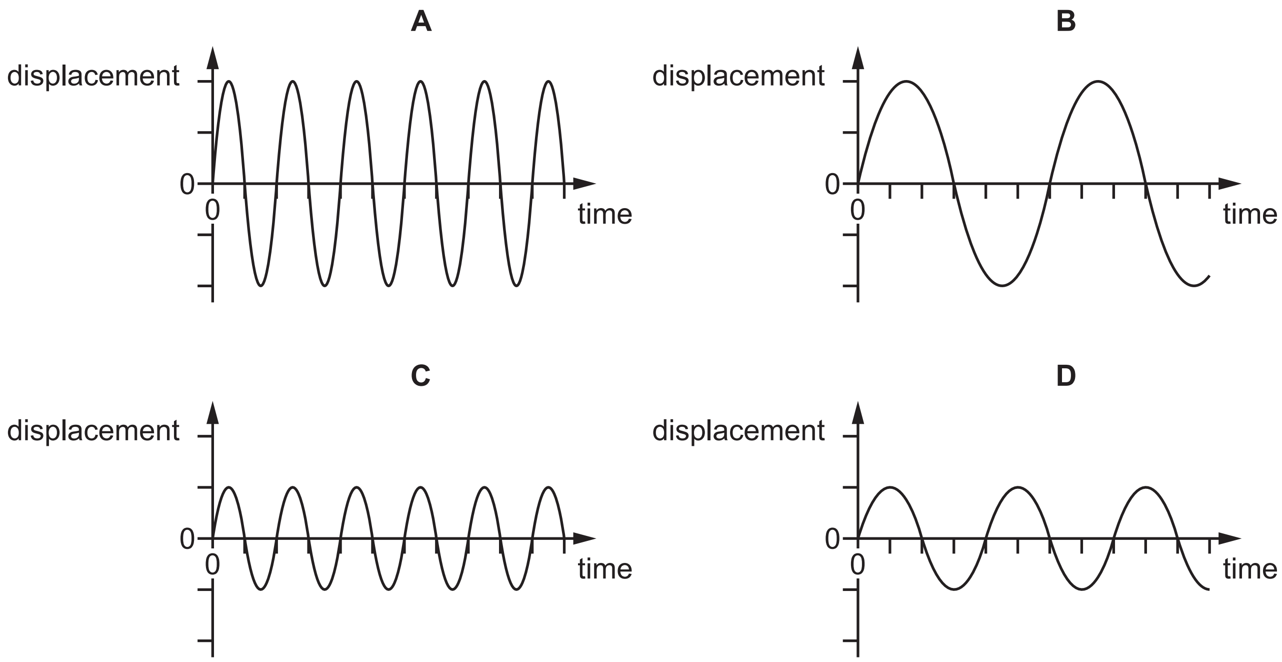
B to increase the rate of convection inside the flask

C to reduce energy loss to the surroundings by conduction

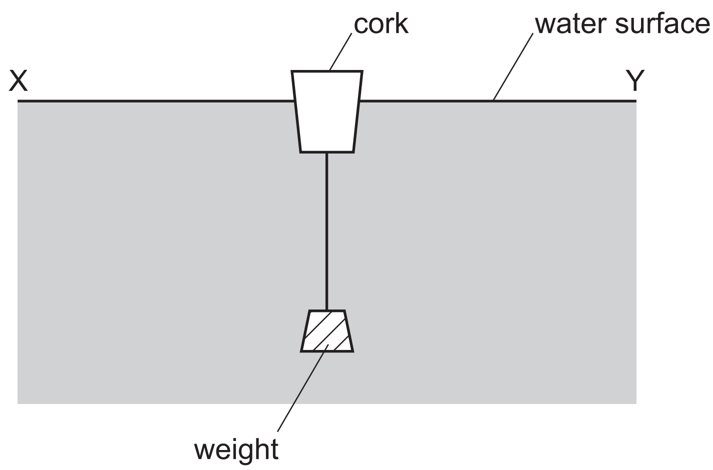
D to reflect thermal radiation back into the flask

21 The diagrams show graphs of displacement against time for four waves. All the graphs are drawn to the same scale.

Which wave has the largest amplitude and the highest frequency?



22 The diagram shows a cork with a weight attached so that the cork floats upright in water.



Transverse waves travel across the water from X to Y.

In which direction do the waves make the cork move?

A $\rightarrow \leftarrow$ right and left

B $\uparrow\downarrow$ up and down

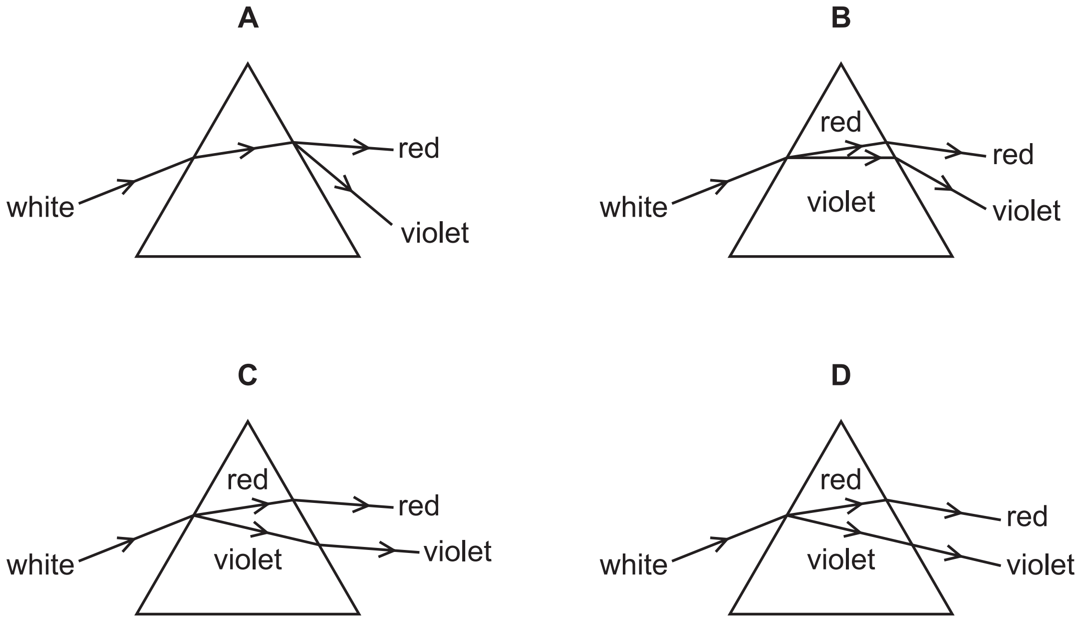
C $\rightarrow$ only to the right

D $\leftarrow$ only to the left

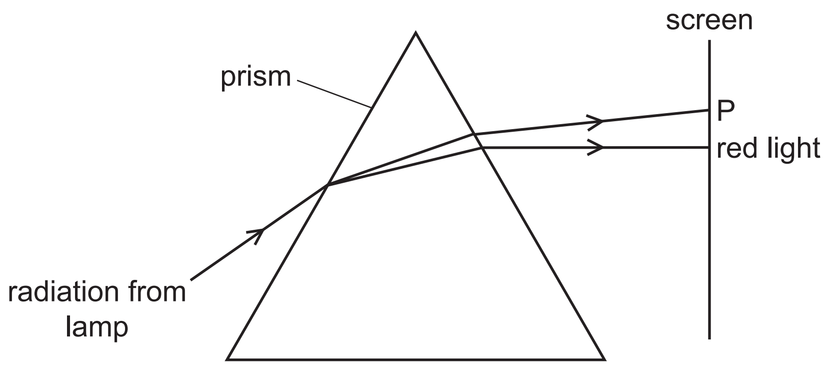
23 Which conditions are necessary for light to be totally internally reflected?

	the incident light is in	angle of incidence
A	the less dense medium	less than the critical angle
B	the less dense medium	greater than the critical angle
C	the more dense medium	less than the critical angle
D	the more dense medium	greater than the critical angle

24 Which diagram shows the dispersion of white light by a glass prism?



25 The diagram shows radiation from a lamp passing through a prism.



Which type of radiation is found at P?

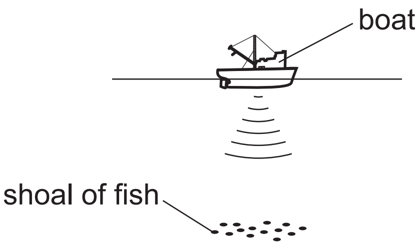
A γ-rays

B infrared

C ultraviolet

D X-rays

26 A pulse of sound is produced at the bottom of a boat. The sound travels through the water and is reflected from a shoal of fish. The sound reaches the boat again after 1.2 s. The speed of sound in the water is 1500 m/s.



How far below the bottom of the boat is the shoal of fish?

A 450 m **B** 900 m **C** 1800 m **D** 3600 m

27 An observer stands at the finish line of a 100 m race. He wants to time the winner's run. He starts his stop-watch as soon as he sees the smoke from the starting gun instead of when he hears the bang.

What is the reason for doing this?

A Light travels much faster than sound.

B There is a risk he might respond to an echo from a wall.

C Humans react slower to sound than to light.

D Humans react more quickly to sound than to light.

28 A soft iron bar is a long way from any magnetic field.

How can the material of the bar be described?

A It is magnetic and strongly magnetised.

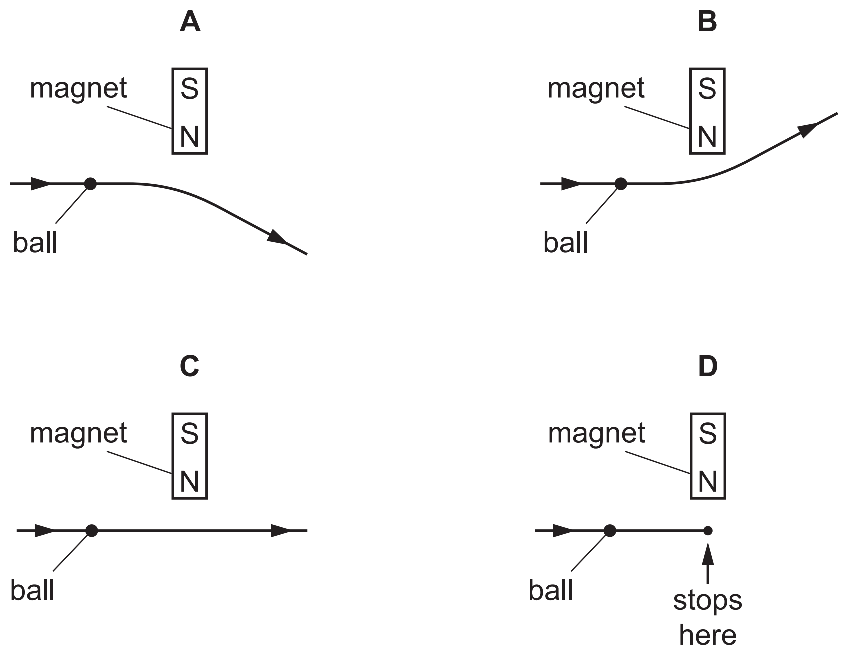
B It is magnetic and unmagnetised.

C It is non-magnetic and strongly magnetised.

D It is non-magnetic and unmagnetised.

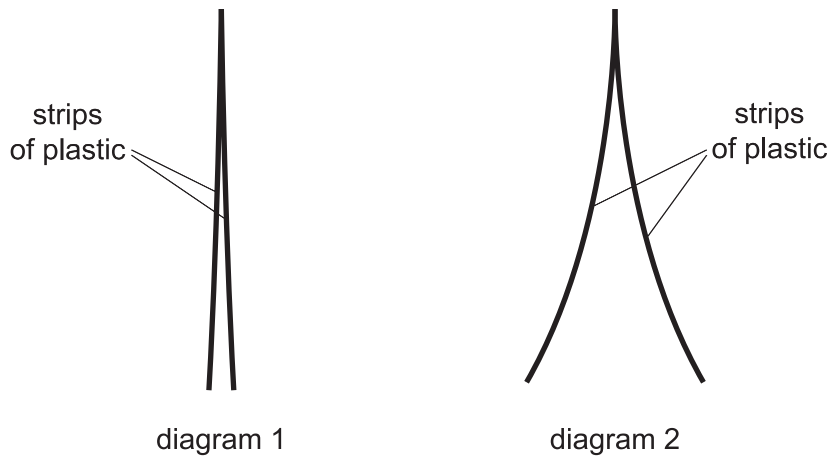
29 An iron ball on a horizontal wooden table rolls near the north pole of a bar magnet which is lying on the table.

Which diagram shows the most likely path of the ball, as seen from above the table?



30 Diagram 1 shows two thin, uncharged strips of plastic.

Diagram 2 shows the same strips after they have been rubbed with a dry cloth.

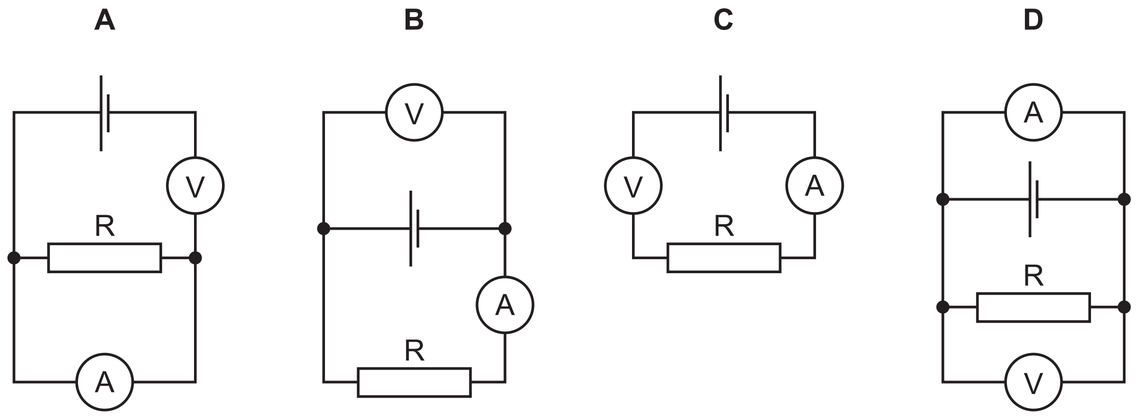


Which row describes the charge on the strips after rubbing, and the force between the strips after rubbing?

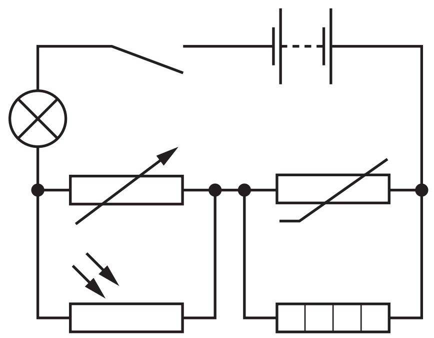
	charge on strips	force between strips
A	opposite	attraction
B	opposite	repulsion
C	the same	attraction
D	the same	repulsion

31 An ammeter and a voltmeter are used to determine the resistance of a resistor.

Which circuit diagram shows the ammeter and the voltmeter correctly connected?



32 The diagram shows a circuit.



What is connected in parallel with the thermistor?

A heater

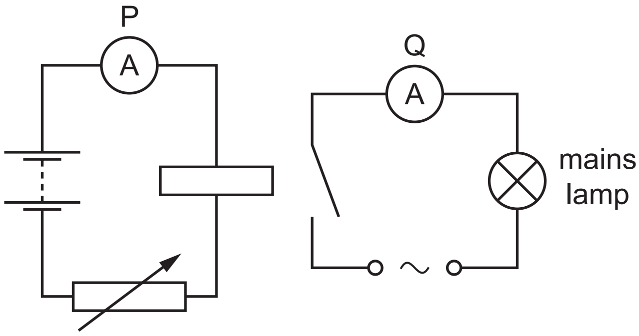
B lamp

C light-dependent resistor

D variable resistor

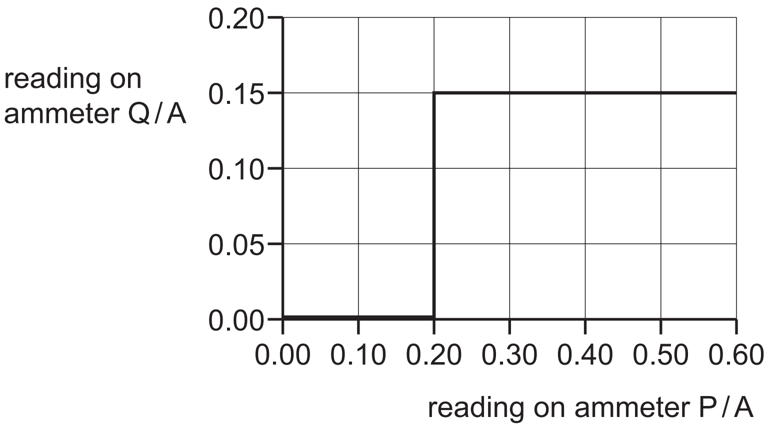
33 The circuit shows a relay being used to operate a mains lamp.

Two ammeters are labelled P and Q.



The variable resistor is used to vary the current in the relay coil. The mains lamp switches on when there is a large enough current in the relay coil.

The graph shows how the reading on ammeter Q changes as the reading on ammeter P increases.

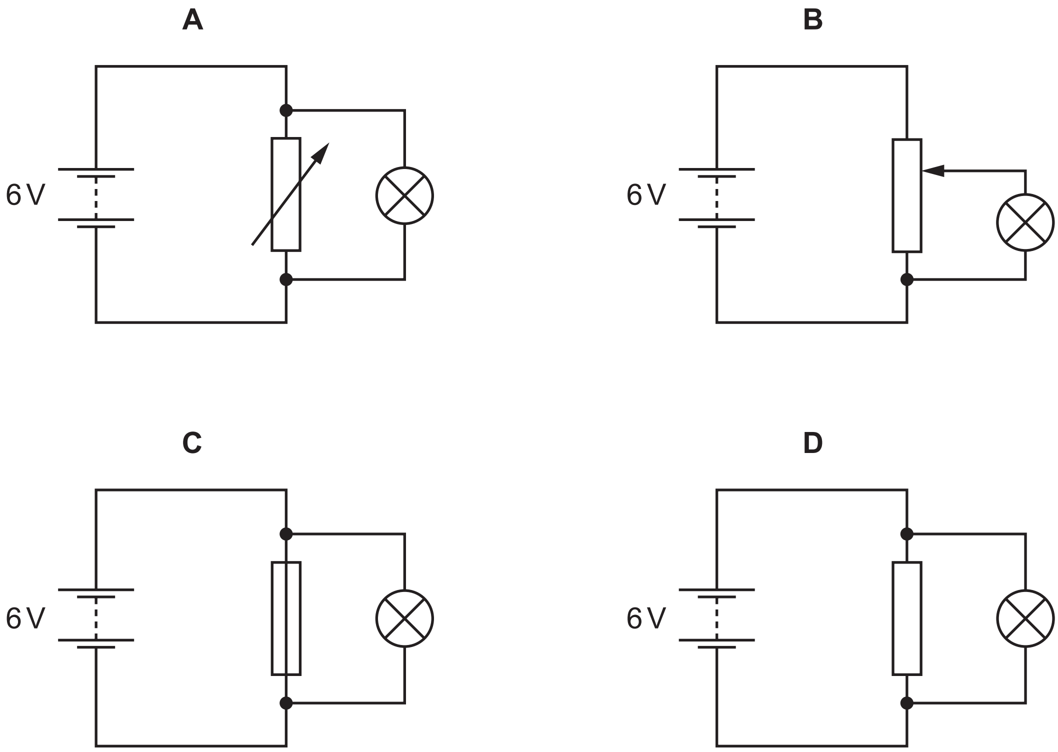


What is the minimum current needed in the relay coil to switch on the mains lamp?

A 0.15 A **B** 0.20 A **C** 0.35 A **D** 0.60 A

34 A lamp is to be connected in a circuit so that the potential difference (p.d.) across it can be varied from 0 to 6 V.

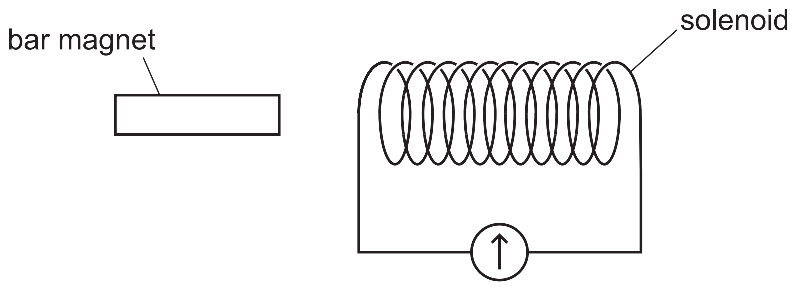
Which circuit would be most suitable?



35 Which components are designed to improve the safe working of a mains electrical supply?

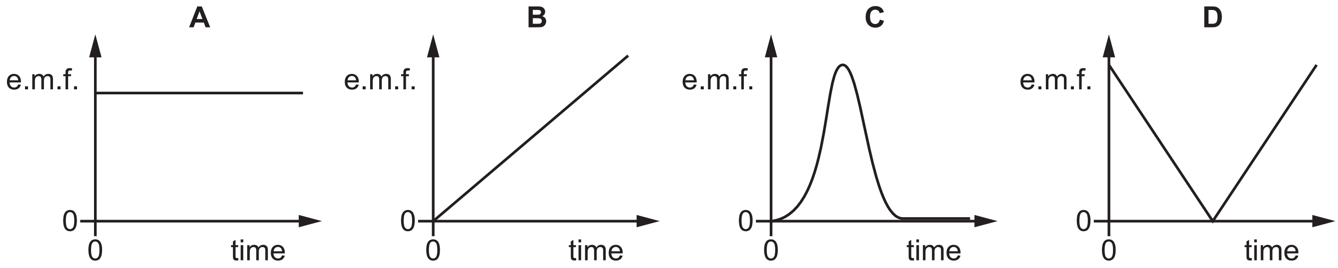
	circuit breaker	earth wire	fuse
A	✓	✓	✗
B	✓	✗	✓
C	✗	✓	✓
D	✓	✓	✓

36 A bar magnet is held near a solenoid. The coil is connected to a galvanometer.



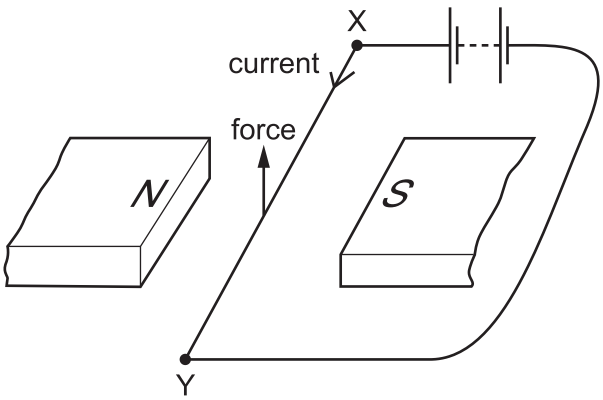
The magnet is moved into the coil of wire and then held stationary inside the coil.

Which graph shows how the induced electromotive force (e.m.f.) varies with time?



37 A wire XY lies between the poles of a magnet.

The diagram shows the upward force on the wire XY caused when there is an electric current in the direction XY as shown.



Three tests are made using this apparatus.

1 The current direction is reversed.

2 The N and S poles are swapped around.

3 The current is switched off.

Which will result in **no change** in the size of the force on the wire?

A 1 and 2 only **B** 1 only **C** 2 only **D** 3 only

38 A simple model of the atom consists of small particles orbiting a central nucleus.

Which row is correct?

	charge on nucleus	charge on orbiting particles
A	negative	negative
B	negative	positive
C	positive	negative
D	positive	positive

39 Which statement explains the meaning of the half-life of a radioactive isotope?

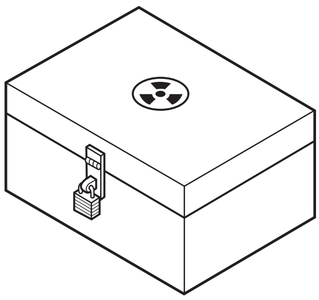
A half the time taken for one nucleus of the isotope to decay

B half the time taken for the isotope to decay completely

C the time taken for half of the nuclei of the isotope to decay

D the time taken for one nucleus of the isotope to split in half

40 The diagram shows a lead-lined box used for storing radioactive sources.



Why is the inside of the box lined with lead?

A It helps the sources to stay radioactive for longer.

B It makes the box heavier.

C It makes the radioactive sources more stable.

D It reduces the amount of radiation that can escape from the box.

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PHYSICS **0625/13**

Paper 1 Multiple Choice (Core) **May/June 2019**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

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READ THESE INSTRUCTIONS FIRST

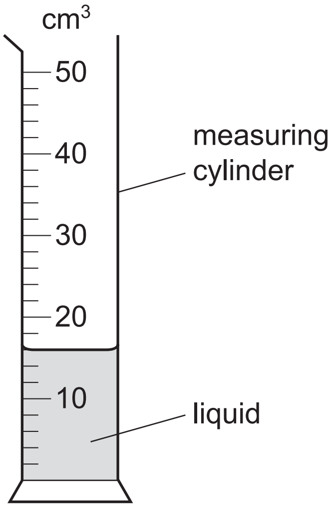
Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

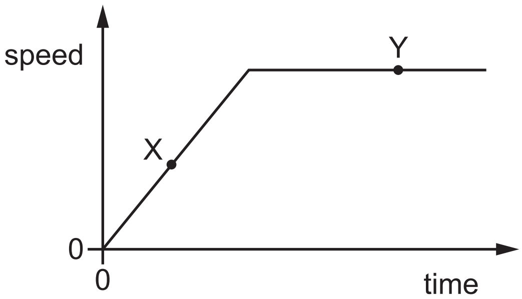
1 The diagram shows a measuring cylinder containing liquid.



What is the reading for the volume of liquid in the cylinder?

A 13.0 cm^3 **B** 13.5 cm^3 **C** 16.0 cm^3 **D** 17.0 cm^3

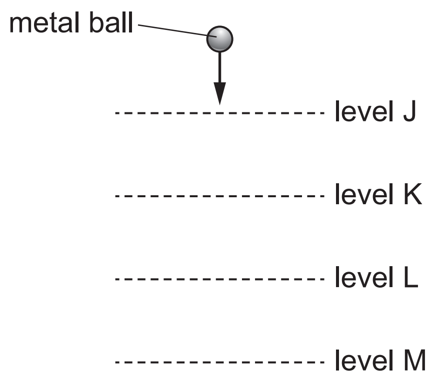
2 The diagram shows the speed-time graph for a car.



Which row describes the motion of the car at point X and at point Y?

	point X	point Y
A	at rest	moving with constant speed
B	moving with constant speed	at rest
C	moving with changing speed	at rest
D	moving with changing speed	moving with constant speed

3 A heavy metal ball falls vertically downwards through air past four equally spaced levels J, K, L and M.



The times taken to fall from one level to the next are measured.

Where is the speed of the ball greatest and which time is shortest?

	speed is greatest between	time is shortest between
A	J and K	J and K
B	J and K	L and M
C	L and M	J and K
D	L and M	L and M

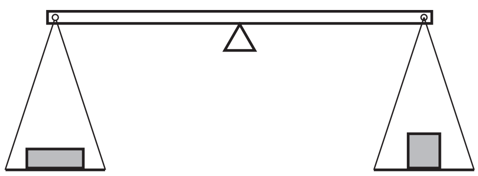
4 An object which has a mass of 600 kg is on the planet Mars.

The acceleration due to gravity on Mars is $4.0\,m/s^2$.

What is the weight of the object on Mars?

A 60 N **B** 150 N **C** 2400 N **D** 6000 N

5 Two objects are placed on a balance, one on each side:



Which properties of the objects can be compared using the balance?

A weight, mass and volume

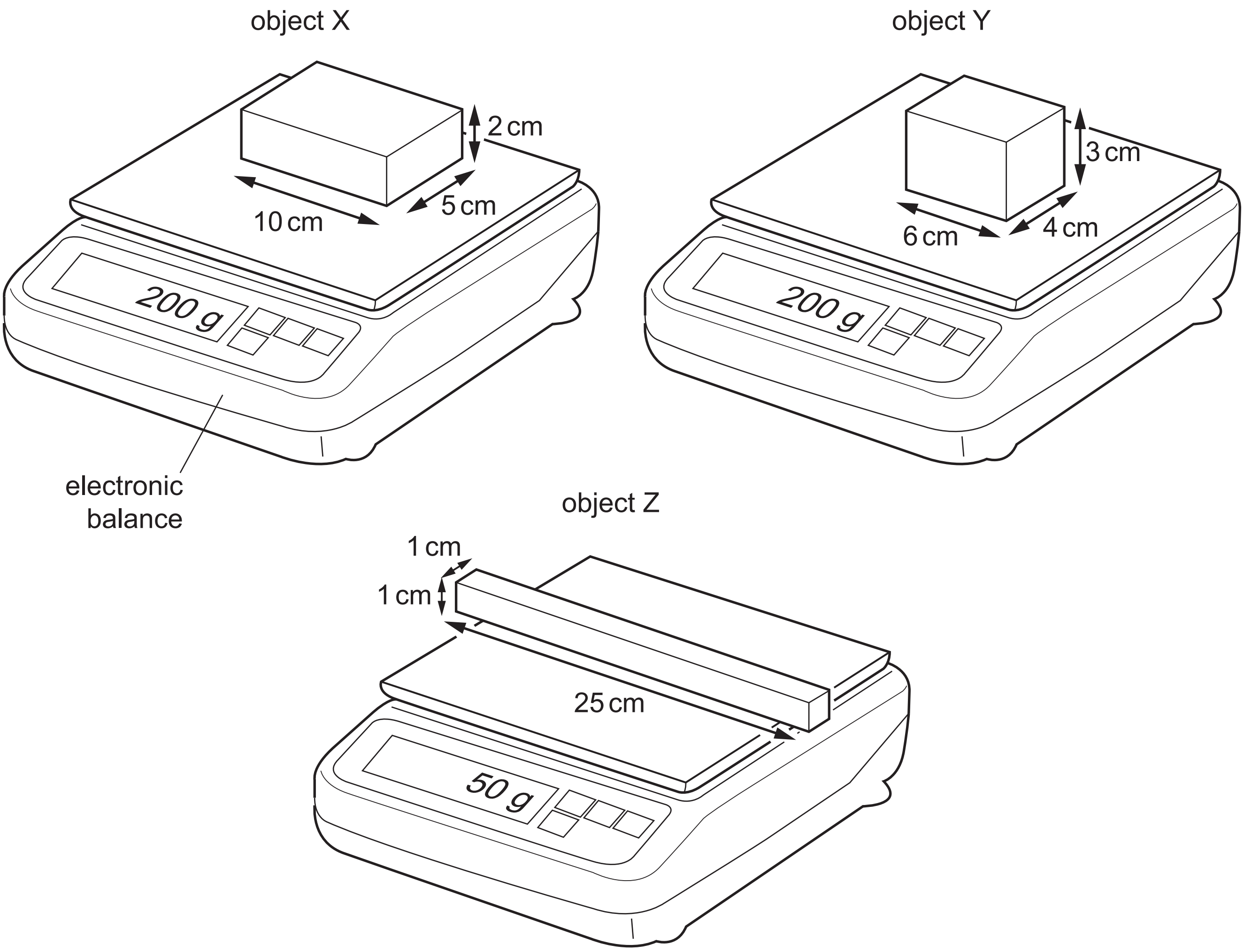
B weight and mass only

C volume and density

D density only

6 X, Y and Z are three regularly shaped solid objects.

Their dimensions and masses are shown in the diagrams.

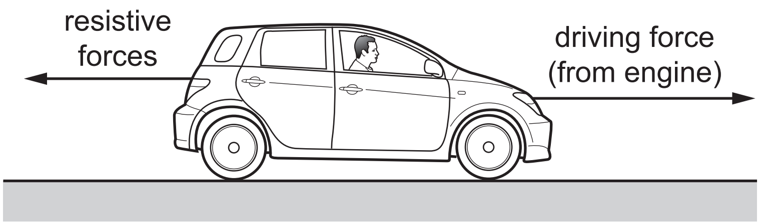


Which objects have the same density?

A X, Y and Z **B** X and Y only **C** X and Z only **D** Y and Z only

7 A car is driven from rest on a long straight road. The car engine exerts a constant driving force.

The diagram shows the horizontal forces acting on the car. The resistive forces are proportional to the speed of the car.



Why does the car eventually reach a maximum speed?

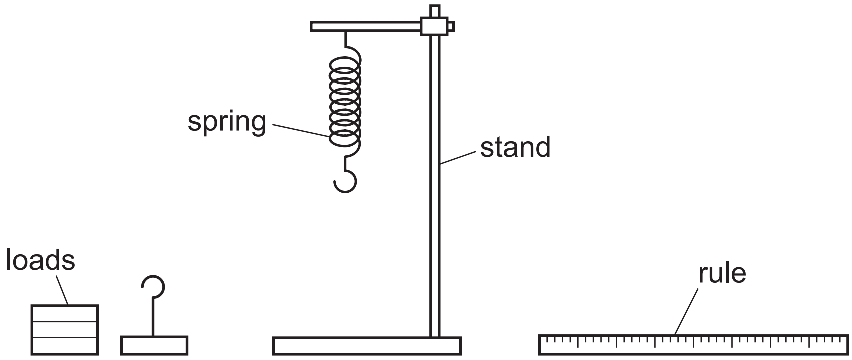
A The resistive forces decrease to make the acceleration of the car negative.

B The resistive forces decrease to make the acceleration of the car zero.

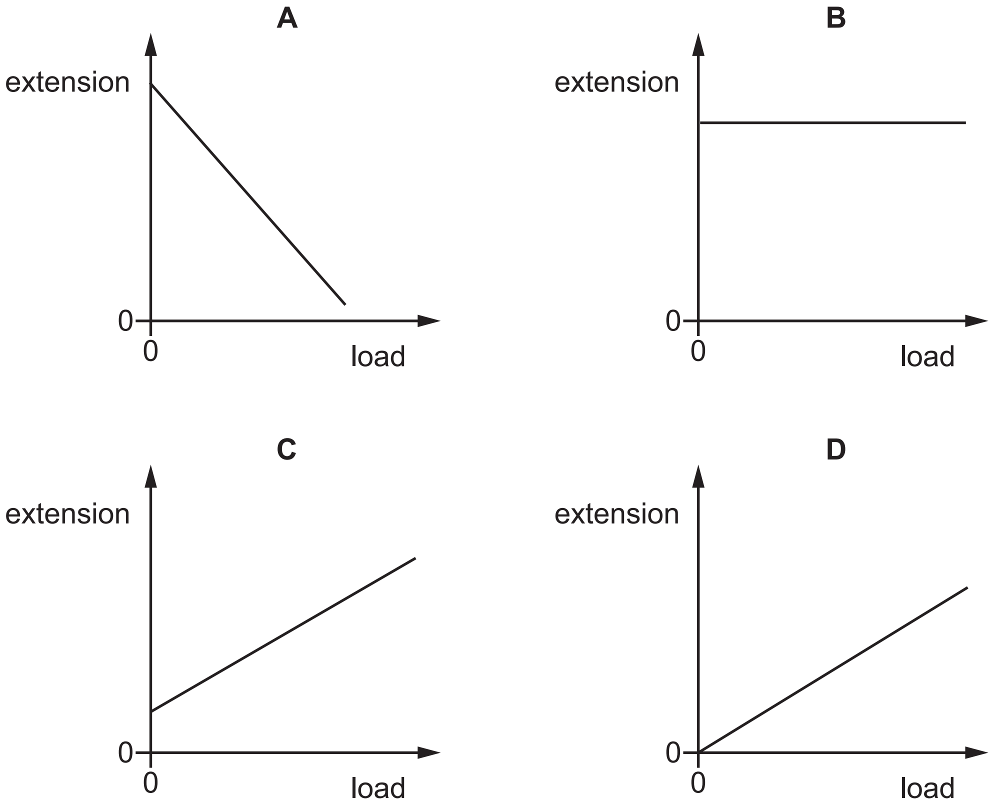
C The resistive forces increase to make the acceleration of the car negative.

D The resistive forces increase to make the acceleration of the car zero.

8 A spring is suspended from a stand. Loads are added and the extensions are measured.

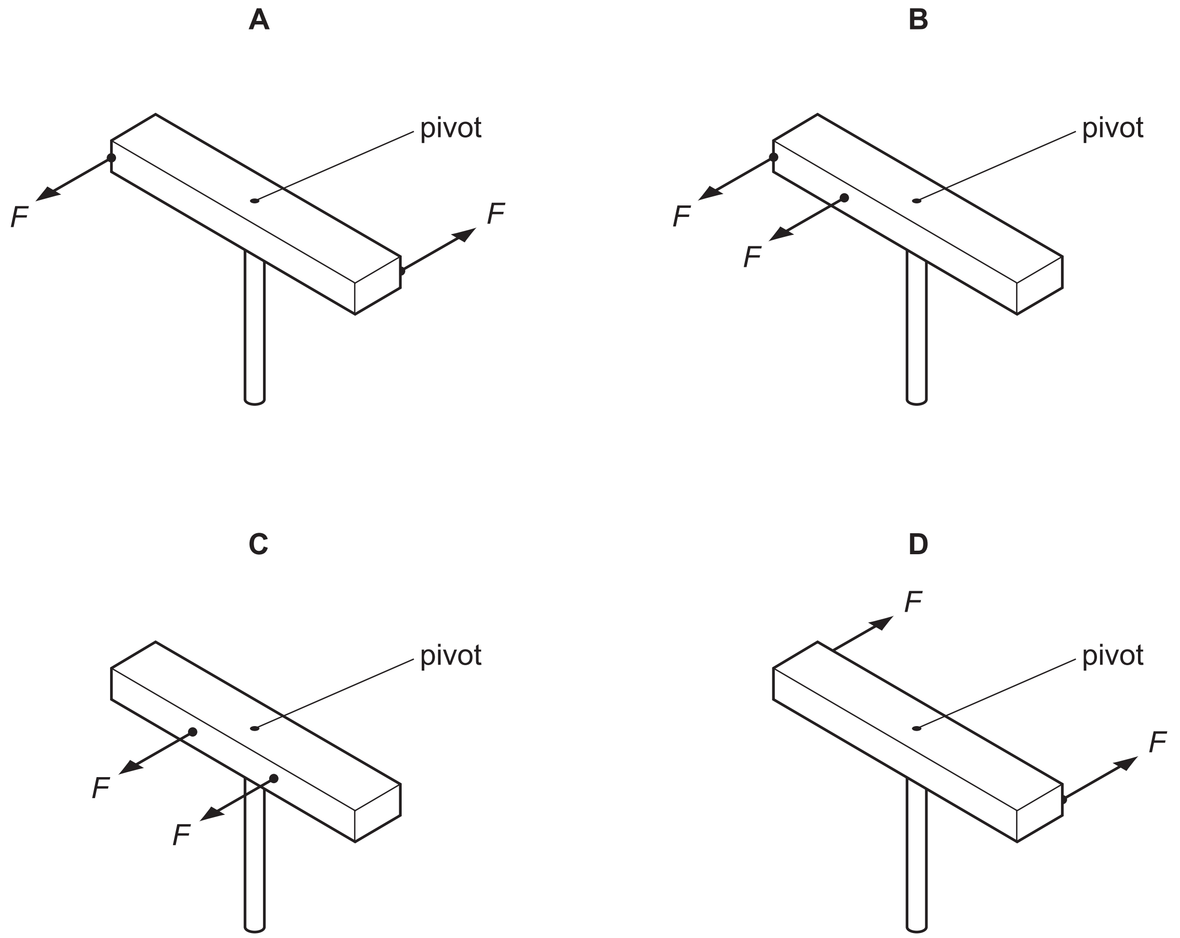


Which graph shows the result of plotting extension against load?



9 A wooden bar is pivoted at its centre so that it can rotate freely. Two equal forces F are applied to the bar.

In which diagram is the turning effect greatest?



10 A machine is very efficient.

What does this mean?

A It produces a large amount of power.

B It uses very little energy.

C It wastes very little energy.

D It works very quickly.

11 A body is lifted against gravity.

Which equation shows the work done on the body?

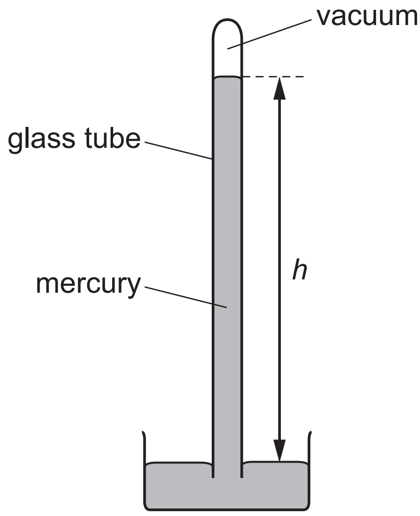
A work done = change in distance moved by the body

B work done = change in energy of the body

C work done = change in force on the body

D work done = change in power of the body

12 The diagram shows a simple mercury barometer.



A change is made and the vertical height h of the column increases.

Which change causes this increase?

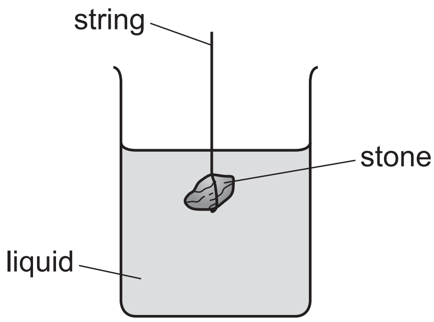
A A liquid with a lower density than mercury has been used.

B Atmospheric pressure decreases.

C A narrower glass tube is used.

D The glass tube is tilted.

13 The diagram shows a stone suspended on a string under the surface of a liquid. The stone experiences a pressure caused by the liquid.



What would increase the pressure on the stone?

A decreasing the surface area of the stone

B increasing the mass of the stone

C lowering the stone deeper into the liquid

D using a liquid with a lower density

14 Which statement is correct?

A A solid can flow.

B A solid can be compressed easily.

C A solid has a fixed shape.

D A solid takes the shape of its container.

15 On a hot summer day, the level of the water in a pond falls.

Which statement explains this?

A The least energetic water molecules escape from the surface and do not return.

B The least energetic water molecules escape from the surface and then return.

C The most energetic water molecules escape from the surface and do not return.

D The most energetic water molecules escape from the surface and then return.

16 Here are three statements about a liquid-in-glass thermometer with a Celsius scale.

1 The lower fixed point is the temperature at which pure water freezes.

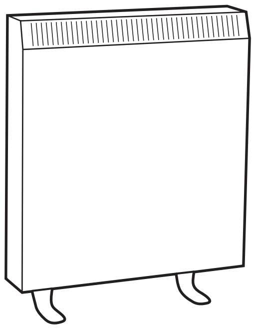
2 The upper fixed point is the temperature at which pure water boils.

3 A scale is made by dividing the distance between the fixed points into equal divisions.

Which statements are correct?

A 1 and 2 only **B** 2 and 3 only **C** 1 and 3 only **D** 1, 2 and 3

17 A night storage heater contains a large block of material that is heated electrically during the night. During the day the block cools down, releasing thermal energy into the room.



Which thermal capacity and which night-time temperature increase will cause the most energy to be stored by the block?

	thermal capacity of block	night-time temperature increase
A	large	large
B	large	small
C	small	large
D	small	small

18 A student investigates the melting point of a pure substance. She heats the substance slowly and takes readings of its temperature as the substance starts to melt and when it finishes melting.

Which statement is correct?

A The temperature decreases slightly as the substance melts.

B The temperature fluctuates as the substance melts.

C The temperature increases as the substance melts.

D The temperature stays the same as the substance melts.

19 A person holds an empty glass beaker and pours hot water into it.

Why does it take a few seconds before his hand starts to feel hot?

A Glass is a poor conductor of heat.

B Water is a poor conductor of heat.

C Glass is a better conductor of heat than water.

D Water is a better conductor of heat than glass.

20 The metal surface of a kettle is hot.

What happens to the cool air outside the kettle when it comes into contact with the hot kettle?

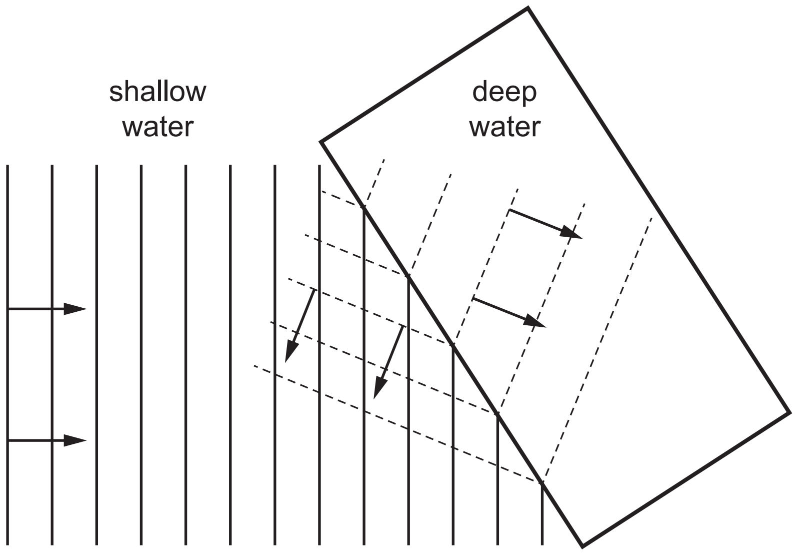
A The density of the air decreases and the air falls.

B The density of the air decreases and the air rises.

C The density of the air increases and the air falls.

D The density of the air increases and the air rises.

21 A student draws a diagram to show two different properties of a water wave. The arrows show the wave directions.



Which two wave properties does the diagram show?

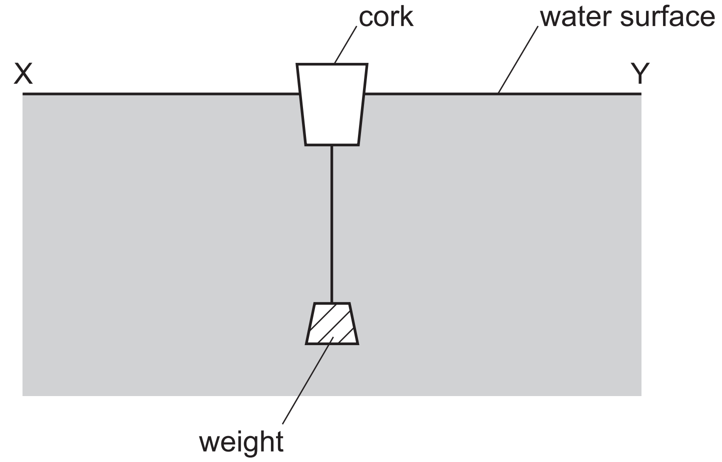
A refraction and diffraction

B reflection and dispersion

C reflection and diffraction

D reflection and refraction

22 The diagram shows a cork with a weight attached so that the cork floats upright in water.



Transverse waves travel across the water from X to Y.

In which direction do the waves make the cork move?

A $\rightarrow\leftarrow$ right and left

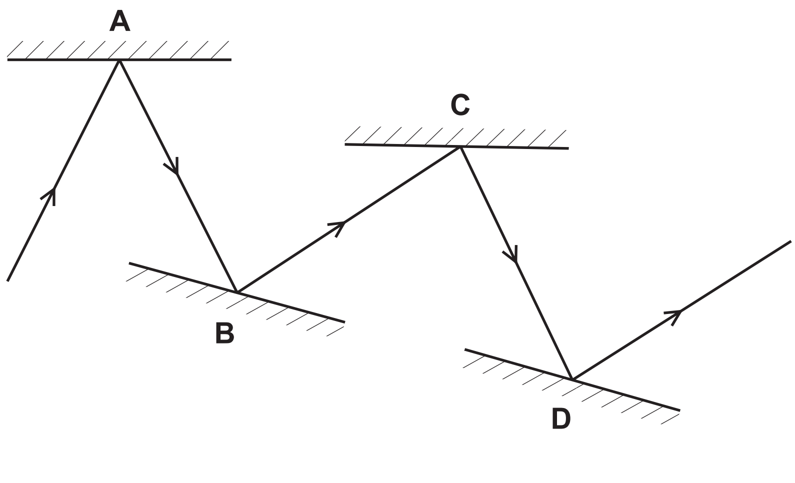
B $\uparrow\downarrow$ up and down

C $\rightarrow$ only to the right

D $\leftarrow$ only to the left

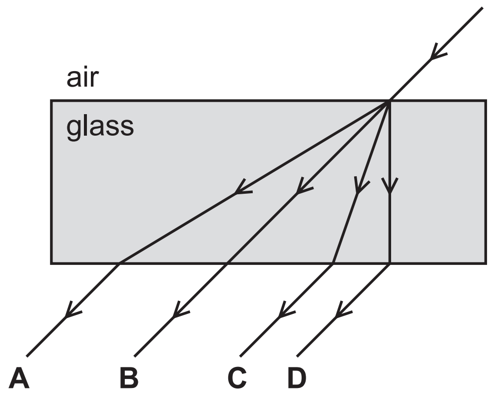
23 A student draws a ray diagram to show how a ray of light is reflected by a number of mirrors.

Which reflection has **not** been drawn correctly?

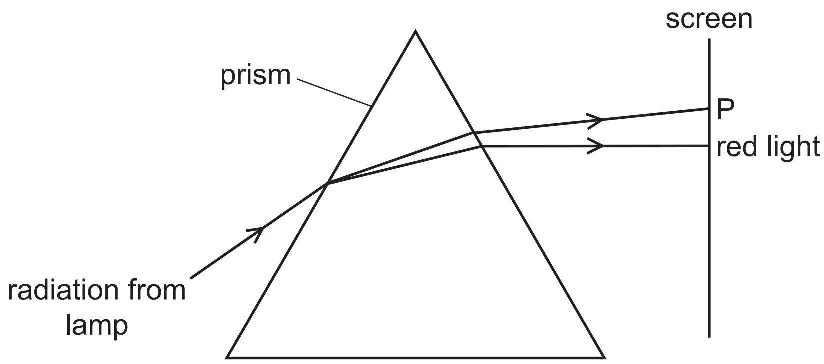


24 Light passes through a glass block.

What is the path of the light?



25 The diagram shows radiation from a lamp passing through a prism.



Which type of radiation is found at P?

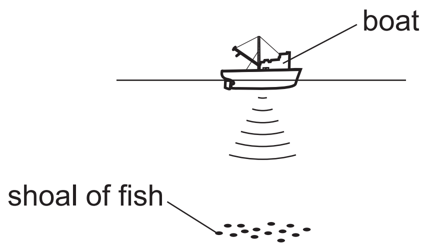
A γ-rays

B infrared

C ultraviolet

D X-rays

26 A pulse of sound is produced at the bottom of a boat. The sound travels through the water and is reflected from a shoal of fish. The sound reaches the boat again after 1.2 s. The speed of sound in the water is 1500 m / s.



How far below the bottom of the boat is the shoal of fish?

A 450 m **B** 900 m **C** 1800 m **D** 3600 m

27 Which statement about ultrasound is correct?

A It has a higher frequency than audible sound, and it is a longitudinal wave.

B It has a higher frequency than audible sound, and it is a transverse wave.

C It has a lower frequency than audible sound, and it is a longitudinal wave.

D It has a lower frequency than audible sound, and it is a transverse wave.

28 A metal bar is placed inside a current-carrying coil, as shown in diagram 1.

There is a small current in the coil. The bar holds a few nails, as shown in diagram 2.

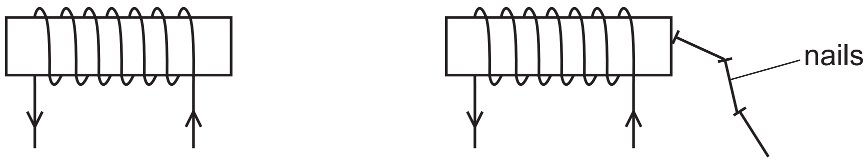


diagram 1 diagram 2

When there is no current in the coil, the nails drop off.

Which row is correct?

	metal from which the bar is made	effect of a larger current in the coil
A	soft iron	it makes no difference
B	soft iron	the bar holds more nails
C	steel	it makes no difference
D	steel	the bar holds more nails

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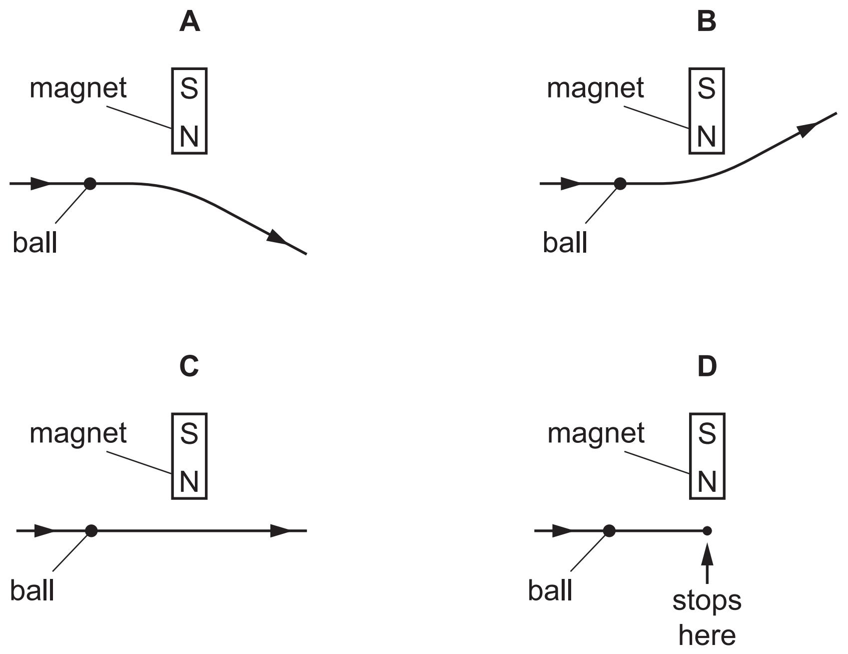
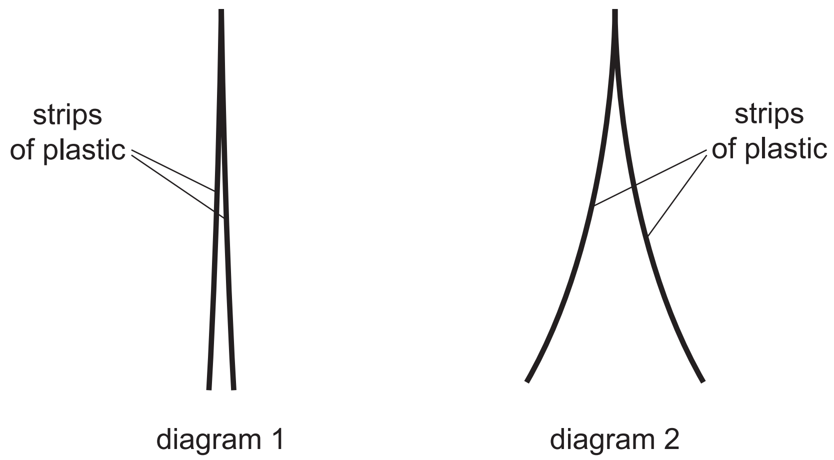
29 An iron ball on a horizontal wooden table rolls near the north pole of a bar magnet which is lying on the table.

Which diagram shows the most likely path of the ball, as seen from above the table?



30 Diagram 1 shows two thin, uncharged strips of plastic.

Diagram 2 shows the same strips after they have been rubbed with a dry cloth.



Which row describes the charge on the strips after rubbing, and the force between the strips after rubbing?

	charge on strips	force between strips
A	opposite	attraction
B	opposite	repulsion
C	the same	attraction
D	the same	repulsion

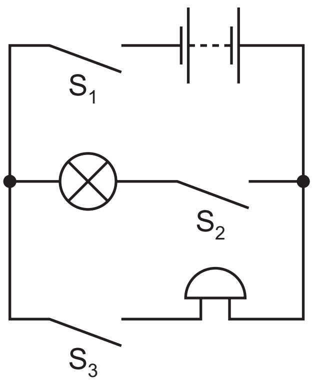
31 A battery stores chemical potential energy. The battery is connected to a resistor.

As the battery runs down, what happens to its chemical energy?

	The energy is transferred by	and ends up as
A	electrical working	internal energy in the resistor
B	electrical working	potential energy in the resistor
C	mechanical working	internal energy in the resistor
D	mechanical working	potential energy in the resistor

32 The diagram shows a circuit including a lamp, an electric bell and three switches S_1, S_2 and S_3.

The lamp and bell are not faulty.



The bell is ringing but the lamp is not lit.

Which switches are closed?

A S_1 only

B S_1 and S_2 only

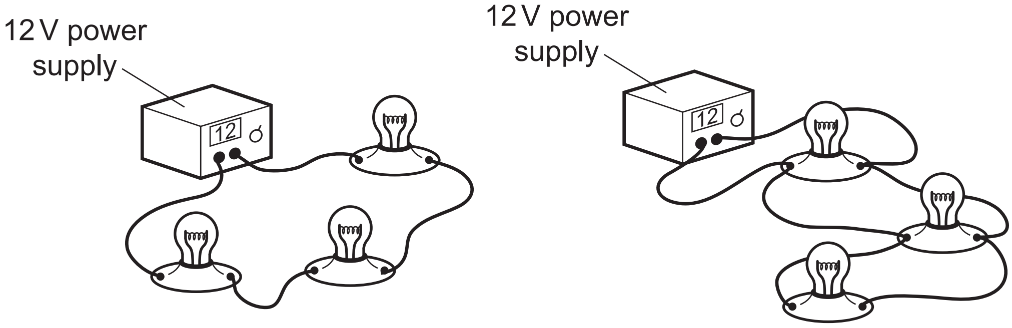
C S_1 and S_3 only

D S_1, S_2 and S_3

33 A student is designing a lighting circuit for a dolls' house. He sets up two different circuits.

Each circuit contains a 12 V power supply and three identical lamps.

Each lamp is designed to operate at normal brightness when connected individually to a 12 V supply.



circuit 1 circuit 2

Which statement is correct?

A In circuit 1, each of the lamps is at normal brightness.

B In circuit 1, if one lamp fails, the other lamps remain lit.

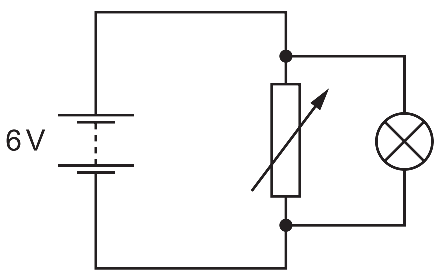
C In circuit 2, if one lamp fails, the other lamps remain lit.

D In circuit 2, the current from the power supply is less than in circuit 1.

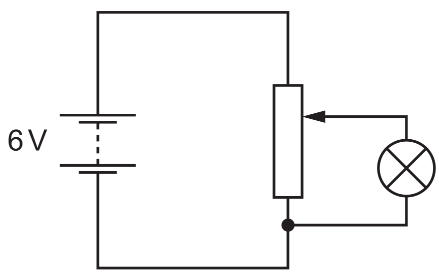
34 A lamp is to be connected in a circuit so that the potential difference (p.d.) across it can be varied from 0 to 6 V.

Which circuit would be most suitable?

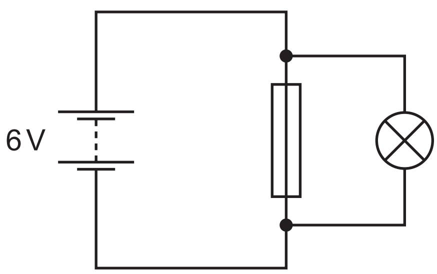
A



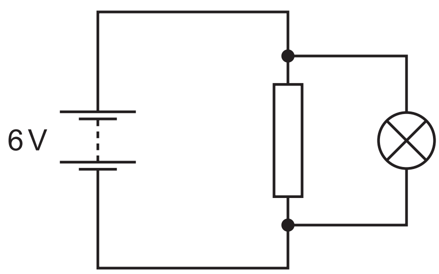
B



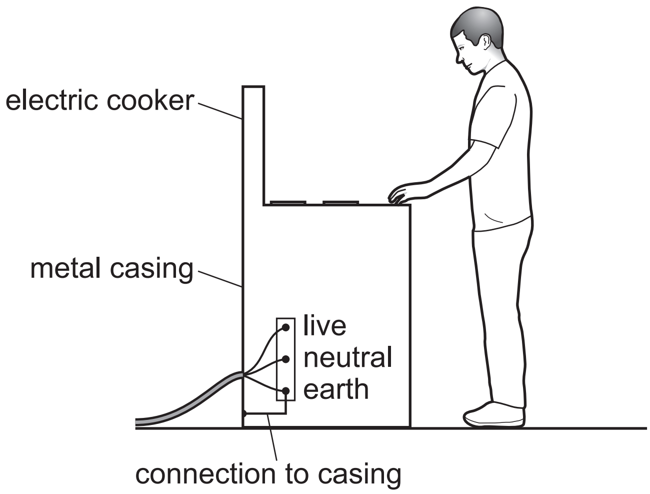
C



D



35 A simple wiring diagram for an electric cooker is shown.



Why is there a wire connecting the metal case of the cooker to earth?

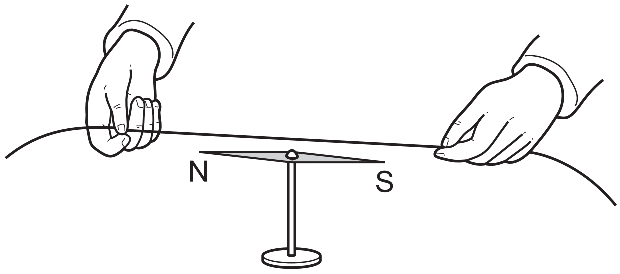
A It improves the efficiency of the cooker.

B It prevents the metal case from becoming too hot when the cooker is left on.

C It reduces the risk of an electric shock if the live wire touches the metal case.

D The electric cooker will not switch on without it.

36 In an experiment, a wire is held above a compass needle as shown.



An electric current is switched on in the wire and the compass needle is deflected.

Which row explains why this happens and then describes what happens when the current is reversed?

	why this happens	what happens when the current is reversed
A	there is a magnetic field inside the wire	the compass needle deflects in the opposite direction
B	there is a magnetic field inside the wire	there is no effect on the compass needle
C	there is a magnetic field around the wire	the compass needle deflects in the opposite direction
D	there is a magnetic field around the wire	there is no effect on the compass needle

37 Which device relies upon the magnetic effect of an electric current?

A fuse

B relay

C thermistor

D variable resistor

38 Which statement about the structure of an atom is correct?

A It contains positively charged particles only.

B It contains negatively charged particles only.

C It contains no charged particles.

D It contains positively charged particles and negatively charged particles.

39 Which statement about γ-radiation is correct?

A It consists of very small charged particles.

B It is a form of electromagnetic radiation.

C It is less penetrating than β-radiation.

D It is more highly ionising than α-radiation.

40 A radioactive element undergoes α-decay.

Which statement is **not** correct?

A A different element is formed.

B Radiation is emitted from the nucleus.

C The decay is a random process.

D The number of particles in the nucleus stays the same.

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PHYSICS **0625/21**

Paper 2 Multiple Choice (Extended) **May/June 2019**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

7296374499

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = $10\,m/s^2$).

IB19 06_0625_21/3RP

1 Which quantity can be measured directly using a micrometer screw gauge?

A the area of a sheet of paper

B the mass of a sheet of paper

C the thickness of a sheet of paper

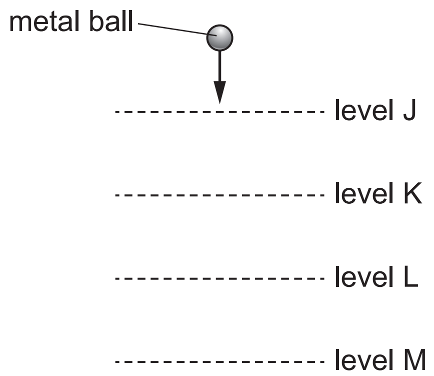
D the volume of a sheet of paper

2 The velocity of an object increases from 30 m / s to 50 m / s in 5.0 seconds.

What is the average acceleration of the object?

A $0.10\,m/s^2$ **B** $0.25\,m/s^2$ **C** $4.0\,m/s^2$ **D** $10\,m/s^2$

3 A heavy metal ball falls vertically downwards through air past four equally spaced levels J, K, L and M.



The times taken to fall from one level to the next are measured.

Where is the speed of the ball greatest and which time is shortest?

	speed is greatest between	time is shortest between
A	J and K	J and K
B	J and K	L and M
C	L and M	J and K
D	L and M	L and M

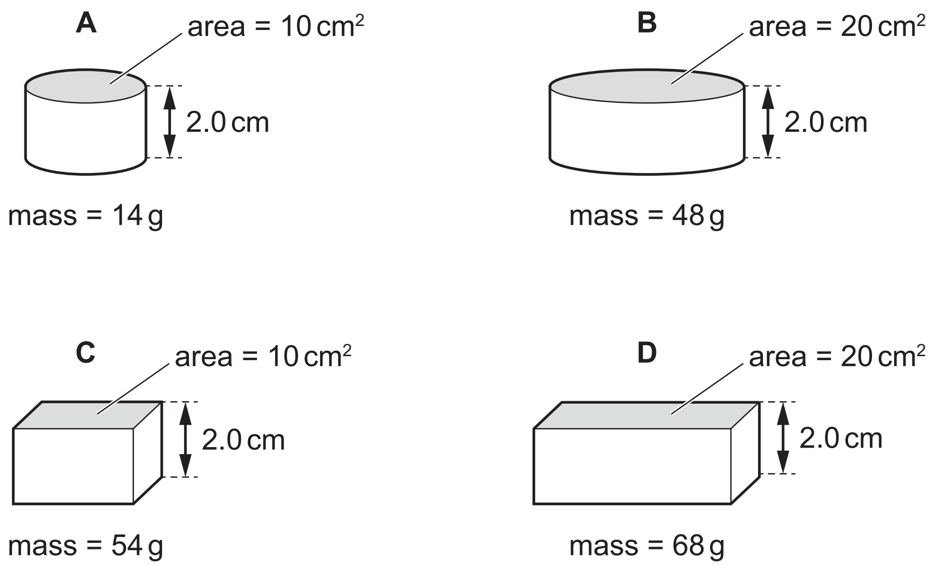
4 A body is moved from place X to place Y where the gravitational field strength is different.

What happens to its mass and to its weight due to the move?

	mass	weight
A	changes	changes
B	changes	stays the same
C	stays the same	changes
D	stays the same	stays the same

5 The diagrams show four solid blocks with their dimensions and masses.

Which block has the greatest density?



6 A student wishes to determine the spring constant of a spring where it obeys Hooke's law.

Different loads are hung from the spring and its length is measured for each different load.

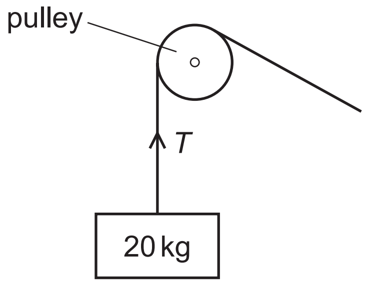
The table shows the results of the experiment.

weight of load / N	0	2.0	4.0	5.0
length of spring / cm	12	20	28	38

What is the value of the spring constant of the spring?

A 0.13 N / cm **B** 0.14 N / cm **C** 0.19 N / cm **D** 0.25 N / cm

7 A mass of 20 kg is held stationary by a rope passing over a frictionless pulley.

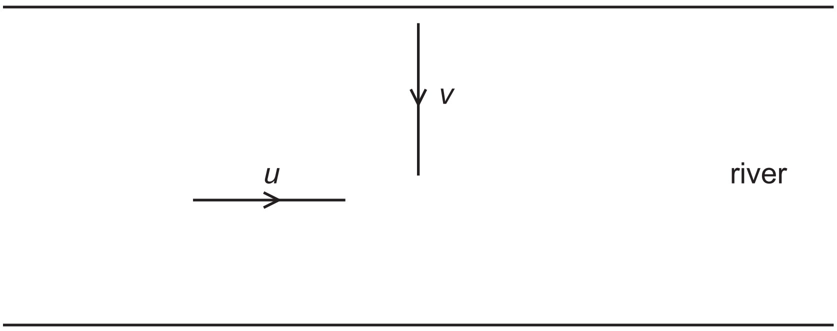


What is the tension *T* in the rope?

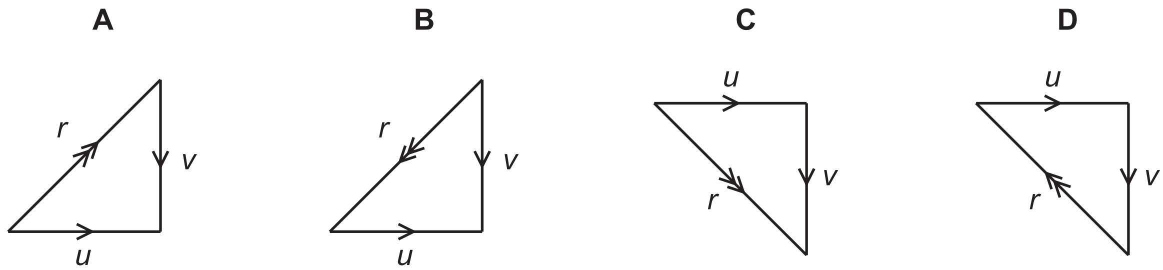
A 10 kg **B** 20 kg **C** 100 N **D** 200 N

8 A boat starts moving across a river at velocity *v* perpendicular to the river bank.

The boat encounters a current along the river of velocity *u*, as shown.



Which vector diagram shows the resultant velocity *r* of the boat?



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9 A ball of mass 0.50 kg falls and hits the floor at 10 m / s.

It rebounds at speed 8.0 m / s, as shown.

The collision between the ball and the floor lasts for 0.50 s.

What is the average force acting on the ball during the collision?

A 2.0 N upwards

B 2.0 N downwards

C 18 N upwards

D 18 N downwards

10 An object falls from the top of a building that is 25 m high. Air resistance is negligible.

What is the speed of the object when it hits the ground?

A 10 m / s **B** 22 m / s **C** 25 m / s **D** 625 m / s

11 A machine is very efficient.

What does this mean?

A It produces a large amount of power.

B It uses very little energy.

C It wastes very little energy.

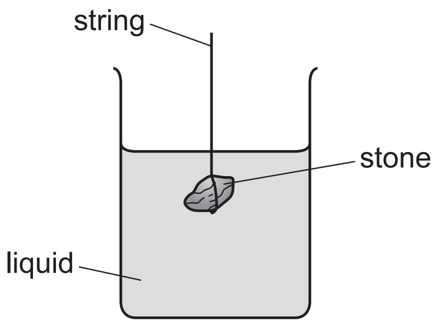
D It works very quickly.

12 A crane takes 2.0 minutes to lift a load to the top of a building. The change in gravitational potential energy of the load is 360 kJ.

What is the useful power output of the crane?

A 3.0 kW **B** 180 kW **C** 720 kW **D** 43 200 kW

13 The diagram shows a stone suspended on a string under the surface of a liquid. The stone experiences a pressure caused by the liquid.



What would increase the pressure on the stone?

A decreasing the surface area of the stone

B increasing the mass of the stone

C lowering the stone deeper into the liquid

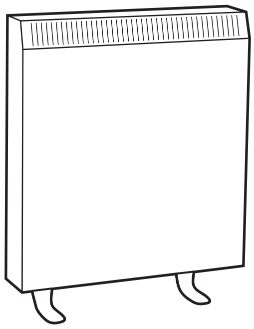
D using a liquid with a lower density

14 A stationary smoke particle is hit by a fast-moving nitrogen molecule.

Which row describes the motion of the smoke particle and of the nitrogen molecule after the collision?

	smoke particle	nitrogen molecule
A	moves	rebounds
B	moves	stops
C	remains stationary	rebounds
D	remains stationary	stops

15 A night storage heater contains a large block of material that is heated electrically during the night. During the day the block cools down, releasing thermal energy into the room.



Which thermal capacity and which night-time temperature increase will cause the most energy to be stored by the block?

	thermal capacity of block	night-time temperature increase
A	large	large
B	large	small
C	small	large
D	small	small

16 100 g of water at 25 °C is poured into an insulating cup. 50 g of ice at 0 °C is added to the water. The water is stirred until the temperature of the water has fallen to 0 °C.

18 g of ice remains unmelted.

The specific heat capacity of water is 4.2 J / g °C.

Which value does this experiment give for the specific latent heat of fusion of ice?

A 210 J / g **B** 330 J / g **C** 580 J / g **D** 770 J / g

17 In which does thermal conduction **not** occur?

A a gas

B a liquid

C a solid

D a vacuum

18 The metal surface of a kettle is hot.

What happens to the cool air outside the kettle when it comes into contact with the hot kettle?

A The density of the air decreases and the air falls.

B The density of the air decreases and the air rises.

C The density of the air increases and the air falls.

D The density of the air increases and the air rises.

19 Some hot water is sealed inside a metal can. The can is in a vacuum in outer space. The hot water slowly cools down.

How does the thermal energy escape into space?

A by conduction then convection

B by conduction then radiation

C by evaporation then convection

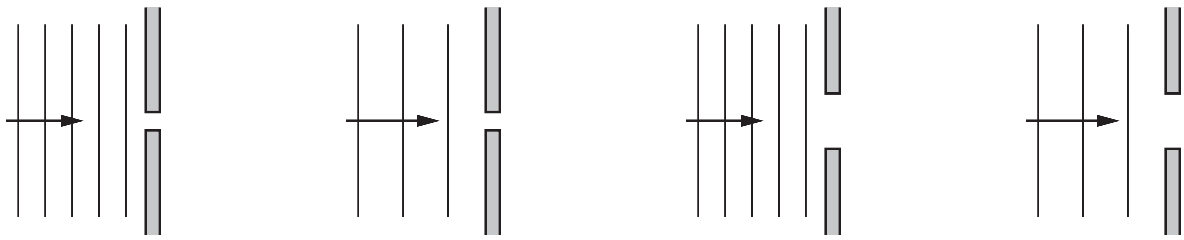
D by evaporation then radiation

20 When water waves pass through a gap they diffract.

The diagrams show wavefronts approaching a narrow gap.

In which diagram will the diffraction be least?

A B C D



21 An object is placed 30 cm in front of a plane mirror.

Which statement describes the image of the object?

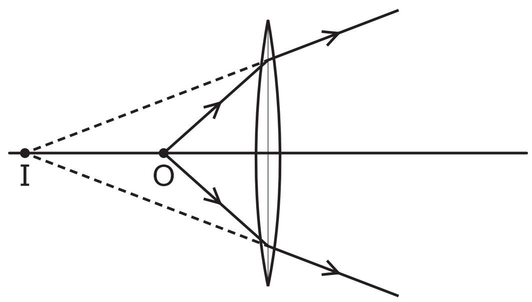
A The image is the same size and 30 cm from the object.

B The image is the same size and 60 cm from the object.

C The image is smaller and 30 cm from the object.

D The image is smaller and 60 cm from the object.

22 A small object O is placed near a converging lens, as shown. The lens forms an image I.



Which statement is correct?

A The image I is diminished.

B The image I is inverted.

C The image I is real.

D The object O is closer to the lens than its principal focus.

23 An eclipse of the Sun happens when the Moon comes between the Earth and the Sun.

Which statement is correct?

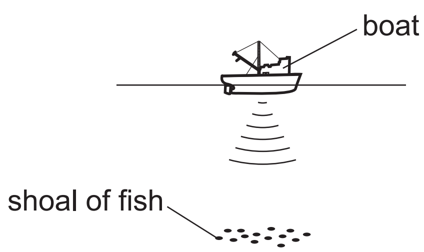
A Infra-red radiation from the Sun disappears before visible light and ultra-violet radiation.

B Ultra-violet radiation from the Sun disappears before visible light and infra-red radiation.

C Visible light from the Sun disappears before ultra-violet radiation and infra-red radiation.

D Infra-red radiation, ultra-violet radiation and visible light from the Sun all disappear at the same moment.

24 A pulse of sound is produced at the bottom of a boat. The sound travels through the water and is reflected from a shoal of fish. The sound reaches the boat again after 1.2 s. The speed of sound in the water is 1500 m / s.



How far below the bottom of the boat is the shoal of fish?

A 450 m **B** 900 m **C** 1800 m **D** 3600 m

25 What is the approximate value of the speed of sound in air at normal temperature?

A 340 m / s **B** 34 000 m / s **C** 340 km / s **D** 3.0×10^8 m / s

26 Why is soft iron used for the core of an electromagnet?

A Soft iron easily becomes a permanent magnet.

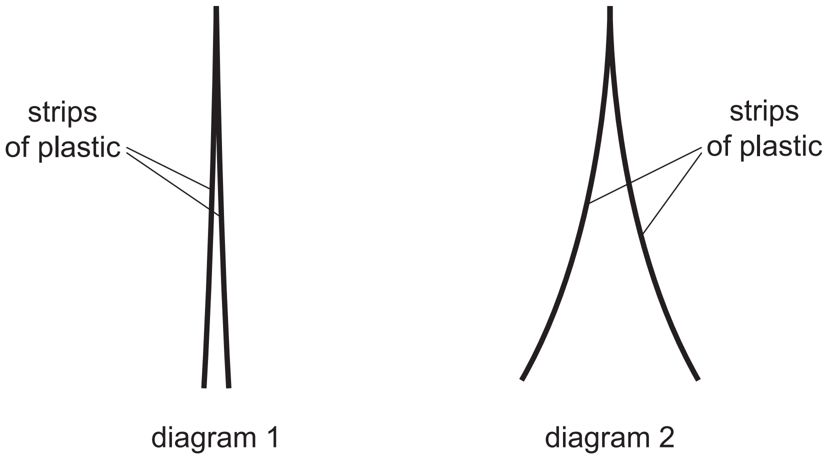
B Soft iron is a good electrical conductor.

C Soft iron is a poor thermal conductor.

D Soft iron loses its magnetism when the current in the coil is switched off.

27 Diagram 1 shows two thin, uncharged strips of plastic.

Diagram 2 shows the same strips after they have been rubbed with a dry cloth.



Which row describes the charge on the strips after rubbing, and the force between the strips after rubbing?

	charge on strips	force between strips
A	opposite	attraction
B	opposite	repulsion
C	the same	attraction
D	the same	repulsion

28 A cell has an electromotive force (e.m.f.) of 1.5 V.

What does this statement mean?

A The cell converts 1.0 J of energy when driving 1.5 C of charge round a complete circuit.

B The cell converts 1.5 J of energy when driving 1.0 C of charge round a complete circuit.

C The cell converts 1.5 J of energy per second when driving 1.0 C of charge round a complete circuit.

D The cell converts 1.5 W of power when driving 1.0 C of charge round a complete circuit.

29 Which two changes to a metal wire both increase resistance?

A decreasing its length and increasing its temperature

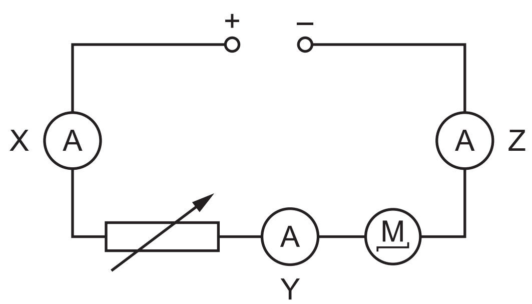
B increasing its length and decreasing its temperature

C decreasing its thickness and increasing its temperature

D increasing its thickness and decreasing its temperature

30 The diagram shows a circuit containing a d.c. power supply, a motor and a variable resistor.

Three ammeters X, Y and Z show the current in different parts of the circuit.



The reading on X is 4.0 A.

Which statement is correct?

A The readings on Y and Z are both less than 4.0 A.

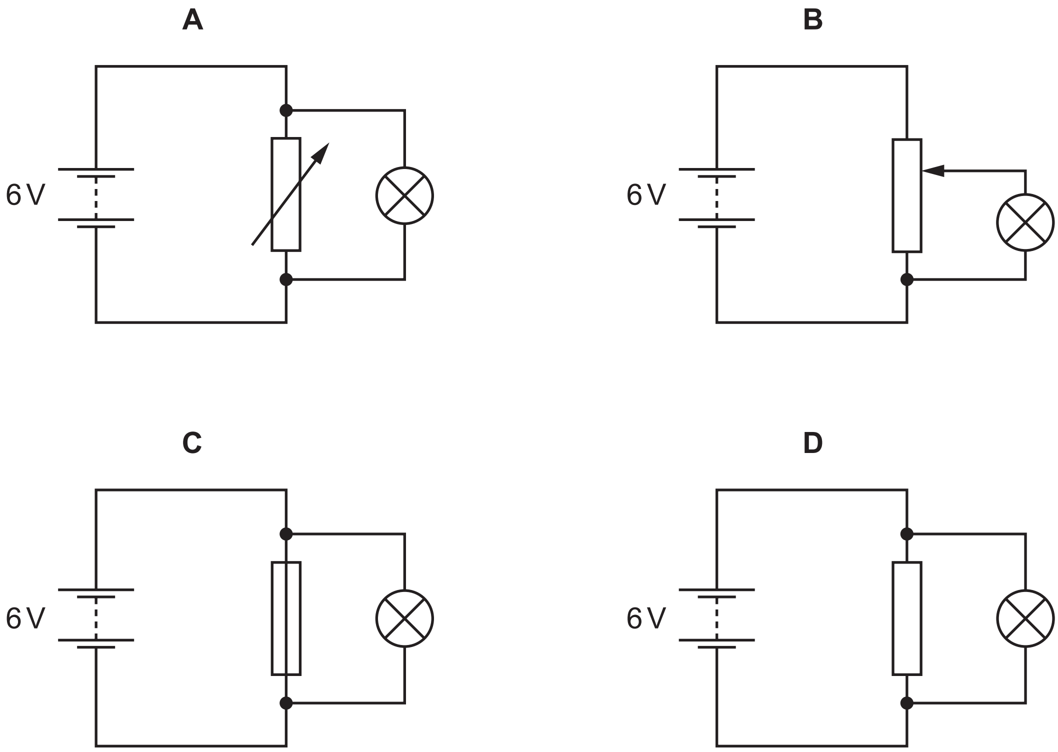
B The readings on Y and Z are both equal to 4.0 A.

C The readings on Y and Z are both greater than 4.0 A.

D The reading on Z is zero.

31 A lamp is to be connected in a circuit so that the potential difference (p.d.) across it can be varied from 0 to 6 V.

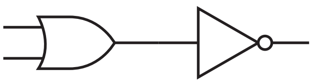
Which circuit would be most suitable?



32 Which logic gate is represented by the symbol shown?

A AND **B** NAND **C** NOR **D** OR

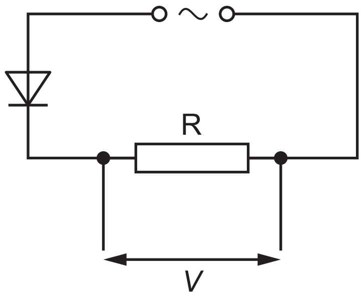
33 The diagram shows a combination of logic gates.



Which single logic gate is equivalent to this combination?

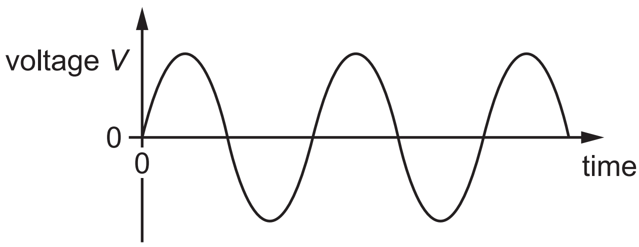
A AND **B** NOR **C** NOT **D** OR

34 An alternating current (a.c.) power supply is connected in series with a resistor R and a diode.

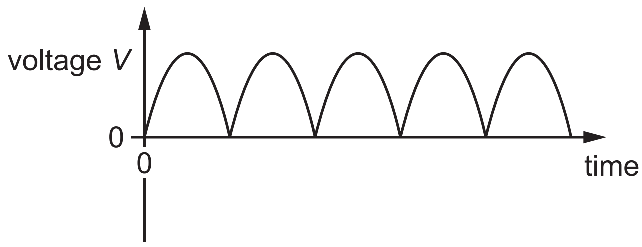


Which graph shows how the voltage V across the resistor R varies with time?

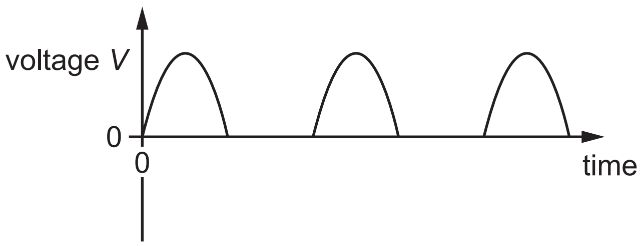
A



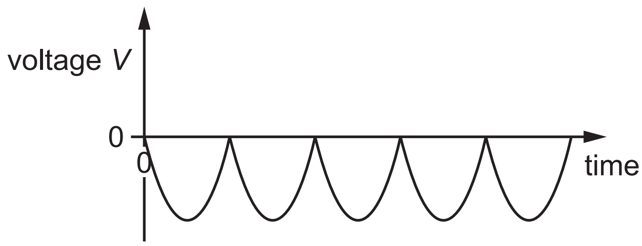
B



C



D



35 An electric heater is plugged into the mains supply using a fused plug.

The current in the heater is 10 A.

The cable attached to the heater is rated at 15 A.

The fuses available are rated at 1 A, 3 A, 5 A and 13 A.

Which fuse should be used?

A 1 A **B** 3 A **C** 5 A **D** 13 A

36 What is the purpose of the commutator in a d.c. electric motor?

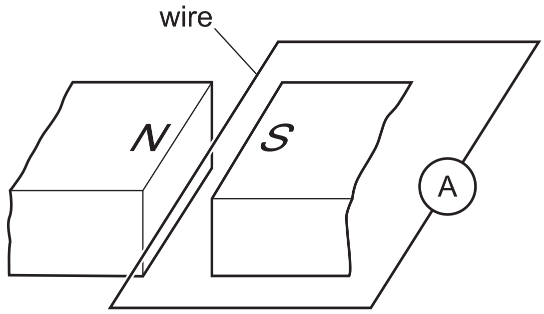
A to control the speed at which the motor rotates

B to reverse the direction of the voltage across the power supply every half-turn

C to reverse the direction of the current in the motor coil every half-turn

D to reverse the direction of spin of the motor coil every half-turn

37 The diagram shows a wire between two magnetic poles. The wire is connected in a circuit with an ammeter.



The wire is moved downwards, towards the bottom of the page. A current is induced in the wire.

In which direction is the force on the wire caused by this current?

A towards the bottom of the page

B towards the left of the page

C towards the right of the page

D towards the top of the page

38 The chemical symbol for sodium is Na. The equation represents the radioactive decay of sodium-24.

$$^{24}_{11}\text{Na} \rightarrow {}^{24}_{x}\text{Mg} + {}^{y}_{-1}\text{e}$$

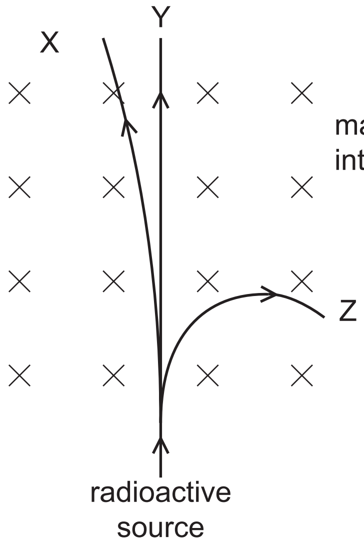
What are the numbers x and y?

	x	y
A	10	0
B	10	1
C	12	0
D	12	1

39 A radioactive source emits α-particles, β-particles and γ-rays into a vacuum where there is a magnetic field.

The magnetic field acts perpendicularly into the plane of the paper.

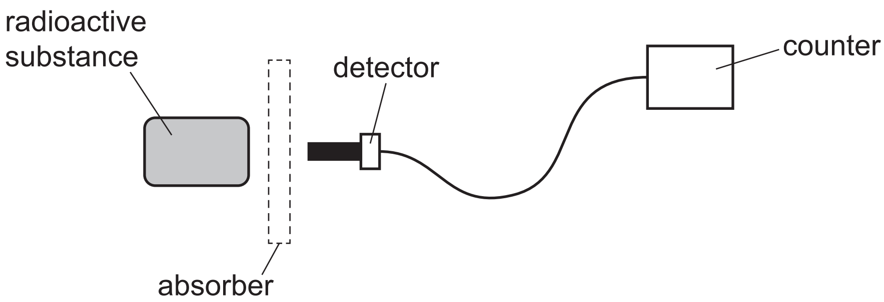
The paths X, Y and Z of the three types of radiation through the magnetic field are shown.



Which radiation follows path X, path Y and path Z?

	X	Y	Z
A	α-particles	β-particles	γ-rays
B	α-particles	γ-rays	β-particles
C	β-particles	α-particles	γ-rays
D	β-particles	γ-rays	α-particles

40 A student measures the level of radiation emitted from a radioactive substance. He places a detector very close to the substance. He puts different absorbers between the radioactive substance and the detector.



The student's results are shown. These results are corrected for background radiation.

absorber	counter reading / counts per minute
none	95
thin paper	52
few mm of aluminium	52
several cm of lead	12

Which types of radiation are being emitted by the substance?

A α-particles and β-particles only

B α-particles and γ-rays only

C β-particles and γ-rays only

D α-particles, β-particles and γ-rays

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/22**

Paper 2 Multiple Choice (Extended) **May/June 2019**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

MODIFIED LANGUAGE

8579442859

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

1 Which quantity can be measured directly using a micrometer screw gauge?

A the area of a sheet of paper

B the mass of a sheet of paper

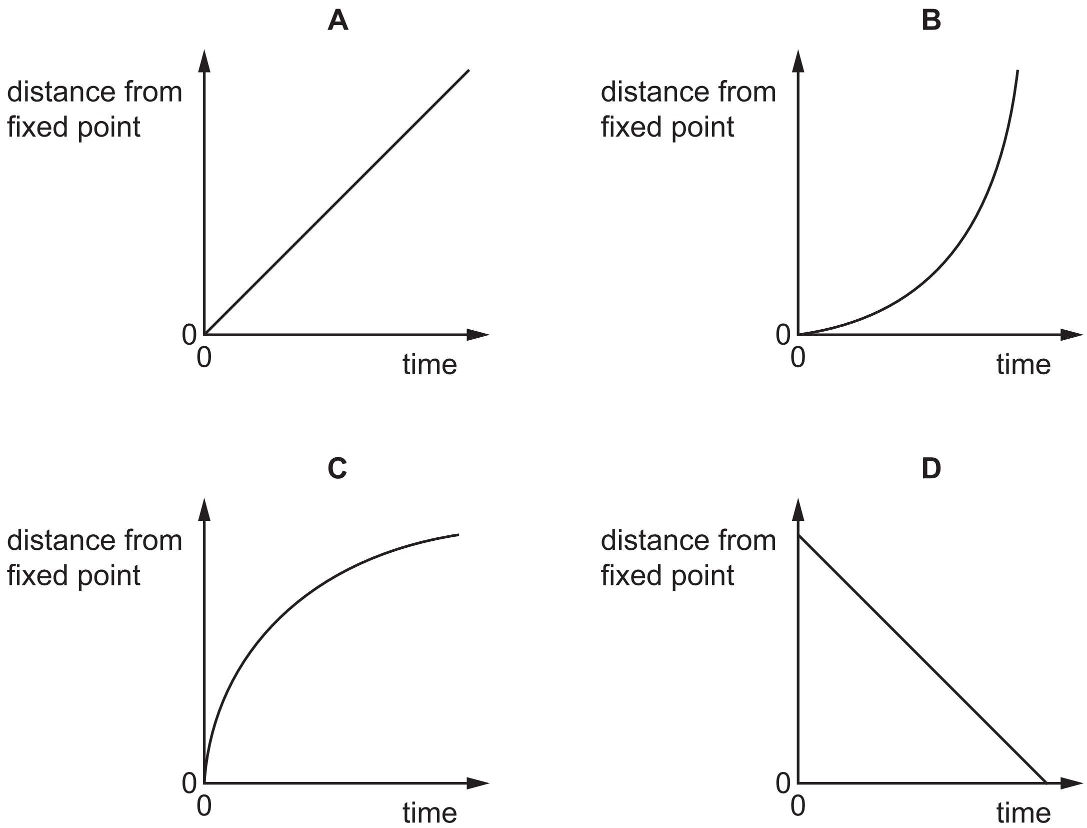
C the thickness of a sheet of paper

D the volume of a sheet of paper

2 Four objects are moving along a straight line.

The distance of an object from a fixed point on the line is plotted against time for each object.

Which object is decelerating?



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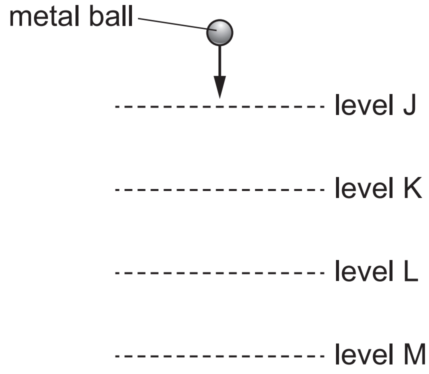
3 A heavy metal ball falls vertically downwards through air past four equally spaced levels J, K, L and M.



The times taken to fall from one level to the next are measured.

Where is the speed of the ball greatest and which time is shortest?

	speed is greatest between	time is shortest between
A	J and K	J and K
B	J and K	L and M
C	L and M	J and K
D	L and M	L and M

4 Four students make statements about the mass of an object.

Which statement is correct?

A The mass of an object depends on the gravitational field which acts on the object.

B The mass of an object divided by its weight is equal to the acceleration with which it falls freely.

C The mass of an object increases when the temperature of the object increases.

D The mass of an object resists change in motion of the object.

5 A metal has a density of 8.0 g / cm^3. A solid cube of mass 1.0 kg is made from this metal.

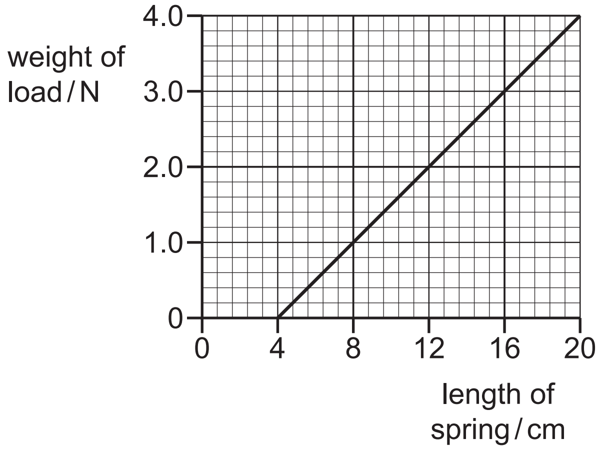
How long is each side of the cube?

A 0.50 cm **B** 2.0 cm **C** 5.0 cm **D** 42 cm

6 An experiment is done to determine the spring constant for a spring.

Different loads are hung from the spring and its length is measured for each different load.

The graph shows how its length varies with load.

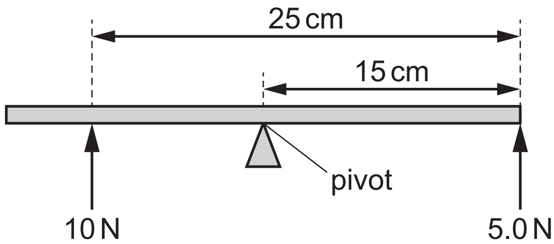


What is the value of the spring constant?

A 0.20 N / cm **B** 0.25 N / cm **C** 4.0 N / cm **D** 5.0 N / cm

7 A beam is pivoted at its centre of mass.

It is acted upon by two forces, 10 N and 5.0 N, as shown.



What is the resultant moment about the pivot?

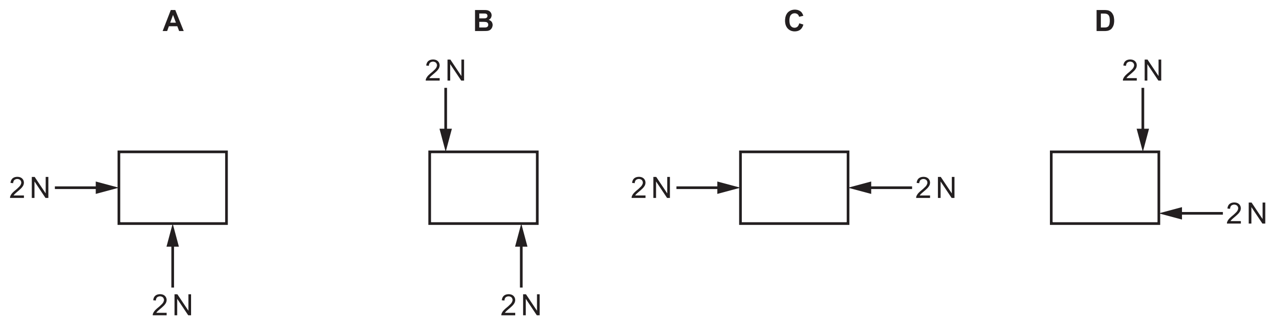
A 25 N cm anticlockwise

B 25 N cm clockwise

C 175 N cm anticlockwise

D 175 N cm clockwise

8 Which object is in equilibrium?



9 An object of mass 4.0 kg is moving with a velocity of 3.0 m / s in a straight line.

What is the momentum of the object?

A 0.75 kg m / s **B** 1.3 kg m / s **C** 12 kg m / s **D** 24 kg m / s

10 A machine is very efficient.

What does this mean?

A It produces a large amount of power.

B It uses very little energy.

C It wastes very little energy.

D It works very quickly.

11 A force F acts on a body and the body moves a distance d in the direction of the force.

Which expression for the work done W is correct?

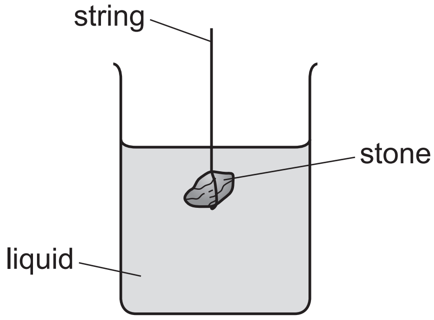
A $W = Fd$ **B** $W = Fd^2$ **C** $W = \frac{1}{2}Fd$ **D** $W = \frac{1}{2}Fd^2$

12 A boy produces an average power output of 60 W as he rides his bicycle for 2.0 minutes.

How much useful energy does he expend?

A 0.50 J **B** 30 J **C** 120 J **D** 7200 J

13 The diagram shows a stone suspended on a string under the surface of a liquid. The stone experiences a pressure caused by the liquid.



What would increase the pressure on the stone?

A decreasing the surface area of the stone

B increasing the mass of the stone

C lowering the stone deeper into the liquid

D using a liquid with a lower density

14 At room temperature, iron is difficult to compress.

At the same temperature, oxygen is much easier to compress.

Which comparison of the structures of iron and oxygen explains this?

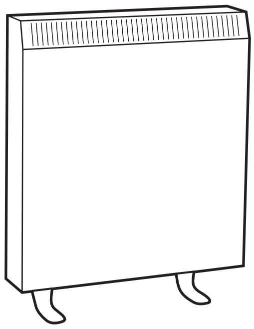
A The iron particles are closer together.

B The iron particles have a greater mass.

C The iron particles can be magnetised.

D The iron particles have less average kinetic energy.

15 A night storage heater contains a large block of material that is heated electrically during the night. During the day the block cools down, releasing thermal energy into the room.



Which thermal capacity and which night-time temperature increase will cause the most energy to be stored by the block?

	thermal capacity of block	night-time temperature increase
A	large	large
B	large	small
C	small	large
D	small	small

16 100 g of water at 25 °C is poured into an insulated cup. 50 g of ice at 0 °C is added to the water. The water is stirred until the temperature of the water has fallen to 0 °C.

18 g of ice remains unmelted.

The specific heat capacity of water is 4.2 J / g °C.

Which value does this experiment give for the specific latent heat of fusion of ice?

A 210 J / g **B** 330 J / g **C** 580 J / g **D** 770 J / g

17 The handle of a metal saucepan is made of plastic. As the saucepan heats up, the handle gets warmer.

Which statement explains this?

A Molecules of the plastic radiate their energy to other molecules.

B Molecules of the plastic vibrate more and pass on their energy to nearby molecules.

C The free electrons in the plastic transfer the thermal energy along the handle.

D The heated molecules very slowly move along the plastic handle.

18 The metal surface of a kettle is hot.

What happens to the cool air outside the kettle when it comes into contact with the hot kettle?

A The density of the air decreases and the air falls.

B The density of the air decreases and the air rises.

C The density of the air increases and the air falls.

D The density of the air increases and the air rises.

19 Vacuum flasks usually have silvered walls that help to keep the contents of the flask hot.

Why are the walls silvered?

A to absorb thermal energy from the air around the flask

B to increase the rate of convection inside the flask

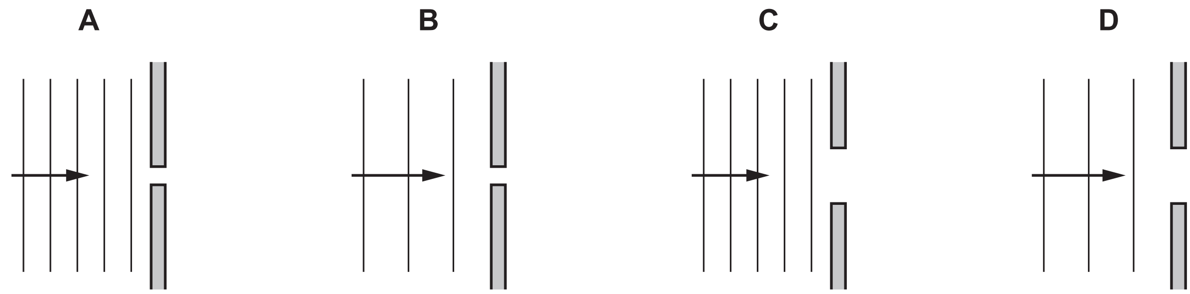
C to reduce energy loss to the surroundings by conduction

D to reflect thermal radiation back into the flask

20 When water waves pass through a gap they diffract.

The diagrams show wavefronts approaching a narrow gap.

In which diagram will the diffraction be least?



21 Which conditions are necessary for light to be totally internally reflected?

	the incident light is in	angle of incidence
A	the less dense medium	less than the critical angle
B	the less dense medium	greater than the critical angle
C	the more dense medium	less than the critical angle
D	the more dense medium	greater than the critical angle

22 Light is travelling through air. The light strikes a glass block at an angle of incidence of 45°. The glass has a refractive index of 1.4.

What is the angle of refraction of the light as it enters the glass?

A 29° **B** 30° **C** 32° **D** 82°

23 An eclipse of the Sun happens when the Moon comes between the Earth and the Sun.

Which statement is correct?

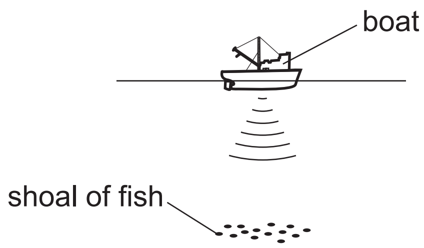
A Infra-red radiation from the Sun disappears before visible light and ultra-violet radiation.

B Ultra-violet radiation from the Sun disappears before visible light and infra-red radiation.

C Visible light from the Sun disappears before ultra-violet radiation and infra-red radiation.

D Infra-red radiation, ultra-violet radiation and visible light from the Sun all disappear at the same moment.

24 A pulse of sound is produced at the bottom of a boat. The sound travels through the water and is reflected from a shoal of fish. The sound reaches the boat again after 1.2 s. The speed of sound in the water is 1500 m/s.



How far below the bottom of the boat is the shoal of fish?

A 450 m **B** 900 m **C** 1800 m **D** 3600 m

25 An observer stands at the finish line of a 100 m race. He wants to time the winner's run. He starts his stop-watch as soon as he sees the smoke from the starting gun instead of when he hears the bang.

What is the reason for doing this?

A Light travels much faster than sound.

B There is a risk he might respond to an echo from a wall.

C Humans react slower to sound than to light.

D Humans react more quickly to sound than to light.

26 A soft iron bar is a long way from any magnetic field.

How can the material of the bar be described?

A It is magnetic and strongly magnetised.

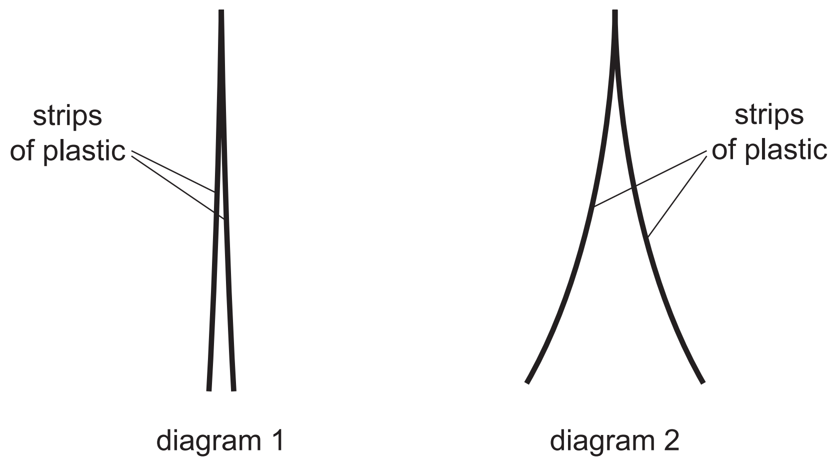
B It is magnetic and unmagnetised.

C It is non-magnetic and strongly magnetised.

D It is non-magnetic and unmagnetised.

27 Diagram 1 shows two thin, uncharged strips of plastic.

Diagram 2 shows the same strips after they have been rubbed with a dry cloth.



Which row describes the charge on the strips after rubbing, and the force between the strips after rubbing?

	charge on strips	force between strips
A	opposite	attraction
B	opposite	repulsion
C	the same	attraction
D	the same	repulsion

28 A cell has an electromotive force (e.m.f.) of 1.5 V.

What does this statement mean?

A The cell converts 1.0 J of energy when driving 1.5 C of charge round a complete circuit.

B The cell converts 1.5 J of energy when driving 1.0 C of charge round a complete circuit.

C The cell converts 1.5 J of energy per second when driving 1.0 C of charge round a complete circuit.

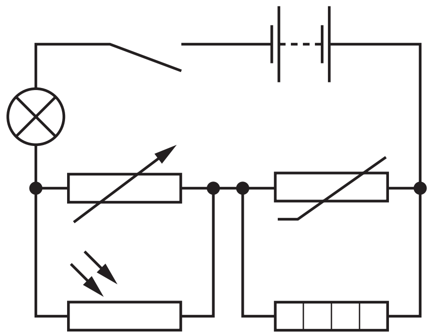
D The cell converts 1.5 W of power when driving 1.0 C of charge round a complete circuit.

29 A metal wire of length 100 cm and cross-sectional area 0.20 mm^2 has a resistance of 8.0 Ω.

What is the resistance of a wire of the same metal of length 50 cm and cross-sectional area of 0.40 mm^2?

A 2.0 Ω **B** 8.0 Ω **C** 16 Ω **D** 32 Ω

30 The diagram shows a circuit.



What is connected in parallel with the thermistor?

A heater

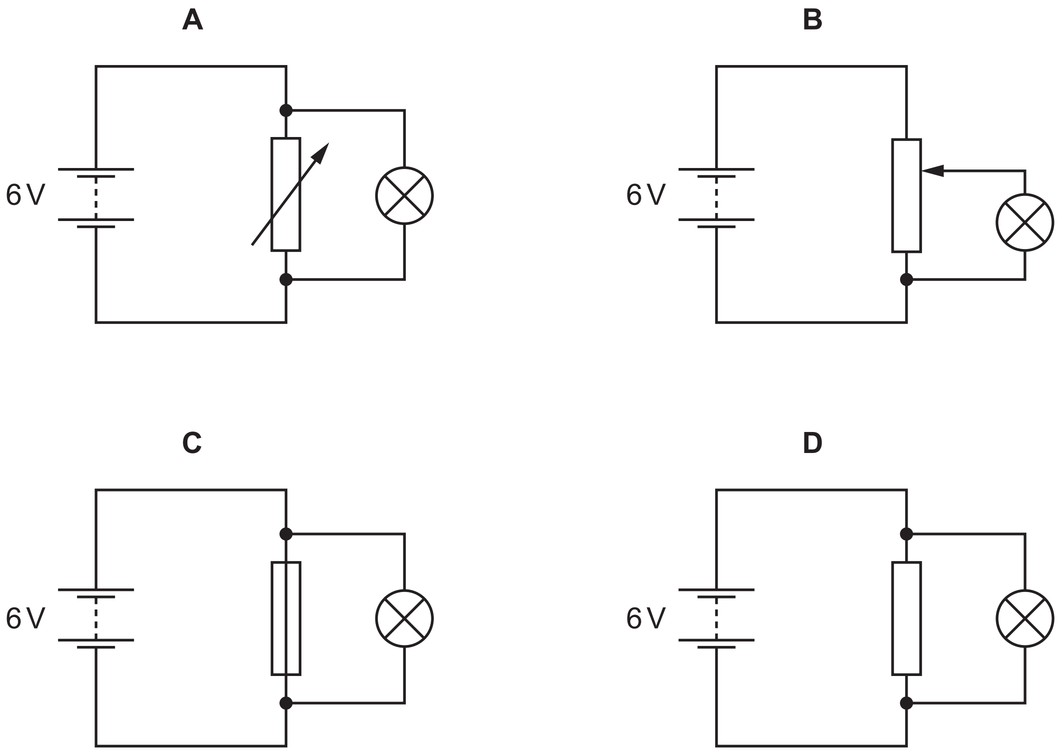
B lamp

C light-dependent resistor

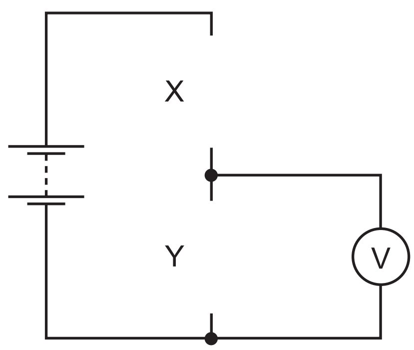
D variable resistor

31 A lamp is to be connected in a circuit so that the potential difference (p.d.) across it can be varied from 0 to 6V.

Which circuit would be most suitable?



32 Components X and Y can be inserted to complete the circuit below. The completed circuit is a potential divider in which the potential difference across component Y increases when the temperature increases.



Which row shows the components X and Y?

	X	Y
A	light-dependent resistor	resistor
B	resistor	light-dependent resistor
C	resistor	thermistor
D	thermistor	resistor

33 Which two logic gates each have a high output (1) when both of their inputs are low (0)?

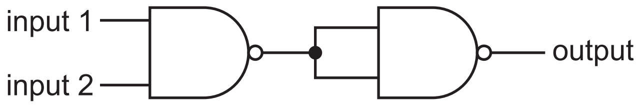
A AND and OR

B AND and NOR

C NAND and NOR

D NAND and OR

34 Two NAND gates are joined together as shown.



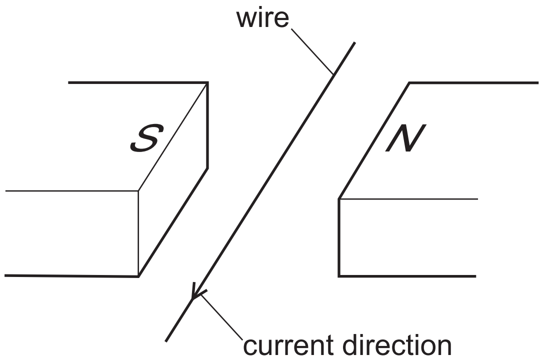
Which single logic gate is equivalent to this combination?

A AND **B** NAND **C** NOR **D** OR

35 Which components are designed to improve the safe working of a mains electrical supply?

	circuit breaker	earth wire	fuse
A	✓	✓	✗
B	✓	✗	✓
C	✗	✓	✓
D	✓	✓	✓

36 The diagram shows a current-carrying wire placed between two magnetic poles. The current is in the direction shown.



What is the direction of the force on the wire?

A towards the bottom of the page

B towards the top of the page

C towards the left-hand side of the page

D towards the right-hand side of the page

37 Diagram 1 shows an a.c. generator. The coil is turning as shown.

diagram 1

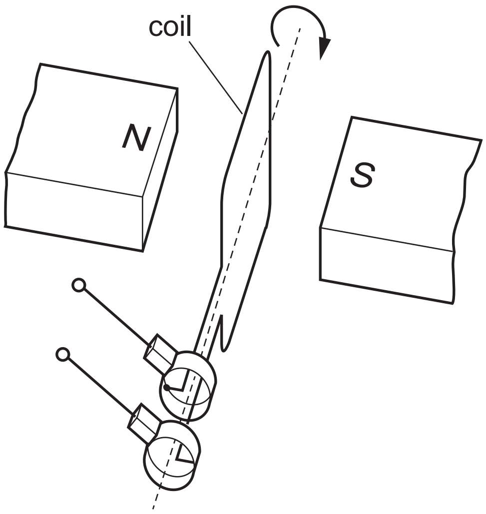
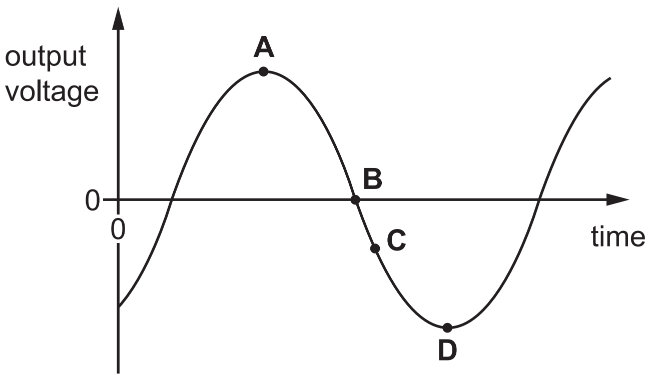


Diagram 2 shows the output voltage produced by the generator as the coil turns.

Which point on diagram 2 shows the voltage induced when the coil is moving through the position shown in diagram 1?

diagram 2



38 Which observation provides evidence for the nuclear atom?

A attraction of opposite charges

B emission of γ-rays during the decay of a radioactive nuclide

C scattering of α-particles by thin metal foils

D scattering of γ-rays by a thin metal foil

39 The chemical symbol for uranium is U. The equation represents the radioactive decay of uranium-235.

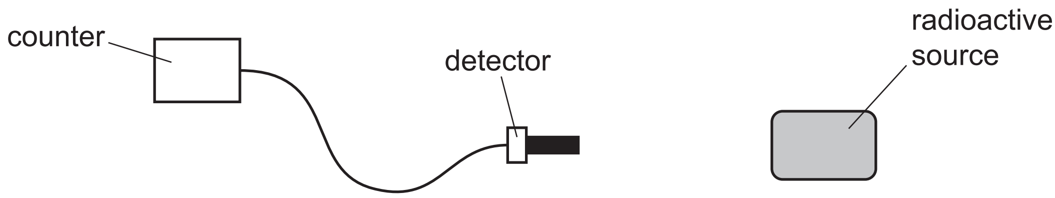
$$^{235}_{92}\mathrm{U} \rightarrow {}^{x}_{y}\mathrm{Th} + {}^{4}_{2}\mathrm{He}$$

What are the numbers x and y?

	x	y
A	231	94
B	231	90
C	239	94
D	239	90

40 An experiment is done to measure the radiation from a radioactive source that has a half-life of 10 minutes.

The source is placed close to a detector that is connected to a counter, as shown.



The average background count-rate is 20 counts / minute.

At the start of the experiment, the count-rate recorded by the counter is 1000 counts / minute.

What is the count-rate 10 minutes later?

A 490 counts / minute

B 500 counts / minute

C 510 counts / minute

D 530 counts / minute

Cambridge IGCSE

Cambridge Assessment International Education
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* 7 1 1 5 1 9 5 4 4 9 2 *

PHYSICS **0625/23**

Paper 2 Multiple Choice (Extended) **May/June 2019**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

This document consists of **16** printed pages.

1 Which quantity can be measured directly using a micrometer screw gauge?

A the area of a sheet of paper

B the mass of a sheet of paper

C the thickness of a sheet of paper

D the volume of a sheet of paper

2 A brass ball and a feather are released at the same time.

On Earth, the ball reaches the ground first.

On the Moon, they reach the ground at the same time.

What is the explanation for this?

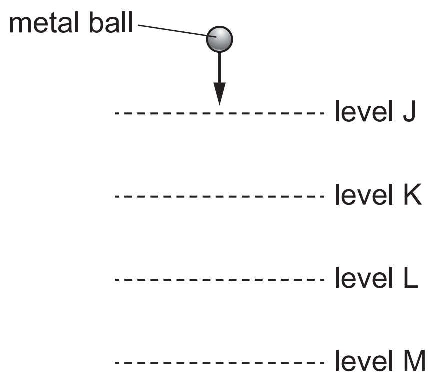
A Both weigh the same on the Moon.

B Both weigh less on the Moon.

C There is a greater air resistance on the Moon.

D There is no air resistance on the Moon.

3 A heavy metal ball falls vertically downwards through air past four equally spaced levels J, K, L and M.



The times taken to fall from one level to the next are measured.

Where is the speed of the ball greatest and which time is shortest?

	speed is greatest between	time is shortest between
A	J and K	J and K
B	J and K	L and M
C	L and M	J and K
D	L and M	L and M

4 On Earth, a spring stretches by 5.0 cm when a mass of 3.0 kg is suspended from one end.

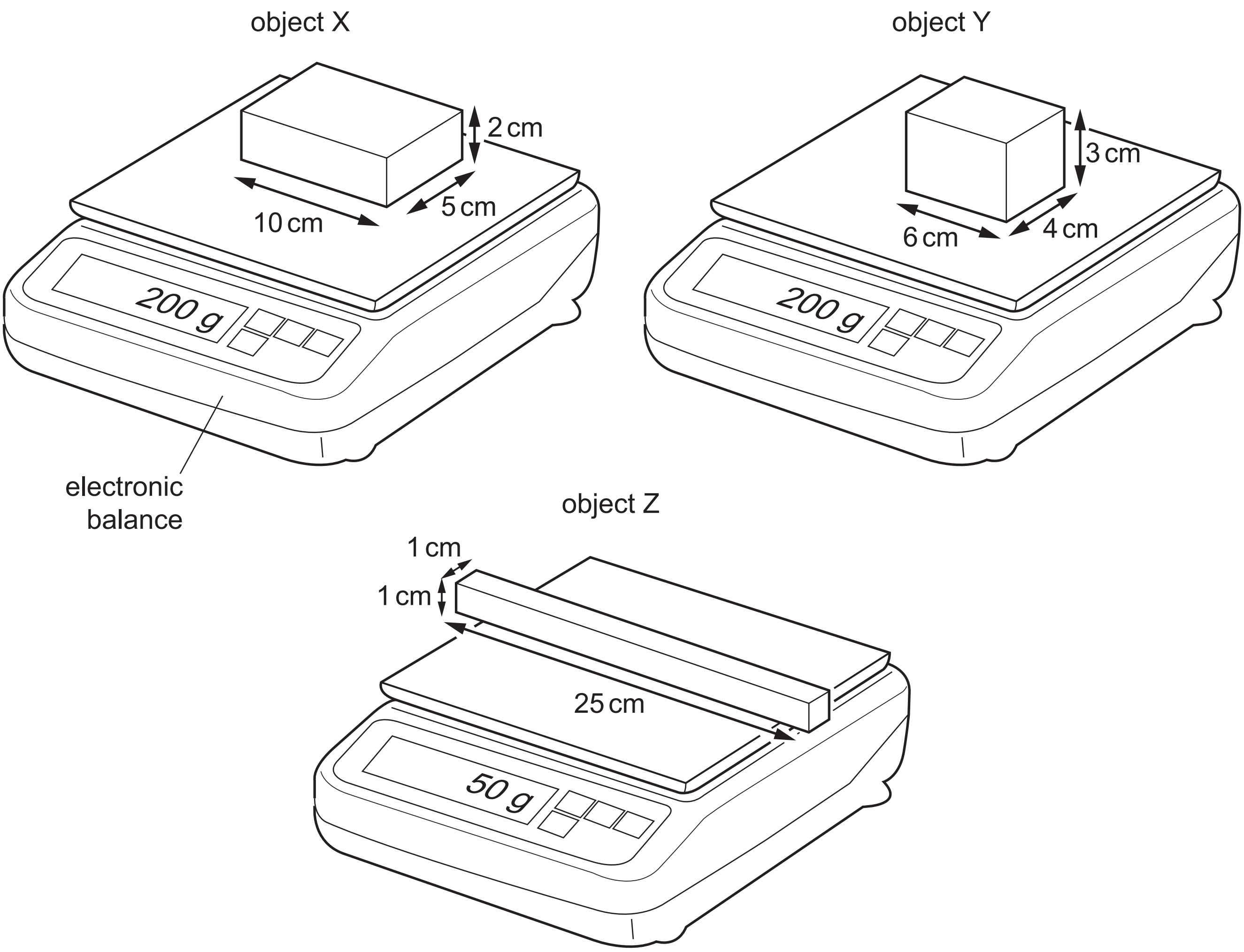
The gravitational field strength on the Moon is $\frac{1}{6}$ of that on Earth.

Which mass, on the Moon, would stretch the spring by the same extension?

A 0.50 kg **B** 3.0 kg **C** 5.0 kg **D** 18 kg

5 X, Y and Z are three regularly shaped solid objects.

Their dimensions and masses are shown in the diagrams.



Which objects have the same density?

A X, Y and Z **B** X and Y only **C** X and Z only **D** Y and Z only

6 An experiment is carried out to determine the spring constant for a spring that obeys Hooke's law.

A load is hung from the spring and the extension of the spring is measured.

Which calculation is used to calculate the spring constant?

A $\dfrac{\text{extension}}{\text{mass of the load}}$

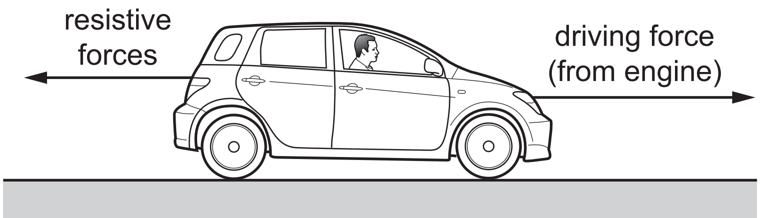
B $\dfrac{\text{extension}}{\text{weight of the load}}$

C $\dfrac{\text{mass of the load}}{\text{extension}}$

D $\dfrac{\text{weight of the load}}{\text{extension}}$

7 A car is driven from rest on a long straight road. The car engine exerts a constant driving force.

The diagram shows the horizontal forces acting on the car. The resistive forces are proportional to the speed of the car.



Why does the car eventually reach a maximum speed?

A The resistive forces decrease to make the acceleration of the car negative.

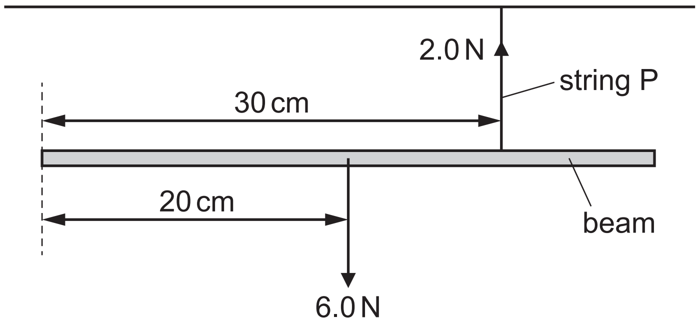
B The resistive forces decrease to make the acceleration of the car zero.

C The resistive forces increase to make the acceleration of the car negative.

D The resistive forces increase to make the acceleration of the car zero.

8 A beam of weight 6.0 N is suspended from two strings P and Q.

String P is 30 cm from the left-hand end of the beam, as shown. String Q is not shown.



The tension in string P is 2.0 N.

What is the tension in string Q and where is it attached so that the beam is in equilibrium?

A 4.0 N at 10.0 cm from the left-hand end

B 4.0 N at 15.0 cm from the left-hand end

C 6.0 N at 10.0 cm from the left-hand end

D 8.0 N at 7.5 cm from the left-hand end

9 How is momentum *p* calculated in terms of the mass *m* of a body and its velocity *v*, and what type of quantity is *p*?

	equation	type of quantity
A	$p = m \times v$	scalar
B	$p = m \times v$	vector
C	$p = \frac{m}{v}$	scalar
D	$p = \frac{m}{v}$	vector

10 An object is in free fall. The change in gravitational potential energy of the body depends upon its mass *m*, the change in height Δh and the gravitational field strength *g*.

What is the correct expression for the change in gravitational potential energy?

A $gm\Delta h$ **B** $\frac{gm}{\Delta h}$ **C** $\frac{g\Delta h}{m}$ **D** $\frac{m\Delta h}{g}$

11 A machine is very efficient.

What does this mean?

A It produces a large amount of power.

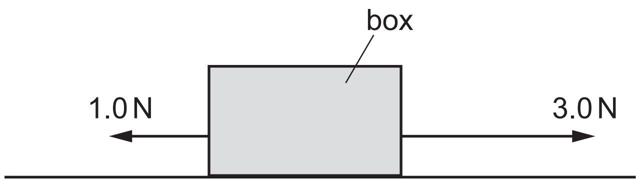
B It uses very little energy.

C It wastes very little energy.

D It works very quickly.

12 A box is pulled along a floor by a force of 3.0 N.

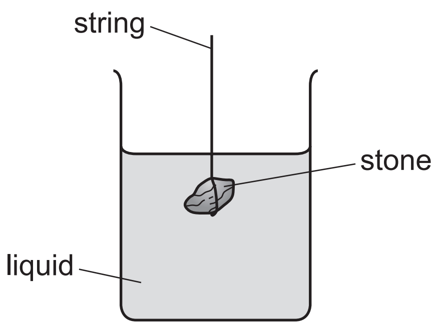
The friction acting on the box is 1.0 N, as shown.



How much kinetic energy does the box gain in moving 2.0 m?

A 2.0 J **B** 4.0 J **C** 6.0 J **D** 8.0 J

13 The diagram shows a stone suspended on a string under the surface of a liquid. The stone experiences a pressure caused by the liquid.



What would increase the pressure on the stone?

A decreasing the surface area of the stone

B increasing the mass of the stone

C lowering the stone deeper into the liquid

D using a liquid with a lower density

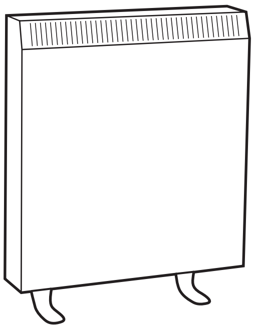
14 Water in a beaker evaporates when it is left on a bench for a period of time.

Increasing the surface area and increasing the temperature of the water each change the rate of evaporation.

Which row is correct?

	increasing the surface area	increasing the temperature
A	rate of evaporation decreases	rate of evaporation decreases
B	rate of evaporation decreases	rate of evaporation increases
C	rate of evaporation increases	rate of evaporation decreases
D	rate of evaporation increases	rate of evaporation increases

15 A night storage heater contains a large block of material that is heated electrically during the night. During the day the block cools down, releasing thermal energy into the room.



Which thermal capacity and which night-time temperature increase will cause the most energy to be stored by the block?

	thermal capacity of block	night-time temperature increase
A	large	large
B	large	small
C	small	large
D	small	small

16 100 g of water at 25 °C is poured into an insulating cup. 50 g of ice at 0 °C is added to the water. The water is stirred until the temperature of the water has fallen to 0 °C.

18 g of ice remains unmelted.

The specific heat capacity of water is 4.2 J / g °C.

Which value does this experiment give for the specific latent heat of fusion of ice?

A 210 J / g **B** 330 J / g **C** 580 J / g **D** 770 J / g

17 Why does a metal rod conduct thermal energy much better than a similar-sized plastic rod?

A The molecules in the plastic are much closer together than the atoms in the metal.

B The molecules in the plastic are much larger than the atoms in the metal.

C The molecules in the plastic are much more tightly held together than the atoms in the metal.

D The molecular structure in the plastic contains no free electrons, but the metal has free electrons.

18 The metal surface of a kettle is hot.

What happens to the cool air outside the kettle when it comes into contact with the hot kettle?

A The density of the air decreases and the air falls.

B The density of the air decreases and the air rises.

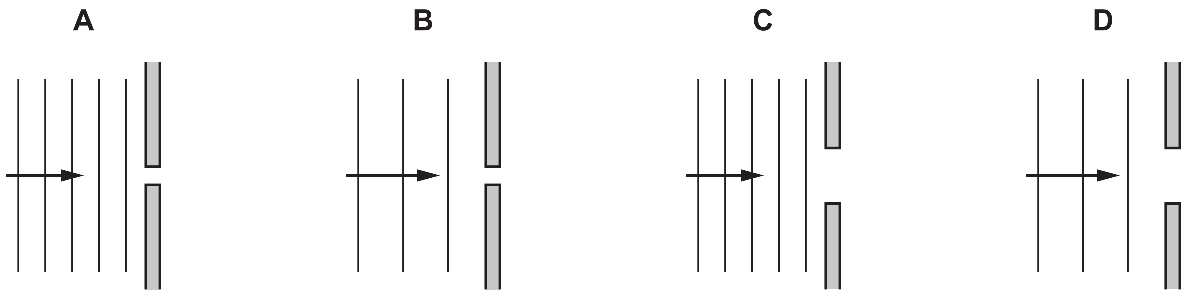
C The density of the air increases and the air falls.

D The density of the air increases and the air rises.

19 When water waves pass through a gap they diffract.

The diagrams show wavefronts approaching a narrow gap.

In which diagram will the diffraction be least?



20 Sound travels through air at a speed of 340 m/s. A source generates sound waves at a frequency of 1.2 kHz.

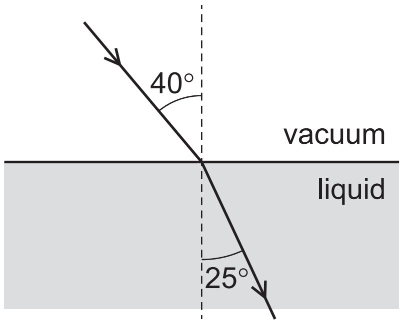
What is the wavelength of the sound waves?

A 0.28 m **B** 3.5 m **C** 280 m **D** 410 m

21 Which conditions are necessary for light to be totally internally reflected?

	the incident light is in	angle of incidence
A	the less dense medium	less than the critical angle
B	the less dense medium	greater than the critical angle
C	the more dense medium	less than the critical angle
D	the more dense medium	greater than the critical angle

22 A beam of light passes through a vacuum and then enters a liquid. The diagram shows the path it takes.



The light travels through the vacuum at a speed of 3.0×10^8 m/s.

What is the speed of light in the liquid?

A 1.9×10^8 m/s

B 2.0×10^8 m/s

C 4.6×10^8 m/s

D 4.8×10^8 m/s

23 An eclipse of the Sun happens when the Moon comes between the Earth and the Sun.

Which statement is correct?

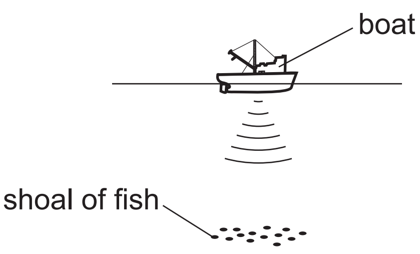
A Infra-red radiation from the Sun disappears before visible light and ultra-violet radiation.

B Ultra-violet radiation from the Sun disappears before visible light and infra-red radiation.

C Visible light from the Sun disappears before ultra-violet radiation and infra-red radiation.

D Infra-red radiation, ultra-violet radiation and visible light from the Sun all disappear at the same moment.

24 A pulse of sound is produced at the bottom of a boat. The sound travels through the water and is reflected from a shoal of fish. The sound reaches the boat again after 1.2 s. The speed of sound in the water is 1500 m/s.



How far below the bottom of the boat is the shoal of fish?

A 450 m **B** 900 m **C** 1800 m **D** 3600 m

25 Which statement about ultrasound is correct?

A It has a higher frequency than audible sound, and it is a longitudinal wave.

B It has a higher frequency than audible sound, and it is a transverse wave.

C It has a lower frequency than audible sound, and it is a longitudinal wave.

D It has a lower frequency than audible sound, and it is a transverse wave.

26 A metal bar is placed inside a current-carrying coil, as shown in diagram 1.

There is a small current in the coil. The bar holds a few nails, as shown in diagram 2.

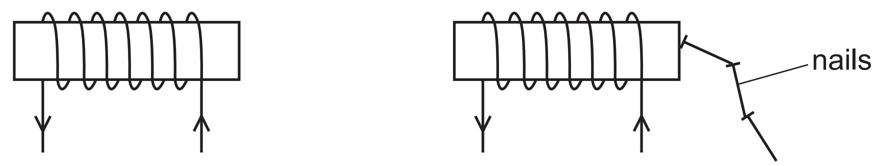


diagram 1 diagram 2

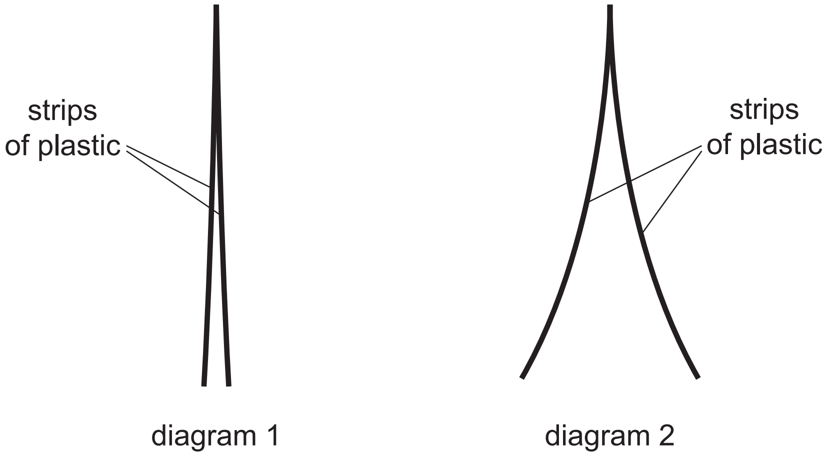
When there is no current in the coil, the nails drop off.

Which row is correct?

	metal from which the bar is made	effect of a larger current in the coil
A	soft iron	it makes no difference
B	soft iron	the bar holds more nails
C	steel	it makes no difference
D	steel	the bar holds more nails

27 Diagram 1 shows two thin, uncharged strips of plastic.

Diagram 2 shows the same strips after they have been rubbed with a dry cloth.



Which row describes the charge on the strips after rubbing, and the force between the strips after rubbing?

	charge on strips	force between strips
A	opposite	attraction
B	opposite	repulsion
C	the same	attraction
D	the same	repulsion

28 A cell has an electromotive force (e.m.f.) of 1.5 V.

What does this statement mean?

A The cell converts 1.0 J of energy when driving 1.5 C of charge round a complete circuit.

B The cell converts 1.5 J of energy when driving 1.0 C of charge round a complete circuit.

C The cell converts 1.5 J of energy per second when driving 1.0 C of charge round a complete circuit.

D The cell converts 1.5 W of power when driving 1.0 C of charge round a complete circuit.

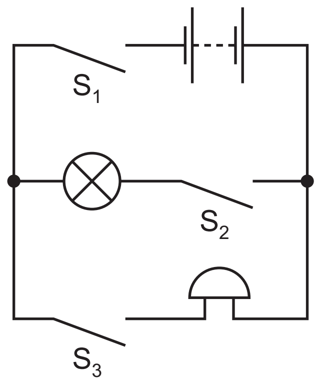
29 Two wires X and Y are made from the same metal and have the same resistance.

Which row identifies a possible pair of values for X and for Y?

	length of X / cm	diameter of X / mm	length of Y / cm	diameter of Y / mm
A	50	0.40	200	0.10
B	50	0.40	200	0.20
C	50	0.40	200	0.80
D	50	0.40	200	1.60

30 The diagram shows a circuit including a lamp, an electric bell and three switches S_1, S_2 and S_3.

The lamp and bell are not faulty.



The bell is ringing but the lamp is not lit.

Which switches are closed?

A S_1 only

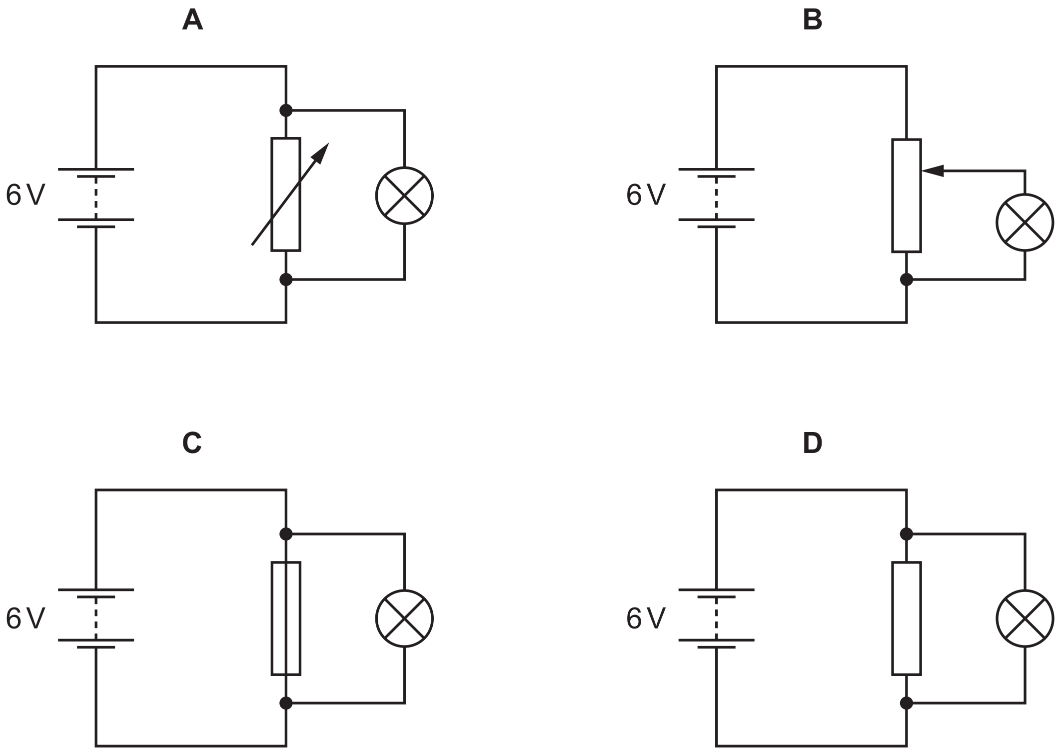
B S_1 and S_2 only

C S_1 and S_3 only

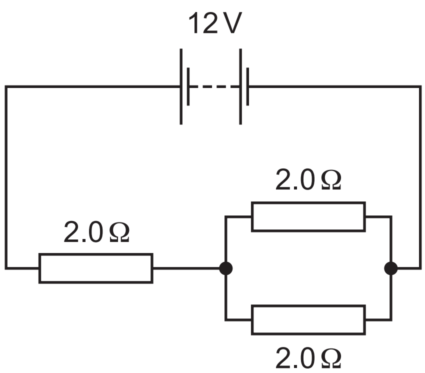
D S_1, S_2 and S_3

31 A lamp is to be connected in a circuit so that the potential difference (p.d.) across it can be varied from 0 to 6 V.

Which circuit would be most suitable?



32 A 12 V battery is connected to a combination of 2.0 Ω resistors as shown.



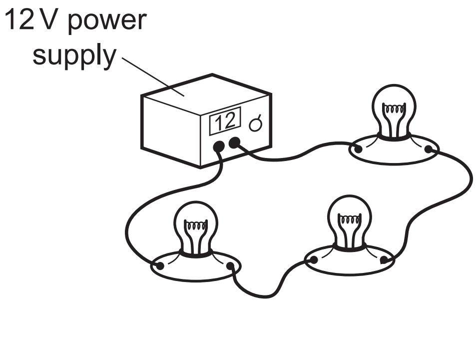
What is the current in the battery?

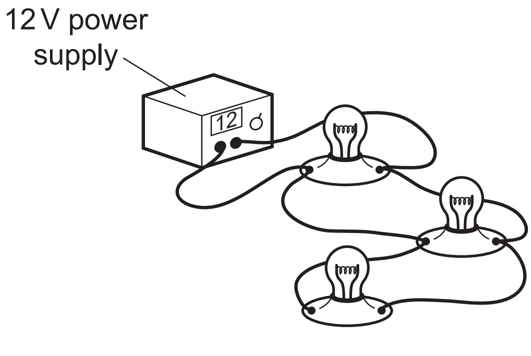
A 1.5 A **B** 2.0 A **C** 4.0 A **D** 6.0 A

33 A student is designing a lighting circuit for a dolls' house. He sets up two different circuits.

Each circuit contains a 12 V power supply and three identical lamps.

Each lamp is designed to operate at normal brightness when connected individually to a 12 V supply.





Which statement is correct?

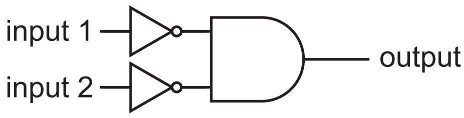
A In circuit 1, each of the lamps is at normal brightness.

B In circuit 1, if one lamp fails, the other lamps remain lit.

C In circuit 2, if one lamp fails, the other lamps remain lit.

D In circuit 2, the current from the power supply is less than in circuit 1.

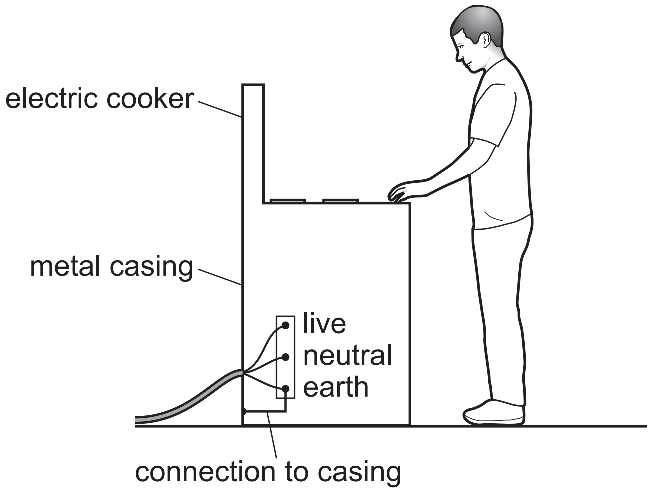
34 The combination of logic gates shown has two inputs and one output.



Which single logic gate is equivalent to this combination?

A AND **B** NOR **C** NOT **D** OR

35 A simple wiring diagram for an electric cooker is shown.



Why is there a wire connecting the metal case of the cooker to earth?

A It improves the efficiency of the cooker.

B It prevents the metal case from becoming too hot when the cooker is left on.

C It reduces the risk of an electric shock if the live wire touches the metal case.

D The electric cooker will not switch on without it.

36 α-particles are directed at a metal foil.

Most of the particles pass through the foil with little change in direction.

A small proportion of the particles are scattered back through large angles.

What does this evidence suggest about the structure of an atom?

A It consists of a charged centre much smaller than the size of the atom and with little of the mass of the atom.

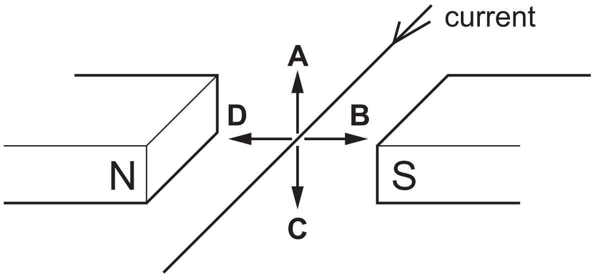
B It consists of a negative charge the size of the atom containing small positive charges scattered through it.

C It consists of a charged centre much smaller than the size of the atom but with most of the mass of the atom.

D It consists of a positive charge the size of the atom containing small negative charges scattered through it.

37 A conductor carrying a current is placed in a magnetic field.

In which direction does the force on the conductor act?



38 What is nuclear fission?

A the merging of two nuclei to create a heavier nucleus

B the process by which electrons are removed from an atom

C the process by which stars generate energy

D the splitting of a nucleus to create two smaller nuclei

39 Which statement about γ-radiation is correct?

A It consists of very small charged particles.

B It is a form of electromagnetic radiation.

C It is less penetrating than β-radiation.

D It is more highly ionising than α-radiation.

40 A radium nucleus with nucleon number 226 decays by emitting an α-particle.

The proton number of radium is 88.

What are the nucleon number and proton number for the nucleus produced by this decay?

	nucleon number	proton number
A	222	86
B	222	87
C	226	86
D	226	87

Cambridge IGCSE

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CANDIDATE NAME	

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PHYSICS **0625/31**

Paper 3 Theory (Core) **May/June 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m/s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **16** printed pages.

DC (LEG/JG) 168104/5

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[Turn over

1 **(a)** A student has a metal object.

(i) The student measures the mass of the object.

State the name of the equipment used to measure the mass.

.... [1]

(ii) The mass of the metal object is 1260 g. The volume of the metal is 150 cm^3.

Calculate the density of the metal. Include the unit.

density = ... [4]

(iii) The mass of the metal object is given in grams. State the mass in kg.

mass = ... kg [1]

(b) A vase is placed on a table. Forces X and Y act on the vase, as shown in Fig. 1.1.

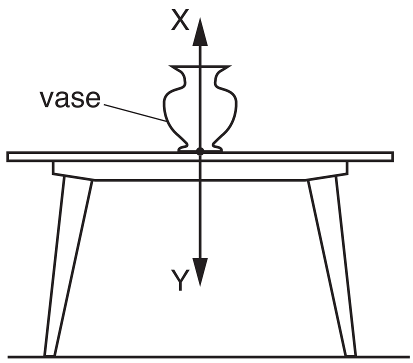

Fig. 1.1

The mass of the vase is 0.25 kg. The vase is not moving.

Calculate the value of force X and the value of force Y.

X ....

Y ....

[4]

[Total: 10]

2 Fig. 2.1 shows a man pushing down on a lever to lift one end of a heavy log.

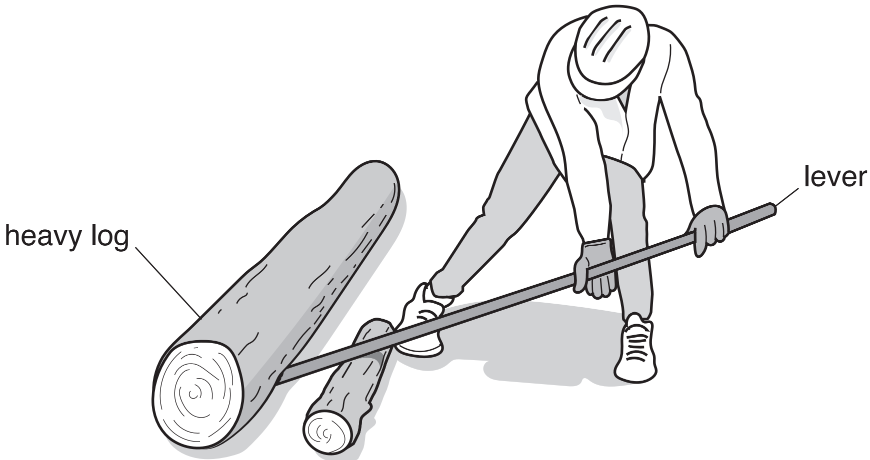

Fig. 2.1

(a) State the term used to describe the turning force exerted by the man.

.... [1]

(b) (i) Fig. 2.2 shows the forces acting as the man starts to lift the heavy log.

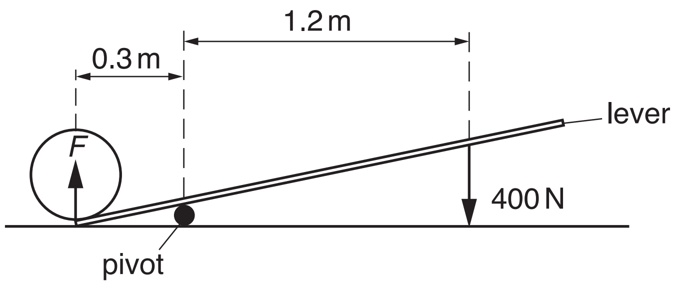

Fig. 2.2

Calculate the force *F*, exerted by the lever on the heavy log.

force *F* = ... N [3]

(ii) Describe how the man can use a smaller force to lift the heavy log.

....

.... [1]

[Total: 5]

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3 A teacher investigates the reaction time of five students. A 0.50 m ruler is held above the hand of a student before being allowed to fall. The arrangement is shown in Fig. 3.1.

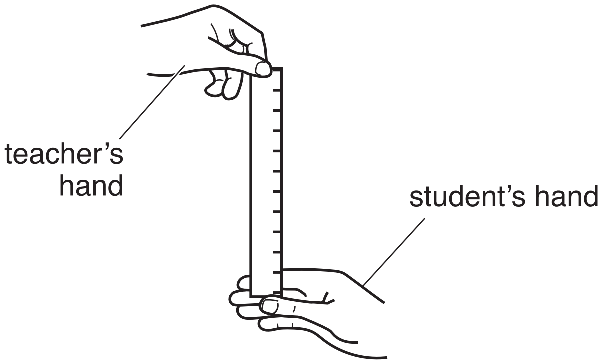

Fig. 3.1

As soon as the ruler falls the student closes their hand, catching the ruler. The further the ruler falls, the greater the reaction time of the student. The results obtained are shown in Fig. 3.2.

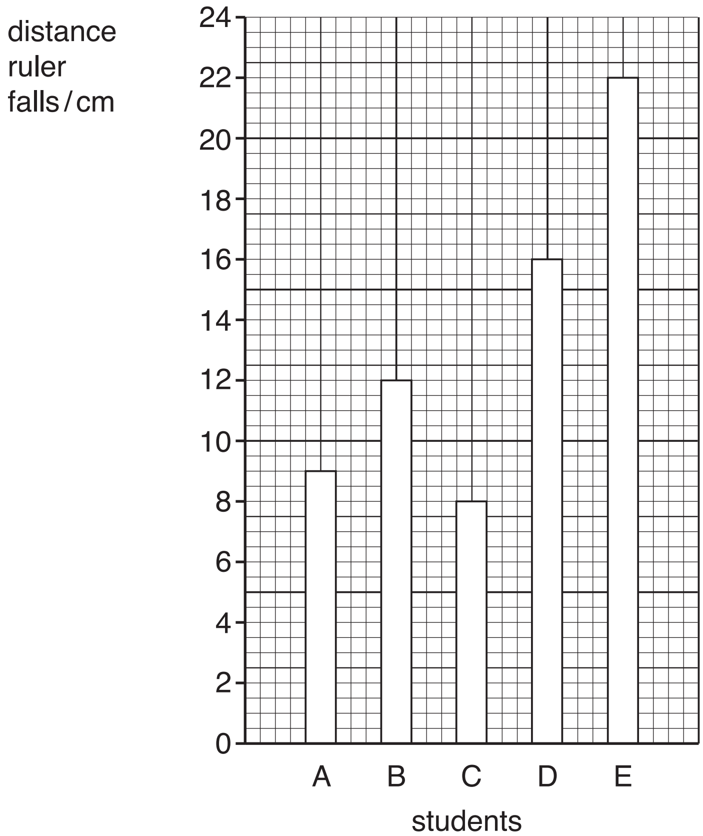

Fig. 3.2

(a) Using the results shown in Fig. 3.2, calculate the average distance that the ruler drops.

average distance = ... cm [2]

(b) List the students in order of their reaction times, with the shortest reaction time at the top of the table. One has been done for you.

order	student
1st	
2nd	
3rd	B
4th	
5th	

[2]

(c) In a similar investigation, a ruler drops a distance of 11.0 cm and has an average speed of 16 cm/s.

Calculate the reaction time.

reaction time = ... s [3]

[Total: 7]

4 Fig. 4.1 shows a pin. Fig. 4.2 shows a person pushing the pin into a wall.

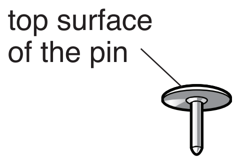

Fig. 4.1

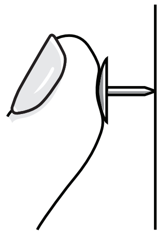

Fig. 4.2

(a) **(i)** The area of the top surface of the pin is 1.8 cm^2. The person applies a force of 50 N.

Calculate the pressure exerted on the top surface of the pin.

pressure = ... N/cm^2 [3]

(ii) The area of the top surface of the pin is 500 times larger than the area of the point. Calculate the value of the pressure exerted by the point on the wall.

pressure = ... N/cm^2 [1]

(b) Fig. 4.3 shows a simple device for measuring atmospheric pressure.

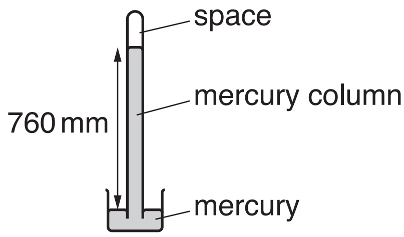

Fig. 4.3

(i) State the name given to the device shown in Fig. 4.3.

.... [1]

(ii) State what, if anything, is in the space at the top of the tube, above the mercury column.

.... [1]

(iii) Fig. 4.3 shows normal atmospheric pressure. Suggest a possible value for the height of the mercury column when atmospheric pressure decreases. Include the unit.

reading = ... [1]

[Total: 7]

5 Coal is a non-renewable source of energy.

(a) **(i)** Explain what is meant by the term *non-renewable*.

....

.... [1]

(ii) There are other non-renewable sources of energy.

Place a tick in the box by each non-renewable source of energy.

☐ nuclear

☐ oil

☐ solar

☐ wave

☐ wind

[1]

(b) State **two** advantages and **two** disadvantages of using natural gas as an energy source.

advantages

1. ....

....

2. ....

....

disadvantages

1. ....

....

2. ....

....

[4]

[Total: 6]

6 A liquid-in-glass thermometer is placed in some ice made from pure water. The ice is heated. It changes to water and then to steam.

The graph in Fig. 6.1 shows how the temperature varies with time. The values of temperature are missing from the y-axis.

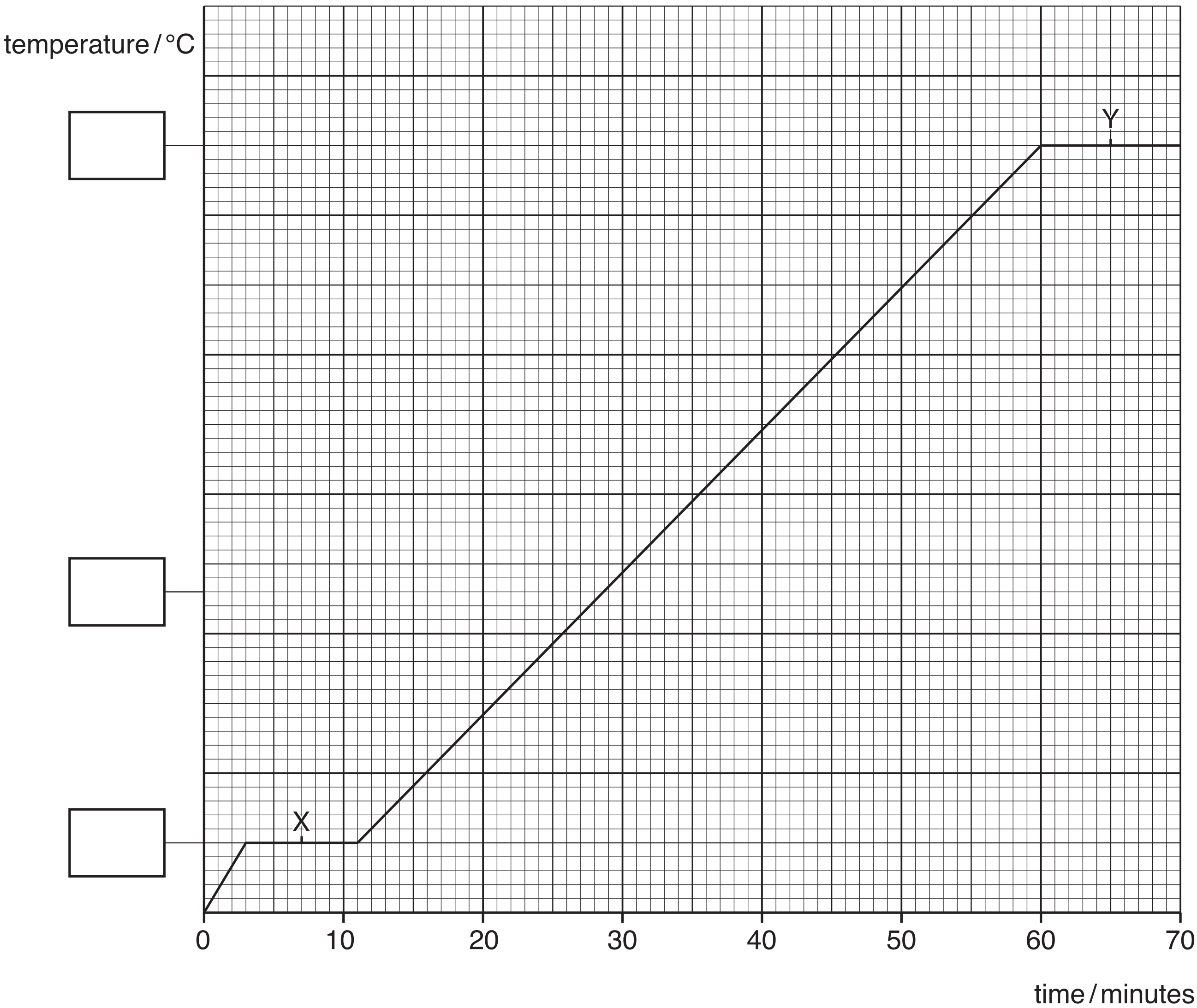

Fig. 6.1

(a) On Fig. 6.1, suggest a value for the temperature at each of the three points marked on the y-axis.

Write a value in each of the boxes. [2]

(b) In both section X and section Y the line on the graph is horizontal.

For each section, state the name for the process taking place and explain what is happening to the molecules.

(i) section X

name ....

explanation ....

....

....

....
[2]

(ii) section Y

name ....

explanation ....

....

....

....
[2]

[Total: 6]

7 **(a)** Fig. 7.1 shows some devices that each use one type of electromagnetic radiation.

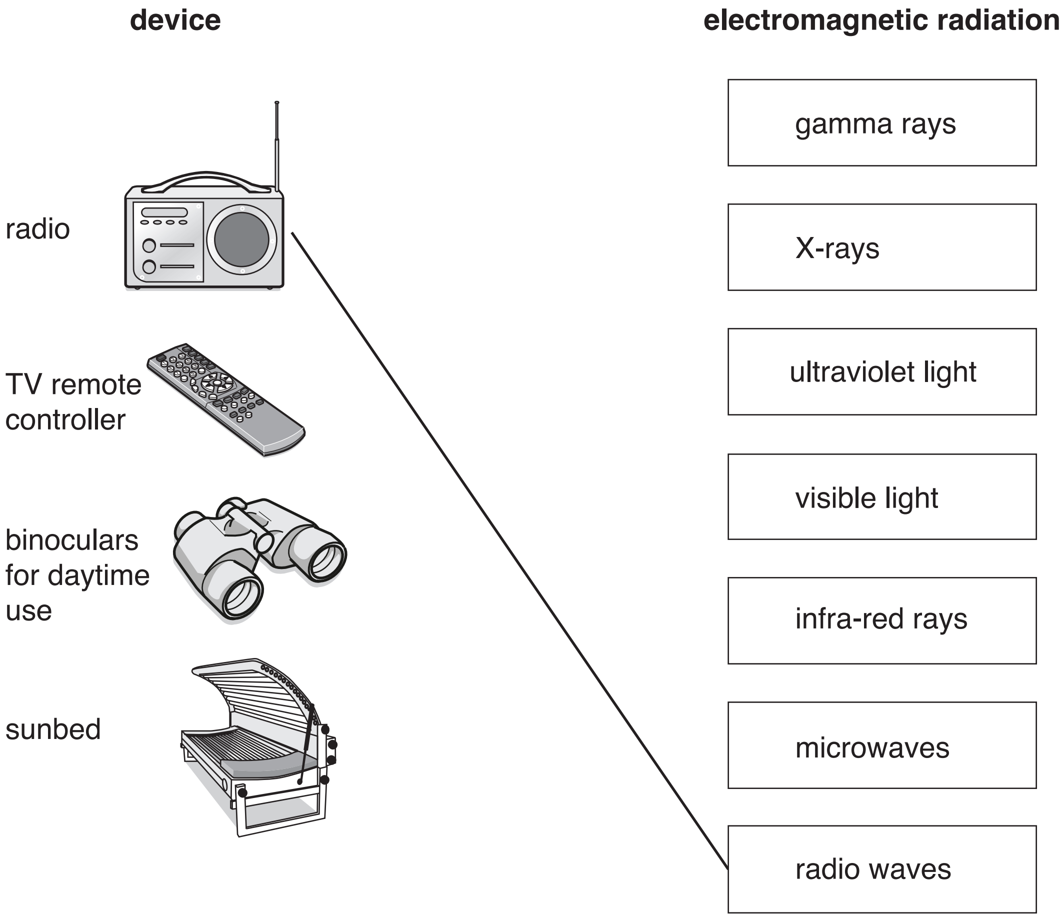

Fig. 7.1

Draw one line from each device to the correct type of electromagnetic radiation. One has been done for you. [3]

(b) **(i)** State the name of one type of radiation that has a longer wavelength than visible light.

.... [1]

(ii) Complete the sentence about electromagnetic radiation. Use a word from the box.

amplitude	frequency	speed	wavelength

All types of electromagnetic radiation travel through a vacuum with the same

.... [1]

[Total: 5]

8 **(a)** A student rubs a plastic rod with a dry cloth, as shown in Fig. 8.1. The rod becomes negatively charged.

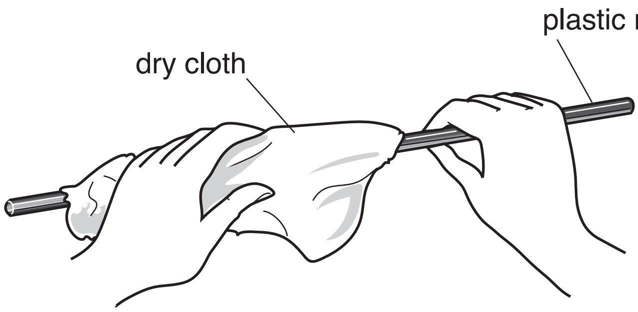

Fig. 8.1

(i) Use words from the box to complete the sentence.

air	cloth	electrons	hand	neutrons	protons

The rod becomes negatively charged because .... move from the

.... to the rod.

[2]

(ii) The student moves the rod close to a suspended, charged rod. The two rods repel each other.

State the type of charge on the suspended rod.

.... [1]

(iii) Explain your answer to **(a)(ii)**.

....

.... [1]

(b) A device has a metal case. Any charge on the case must be able to move to earth.

(i) Draw **one** ring around a material that is suitable for the connection to earth.

copper glass plastic rubber [1]

(ii) Explain your answer to **(b)(i)**.

....

.... [1]

[Total: 6]

9 A student makes a circuit to switch on a 6.0 V lamp from two different switches X and Y.

Fig. 9.1 shows the circuit.

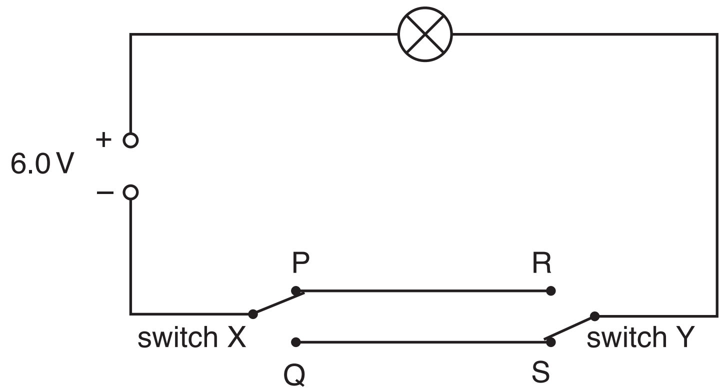

Fig. 9.1

(a) Switch X is in position P. State the position of switch Y for the lamp to be lit.

.... [1]

(b) The current in the lamp is 0.50 A when the potential difference (p.d.) across the lamp is 6.0 V. Calculate the resistance of the lamp. Include the unit.

resistance = ... [4]

(c) The student connects another 6.0 V lamp in parallel with the first lamp, as shown in Fig. 9.2.

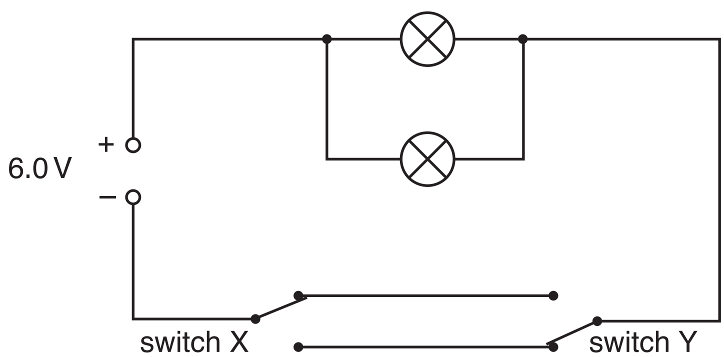

Fig. 9.2

Give **two** advantages of connecting the lamps in parallel.

....

....

.... [2]

[Total: 7]

10 **(a)** A teacher demonstrates the action of a device. Fig. 10.1 shows the symbol for the device.

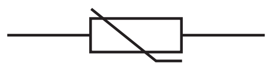

Fig. 10.1

State the name of this device.

.... [1]

(b) Fig. 10.2 shows another device being used in a circuit. The circuit contains a 6.0 V lamp.

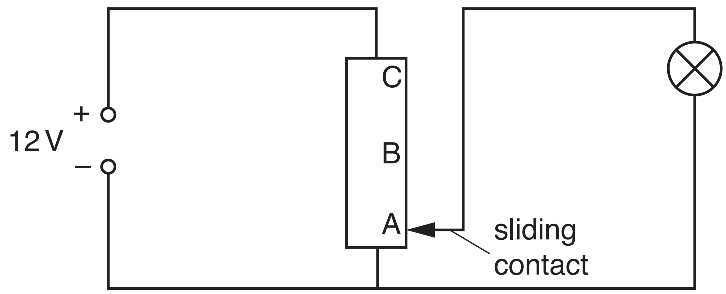

Fig. 10.2

(i) The sliding contact of this device is at position A, as shown in Fig. 10.2.

Describe and explain the brightness of the lamp when the sliding contact is in this position.

brightness of lamp ....

explanation ....
[2]

(ii) The teacher moves the sliding contact from position A to position B. Describe and explain what happens to the brightness of the lamp.

....

.... [2]

(iii) The teacher moves the sliding contact from position B to position C. Suggest what happens to the lamp.

.... [1]

[Total: 6]

11 **(a)** Fig. 11.1 shows in each of the diagrams a current-carrying conductor and a magnetic field pattern.

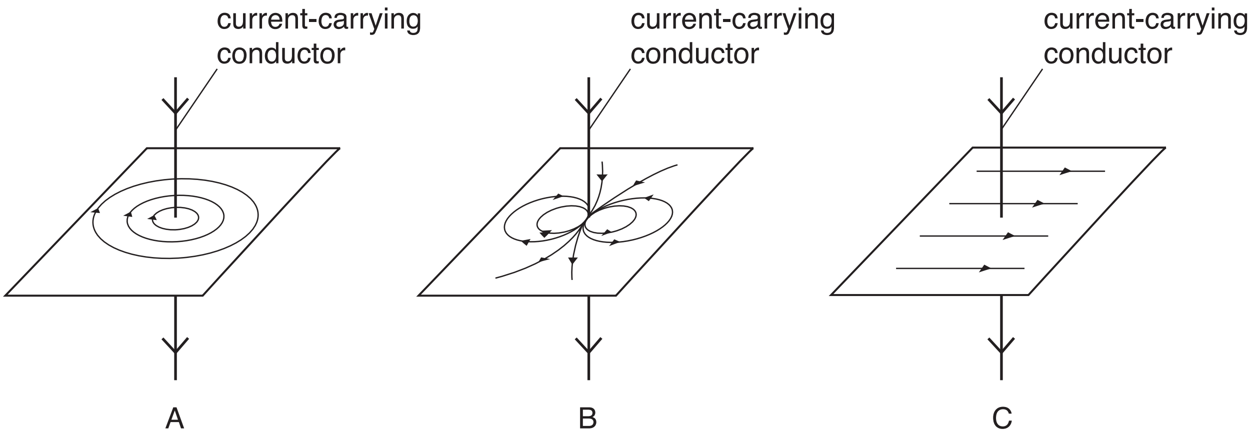

Fig. 11.1

State the diagram which correctly shows the magnetic field around a current-carrying conductor.

.... [1]

(b) Fig. 11.2 shows three pieces of equipment.

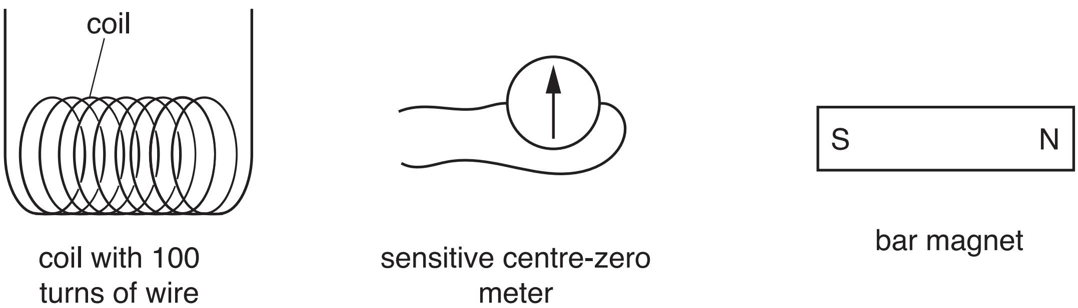

Fig. 11.2

(i) Describe how to generate and detect an electromotive force (e.m.f.) using the equipment in Fig. 11.2. You may draw a diagram.

....

....

....

.... [3]

(ii) Describe **two** changes that will generate a larger e.m.f. using similar equipment to that in Fig. 11.2.

....

....

....

.... [2]

(c) A student connects a lamp and centre-zero galvanometer in series with a generator, as shown in Fig. 11.3.

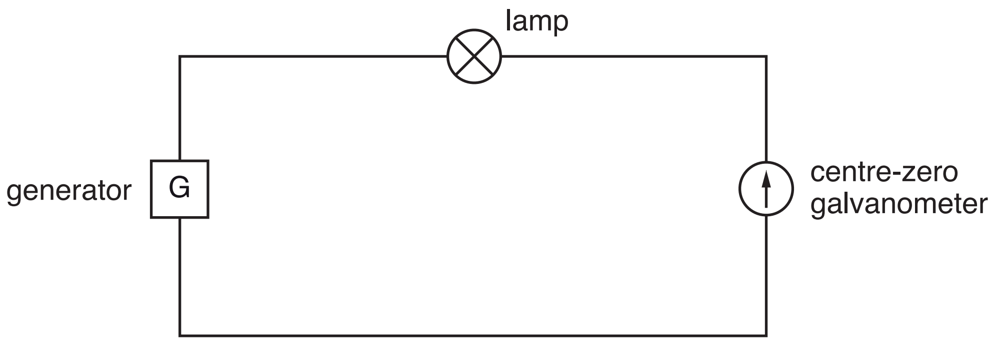

Fig. 11.3

The student observes the galvanometer needle moving from side-to-side repeatedly.

Explain why the needle moves in this way.

....

....

.... [1]

[Total: 7]

12 **(a)** Use words from the box to complete the sentences about the charges in an atom. Words can be used once, more than once or not at all.

negative	neutral	positive

The charge on the nucleus of an atom is ....

The charge on a proton is ....

The charge on electrons orbiting the nucleus is ....

[3]

(b) A nucleus of radium-226 has the nuclide notation shown.

$$^{226}_{88}\mathrm{Ra}$$

(i) Determine the number of protons in a nucleus of radium-226.

.... [1]

(ii) Determine the number of neutrons in a nucleus of radium-226.

.... [1]

(iii) Radium has another isotope, radium-223.

Write the nuclide notation for radium-223 in the space.

[1]

(c) Radium-226 has a half-life of 1600 years.

A sample contains 8.0 mg of radium-226.

Calculate the time for the sample to decay until only 1.0 mg of radium-226 remains.

time = ... years [2]

[Total: 8]

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CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

0781809913

PHYSICS **0625/32**

Paper 3 Theory (Core) **May/June 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
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Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
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At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages.

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[Turn over

1 A student moves a model car along a bench.

Fig. 1.1 is the speed-time graph for the motion of the model car.

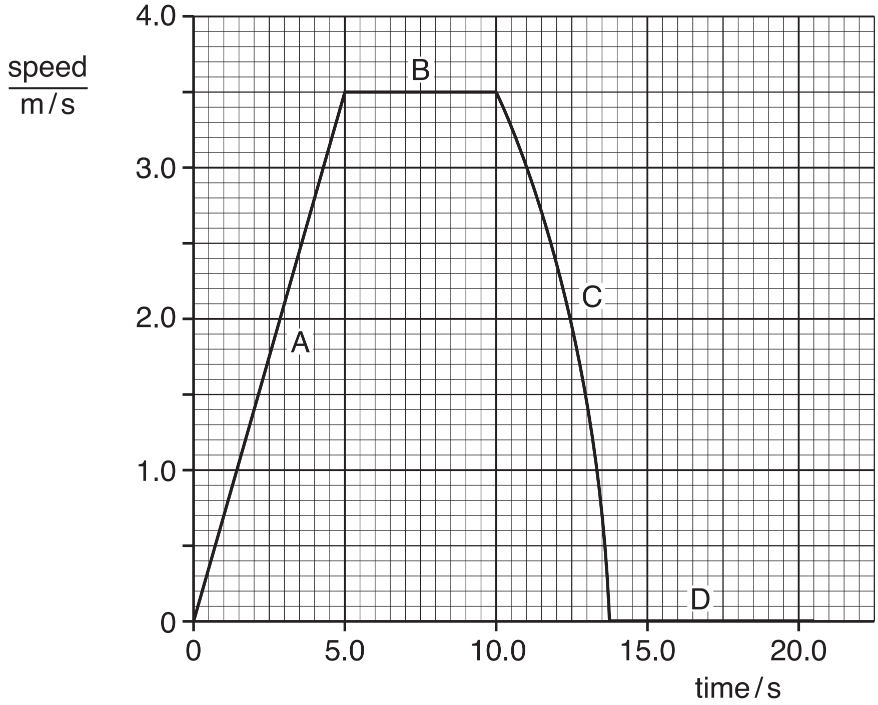

Fig. 1.1

(a) Describe the motion of the car in each of the sections A, B, C and D.

A ....

B ....

C ....

D ....

[4]

(b) Determine the distance moved by the model car in the first five seconds.

distance = ... m [3]

[Total: 7]

2 A bottle contains some oil.

(a) The mass of the oil and the bottle is 678 g. The mass of the empty bottle is 318 g.

Calculate the mass of the oil.

mass = ... g [1]

(b) Some of the oil from **(a)** is poured into measuring cylinder A. The rest of the oil is poured into measuring cylinder B, as shown in Fig. 2.1.

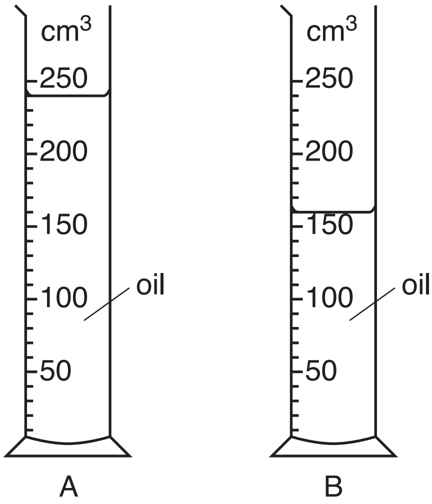

Fig. 2.1

(i) State the volume of oil in measuring cylinder B, as shown in Fig. 2.1.

volume = ... cm^3 [1]

(ii) Calculate the total volume of oil.

volume = ... cm^3 [1]

(iii) Calculate the density of the oil.

density = ... g/cm^3 [3]

[Total: 6]

3 Fig. 3.1 shows a simple pendulum swinging backwards and forwards between P and Q. One complete oscillation of the pendulum is when the bob swings from P to Q and then back to P.

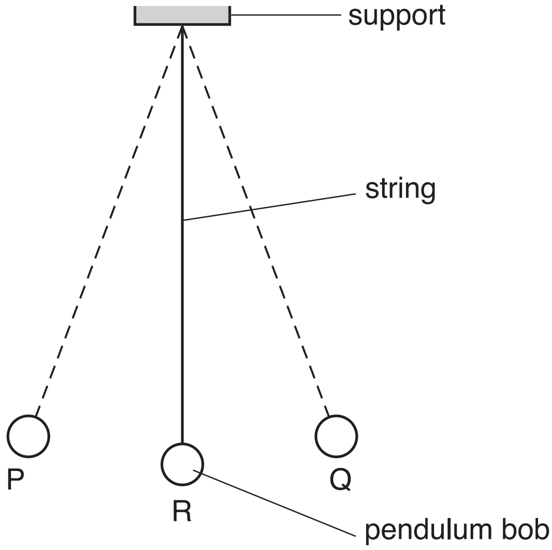

Fig. 3.1

(a) A student starts two stopwatches at the same time while the pendulum bob is swinging.

The student stops one stopwatch when the pendulum bob is at P. He stops the other stopwatch when the pendulum bob next is at Q.

Fig. 3.2 shows the readings on the stopwatches.

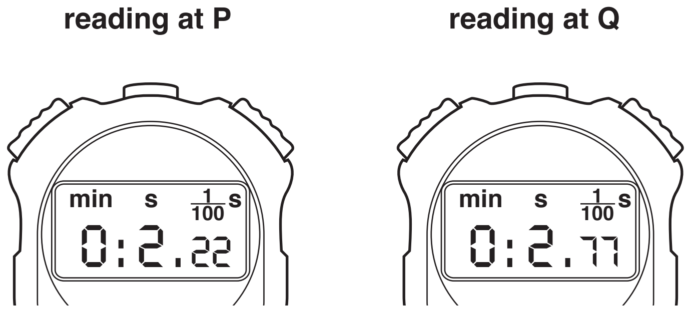

Fig. 3.2

(i) Use readings from Fig. 3.2 to determine the time for one complete oscillation of the pendulum.

time = ... s [2]

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(ii) The method described in **(a)** does not give an accurate value for one complete oscillation of the pendulum.

Describe how the student could obtain an accurate value for one complete oscillation of the pendulum.

....

....

....

....

....

.... [4]

(b) As the pendulum bob moves from R to Q it gains 0.4 J of gravitational potential energy.

Air resistance can be ignored.

State the value of kinetic energy of the pendulum bob at

1. R .... J

2. Q .... J [2]

[Total: 8]

4 A student places a balloon filled with air next to a window, as shown in Fig. 4.1. The Sun warms the air in the balloon.

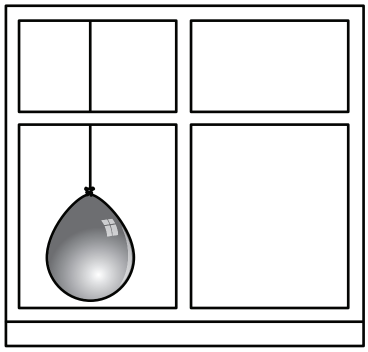


Fig. 4.1

(a) **(i)** Suggest what happens to the balloon as the air in it becomes hotter than the surroundings.

.... [1]

(ii) Use ideas about molecules to explain your answer to **(a)(i)**.

....

....

....

....

.... [3]

(b) The student uses a pump to inflate another balloon.

Fig. 4.2 shows the student inflating a balloon.

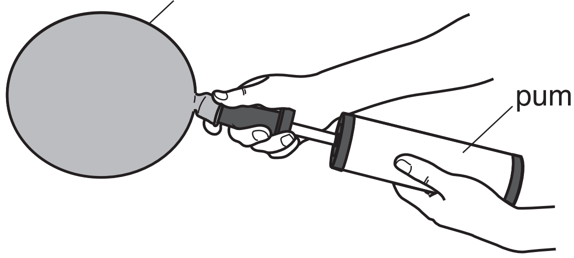


Fig. 4.2

The student applies a force of 30 N to the pump handle. The force acts on an area of $12\,\text{cm}^2$.

Calculate the pressure on the pump handle. Include the unit.

pressure = ... [4]

[Total: 8]

5 **(a)** A nuclear power station generates electrical energy.

The main stages in the operation of the nuclear power station are listed.
They are **not** in the correct order.

E Electrical energy is produced.

F The fission of uranium nuclei releases thermal energy.

G A turbine drives a generator.

H Thermal energy heats water to produce steam.

Complete the flow chart to describe how a nuclear power station works.

In each empty box, insert the letter for the correct statement.

The nuclear power station uses uranium as a fuel.

↓

$\square$

↓

$\square$

↓

The steam drives a turbine.

$\square$

↓

$\square$

↓

Electrical energy is transmitted.

[2]

(b) Electrical energy from the power station is used to power two different lamps. Fig. 5.1 shows how the light outputs from two types of lamp vary with the power input.

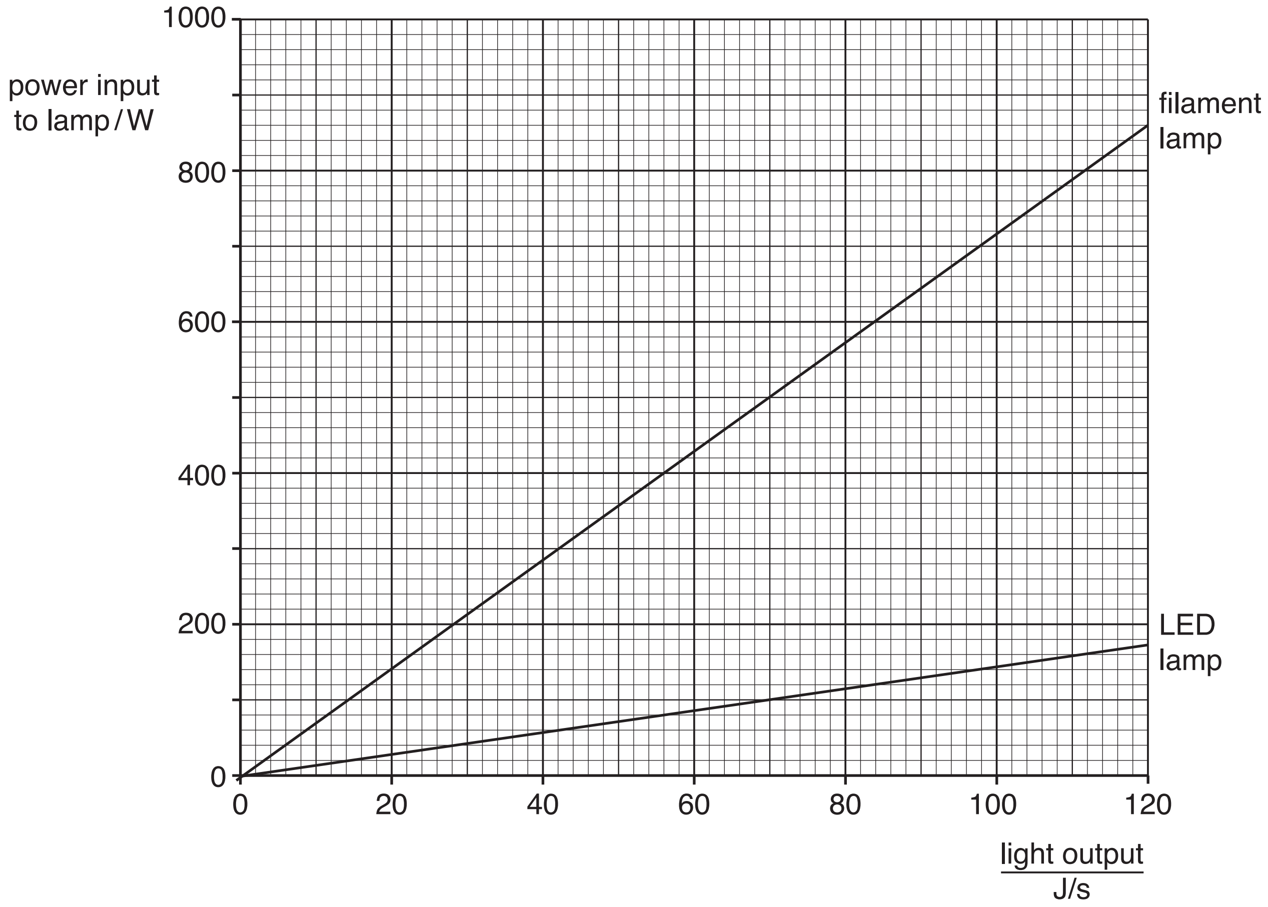


Fig. 5.1

(i) An experiment requires a lamp with a light output of 70 J / s.

For the LED lamp and for the filament lamp determine the input power required to give a light output of 70 J / s. Use information from Fig. 5.1.

1. For the LED lamp, input power = ... W

2. For the filament lamp, input power = ... W

[2]

(ii) Explain why using LED lamps is better for the environment. Use information from Fig. 5.1 in your answer.

....

....

....

.... [2]

[Total: 6]

6 Fig. 6.1 shows a ray of light that is reflected by a mirror.

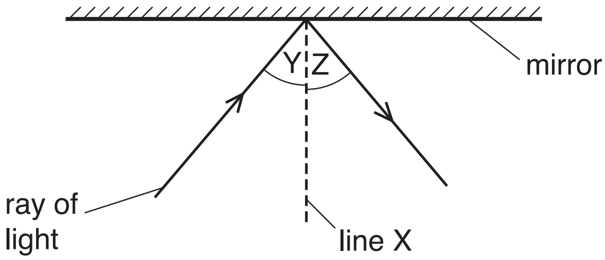


Fig. 6.1

(a) **(i)** State the name of line X shown on Fig. 6.1.

.... [1]

(ii) State the name of angle Y shown on Fig. 6.1.

.... [1]

(iii) A student moves the ray of light and doubles the size of angle Y. State the effect on angle Z.

.... [1]

(b) Fig. 6.2 shows a converging lens used to form an image I of an object O.

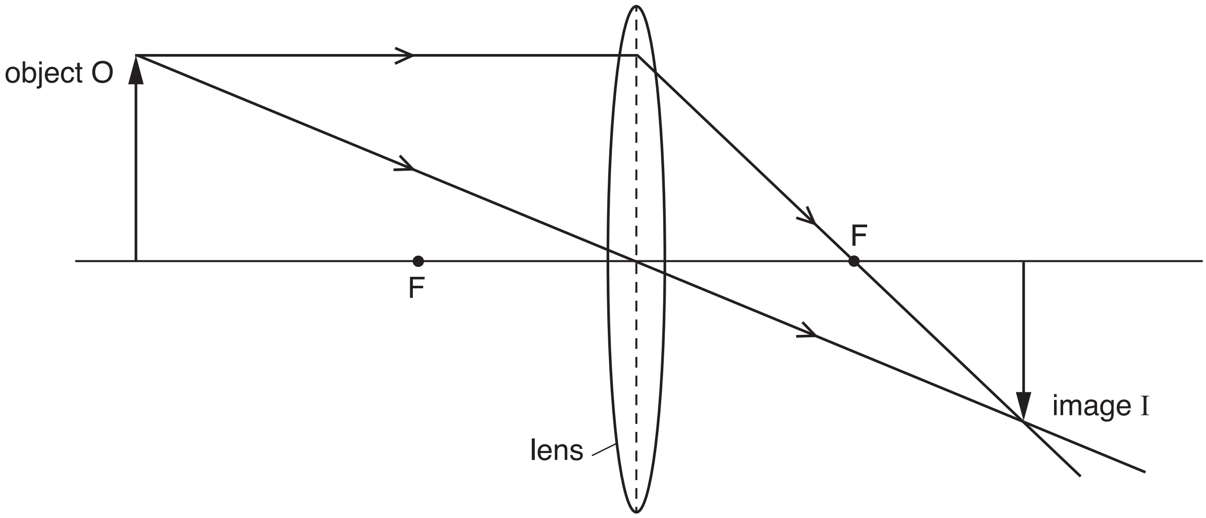


Fig. 6.2

(i) State the name of the points labelled F on Fig. 6.2.

.... [1]

(ii) Describe the nature of the image I.

....

....

.... [2]

[Total: 6]

7 **(a)** Solid, liquid and gas are three states of matter.

For each state of matter describe the arrangement of the molecules.

solid ....

....

liquid ....

....

gas ....

....
[3]

(b) A liquid is spilt on a bench in a warm laboratory. After a short time, the liquid disappears.

(i) State the name of the process that causes the liquid to disappear.

.... [1]

(ii) The process in **(b)(i)** causes a cooling effect.

Explain why the cooling effect occurs. Use your ideas about molecules.

....

....

....

....

.... [3]

[Total: 7]

8 **(a)** Fig. 8.1 shows the magnetic field pattern around a bar magnet.

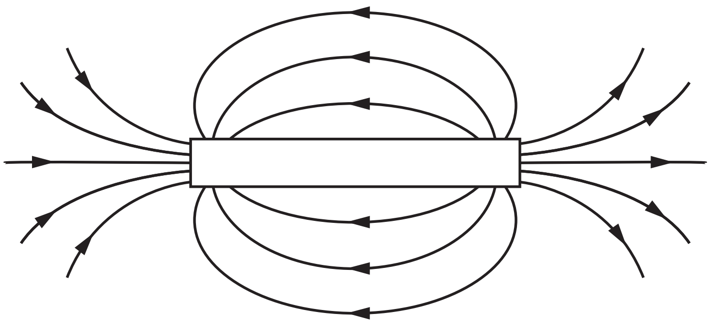


Fig. 8.1

(i) On Fig. 8.1, mark the North and South poles of the magnet. Use the letter N for the North pole and S for the South pole. [1]

(ii) A small bar of unmagnetised iron is placed next to a bar magnet, as shown in Fig. 8.2.

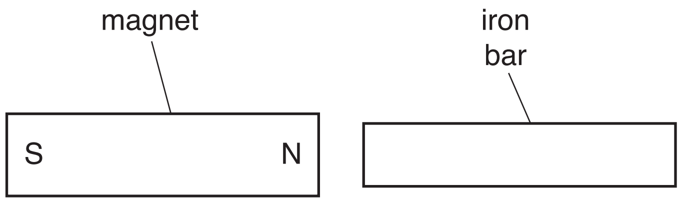


Fig. 8.2

The iron bar moves towards the magnet.

Explain why the iron bar moves.

....

....

.... [2]

(b) Fig. 8.3 shows a coil of wire wrapped around an iron core. A student uses these to make an electromagnet.

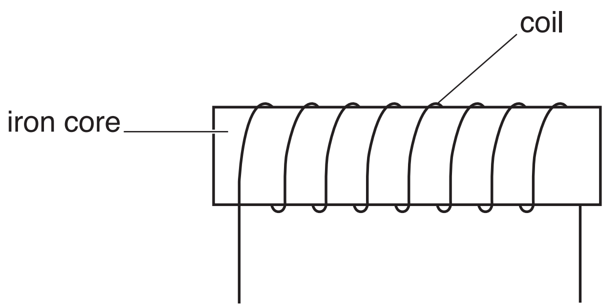


Fig. 8.3

(i) Complete the diagram in Fig. 8.3 to show how it could be used to make an electromagnet. [1]

(ii) State **one** advantage of an electromagnet compared to a permanent magnet.

.... [1]

[Total: 5]

9 Fig. 9.1 shows a plastic ruler.

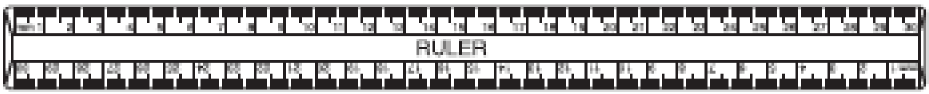


Fig. 9.1

(a) Suggest and explain how a student could give a positive charge to a plastic ruler.

....

....

.... [3]

(b) A plastic ruler is given a positive charge. A sphere hangs from an insulating thread.

A student holds the ruler near the sphere, as shown in Fig. 9.2. The ruler repels the sphere.

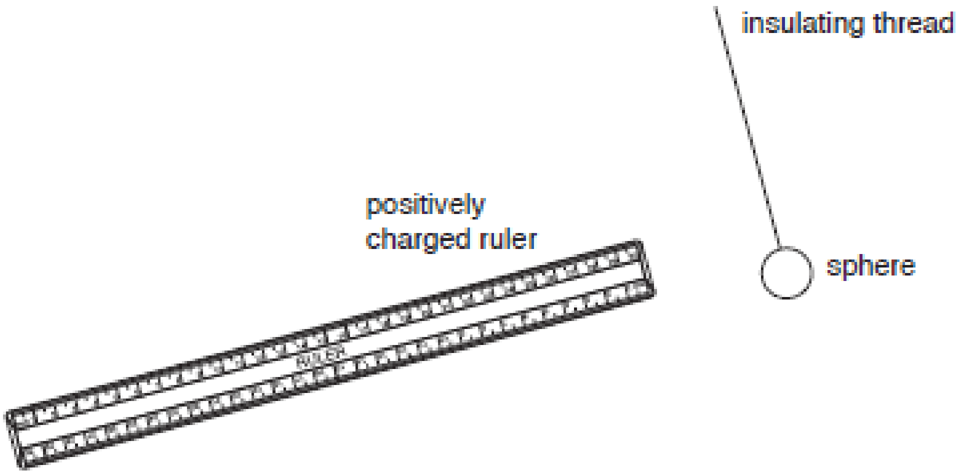


Fig. 9.2

(i) State what charge, if any, the sphere carries.

.... [1]

(ii) Explain your answer to (b)(i).

.... [1]

[Total: 5]

10 Fig. 10.1 shows an incomplete circuit diagram for two identical lamps arranged in parallel. The circuit contains an ammeter and a voltmeter.

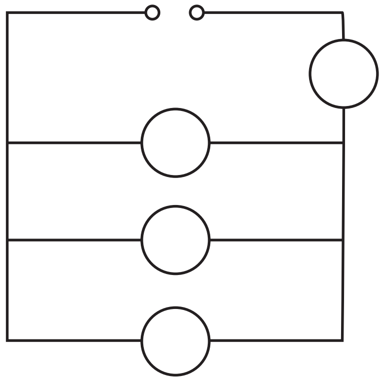


Fig. 10.1

(a) On Fig. 10.1, complete the symbols for two lamps, an ammeter and a voltmeter positioned correctly. [5]

(b) One of the lamps breaks.

State the effect, if any, this has on the brightness of the other lamp. Explain your answer.

effect ....

explanation ....

....
[2]

[Total: 7]

11 Fig. 11.1 shows a transformer that can provide two different output voltages from a 240 volt mains a.c. supply.

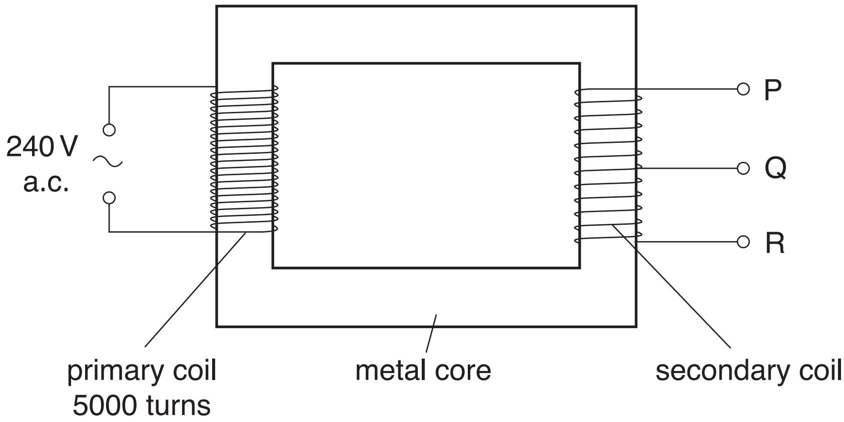


Fig. 11.1

In the transformer, the primary coil has 5000 turns.

The secondary coil has 250 turns between P and R.

(a) State the term used to describe this type of transformer.

.... [1]

(b) The primary and secondary coils are mounted on a metal core.

State the metal used for the core and explain why it is suitable.

metal ....

explanation ....

....
[2]

(c) **(i)** The secondary coil has 125 turns between P and Q. Calculate the output voltage between connections P and Q.

voltage = ... V [3]

(ii) Compare the output voltage between P and Q with the output voltage between P and R.

Explain your answer.

comparison ....

explanation ....
[2]

[Total: 8]

12 **(a)** Radioactive emission is a random process.

Explain the meaning of the word *random*.

....

.... [1]

(b) The table compares three types of radioactive emission.

emission	relative ionising ability	relative penetrating ability
alpha		
beta		
gamma		

Table 12.1

Complete the table by choosing words from the box.

high	low	medium

[3]

(c) A radioactive substance decays by emitting an α-particle.

An α-particle can be represented as ${}^{4}_{2}\alpha$.

Draw a labelled diagram showing the composition of an α-particle.

[3]

[Total: 7]

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

4410060547

PHYSICS **0625/33**

Paper 3 Theory (Core) **May/June 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

DC (LK/CT) 168102/6

Cambridge Assessment International Education

[Turn over

1 Fig. 1.1 shows three metal blocks. Each block has the same mass.

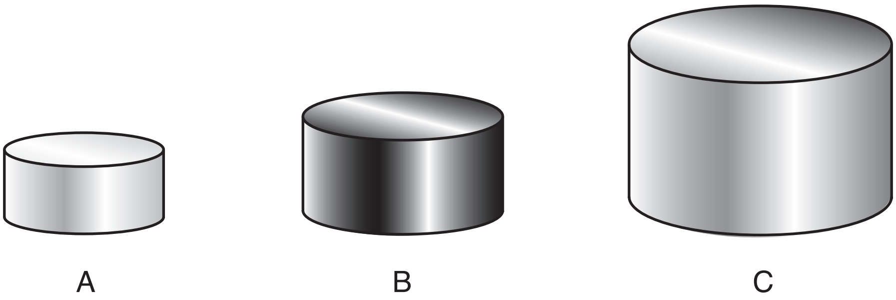


Fig. 1.1

The volumes of the blocks are different.

Each block is made of a different metal. The table gives the density of each metal.

name of metal	density (g / cm^3)
aluminium	2.83
iron	6.95
lead	11.3

(a) Use the data from the table to identify the metal used to make each block.

A ....

B ....

C .... [1]

(b) Another metal block is made of brass. Its mass is 200 g.

The density of brass is 8.4 g / cm^3.

Calculate the volume of the brass block.

volume = ... cm^3 [3]

(c) Describe a method for determining the volume of a small, dense, irregularly-shaped object.

You may draw a labelled diagram.

....

....

....

....

....

.... [4]

[Total: 8]

2 Fig. 2.1 shows a distance-time graph for a man walking from home to a café. At the café the man stops for a drink. On the return journey from the café, the man stops to rest.

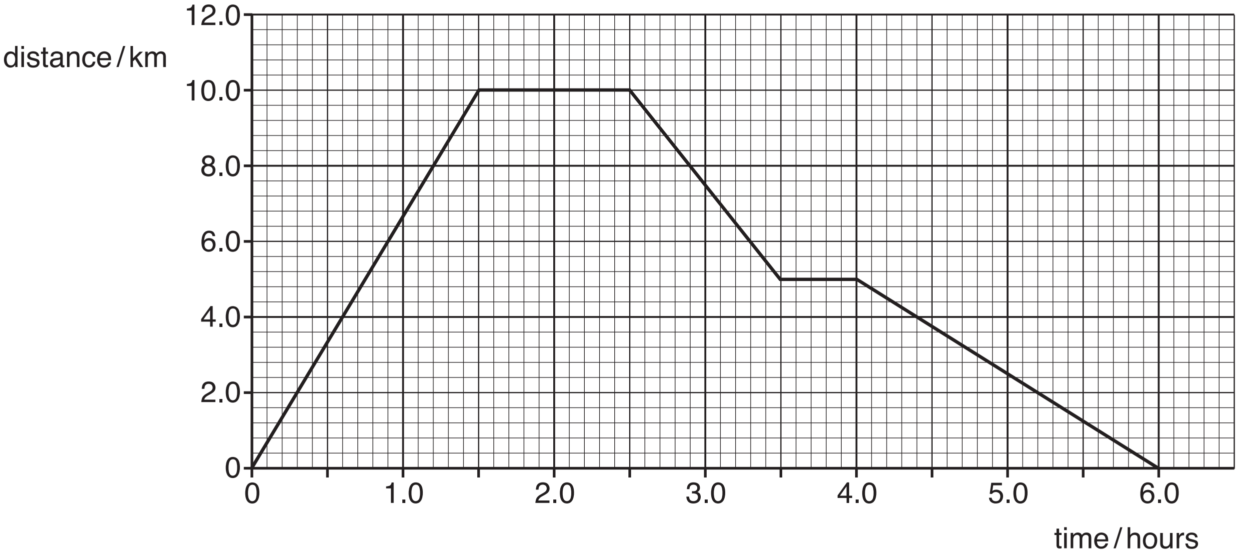


Fig. 2.1

(a) Using Fig. 2.1, determine

(i) the distance from the man's home to the café.

distance = ... km [1]

(ii) the time taken to walk to the café.

time = ... hours [1]

(iii) the speed, in km / hour, of the man as he walks to the café.

speed = ... km / hour [3]

(b) On the return journey from the café, the man stopped to rest.

(i) The man left home at 13:00.

Determine the time when the man began his rest.

time when rest began .... [1]

(ii) For how long did the man rest on the return journey? State the time in minutes.

time = ... minutes [1]

(iii) Describe, in words, how the graph in Fig. 2.1 shows that the man travelled at a slower speed on the return journey after resting.

....

.... [1]

[Total: 8]

3 Fig. 3.1 shows a wheelbarrow and Fig. 3.2 shows the dimensions of its wheel.

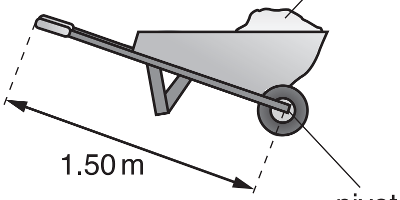


Fig. 3.1

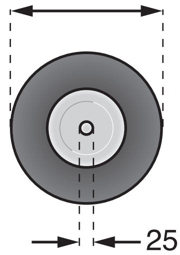


Fig. 3.2

(a) Complete the table to show the diameter of the wheel and axle in metres.

	measurement	measurement in metres
diameter of wheel	35 cm	
diameter of axle	25 mm	

[2]

(b) The mass of the wheelbarrow is 20 kg. The mass of the load in the wheelbarrow is 30 kg.

Calculate the total weight of the wheelbarrow and its load.

weight of wheelbarrow and load = ... N [3]

(c) A man lifts the handle of the wheelbarrow. He applies a force of 140 N, as shown in Fig. 3.3.

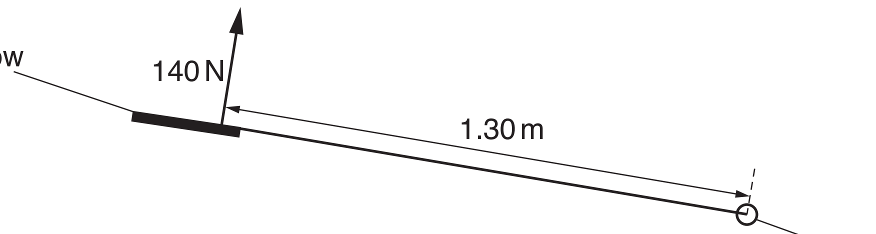


Fig. 3.3

Calculate the moment of the force about the pivot. Include the unit.

moment = ... [4]

[Total: 9]

4 Fig. 4.1 shows a flat-top cone and a sphere, resting on a table.

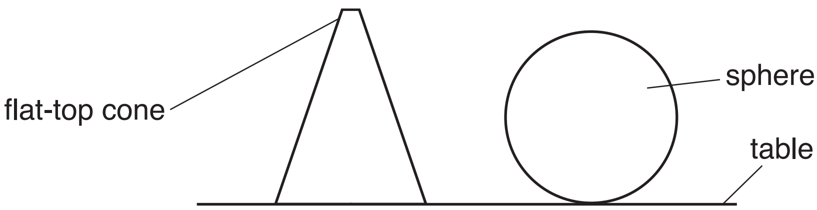


Fig. 4.1

(a) On Fig. 4.1, mark a cross on each object to show the position of the centre of mass of each object. [2]

(b) The cone is inverted and balanced on its top, as shown in Fig. 4.2.

Fig. 4.2

Explain why the flat-top cone is less stable when it is inverted.

....

....

....

....

.... [3]

[Total: 5]

5 Fig. 5.1 represents part of a roller coaster track.

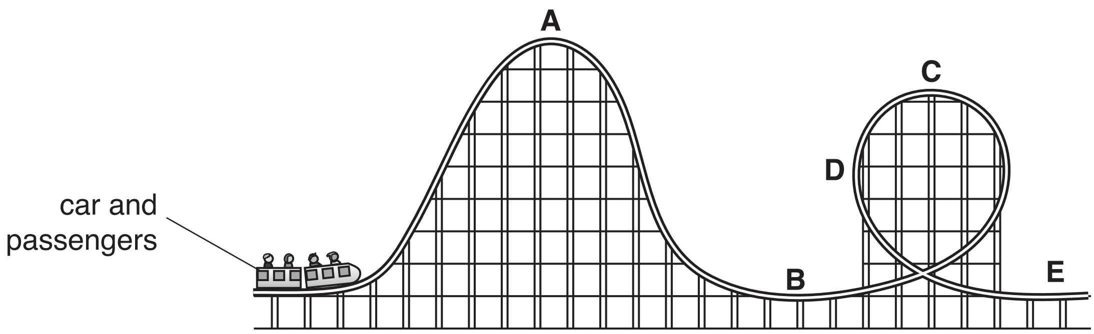


Fig. 5.1

(a) The car is lifted to point **A** and then released. It continues along the track.

Complete the sentences about the energy of the car using letters from Fig. 5.1.

The car has maximum gravitational potential energy at point ....

The car has maximum kinetic energy at point ....

[2]

(b) **(i)** State the principle of conservation of energy.

....

.... [2]

(ii) A machine lifts the car to point **A**. The machine is **not** 100% efficient.

Suggest why the machine is not 100% efficient. Use your ideas about energy.

....

.... [1]

[Total: 5]

6 Fig. 6.1 shows a metal pan containing water being heated by an electrical heater.

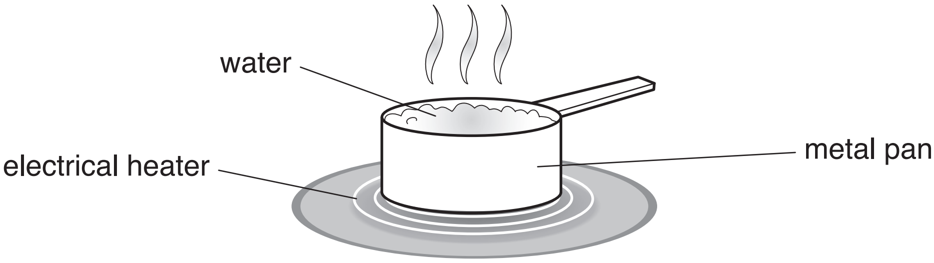


Fig. 6.1

(a) Complete the sentences to describe how thermal energy is transferred.

(i) Thermal energy is transferred from the electrical heater to the bottom of the pan by .... [1]

(ii) Thermal energy is transferred through the bottom of the metal pan by .... [1]

(iii) Thermal energy is transferred throughout the water by .... [1]

(b) A student carries out an experiment to determine which surface is the better emitter of thermal energy. She uses two similar metal containers. One of the containers has a dull black surface. The other has a shiny white surface. Fig. 6.2 shows the metal containers on a bench.

(i) Suggest a procedure for her experiment. You may add to Fig. 6.2 to assist with your explanation.

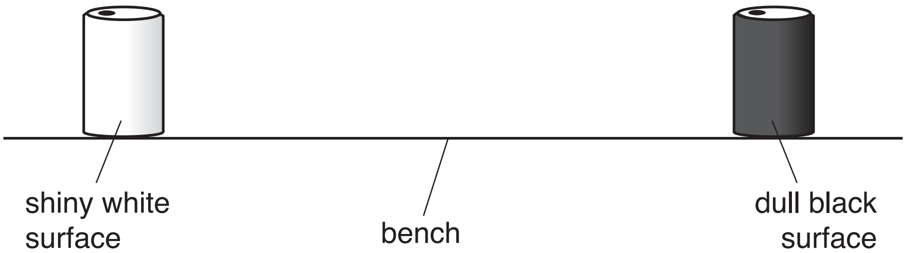


Fig. 6.2

....

....

....

.... [3]

(ii) Predict the result of the experiment described in **(b)(i)**.

....

.... [1]

[Total: 7]

7 Fig. 7.1 shows a ray of red light being reflected at the flat surface of a glass block.

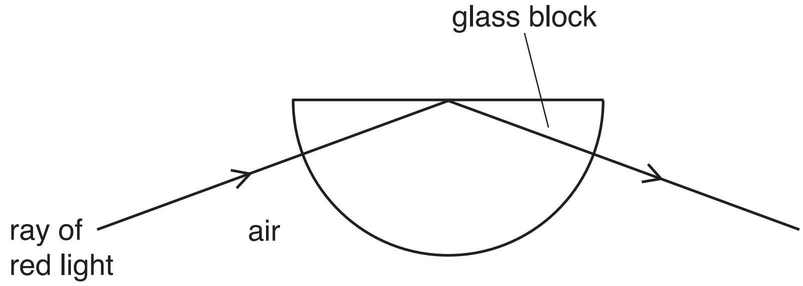


Fig. 7.1

(a) Explain why the ray of red light is totally internally reflected by the surface of the glass block.

....

.... [1]

(b) A ray of white light passes through a prism and produces a spectrum of colours on a screen, as shown in Fig. 7.2.

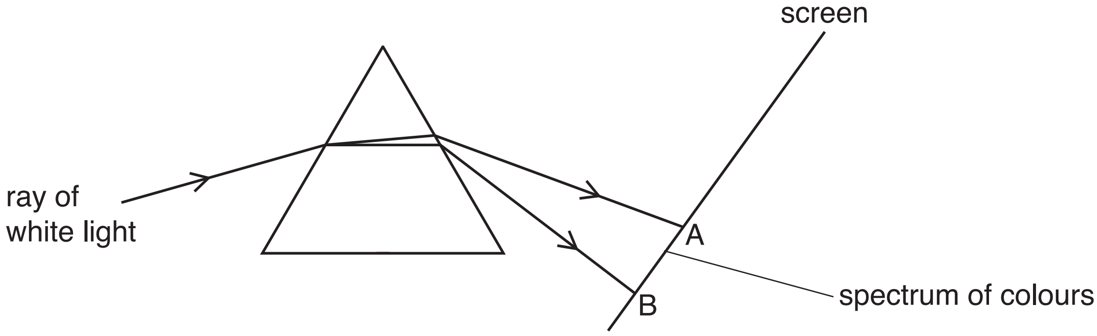


Fig. 7.2

(i) State the name of the process of separating white light into a spectrum.

.... [1]

(ii) Write the names of the seven colours that appear on the screen between A and B.

colour at A ....

....

....

....

....

....

colour at B .... [1]

(c) Visible light is one part of the electromagnetic spectrum.

State the name of **one** other part of the electromagnetic spectrum and describe a use of this type of radiation.

name of radiation ....

use of radiation ....
[2]

[Total: 5]

8 **(a)** Fig. 8.1 shows an incomplete ray diagram of a converging lens forming an image of the object, O.

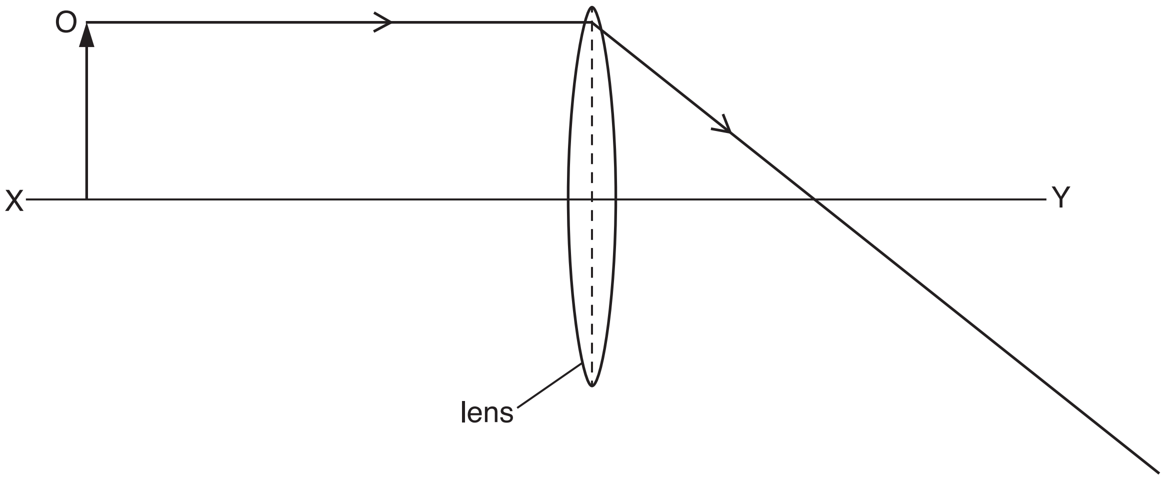


Fig. 8.1

(i) State the term given to the line XY.

.... [1]

(ii) On Fig. 8.1, indicate the position of one principal focus of the lens. Label the principal focus, F. [1]

(b) **(i)** On Fig. 8.1, draw a ray of light from the top of the object that passes through the lens to form the image. Use a ruler. [2]

(ii) On Fig. 8.1, draw the image formed by the lens. Label the image I. [1]

(iii) Choose words from the box that describe the image formed by the lens in Fig. 8.1.

diminished	enlarged	horizontal	inverted	same size	upright

Draw a ring around each correct word. [2]

[Total: 7]

9 **(a)** A student tests some materials to find which ones are electrical conductors.
He uses the circuit in Fig. 9.1.

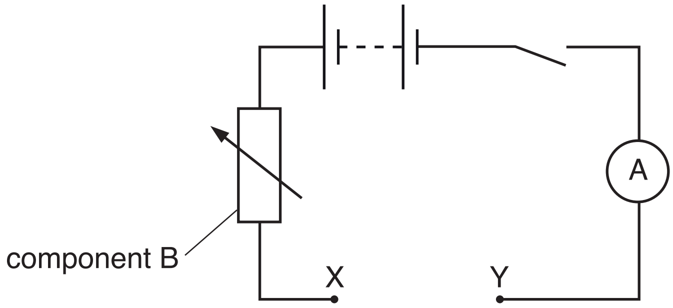


Fig. 9.1

(i) State the name of component B.

.... [1]

(ii) Describe how the student can use the circuit in Fig. 9.1 to test whether a material is an electrical conductor.

....

....

....

.... [2]

(iii) State which materials are electrical conductors.

Put a tick in the box next to each material that is an electrical conductor.

plastic	☐	copper	☐
rubber	☐	gold	☐

[1]

(b) The student connects a resistor R, between X and Y. The student determines the resistance of the resistor.

(i) Name the instrument he uses to measure the potential difference (p.d.) across resistor R.

.... [1]

(ii) The current in resistor R is 0.2 A when the p.d. across the resistor is 6.0 V. Calculate the resistance of resistor R.

resistance = ... Ω [3]

[Total: 8]

10 Fig. 10.1 shows a desktop computer. The computer is connected to a mains supply by a plug containing a fuse.

Fig. 10.1

(a) The computer has a metal case. A fault occurs and a live wire touches the metal case.

Explain how an earth wire and the fuse in the plug protect the user.

....

....

....

....

.... [3]

(b) The computer contains a transformer. The input voltage to the transformer is 240 V and the output voltage is 12.0 V. The input coil of the transformer has 3000 turns.

Calculate the number of turns on the output coil.

number of turns = ... [3]

[Total: 6]

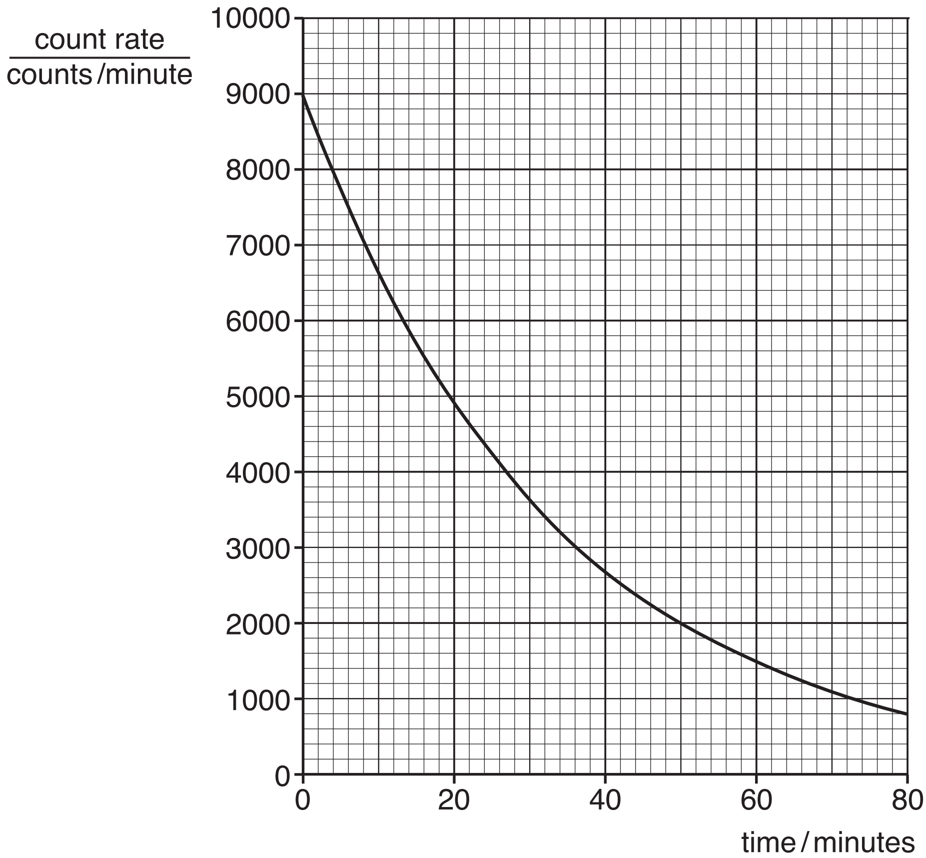
11 **(a)** Table 11.1 includes information about the properties of three types of naturally occurring, nuclear radiation.

Table 11.1

type of radiation	charge	mass (atomic mass units)	nature
	0	0	electromagnetic wave
α (alpha)	+2		helium-4 nucleus
		1/2000	

Complete the table. [4]

(b) The graph shows the decay curve for a radioactive substance.



Use the graph to determine the half-life of the radioactive substance.

half-life = ... minutes [3]

[Total: 7]

12 A student uses the equipment shown in Fig. 12.1.

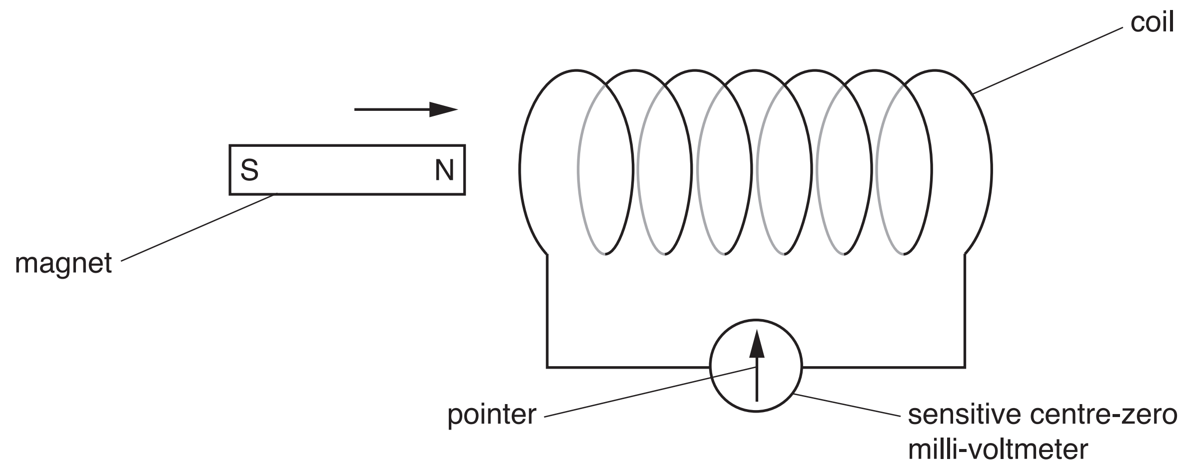


Fig. 12.1

The student moves the magnet to the right into the coil and then holds the magnet stationary for a few seconds. The pointer deflects to the right and then returns to the centre.

The student then moves the magnet to the left so that it is completely out of the coil and moves it far away from the coil.

(a) Describe how the pointer moves when the student moves the magnet out of the coil.

....

.... [2]

(b) Explain why the pointer behaves as described in **(a)**.

....

....

....

....

.... [3]

[Total: 5]

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

4702702278

PHYSICS **0625/41**

Paper 4 Theory (Extended) **May/June 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **18** printed pages and **2** blank pages.

DC (KS/TP) 169309/4

Cambridge Assessment International Education

1 A rocket is stationary on the launchpad. At time t = 0, the rocket engines are switched on and exhaust gases are ejected from the nozzles of the engines. The rocket accelerates upwards.

Fig. 1.1 shows how the acceleration of the rocket varies between time t = 0 and time $t = t_f$.

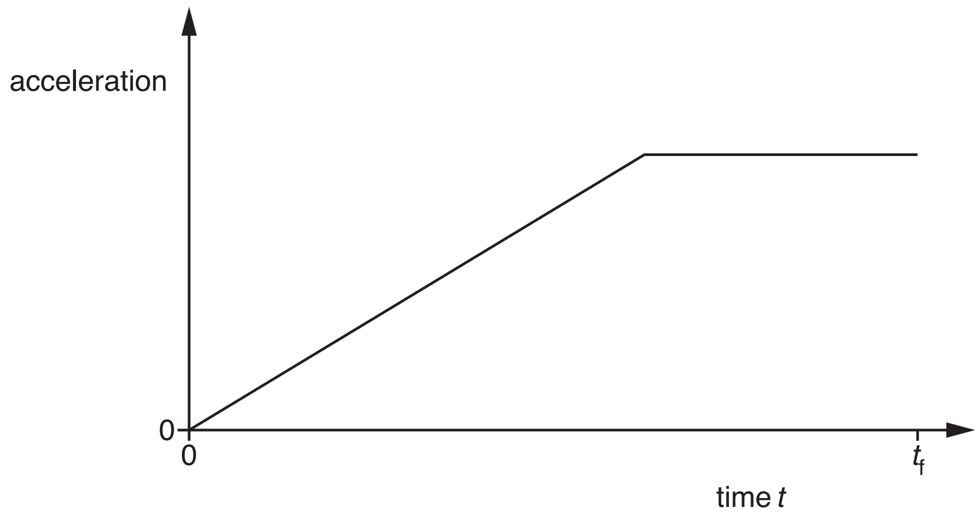


Fig. 1.1

(a) Define *acceleration*.

....

.... [1]

(b) On Fig. 1.2, sketch a graph to show how the speed of the rocket varies between time t = 0 and time $t = t_f$.

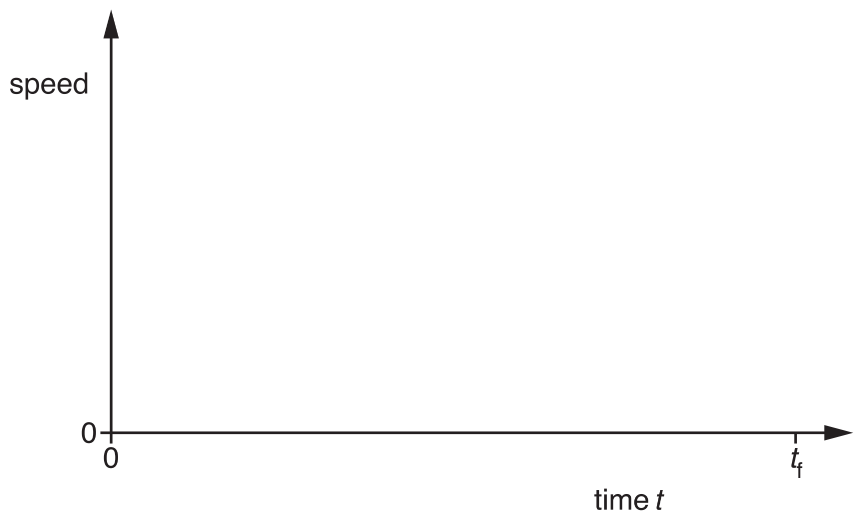


Fig. 1.2

[3]

(c) Some time later, the rocket is far from the Earth. The effect of the Earth's gravity on the motion of the rocket is insignificant. As the rocket accelerates, its momentum increases.

(i) State the principle of the conservation of momentum.

....

....

.... [2]

(ii) Explain how the principle of the conservation of momentum applies to the accelerating rocket and the exhaust gases.

....

....

....

.... [2]

[Total: 8]

2 Fig. 2.1 shows a sign that extends over a road.

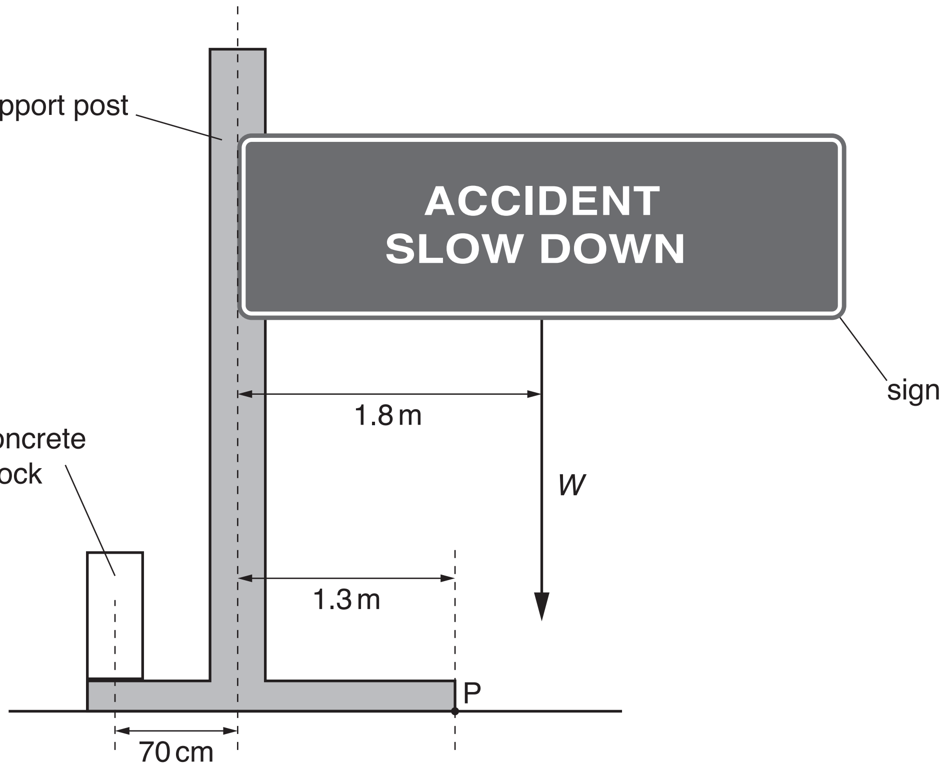


Fig. 2.1

The mass of the sign is 3.4×10^3 kg.

(a) Calculate the weight *W* of the sign.

W = ... [2]

(b) The weight of the sign acts at a horizontal distance of 1.8 m from the centre of the support post and it produces a turning effect about point P.

Point P is a horizontal distance of 1.3 m from the centre of the support post.

(i) Calculate the moment about P due to the weight of the sign.

moment = ... [3]

(ii) A concrete block is positioned on the other side of the support post with its centre of mass a horizontal distance of 70 cm from the centre of the support post.

1. State what is meant by *centre of mass*.

....

.... [1]

2. The weight of the concrete block produces a moment about point P that exactly cancels the moment caused by the weight *W*.

Calculate the weight of the concrete block.

weight = ... [2]

(c) The concrete block is removed. The sign and support post rotate about point P in a clockwise direction.

State and explain what happens to the moment about point P due to the weight of the sign as it rotates.

....

....

.... [2]

[Total: 10]

3 A cube of side 0.040 m is floating in a container of liquid. Fig. 3.1 shows that the surface of the liquid is 0.028 m above the level of the bottom face of the cube.

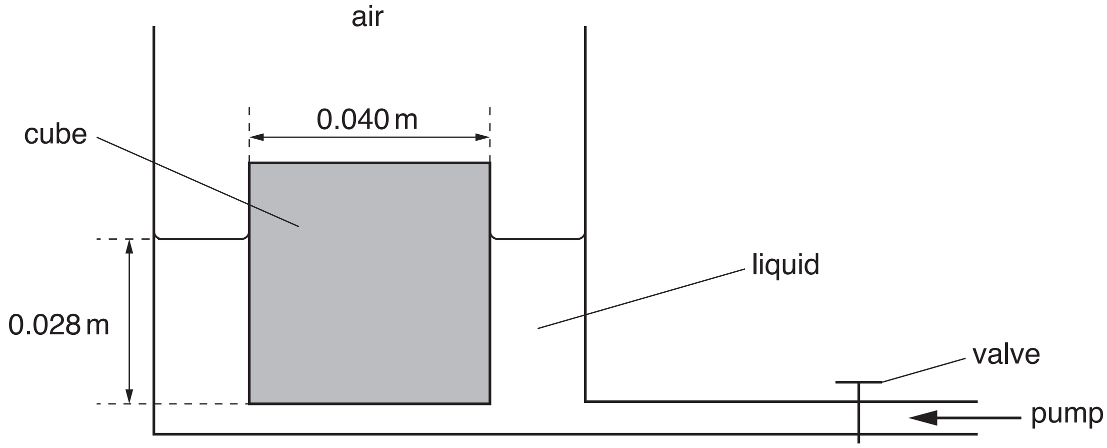


Fig. 3.1

The pressure of the air above the cube exerts a force on the top face of the cube. The valve is closed.

(a) Explain, in terms of air molecules, how the force due to the pressure of the air is produced.

....

....

....

.... [3]

(b) The density of the liquid in the container is 1500 kg / m^3.

Calculate:

(i) the pressure due to the liquid at a depth of 0.028 m

pressure = ... [2]

(ii) the force on the bottom face of the cube caused by the pressure due to the liquid.

force = ... [2]

(c) The valve is opened and liquid is pumped into the container. The surface of the liquid rises a distance of 0.034 m.

The cube remains floating in the liquid with its bottom face 0.028 m below the surface of the liquid.

(i) Calculate the work done on the cube by the force in **(b)(ii)**.

work done = ... [2]

(ii) Suggest **one** reason why this is **not** an efficient method of lifting up the cube.

....

.... [1]

[Total: 10]

4 Gas of mass 0.23 g is trapped in a cylinder by a piston. The gas is at atmospheric pressure which is 1.0×10^5 Pa. Fig. 4.1 shows the piston held in position by a catch.

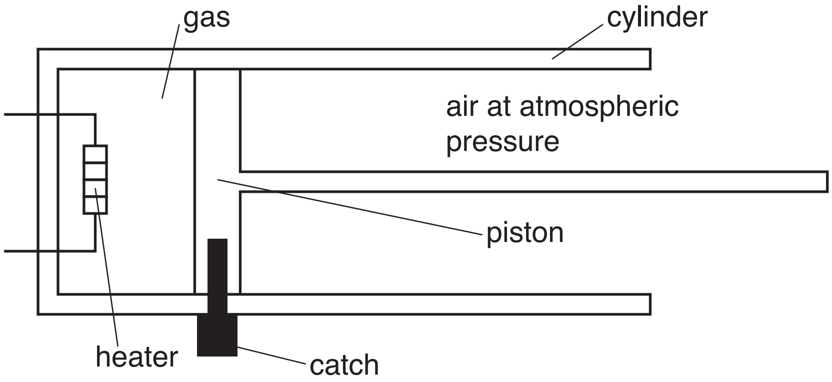


Fig. 4.1

The volume of the trapped gas is $1.9 \times 10^{-4}\,\text{m}^3$.

An electrical heater is used to increase the temperature of the trapped gas by 550 °C.

(a) The specific heat capacity of the gas is 0.72 J / (g °C).

(i) Calculate the energy required to increase the temperature of the trapped gas by 550 °C.

energy = ... [2]

(ii) The power of the heater is 2.4 W.

1. Calculate how long it takes for the heater to supply the energy calculated in **(a)(i)**.

time = ... [2]

2. In practice, it takes much longer to increase the temperature of the gas by 550 °C using the heater.

Suggest **one** reason for this.

....

....

.... [1]

(b) When the temperature of the gas has increased by 550 °C, its pressure is 2.9×10^5 Pa. The catch is then released allowing the piston to move. As the piston moves, the temperature of the gas remains constant.

(i) State and explain what happens to the piston.

....

....

.... [2]

(ii) Determine the volume of the gas when the piston stops moving.

volume = ... [2]

[Total: 9]

5 Liquids and gases are two states of matter.

(a) In both boiling and evaporation, a liquid changes into a gas.

(i) State **two** ways in which boiling differs from evaporation.

1. ....

....

2. ....

....
[2]

(ii) Before injecting a patient, a doctor wipes a small amount of a volatile liquid on to the patient's skin.

Explain, in terms of molecules, how this procedure cools the patient's skin.

....

....

....

....

.... [4]

(b) Gases can be compressed but liquids are incompressible.

Explain, in terms of molecules, why liquids are incompressible.

....

....

.... [2]

[Total: 8]

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6 Green light of frequency 5.7×10^{14} Hz is travelling in air at a speed of 3.0×10^{8} m/s. The light is incident on the surface of a transparent solid.

Fig. 6.1 shows the wavefronts and the direction of travel of the light in the air.

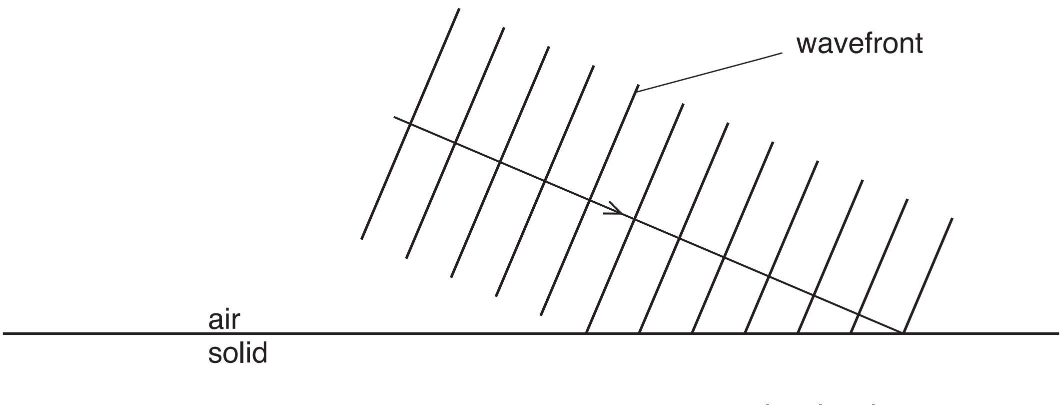

Fig. 6.1

The light travels more slowly in the transparent solid.

(a) Explain, in terms of the wavefronts, why the light changes direction as it enters the solid. You may draw on Fig. 6.1 as part of your answer.

....

....

....

.... [3]

(b) The refractive index of the transparent solid is 1.3.

(i) The light is incident on the surface of the solid at an angle of incidence of 67°.

Calculate the angle of refraction of the light in the solid.

angle of refraction = ... [2]

(ii) Determine the wavelength of the green light in the transparent solid.

wavelength = ... [4]

[Total: 9]

7 Fig. 7.1 shows a circuit diagram that includes component X.

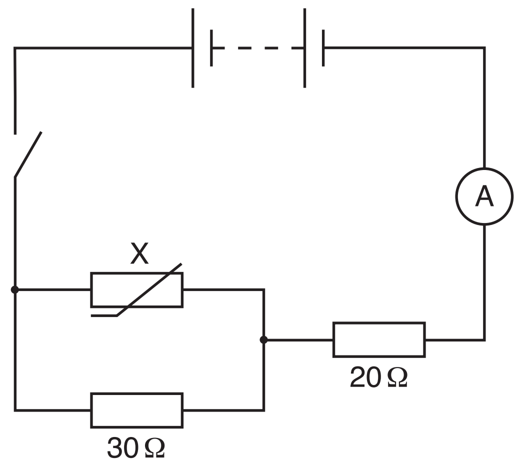

Fig. 7.1

(a) State the name of component X.

.... [1]

(b) The electromotive force (e.m.f.) of the battery is E. The switch is closed.

The potential difference (p.d.) across the 30Ω resistor is V_{30}.
The p.d. across the 20Ω resistor is V_{20}.
The p.d. across component X is V_X.

State an equation that relates V_X to:

(i) V_{30}

.... [1]

(ii) E and V_{20}.

.... [1]

(c) The e.m.f. of the battery is 6.0 V and the resistance of component X is 15 Ω.

Calculate:

(i) the total resistance of the circuit

resistance = ... [3]

(ii) the ammeter reading.

reading = ... [2]

(d) The temperature of component X increases.

State and explain what happens to the ammeter reading.

....

....

.... [2]

[Total: 10]

8 A student turns the handle of an alternating current (a.c.) generator and the coil rotates.

Fig. 8.1 represents the structure of the a.c. generator.

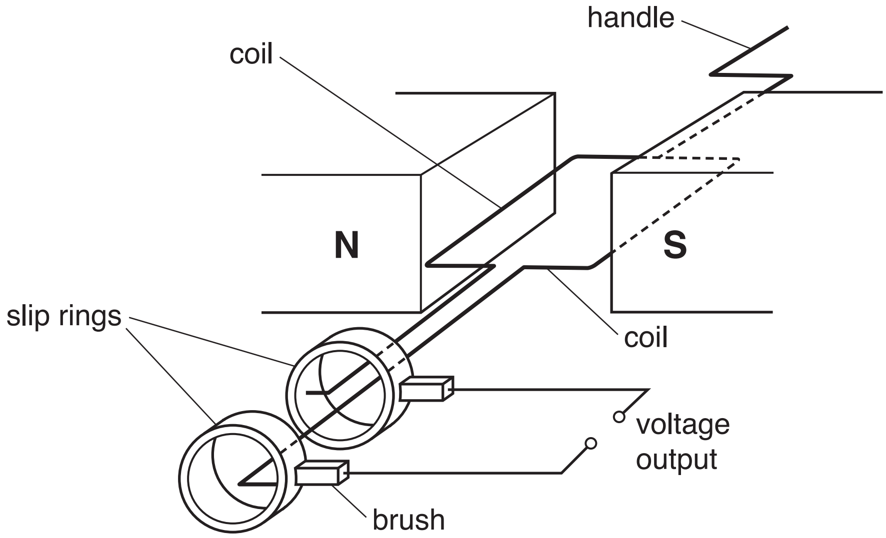

Fig. 8.1

(a) There is an alternating voltage output between the two terminals.

(i) Explain why rotating the coil produces an output voltage.

....

....

....

.... [3]

(ii) State the position of the rotating coil when the alternating output voltage is at a maximum value and explain why the maximum output occurs at this position.

....

....

.... [2]

(b) A lamp and an open switch are connected in series to the output terminals of the a.c. generator.

The switch is closed and the lamp lights up. The student has to apply a greater force on the handle.

Explain why a greater force is needed to keep the lamp lit.

....

....

....

.... [3]

[Total: 8]

9 **(a)** Fig. 9.1 shows a beam of α-particles moving towards a thin sheet of gold in a vacuum.

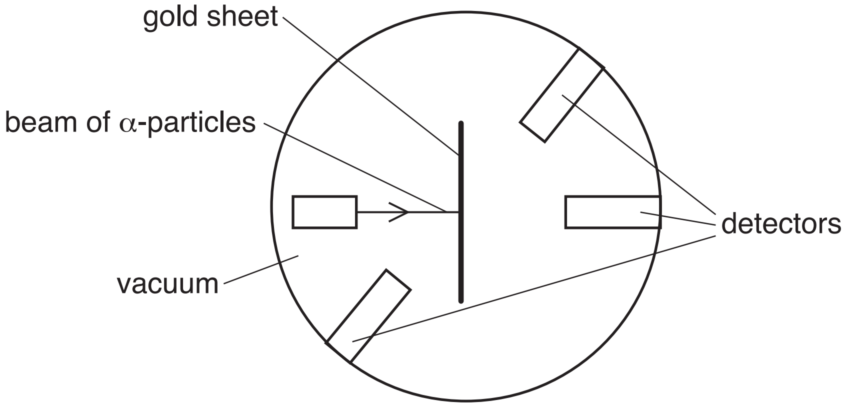

Fig. 9.1

Detectors in the region surrounding the thin gold sheet detect the α-particles and determine the number of particles that travel in various directions.

State and explain what can be deduced from the following observations.

(i) The majority of the α-particles pass through the gold sheet undeflected and are detected on the far side.

deduction ....

explanation ....

.... [2]

(ii) A small number of α-particles are deflected as they pass through the gold sheet.

deduction ....

explanation ....

.... [2]

(iii) A very small number of α-particles are deflected through very large angles or return back the way they came.

deduction ....

explanation ....

.... [2]

(b) A beam that consists of both α-particles and β-particles is passed through a region of space where there is a magnetic field perpendicular to the direction of the beam.

State **two** ways in which the deflection of the α-particles differs from that of the β-particles.

1. ....

2. ....
[2]

[Total: 8]

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Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

3376120828

PHYSICS **0625/42**

Paper 4 Theory (Extended) **May/June 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **15** printed pages and **1** blank page.

DC (CE/FC) 169310/4

Cambridge Assessment International Education

1 A bus is travelling between points A and D. There are bus stops at A, B, C and D but the bus does not stop at B and C. Fig. 1.1 is a speed-time graph for the bus.

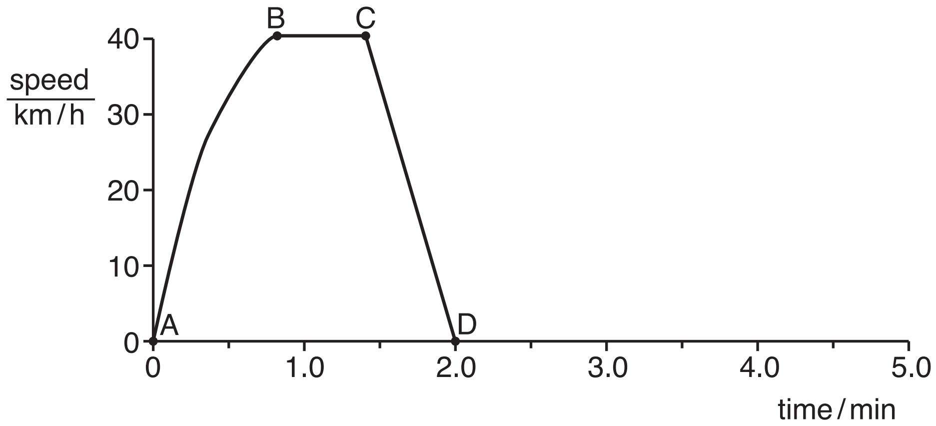

Fig. 1.1

(a) Describe the motion of the bus between each of the bus stops. Select the appropriate description from the list below.

constant acceleration **decreasing acceleration**

increasing acceleration **moving backwards at constant speed**

moving forwards at constant speed **stationary**

1. between A and B ....

2. between B and C ....

3. between C and D .... [3]

(b) The average speed of the bus between A and D is 23 km / h.

Calculate the distance between A and D.

distance = ... [3]

(c) The bus stops at D for 1 min and then travels at a constant acceleration for 30 seconds.

On Fig. 1.1, sketch a possible graph for this additional motion. Label X when the bus starts to accelerate and label Y for 30 seconds later. [3]

[Total: 9]

2 Fig. 2.1 shows a model fire engine. Its brakes are applied.

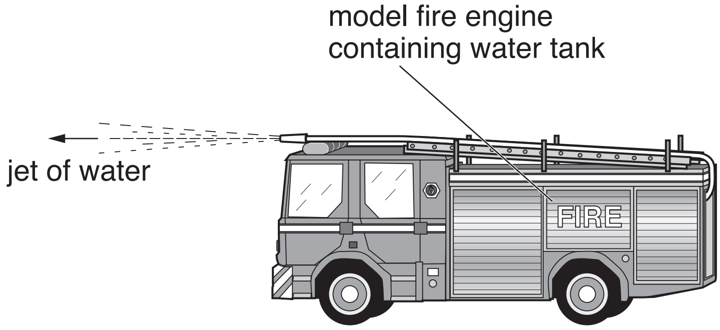

Fig. 2.1

0.80 kg of water is emitted in the jet every 6.0 s at a velocity of 0.72 m / s relative to the model.

(a) Calculate the change in momentum of the water that is ejected in 6.0 s.

momentum = ... [2]

(b) Calculate the magnitude of the force acting on the model because of the jet of water.

force = ... [2]

(c) The brakes of the model are released.

State and explain the direction of the acceleration of the model.

Statement ....

Explanation ....

....
[2]

(d) In **(c)** the model contains a water tank, which is initially full.

State and explain any change in the magnitude of the initial acceleration if the brakes are first released when the tank is nearly empty.

Statement ....

Explanation ....

....

....
[3]

[Total: 9]

3 Fig. 3.1 shows solar cells used to generate electrical energy.

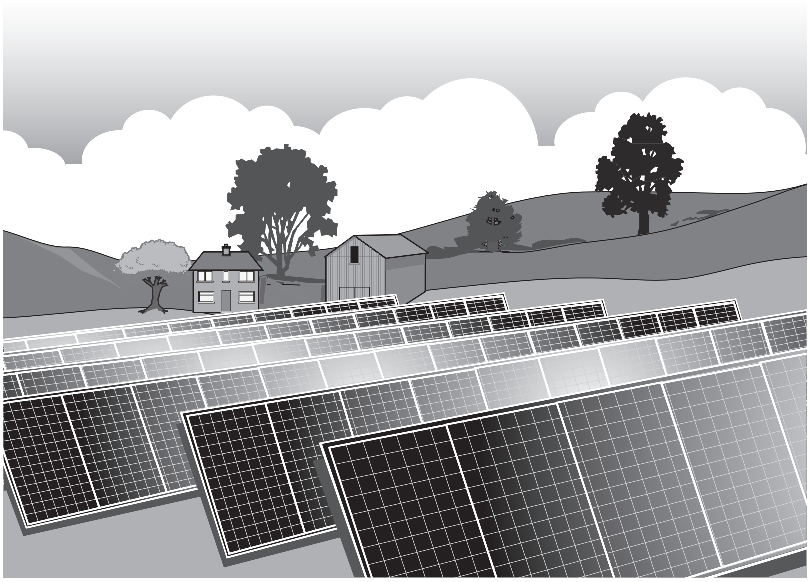

Fig. 3.1

(a) State the main form of energy transferred from the Sun to the solar cells for the generation of electrical energy.

.... [1]

(b) Consider the generation of electrical energy by a large number of solar cells, as shown in Fig. 3.1.

(i) State **one** environmental advantage and **one** environmental disadvantage.

advantage ....

....

disadvantage ....

....
[2]

(ii) State and explain whether this source of electrical energy is renewable.

....

.... [1]

(c) Each group of solar cells is arranged in a rectangle 1.2 m × 2.8 m. The solar cells are situated in a region where 260 W of solar energy is received per square metre of the cells. The electrical output of each group of solar cells is a current of 2.5 A with a potential difference of 86 V.

Calculate the efficiency of the solar cells.

efficiency = ... % [4]

[Total: 8]

4 **(a)** State and explain, in terms of molecules, any change in the pressure of a gas when the volume is reduced at a constant temperature.

Statement ....

Explanation ....

....

....

....

....

.... [3]

(b) Complete Table 4.1 to give the relative order of magnitude of the expansion of gases, liquids and solids for the same increase of temperature.

Write one of these words in each blank space:

gas **liquid** **solid**

Table 4.1

expands most	
expands least	

[2]

[Total: 5]

5 **(a)** **(i)** A liquid is heated so that bubbles of its vapour rise to the surface and molecules escape to the atmosphere.

State the name of this process .... [1]

(ii) At a lower temperature than in **(a)(i)**, molecules escape from the surface to the atmosphere.

State the name of this process .... [1]

(b) **(i)** Fig. 5.1 shows apparatus used to determine the power output of a heater.

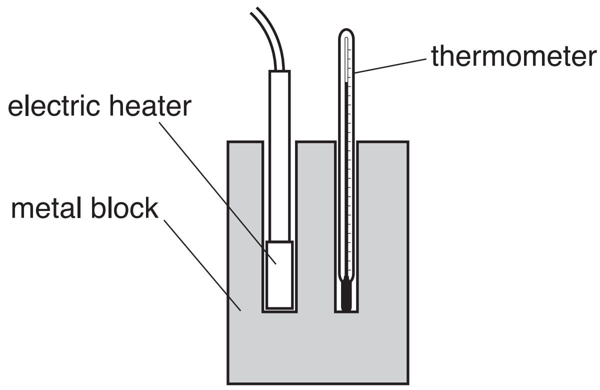

Fig. 5.1

The metal block has a mass of 2.7 kg. The metal of the block has a specific heat capacity of 900 J / (kg °C).

In 2 min 30 s, the temperature of the block increases from 21 °C to 39 °C.

Calculate the power of the heater.

power = ... [4]

(ii) State and explain a precaution that can be taken to improve the accuracy of the experiment.

Statement ....

Explanation ....

....
[2]

[Total: 8]

6 (a) Fig. 6.1 shows a water wave in a ripple tank.

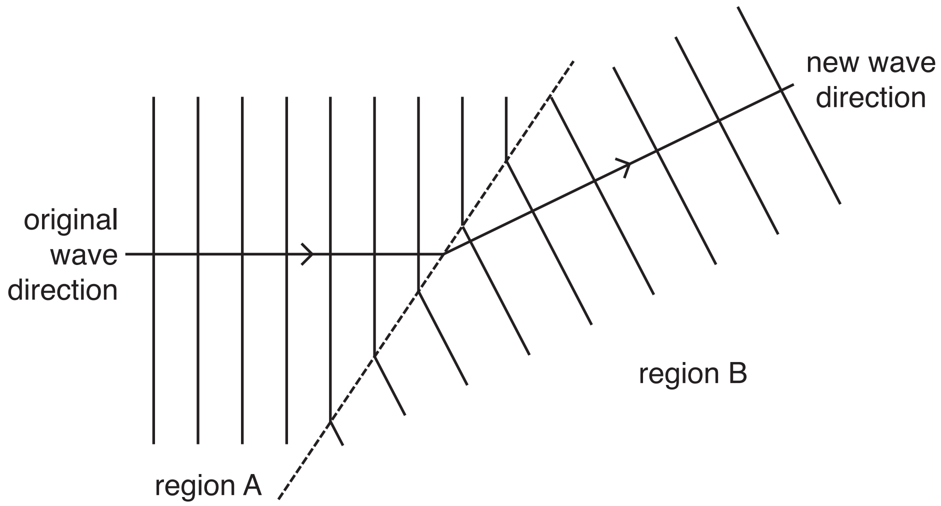

Fig. 6.1

(i) State the name of the process that occurs as the wave moves from region A to region B.

.... [1]

(ii) Suggest a cause for the change in direction of the wave.

.... [1]

(b) Fig. 6.2 shows a transverse wave.

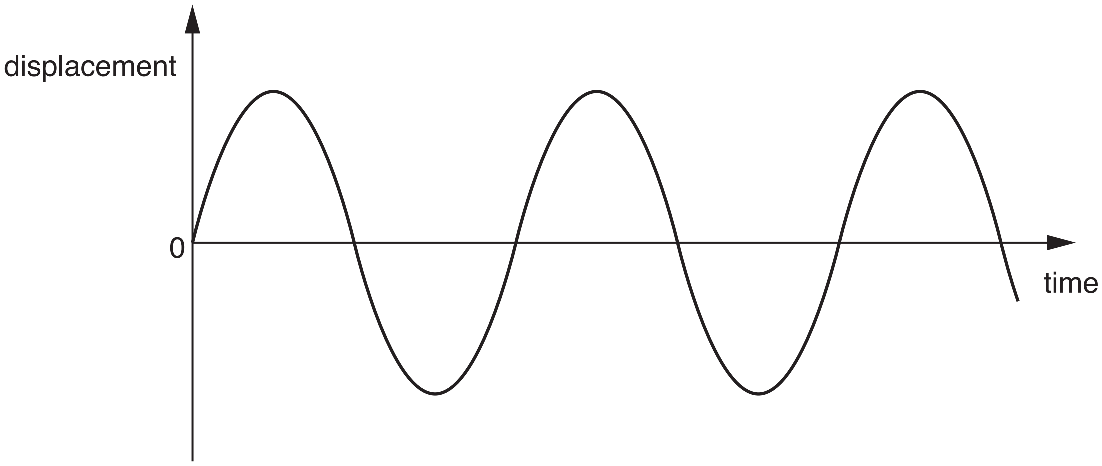

Fig. 6.2

On Fig. 6.2, draw a wave which has half the amplitude and a greater frequency than the wave shown. [2]

(c) A train travels along steel rails. A person waiting at a station hears the sound of the train through the rails before he hears the sound through the air.

(i) Explain why this happens.

....

.... [1]

(ii) The speed of sound in the rails is 5800 m/s.

Calculate the wavelength of sound of frequency 1100 Hz travelling at this speed.

wavelength = ... [2]

[Total: 7]

7 **(a)** In Fig. 7.1, a converging lens projects a sharp image of an object O on to a screen.

Complete the paths of the two rays from the object to the screen.

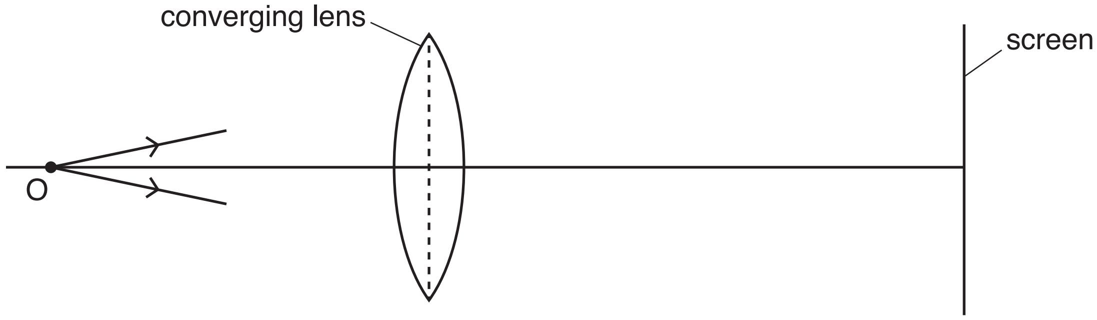

Fig. 7.1 [2]

(b) The converging lens in **(a)** is replaced with a thinner converging lens. The object O and the screen remain in the same positions as in **(a)**. The thinner converging lens has a longer focal length than the converging lens in **(a)**.

Complete the paths of the two rays from the object to the screen in Fig. 7.2.

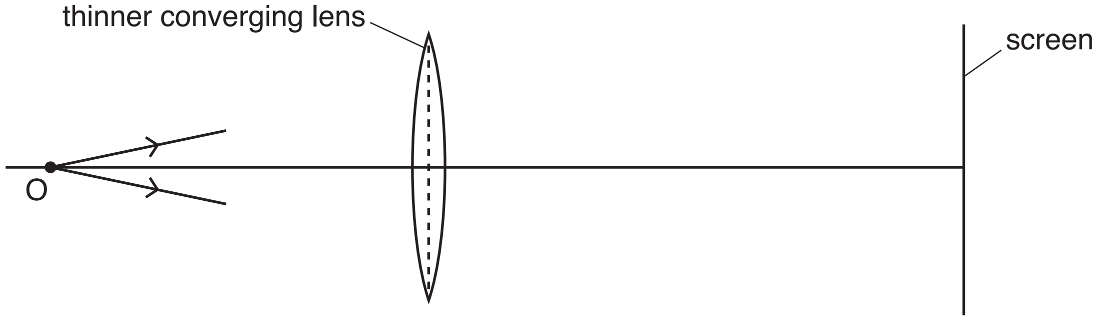

Fig. 7.2 [2]

(c) A converging lens is used as a magnifying glass.
The focal length of the lens is 10 cm.

(i) Describe the position of the object in relation to the lens.

....

.... [1]

(ii) Describe the position of the image in relation to the lens and the object.

....

.... [1]

(iii) Give three properties of the image formed by a magnifying glass.

....

....

.... [2]

[Total: 8]

8 **(a)** A conducting sphere is mounted on an insulating stand. Explain how you would use a positively charged rod of insulating material to charge the sphere by induction.

....

....

....

....

.... [3]

(b) Fig. 8.1 shows an electronic component.

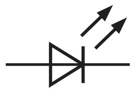

Fig. 8.1

State the name of the component shown in Fig. 8.1 .... [1]

(c) In the space below, write down the truth table for a NAND gate.

[2]

(d) Fig. 8.2 shows the connections to two logic gates.

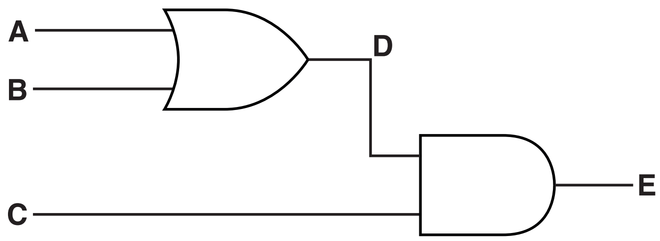

Fig. 8.2

Table 8.1 shows part of the truth table for the arrangement of logic gates in Fig. 8.2.

Complete Table 8.1 for the input values shown.

Table 8.1

inputs			intermediate point	output
A	**B**	**C**	**D**	**E**
0	0	1		
0	1	1		
1	1	0		
1	1	1		

[3]

[Total: 9]

9 **(a)** Describe how to demagnetise a bar magnet using alternating current (a.c.) in a coil.

....

....

....

.... [3]

(b) Fig. 9.1 shows a simple direct current (d.c.) motor.

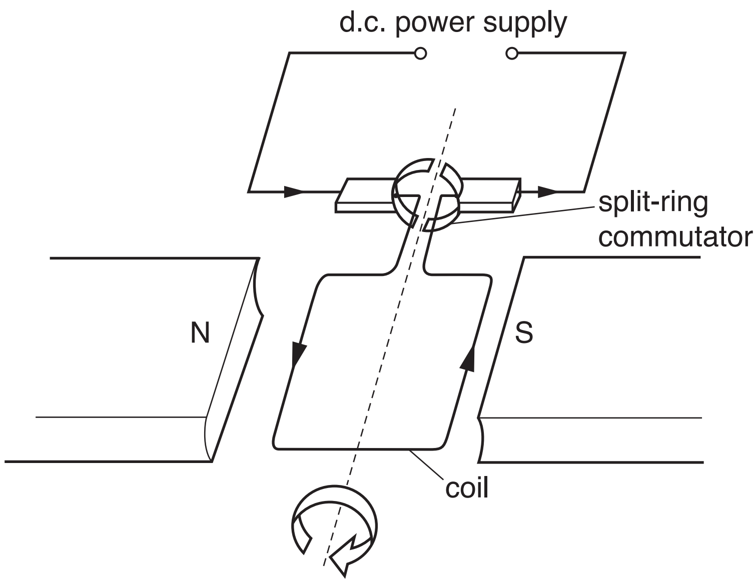

Fig. 9.1

(i) Explain the purpose of the split-ring commutator.

....

....

....

.... [3]

(ii) The voltage of the power supply is increased.

State the effect this has on the motor.

.... [1]

[Total: 7]

10 Fig. 10.1 shows a circuit containing a filament lamp of resistance 0.30 Ω and two resistors, each of resistance 0.20 Ω.

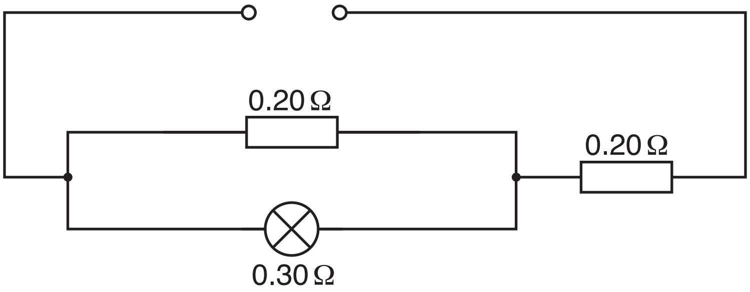

Fig. 10.1

(a) Calculate the combined resistance of the lamp and the two resistors.

resistance = ... [3]

(b) The potential difference (p.d.) of the supply is increased so that the current in the lamp increases.

State and explain any change in the resistance of the lamp.

Statement ....

Explanation ....

....
[2]

[Total: 5]

11 **(a)** A radon-222 nucleus contains 86 protons and 136 neutrons. It decays by emitting an α-particle and becomes a nucleus of an isotope of polonium. The symbol for radon is Rn and the symbol for polonium is Po.

Write down the nuclide equation for this decay.

[3]

(b) Carbon-14 is radioactive with a half-life of 5700 years. An animal bone is dug up in an archaeological excavation. The quantity of carbon-14 in the bone is 25% of what it was when the bone was buried.

Calculate the time that has elapsed since it was buried.

time = ... years [2]

[Total: 5]

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Cambridge IGCSE

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Cambridge International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

8247445056

PHYSICS **0625/43**

Paper 4 Theory (Extended) **May/June 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
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This document consists of **18** printed pages and **2** blank pages.

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Cambridge Assessment International Education

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1 Fig. 1.1 shows a distance-time graph for a cyclist travelling between points P and V on a straight road.

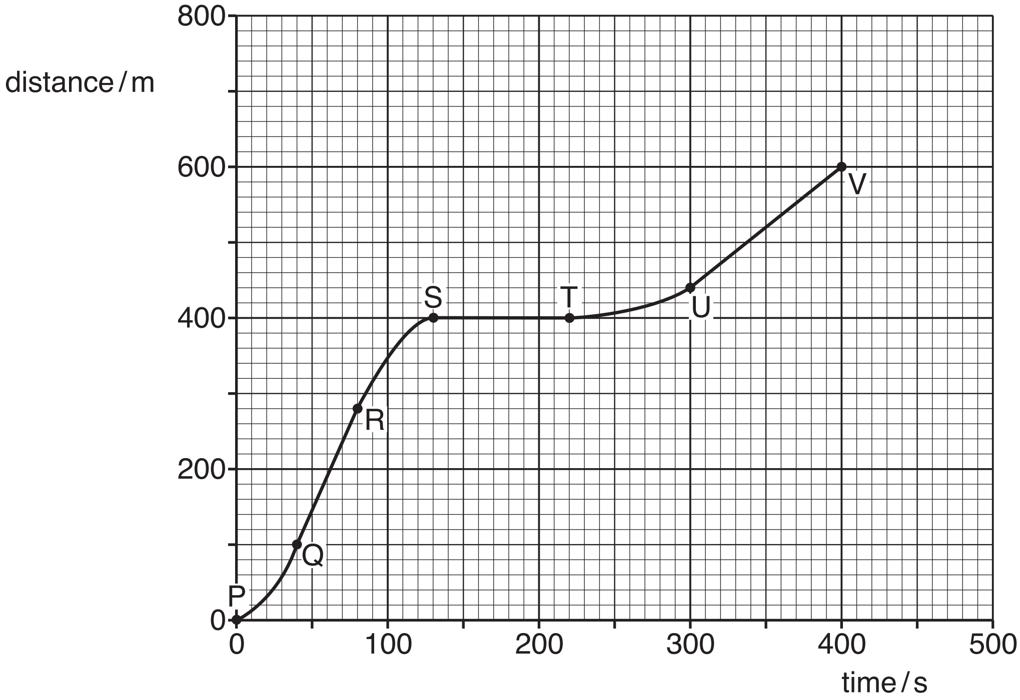

Fig. 1.1

(a) Describe the motion between:

Q and R ....

R and S ....

S and T. .... [3]

(b) Calculate the speed between U and V.

speed = ... [2]

(c) After point V, the straight road continues down a steep hill. The cyclist travels down the steep hill. He does not apply the brakes and all resistive forces can be ignored.

On Fig. 1.1, sketch a possible motion for the cyclist after V. [1]

[Total: 6]

2 Fig. 2.1 is the top view of a small ship of mass 1.2×10^6 kg. The ship is moving slowly sideways at 0.040 m/s as it comes in to dock.

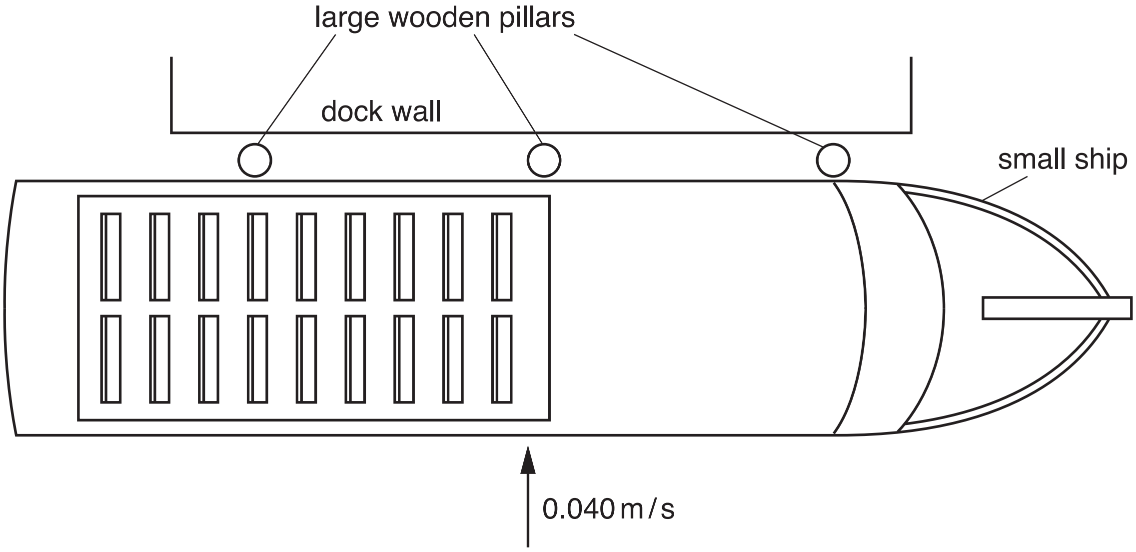

Fig. 2.1

The ship hits the wooden pillars which move towards the dock wall.

(a) Calculate the kinetic energy of the ship before it hits the pillars.

kinetic energy = ... [2]

(b) The ship is in contact with the pillars for 0.30 s as it comes to rest.

Calculate the average force exerted on the side of the ship.

force = ... [4]

(c) Assume that the kinetic energy calculated in **(a)** is used to do work moving the pillars.

Calculate the distance moved by the pillars.

distance = ... [2]

(d) Dock walls sometimes have the pillars replaced with rubber car tyres.

Explain how this reduces the possibility of damage when a boat docks.

....

....

.... [1]

[Total: 9]

3 Fig. 3.1 shows a small submarine submerged below the surface of the sea.

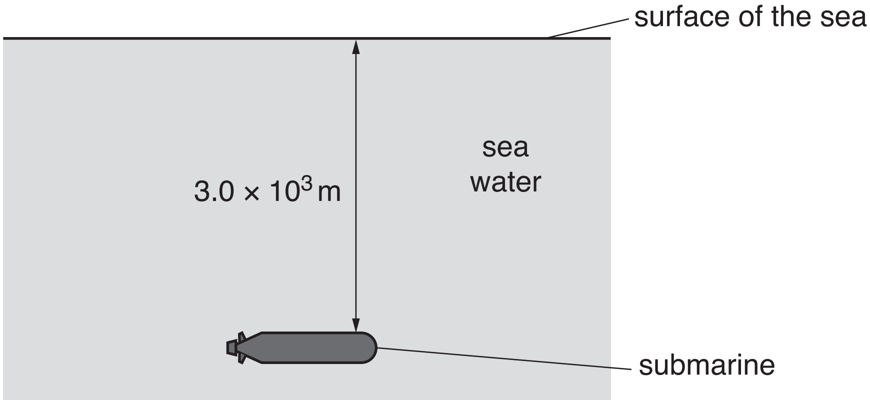

Fig. 3.1

(a) The density of sea water is $1030\,kg/m^3$.

Calculate the pressure due to the sea water on the top of the submarine when it is 3.0×10^3 m below the surface.

pressure = ... [2]

(b) The submarine emits a pulse of sound to detect other objects in the sea. The speed of sound in sea water is 1500 m/s. An echo is received with a time delay of 0.50 s after the original sound is emitted.

(i) Calculate the distance between the submarine and the other object.

distance = ... [3]

(ii) Another pulse of sound is emitted through the air when the submarine is on the surface.

An echo is received from a second object that is in the air. This echo is received 0.50 s after the pulse of sound is emitted.

Compare the distance of the second object from the submarine with the distance calculated in **(b)(i)**. Tick **one** box. Give a reason for your answer.

distance is smaller ☐

distance is the same ☐

distance is larger ☐

Reason .... [1]

[Total: 6]

4 **(a)** Water molecules escape to the atmosphere from water boiling in a pan. Water molecules evaporate from the surface of a bowl of cool water and also escape to the atmosphere.

State **two** ways in which boiling is different from evaporation.

1. ....

....

2. ....

.... [2]

(b) Fig. 4.1 shows a heater in a metal block.

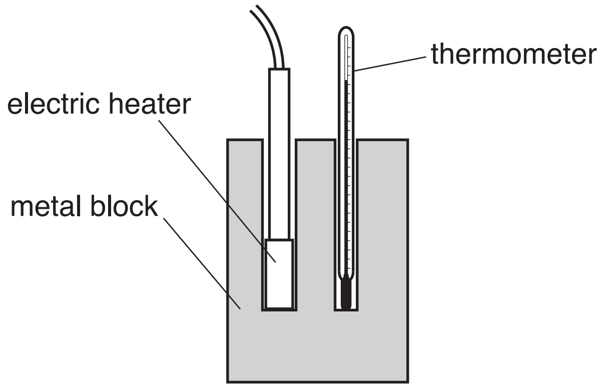

Fig. 4.1

The power of the heater is 370 W and it is switched on for 4.0 minutes. The metal block has a specific heat capacity of 420 J / (kg °C) and a mass of 5.0 kg.

Calculate the increase of temperature of the block. Assume all the thermal energy from the heater is transferred to the block.

temperature increase = ... [4]

[Total: 6]

5 Fig. 5.1 shows a cross-section of the inside of a vacuum flask containing a cold liquid. The walls of the vacuum flask are made of glass.

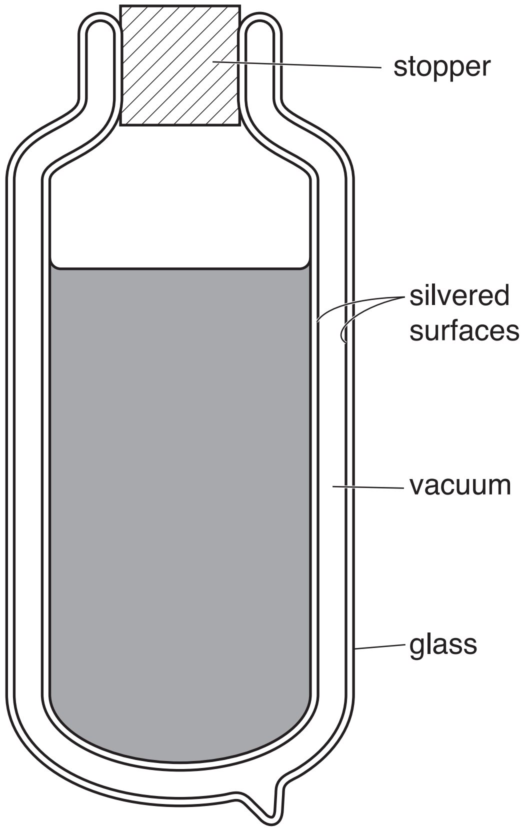

Fig. 5.1

(a) The vacuum flask is being used to keep a liquid cool on a hot day.

Explain how the labelled features of the vacuum flask keep the liquid cool by reducing thermal energy transfer. Include the names of the processes involved.

....

....

....

....

....

....

.... [5]

(b) Suggest a suitable material for the stopper.

.... [1]

[Total: 6]

6 **(a)** Fig. 6.1 shows wavefronts of a wave approaching a narrow gap and passing through the gap. The wavelength is λ.

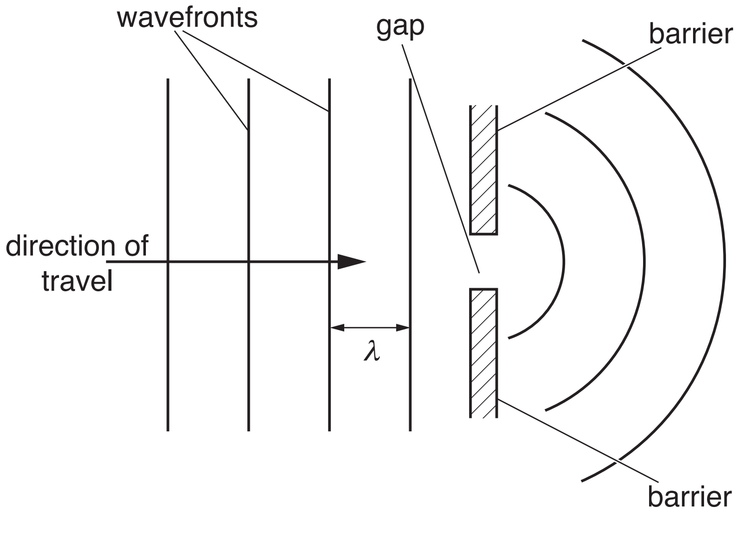

Fig. 6.1

(i) State the name of the process that occurs as the wave passes through the gap.

.... [1]

(ii) A wave with a wavelength $\frac{\lambda}{2}$ approaches the same gap.

On Fig. 6.2, draw three wavefronts for this wave as it approaches the gap and three more wavefronts as the wave continues beyond it. [3]

Fig. 6.2

(b) Table 6.1 shows 5 different types of electromagnetic wave.

In the blank column in Table 6.1, write the numbers 1 to 5 to show the order of wavelength. Write 1 for the wave with the shortest wavelength and 5 for the wave with the longest wavelength. [2]

Table 6.1

type of electromagnetic wave	order of wavelength
gamma rays	
light	
microwaves	
ultraviolet	
X-rays	

(c) **(i)** State the speed of radio waves in air.

.... [1]

(ii) A radio station transmits radio waves with a frequency of 96 MHz. Calculate the wavelength of these radio waves.

wavelength = ... [3]

[Total: 10]

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7 Fig. 7.1 shows light approaching a boundary between two materials at speed *v*. The speed of the light after crossing the boundary is 1.3*v*.

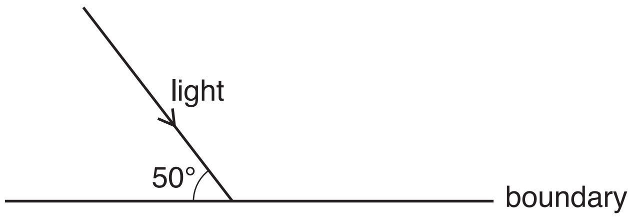

Fig. 7.1

(a) Determine the angle of incidence.

angle of incidence = ... [1]

(b) Calculate the angle of refraction.

angle of refraction = ... [3]

[Total: 4]

8 Fig. 8.1 shows a 240 V mains supply connected to an air-conditioning unit and a freezer. A fuse X is placed in the circuit as shown.

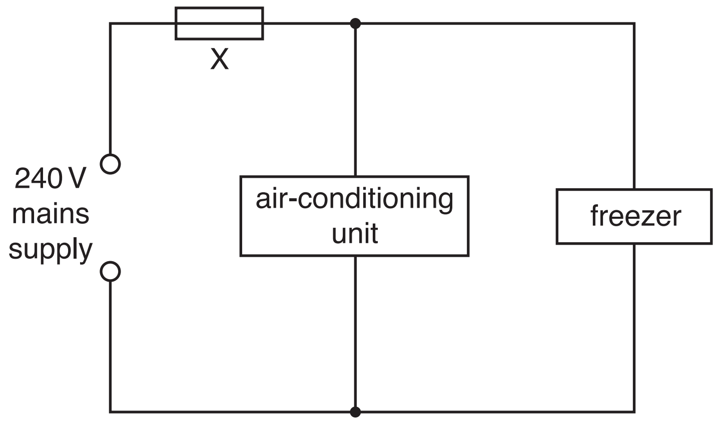

Fig. 8.1

The freezer has an operating power of 700 W.

(a) Calculate the current in the freezer.

current = ... [2]

(b) The maximum operating current of the air-conditioning unit is 7.5 A.

Fuses of current rating 1 A, 3 A, 5 A, 10 A, 13 A and 30 A are available.

Suggest a suitable rating for fuse X. Give **two** reasons for your answer.

fuse rating ....

Reason 1 ....

....

....

Reason 2 ....

....

.... [3]

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(c) A fuse is made out of a short length of wire.

Explain why fuses of a higher rating are made of thicker wire.

....

....

....

....

.... [3]

(d) Electrical energy can be obtained from renewable and non-renewable sources of energy.

(i) State **two** renewable sources of energy.

Source 1 ....

Source 2 .... [2]

(ii) State **one** social, economic or environmental disadvantage of one of your answers to **(d)(i)**.

....

....

.... [1]

[Total: 11]

9 (a) Fig. 9.1 shows an electrical component.

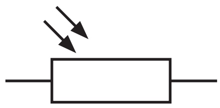

Fig. 9.1

State the name of the component shown in Fig. 9.1. .... [1]

(b) In the space below, write down the truth table for a NOR gate.

[2]

(c) Fig. 9.2 shows the connections between two logic gates.

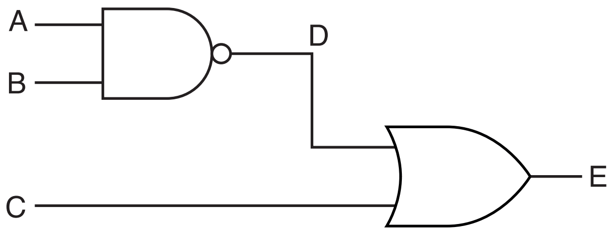

Fig. 9.2

Complete the truth table shown in Table 9.1 for this combination of logic gates.

Table 9.1

inputs			intermediate point	output
A	B	C	D	E
0	1	1		
1	0	1		
1	1	0		
1	1	1		

[3]

(d) Referring to a simple electron model, state what distinguishes electrical conductors from electrical insulators.

....

....

....

.... [1]

[Total: 7]

10 Fig. 10.1 shows a simple alternating current generator.

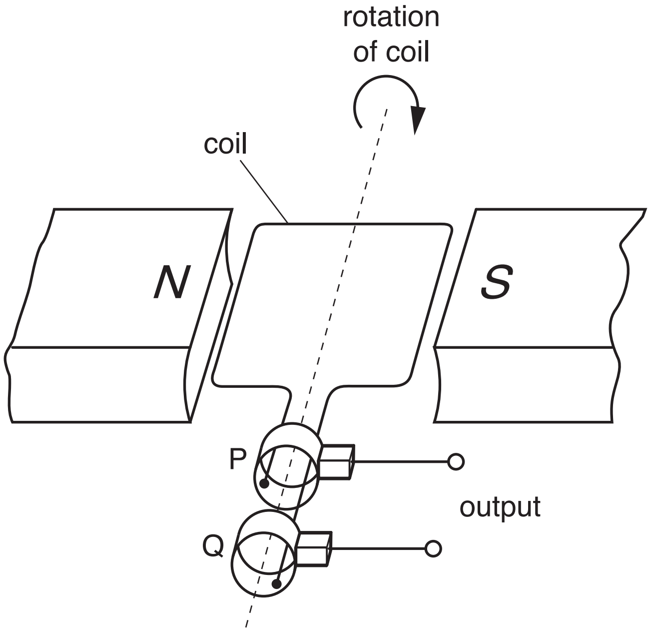

Fig. 10.1

(a) On Fig. 10.2, sketch a graph to show how the electromotive force (e.m.f.) induced varies with time for one revolution of the coil. Assume that the coil starts in the horizontal position, as shown in Fig. 10.1.
Label the points on the time axis where the coil has completed 1/4 revolution and 3/4 revolution. [3]

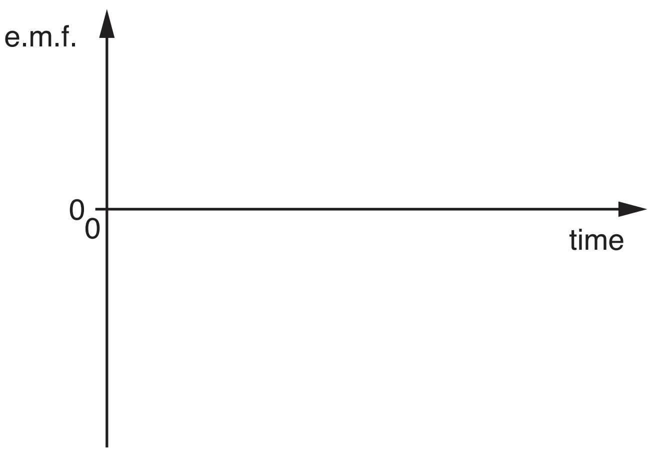

Fig. 10.2

(b) Explain why an e.m.f. is induced only when the coil is turning.

....

....

.... [1]

(c) State the name of the components labelled P and Q and state their purpose.

Name: ....

Purpose: ....

.... [2]

(d) State **two** possible changes that cause a larger e.m.f. to be induced.

1. ....

2. ....
[2]

[Total: 8]

11 **(a)** Americium (Am) is a radioactive isotope. A nucleus of americium contains 95 protons and 146 neutrons. It decays by emitting an α-particle to form a nucleus of an isotope of neptunium (Np).

Write down the nuclide equation for the decay of americium to neptunium.

[4]

(b) Ionisation smoke detectors contain americium and two small electrodes with a small voltage between them. The air between the electrodes is ionised by α-particles so that there is a small electric current between the electrodes.

(i) Suggest and explain the effect of smoke on the current between the electrodes in the smoke detector.

Suggestion: ....

....

Explanation: ....

.... [1]

(ii) Suggest **two** reasons for using an α-particle emitter in a smoke detector.

Reason 1 ....

....

Reason 2 ....

.... [2]

[Total: 7]

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CANDIDATE NAME											
CENTRE NUMBER							CANDIDATE NUMBER				

3276272928

PHYSICS **0625/51**

Paper 5 Practical Test **May/June 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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Cambridge Assessment International Education

1 In this experiment, you will determine the weight of a metre rule using a balancing method.

Carry out the following instructions, referring to Fig. 1.1.

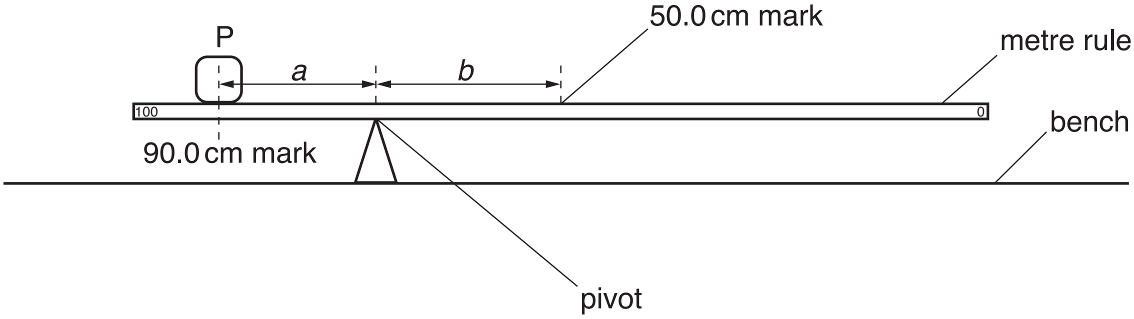

Fig. 1.1

(a) Place the metre rule on the pivot. Place the load P with its centre on the metre rule at the 90.0 cm mark. Keeping the load P at the 90.0 cm mark, adjust the position of the metre rule on the pivot so that the metre rule is as near as possible to being balanced.

Measure, and record in the first row of Table 1.1, the distance *a* from the 90.0 cm mark to the pivot.

Measure, and record in the first row of Table 1.1, the distance *b* from the pivot to the 50.0 cm mark.

Repeat the steps above, placing the centre of the load P at the 85.0 cm, 80.0 cm, 75.0 cm and 70.0 cm marks. Record all values of *a* and *b* in Table 1.1.

Table 1.1

a / cm	*b* / cm

[3]

(b) Plot a graph of a/cm (y-axis) against b/cm (x-axis). You do **not** need to begin your axes at the origin (0, 0).

[4]

(c) Determine the gradient G of the graph. Show clearly on the graph how you obtained the necessary information.

G = ... [1]

(d) Calculate the weight W of the metre rule using the equation $W = G \times P$, where $P = 1.0\,\text{N}$.

W = ... [1]

(e) Suggest **one** practical reason why it is difficult to obtain accurate readings for a and b in this type of experiment.

....

.... [1]

(f) Use the balance provided to measure the mass of the metre rule.

mass = ... [1]

[Total: 11]

2 In this experiment, you will determine the resistance of a resistance wire.

Carry out the following instructions, referring to Fig. 2.1.

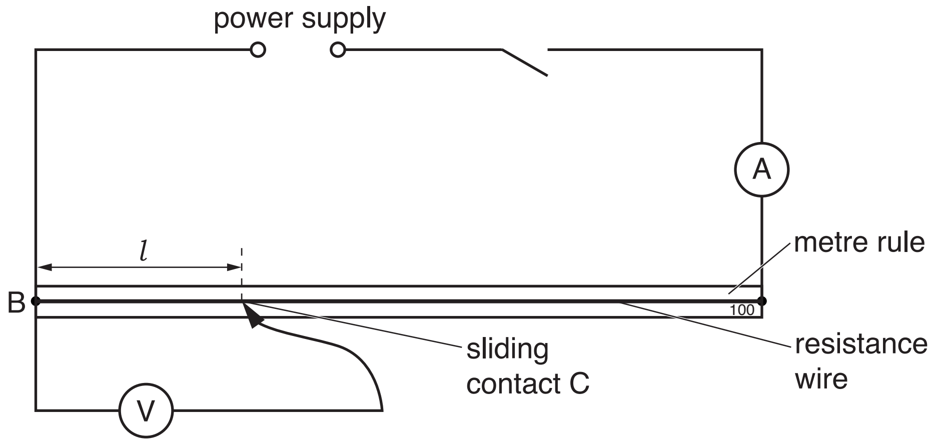

Fig. 2.1

(a) **(i)** Switch on.

Measure the current I in the circuit.

I = ... [1]

(ii) Place the sliding contact C at a distance l = 20.0 cm from B.

Measure, and record in Table 2.1, the potential difference V across the length l of the resistance wire.

Calculate, and record in Table 2.1, $\frac{V}{l}$.

Repeat the procedure using l values of 40.0 cm, 60.0 cm, 80.0 cm and 100.0 cm.

Switch off.

Table 2.1

l / cm	V / V	$\frac{V}{l} \Big/ \frac{\text{V}}{\text{cm}}$
20.0		
40.0		
60.0		
80.0		
100.0		

[4]

(b) Look carefully at the values of $\frac{V}{l}$ in Table 2.1.

(i) Tick the box to show your conclusion from the results.

☐ $\frac{V}{l}$ is approximately constant.

☐ $\frac{V}{l}$ is decreasing as V increases.

☐ $\frac{V}{l}$ is increasing as V increases.

☐ There is no simple pattern for $\frac{V}{l}$ in the results.

[1]

(ii) Justify your conclusion by reference to your results.

....

.... [1]

(c) Calculate the resistance of 100 cm of the resistance wire using the equation $R = \frac{V}{I}$, where V is the potential difference across 100 cm of the resistance wire. Use the value of current I from part **(a)(i)**. Give your answer to a suitable number of significant figures for this experiment and include the unit.

R = ... [3]

(d) In this type of experiment, it is sensible to keep the temperature of the resistance wire as close to room temperature as possible. Suggest **one** way to minimise the rise in temperature of the resistance wire.

....

.... [1]

[Total: 11]

3 In this experiment, you will investigate the rate of cooling of water under different conditions. A greater rate of cooling occurs if there is a greater change in the temperature during the same period of time.

Carry out the following instructions referring to Fig. 3.1. You are provided with a beaker labelled A and a can labelled B.

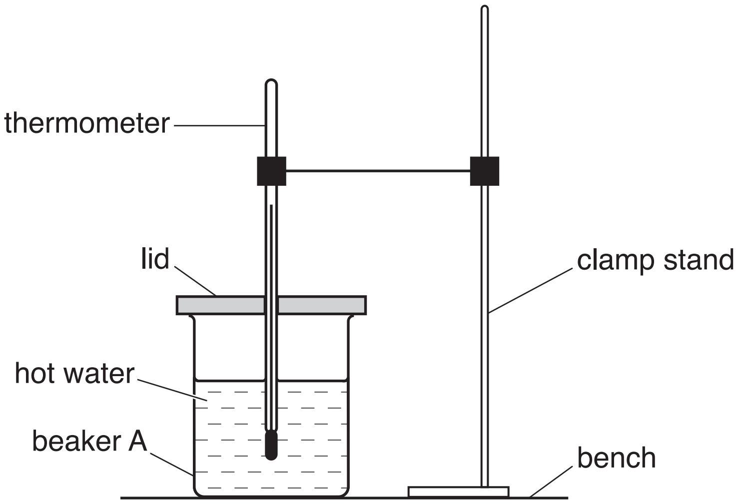

Fig. 3.1

(a) Use the thermometer to measure room temperature θ_R.

θ_R = ... [1]

(b) Pour 200 cm^3 of hot water into beaker A. Place the lid on the beaker and place the thermometer in the beaker, as shown in Fig. 3.1.

Record in Table 3.1 the temperature θ of the hot water at time $t = 0$. Immediately start the stopclock.

After 30 s, measure the temperature θ shown on the thermometer. Record the time $t = 30$ s and the temperature reading in Table 3.1.

Continue recording the time and the temperature readings every 30 s until you have six sets of readings.

[3]

Table 3.1

beaker A

t / s	θ / °C

Table 3.2

can B

t / s	θ / °C

(c) Pour 200 cm^3 of hot water into can B. Place the lid on the can and place the thermometer in the can.

Record in Table 3.2 the temperature θ of the hot water at time t = 0. Immediately start the stopclock.

After 30 s, measure the temperature θ shown on the thermometer. Record the time t = 30 s and the temperature reading in Table 3.2.

Continue recording the time and temperature readings every 30 s until you have six sets of readings.

[2]

(d) Look carefully at the readings in Table 3.1 and in Table 3.2.

(i) Tick the box to show your conclusion from the readings.

☐ The water in the beaker has a greater rate of cooling than the water in the can.

☐ The water in the beaker has a smaller rate of cooling than the water in the can.

☐ There is no significant difference between the rates of cooling of the water in the beaker and the can.

[1]

(ii) Justify your conclusion by reference to your readings.

....

....

....

.... [2]

(e) A student in another school carries out the experiment and reports that the rate of cooling of the water in the can is different from the rate of cooling of the water in the beaker. He plans a change to the experiment to find out whether this difference in the rates of cooling is caused by

- the matt black surface of the can being a better radiator of thermal energy than the shiny surface of the beaker
- the metal of the can being a better conductor of thermal energy than the material of the beaker.

Suggest **two** suitable changes to the apparatus that the student could make.

1. ....

....

2. ....

....

[2]

[Total: 11]

4 A student is investigating the work required to pull a box containing some masses up a sloping wooden board. Fig. 4.1 shows the board and the box.

Plan an experiment to investigate how the work required to pull the box up the slope depends on the mass of the box and its contents.

Work done is calculated using the equation:

work done = force × distance moved in the direction of the force.

You are **not** required to carry out this experiment.

The following apparatus is available to the students:

a wooden board
a box with a length of string attached
a selection of masses that fit in the box
a metre rule
an electronic balance.

In your plan, you should:

- list any other apparatus that you would use
- explain briefly how you would carry out the investigation, including the measurements you would take
- state the key variables that you would control
- draw a suitable table, with column headings, to show how you would display your readings (you are **not** required to enter any readings in the table)
- explain how you would use the results to reach a conclusion.

You may add to the diagram if it helps your explanation.

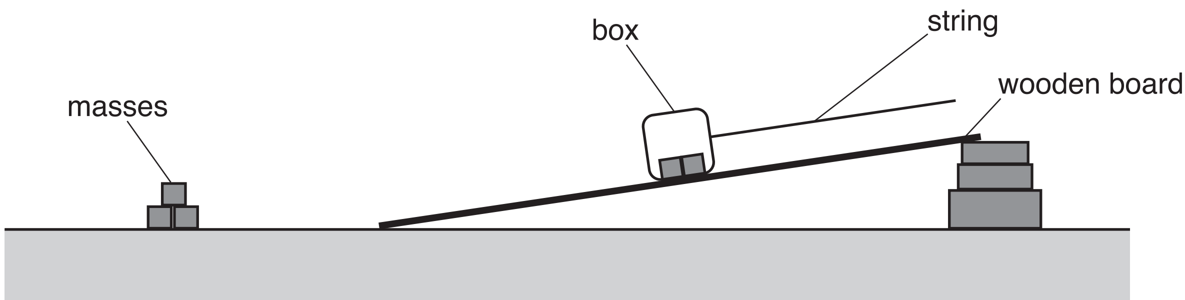

Fig. 4.1

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[7]

[Total: 7]

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7592061561

PHYSICS **0625/52**

Paper 5 Practical Test **May/June 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

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Write your centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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1 In this experiment, you will investigate moments using a balancing method.

Carry out the following instructions, referring to Fig. 1.1.

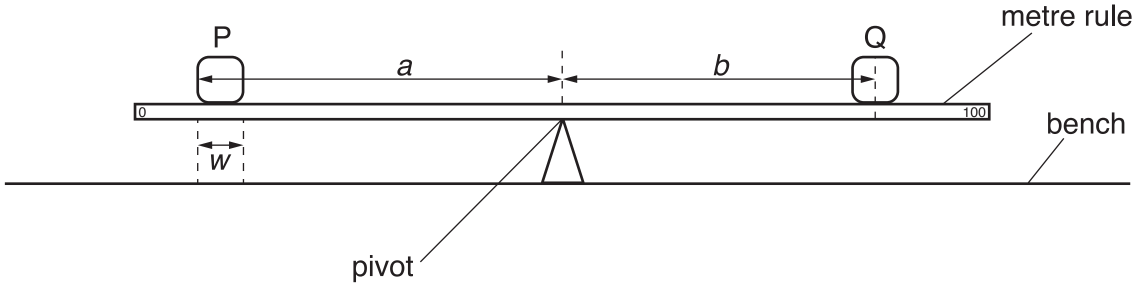

Fig. 1.1

(a) Place the metre rule on the pivot, without the loads P and Q, and adjust its position so that the metre rule is as near as possible to being balanced. **The rule must remain at this position on the pivot throughout the experiment**.

Place the load P on the metre rule so that the **edge** that is furthest from the pivot is exactly at the 10.0 cm mark on the rule.

Record in Table 1.1, the distance *a* between this **edge** of the load P and the pivot, as shown in Fig. 1.1.

Place the load Q on the metre rule and adjust the position of load Q so that the metre rule is as near as possible to being balanced.

Determine the distance *b* between the **centre** of load Q and the pivot, as shown in Fig. 1.1. Record the distance *b* in Table 1.1.

Repeat the procedure, with the **edge** of the load P that is furthest from the pivot at the 15.0 cm, 20.0 cm, 25.0 cm and 30.0 cm marks. Record all the readings in Table 1.1.

Table 1.1

a / cm	*b* / cm

[2]

(b) Plot a graph of a/cm (y-axis) against b/cm (x-axis). Start both axes at the origin (0,0).

[4]

(c) Determine the gradient G of the graph. Show clearly on the graph how you obtained the necessary information.

G = ... [2]

(d) Determine the intercept C on the y-axis of the graph. This is the value of a when b = 0.

C = ... [1]

(e) Measure the width w of the load P.

w = ... [1]

(f) Suggest **one** practical reason why it is difficult to obtain accurate values for a and b.

....

.... [1]

[Total: 11]

2 In this experiment, you will investigate the rate of cooling of water under different conditions. A greater rate of cooling occurs if there is a greater change in the temperature during the same period of time.

Carry out the following instructions referring to Fig. 2.1 and Fig. 2.2.

Beaker A has a lid. Beaker B is on a mat made of the same material as the lid. The mat and the lid have the same thickness.

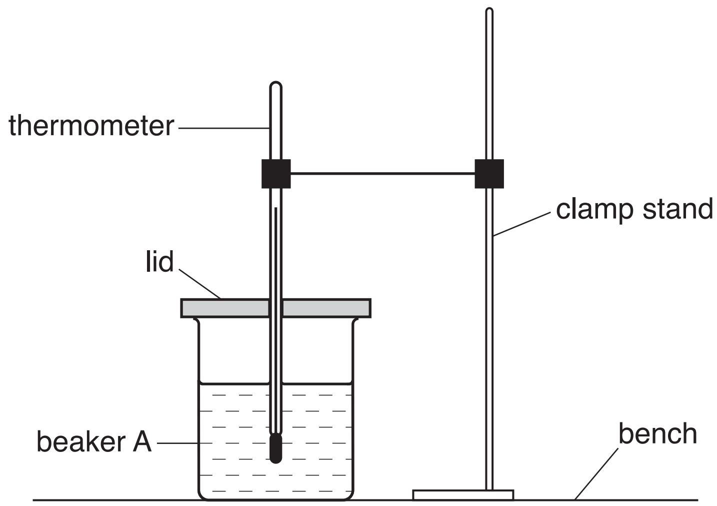

Fig. 2.1

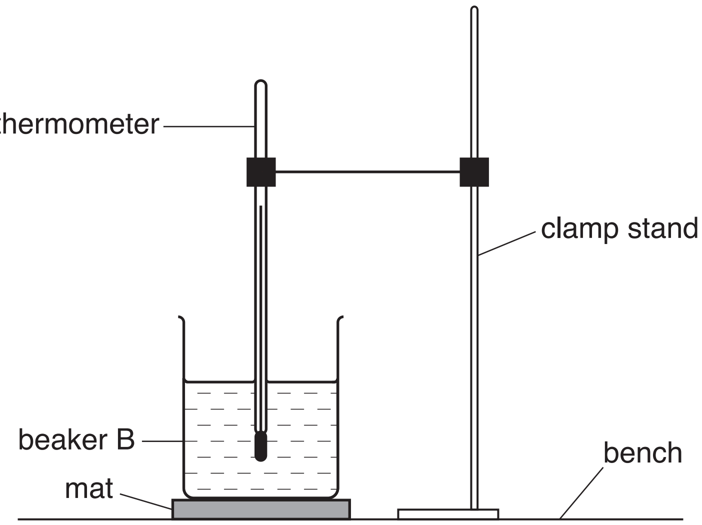

Fig. 2.2

(a) Use the thermometer to measure room temperature θ_R.

θ_R = ... [1]

(b) Pour 200 cm^3 of hot water into beaker A. Place the lid on the beaker and place the thermometer in the beaker, as shown in Fig. 2.1.

Record in Table 2.1 the temperature θ of the hot water at time $t = 0$. Immediately start the stopclock.

After 30 s, measure the temperature θ shown on the thermometer. Record the time $t = 30$ s and the temperature reading in Table 2.1.

Continue recording the time and temperature readings every 30 s until you have six sets of readings in Table 2.1.

[3]

Table 2.1

Beaker A, with lid	
t / s	θ / °C

Table 2.2

Beaker B, on mat	
t / s	θ / °C

(c) Pour 200 cm^3 of hot water into beaker B. Check that the beaker is on the mat and place the thermometer in the beaker, as shown in Fig. 2.2. Do **not** use the lid.

Record in Table 2.2 the temperature θ of the hot water at time $t = 0$. Immediately start the stopclock.

After 30 s, measure the temperature θ shown on the thermometer. Record the time $t = 30$ s and the temperature reading in Table 2.2.

Continue recording the time and temperature readings every 30 s until you have six sets of readings in Table 2.2.

[2]

(d) Look carefully at the readings in Table 2.1 and in Table 2.2.

(i) Tick the box to show your conclusion from the readings.

☐ The lid reduces the rate of cooling of the water significantly more than the mat reduces the rate of cooling of the water.

☐ The mat reduces the rate of cooling of the water significantly more than the lid reduces the rate of cooling of the water.

☐ There is no significant difference between the lid and the mat in reducing the rate of cooling of the water.

[1]

(ii) Justify your conclusion by reference to your readings.

....

....
[2]

(e) A student plans to repeat the experiment using the same apparatus and the same volume of water. Suggest **one** change to the procedure that would decrease the rate of cooling of the water.

....

.... [1]

(f) State **one** precaution that you took in order to record accurate temperature readings.

....

.... [1]

[Total: 11]

3 In this experiment, you will investigate resistance.

The circuit shown in Fig. 3.1 has been set up for you.

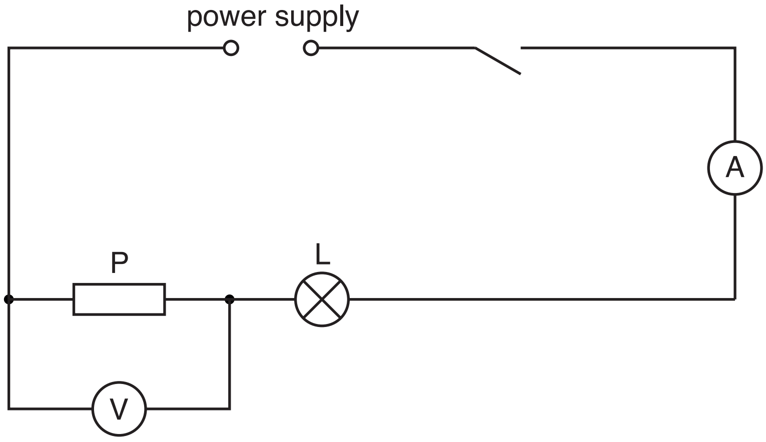

Fig. 3.1

(a) (i) Switch on. Measure and record the potential difference V_1 across the resistor P and the current I_1 in the circuit. Switch off.

V_1 = ...

I_1 = ...
[2]

(ii) Calculate the resistance R_1 of the resistor P using the equation $R_1 = \frac{V_1}{I_1}$.

R_1 = ... [1]

(b) Disconnect the voltmeter.

Connect the voltmeter across the lamp L. Switch on.

Measure and record the potential difference V_2 across the lamp L. Switch off.

V_2 = ...

Calculate the resistance R_2 of the lamp L using the equation $R_2 = \frac{V_2}{I_1}$.

R_2 = ... [1]

(c) Disconnect the voltmeter. Replace the resistor P with the resistor Q.

Connect the voltmeter across the resistor Q. Switch on.

Measure and record the potential difference V_3 across the resistor Q and the current I_2 in the circuit. Switch off.

V_3 = ...

I_2 = ...

Calculate the resistance R_3 of the resistor Q using the equation $R_3 = \frac{V_3}{I_2}$.

R_3 = ... [1]

(d) Disconnect the voltmeter.

Connect the voltmeter across the lamp L. Switch on.

Measure and record the potential difference V_4 across the lamp L. Switch off.

V_4 = ...

Calculate the resistance R_4 of the lamp L using the equation $R_4 = \frac{V_4}{I_2}$.

R_4 = ... [1]

(e) State whether your results suggest that resistor P and resistor Q have the same value of resistance, within the limits of experimental accuracy. Justify your statement by reference to your results.

statement ....

justification ....

....

....
[2]

(f) Complete the circuit diagram in Fig. 3.2 to show that:

- the two resistors and the lamp are all connected in parallel
- the voltmeter is connected to measure the potential difference across the resistors and the lamp

You are not required to set up this circuit.

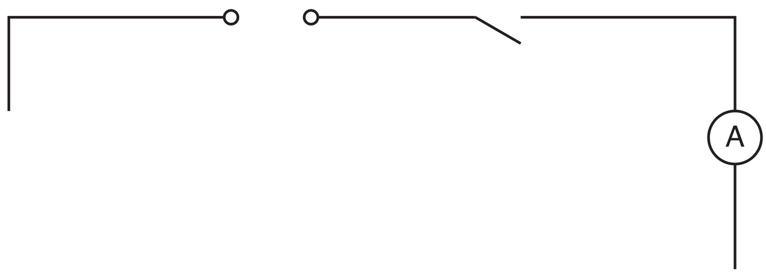

Fig. 3.2

[2]

(g) State the name of the circuit component that you would add to the circuit you have drawn to control the current in the circuit.

.... [1]

[Total: 11]

4 A student is investigating the relationship between the thickness of a converging (convex) lens and its focal length. Fig. 4.1 shows the cross-section of a converging lens.

The focal length f of a lens can be calculated if u (the distance between the object and the lens) and v (the distance between the lens and the image on a screen) are known.

The equation is: $f = \frac{uv}{(u+v)}$

Fig. 4.1

Plan an experiment to investigate the relationship between the thickness t and the focal length f of converging lenses. You may add to Fig. 4.1 as part of your answer. You are **not** required to carry out this experiment.

The following apparatus is available to the student:

illuminated object
selection of lenses of different thicknesses and a lens holder
screen
metre rule
30 cm ruler
two rectangular wooden blocks with the longest sides longer than the diameter of the lenses.

In your plan, you should:

- draw a diagram to show the arrangement of the apparatus, labelling u and v
- explain briefly how you would carry out the investigation, including the measurements you would take
- explain briefly how you would determine the thickness t of each lens (you may draw a diagram if it helps your explanation)
- draw a suitable table, with column headings, to show how you would display your readings (you do **not** need to use the equation to calculate focal length).

[7]

[Total: 7]

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5629887572

PHYSICS **0625/53**

Paper 5 Practical Test **May/June 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

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Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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[Turn over

1 In this experiment, you will determine the mass of a block U by a balancing method.

Carry out the following instructions, referring to Fig. 1.1.

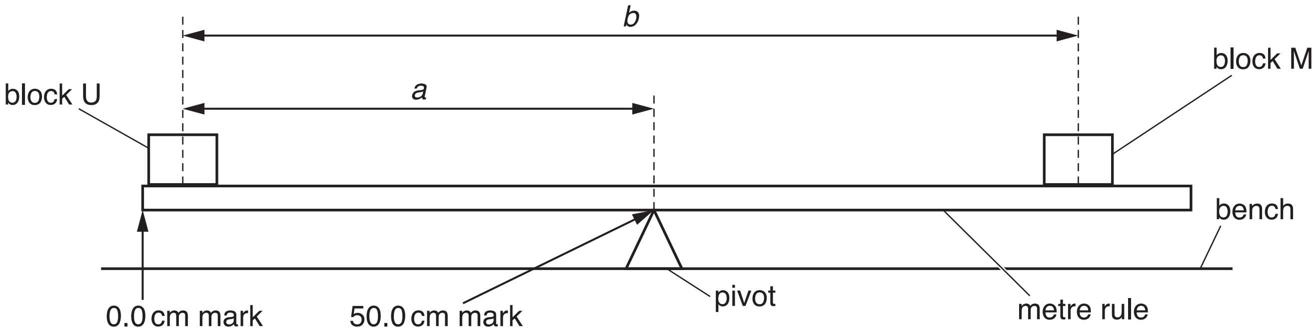


Fig. 1.1

(a) Place the metre rule with the pivot below the 50.0 cm mark. **The pivot must stay in this position for the duration of the experiment.**

Place block U on the metre rule with its centre at the 5.0 cm mark.

Place block M on the metre rule on the other side of the pivot as shown in Fig. 1.1. Adjust the position of block M until the metre rule is as near to being balanced as possible.

The distance *a* between the centre of block U and the 50.0 cm mark has been recorded in Table 1.1.

In Table 1.1, record the position of block M.

Calculate the distance *b* between the centre of block U and the centre of block M, using the equation:

$$b = (\text{position of block M} - \text{position of block U}).$$

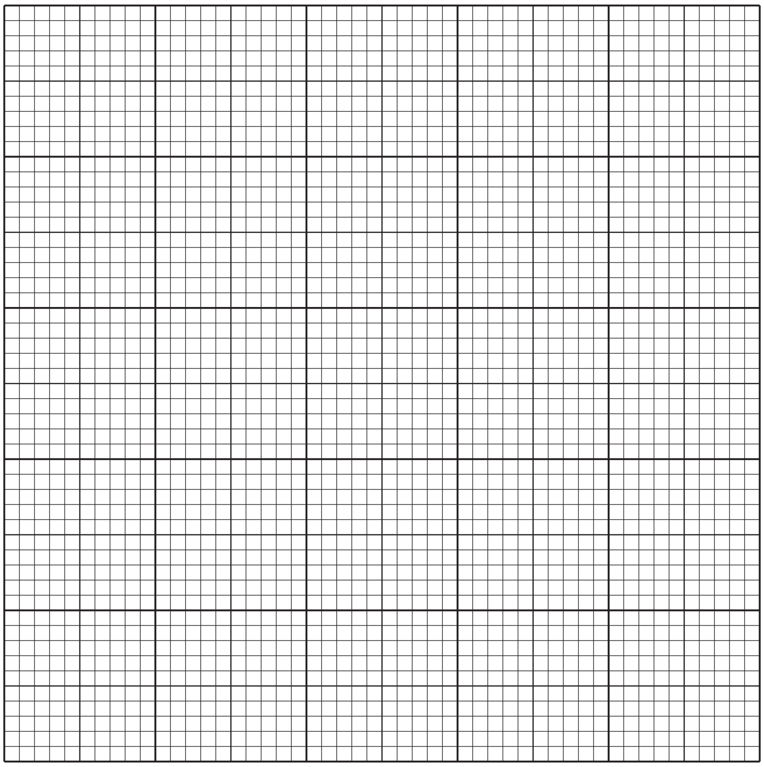
Repeat the procedure for positions of block U at the 10.0 cm, 15.0 cm, 20.0 cm and 25.0 cm marks.

Table 1.1

position of block U / cm	*a* / cm	position of block M / cm	*b* / cm
5.0	45.0		
10.0	40.0		
15.0	35.0		
20.0	30.0		
25.0	25.0		

[2]

(b) Plot a graph of *b*/cm (*y*-axis) against *a*/cm (*x*-axis). You do not need to start the axis at the origin (0,0).



[4]

(c) **(i)** Determine the gradient *G* of the graph. Show clearly on the graph how you obtained the necessary information.

G = ... [1]

(ii) Calculate the mass M_U of block U using the equation $M_U = (G - 1) \times k$, where $k = 200\,g$.

Record the value of M_U to a suitable number of significant figures for this experiment.

M_U = ... [2]

(d) Describe why it is difficult to place the block U at the correct mark on the metre rule each time. Explain how you overcame this difficulty. You may draw a diagram.

....

....

.... [1]

(e) It is difficult to balance the metre rule in this type of experiment.
Describe how to adjust the position of block M on the metre rule until the metre rule is as close to balance as possible.
You may draw a diagram if it helps your explanation.

....

....

.... [1]

[Total: 11]

2 In this experiment, you will investigate the transfer of thermal energy between hot water in a beaker and cold water in a glass tube.

Carry out the following instructions, referring to Fig. 2.1.

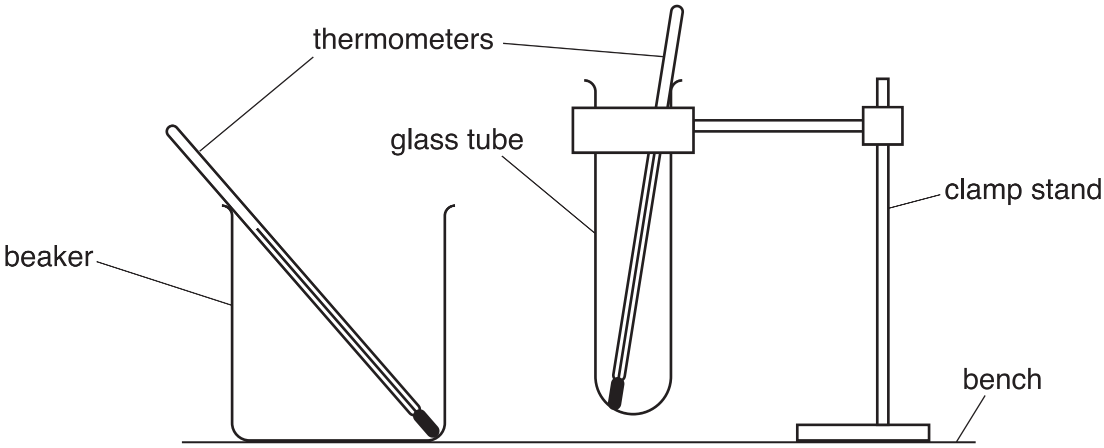


Fig. 2.1

The glass tube must remain in the clamp throughout the experiment.

(a) Use one of the thermometers to measure the room temperature θ_R.

θ_R = ... [1]

(b) Pour $50\,cm^3$ of cold water into the glass tube.

Pour $300\,cm^3$ of hot water into the beaker.

In the first row of Table 2.1, for $t = 0$, record the temperature θ_C of the water in the glass tube and the temperature θ_H of the water in the beaker.

Place the glass tube in the beaker and immediately start the stopclock.

Record, in Table 2.1, the temperatures θ_C of the water in the glass tube and the temperatures θ_H of the water in the beaker at times $t = 30\,s$, $60\,s$, $90\,s$, $120\,s$, $150\,s$ and $180\,s$.

[3]

Table 2.1

	glass tube	beaker
t /	θ_C /	θ_H /
0		

(c) Complete the headings and the time column in the table. [2]

(d) **(i)** State what you expect the temperature of the water in the glass tube will be when θ_C stops rising.
Justify your answer by reference to your readings.

statement ....

justification ....

....

....
[2]

(ii) State what you expect the temperature θ_H of the water in the beaker will be after a few hours.

θ_H = ... [1]

(e) Suggest **two** changes that could be made to the apparatus or the procedure to ensure that the temperature θ_C of the cold water in the glass tube rises more quickly.

1. ....

....

....

2. ....

....

....
[2]

[Total: 11]

3 In this experiment, you will investigate a circuit containing different resistors.

The circuit has been set up for you.
Carry out the following instructions, referring to Fig. 3.1.

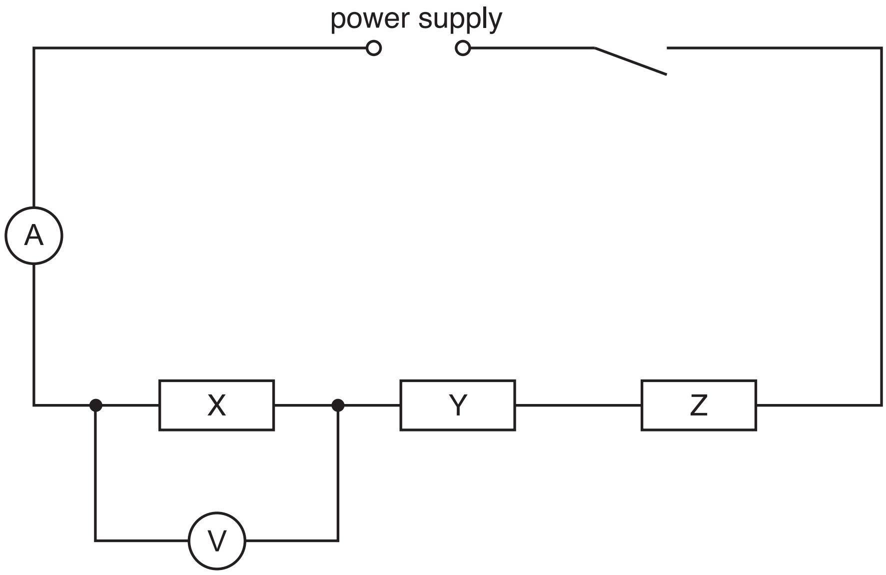


Fig. 3.1

(a) Switch on.

Measure, and record in Table 3.1, the current I in the circuit.

Use the voltmeter to measure and record the potential difference V across resistor X.

Table 3.1

resistor combination	I /	V /	R /
X			
X and Y			
X, Y and Z			

[1]

(b) Disconnect the voltmeter.

Connect the voltmeter to measure the potential difference V across the combination of resistors X and Y.

Measure, and record in Table 3.1, the current I in the circuit and the potential difference V across the combination of resistors X and Y.

[1]

(c) (i) Disconnect the voltmeter.

Connect the voltmeter to measure the potential difference V across the combination of resistors X, Y and Z.

Measure, and record in Table 3.1, the current I in the circuit and the potential difference V across the combination of resistors X, Y and Z.

Switch off.

Complete the headings in Table 3.1. [1]

(ii) A student suggests that the current should remain constant when the voltmeter is used to measure potential differences across the different combinations of resistors.

State whether your readings support this suggestion.

Justify your answer by reference to your readings.

statement ....

justification ....

....

....
[1]

(d) (i) Calculate, and record in Table 3.1, the resistance R of each combination of resistors. Use your readings from Table 3.1 and the equation $R = \frac{V}{I}$.

[2]

(ii) For resistors in series, the total resistance of the combination is the sum of the individual resistances.
Use your results from Table 3.1 to calculate the resistances R_Y and R_Z of resistors Y and Z.

R_Y = ...

R_Z = ...
[1]

(e) The circuit components are to be rearranged so that

- resistors X, Y and Z are in parallel
- the ammeter will measure the current in the circuit
- the voltmeter will measure the potential difference across the resistors.

In the space below, draw a diagram of this circuit.

[2]

(f) Set up the circuit as described in **(e)**.

Switch on. Measure and record the current I_P in the circuit and the potential difference V_P across the resistors.

I_P = ...

V_P = ...

Switch off.

Calculate the resistance R_P of the resistors in parallel. Use your readings and the equation $R_P = \frac{V_P}{I_P}$.

R_P = ...
[2]

[Total: 11]

4 A student wants to investigate the factors that affect the height to which a ball bounces when it is dropped.

Plan an experiment that will enable him to investigate in detail how the height from which a ball is dropped affects how high it bounces.

You are **not** required to carry out the experiment.

The apparatus available includes:

balls of different materials and sizes
sheets of different floor coverings.

Write a plan for the experiment.

In your plan, you should:

- list any additional apparatus needed
- explain briefly how you would carry out the experiment
- describe a precaution which could be taken to ensure that measurements of the height of bounce are reliable
- state the key variables that you would control
- draw a table, with column headings, to show how you would display your readings (you are **not** required to enter any readings in the table)
- explain how you could analyse your readings to reach a conclusion.

You may draw a diagram if it helps to explain your plan.

....

....

....

....

[7]

[Total: 7]

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Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

3954095811

PHYSICS **0625/61**

Paper 6 Alternative to Practical **May/June 2019**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **12** printed pages.

DC (SC/SW) 171390/3

Cambridge Assessment International Education

[Turn over

1 A student is determining the weight of a metre rule using a balancing method.

Fig. 1.1 shows the apparatus.

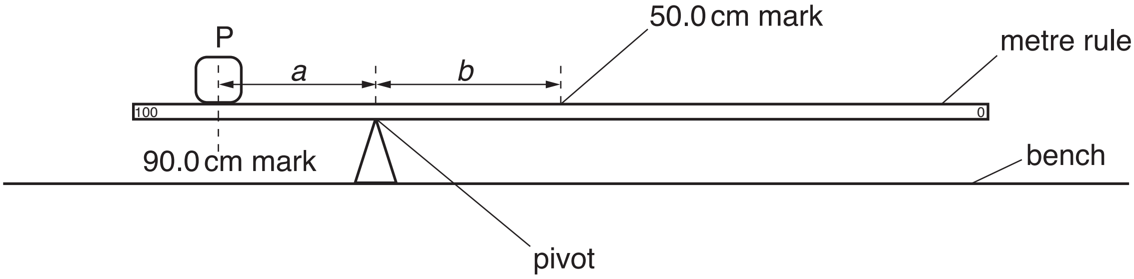


Fig. 1.1

The student places the metre rule on the pivot. He places the load P on the metre rule at the 90.0 cm mark. Keeping load P at the 90.0 cm mark, he adjusts the position of the metre rule on the pivot so that the metre rule is as near as possible to being balanced.

He records the distance *a* from the 90.0 cm mark to the pivot.

He records the distance *b* from the pivot to the 50.0 cm mark.

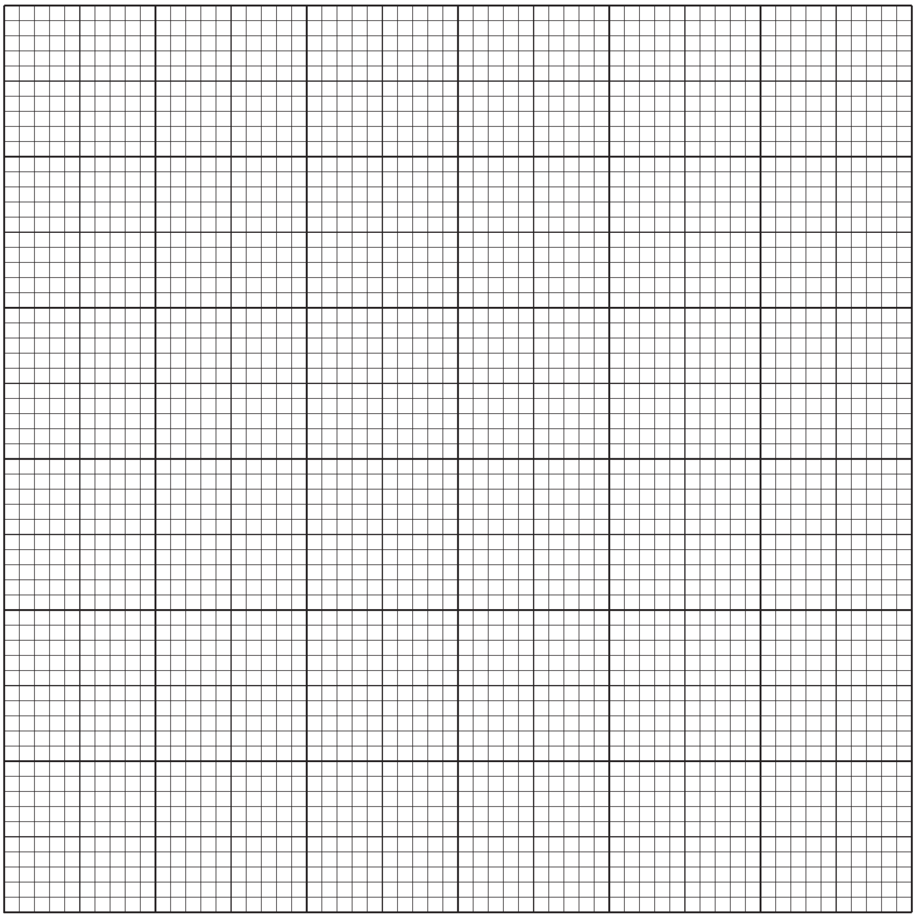
He repeats the steps, placing the load P at the 85.0 cm, the 80.0 cm, the 75.0 cm and the 70.0 cm marks.

The readings are shown in Table 1.1.

Table 1.1

a / cm	*b* / cm
21.0	19.1
18.0	17.2
16.0	14.1
13.0	11.8
10.5	9.5

(a) Plot a graph of a/cm (y-axis) against b/cm (x-axis). You do **not** need to begin your axes at the origin (0,0).



[4]

(b) Determine the gradient G of the graph. Show clearly on the graph how you obtained the necessary information.

G = ... [2]

(c) Calculate the weight W_1 of the metre rule using the equation $W_1 = G \times P$, where $P = 1.0\,\text{N}$.

W_1 = ... [2]

(d) Suggest **one** practical reason why it is difficult to obtain accurate readings for a and b in this type of experiment.

....

.... [1]

(e) The student measures the mass of the rule on a balance. Write down the mass m shown on the balance in Fig. 1.2 to the nearest gram.

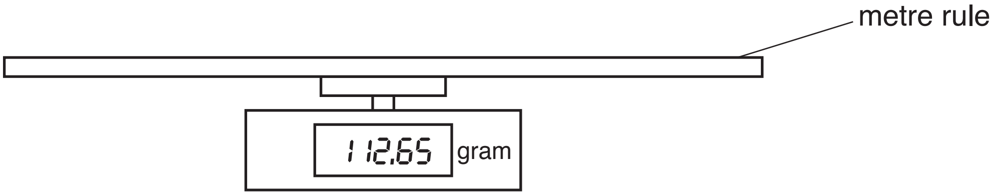


Fig. 1.2

m = ... g [1]

(f) **(i)** Calculate the weight W_2 of the metre rule using the equation $W_2 = mg$, where $g = 10.0\,\text{N/kg}$.

W_2 = ... N [1]

(ii) State and explain whether this value of W_2 can be considered equal to the value of W_1 obtained in part **(c)** within the limits of experimental accuracy.

....

.... [1]

[Total: 12]

2 A student is determining the resistance of a resistance wire.

The circuit is shown in Fig. 2.1.

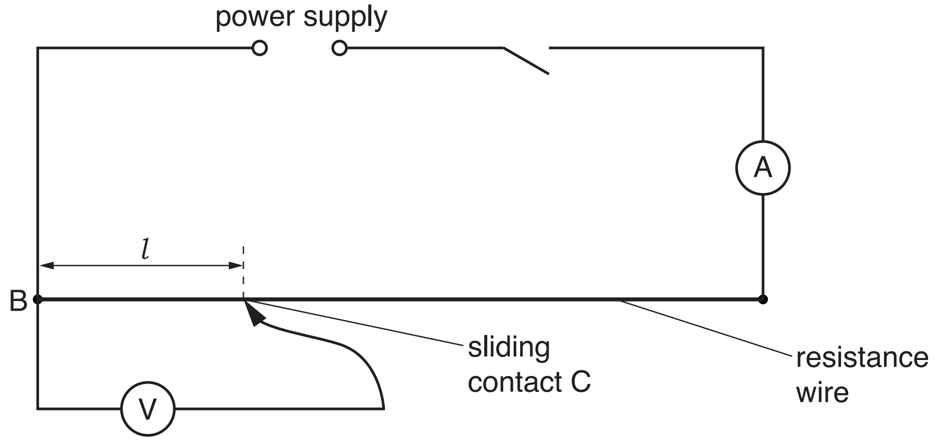


Fig. 2.1

(a) Record the current I in the circuit, as shown on the ammeter in Fig. 2.2.

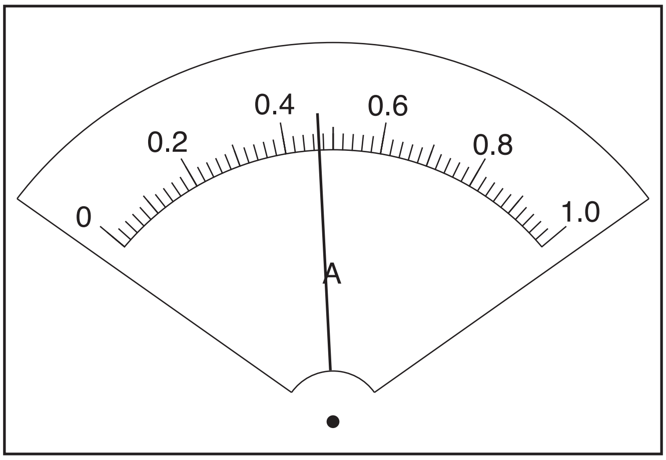


Fig. 2.2

I = ... [1]

(b) The student places the sliding contact C at a distance $l = 20.0\,\text{cm}$ from B.

She records the potential difference V across the length l of the resistance wire.

She repeats the procedure using l values of 40.0 cm, 60.0 cm, 80.0 cm and 100.0 cm. All the readings are shown in Table 2.1.

Calculate, and record in Table 2.1, $\frac{V}{l}$ for each value of l.

Complete the $\frac{V}{l}$ column heading.

Table 2.1

l/cm	V/V	$\frac{V}{l}$ /
20.0	0.50	
40.0	0.92	
60.0	1.62	
80.0	2.08	
100.0	2.40	

[3]

(c) Look carefully at the values of $\frac{V}{l}$ in Table 2.1.

(i) Tick the box to show your conclusion from the results.

☐ $\frac{V}{l}$ is approximately constant.

☐ $\frac{V}{l}$ is decreasing as V increases.

☐ $\frac{V}{l}$ is increasing as V increases.

☐ There is no simple pattern for $\frac{V}{l}$ in the results.

[1]

(ii) Justify your conclusion by reference to your results.

....

.... [1]

(d) Calculate the resistance of 100 cm of the resistance wire using the equation $R = \frac{V}{I}$, where V is the potential difference across 100 cm of the resistance wire. Use the value of current I from part **(a)**. Give your answer to a suitable number of significant figures for this experiment and include the unit.

R = ... [3]

(e) In this type of experiment, it is sensible to keep the temperature of the resistance wire as close to room temperature as possible. Suggest **one** way to minimise the rise in temperature of the resistance wire.

....

.... [1]

(f) Draw the circuit symbol for a variable resistor.

[1]

[Total: 11]

3 A student is investigating the rate of cooling of water under different conditions. A greater rate of cooling occurs if there is a greater change in the temperature during the same period of time.

Fig. 3.1 shows some of the apparatus.

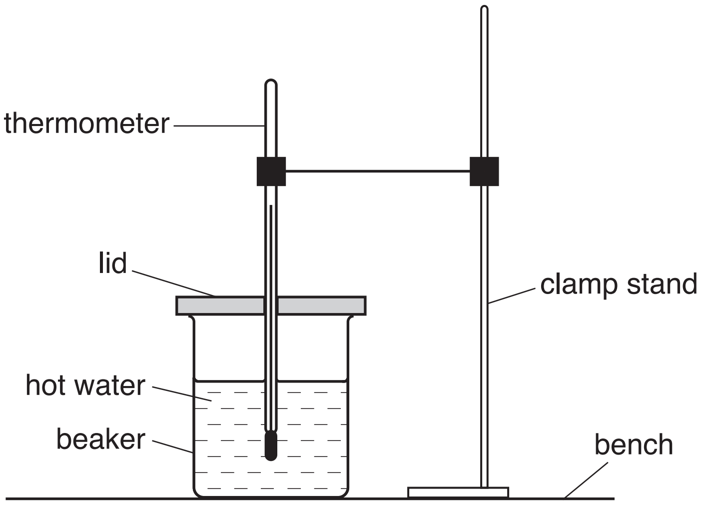


Fig. 3.1

(a) The thermometer in Fig. 3.2 shows the room temperature θ_R at the beginning of the experiment. Record θ_R.

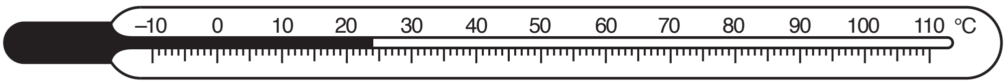


Fig. 3.2

θ_R = ... [1]

(b) The student pours 200 cm^3 of hot water into the beaker.

She records the temperature θ of the hot water at time t = 0. She immediately starts a stopclock.

She continues recording the time and the temperature readings every 30 s. The readings are shown in Table 3.1.

Table 3.1

beaker

t/	θ/
0	94
30	93
60	92
90	91
120	90
150	89

Table 3.2

can

t/	θ/
0	93
30	91
60	90
90	89
120	88
150	87

The student repeats the procedure using a metal can, painted matt black, in place of the beaker.

The readings are shown in Table 3.2.

(i) Complete the column headings in Table 3.1 and in Table 3.2. [1]

(ii) Look carefully at the readings in Table 3.1 and in Table 3.2.

Tick the box to show your conclusion from the readings.

☐ The water in the beaker has a greater rate of cooling than the water in the can.

☐ The water in the beaker has a smaller rate of cooling than the water in the can.

☐ There is no significant difference between the rates of cooling of the water in the beaker and the can.

[1]

(iii) Justify your conclusion by reference to the readings.

....

....

....

.... [2]

(c) A student in another school carries out the experiment and reports that the rate of cooling of the water in the can is different from the rate of cooling of the water in the beaker. He plans a change to the experiment to find out whether this difference in the rates of cooling is caused by

- the matt black surface of the can being a better radiator of thermal energy than the shiny surface of the beaker
- the metal of the can being a better conductor of thermal energy than the material of the beaker.

(i) Suggest **two** suitable changes to the apparatus that the student could make.

1. ....

....

2. ....

.... [2]

(ii) Suggest **two** variables that should be controlled in order to make the experiment a fair test.

1. ....

....

2. ....

.... [2]

(d) State **one** precaution that you would take in order to record accurate temperature readings.

....

.... [1]

[Total: 10]

4 A student is investigating the work required to pull a box containing some masses up a sloping wooden board. Fig. 4.1 shows the board and the box.

Plan an experiment to investigate how the work required to pull the box up the slope depends on the mass of the box and its contents.

Work done is calculated using the equation:

work done = force × distance moved in the direction of the force.

The following apparatus is available to the students:

a wooden board
a box with a length of string attached
a selection of masses that fit in the box
a metre rule
an electronic balance.

In your plan, you should:

- list any other apparatus that you would use
- explain briefly how you would carry out the investigation, including the measurements you would take
- state the key variables that you would control
- draw a suitable table, with column headings, to show how you would display your readings (you are **not** required to enter any readings in the table)
- explain how you would use the results to reach a conclusion.

You may add to the diagram if it helps your explanation.

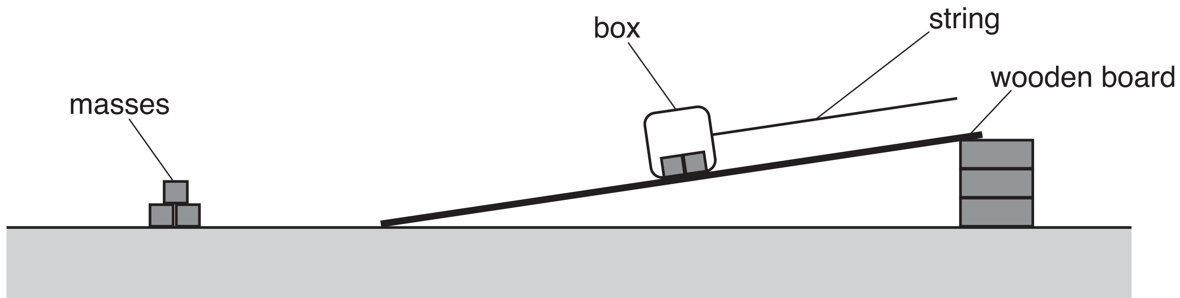


Fig. 4.1

[7]

[Total: 7]

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

3230481029

PHYSICS **0625/62**

Paper 6 Alternative to Practical **May/June 2019**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **12** printed pages.

DC (SC/CB) 171391/5

Cambridge Assessment International Education

[Turn over

1 A student is investigating moments using a balancing method.

Fig. 1.1 shows the apparatus.

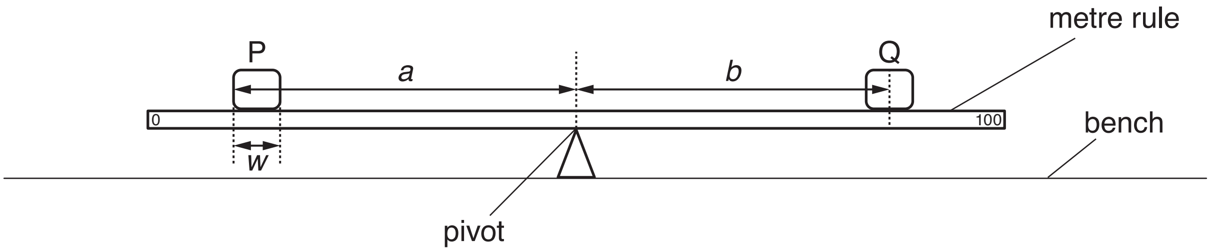


Fig. 1.1

(a) The student places the metre rule, without the loads, on the pivot and adjusts its position so that the metre rule is as near as possible to being balanced. She keeps the rule at this position on the pivot throughout the experiment.

Explain briefly why this position on the pivot may not be exactly at the 50.0 cm mark of the rule.

....

.... [1]

(b) She places a load P on the metre rule so that the **edge** that is furthest from the pivot is exactly at the 10.0 cm mark on the rule.

She measures the distance *a* between this **edge** of the load P and the pivot, as shown in Fig. 1.1.

She places a load Q on the metre rule and adjusts the position of load Q so that the metre rule is as near as possible to being balanced.

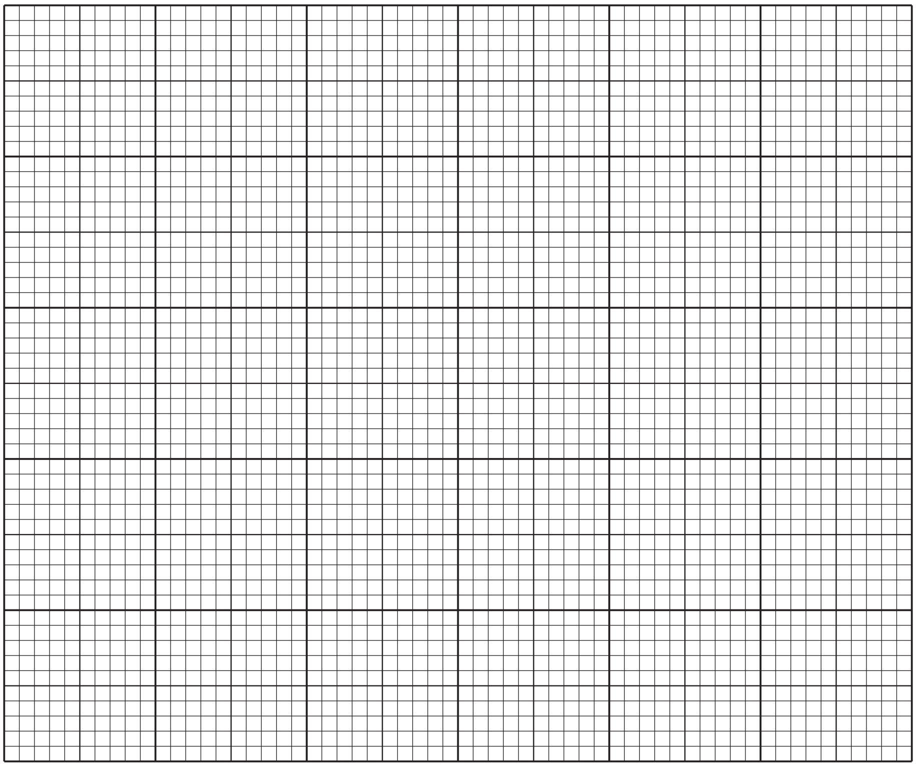
She measures the distance *b* between the **centre** of load Q and the pivot, as shown in Fig. 1.1.

She repeats the procedure, with the **edge** of the load P that is furthest from the pivot at the 15.0 cm, 20.0 cm, 25.0 cm and 30.0 cm marks. All the readings are shown in Table 1.1.

Table 1.1

a / cm	*b* / cm
38.0	44.5
33.0	38.5
28.0	33.6
23.0	27.2
18.0	22.0

Plot a graph of a/cm (y-axis) against b/cm (x-axis). Start both axes at the origin (0,0).



[4]

(c) Determine the gradient G of the graph. Show clearly on the graph how you obtained the necessary information.

G = ... [2]

(d) Determine the intercept C on the x-axis of the graph. This is the value of b when $a = 0$.

C = ... [1]

(e) On Fig. 1.2, measure the width w of the load P.

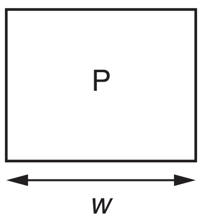


Fig. 1.2

w = ... [1]

(f) Another student suggests that the value of the intercept C should be equal to half the width w of the load P. State whether the results support the suggestion. Justify your answer by reference to the results.

statement ....

justification ....

....
[2]

(g) Suggest **one** practical reason why it is difficult to obtain accurate values for a and for b.

....

.... [1]

[Total: 12]

2 A student is investigating the rate of cooling of water under different conditions. A greater rate of cooling occurs if there is a greater change in the temperature during the same period of time.

Fig. 2.1 and Fig. 2.2 show the apparatus used.

Beaker A has a lid. Beaker B is on a mat made of the same material as the lid. The mat and the lid have the same thickness.

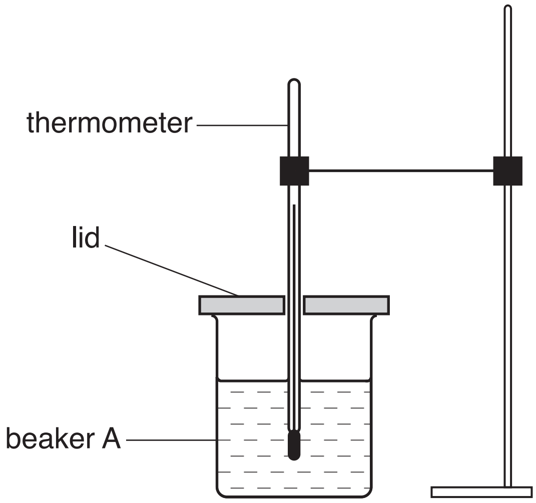


Fig. 2.1

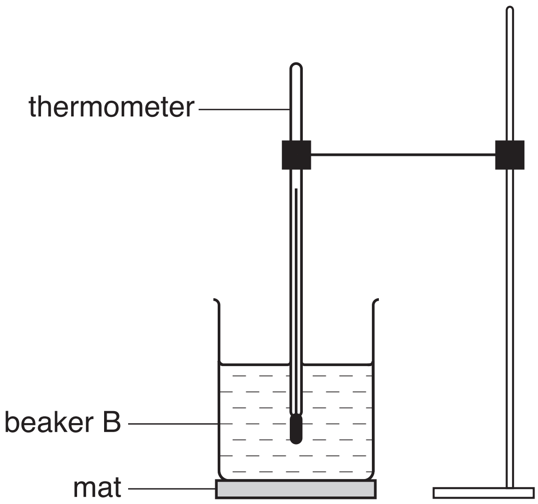


Fig. 2.2

(a) The thermometer in Fig. 2.3 shows the room temperature θ_R at the beginning of the experiment. Record θ_R.

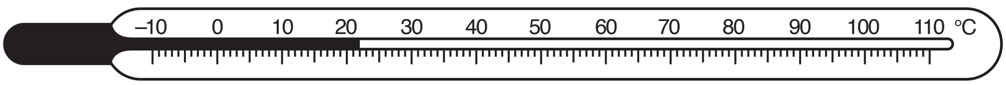


Fig. 2.3

θ_R = ... [1]

(b) The student pours 200 cm^3 of hot water into beaker A. He places the lid on the beaker and places the thermometer in the beaker, as shown in Fig. 2.1.

He records the temperature θ of the hot water at time t = 0. He immediately starts the stopclock.

He records the time and temperature readings every 30 s until he has six sets of readings.

He repeats the procedure using beaker B. This beaker is on a mat but has no lid.

All the readings are shown in Table 2.1 and Table 2.2.

Table 2.1

Beaker A, with lid	
t/	θ/
0	81
30	80
60	79
90	78
120	77
150	76

Table 2.2

Beaker B, on a mat	
t/	θ/
0	83
30	82
60	80
90	79
120	78
150	77

(i) Complete the column headings in Table 2.1 and in Table 2.2. [1]

(ii) Look carefully at the readings in Table 2.1 and in Table 2.2.

Tick the box to show your conclusion from the readings.

☐ The lid reduces the rate of cooling of the water significantly more than the mat reduces the rate of cooling of the water.

☐ The mat reduces the rate of cooling of the water significantly more than the lid reduces the rate of cooling of the water.

☐ There is no significant difference between the lid and the mat in reducing the rate of cooling of the water.

[1]

(iii) Justify your conclusion by reference to the readings.

....

.... [2]

(c) A student plans to repeat the experiment using the same apparatus and the same volume of water. Suggest **one** change to the procedure that will decrease the rate of cooling of the water.

....

.... [1]

(d) State **one** precaution that you must take in order to record accurate temperature readings.

....

.... [1]

(e) Suggest **two** variables that must be controlled in order to make the experiment a fair test.

1. ....

....

2. ....

....

[2]

(f) It is important to view a measuring cylinder correctly to obtain an accurate value of the volume of a liquid. Tick the box that gives the best description of how to read a measuring cylinder.

☐ The line of sight should be along the scale.

☐ The line of sight should be vertical.

☐ The line of sight should be at right-angles to the scale.

☐ The line of sight should be parallel to the scale.

[1]

[Total: 10]

3 A student is investigating electrical resistance.

She uses the circuit shown in Fig. 3.1.

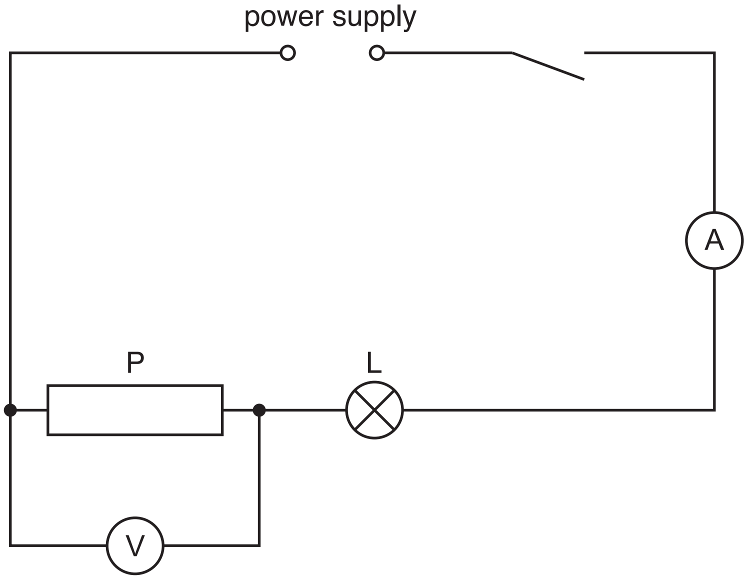


Fig. 3.1

(a) Write down the readings shown on the meters in Figs. 3.2 and 3.3.

V_1 = ...

I_1 = ...
[2]

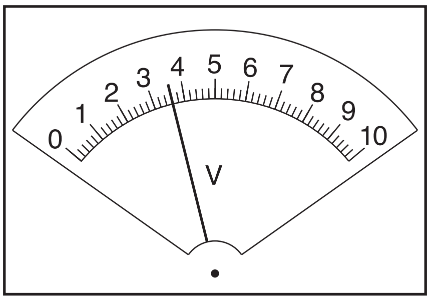


Fig. 3.2

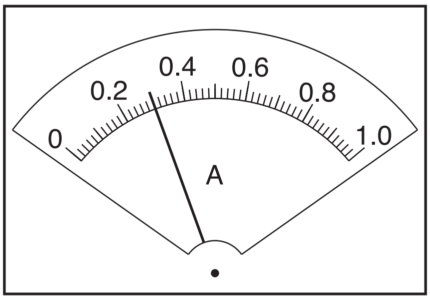


Fig. 3.3

(b) Calculate the resistance R_1 of the resistor P using the equation $R_1 = \frac{V_1}{I_1}$.

R_1 = ... [1]

(c) The student connects the voltmeter across the lamp L.

She records the potential difference V_2 across the lamp L.

V_2 = ...2.4 V..............................

Calculate the resistance R_2 of the lamp L using the equation $R_2 = \frac{V_2}{I_1}$.

R_2 = ... [1]

(d) The student replaces the resistor P with the resistor Q.

She records the potential difference V_3 across the resistor Q and the current I_2 in the circuit.

V_3 = ...3.5 V..............................

I_2 = ...0.31 A..............................

(i) Calculate the resistance R_3 of the resistor Q using the equation $R_3 = \frac{V_3}{I_2}$.

R_3 = ... [1]

(ii) State whether the results R_1 and R_3 suggest that resistor P and resistor Q have the same value of resistance, within the limits of experimental accuracy. Justify your statement by reference to your results.

statement ....

justification ....

....

....
[2]

(e) The student connects the voltmeter across the lamp L.

She records the potential difference V_4 across the lamp L.

V_4 = ...2.5 V..............................

She calculates the resistance R_4 of the lamp L.

R_4 = ...8.1 Ω..............................

She suggests that the change in resistance of the lamp from part **(c)** is due to a change in temperature of the lamp filament. Suggest an observation that she could make to confirm that the temperature of the lamp filament changes.

.... [1]

(f) Complete the circuit diagram in Fig. 3.4 to show that:

- the two resistors and the lamp are all connected in parallel
- the voltmeter is connected to measure the potential difference across the resistors and the lamp.

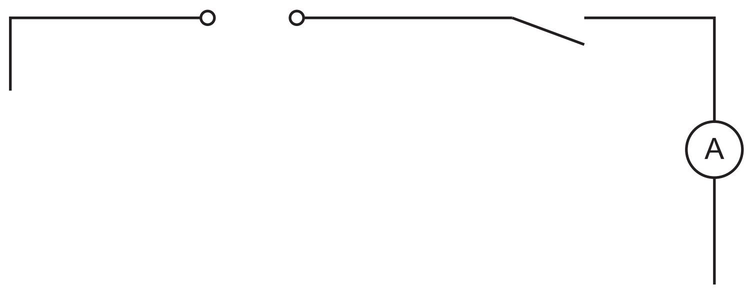


Fig. 3.4

[2]

(g) State the name of the circuit component that you would add to the circuit you have drawn to control the current in the circuit.

.... [1]

[Total: 11]

4 A student is investigating the relationship between the thickness of a converging (convex) lens and its focal length. Fig. 4.1 shows the cross-section of a converging lens.

The focal length f of a lens can be calculated if u (the distance between the object and the lens) and v (the distance between the lens and the image on a screen) are known.

The equation is: $f = \dfrac{uv}{(u + v)}$

Fig. 4.1

Plan an experiment to investigate the relationship between the thickness t and the focal length f of converging lenses. You may add to Fig. 4.1 as part of your answer.

The following apparatus is available to the student:

illuminated object
selection of lenses of different thicknesses and a lens holder
screen
metre rule
30 cm ruler
two rectangular wooden blocks with the longest sides longer than the diameter of the lenses.

In your plan, you should:

- draw a diagram to show the arrangement of the apparatus, labelling u and v
- explain briefly how you would carry out the investigation, including the measurements you would take
- explain briefly how you would determine the thickness t of each lens (you may draw a diagram if it helps your explanation)
- draw a suitable table, with column headings, to show how you would display your readings (you do **not** need to use the equation to calculate focal length).

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.... [7]

[Total: 7]

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

0164169978

PHYSICS **0625/63**

Paper 6 Alternative to Practical **May/June 2019**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **12** printed pages.

DC (LK/CB) 171392/4

Cambridge Assessment International Education

[Turn over

1 Some students are determining the mass of a block U by a balancing method.

They are using the apparatus shown in Fig. 1.1.

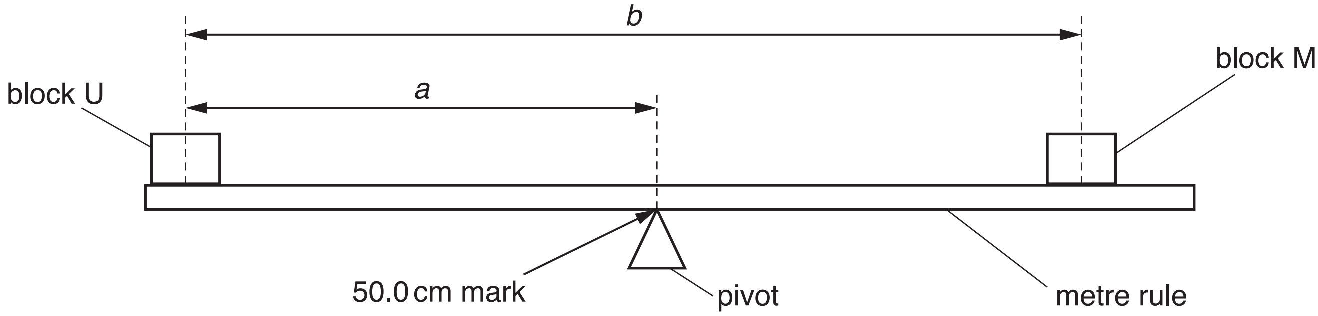


Fig. 1.1

(a) One student places the metre rule on the pivot at the 50.0 cm mark and then places block U with its centre at the 5.0 cm mark.
Suggest why it might be difficult to place block U accurately at the 5.0 cm mark. Explain how the student could overcome this difficulty. You may draw a diagram.

....

....

.... [1]

(b) **(i)** The student places block M on the metre rule as shown in Fig. 1.1 and adjusts the position of block M until the metre rule is as near to being balanced as possible.

Briefly describe a method to find the position at which the metre rule is as near to being balanced as possible.

....

....

....

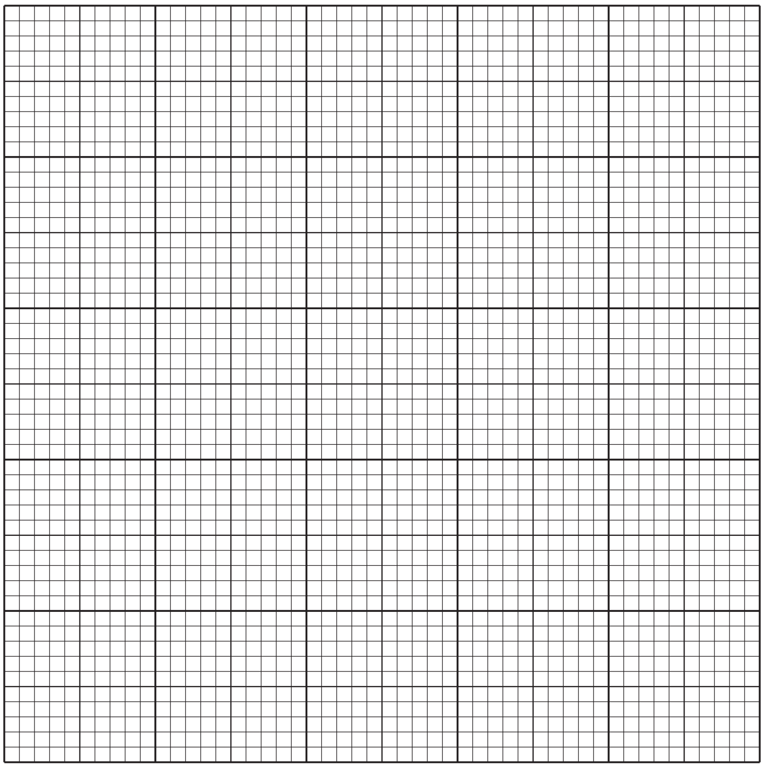
.... [1]

(ii) The student determines the distance *a* between the centre of block U and the pivot. He also determines the distance *b* between the centre of block U and the centre of block M. He repeats the procedure for positions of block U at the 10.0 cm, 15.0 cm, 20.0 cm and 25.0 cm marks.
His results are shown in Table 1.1.

Table 1.1

position of block U / cm	*a* / cm	*b* / cm
5.0	45.0	65.5
10.0	40.0	59.0
15.0	35.0	51.8
20.0	30.0	45.0
25.0	25.0	38.6

Plot a graph of *b* / cm (*y*-axis) against *a* / cm (*x*-axis). You do not need to start the axes at the origin (0,0).



[4]

(c) **(i)** Determine the gradient G of the graph. Show clearly on the graph how you obtained the necessary information.

G = ... [1]

(ii) Calculate the mass M_U of block U using the equation $M_U = (G - 1) \times k$, where $k = 200\,g$.

Record the value of M_U to a suitable number of significant figures for this experiment.

M_U = ... [2]

(d) A student suggests that a and b are proportional.
State whether the results support this suggestion.
Justify your statement by reference to some results from Table 1.1.

statement ....

justification ....

....

....
[2]

[Total: 11]

2 A student is investigating the transfer of thermal energy between hot water in a beaker and cold water in a glass boiling tube.

He is using the apparatus shown in Fig. 2.1.

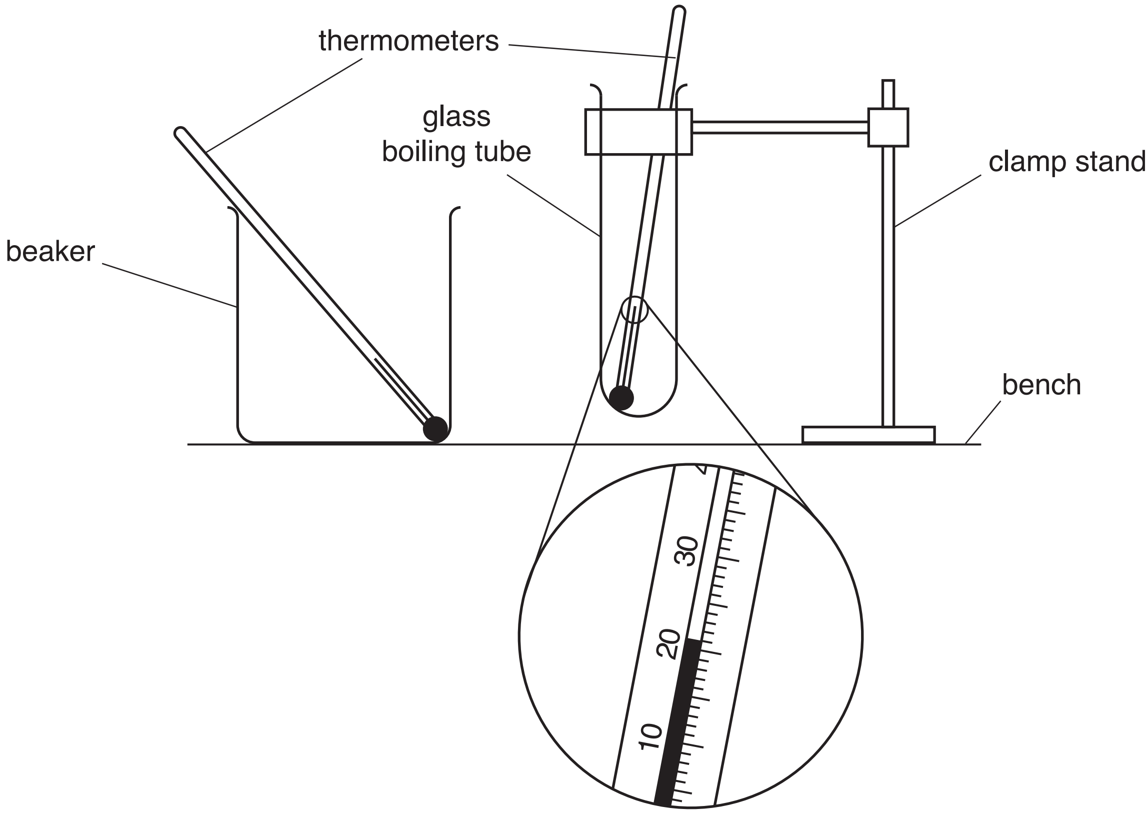


Fig. 2.1

(a) Record the room temperature θ_R, shown on the thermometer in the boiling tube.

θ_R = ... [1]

(b) The student pours cold water into the boiling tube and hot water into the beaker.
He places the boiling tube into the beaker of hot water.
He then records the temperatures θ_C of the water in the boiling tube and the temperatures θ_H of the water in the beaker every 30 s.

His readings are shown in Table 2.1.

(i) Complete the headings and the time column in Table 2.1. [2]

(ii) It is difficult to read both thermometers every 30 s.
Describe briefly a technique that would ensure the temperature readings are as accurate as possible in the experiment.

....

....

.... [1]

Table 2.1

	boiling tube	beaker	difference in temperature
t /	θ_C /	θ_H /	$(\theta_H - \theta_C)$ /
0	19.5	88.5	69.0
	31.0	83.0	52.0
	39.5	80.0	40.5
	47.5	77.5	30.0
	54.0	75.5	21.5
	59.0	74.0	15.0
	63.0	73.0	10.0

(c) Write a conclusion stating how the difference in temperature between the cold water and the hot water affects the rate of heating of the water in the boiling tube.

Justify your answer by reference to the readings.

....

....

....

.... [2]

(d) **(i)** State what you expect the temperature in the boiling tube will be when θ_C stops rising. Justify your answer by reference to the readings.

statement ....

justification ....

....

.... [2]

(ii) State what you predict the temperature θ_H of the water in the beaker will be after a few hours.

θ_H = ... [1]

(e) Suggest **two** changes that could be made to the apparatus or the procedure to ensure that the temperature θ_C of the cold water in the boiling tube rises more quickly.

1. ....

....

....

2. ....

....

.... [2]

[Total: 11]

3 Some students are investigating a circuit containing different resistors.

They are using the circuit shown in Fig. 3.1.

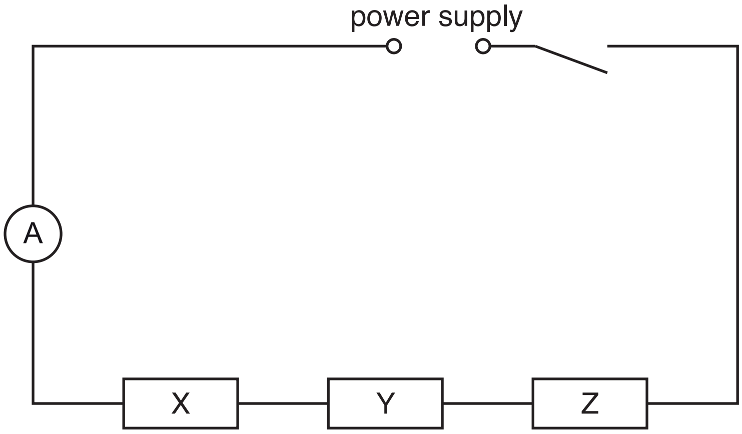


Fig. 3.1

(a) On Fig. 3.1, draw the symbol for a voltmeter connected to measure the potential difference V across resistor X. [1]

(b) A student connects the voltmeter as described in **(a)** and measures the current I in the circuit and the potential difference V across resistor X.

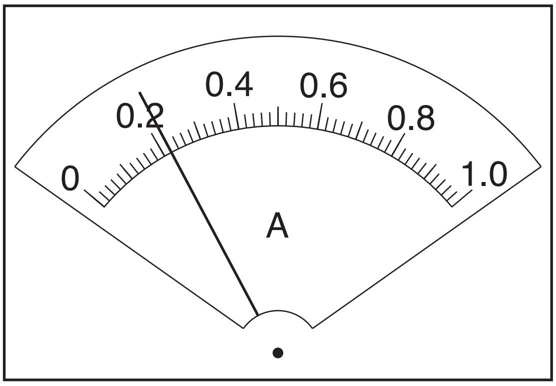


Fig. 3.2

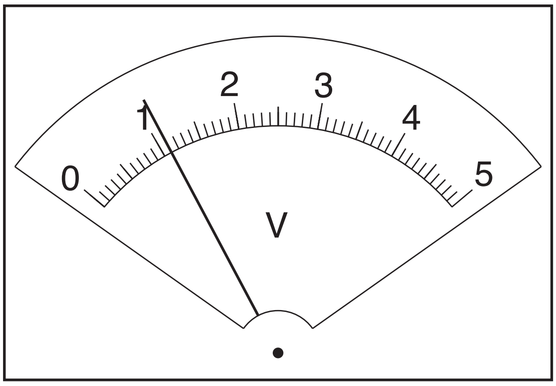


Fig. 3.3

Read, and record in Table 3.1, the values of I and V shown on the meters in Fig. 3.2 and in Fig. 3.3.

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Table 3.1

resistor combination	I /	V /	R /
X			
X and Y	0.23	3.3	
X, Y and Z	0.21	5.0	

The student connects the voltmeter to measure the potential difference V across the combination of resistors X and Y together and then X, Y and Z together.
Her readings are shown in Table 3.1.

Complete the headings in Table 3.1.

[3]

(c) A student suggests that the current should remain constant when the voltmeter is used to measure potential differences across the different combinations of resistors.
State whether the readings in Table 3.1 support this suggestion.
Justify your answer by reference to the readings.

statement ....

justification ....

....

....
[1]

(d) **(i)** Calculate, and record in Table 3.1, the resistance R of each combination of resistors.
Use the readings from Table 3.1 and the equation $R = \frac{V}{I}$.

[2]

(ii) For resistors in series, the total resistance of the combination is the sum of the individual resistances.
Use your results from Table 3.1 to calculate the resistances R_Y and R_Z of resistors Y and Z.

R_Y = ...

R_Z = ...
[1]

(e) **(i)** The circuit components are to be rearranged so that

- resistors X, Y and Z are in parallel
- the ammeter will measure the current in the circuit
- the voltmeter will measure the potential difference across the resistors.

In the space below, draw a diagram of this circuit.

[2]

(ii) One student sets up the circuit as described in **(e)(i)**.
She measures the current I_P in the circuit and the potential difference V_P across the resistors.
She uses these values to calculate the resistance R_P of the resistors in parallel.

R_P = ...2.31.......... Ω

Use the student's result and your result from Table 3.1 to compare R_P with the resistance R_S of the three resistors connected in series.
Tick the box next to the description that most closely matches the results.

☐ $R_P = R_S$

☐ $R_P = 10R_S$

☐ $10R_P = R_S$

☐ None of these descriptions apply

[1]

[Total: 11]

4 A student wants to investigate the factors that affect the height to which a ball bounces when it is dropped.

Plan an experiment that will enable him to investigate in detail how the height from which a ball is dropped affects how high it bounces.

The apparatus available includes:

balls of different materials and sizes
sheets of different floor coverings.

Write a plan for the experiment.

In your plan, you should:

- list any additional apparatus needed
- explain briefly how you would carry out the experiment
- describe a precaution which could be taken to ensure that measurements of the height of bounce are reliable
- state the key variables that you would control
- draw a table, with column headings, to show how you would display your readings (you are **not** required to enter any readings in the table)
- explain how you could analyse your readings to reach a conclusion.

You may draw a diagram if it helps to explain your plan.

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.... [7]

[Total: 7]

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/51**

Paper 5 Practical Test **October/November 2019**

CONFIDENTIAL INSTRUCTIONS

2676433250

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DC (PQ/TP) 176075/2

Cambridge Assessment International Education

General information about practical exams

Centres must follow the guidance on science practical exams given in the *Cambridge Handbook*.

Safety

Supervisors must follow national and local regulations relating to safety and first aid.

Only those procedures described in the question paper should be attempted.

Supervisors must inform candidates that materials and apparatus used in the exam should be treated with caution. Suitable eye protection should be used where necessary.

Before the exam

- The packets containing the question papers must **not** be opened before the exam.
- It is assumed that standard school laboratory facilities, as indicated in the *Guide to Planning Practical Science*, will be available.
- Spare materials and apparatus for the tasks set must be available for candidates, if required.

During the exam

- It must be made clear to candidates at the start of the exam that they may request spare materials and apparatus for the tasks set.
- Where specified, the supervisor **must** perform the experiments and record the results as instructed. This must be done **out of sight** of the candidates, using the same materials and apparatus as the candidates.
- Any assistance provided to candidates must be recorded in the supervisor's report.
- If any materials or apparatus need to be replaced, for example, in the event of breakage or loss, this must be recorded in the supervisor's report.

After the exam

- The supervisor must complete a report for each practical session held and each laboratory used.
- Each packet of scripts returned to Cambridge International must contain the following items:
  - the scripts of the candidates specified on the bar code label provided
  - the supervisor's results relevant to these candidates
  - the supervisor's reports relevant to these candidates
  - seating plans for each practical session, referring to each candidate by candidate number
  - the attendance register.

Specific information for this practical exam

Question 1

Items to be supplied by the Centre (per set of apparatus unless otherwise specified)

- **(i)** Metre rule with a mm scale. See note 1.
- **(ii)** Triangular block to act as a pivot for the metre rule. This block is to stand on the bench.
- **(iii)** Masses of 50 g, 80 g, 100 g, 120 g and 150 g labelled **0.5 N**, **0.8 N**, **1.0 N**, **1.2 N** and **1.5 N** respectively. See note 2.

Notes

1. If the metre rule has two scales in opposite directions, one scale must be taped over.
2. The triangular block can be made of any solid material that is durable enough to support the ruler **(i)** and the masses in **(iii)**. When placed on a surface with its apex pointing upward, the height of the apex should be about 5–8 cm above the surface.
3. Any suitable masses that can rest on the metre rule can be used. Slotted masses taped together are suitable.

Action at changeover

Remove the masses from the rule.

Remove the rule from the pivot.

Check that the apparatus is ready for the next candidate.

Question 2

Items to be supplied by the Centre (per set of apparatus unless otherwise specified)

(i) Power supply with an output potential difference (p.d.) of 1.5V–3V. Where candidates are provided with a power supply with a variable output p.d., the p.d. must be set by the Supervisor and fixed (e.g. taped). See note 2.

(ii) Three identical lamps in suitable holders. Any lamps will suffice, provided that they glow when connected as shown in Fig. 2.1. See note 3.

(iii) Switch. The switch may be an integral part of the power supply.

(iv) Ammeter capable of reading up to 1.00A with a resolution of at least 0.05A. See note 4.

(v) Voltmeter capable of measuring the supply p.d. with a resolution of at least 0.1V. See note 4.

(vi) Sufficient connecting leads to construct the circuit shown in Fig. 2.1, with two additional leads.

(vii) Spare lamps should be available.

Notes

1. The circuit is to be connected by the Supervisor as shown in Fig. 2.1.

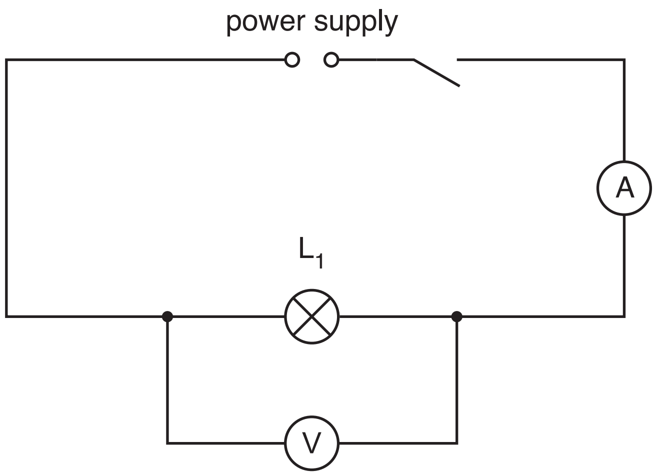

Fig. 2.1

2. If cells are to be used, they must remain adequately charged throughout the examination. Spare cells must be available.

3. The lamps must be labelled L_1, L_2 and L_3. The lamps must have suitable terminals so that candidates are able easily and quickly to rearrange the circuit. Spare lamps should be available.

4. Either analogue or digital meters are suitable. Any variable settings must be set by the Supervisor and fixed (e.g. taped). Spare meters should be available.

Action at changeover

Set up the circuit so that it is arranged as shown in Fig. 2.1.

Check that the circuit and all the lamps work. Switch off.

Question 3

Items to be supplied by the Centre (per set of apparatus, unless otherwise specified)

(i) Thermometer, –10 °C to 110°C, graduated in 1°C intervals.

(ii) 250 cm^3 beaker.

(iii) 250 cm^3 measuring cylinder.

(iv) Stopclock or stopwatch or wall-mounted clock showing seconds. Candidates will be required to take readings at 60-second intervals. Candidates may use their own wristwatches. The question will refer to a stopclock.

(v) Supply of hot water. See notes 1 and 2.

(vi) Supply of paper towels to mop up any spills of water.

Notes

1. The hot water is to be supplied for each candidate by the Supervisor. The water should be maintained at a temperature as hot as is reasonably and safely possible. Each candidate will require about 300 cm^3 of hot water.

2. Candidates should be warned of the dangers of burns or scalds when using hot water.

Action at changeover

Empty the beaker and measuring cylinder.

Check the supply of hot water.

Question 4

No apparatus is required for this question.

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Supervisor's report

Syllabus and component number | | | | | / | | |

Centre number | | | | | |

Centre name ....

Time of the practical session ....

Laboratory name/number ....

Give details of any difficulties experienced by the centre or by candidates (include the relevant candidate names and candidate numbers).

You must include:

- any difficulties experienced by the centre in the preparation of materials
- any difficulties experienced by candidates, e.g. due to faulty materials or apparatus
- any specific assistance given to candidates.

Declaration

1 Each packet that I am returning to Cambridge International contains the following items:

- ☐ the scripts of the candidates specified on the bar code label provided
- ☐ the supervisor's results relevant to these candidates
- ☐ the supervisor's reports relevant to these candidates
- ☐ seating plans for each practical session, referring to each candidate by candidate number
- ☐ the attendance register

2 Where the practical exam has taken place in more than one practical session, I have clearly labelled the supervisor's results, supervisor's reports and seating plans with the time and laboratory name/number for each practical session.

3 I have included details of difficulties relating to each practical session experienced by the centre or by candidates.

4 I have reported any other adverse circumstances affecting candidates, e.g. illness, bereavement or temporary injury, directly to Cambridge International on a *special consideration form*.

Signed .... (supervisor)

Name (in block capitals) ....

Cambridge IGCSE

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PHYSICS **0625/52**

Paper 5 Practical Test **October/November 2019**

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Only those procedures described in the question paper should be attempted.

Supervisors must inform candidates that materials and apparatus used in the exam should be treated with caution. Suitable eye protection should be used where necessary.

Before the exam

- The packets containing the question papers must **not** be opened before the exam.
- It is assumed that standard school laboratory facilities, as indicated in the *Guide to Planning Practical Science*, will be available.
- Spare materials and apparatus for the tasks set must be available for candidates, if required.

During the exam

- It must be made clear to candidates at the start of the exam that they may request spare materials and apparatus for the tasks set.
- Where specified, the supervisor **must** perform the experiments and record the results as instructed. This must be done **out of sight** of the candidates, using the same materials and apparatus as the candidates.
- Any assistance provided to candidates must be recorded in the supervisor's report.
- If any materials or apparatus need to be replaced, for example, in the event of breakage or loss, this must be recorded in the supervisor's report.

After the exam

- The supervisor must complete a report for each practical session held and each laboratory used.
- Each packet of scripts returned to Cambridge International must contain the following items:
    - the scripts of the candidates specified on the bar code label provided
    - the supervisor's results relevant to these candidates
    - the supervisor's reports relevant to these candidates
    - seating plans for each practical session, referring to each candidate by candidate number
    - the attendance register.

Specific information for this practical exam

Apparatus for Question 1

Items to be supplied by the centre (per set of apparatus unless otherwise specified)

(i) Clamp, boss and stand.

(ii) Pendulum bob attached to approximately 110 cm of thin inextensible string.

(iii) Metre rule, graduated in mm.

(iv) Stopwatch with a minimum precision of 0.1 s. Candidates may use their own wristwatch if they wish.

(v) Split cork or similar device to hold the string of the pendulum between the jaws of the clamp.

Notes

1. The pendulum should be set up for the candidates with length approximately 60 cm from the bottom of the split cork to the bottom of the pendulum bob.

2. Candidates must be able easily to adjust the length of the pendulum up to a length of 100 cm.

3. It may be necessary to increase the stability of the clamp stand (for example, using a G-clamp or by placing a weight on the base).

Action at changeover

Arrange the pendulum as described in Note 1.

Apparatus for Question 2

Items to be supplied by the centre (per set of apparatus unless otherwise specified)

(i) Power supply of approximately 1.5 V – 3 V. Where candidates are provided with a power supply with a variable output voltage, the voltage must be set by the Supervisor and fixed (e.g. taped). See note 2.

(ii) Switch. The switch may be an integral part of the power supply.

(iii) Ammeter capable of reading up to 1.00 A with a resolution of at least 0.05 A. See note 3.

(iv) Voltmeter capable of measuring the supply p.d. with a resolution of at least 0.1 V. See note 3.

(v) Metre rule, graduated in mm. See notes 1, 4 and 5.

(vi) Approximately 105 cm of straight, bare constantan (Eureka) wire. The resistance of the wire must be in the range 5 Ω – 8 Ω. Diameter 0.45 mm (26 swg) or 0.38 mm (28 swg) or 0.32 mm (30 swg) are suitable. The wire must be taped to the metre rule only between the 3 cm and 7 cm marks and between the 93 cm and 97 cm marks. The end of the wire at the zero end of the rule is to be labelled **P**. See note 4.

(vii) Two suitable terminals (e.g. crocodile clips) attached to the constantan wire at the ends of the metre rule so that connections can be made to the circuit shown in Fig. 2.1.

(viii) Sliding contact, labelled '**C**'. This may be a jockey or a small screwdriver connected to a lead by means of a crocodile clip.

(ix) Sufficient connecting leads to set up the circuit shown in Fig. 2.1.

Notes

1. The circuit is to be set up for the candidates as shown in Fig. 2.1.

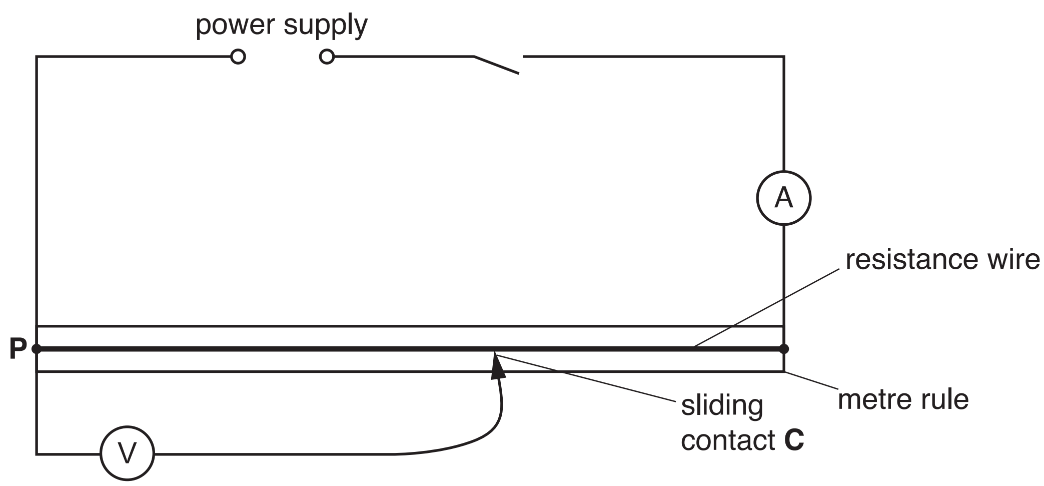

Fig. 2.1

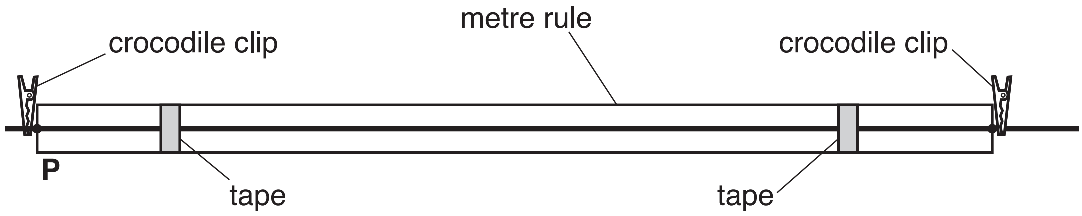

Fig. 2.2

2. If cells are to be used, they must remain adequately charged throughout the examination. Spare cells should be available.

3. Either analogue or digital meters are suitable. Any variable settings should be set by the Supervisor and fixed (e.g. taped). Spare meters should be available.

4. The wire must be attached to the metre rule as shown in Fig. 2.2.

5. If the metre rule has two scales in opposite directions, one scale must be taped over.

Action at changeover

Check that the circuit is arranged as shown in Fig. 2.1.

Check that the circuit works. Switch off.

Apparatus for Question 3

Items to be supplied by the centre (per set of apparatus unless otherwise specified)

(i) Converging lens, focal length 14 cm – 16 cm, with a suitable holder. See note 2.

(ii) Illuminated object with a triangular hole of height 1.5 cm (see Figs. 3.1 and 3.2). The hole is to be covered with thin translucent paper (e.g. tracing paper). See note 2.

(iii) Metre rule, graduated in mm.

(iv) Screen. A white sheet of stiff card approximately 15 cm × 15 cm, fixed to a wooden support is suitable. See Fig. 3.3.

(v) Spare lamps should be available.

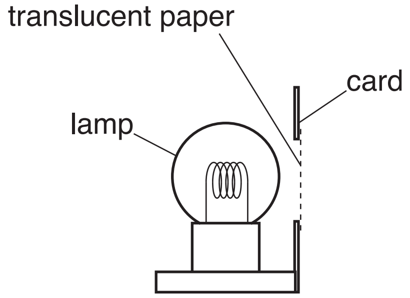

Fig. 3.1

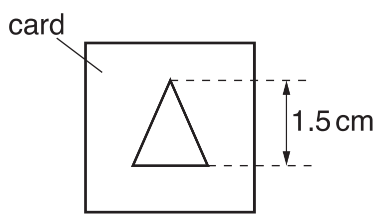

Fig. 3.2

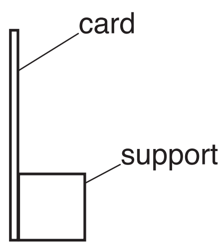

Fig. 3.3

Notes

1. The lamp for the illuminated object should be a low-voltage lamp, approximately 24 W or higher power (a car headlamp bulb is suitable), with a suitable power supply.

2. The centre of the hole which forms the object, the lamp filament and the centre of the lens in its holder are all to be at the same height above the bench.

3. The apparatus is to be situated away from direct sunlight.

Action at changeover

Check that the apparatus is ready for the next candidate.

Question 4

No apparatus is required for this question.

Supervisor’s report

Syllabus and component number | | | | | / | | |

Centre number | | | | | |

Centre name ....

Time of the practical session ....

Laboratory name/number ....

Give details of any difficulties experienced by the centre or by candidates (include the relevant candidate names and candidate numbers).

You must include:

- any difficulties experienced by the centre in the preparation of materials
- any difficulties experienced by candidates, e.g. due to faulty materials or apparatus
- any specific assistance given to candidates.

Declaration

1 Each packet that I am returning to Cambridge International contains the following items:

- ☐ the scripts of the candidates specified on the bar code label provided
- ☐ the supervisor's results relevant to these candidates
- ☐ the supervisor's reports relevant to these candidates
- ☐ seating plans for each practical session, referring to each candidate by candidate number
- ☐ the attendance register

2 Where the practical exam has taken place in more than one practical session, I have clearly labelled the supervisor's results, supervisor's reports and seating plans with the time and laboratory name/number for each practical session.

3 I have included details of difficulties relating to each practical session experienced by the centre or by candidates.

4 I have reported any other adverse circumstances affecting candidates, e.g. illness, bereavement or temporary injury, directly to Cambridge International on a *special consideration form*.

Signed .... (supervisor)

Name (in block capitals) ....

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/53**

Paper 5 Practical Test **October/November 2019**

CONFIDENTIAL INSTRUCTIONS

1205566786

This document gives details of how to prepare for and administer the practical exam.

The information in this document and the identity of any materials supplied by Cambridge International are confidential and must NOT reach candidates either directly or indirectly.

The supervisor must complete the report at the end of this document and return it with the scripts.

If you have any queries regarding these confidential instructions, contact Cambridge International stating the centre number, the syllabus and component number and the nature of the query.

email info@cambridgeinternational.org
phone +44 1223 553554
fax +44 1223 553558

This document consists of **8** printed pages.

DC (SC/CB) 176071/1

General information about practical exams

Centres must follow the guidance on science practical exams given in the *Cambridge Handbook*.

Safety

Supervisors must follow national and local regulations relating to safety and first aid.

Only those procedures described in the question paper should be attempted.

Supervisors must inform candidates that materials and apparatus used in the exam should be treated with caution. Suitable eye protection should be used where necessary.

Before the exam

- The packets containing the question papers must **not** be opened before the exam.
- It is assumed that standard school laboratory facilities, as indicated in the *Guide to Planning Practical Science*, will be available.
- Spare materials and apparatus for the tasks set must be available for candidates, if required.

During the exam

- It must be made clear to candidates at the start of the exam that they may request spare materials and apparatus for the tasks set.
- Where specified, the supervisor **must** perform the experiments and record the results as instructed. This must be done **out of sight** of the candidates, using the same materials and apparatus as the candidates.
- Any assistance provided to candidates must be recorded in the supervisor's report.
- If any materials or apparatus need to be replaced, for example, in the event of breakage or loss, this must be recorded in the supervisor's report.

After the exam

- The supervisor must complete a report for each practical session held and each laboratory used.
- Each packet of scripts returned to Cambridge International must contain the following items:
  - the scripts of the candidates specified on the bar code label provided
  - the supervisor's results relevant to these candidates
  - the supervisor's reports relevant to these candidates
  - seating plans for each practical session, referring to each candidate by candidate number
  - the attendance register.

Specific information for this practical exam

Question 1

Items to be supplied by the centre (per set of apparatus unless otherwise specified)

(i) A resistance wire about 105 cm in length. 32 swg (0.274 mm diameter) constantan (Eureka) is suitable, or any other wire with a resistance of approximately $8\,\Omega\,m^{-1}$. See note 1.

(ii) Filament lamp, 2.5 V 0.2 A, or similar, in holder.

(iii) Metre rule, graduated in mm. See note 1.

(iv) Power supply of 2 V to 3 V. See note 3.
Where candidates are provided with a variable power supply, the voltage should be set by the Supervisor and fixed, e.g. taped.

(v) Switch. The switch may be an integral part of the power supply.

(vi) Sufficient connecting leads to set up the circuit shown in Fig. 1.1.

(vii) Crocodile clip.

(viii) Ammeter capable of measuring currents up to 1.00 A with a resolution of at least 0.05 A. See note 4.

(ix) Voltmeter capable of measuring up to 3.0 V with a resolution of at least 0.1 V. See note 4.

Notes

1. The resistance wire is to be fixed to the metre rule in such a way as to allow candidates to connect a crocodile clip to lengths of the wire from 20.0 cm to 100.0 cm. The 0.0 cm mark of the metre rule must be in the position indicated in Fig. 1.1. If the metre rule has two scales in opposite directions, one must be taped over.

2. The circuit is to be set up for candidates as shown in Fig. 1.1, with the crocodile clip clipped to the resistance wire. The position of the crocodile clip is not important.

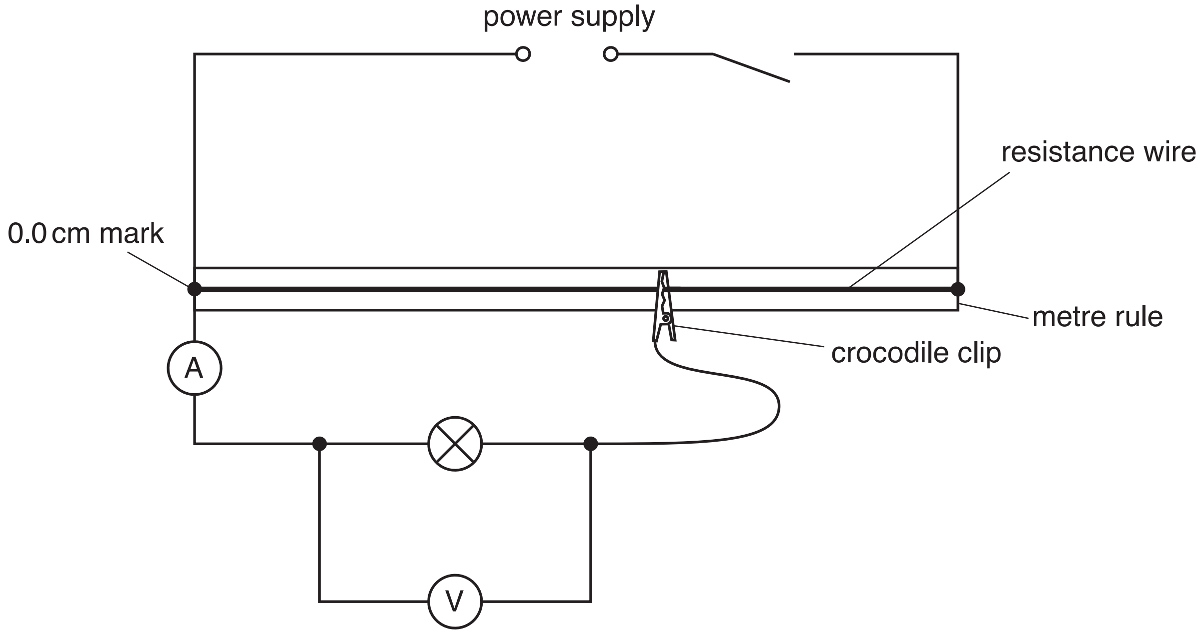

Fig. 1.1

3. If cells are used, they must remain adequately charged throughout the examination. Spare cells must be available.

4. Either analogue or digital meters are suitable. Any variable settings should be set by the Supervisor and fixed, e.g. taped. Spare meters should be available.

Action at changeover

Ensure that the circuit is connected as shown in Fig. 1.1 and check that the circuit and the lamp are working.
Switch the circuit off.

Question 2

Items to be supplied by the centre (per set of apparatus unless otherwise specified)

(i) Converging lens of focal length approximately 15 cm to 18 cm with a suitable holder. See note 2.

(ii) Metre rule, graduated in mm.

(iii) Illuminated object consisting of rigid card with a triangular hole of height 1.5 cm (see Fig. 2.1). The hole is to be covered with thin translucent paper (e.g. tracing paper) secured with adhesive tape. See note 2.

(iv) Screen. A white sheet of stiff card approximately 150 mm × 150 mm, fixed to a wooden support is suitable (see Fig. 2.2).

(v) 50 cm or 30 cm ruler, graduated in mm. Candidates may use their own.

Notes

1. The lamp used for the illuminated object should be low voltage, 24 W or greater.

2. The lamp filament, the centre of the hole which forms the object and the centre of the lens in its holder must all be the same height above the bench.

3. The apparatus should be situated away from direct sunlight.

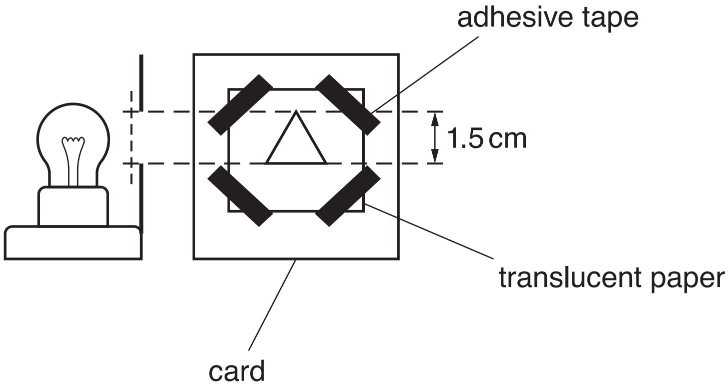

Fig. 2.1

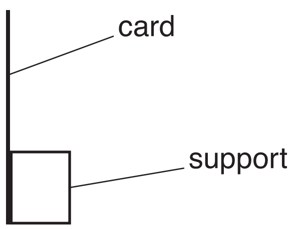

Fig. 2.2

Action at changeover

Check that the apparatus is intact and that the lamp is working.

Question 3

Items to be supplied by the centre (per set of apparatus unless otherwise specified)

(i) Steel spring. See note 1.

(ii) Clamp, boss and stand. See note 2.

(iii) Masses of 100 g, 200 g and 300 g, labelled 1.0 N, 2.0 N and 3.0 N respectively. See note 3.

(iv) Object of mass approximately 230 g, labelled '**X**'. See note 4.

(v) 50 cm or 30 cm ruler, graduated in mm. Candidates may use their own.

Notes

1. An expendable steel spring is suitable, for example a spring with a diameter of 16 mm and a length of 20 mm across the unextended coils (e.g. Philip Harris expendable steel spring B8G87194, www.philipharris.co.uk). The spring must be able to support a load of at least 5 N without overstretching.

2. The clamp, boss and stand must be set up with the spring suspended from the clamp. The stand must be sufficiently tall to support the spring with the 3.0 N load, without the load touching the bench.

3. The masses must each include a hanger so that they can be hung from the spring.

4. The object **X** must include a hanger. It could be formed from a 100 g mass hanger surrounded by modelling clay. It must be made up in such a way that candidates cannot easily detect its mass.

5. Spare springs must be available.

Action at changeover

Remove the load from the spring if necessary.
Check that the spring has not been deformed by overstretching and replace if necessary.

Question 4

No apparatus is required for this question.

Supervisor's report

Syllabus and component number | | | | | / | | |

Centre number | | | | | |

Centre name ....

Time of the practical session ....

Laboratory name/number ....

Give details of any difficulties experienced by the centre or by candidates (include the relevant candidate names and candidate numbers).

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- [ ] the supervisor's reports relevant to these candidates
- [ ] seating plans for each practical session, referring to each candidate by candidate number
- [ ] the attendance register

2 Where the practical exam has taken place in more than one practical session, I have clearly labelled the supervisor's results, supervisor's reports and seating plans with the time and laboratory name/number for each practical session.

3 I have included details of difficulties relating to each practical session experienced by the centre or by candidates.

4 I have reported any other adverse circumstances affecting candidates, e.g. illness, bereavement or temporary injury, directly to Cambridge International on a *special consideration form*.

Signed .... (supervisor)

Name (in block capitals) ....

Cambridge Assessment International Education

Grade thresholds – November 2019

Cambridge IGCSE™ Physics (0625)

Grade thresholds taken for Syllabus 0625 (Physics) in the November 2019 examination.

		minimum raw mark required for grade:						
	maximum raw mark available	A	B	C	D	E	F	G
Component 11	40	–	–	25	22	20	18	17
Component 12	40	–	–	25	23	20	17	14
Component 13	40	–	–	22	20	18	16	14
Component 21	40	29	26	23	20	17	14	11
Component 22	40	30	26	23	20	18	15	13
Component 23	40	27	24	21	18	15	13	11
Component 31	80	–	–	50	42	35	28	20
Component 32	80	–	–	54	44	35	26	17
Component 33	80	–	–	50	44	37	30	24
Component 41	80	45	36	26	21	16	12	8
Component 42	80	43	34	23	20	15	12	8
Component 43	80	46	36	25	21	16	12	8
Component 51	40	31	28	26	22	17	13	8
Component 52	40	30	27	25	22	20	18	16
Component 53	40	26	24	22	19	17	14	11
Component 61	40	30	26	23	21	18	15	11
Component 62	40	30	27	24	21	19	16	13
Component 63	40	23	20	18	16	15	13	11

Grade A* does not exist at the level of an individual component.

The maximum total mark for this syllabus, after weighting has been applied, is **200**.

The overall thresholds for the different grades were set as follows.

Option	Combination of Components	A*	A	B	C	D	E	F	G
BX	21, 41, 51	150	131	112	93	78	63	49	35
BY	22, 42, 52	150	129	108	88	77	66	56	46
BZ	23, 43, 53	144	124	104	85	72	60	49	38
CX	21, 41, 61	150	130	110	90	77	64	51	38

Grade thresholds continued
Cambridge IGCSE Physics (0625)

Option	Combination of Components	A*	A	B	C	D	E	F	G
CY	22, 42, 62	150	129	108	87	76	65	54	43
CZ	23, 43, 63	141	121	101	81	69	58	48	38
FX	11, 31, 51	–	–	–	126	108	91	75	59
FY	12, 32, 52	–	–	–	130	112	94	76	58
FZ	13, 33, 53	–	–	–	118	104	90	76	62
GX	11, 31, 61	–	–	–	123	107	92	77	62
GY	12, 32, 62	–	–	–	129	111	93	74	55
GZ	13, 33, 63	–	–	–	114	101	88	75	62

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/11**

Paper 1 Multiple Choice (Core) **October/November 2019**

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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This document consists of **3** printed pages.

Question	Answer	Marks
1	B	**1**
2	C	**1**
3	B	**1**
4	C	**1**
5	D	**1**
6	D	**1**
7	C	**1**
8	C	**1**
9	C	**1**
10	B	**1**
11	A	**1**
12	C	**1**
13	C	**1**
14	B	**1**
15	C	**1**
16	C	**1**
17	C	**1**
18	A	**1**
19	D	**1**
20	A	**1**
21	C	**1**
22	C	**1**
23	C	**1**
24	C	**1**
25	D	**1**
26	B	**1**
27	A	**1**
28	A	**1**

Question	Answer	Marks
29	C	**1**
30	C	**1**
31	D	**1**
32	D	**1**
33	A	**1**
34	B	**1**
35	C	**1**
36	B	**1**
37	A	**1**
38	D	**1**
39	D	**1**
40	A	**1**

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/12**

Paper 1 Multiple Choice (Core) **October/November 2019**

MARK SCHEME

Maximum Mark: 40

Published

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This document consists of **3** printed pages.

Question	Answer	Mark
1	A	**1**
2	B	**1**
3	B	**1**
4	A	**1**
5	D	**1**
6	D	**1**
7	D	**1**
8	C	**1**
9	C	**1**
10	C	**1**
11	A	**1**
12	C	**1**
13	A	**1**
14	A	**1**
15	D	**1**
16	D	**1**
17	B	**1**
18	A	**1**
19	B	**1**
20	D	**1**
21	B	**1**
22	C	**1**
23	C	**1**
24	C	**1**
25	D	**1**
26	B	**1**
27	C	**1**
28	A	**1**

Question	Answer	Mark
29	C	**1**
30	B	**1**
31	D	**1**
32	D	**1**
33	B	**1**
34	B	**1**
35	B	**1**
36	A	**1**
37	D	**1**
38	C	**1**
39	A	**1**
40	A	**1**

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/13**

Paper 1 Multiple Choice (Core) **October/November 2019**

MARK SCHEME

Maximum Mark: 40

Published

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This document consists of **3** printed pages.

Question	Answer	Marks
1	B	**1**
2	A	**1**
3	B	**1**
4	B	**1**
5	A	**1**
6	D	**1**
7	D	**1**
8	A	**1**
9	C	**1**
10	B	**1**
11	C	**1**
12	C	**1**
13	A	**1**
14	A	**1**
15	A	**1**
16	D	**1**
17	C	**1**
18	A	**1**
19	D	**1**
20	C	**1**
21	A	**1**
22	C	**1**
23	B	**1**
24	C	**1**
25	D	**1**
26	B	**1**
27	C	**1**
28	A	**1**

Question	Answer	Marks
29	C	**1**
30	A	**1**
31	B	**1**
32	D	**1**
33	B	**1**
34	B	**1**
35	B	**1**
36	D	**1**
37	A	**1**
38	D	**1**
39	D	**1**
40	A	**1**

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/21**

Paper 2 Multiple Choice (Extended) **October/November 2019**

MARK SCHEME

Maximum Mark: 40

Published

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This document consists of **3** printed pages.

Question	Answer	Marks
1	C	**1**
2	C	**1**
3	B	**1**
4	C	**1**
5	D	**1**
6	B	**1**
7	D	**1**
8	C	**1**
9	B	**1**
10	C	**1**
11	D	**1**
12	C	**1**
13	C	**1**
14	B	**1**
15	C	**1**
16	D	**1**
17	A	**1**
18	A	**1**
19	C	**1**
20	B	**1**
21	A	**1**
22	C	**1**
23	A	**1**
24	D	**1**
25	D	**1**
26	D	**1**
27	C	**1**
28	D	**1**

Question	Answer	Marks
29	B	**1**
30	D	**1**
31	A	**1**
32	B	**1**
33	B	**1**
34	C	**1**
35	B	**1**
36	C	**1**
37	A	**1**
38	A	**1**
39	B	**1**
40	A	**1**

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/22**

Paper 2 Multiple Choice (Extended) **October/November 2019**

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination.

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This document consists of **3** printed pages.

Question	Answer	Mark
1	D	**1**
2	C	**1**
3	B	**1**
4	A	**1**
5	D	**1**
6	C	**1**
7	D	**1**
8	C	**1**
9	B	**1**
10	C	**1**
11	C	**1**
12	B	**1**
13	C	**1**
14	C	**1**
15	B	**1**
16	A	**1**
17	C	**1**
18	A	**1**
19	A	**1**
20	D	**1**
21	D	**1**
22	A	**1**
23	C	**1**
24	B	**1**
25	D	**1**
26	D	**1**
27	D	**1**
28	C	**1**

Question	Answer	Mark
29	D	**1**
30	D	**1**
31	A	**1**
32	A	**1**
33	A	**1**
34	B	**1**
35	B	**1**
36	C	**1**
37	D	**1**
38	B	**1**
39	B	**1**
40	A	**1**

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/23**

Paper 2 Multiple Choice (Extended) **October/November 2019**

MARK SCHEME

Maximum Mark: 40

Published

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This document consists of **3** printed pages.

Question	Answer	Marks
1	C	**1**
2	D	**1**
3	B	**1**
4	B	**1**
5	B	**1**
6	A	**1**
7	D	**1**
8	C	**1**
9	B	**1**
10	A	**1**
11	C	**1**
12	C	**1**
13	C	**1**
14	C	**1**
15	A	**1**
16	B	**1**
17	A	**1**
18	D	**1**
19	D	**1**
20	B	**1**
21	A	**1**
22	B	**1**
23	D	**1**
24	D	**1**
25	D	**1**
26	D	**1**
27	C	**1**
28	D	**1**

Question	Answer	Marks
29	D	**1**
30	B	**1**
31	C	**1**
32	B	**1**
33	B	**1**
34	B	**1**
35	B	**1**
36	B	**1**
37	A	**1**
38	A	**1**
39	C	**1**
40	C	**1**

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/31**

Paper 3 Core Theory **October/November 2019**

MARK SCHEME

Maximum Mark: 80

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

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This document consists of **11** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

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- marks are not deducted for errors
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NOTES ABOUT MARK SCHEME SYMBOLS AND OTHER MATTERS

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Significant	Answers are normally acceptable to any number of significant figures $\geqslant 2$. Any exceptions to this general rule will be specified in the mark scheme.

Question	Answer	Marks
1(a)	density = mass ÷ volume in any form OR (mass =) density × volume	**C1**
	mass = 1000 × 0.05	**C1**
	50 (kg)	**A1**
1(b)	Floats OR does not sink	**M0**
	density of full barrel OR its density OR density of plastic OR density of barrel OR density of (pure) water is less than sea water	**C1**
	density of plastic OR barrel AND (pure) water is less than sea water	**A1**

Question	Answer	Marks
2(a)	(student) S	**B1**
2(b)	83.37 (s) seen	**C1**
	83.37 ÷ 50	**C1**
	1.67 (s) cao	**A1**
2(c)	165 (mm)	**B1**

Question	Answer	Marks
3(a)	measure without any load / weights AND measure with load / weights	B1
	measure length OR ruler stated or seen	B1
	(extension =) difference in two values	B1
3(b)(i)	30 (cm)	B1
3(b)(ii)	2.5 (N)	B1
3(c)	W = m × g OR W = m × 10 OR (m =) W ÷ g in any form	C1
	6.0 ÷ 10	C1
	0.6(0) (kg)	A1

Question	Answer	Marks
4(a)(i)	stop the tractor tipping up/keep tractor level owtte	B1
4(a)(ii)	moment = force × (perp.) distance from pivot in any form	C1
	6000 × 2.1	C1
	12 600	A1
	Nm	B1
4(b)	Any **three** from: (wide tyres have) greater area (in contact with ground) pressure = force ÷ area in any form the bigger the area the smaller the pressure so tractor less likely to sink/become stuck (in soft ground)	B3

Question	Answer	Marks
5	Box 1 ✓	B3
	Box 2 ✓	
	Box 3	
	Box 4	
	Box 5 ✓	

Question	Answer	Marks
6(a)(i)	straight line to mirror **AND** normal correctly positioned	B1
6(a)(ii)	two correct reflections drawn	B1
6(a)(iii)	angle of incidence = angle of reflection	B1
6(b)	refracted away from normal	B1
	refracted along straight edge	B1
	totally internally reflected	B1

Question	Answer	Marks
7(a)(i)	ray from X through centre of lens	**B1**
7(a)(ii)	image drawn from axis to point where rays cross and labelled I	**B1**
7(a)(iii)	point labelled F where ray crosses principal axis	**B1**
7(a)(iv)	2.7 (cm) $\pm$ 0.2 cm	**B1**
7(b)	diminished 2nd box ticked	**B1**
	inverted 4th box ticked	**B1**

Question	Answer	Marks
8(a)(i)	(it is) vibrating	**B1**
8(a)(ii)	longitudinal	**B1**
8(a)(iii)	<u>frequency</u> (of sound) OR 25 kHz	**B1**
	is above (upper limit of) human hearing range OR is an ultrasound	**B1**
8(b)(i)	horizontal line with arrows at either end	**B1**
8(b)(ii)	(14.4 ÷ 4 =) 3.6 (cm)	**B1**
8(c)	Any **four** from: use of shallow water use of flat lamina or shape below surface / different depths (of water) used waves hit {shallower water / shape} at an angle (other than 90°) waves change direction (due to) change in speed	**B4**

Question	Answer	Marks
9(a)	correct field pattern for bar magnet	**B1**
	no lines crossing and good detail of curvature	**B1**
	correct direction of arrow, i.e. out from N pole	**B1**
9(b)	electrons	**M1**
	move from the rod/to the cloth	**A1**
9(c)	1. force of repulsion circled	**B1**
	2. no force circled	**B1**

Question	Answer	Marks
10(a)(i)	correct symbol for ammeter	**B1**
	correct symbol for voltmeter	**B1**
	ammeter in series and voltmeter in parallel with lamp	**B1**
10(a)(ii)	(R =) $V \div I$ OR $V = I \times R$ in any form	**C1**
	(R =) $4.5 \div 0.25$	**C1**
	18 (Ω)	**A1**
10(b)(i)	<u>variable</u> resistor	**B1**
10(b)(ii)	(sliding contact moved to) change resistance (in circuit)	**B1**
	(and so) change current (in lamp) or p.d. (across lamp)	**B1**

Question	Answer	Marks
11(a)	relative movement (between conductor and magnetic field) And any **two** from: connect conductor/coil to (sensitive) meter use of magnet/magnetic field	B1
	deflection on meter (indicates emf) OR voltage generated OR current in conductor	B2
11(b)(i)	(soft-) iron	B1
11(b)(ii)	more turns on output coil (than input coil) ora	B1
11(b)(iii)	Vs / Vp = Ns / Np in any form	C1
	Vs / 12 = 300 / 20 OR Vs = (300 / 20) × 12 OR Vs = 15 × 12 OR 12 / 20 = ? / 300	C1
	180 (V)	A1

Question	Answer	Marks
12(a)	2.5 (minutes)	B1
12(b)	any answer above 1246 (counts/s), e.g. 1247	B1
12(c)	1. helium nucleus OR 2 protons **AND** 2 neutrons	B1
	2. strongly (ionising)	B1
	3. weakly (penetrating)	B1

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS	**0625/32**
Paper 3 Core Theory	**October/November 2019**
MARK SCHEME	
Maximum Mark: 80	

Published

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Significant Figures	Answers are normally acceptable to any number of significant figures ≥ 2. Any exceptions to this general rule will be specified in the mark scheme. A second (or further) sig. fig. error in a single question is not penalised; annotate with SF SF. It is normally acceptable to quote just 1 s.f. for answers, which are exact to 1 s.f
Arithmetic errors	If the **only** error in arriving at a final answer is clearly an arithmetic one, then the mark awarded will be one mark lower than the maximum mark. Regard a power-of-ten error as an arithmetic error unless otherwise specified in the mark scheme. Annotate with POT. However if the power-of-ten error is due to the wrong omission or inclusion of g (= 10 N / kg) this rule does not apply. The use of a wrong SI prefix in the final answer is counted as a power-of-ten error rather than a unit error.
Transcription errors	If the only error in arriving at a final answer is because previously calculated data has clearly been misread, but used correctly, then for that part question the mark will be one less than the maximum mark
Fractions	Allow these only where specified in the mark scheme; they are a form of sig. fig. error; annotate with SF. Consequently, when a sig. fig. error and a fraction is used in the same question, the second answer may still be awarded full marks.
Crossed out	Work which has been crossed out **and not replaced but can easily be read**, should be marked as if it had not been crossed out. Look to see if it has been replaced on a blank page or another part of the same page.
Use of **NR**	(# or / key on the keyboard). Use this if the answer space for a question is completely blank or contains no readable words, figures or symbols.

Question	Answer	Marks
1(a)(i)	13.2(0) (s)	**B1**
1(a)(ii)	13.2 ÷ 30	**C1**
	0.44 (s)	**A1**
1(a)(iii)	reduces the effects of (timing / reaction time) errors owtte	**B1**
1(b)	Drops are accelerating **OR** moving with increasing speed	**B1**
1(c)	distance = area under graph OR ½ × b × h	**C1**
	0.5 × 1.5 × 15	**C1**
	11.25 (m)	**A1**

Question	Answer	Marks
2(a)	Any **four** from: pour some water into measuring cylinder record volume / reading of water (in measuring cylinder) place metal in water (in cylinder and completely submerge) record volume of water and metal (in cylinder) subtract starting volume from final volume (to give volume of metal)	**B4**
2(b)(i)	balance	**B1**
2(b)(ii)	density = mass ÷ volume	**C1**
	146 ÷ 20	**C1**
	7.3	**A1**
	g/cm^3	**B1**

Question	Answer	Marks
3(a)(i)	10 (N) AND forwards/to the right	**B1**
3(a)(ii)	friction (between swimmer and water)	**B1**
3(a)(iii)	(now) moving at steady/constant speed	**B1**
	forces (now)balanced / in equilibrium **OR** forward force = backward force OR no resultant force	**B1**
3(b)	moment = force × (perp.) distance (from pivot)	**C1**
	700 × 3.5	**C1**
	2450 (N m)	**A1**

Question	Answer	Marks
4(a)	below	**B1**
4(b)	B A D C	**B3**

Question	Answer	Marks
5(a)	gas AND oil both circled	**B1**
5(b)	water is heated / **changed to steam** as it passes through (fractures in) rocks	**B1**
	steam turns a turbine	**B1**
	the turbine drives a generator	**B1**
	generator produces electricity	**B1**

Question	Answer	Marks
6(a)(i)	mercury or alcohol	**B1**
6(a)(ii)	0 (°C) **AND** 100 (°C)	**B1**
6(b)(i)	conduction	**B1**
6(b)(ii)	Any **three** from: (heat causes) water molecules (to) move further apart OR (hot) water expands / volume increases (hot water) is less dense NOT molecules less dense/expand (so hot / less dense) water rises (and is replaced by cooler / more dense water) convection / current (in water)	**B3**

Question	Answer	Marks
7(a)	no fixed position	**B1**
	(average) distance between molecules is greater than that of solids and liquids	**B1**
	molecules move in any direction owtte at high speeds	**B1**
7(b)(i)	change of direction	**B1**
	minimum of two straight lines drawn	**B1**
7(b)(ii)	Brownian (movement)	**B1**

Question	Answer	Marks
8(a)	top box ticked C to F_1	**B1**
8(b)	Diagonal ray through F1 to lens then parallel to optical axis to I.	**B1**
	ray parallel to principal axis to lens then refracted through F_2 to I	**B1**
	both rays meet at arrowhead of image	**B1**
8(c)	(image) closer (to lens / F_2) owtte (image) smaller	**B1** **B1**

Question	Answer	Marks
9(a)(i)	light travels faster than sound **OR** flash / light seen before bang heard	**B1**
9(a)(ii)	speed = distance ÷ time in any form	**C1**
	500 ÷ 1.6	**C1**
	312.5 (m / s)	**A1**
9(a)(iii)	it is windy owtte **OR** reaction times to start / stop watch	**B1**
9(b)	echo	**B1**
	(sound) reflected from cliffs	**B1**

Question	Answer	Marks
10(a)(i)	cell symbol correctly drawn	**B1**
10(a)(ii)	series	**B1**
10(a)(iii)	electrons	**B1**
10(b)(i)	any **two** from: (both) lamps have correct / full potential difference if one lamp fails the other lamp still lights lamps can be switched (on/off)independently	**B2**
10(b)(ii)	V = IR or (I =) V ÷ R	**C1**
	3 ÷ 12	**C1**
	0.25 (A)	**A1**

Question	Answer	Marks
11(a)	3rd box ticked steel	**B1**
11(b)	place ends/poles together	**B1**
	repulsion (takes place)	**B1**
11(c)(i)	coil of wire	**B1**
	iron rod inside	**B1**
	coil connected to an (electrical) power supply OR current in coil	**B1**
11(c)(ii)	number of turns (in coil)	**B1**
	current (in coil)	**B1**

Question	Answer	Marks
12(a)(i)	nucleon number OR mass number	**B1**
12(a)(ii)	proton number OR atomic number	**B1**
12(b)(i)	selected count rate halved	**B1**
	two pairs of co-ordinates clearly indicated	**B1**
	(half-life =) 4 (minutes)	**B1**
12(b)(ii)	shallower curve drawn	**B1**

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS	**0625/33**
Paper 3 Core Theory	**October/November 2019**
MARK SCHEME	
Maximum Mark: 80	

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Question	Answer	Marks
1(a)	226.50 – 82.10 **OR** 3:46.5(0) – 1:22.1(0) **OR** 2 min 24.4 (s) 144.4(0) (s)	**C1** **A1**
1(b)	start stopwatch as LED lights owtte count large number of flashes i.e. > = 10 stop stopwatch on nth lighting of LED AND n > = 1 divide time on stopwatch by n	**B4**

Question	Answer	Marks
2(a)	speed = (total) distance ÷ time in any form 12 ÷ 1.5 8 (km / h)	**C1** **C1** **A1**
2(b)(i)	distance = area under graph **OR** area = ½ × base × height ½ × 3.0 × 4.0 6(.0) (m)	**C1** **C1** **A1**
2(b)(ii)	(between) 10(.0) and 12(.0) steepest section of graph / greatest gradient	**M1** **A1**
2(c)	W = mg in any form 72 × 10 720 (N)	**C1** **C1** **A1**

Question	Answer	Marks
3(a)(i)	8.0 (N) **AND** forwards / to the left	**B1**
3(a)(ii)	accelerating forwards / to the left	**B1** **B1**
3(b)	greater drag force / air resistance **OR** lower thrust owtte	**B1**

Question	Answer	Marks
4(a)(i)	(gravitational) potential energy	**B1**
4(a)(ii)	2nd (bag) as it has a greater load / force / weight (moved through same distance)	**B1**
4(a)(iii)	time (taken) (vertical) height (raised) / distance	**B1** **B1**
4(b)	B A E D C	**B3**

Question	Answer	Marks
5(a)	1. melting 2. boiling / evaporation 3. freezing / solidification	**B1** **B1** **B1**
5(b)	Any **three** from: (evaporation –) most energetic molecules escape from surface of liquid average KE of molecules remaining in liquid decreases temperature of liquid decreases energy transfers from water (on bench) to liquid (so water cools / freezes)	**B3**

Question	Answer	Marks
6(a)(i)	vertical arrow pointing down **AND** up	**B1**
6(a)(ii)	(10.0 ÷ 4 =) 2.5 (cm)	**B1**
6(a)(iii)	more waves / waves closer together / shorter wavelength	**B1**
6(b)(i)	light **AND** radio	**B1**
6(b)(ii)	sound **OR** ultrasound **OR** longitudinal	**B1**

Question	Answer	Marks
7(a)	(degrees) celsius **OR** ^{o}C volume	**B1** **B1**
7(b)	**Lower** <u>0 ^{o}C</u> (water) freezes **OR** turns to ice **Upper** <u>100 ^{o}C</u> (water) boils	 **B1** **B1** **B1** **B1**

Question	Answer	Marks
8(a)	<u>normal</u>	**B1**
8(b)	angle of incidence: N angle of reflection: S angle of refraction: P	**B1** **B1** **B1**
8(c)	<u>refraction</u> change in speed **OR** different refractive indices	**B1**

Question	Answer	Marks
9(a)(i)	either N and N **OR** S and S facing each other	**B1**
9(a)(ii)	repel / repulsion	**B1**
9(a)(iii)	attracted **OR** steel bar moves towards magnet A	**B1**
9(b)(i)	prediction: one end attracts **AND** the other end repels reason: like poles repel **OR** unlike poles attract	**B1** **B1**
9(b)(ii)	they attract (because) steel forms a permanent magnet owtte	**B1** **B1**
9(b)(iii)	sorting scrap metal **OR** doorbell **OR** relay **OR** (electric) motor **OR** circuit breakers	**B1**

Question	Answer	Marks
10(a)	<u>thermistor</u>	**B1**
10(b)(i)	2000 (Ω)	**B1**
10(b)(ii)	(I =) V ÷ R **OR** V = I × R in any form 12 ÷ 800 0.015 (A)	**C1** **C1** **A1**

Question	Answer	Marks
11(a)(i)	current is in one direction	**B1**
11(a)(ii)	symbols for two cells connected in series symbol for a switch	**B1** **B1**
11(b)(i)	<u>motor</u>	**B1**
11(b)(ii)	any **two** from: increasing number of turns on coil increasing the current (in the coil) increasing the strength of the magnetic field	**B2**

Question	Answer	Marks
12(a)(i)	same proton number **OR** same number of protons **OR** same atomic number **OR** same Z	**B1**
12(a)(ii)	different nucleon number **OR** different number of neutrons **OR** different mass number **OR** different A	**B1**
12(b)	alpha, beta and gamma **OR** symbols	**B2**
12(c)	top line: electrons – positive(ly) bottom line: electrons – negative(ly)	**B2** **B2**
12(d)	two half-lives indicated 2.0×10^{10} (atoms remain)	**C1** **A1**

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/41**

Paper 4 Extended Theory **October/November 2019**

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks
1(a)(i)	$a = \Delta v / \Delta t$ **or** $a = (v - u) / t$ in any form words, symbols or numbers **or** (a =) $\Delta v / \Delta t$ **or** (a =) $(v - u) / t$ **or** 15 (– 0) / 5.0 **or** (a =) gradient 3.0 m / s^2	**C1** **A1**
1(a)(ii)	(F =) ma in any form words, symbols or numbers **or** (F =) ma **or** 2300 × 3.0 6900 N	**C1** **A1**
1(b)	accelerating **or** speed / velocity increasing at a decreasing rate **or** acceleration decreasing gradient (of graph is positive and) decreasing	**B1** **B1** **B1**
1(c)	air resistance **or** friction mentioned **or** resistive force air resistance **or** friction **or** resistive force increases (with speed)	**B1** **B1**

Question	Answer	Marks
2(a)	any **two** from: shape size / volume / length / density / any linear dimension direction (of motion) / speed / velocity / momentum / kinetic energy / acceleration	**B2**
2(b)(i)	extension **and** tension / force / load mentioned extension is directly proportional to tension / force / load	**C1** **A1**
2(b)(ii)1.	260 N	**B1**
2(b)(ii)2.	$k = F / x$ in any form words, symbols or numbers **or** (k =) F / x **or** 260 / (0.94 – 0.63) **or** 260 / 0.31 840 N / m	**C1** **A1**
2(b)(iii)	from chemical (potential energy) to elastic (potential) / strain (at end)	**B1** **B1**

Question	Answer	Marks
3(a)	force × time (for which it acts)	**B1**
3(b)(i)	$v = I/m$ **or** 0.019 / 0.00011 in any form words, symbols or numbers **or** (v =) I/m 170 m / s	**C1** **A1**
3(b)(ii)	$KE = ½mv^2$ in any form words, symbols or numbers **or** (KE =) $½mv^2$ $0.50 \times 0.00011 \times 170^2$ 1.6 J **or** 1.7 J	**C1** **C1** **A1**
3(c)	**accept** reverse comments if clearly about how the molecular structure of a solid differs from that of a liquid (molecules / they) have an irregular arrangement / not ordered / random arrangement (molecules / they) are (slightly) further apart (on average) (molecules / they are) not fixed in place	 **B1** **B1** **B1**

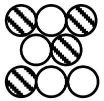
Question	Answer	Marks
4(a)	it / cone vibrates any **two** from: alternating current (a.c.) (in coil / wire) **or** alternating magnetic field (neighbouring) air vibrates **or** vibrations passed on (producing) compressions **and** rarefactions / vibrations parallel to energy transfer vibrating at 15 000 Hz	**B1** **B2**
4(b)	$\lambda = v / f$ in any form words, symbols or numbers **or** (λ =) v / f **or** 330 / 15 000 0.022 m	**C1** **A1**
4(c)	at least two vertical wavefronts either to left of barrier or in gap at least one wavefront showing some diffraction approximately constant wavelength throughout **and** ~50% of gap width	**B1** **B1** **B1**

Question	Answer	Marks
5(a)	four or more radial arrows / lines outside surface at least one arrow pointing towards (centre of) sphere **and** none wrong	**B1** **B1**
5(b)(i)	positive charges on left **and** negative charges on right of S equal numbers	**M1** **A1**
5(b)(ii)	it moves towards / attracted towards the negatively charged sphere / to the left	**B1**
5(b)(iii)	electrons / negative charges move (along the wire) towards Earth / towards ground / down the wire S becomes positively charged	**B1** **B1**
5(c)	electrons mentioned free (to move) / delocalised / mobile in metals / S **or** fixed in position in plastic / stand	**M1** **A1**

Question	Answer	Marks
6(a)(i)	$I = P/V$ **or** in any form words, symbols or numbers **or** (I =) P/V **or** 9000 / 230 39 A	C1 A1
6(a)(ii)	40 A **or** any greater integer value (in A) up to and including 60 A	B1
6(b)	$E = Pt$ **or** in any form words, symbols or numbers **or** (E =) Pt **or** 9000 × 1.0 **or** 9000 J seen 35 – 16 **or** 19 (°C) seen $m = E/(c\Delta T)$ **or** in any form words, symbols or numbers **or** (m =) $E/(c\Delta T)$ **or** 9000 / (4200 × 19) 0.11 kg	C1 C1 C1 A1
6(c)(i)	two different metal wires joined at one end **and** voltmeter between free ends **or** three metal wires **and** two different joined ABA **and** voltmeter between free ends	B1 B1
6(c)(ii)	any **one** from: quick response / makes measurements fast measures rapidly varying temperatures electrical output small heat capacity robust / rugged	B1

Question	Answer	Marks
7(a)	7 / 7.6 / 8 / 10 marked towards top of *y*-axis **and** 1(.0) towards right of *x*-axis a straight line of positive gradient from 0, 0 to point 1.0, 7.6	**B1** **B1**
7(b)(i)	energy (transferred) per unit charge energy (transferred) from chemical **or** energy (transferred) to electrical **or** energy (transferred) around / in a (complete) circuit	**B1** **B1**
7(b)(ii)	1. $I = V / R$ **or** in any form words, symbols or numbers **or** (I =) V / R **or** 12 / 7.6 1.6 A	**C1** **A1**
	2. 4.2 V **or** 4.3 V	**B1**
	3. $Q = It$ **or** in any form words, symbols or numbers **or** (Q =) It **or** 1.6 × 5.5 × 60 **or** 1.6 × 5.5 **or** 8.8 (C) 520 C **or** 530 C	**C1** **A1**

Question	Answer	Marks
8(a)(i)	$n = \sin(i)/\sin(r)$ in any form words, symbols or numbers **or** (n =) $\sin(i)/\sin(r)$ **or** $\sin(53°)/\sin(30°)$ 1.6	**C1** **A1**
8(a)(ii)	path emerging into air along correct path (by eye) **and** labelled R	**B1**
8(a)(iii)	ratio / division of two identical quantities / speeds / sine functions / (pure) numbers	**B1**
8(b)(i)	path labelled V with two correct refractions **and** below path of red light in glass	**B1**
8(b)(ii)	larger frequency results in smaller speed (in glass) **or** r.a. (reverse argument) **or** inversely related / proportional. any **two** from: more refraction / closer to normal / larger refractive index for larger frequency **or** r.a. violet light has larger frequency **or** o.r.a. violet light has a smaller speed (in glass) **or** o.r.a. violet light has larger refractive index **or** o.r.a.	**B1** **B2**

Question	Answer	Marks
9(a)(i)	${}^{8}_{3}$(Li)	**B1**
9(a)(ii)	 4 ×  4 ×  electron	**B1** **B1** **B1**
9(b)(i)	radioactive emission / (background) radiation / decay is random	**B1**
9(b)(ii)	any **one** of: rocks, buildings, soil, Earth, space, cosmic rays, Sun, radon, nuclear waste, weapons testing	**B1**
9(b)(iii)	440 – 24 **or** 416 **or** 52 **or** 55 **or** 79 **or** 3 (half-lives) **or** 45 / 15 **or** 1 / 2^3 **or** 1 / 8 1/2^3 **or** 1/8 **or** 52 **or** 55 **or** 79 76 (counts)	**C1** **C1** **A1**

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/42**

Paper 4 Extended Theory **October/November 2019**

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Mark
1(a)	(A = 44 $\times$ 20 =) 880 (m^2)	**C1**
	V = A $\times$ depth in any form OR (d =) V / A	**C1**
	(d = 264 / 880 =) 0.30 m	**A1**
1(b)	ρ = m / V in any form OR (ρ =) m / V	**C1**
	(ρ = 2.7 $\times$ 10^5 / 264 =) 1020 kg / m^3	**A1**
1(c)	p = ρgh in any form OR (p =) ρgh	**C1**
	(p = 1020 $\times$ 10 $\times$ 0.3 =) 3 100 Pa	**A1**
1(d)	tape measure	**B1**

Question	Answer	Mark
2(a)	no resultant force OR forces are balanced OR all forces in opposite directions are equal OR forces cancel	B1
	no resultant {moment / torque / turning effect} OR (sum of) clockwise moment(s) = (sum of) anticlockwise moment(s)	B1
2(b)(i)	1. down arrow labelled W at dashed line on 50 cm mark	B1
	2. up arrow labelled R at pivot	B1
2(b)(ii)	expression / evaluation for one correct moment seen	C1
	expressions / evaluation for all correct moments seen	C1
	equation seen relating correct expressions / evaluations for moments: moment of 0.5 N + moment F = moment of W OR 90 F = 43 OR 0.9F = 0.43	C1
	(F = 43 / 90 OR 0.43 / 0.9 =) 0.48 N	A1
2(b)(iii)	upwards force = downwards force	C1
	(R =) 1.2 N	A1

Question	Answer	Mark
3(a)	they / molecules collide with <u>walls</u>	**B1**
	<u>change of momentum</u> causes <u>force</u> (to be exerted on walls)	**B1**
	pressure = force / area (so pressure is exerted on walls)	**B1**
3(b)	pV = constant or $p_1 V_1 = p_2 V_2$. in any form	**C1**
	$p_1 \times 820 = 20\,000 \times 330$ OR $(p_1 =)\ 20\,000 \times 330 / 820$	**C1**
	$(p_1 =)$ 8000 Pa	**A1**

Question	Answer	Mark
4(a)	E = VIt in any form OR (E =) VIt OR (E =) 3 × 12 × 23 × 60	**C1**
	(E =) 50 000 (J)	**C1**
	C= E / ΔT in any form OR (C=) E / ΔT OR (C=) 49 680 / 50 OR 50 000 / 50	**C1**
	(C=) 990 J / °C	**A1**
4(b)	1. larger sphere emits / radiates / loses thermal energy more	**M1**
	greater (surface) <u>area</u>	**A1**
	2. greater (rate of radiation)	**B1**

Question	Answer	Mark
5(a)(i)	(compression region:) particles / they close(r)	B1
	(rarefaction region:) particles / they far / further apart	B1
5(a)(ii)	(longitudinal) oscillations / vibrations parallel to direction of wave (motion) / energy transfer OR medium is required OR cannot be polarised	B1
	(transverse) oscillations / vibrations perpendicular to direction of wave (motion) / energy transfer OR medium not required OR can be polarised	B1
5(b)(i)	$v = f\lambda$ in any form OR (λ =) v / f	C1
	(λ =) 3500 / 120	C1
	(λ =) 29 m	A1
5(b)(ii)	frequency not changed (in different medium)	B1
	audible / yes AND audible range 20 Hz – 20 kHz	B1

Question	Answer	Mark
6(a)(i)	{light from water OR light to air / eye OR light from coin} bends / changes direction / is refracted	B1
	refracts / bends away from normal OR angle of incidence is smaller than angle of refraction	B1
6(a)(ii)	refraction	B1
6(a)(iii)	rays do not meet at image / only appear to come from image / do not originate from image / cannot be seen on a screen owtte	C1
6(b)	3.0×10^{8} m / s	B1
6(c)	n = c_a / c_w in any form OR (c_w =) c_a / n	C1
	(c_w =) candidate's **(b)** / 1.3	C1
	(c_w =) 2.3×10^{8} m / s	A1

Question	Answer	Mark
7(a)(i)	deflection	**B1**
	(then) reverse deflection / current / voltage OR greater deflection OR deflection for shorter time OR <u>change</u> of (magnetic) field / flux	**B1**
7(a)(ii)	larger deflection OR deflection for shorter time	**M1**
	higher speed OR larger (rate of) <u>change</u> of magnetic field / flux	**A1**
7(b)	{current / power too high OR trip hazard} AND cut (in insulation) AND plug / socket on damp / wet (grass)	**B1**
	<u>overheating / fire</u> in extension lead OR trip hazard	**B1**
	short circuit / shock / electrocution through cut (in insulation)	**B1**
	short circuit / shock / electrocution through plug on damp / wet (grass)	**B1**

Question	Answer	Mark
8(a)	R proportional to length	**C1**
	R proportional to 1 / area	**C1**
	(R =) 0.14 × (3 / 2) × (4 / 9)	**C1**
	(R =) 0.093 (Ω)	**A1**
8(b)(i)	first two rows correct	**B1**
	last two rows correct	**B1**
8(b)(ii)	NOR gate correctly connected accept OR gate followed by NOT gate	**M1**
	correct symbol(s) for NOR gate accept OR gate followed by NOT gate	**A1**

Question	Answer	Mark
9(a)	where / region a(n electric) charge experiences a force	B1
9(b)	All criteria must be met • 5 lines with both ends within 2 mm of plates by eye • middle 3 lines straight and within 10° of horizontal by eye • top / bottom lines, straight or with outward smooth curves, ends vertically <= 16 mm below / above ends of plates, if curved horizontally symmetrical by eye • spacing between lines: 7 mm $\leqslant$ spacing $\leqslant$ 23 mm	B1
	at least 1 arrow left to right NOT any arrow R to L	B1
9(c)(i)	I = Q / t in any form OR (Q =) It	C1
	(Q =) 0.21 $\times$ 10 $\times$ 60 $\times$ 60	C1
	(Q =) 7600 C	A1
9(c)(ii)	E = VQ in any form OR (E =) VQ OR (E =) 1.2 $\times$ 7560	C1
	(E =) 9100 J	A1
9(c)(iii)	chemical (potential energy)	B1

Question	Answer	Mark
10(a)	neutron charge = 0 γ-ray mass = 0 AND charge = 0 He nucleus mass = 4 m He nucleus charge = 2 e	**B1** **B1** **B1** **B1**
10(b)	any 3 different valid points, e.g. • detail of handling source appropriately for, e.g. use of tongs • protective clothing • minimise exposure by time OR distance OR activity • detail of shielded storage • detail of secure storage • monitoring exposure • must be disposed of securely • limitation of access to approved personnel • procedure in place in case of accident / criminal act to protect people and / or environment	**3** × **B1**

Cambridge IGCSE

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PHYSICS **0625/43**

Paper 4 Extended Theory **October/November 2019**

MARK SCHEME

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1(a)	attempt to use 2 rectangles for A	**C1**
	$A = ((1 \times 3.2) + (1.1 \times 1.6) = 3.2 + 1.76 =)\ 4.96\ (m^2)$	**C1**
	9.9 m^3	**A1**
1(b)	$\rho = m / V$ OR $m = \rho V$ OR (m =) $9.9 \times 1.1 \times 10^3$	**C1**
	(m =) 1.1×10^4 kg	**A1**
1(c)	depth of water = 1.2 m	**C1**
	(P =) ρgh OR ($P = 1.1 \times 10^3 \times 10 \times 1.2$)	**C1**
	(P =) 1.3×10^4 Pa	**A1**

Question	Answer	Marks
2(a)(i)	moment = force × distance	**C1**
	moment = force × perpendicular distance	**A1**
2(a)(ii)	turning effect owtte	**B1**
2(a)(iii)	(quantity that has) magnitude <u>and</u> direction	**B1**
2(b)	provides (anticlockwise) moment	**M1**
	total clockwise moment = total anticlockwise moment OR resultant turning effect = 0	**A1**

Question	Answer	Marks
3(a)(i)	from gravitational potential	**B1**
	to kinetic	**B1**
3(a)(ii)	KE gained = PE lost or $1/2mv^2 = mgh$	**C1**
	$h = v^2 / 2g$	**C1**
	22 m	**A1**
3(a)(iii)	No energy lost to surroundings (as thermal energy) OR No air resistance	**B1**
3(b)	Any **two** from geothermal, nuclear and tidal	**B2**

Question	Answer	Marks
4	Solids – molecules in lattice arrangement	**B1**
	solids – strong forces between molecules	**B1**
	liquids – molecules not fixed in place OR molecules have an irregular arrangement OR molecules (slightly) further apart (on average) than in solids OR spaces between the molecules	**B1**
	liquids – (average) forces too weak to keep molecules in a definite pattern OR forces just enough to hold molecules in the bulk of the liquid	**B1**
	gases – molecules far apart	**B1**
	gases – weak / no forces between molecules (except during collisions)	**B1**

Question	Answer	Marks
5(a)	(energy =) power x time in any form	C1
	= 3000 × 3.5 × 60	C1
	= 630 000 J	A1
5(b)	(E =) $mc\Delta T$ in any form	C1
	m = 1700 / 1000	C1
	ΔT = (100–19) OR ΔT = 81	C1
	(E =) $\frac{1700}{1000} \times 4200 \times 81$	C1
	= 580 000 J	A1
5(c)	Efficiency = $\frac{\text{useful energy output}}{\text{total energy input}}$ OR $\underline{\frac{580\,000}{630\,000}}$ (× 100)	C1
	= 0.92 OR 92%	A1

Question	Answer	Marks
6(a)(i)	compression	**B1**
6(a)(ii)	rarefaction	**B1**
6(b)	correct wavelength indicated	**B1**
6(c)	closer together at compression and further apart at rarefaction	**B1**
	amplitude changes	**B1**
	loudness does not affect wavelength	**B1**
6(d)	more spread out / further apart	**B1**
	Velocity / speed greater in water than air	**B1**
	(so) wavelength greater	**B1**

Question	Answer	Marks
7(a)	ray parallel to axis and through F	**M1**
	ray through centre of lens	**M1**
	position of image correct and labelled	**A1**
7(b)	enlarged <u>and</u> upright	**B1**
	virtual	**B1**
7(c)	different colours have different wavelengths / different frequencies / refracted by different amounts OR dispersion (in glass)	**B1**

Question	Answer	Marks
8(a)	radial lines from sphere	**B1**
	arrows pointing towards sphere	**B1**
8(b)	$Q = It$, in any form OR 0.21×75	**C1**
	16 C	**A1**

Question	Answer		Marks
9(a)(i)	voltmeter shown connected across LED		**B1**
9(a)(ii)	ammeter shown connected in series with LED		**B1**
9(b)	p.d. across two resistors in parallel = (3.7 – 2.1 =) 1.6 V	resistance of circuit = (3.7 / 0.19) = 19.5 Ω AND resistance of LED (= 2.1 / 0.19) = 11.1 Ω	**B1**
	combined resistances of two resistors in parallel = R / 2 OR $1 / R = 1 / R_1 + 1 / R_2$ OR $R = R_1 R_2 / R_1 + R_2$ OR current in either R = I / 2	resistance across parallel combination of resistors = (19.5 – 11.1) = 8.4 Ω	**B1**
	$R = V / I$ in any form	$R = V / I$ in any form	**C1**
	R / 2 = 1.6 / 0.19	R / 2 = 8.4 Ω	**C1**
	17 Ω	17 Ω	**A1**

Question	Answer	Marks
10(a)(i)	movement of magnet relative to coil OR induces emf / pd / current (across / in LED)	**B1**
	light goes off when magnet no longer directly below coil	**B1**
10(a)(ii)	door closes more quickly than it was opened so higher current in LED	**B1**
	door / magnet moving for shorter length of time	**B1**
10(b)	Any two from: • quick response • protects against electric shock • protects against overheating • (easily) re-settable • avoids damage to lawnmower	**B2**

Question	Answer	Marks
11(a)	top: any path to the left within 45 degrees to the horizontal	B1
	middle: path to the right and deflected up (ending in a straight line)	B1
	bottom: path to the right and deflected down (ending in a straight line)	B1
11(b)	192	B1
	use or clear indication of 4 half-lives	C1
	(192 / 16 =) 12	A1
	28	B1
11(c)	any 3 different valid points e.g. • must be stored with shielding • must be stored securely / safely • must be transported with shielding • must be transported securely • expensive to store • expensive to transport • in case of accident / terrorism could escape to environment / danger to people • site of storage uninhabitable for thousands of years	3 x B1

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS	**0625/51**
Paper 5 Practical	**October/November 2019**
MARK SCHEME	
Maximum Mark: 40	

Published

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[Turn over

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Question	Answer	Marks
1(a)	*a* values all < 30 cm	**1**
	b values (40 – *a*)	**1**
	a / *b* values correct	**1**
1(b)	Graph:	
	Axes correctly labelled and right way round	**1**
	Suitable scales	**1**
	All plots correct to ½ small square	**1**
	Good line judgement, thin, continuous line	**1**
1(c)	triangle method indicated on graph	**1**
	triangle at least half of candidate's distance between extreme plots	**1**
1(d)	*W* = *G* value in **(c)** to 2 or 3 significant figures	**1**
	Unit N	**1**

Question	Answer	Marks
2(a)(i)	V to at least 1 decimal place and < 3 V	**1**
	I to at least 2 decimal places and < 1 A	**1**
2(a)(ii)	R_1 correct	**1**
2(b)	V_2, I_2 and R_2 present and $I_2 < I_1$	**1**
2(c)	V_3 and I_3 present correct units V, A and Ω seen and not contradicted	**1**
	$R_3 < 3R_1$	**1**
2(d)	Statement matches results (Expect NO)	**1**
	Justification matches statement	**1**
2(e)	Lamps in parallel and correct symbol for lamp	**1**
	One voltmeter, with correct symbol, in parallel with lamps	**1**
	Variable resistor in correct position, with correct symbol	**1**

Question	Answer	Marks
3(a)	Sensible value for room temperature	**1**
3(b)	Units s and °C; times 60, 120, 180, 240, 300	**1**
	Temperatures decreasing, consistent whole numbers or consistent 1dp for temperatures	**1**
3(c)	Correct calculations	**1**
3(d)(i)	Correct box ticked to match readings	**1**
3(d)(ii)	Justification to match **(i)**, quoting figures	**1**
	Reference to same time	**1**
3(e)	Two from: Insulate Lid Lower starting temperature Higher room temperatura Smaller volume of water Smaller surface area	**1**
3(f)	Clearly shown perpendicular line of sight	**1**
	Clearly shown bottom of meniscus	**1**

Question	Answer	Marks
4	**MP1** How the ball will move: Back and forth / like a pendulum	**1**
	MP2 Release from a determined position, time until stops	**1**
	MP3 Repeat with at least two more values of independent variable	**1**
	MP4 Statement of variable to be changed	**1**
	MP5 Statement of a variable to keep constant	**1**
	MP6 Table with columns for chosen variable that is changed and time with correct units, s for time.	**1**
	MP7 Compare chosen variable with time. Or plot graph of chosen variable against time.	**1**

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/52**

Paper 5 Practical **October/November 2019**

MARK SCHEME

Maximum Mark: 40

Published

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Question	Answer	Marks
1(a)	table:	
	t values increasing	**1**
	T values = $t / 20$	**1**
	T_{50} = 1.4 ± 0.1 (s)	**1**
	T^2 correct	**1**
1(b)	graph:	
	axes correctly labelled and right way round	**1**
	suitable scales	**1**
	all plots correct to ½ small square	**1**
	good line judgement, thin, continuous line	**1**
1(c)	triangle method indicated <u>on</u> <u>graph</u>	**1**
1(d)	correct calculation of *g*	**1**
	to 2 or 3 significant figures	**1**

Question	Answer	Marks
2(a)(i)	I to at least 2dp < 1 A	**1**
	with correct unit	**1**
2(a)(ii)	table:	
	V values < 4 V	**1**
	V values increasing	**1**
	V values consistent to either 1 or 2 decimal places	**1**
	R correct	**1**
2(b)(i)	one box ticked, matching results	**1**
2(b)(ii)	justification to match **(i)**	**1**
2(c)(i)	value approximately halfway between 40 cm and 60 cm values	**1**
2(c)(ii)	correct R value	**1**
	2 or 3 significant figures with unit	**1**

Question	Answer	Marks
3(a)(i)	u = 55–65 (cm)	**1**
3(a)(ii)	$v = 80 - u$ (± 2 cm)	**1**
3(a)(iii)	correct calculation of f	**1**
3(b)	u = 15–25 (cm) <u>and</u> $v = 80 - u$ (± 2 cm)	**1**
	u and v values in table all in cm to the nearest mm	**1**
3(c)	correct average	**1**
	2 or 3 significant figures	**1**
3(d)	one from: darkened room / brighter lamp object and lens at same height (above bench) object and lens and screen perpendicular to the bench ruler on bench or clamped mark centre of lens on holder move lens slowly / back and forth (to obtain best image)	**1**
3(e)(i)	D = 120(.0) (cm)	**1**
3(e)(ii)	f = 18.1 (cm)	**1**
3(e)(iii)	Statement matches results (expect NO) justification to include the explanation of within / beyond the limits of experimental accuracy	**1**

Question	Answer	Marks
4	**MP1 method** diagram showing container, ice cubes, (thermometer and insulation)	**1**
	MP2 method ice (in container), measure time (for all the ice) to melt	**1**
	MP3 repeat with different insulators	**1**
	MP4 control variables (total) mass / volume of ice cubes	**1**
	MP5 control variables any **one** from: thickness / amount of insulation room temperature / other environmental condition size / shape / surface area of ice cubes initial temperature of ice cubes	**1**
	MP6 table table with headings of (named) insulator and time with correct units	**1**
	MP7 conclusion (use the table to) compare the insulator with the time taken for the ice to melt	**1**

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/53**

Paper 5 Practical **October/November 2019**

MARK SCHEME

Maximum Mark: 40

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Question	Answer	Marks
1(a)	V all < 4.00 V and to 1dp at least	**1**
	I all < 1.00 A and to 2dp at least	**1**
1(b)	R values correct and increasing	**1**
1(c)	graph:	
	axes labelled correct orientation, with quantity and unit	**1**
	appropriate scales (plots occupying at least ½ grid)	**1**
	plots all correct to less than ½ small square and precise plots	**1**
	well-judged line <u>and</u> thin line	**1**
1(d)	<u>resistance</u> increases as <u>temperature</u> increases	**1**
	(*R increases with* I), brighter lamp = higher (filament) temperature	**1**
1(e)	variable resistor symbol correct (rectangle with strike-through arrow only)	**1**
	in series and rest of circuit correct	**1**

Question	Answer	Marks
2(a)(i)	v = 30.0 to 70.0(cm)	**1**
2(a)(ii)	f_1 correctly calculated	**1**
	2/3 sig fig and unit	**1**
2(a)(iii)	move screen slowly / backwards and forwards	**1**
2(b)(i)	h_I = 1.4 to 5.2(cm) <u>and</u> h_O = 1.0 to 2.0 (cm)	**1**
2(b)(ii)	correct calculation of M <u>and</u> no unit	**1**
2(b)(iii)	f_2 within 10% of f_1	**1**
2(c)	statement matching results	**1**
	values within limits of experimental accuracy / owtte	**1**
2(d)	any **one** from: • mark position of lens on holder ; • clamp rule / place rule on bench ; • ensure screen, lens <u>and</u> object all perpendicular (to bench) ; • view scale perpendicularly ; • mark top and bottom of image and measure later	**1**
2(e)	either method suggested if matching valid explanation e.g. METHOD 1: difficult to measure height of image in method 2 METHOD 1: smaller lengths measured in method 2 / reverse argument METHOD 2: can't measure u and v to lens accurately in method 1	**1**

Question	Answer	Marks
3(a)(i)	sensible value	**1**
3(a)(ii)	any **two** from: • rule close / parallel to spring ; • eye perpendicular to reading / use set square ; • clamp rule	**2**
3(b)	l values all increasing <u>and</u> larger than l_0	**1**
3(c)	correct calculations of e	**1**
3(d)	l_x present	**1**
	2.0 N < W_x < 3.0 N	**1**
3(e)(i)	statement matching results	**1**
	correct justification matching statement e.g. • L/e constant • e doubles when L doubles	**1**
3(e)(ii)	straight line	**1**
	(line) through origin	**1**

Question	Answer	Marks
4	**MP1 Apparatus** beaker and (material for) lid and thermometer and stopclock (or alternative)	**1**
	MP2 Method pour (hot) water into container measure temperature of (hot) water over period of time	**1**
	MP3 Method repeat for different thicknesses of lid	**1**
	MP4 & MP5 Control variables any **two** from: • same initial/starting temperature of water ; • same volume of water ; • same size / material / thickness of beaker ; • same material for lid ; • same time for measuring temperature change / same temperature difference for measuring time taken ; • same room temperature / other environmental condition	**1**
	MP6 Table suitable column headings and units	**1**
	MP7 Analysis any **one** from: • comparison of temperature decrease / rates of cooling with thickness / different lids • draw a suitable graph with axes stated	**1**

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PHYSICS **0625/61**

Paper 6 Alternative to Practical **October/November 2019**

MARK SCHEME

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Question	Answer	Marks
1(a)(i)	*b* 16.9	**1**
1(a)(i)	*a* / *b* 1.37 (ecf allowed)	**1**
1(b)	Graph:	
	Axes correctly labelled and right way round	**1**
	Suitable scales	**1**
	All plots correct to ½ small square	**1**
	Good line judgement, thin, continuous line	**1**
1(c)	triangle method indicated on graph	**1**
	triangle at least half of candidate's distance between extreme plots	**1**
1(d)	Correct calculation, $W = G$	**1**
	to 2 or 3 significant figures	**1**
1(e)	Balance on pivot with no load – balance point is at c of m	**1**
1(f)	Obtaining a stable balance	**1**

Question	Answer	Marks
2(a)(i)	V = 2.5	**1**
	I = 0.3(0)	**1**
	Both units correct	**1**
2(a)(ii)	R_1 8.33 (ecf allowed)	**1**
2(b)	R_2 11.4 with unit Ω	**1**
2(c)	Statement matches results	**1**
	Justification matches statement	**1**
2(d)	Lamps in parallel and correct symbol for lamp	**1**
	One voltmeter, with correct symbol, in parallel with lamps	**1**
	Variable resistor in correct position, with correct symbol	**1**

Question	Answer	Marks
3(a)	24 (°C)	**1**
3(b)(i)	Times 60, 120, 180, 240, 300	**1**
3(b)(ii)	Units s and °C	**1**
3(c)	10, 7	**1**
3(d)(i)	Correct box ticked to match readings	**1**
3(d)(ii)	Justification to match **(i)**, quoting figures	**1**
	Reference to same time	**1**
3(e)	Two from: Insulate Lid Lower starting temperature Higher room temperature Smaller volume of water Smaller surface area	**2**
3(f)	Clearly shown perpendicular line of sight	**1**
	Clearly shown bottom of meniscus	**1**

Question	Answer	Marks
4	**MP1** How the ball will move: Back and forth / like a pendulum	**1**
	MP2 Release from a determined position, time until stops	**1**
	MP3 Repeat with at least two more values of independent variable	**1**
	MP4 Statement of variable to be changed	**1**
	MP5 Statement of a variable to keep constant	**1**
	MP6 Table with columns for chosen variable that is changed and time with correct units, s for time.	**1**
	MP7 Compare chosen variable with time. Or plot graph of chosen variable against time	**1**

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/62**

Paper 6 Alternative to Practical **October/November 2019**

MARK SCHEME

Maximum Mark: 40

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GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks
1(a)	perpendicular viewing of scale / use of horizontal aid, e.g. set-square / clamp rule / rule close to pendulum	**1**
1(b)(i)	27.6(0)	**1**
1(b)(ii)	1.38	**1**
1(b)(iii)	1.90	**1**
1(c)	graph: axes correctly labelled and right way round	**1**
	suitable scales	**1**
	all plots correct to ½ small square	**1**
	good line judgement, thin, continuous line	**1**
1(d)	triangle method indicated on graph	**1**
	with triangle at least half of candidate's line between the extreme plotted points	**1**
1(e)	correct calculation of *g*	**1**
	to 2 or 3 significant figures	**1**

Question	Answer	Marks
2(a)	0.56	**1**
	with correct unit A	**1**
2(b)(i)	1.07 / 1.1	**1**
	2 or 3 significant figures	**1**
2(b)(ii)	V, Ω	**1**
2(c)(i)	2nd box ticked	**1**
2(c)(ii)	justification – only award if the 2nd box is ticked	**1**
2(d)(i)	value approximately halfway between the 40 cm and 60 cm values	**1**
2(d)(ii)	correct *R* value from candidate's value in **(d)(i)**	**1**
	2 or 3 significant figures	**1**
2(e)	use a low(er) current / voltage / switch off between readings / add a resistor <u>in series</u> / use a thinner wire	**1**

Question	Answer	Marks
3(a)(i)	*d* = 8.0 cm or 80 mm	**1**
3(a)(ii)	*D* = 80 cm or 800 mm	**1**
3(b)	15.2 / 15.25 / 15.249 (cm)	**1**
3(c)(i)	14.9 / 14.85 (cm)	**1**
3(c)(ii)	correct average	**1**
	3 significant figures only	**1**
3(d)	one from: darkened room / brighter lamp object and lens at same height (above bench) object and lens and screen perpendicular to the bench ruler on bench or clamped mark centre of lens (on holder) move lens slowly / back and forth (to obtain best image)	**1**
3(e)(i)	*D* = 120(.0) (cm)	**1**
3(e)(ii)	(22.2 × 97.9) / 120 = 18.1 (cm)	**1**
3(e)(iii)	(expect not in agreement) too far apart / not close enough / more than 10% difference between values	**1**

Question	Answer	Marks
4	**MP1 method** diagram: container, ice (cubes, thermometer and insulation)	**1**
	MP2 ice (in container), measure time (for all the ice) to melt	**1**
	MP3 repeat with different insulators	**1**
	MP4 control variables (total) mass / volume of ice cubes	**1**
	MP5 any **one** from: thickness / amount of insulation room temperature / other environmental condition size / shape / surface area of ice cubes initial temperature (of ice cubes)	**1**
	MP6 table table with headings of (named) insulator and time with correct units	**1**
	MP7 conclusion (use the table to) compare the insulator with the time taken for the ice cubes to melt	**1**

Cambridge IGCSE

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PHYSICS **0625/63**

Paper 6 Alternative to Practical **October/November 2019**

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1: Marks must be awarded in line with: • the specific content of the mark scheme or the generic level descriptors for the question • the specific skills defined in the mark scheme or in the generic level descriptors for the question • the standard of response required by a candidate as exemplified by the standardisation scripts.
GENERIC MARKING PRINCIPLE 2: Marks awarded are always **whole marks** (not half marks, or other fractions).
GENERIC MARKING PRINCIPLE 3: Marks must be awarded **positively**: • marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate • marks are awarded when candidates clearly demonstrate what they know and can do • marks are not deducted for errors • marks are not deducted for omissions • answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.
GENERIC MARKING PRINCIPLE 4: Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks
1(a)	correct voltmeter symbol in parallel with lamp	**1**
1(b)(i)	*V* = 0.6(V) and *I* = 0.14(A)	**1**
1(b)(ii)	*R* = 4.3(Ω)	**1**
1(c)	graph:	
	axes labelled correct orientation, with quantity and unit	**1**
	appropriate scales (plots occupying at least ½ grid)	**1**
	plots all correct to less than ½ small square and precise plots	**1**
	well-judged line and thin line	**1**
1(d)	resistance increases as temperature increases	**1**
	temperature / resistance increases with length	**1**
1(e)	variable resistor symbol correct (rectangle with strike-through arrow only)	**1**
	in series and rest of circuit correct	**1**

Question	Answer	Marks
2(a)(i)	u = 5.0(cm) <u>and</u> v = 7.6(cm)	**1**
2(a)(ii)	U = 25(.0)(cm) <u>and</u> V = 38(.0)(cm)	**1**
2(a)(iii)	f_1 15(.1)(cm) <u>and</u> 2/3 sig fig and unit	**1**
2(a)(iv)	move screen slowly / backwards and forwards	**1**
2(b)(i)	h_O = 1.5(cm) <u>and</u> h_I = 2.4(cm)	**1**
2(b)(ii)	M = 1.6 <u>and</u> no unit	**1**
2(b)(iii)	f_2 = 15 / 14.6(cm)	**1**
2(c)	statement matching results	**1**
	values within limits of experimental accuracy / owtte	**1**
2(d)	any **one** from: • mark position of lens on holder ; • clamp rule / place rule on bench ; • ensure screen, lens <u>and</u> object all perpendicular (to bench) / vertical ; • view scale perpendicularly ; • mark top and bottom of image and measure later	**1**
2(e)	either method suggested if matching valid explanation e.g. METHOD 1: difficult to measure height of image in method 2 METHOD 1: smaller lengths measured in method 2 / reverse argument METHOD 2: can't measure u and v to lens accurately in method 1	**1**

Question	Answer	Marks
3(a)	any **two** from: • rule close / parallel to spring ; • eye perpendicular to reading / use set square ; • clamp rule	**2**
3(b)	correct calculations of *e* (4.2, 8.4, 12.6)	**1**
3(c)(i)	l_x = 11.4(cm)	**1**
3(c)(ii)	2.0 N < W_x < 2.5(N)	**1**
	working showing use of ratio/correct logic	**1**
3(d)	data only given to 1 dp / 2 or 3 sig fig	**1**
3(e)(i)	statement matching results	**1**
	correct justification matching statement e.g. • *L*/*e* constant • *e* doubles when *L* doubles	**1**
3(e)(ii)	straight line	**1**
	(line) through origin	**1**

Question	Answer	Marks
4	**MP1 Apparatus** beaker <u>and</u> (material for) lid <u>and</u> thermometer <u>and</u> stop clock (or alternative)	**1**
	MP2 Method pour (hot) water into container measure temperature of (hot) water over period of time	**1**
	MP3 Method repeat for different thickness<u>es</u> of lid	**1**
	MP4 & MP5 Control variables any **two** from: • same <u>initial/starting</u> temperature of water ; • same volume of water ; • same size / material / thickness of beaker ; • same material for lid ; • same time for measuring temperature change / same temperature difference for measuring time taken • same room temperature / other environmental condition	**2**
	MP6 Table suitable column headings and <u>units</u>	**1**
	MP7 Analysis any **one** from: • comparison of temperature decrease / rates of cooling with <u>thickness</u> / different <u>lids</u> • draw a suitable graph with axes stated	**1**

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/11**

Paper 1 Multiple Choice (Core) **October/November 2019**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

6108751254

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

This document consists of **16** printed pages.

IB19 11_0625_11/4RP

1 A student measures the volume of a small irregularly-shaped stone.

Which apparatus must be used?

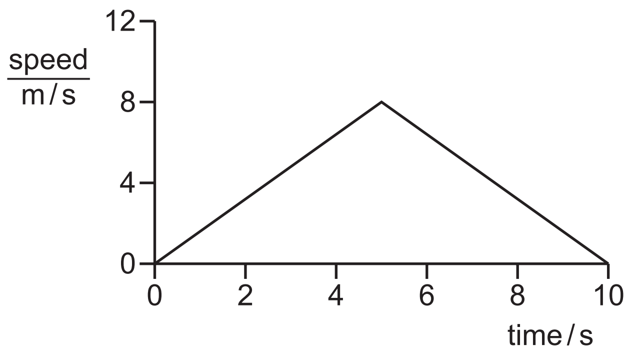
A a measuring cylinder containing water and a ruler only

B a measuring cylinder containing water only

C an empty measuring cylinder and a ruler only

D a ruler only

2 The graph shows how the speed of an object changes with time.



How far does the object travel in 10 seconds?

A 8 m **B** 10 m **C** 40 m **D** 80 m

3 A car travels at an average speed of 60 km / h for 15 minutes.

How far does the car travel in 15 minutes?

A 4.0 km **B** 15 km **C** 240 km **D** 900 km

4 Which quantity is a force due to a gravitational field?

A density

B mass

C weight

D volume

5 The density of air is 1.2 kg / m^3.

A room has dimensions 5.0 m × 4.0 m × 3.0 m.

What is the mass of the air in the room?

A 0.02 kg **B** 0.10 kg **C** 50 kg **D** 72 kg

6 A student measures the length of a spring. She then attaches different weights to the spring. She measures the length of the spring for each weight.

The table shows her results.

weight / N	length / mm
0	520
1.0	524
2.0	528
3.0	533
4.0	537
5.0	540

What is the extension of the spring with a weight of 3.0 N attached to it?

A 4 mm **B** 5 mm **C** 12 mm **D** 13 mm

7 Which statement gives a complete description of any object that is in equilibrium?

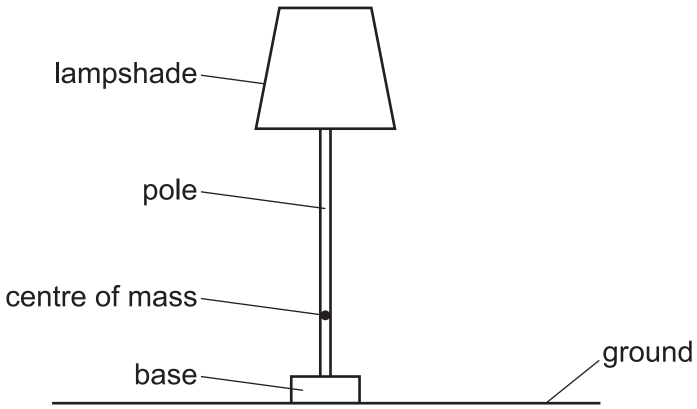
A There are no forces acting.

B There is no resultant force.

C There is no resultant force and no resultant turning effect.

D There is no resultant turning effect.

8 The diagram shows a lamp.



Changing which feature increases the stability of the lamp?

A a larger lampshade

B a longer pole

C a heavier base

D a higher centre of mass

9 Brakes are used to slow down a moving car.

Into which form of energy is most of the kinetic energy converted as the car slows down?

A chemical

B elastic

C thermal

D sound

10 Which does **not** transfer useful energy?

A emitting a sound wave

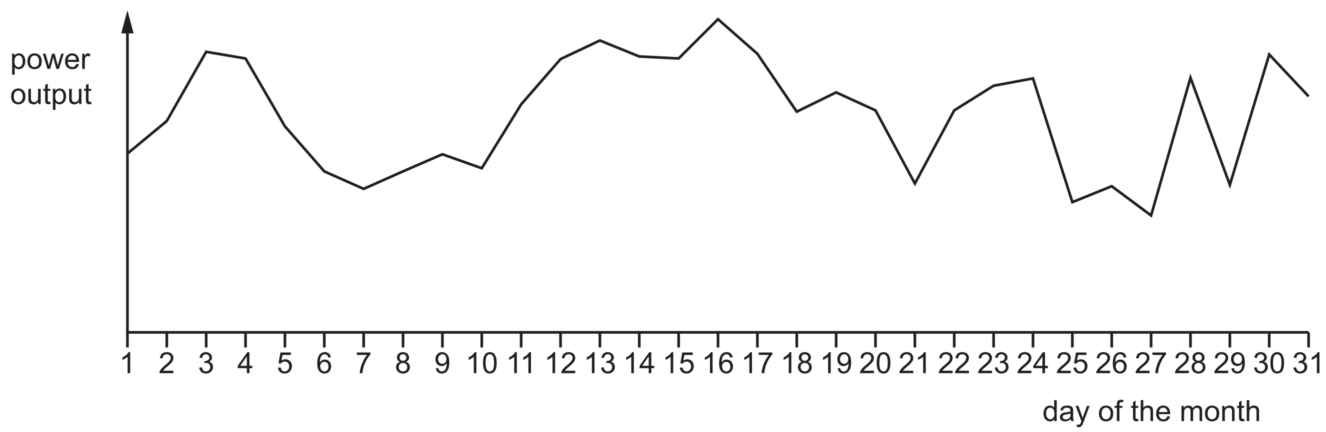
B measuring a temperature

C passing an electric current

D pushing a box along the floor

11 The power output from solar panels is recorded every day for a month.

The graph shows the output recorded.



Which conclusion can be drawn from this graph?

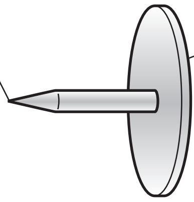
A The power output from the solar panels changes from day to day.

B The power output from the solar panels is cheap to produce.

C Solar panels create no pollution.

D Solar energy is renewable.

12 A drawing pin (thumb tack) has a sharp point at one end and a flat surface at the other end.



The pin is pushed into a wooden board.

How do the pressure and the force at the sharp point compare with the pressure and the force on the flat surface?

	force at the sharp point	pressure at the sharp point
A	greater than on the flat surface	greater than on the flat surface
B	greater than on the flat surface	less than on the flat surface
C	the same as on the flat surface	greater than on the flat surface
D	the same as on the flat surface	less than on the flat surface

13 The table shows four forces. Each force acts on a different surface.

Which row shows the **least** pressure?

	size of the force / N	area of the surface / m^2
A	0.30	0.040
B	10	2.0
C	60	15
D	1200	40

14 A test-tube contains $1.0\,cm^3$ of liquid water at $100\,°C$. The liquid water boils to form $1600\,cm^3$ of steam.

What is the reason for the large increase in volume?

A Steam molecules are bigger than water molecules.

B The average distance between the molecules is much greater in the steam.

C The molecules do not move until the water turns into a gas.

D There are more steam molecules than there were water molecules.

15 Which statement about the evaporation of a liquid is correct?

A The least energetic molecules escape from the surface and the temperature of the liquid decreases.

B The least energetic molecules escape from the surface and the temperature of the liquid increases.

C The most energetic molecules escape from the surface and the temperature of the liquid decreases.

D The most energetic molecules escape from the surface and the temperature of the liquid increases.

16 Which effect is caused by thermal expansion?

A a metal surface heating up in direct sunlight

B ice-cream melting on a hot day

C a railway track buckling on a hot day

D ice forming on a pond on a cold day

17 A liquid-in-glass thermometer uses a change in a property of a liquid to measure temperature.

Which property is used?

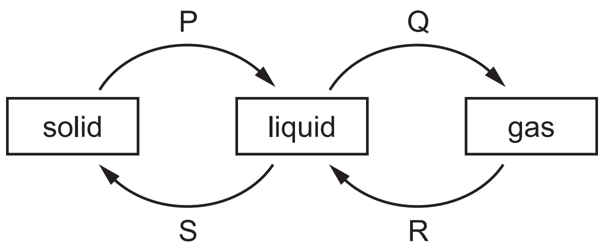
A mass

B thermal capacity

C volume

D weight

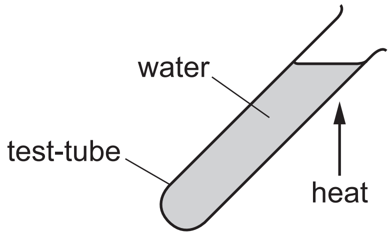
18 The diagram shows four labelled changes of state between solid, liquid and gas.



Which changes need an energy input?

A P and Q **B** Q and R **C** R and S **D** S and P

19 A glass test-tube containing water is heated at the top. The water at the top boils, but the water at the bottom remains cold.



Which row explains why the water at the bottom of the test-tube remains cold?

	glass	water
A	good thermal conductor	good thermal conductor
B	good thermal conductor	poor thermal conductor
C	poor thermal conductor	good thermal conductor
D	poor thermal conductor	poor thermal conductor

20 In countries where it is usually hot, houses are often painted white.

What is the reason for this?

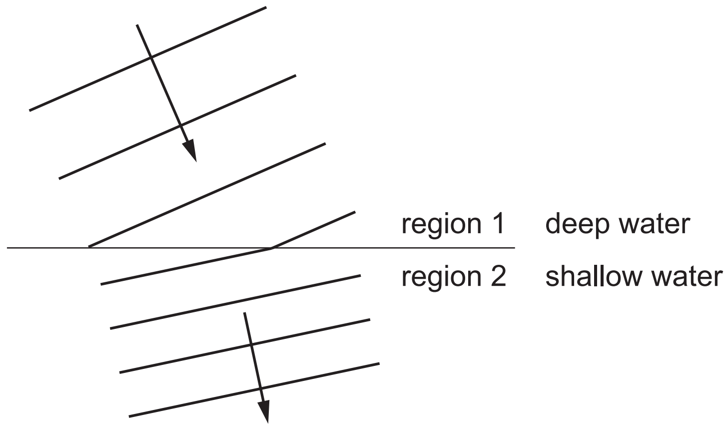
A White surfaces are good reflectors of radiant energy.

B White surfaces are good transmitters of radiant energy.

C White surfaces are good absorbers of radiant energy.

D White surfaces are good emitters of radiant energy.

21 The diagram shows wavefronts on the surface of water, viewed from above.



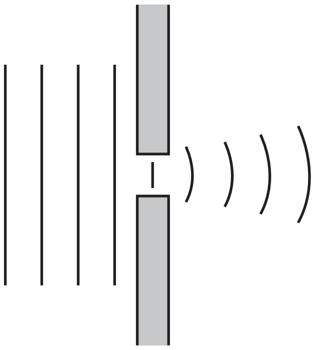
Which row is correct for the wavefronts moving from region 1 to region 2?

	name of process	the speeds of the wavefronts in regions 1 and 2 are
A	diffraction	different
B	diffraction	the same
C	refraction	different
D	refraction	the same

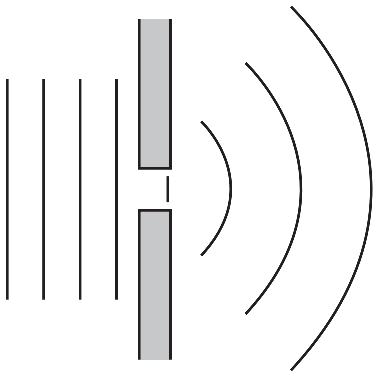
22 Plane water waves approach a narrow gap in a barrier.

Which diagram shows the diffraction pattern that would occur?

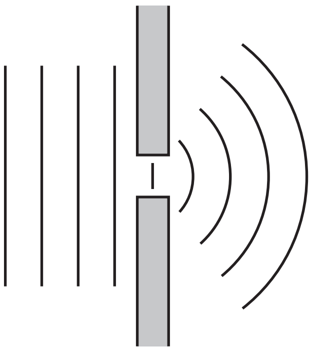
A



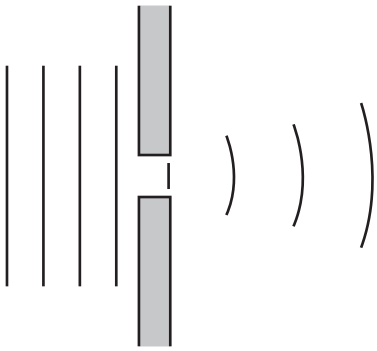
B



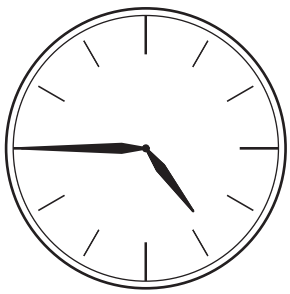
C



D



23 The diagram shows the image of a clock in a plane mirror.



Which is the actual time?

A 04:15 **B** 04:45 **C** 07:15 **D** 07:45

24 Total internal reflection may occur when light reaches an air-glass boundary.

Under which conditions is light totally internally reflected?

	medium in which light travels towards the boundary	angle of incidence
A	air	greater than the critical angle
B	air	less than the critical angle
C	glass	greater than the critical angle
D	glass	less than the critical angle

25 The diagram shows the electromagnetic spectrum.

γ-rays	X-rays	ultraviolet	visible light	infrared	microwaves	radio waves

increasing .... $\longrightarrow$

A word is missing from the label below the spectrum.

Which word is missing?

A amplitude

B frequency

C speed

D wavelength

26 A man hears a starting pistol fire 1.5 seconds after he sees a puff of smoke from the pistol. The sound and the smoke are made at the same time. The starting pistol is 450 metres away from the man.

What is the speed of sound calculated from this observation?

A 150 m/s **B** 300 m/s **C** 330 m/s **D** 625 m/s

27 A student has a bar magnet. He brings the magnet close to an object. The magnet and the object repel each other.

What must the object be?

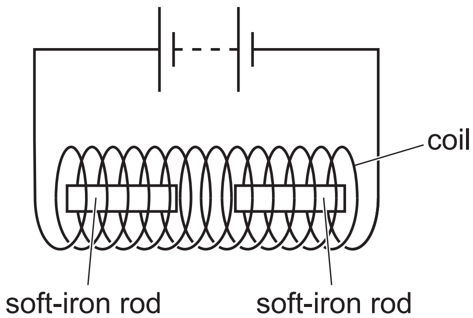
A another permanent magnet

B any magnetic material

C a block of wood

D a piece of copper

28 Two soft-iron rods are placed end-to-end inside a coil. The coil is connected to a battery.



The connections from the battery to the coil are now reversed.

What happens to the soft-iron rods in each case?

	battery connections as shown	battery connections reversed
A	rods attract	rods attract
B	rods attract	rods repel
C	rods repel	rods attract
D	rods repel	rods repel

29 A plastic rod is rubbed with a dry cloth. The rod becomes positively charged.

Why has the rod become positively charged?

A It has gained electrons.

B It has gained neutrons.

C It has lost electrons.

D It has lost neutrons.

30 A teacher asks her class “What quantity can be recorded in volts?”.

Student 1 says “The potential difference across a resistor”.

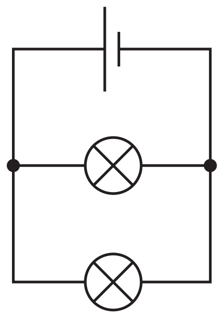
Student 2 says “The rating of a fuse”.

Student 3 says “The electromotive force of a battery”.

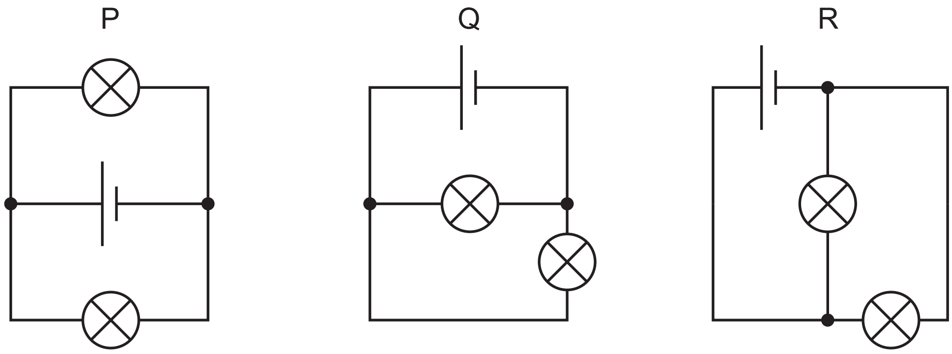
Which students are correct?

A 1 only **B** 1 and 2 **C** 1 and 3 **D** 2 and 3

31 The circuit shows two lamps connected to a d.c. supply.



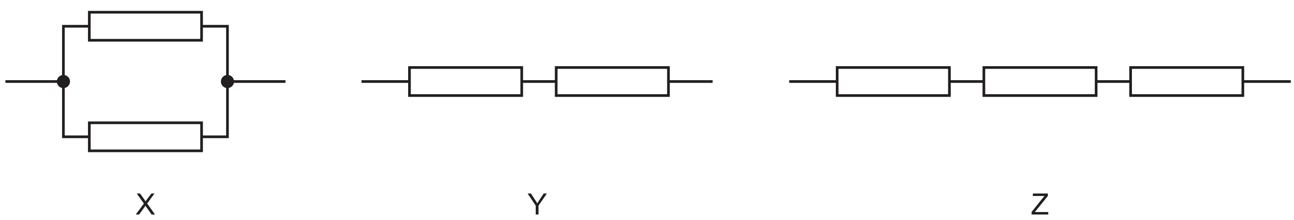
The same lamps and power supply are arranged in different ways, as shown.



In which circuits will the lamps be the same brightness as in the original circuit?

A Q only **B** P and Q only **C** P and R only **D** P, Q and R

32 Identical resistors are connected together to form arrangements X, Y and Z.



What is the correct order of the resistances of the arrangements from the largest to the smallest?

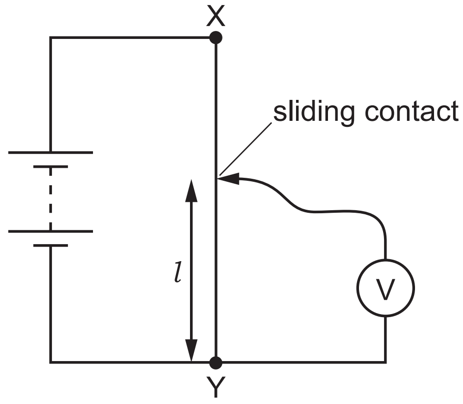
A X → Y → Z

B Y → X → Z

C Z → X → Y

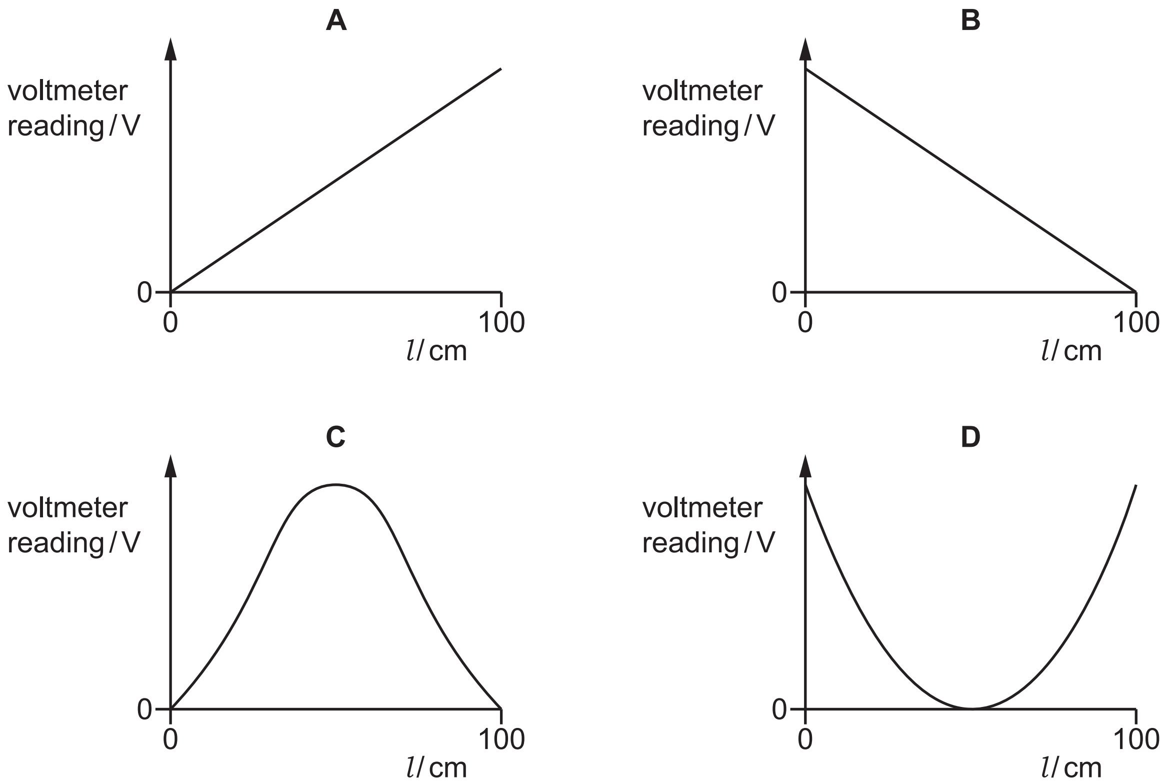
D Z → Y → X

33 A student uses 100 cm of resistance wire XY in a circuit to make a potential divider.



He changes the length of wire l by moving the sliding contact along the resistance wire.

Which graph shows how the voltmeter reading changes as the length of wire l is increased from zero to 100 cm?



34 Where must a fuse be connected in a mains electric circuit?

A the earth wire only

B the live wire only

C the neutral wire only

D the live wire and the earth wire

35 A student investigates the output voltage induced across a coil of wire by a bar magnet.

When will the induced voltage have the greatest value?

A The student slowly moves the bar magnet into the coil of wire.

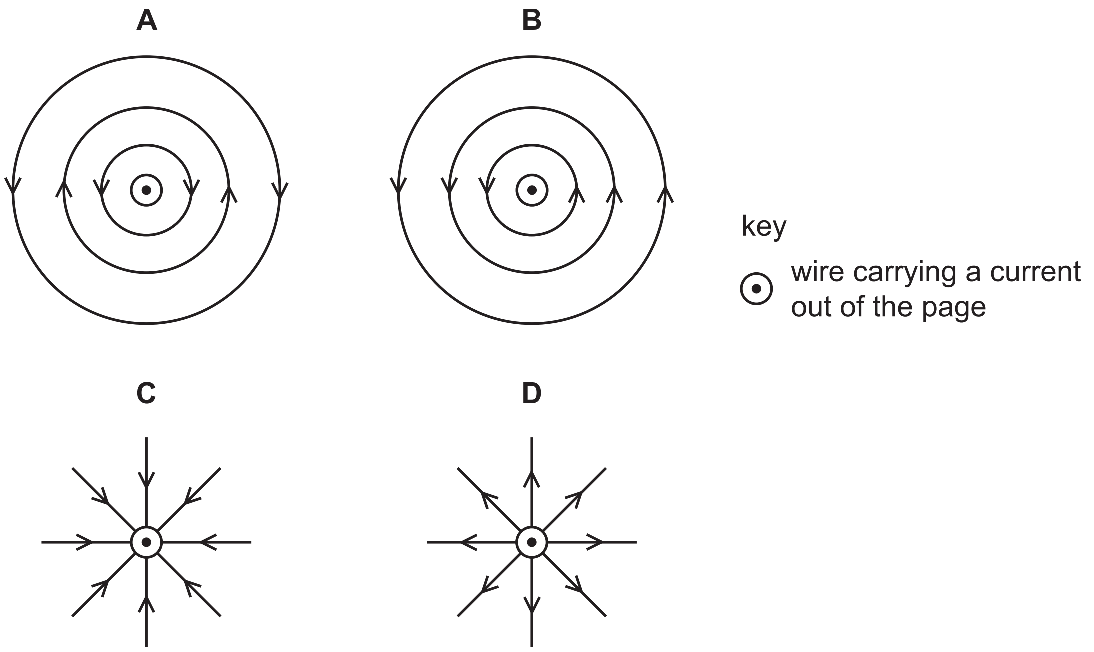
B The student leaves the bar magnet stationary in the coil of wire.

C The student quickly removes the bar magnet from the coil of wire.

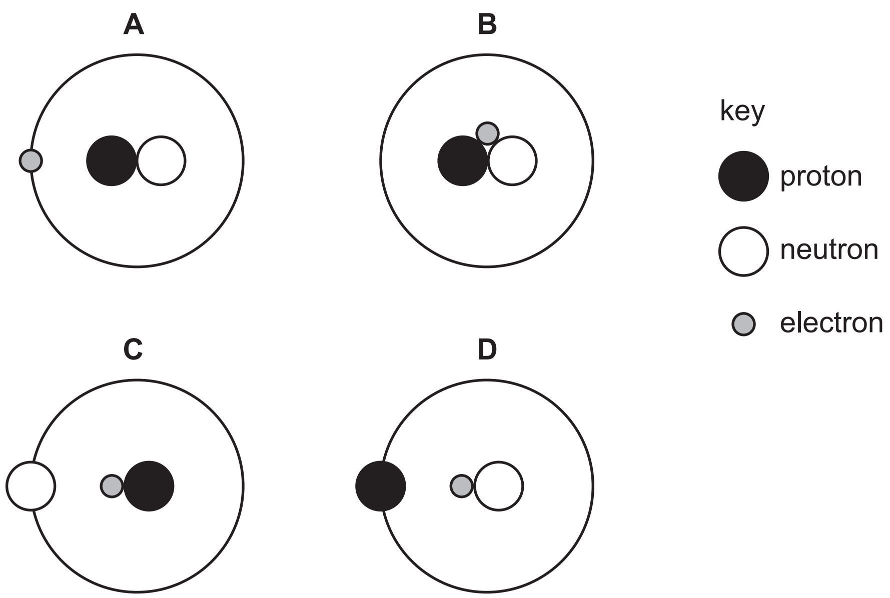
D The student places the bar magnet at rest outside the coil of wire.

36 There is a current in a wire. The direction of the current is out of the page.

Which diagram shows the magnetic field pattern produced?



37 Which diagram shows a possible structure of a neutral atom?



38 A nuclide of cobalt contains 27 protons and 32 neutrons.

Which symbol represents this nuclide?

A $^{27}_{59}\mathrm{Co}$ **B** $^{32}_{27}\mathrm{Co}$ **C** $^{32}_{59}\mathrm{Co}$ **D** $^{59}_{27}\mathrm{Co}$

39 An isotope of radon is radioactive. It decays by emitting an α-particle.

What happens to the nucleus of a radon atom during the emission of the α-particle?

A It becomes the nucleus of a different isotope of radon with fewer neutrons.

B It becomes the nucleus of a different isotope of radon with more neutrons.

C It becomes the nucleus of an element with a higher proton number.

D It becomes the nucleus of an element with a lower proton number.

40 Why are some radioactive sources stored in boxes made from lead?

A Lead absorbs emissions from the radioactive sources.

B Lead decreases the half-life of radioactive sources.

C Lead increases the half-life of radioactive sources.

D Lead repels emissions from the radioactive sources.

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PHYSICS **0625/12**

Paper 1 Multiple Choice (Core) **October/November 2019**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

5658967703

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Do not use staples, paper clips, glue or correction fluid.
Write your name, centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
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There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
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Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **15** printed pages and **1** blank page.

IB19 11_0625_12/4RP

Cambridge Assessment International Education

1 A measuring cylinder contains $10\,cm^3$ of water.

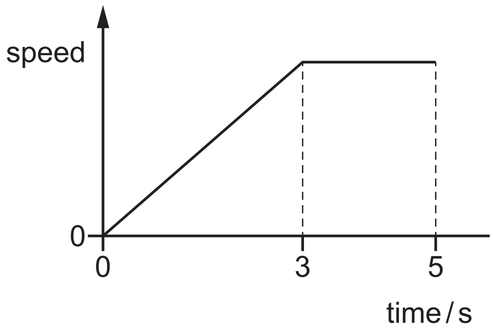
A piece of steel is lowered into the measuring cylinder until it is fully submerged. The volume reading increases to $12\,cm^3$.

A second piece of steel is lowered into the measuring cylinder so that it is also fully submerged. The volume reading increases to $15\,cm^3$.

Which row shows the volumes of the two pieces of steel?

	volume of first piece of steel / cm^3	volume of second piece of steel / cm^3
A	2	3
B	2	5
C	12	3
D	12	15

2 The graph shows the motion of a car for a five-second period.



Which row is correct?

	the car is at rest at	the car is moving at a constant speed at
A	0.0 s	2.0 s
B	0.0 s	4.0 s
C	4.0 s	0.0 s
D	4.0 s	2.0 s

3 A car travels at an average speed of 60 km / h for 15 minutes.

How far does the car travel in 15 minutes?

A 4.0 km **B** 15 km **C** 240 km **D** 900 km

4 A box is placed on the ground. An upward force of 15 N is needed to lift the box at constant speed.

Which row correctly describes the box?

	mass of the box	weight of the box
A	1.5 kg	15 N
B	15 N	1.5 kg
C	15 N	150 kg
D	150 kg	15 N

5 The table gives the mass and the volume of three objects P, Q and R.

object	mass / g	volume / cm^3
P	23	36
Q	170	720
R	240	340

Which objects can float in a liquid of density 0.85 g / cm^3?

A P and Q only

B P and R only

C Q and R only

D P, Q and R

6 A student measures the length of a spring. She then attaches different weights to the spring. She measures the length of the spring for each weight.

The table shows her results.

weight / N	length / mm
0	520
1.0	524
2.0	528
3.0	533
4.0	537
5.0	540

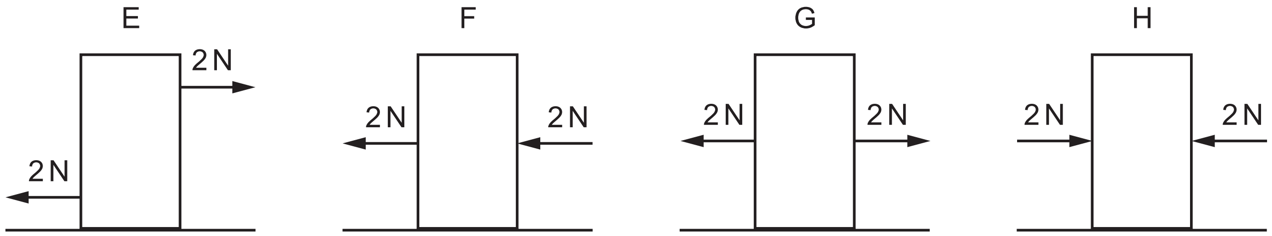
What is the extension of the spring with a weight of 3.0 N attached to it?

A 4 mm **B** 5 mm **C** 12 mm **D** 13 mm

7 What is the unit of the moment of a force?

A N **B** N/kg **C** N/m **D** N m

8 The diagrams show a block of wood on a frictionless surface. In each diagram, the block has two forces acting on its sides.



Which diagrams show the block in equilibrium?

A E, G and H only

B E and F only

C G and H only

D E, F, G and H

9 Brakes are used to slow down a moving car.

Into which form of energy is most of the kinetic energy converted as the car slows down?

A chemical

B elastic

C thermal

D sound

10 What is the unit of thermal energy?

A °C **B** N **C** J **D** W

11 Which source of energy is non-renewable?

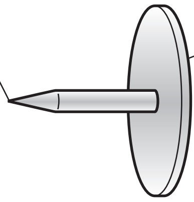
A oil

B solar

C tidal

D wind

12 A drawing pin (thumb tack) has a sharp point at one end and a flat surface at the other end.



The pin is pushed into a wooden board.

How do the pressure and the force at the sharp point compare with the pressure and the force on the flat surface?

	force at the sharp point	pressure at the sharp point
A	greater than on the flat surface	greater than on the flat surface
B	greater than on the flat surface	less than on the flat surface
C	the same as on the flat surface	greater than on the flat surface
D	the same as on the flat surface	less than on the flat surface

13 A metal block of weight *W* rests on a table. In order to calculate the pressure that the block exerts on the table, one other quantity must be known.

What is the other quantity?

A the area of contact between the block and the table

B the density of the block

C the mass of the block

D the volume of the block

14 Which row describes the arrangement and the motion of the molecules in a gas?

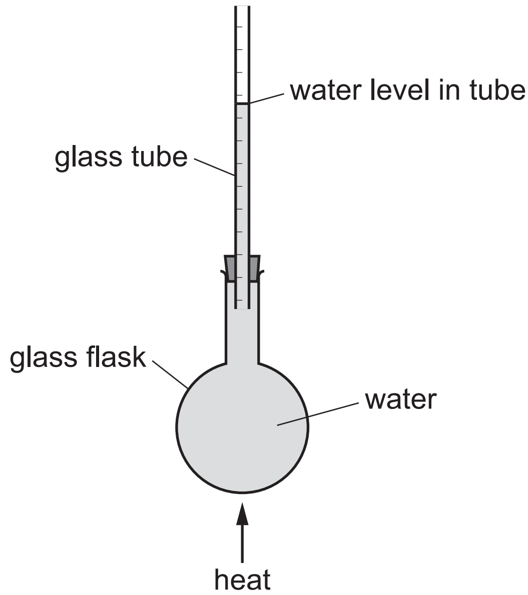
	arrangement	motion
A	far apart	move freely
B	far apart	vibrate only
C	tightly packed	move freely
D	tightly packed	vibrate only

15 A driver of a car measures the pressure of the air in the tyres. He measures the pressure again after a long journey. The pressure reading has increased.

Which row states what has happened to the speed of the air molecules and the temperature of the air in the tyres?

	speed of molecules	temperature
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

16 Some water in a glass flask is gently heated.



Why does the water level in the glass tube rise during heating?

A Only the glass flask expands.

B Only the water expands.

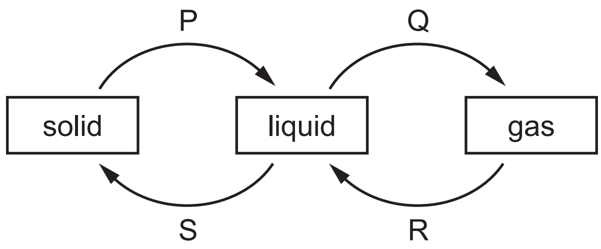
C The glass flask expands more than the water.

D The water expands more than the glass flask.

17 What is the temperature difference between the fixed points on the °C temperature scale?

A 10 °C **B** 100 °C **C** 110 °C **D** 120 °C

18 The diagram shows four labelled changes of state between solid, liquid and gas.



Which changes need an energy input?

A P and Q **B** Q and R **C** R and S **D** S and P

19 Which method of thermal transfer occurs when the density of some of a liquid decreases and the liquid moves upwards?

A conduction

B convection

C evaporation

D radiation

20 The diagram shows a tent made from a new material.

What type of material should the tent be made of to reflect the radiant energy from the Sun?

	material texture	material surface colour
A	dull	black
B	dull	white
C	shiny	black
D	shiny	white

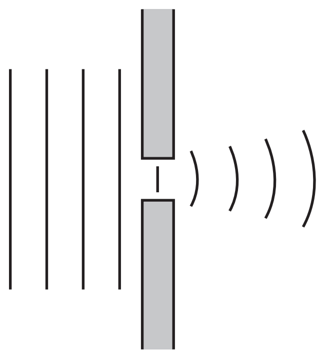
21 Which row correctly describes the vibrations of a transverse wave and also gives a correct example of a transverse wave?

	description of vibration	example of a transverse wave
A	right-angles to the wave direction	sound
B	right-angles to the wave direction	water wave
C	parallel to the wave direction	sound
D	parallel to the wave direction	water wave

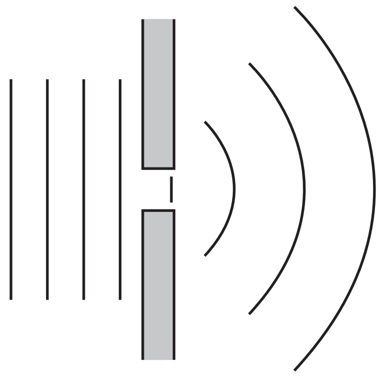
22 Plane water waves approach a narrow gap in a barrier.

Which diagram shows the diffraction pattern that would occur?

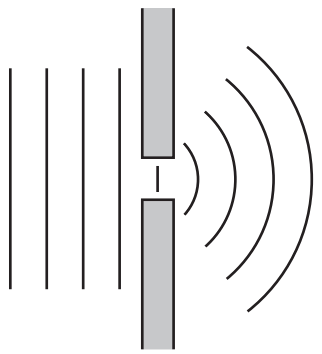
A



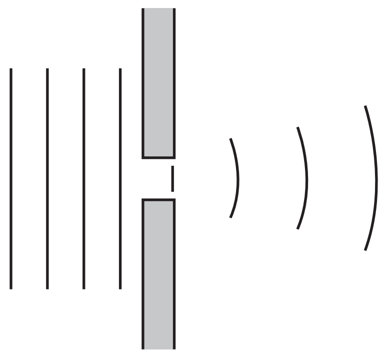
B



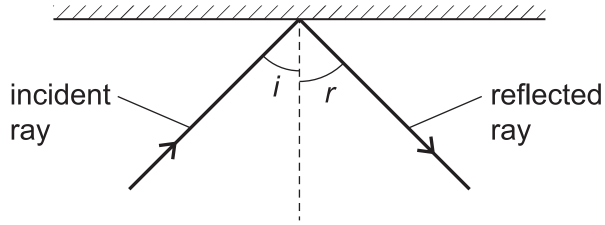
C



D

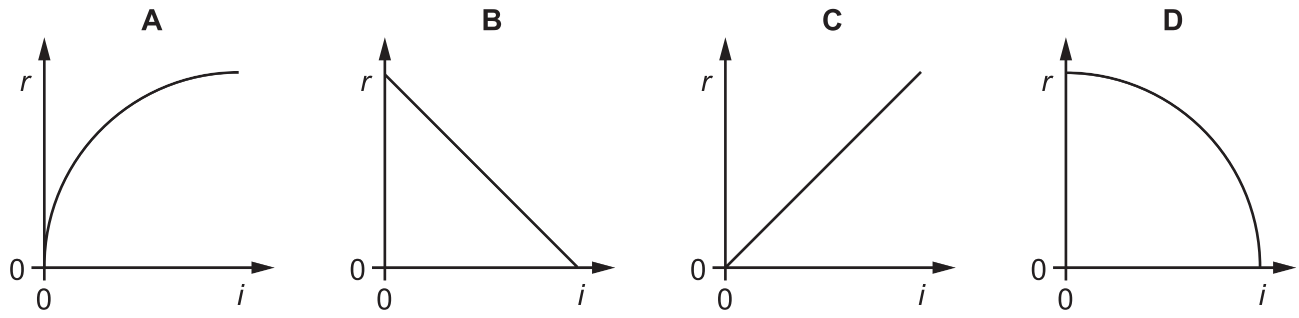


23 A ray of light is incident on a plane mirror. A student measures the angle of incidence *i* and the angle of reflection *r*.



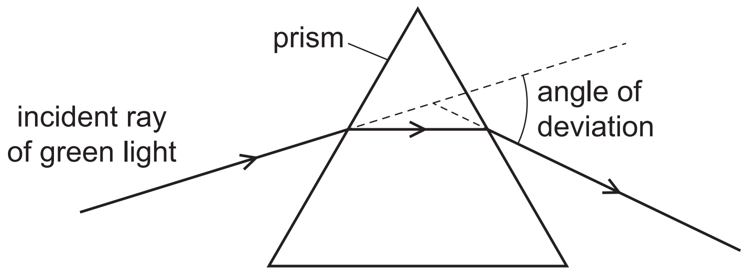
The student varies the angle of incidence and then plots a graph of *r* against *i*.

What does the graph look like?



24 The diagram shows the path of a ray of green light through a glass prism.

The angle of deviation is the angle between the incident ray and the ray leaving the prism.



When a ray of white light is incident on the prism, it separates into the colours of the visible spectrum.

What is the name of this effect and which colour of light has the smallest angle of deviation?

	name of effect	colour with smallest angle of deviation
A	diffraction	red
B	diffraction	violet
C	dispersion	red
D	dispersion	violet

25 The diagram shows the electromagnetic spectrum.

γ-rays	X-rays	ultraviolet	visible light	infrared	microwaves	radio waves

increasing .... $\longrightarrow$

A word is missing from the label below the spectrum.

Which word is missing?

A amplitude

B frequency

C speed

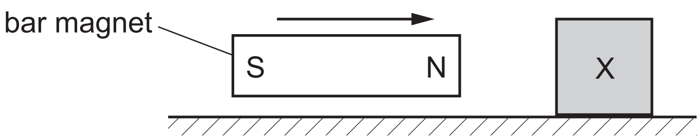
D wavelength

26 A man hears a starting pistol fire 1.5 seconds after he sees a puff of smoke from the pistol. The sound and the smoke are made at the same time. The starting pistol is 450 metres away from the man.

What is the speed of sound calculated from this observation?

A 150 m/s **B** 300 m/s **C** 330 m/s **D** 625 m/s

27 A bar magnet is slowly moved towards an unmagnetised metal object X.



When it is a few centimetres away, the object begins to slide towards the magnet.

Why does this happen?

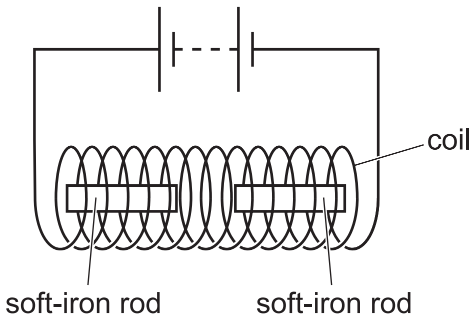
A X is a non-magnetic material and magnetism is induced in it.

B X is a non-magnetic material and magnetism is not induced in it.

C X is a magnetic material and magnetism is induced in it.

D X is a magnetic material and magnetism is not induced in it.

28 Two soft-iron rods are placed end-to-end inside a coil. The coil is connected to a battery.



The connections from the battery to the coil are now reversed.

What happens to the soft-iron rods in each case?

	battery connections as shown	battery connections reversed
A	rods attract	rods attract
B	rods attract	rods repel
C	rods repel	rods attract
D	rods repel	rods repel

29 A plastic rod is rubbed with a dry cloth. The rod becomes positively charged.

Why has the rod become positively charged?

A It has gained electrons.

B It has gained neutrons.

C It has lost electrons.

D It has lost neutrons.

30 Which quantity has the same unit as potential difference (p.d.)?

A current

B electromotive force (e.m.f.)

C resistance

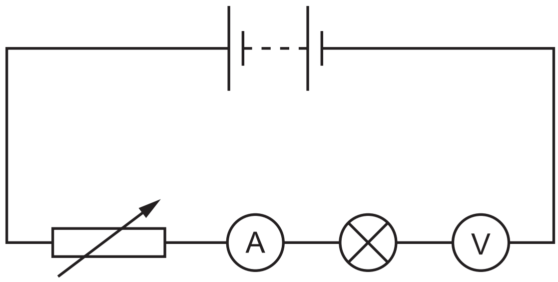
D moment of a force

31 A student determines the resistance of an electric lamp.

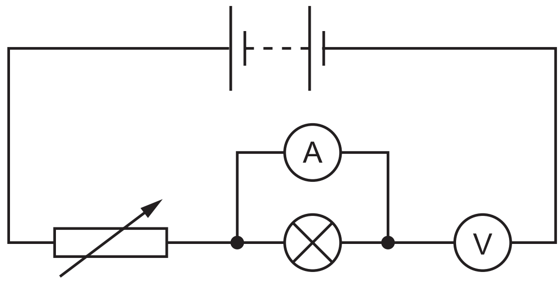
He measures the current in the lamp and the potential difference (p.d.) across it.

Which circuit did he use?

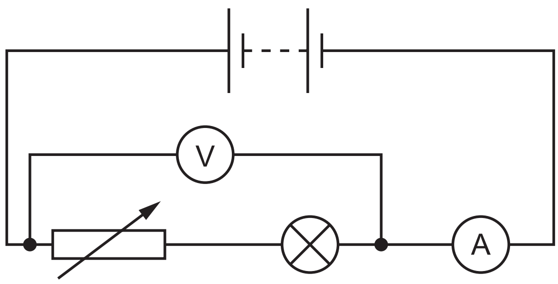
A



B



C



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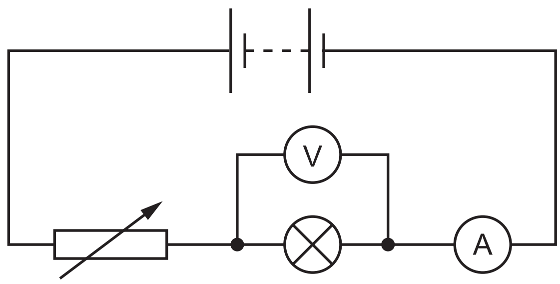
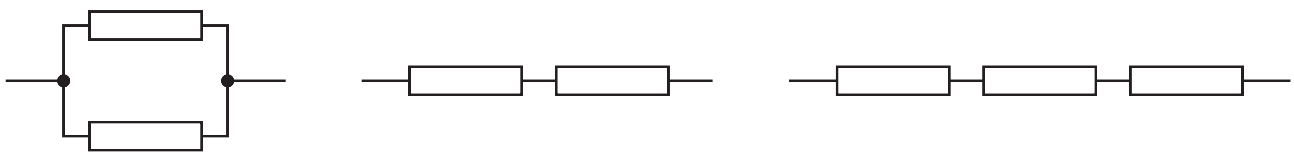


32 Identical resistors are connected together to form arrangements X, Y and Z.



X Y Z

What is the correct order of the resistances of the arrangements from the largest to the smallest?

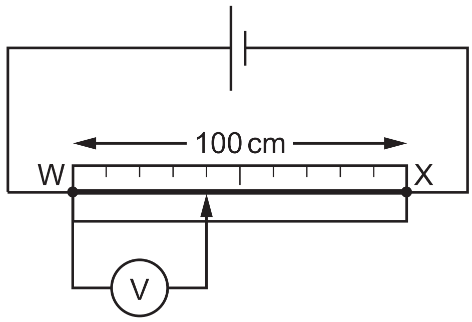
A X → Y → Z

B Y → X → Z

C Z → X → Y

D Z → Y → X

33 The circuit shows a wire WX connected to a cell.



The potential difference (p.d.) between W and X is 1.5 V.

What is the reading on the voltmeter?

A 0.4 V **B** 0.6 V **C** 0.9 V **D** 4.0 V

34 Where must a fuse be connected in a mains electric circuit?

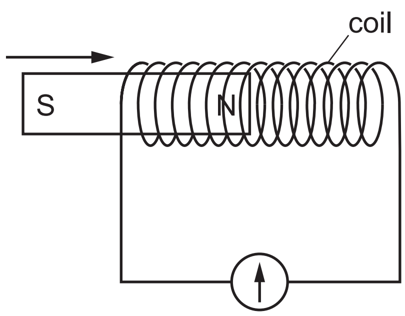
A the earth wire only

B the live wire only

C the neutral wire only

D the live wire and the earth wire

35 The N-pole of a magnet is moved into a coil of wire connected to a galvanometer.



The needle of the galvanometer moves.

Which situation **must** give a smaller galvanometer reading?

A Use a coil with fewer turns and a stronger magnet.

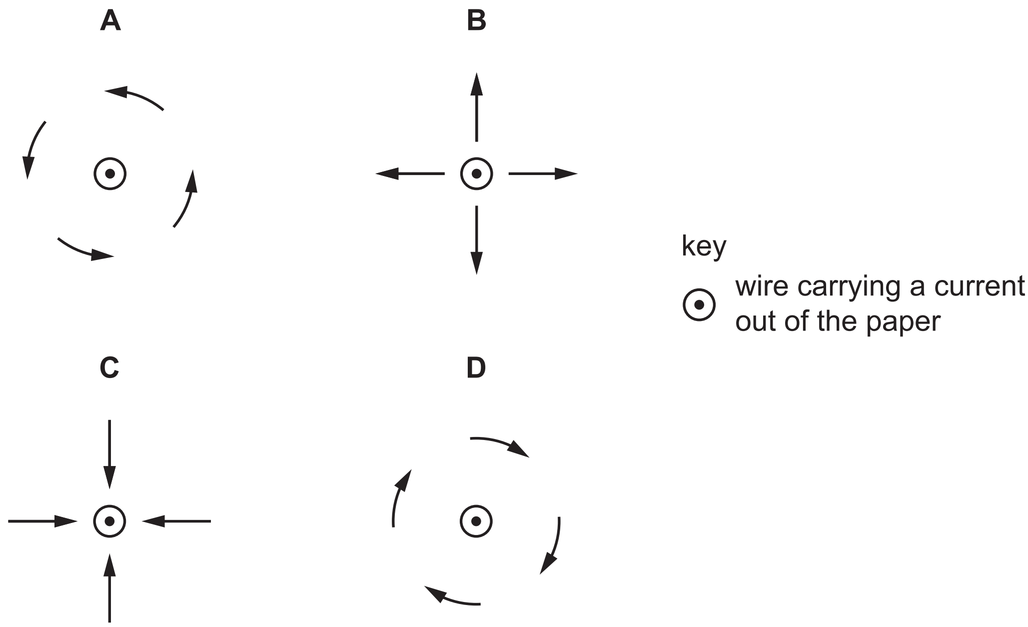
B Use a coil with fewer turns and a weaker magnet.

C Use a coil with more turns and a stronger magnet.

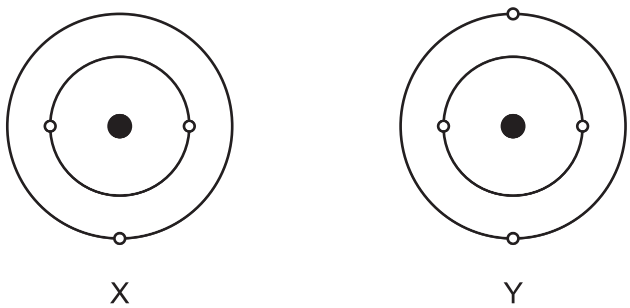
D Use a coil with more turns and a weaker magnet.

36 The diagram shows a conductor carrying current in a direction out of the plane of the page.

Which set of arrows represents the direction of the magnetic field due to this current?



37 The diagrams show the simple atomic structure for two neutral atoms X and Y of different elements.



Which row is correct?

	atom with more electrons	atom with a more positively charged nucleus
A	X	X
B	X	Y
C	Y	X
D	Y	Y

38 A nuclide of chlorine has the symbol shown.

$$^{35}_{17}Cl$$

What is the nucleon number of this nuclide of chlorine?

A 17 **B** 18 **C** 35 **D** 52

39 Which type of radiation can be stopped by a sheet of paper?

A α-particles

B β-particles

C γ-rays

D X-rays

40 Why are some radioactive sources stored in boxes made from lead?

A Lead absorbs emissions from the radioactive sources.

B Lead decreases the half-life of radioactive sources.

C Lead increases the half-life of radioactive sources.

D Lead repels emissions from the radioactive sources.

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Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS	**0625/13**
Paper 1 Multiple Choice (Core)	**October/November 2019**
	45 minutes

Additional Materials: Multiple Choice Answer Sheet
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Soft pencil (type B or HB recommended)

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Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

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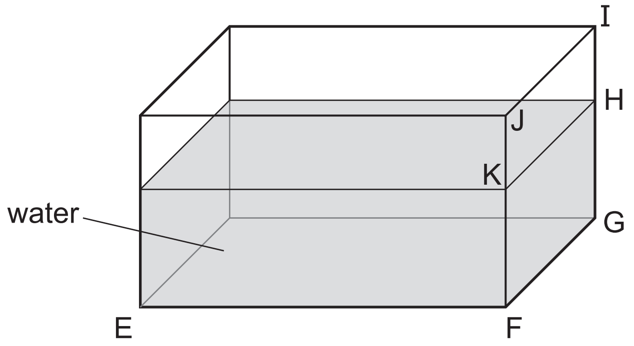
This document consists of **15** printed pages and **1** blank page.

IB19 11_0625_13/4RP

1 A student uses a ruler to find the volume of water in a tank.

She measures the lengths EF and FG.



What other length does she need to measure?

A FJ **B** FK **C** HI **D** IJ

2 An object begins to fall close to the Earth's surface. Air resistance can be ignored.

Which statement about the object's acceleration is correct?

A The acceleration is constant.

B The acceleration decreases as the body falls.

C The acceleration increases as the body falls.

D The acceleration is zero.

3 A car travels at an average speed of 60 km / h for 15 minutes.

How far does the car travel in 15 minutes?

A 4.0 km **B** 15 km **C** 240 km **D** 900 km

4 Which equation shows the relationship between the weight W and the mass m of an object?

A $W = \frac{m}{g}$

B $W = mg$

C $W = m + g$

D $W = \frac{g}{m}$

5 Four hollow glass spheres P, Q, R and S each have a mass of 72 g.

Their volumes are given in the table.

	volume / cm^3
P	55
Q	65
R	75
S	85

Which spheres sink in a liquid of density 0.9 g / cm^3?

A P, Q and R **B** Q, R and S **C** R and S only **D** S only

6 A student measures the length of a spring. She then attaches different weights to the spring. She measures the length of the spring for each weight.

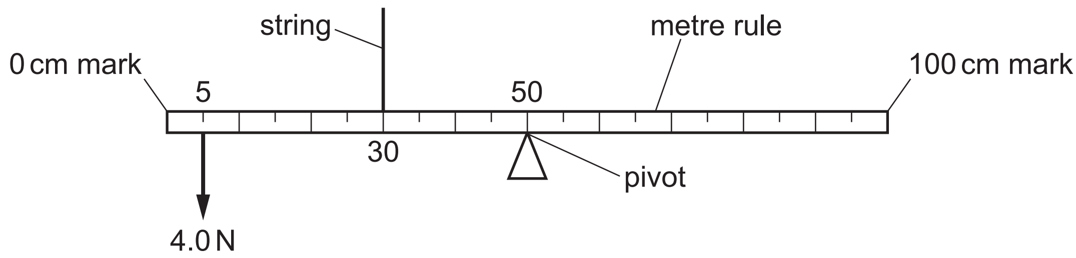
The table shows her results.

weight / N	length / mm
0	520
1.0	524
2.0	528
3.0	533
4.0	537
5.0	540

What is the extension of the spring with a weight of 3.0 N attached to it?

A 4 mm **B** 5 mm **C** 12 mm **D** 13 mm

7 The diagram shows a uniform metre rule. The rule is pivoted at its mid-point. A downward force of 4.0 N acts on the rule at the 5 cm mark. The rule is held by a string at the 30 cm mark. The rule is in equilibrium.

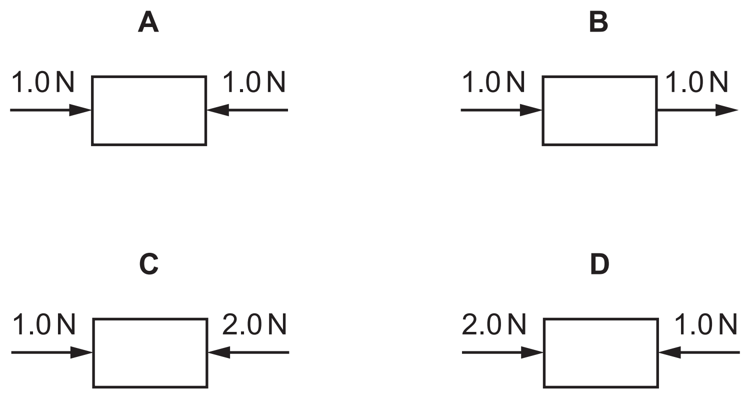


What is the upward force that the string exerts on the rule?

A 0.67 N **B** 4.0 N **C** 6.0 N **D** 9.0 N

8 The diagrams represent the only two forces acting on an object.

Which object could be moving to the right at constant speed?



9 Brakes are used to slow down a moving car.

Into which form of energy is most of the kinetic energy converted as the car slows down?

A chemical

B elastic

C thermal

D sound

10 Three situations are listed.

1 someone blowing air into a party balloon

2 a crane lifting a block of concrete

3 a pile of books at rest on a shelf

In which situations is work being done?

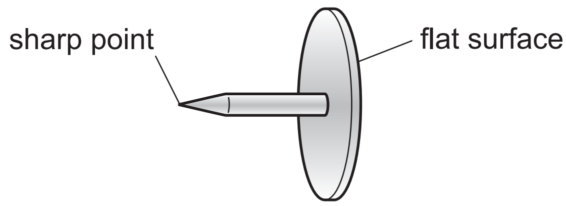
A 1 only **B** 1 and 2 only **C** 2 and 3 only **D** 1, 2 and 3

11 A boy lifts a brick from the ground and places it at rest on a higher shelf. He does 30 J of work against gravity.

Which row correctly describes the final energies of the brick?

	gravitational potential energy gained by the brick / J	kinetic energy gained by the brick / J
A	0	30
B	15	15
C	30	0
D	27	3

12 A drawing pin (thumb tack) has a sharp point at one end and a flat surface at the other end.



The pin is pushed into a wooden board.

How do the pressure and the force at the sharp point compare with the pressure and the force on the flat surface?

	force at the sharp point	pressure at the sharp point
A	greater than on the flat surface	greater than on the flat surface
B	greater than on the flat surface	less than on the flat surface
C	the same as on the flat surface	greater than on the flat surface
D	the same as on the flat surface	less than on the flat surface

13 Pressure is related to force and area.

Which situation **cannot** be explained using this relationship?

A Using a longer spanner than normal to undo a tight nut.

B Hammering a nail into a piece of wood.

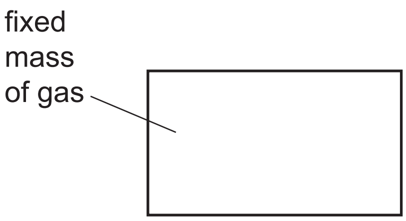
C Tractors using wide tyres in a muddy field.

D A sharp kitchen knife cutting vegetables more easily than a blunt one.

14 Which row compares the separation and the motion of the molecules of a hot gas with those of a cool liquid? (Both the gas and the liquid are at the same pressure.)

	separation	motion
A	greater for a gas	faster for a gas
B	greater for a gas	slower for a gas
C	smaller for a gas	faster for a gas
D	smaller for a gas	slower for a gas

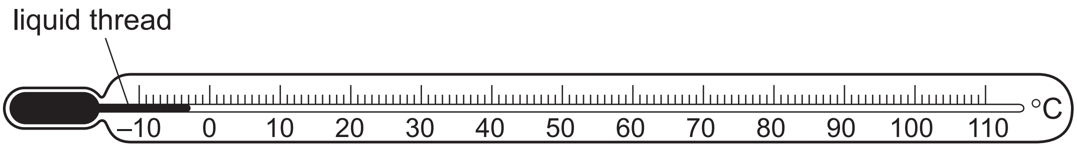
15 A fixed mass of gas is trapped in a container. The temperature of the gas is increased but the volume of the gas is kept constant.



How does this change affect the kinetic energy of the molecules and the pressure on the walls of the container?

	kinetic energy	pressure
A	increases	increases
B	stays the same	increases
C	increases	decreases
D	decreases	increases

16 The diagram shows a liquid-in-glass thermometer.



When the temperature of the thermometer rises, the changes produced cause the liquid thread to move to the right.

Why does this happen when the temperature of the thermometer rises?

A Gases contract and liquids expand.

B Gases contract and solids expand.

C Liquids expand more than gases.

D Liquids expand more than solids.

17 A liquid-in-glass thermometer has a range from –10 °C to 110 °C.

What are the fixed point temperatures used when calibrating this thermometer in °C?

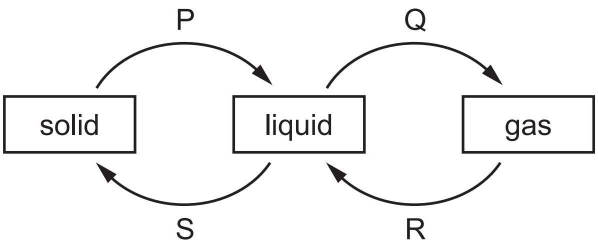
A –10 °C and 0 °C

B –10 °C and 110 °C

C 0 °C and 100 °C

D 0 °C and 110 °C

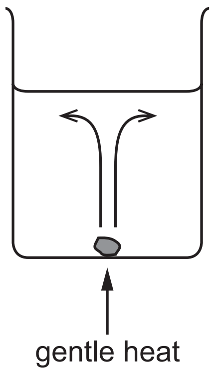
18 The diagram shows four labelled changes of state between solid, liquid and gas.



Which changes need an energy input?

A P and Q **B** Q and R **C** R and S **D** S and P

19 A beaker contains some cold water. A purple crystal is placed on the bottom of the beaker. The beaker is gently heated beneath the crystal. The crystal dissolves in the water. The colour spreads, as shown in the diagram.



Three students each make a statement about the experiment.

Student 1 says the purple water is less dense than the rest of the water.

Student 2 says the purple water is warmer than the rest of the water.

Student 3 says all of the water will eventually get heated, even though water is a poor conductor of thermal energy.

Which students are correct?

A 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3

20 Why are the outside walls of houses often painted white in very hot countries?

A White surfaces are good absorbers of infrared radiation.

B White surfaces are good emitters of infrared radiation.

C White surfaces are poor absorbers of infrared radiation.

D White surfaces are poor reflectors of infrared radiation.

21 Which type of wave is **not** an example of a transverse wave?

A sound wave

B microwave

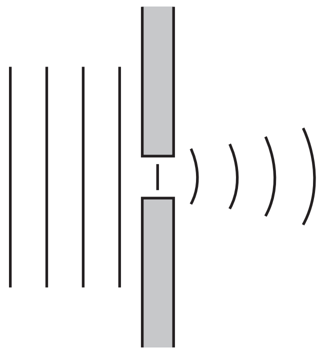
C infrared wave

D radio wave

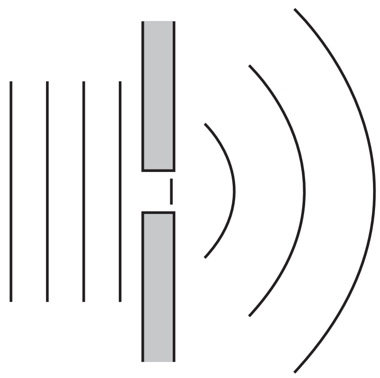
22 Plane water waves approach a narrow gap in a barrier.

Which diagram shows the diffraction pattern that would occur?

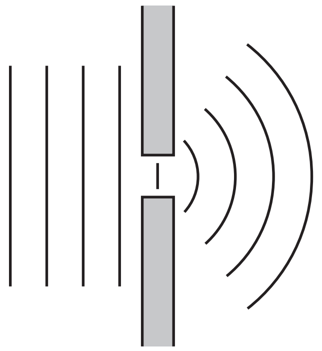
A



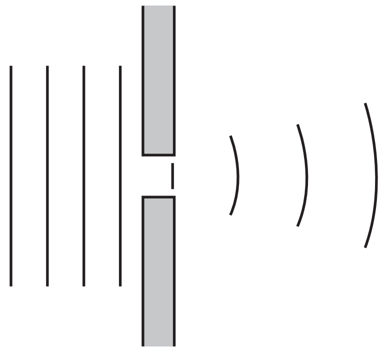
B



C



D



23 A person stands 1.0 m in front of a plane mirror. The mirror is moved away from the person at a speed of 1.0 m / s.

Which statement is correct?

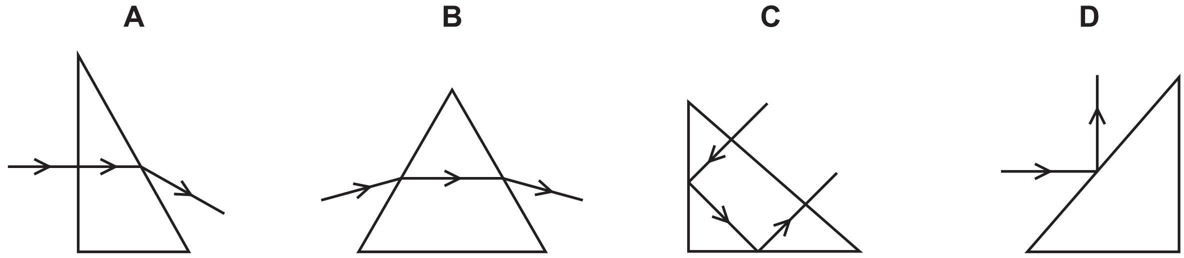
A The image moves away from the person at a speed of 1.0 m / s.

B The image moves away from the person at a speed of 2.0 m / s.

C The image moves towards the person at a speed of 1.0 m / s.

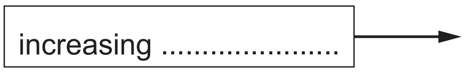
D The image moves towards the person at a speed of 2.0 m / s.

24 Which diagram shows total internal reflection of light by a glass prism?



25 The diagram shows the electromagnetic spectrum.

γ-rays	X-rays	ultraviolet	visible light	infrared	microwaves	radio waves



A word is missing from the label below the spectrum.

Which word is missing?

A amplitude

B frequency

C speed

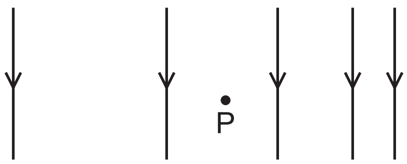
D wavelength

26 A man hears a starting pistol fire 1.5 seconds after he sees a puff of smoke from the pistol. The sound and the smoke are made at the same time. The starting pistol is 450 metres away from the man.

What is the speed of sound calculated from this observation?

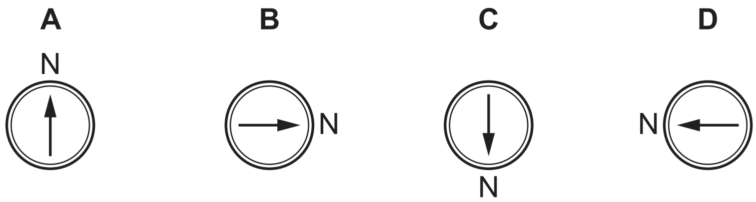
A 150 m / s **B** 300 m / s **C** 330 m / s **D** 625 m / s

27 The diagram represents a magnetic field. The field increases in strength from left to right.

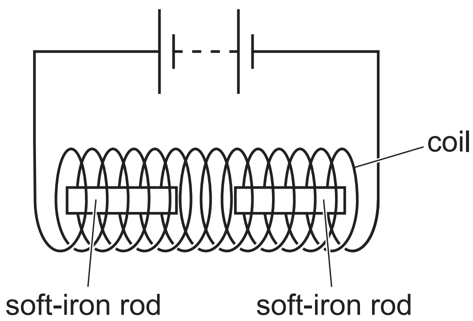


A small compass is placed at P.

Which way will the compass needle point?



28 Two soft-iron rods are placed end-to-end inside a coil. The coil is connected to a battery.



The connections from the battery to the coil are now reversed.

What happens to the soft-iron rods in each case?

	battery connections as shown	battery connections reversed
A	rods attract	rods attract
B	rods attract	rods repel
C	rods repel	rods attract
D	rods repel	rods repel

29 A plastic rod is rubbed with a dry cloth. The rod becomes positively charged.

Why has the rod become positively charged?

A It has gained electrons.

B It has gained neutrons.

C It has lost electrons.

D It has lost neutrons.

30 A resistor is connected to a battery. There is a current in the resistor.

What is the main energy change?

A Chemical energy is converted into thermal energy.

B Chemical energy is converted into gravitational potential energy.

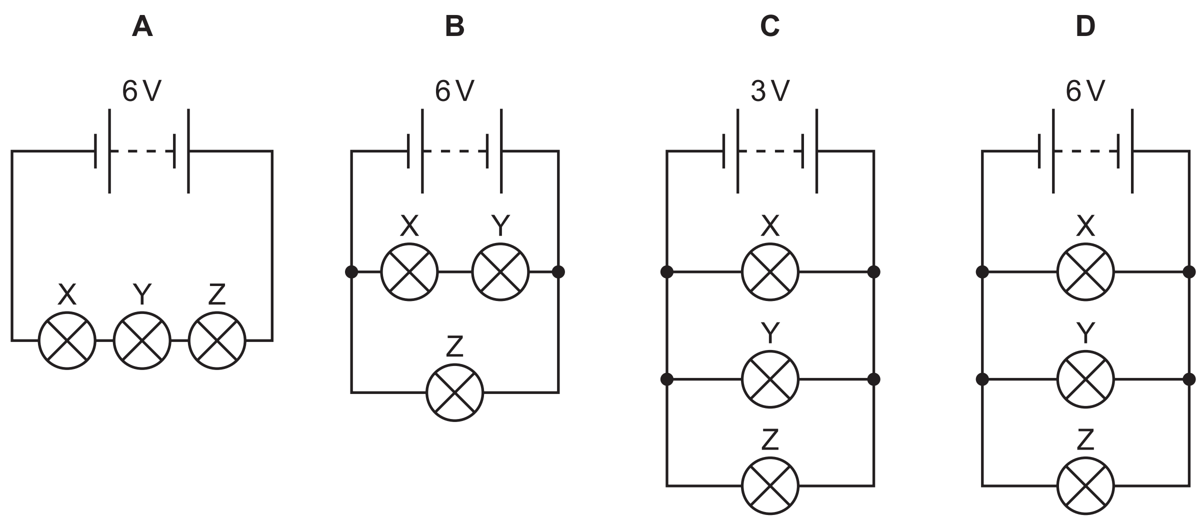
C Nuclear energy is converted into thermal energy.

D Nuclear energy is converted into gravitational potential energy.

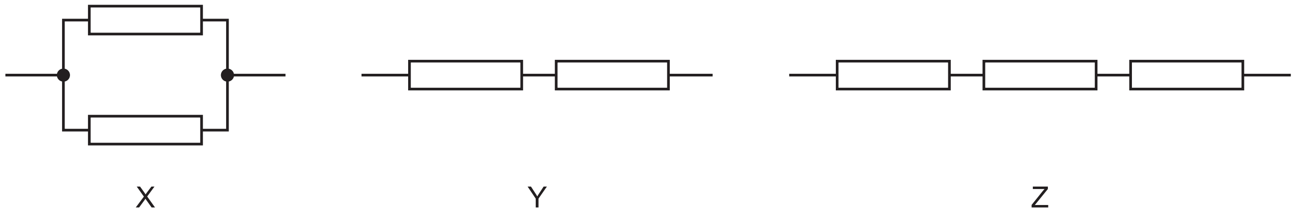
31 Lamps X and Y are designed to operate at normal brightness when each are connected to a 3.0 V supply.

Lamp Z is designed to operate at normal brightness when connected to a 6.0 V supply.

In which circuit do all three lamps operate at normal brightness?



32 Identical resistors are connected together to form arrangements X, Y and Z.



What is the correct order of the resistances of the arrangements from the largest to the smallest?

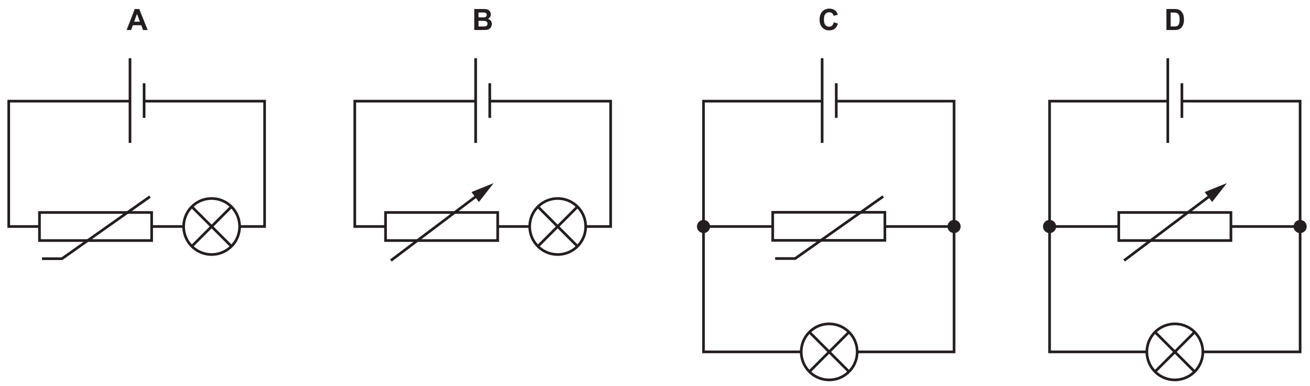
A X → Y → Z

B Y → X → Z

C Z → X → Y

D Z → Y → X

33 Which circuit shows a variable resistor used to control the brightness of a lamp?



34 Where must a fuse be connected in a mains electric circuit?

A the earth wire only

B the live wire only

C the neutral wire only

D the live wire and the earth wire

35 A step-up transformer produces a 60 V a.c. output from a 12 V a.c. input.

There are 50 turns on the secondary coil.

How many turns are there on the primary coil?

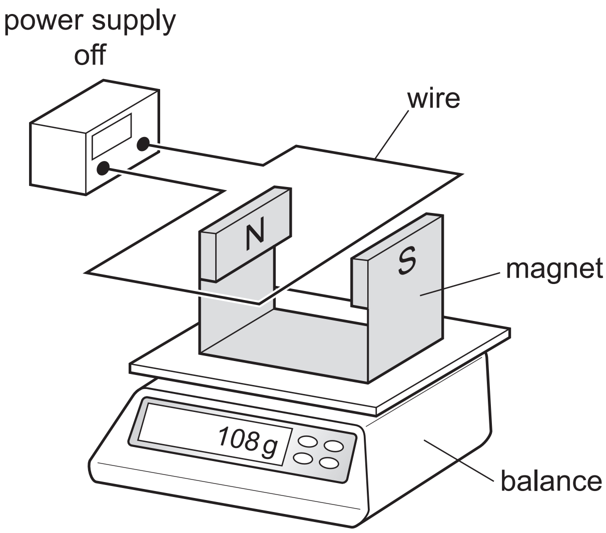
A 5 **B** 10 **C** 50 **D** 250

36 A student uses a balance, a magnet and a power supply to determine the force on a wire in a magnetic field.

The wire is held between the poles of the magnet.

The student switches on the power supply.

The diagrams show the readings with and without a current in the wire.



no current in wire

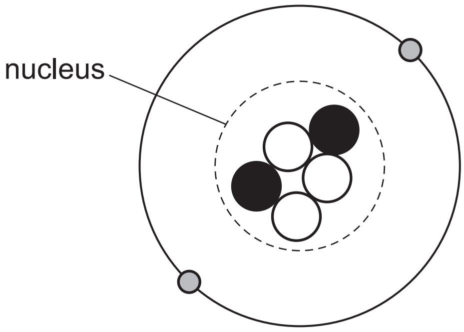
current in wire

The student reverses the current in the wire. The magnitude of the current does not change.

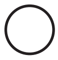
What is the new reading on the balance?

A 106 g **B** 107 g **C** 108 g **D** 109 g

37 The diagram represents a neutral atom.



Which row identifies each type of particle in the diagram?

			
A	electron	neutron	proton
B	electron	proton	neutron
C	neutron	electron	proton
D	proton	electron	neutron

38 An iron nuclide is represented by the symbol shown.

$$^{56}_{26}\mathrm{Fe}$$

Which statements about a nucleus of this iron nuclide are correct?

1 The nucleus contains 56 neutrons.

2 The nucleon number is 30.

3 The proton number is 26.

A 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 3 only

39 Three types of radiation that can cause ionisation are α-, β- and γ-radiation.

Which row identifies the least and the most ionising of these radiations?

	least ionising	most ionising
A	α	β
B	α	γ
C	γ	β
D	γ	α

40 Why are some radioactive sources stored in boxes made from lead?

A Lead absorbs emissions from the radioactive sources.

B Lead decreases the half-life of radioactive sources.

C Lead increases the half-life of radioactive sources.

D Lead repels emissions from the radioactive sources.

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Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

PHYSICS **0625/21**

Paper 2 Multiple Choice (Extended) **October/November 2019**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

8731446642

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

This document consists of **15** printed pages and **1** blank page.

1 A student measures the diameter of a pencil.

Which measuring instrument will give the most precise reading?

A a measuring tape

B a metre rule

C a micrometer screw gauge

D a ruler

2 A light object is dropped from rest. It falls a large distance vertically through air.

How can the motion of the object be described?

A constant acceleration

B increasing acceleration

C decreasing acceleration and then moving at terminal velocity

D increasing acceleration and then moving at terminal velocity

3 A car travels at an average speed of 60 km / h for 15 minutes.

How far does the car travel in 15 minutes?

A 4.0 km **B** 15 km **C** 240 km **D** 900 km

4 Which quantity is a force due to a gravitational field?

A density

B mass

C weight

D volume

5 The density of air is 1.2 kg / m^3.

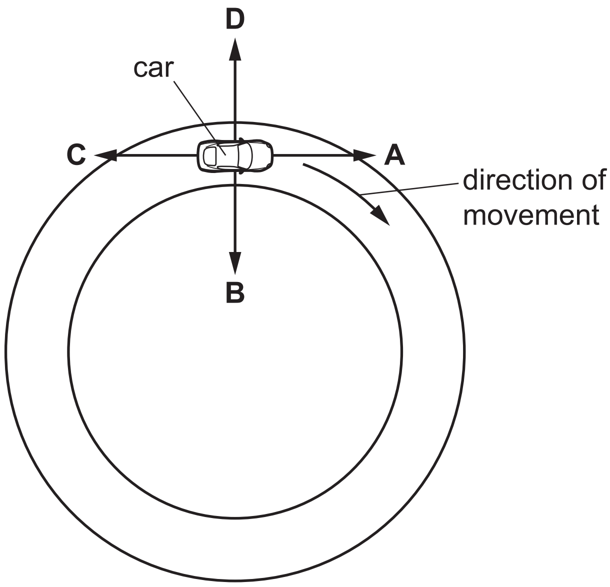
A room has dimensions 5.0 m × 4.0 m × 3.0 m.

What is the mass of the air in the room?

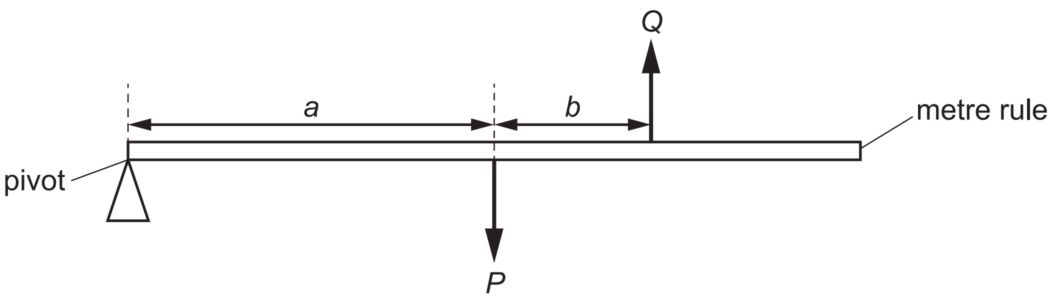
A 0.02 kg **B** 0.10 kg **C** 50 kg **D** 72 kg

6 A car is travelling around a circular track at a constant speed, as shown.

In which direction is the resultant force on the car?



7 Two forces P and Q act on a metre rule as shown. The metre rule is pivoted at one end. The rule starts to rotate in a clockwise direction.



Which statement is correct?

A P equals Q

B P is less than Q

C $(P \times a)$ is equal to $(Q \times b)$

D $(P \times a)$ is greater than $(Q \times (a + b))$

8 Which statement gives a complete description of any object that is in equilibrium?

A There are no forces acting.

B There is no resultant force.

C There is no resultant force and no resultant turning effect.

D There is no resultant turning effect.

9 Two objects X and Y move directly towards each other. The objects have the same mass.

Object X has a velocity of 5.0 m / s to the right. Object Y has a velocity of 3.0 m / s to the left.

Object X and object Y collide and stick together.

What is their velocity after colliding?

A 1.0 m / s to the left

B 1.0 m / s to the right

C 4.0 m / s to the left

D 4.0 m / s to the right

10 Brakes are used to slow down a moving car.

Into which form of energy is most of the kinetic energy converted as the car slows down?

A chemical

B elastic

C thermal

D sound

11 A man carries 20 tiles from the ground to the roof of a house. Each tile has a mass of 1.2 kg. The roof of the house is 15 m above the ground.

How much work does the man do against gravity on the tiles in carrying them to the roof?

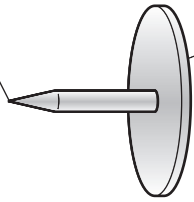
A 36 J **B** 180 J **C** 360 J **D** 3600 J

12 A car is moving along a straight horizontal road. The car has 1.6 MJ of kinetic energy. The car accelerates for 20 s until the kinetic energy of the car increases to 2.5 MJ.

What is the minimum average power developed by the car engine for this acceleration?

A 45 W **B** 205 W **C** 45 kW **D** 205 kW

13 A drawing pin (thumb tack) has a sharp point at one end and a flat surface at the other end.



The pin is pushed into a wooden board.

How do the pressure and the force at the sharp point compare with the pressure and the force on the flat surface?

	force at the sharp point	pressure at the sharp point
A	greater than on the flat surface	greater than on the flat surface
B	greater than on the flat surface	less than on the flat surface
C	the same as on the flat surface	greater than on the flat surface
D	the same as on the flat surface	less than on the flat surface

14 An object is 20 cm below the surface of a liquid. The density of the liquid is 1200 kg / m^3.

What is the pressure on the object due to the liquid?

A 600 Pa **B** 2400 Pa **C** 60 000 Pa **D** 240 000 Pa

15 Which statement about the evaporation of a liquid is correct?

A The least energetic molecules escape from the surface and the temperature of the liquid decreases.

B The least energetic molecules escape from the surface and the temperature of the liquid increases.

C The most energetic molecules escape from the surface and the temperature of the liquid decreases.

D The most energetic molecules escape from the surface and the temperature of the liquid increases.

16 A bubble of gas is formed deep under water. The bubble has a volume of 40 cm^3 and the pressure inside the bubble is *P*.

The bubble rises up through the water. The volume of the bubble increases to 56 cm^3 and the pressure becomes 100 kPa. The temperature of the gas does not change.

What is the initial pressure *P*?

A 71 Pa **B** 71 kPa **C** 140 Pa **D** 140 kPa

17 Which change in the design of a liquid-in-glass thermometer makes it more sensitive?

A a larger liquid reservoir

B a longer tube

C a smaller liquid reservoir

D a wider tube

18 A liquid turns into a gas. This occurs only at one particular temperature, and the change happens throughout the liquid.

What is this process called?

A boiling

B condensation

C evaporation

D fusion

19 One end of a rod of copper is placed in hot water. Thermal energy travels along the rod to make the other end warmer.

What is the behaviour of the copper at an atomic level that accounts for most of the transfer of thermal energy from one end to the other?

A Atoms at the hot end gain kinetic energy and move towards the other end.

B Atoms at the hot end expand, colliding with other atoms and transferring energy.

C Free electrons at the hot end gain energy and move towards the other end, colliding with atoms along the rod.

D Free electrons at the hot end gain energy from the hot water and move directly to the other end.

20 A surface is made so that it is a good source of infrared radiation.

Which surface is **not** suitable?

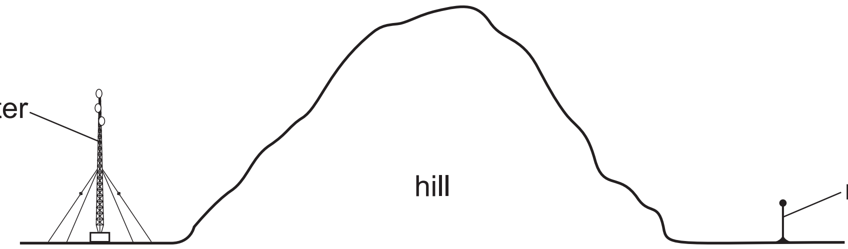
A a surface that is painted matt black

B a surface that is painted white

C a surface that is heated to a high temperature

D a surface that has a large surface area

21 A large hill blocks the direct path between a transmitter of radio waves and a receiver, as shown.

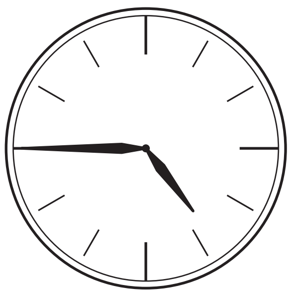


The receiver picks up the signal from the transmitter even though the radio waves do not travel through the hill.

Which row is correct?

	A possible way for this to happen is	A stronger signal is received using
A	diffraction round the hill.	longer wavelengths.
B	diffraction round the hill.	shorter wavelengths.
C	refraction round the hill.	longer wavelengths.
D	refraction round the hill.	shorter wavelengths.

22 The diagram shows the image of a clock in a plane mirror.

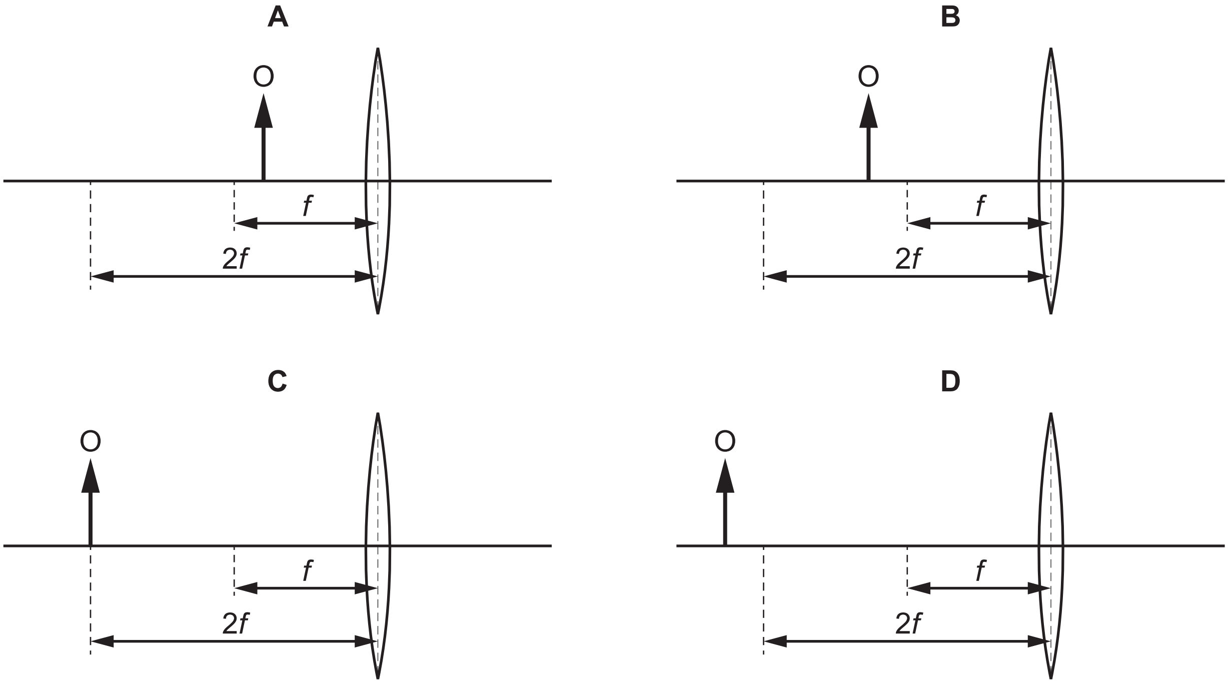


Which is the actual time?

A 04:15 **B** 04:45 **C** 07:15 **D** 07:45

23 A converging lens produces an image of an object O. The focal length of the lens is *f*.

Which position of the object produces a virtual image?



24 The diagram shows the electromagnetic spectrum.

γ-rays	X-rays	ultraviolet	visible light	infrared	microwaves	radio waves

increasing .... →

A word is missing from the label below the spectrum.

Which word is missing?

A amplitude

B frequency

C speed

D wavelength

25 Which row gives a possible set of values for the speed of sound in ice, in water and in steam?

	speed of sound in ice m/s	speed of sound in water m/s	speed of sound in steam m/s
A	500	1500	4000
B	1500	4000	500
C	4000	500	1500
D	4000	1500	500

26 A steel bar is placed in an East-West direction for it to be demagnetised. No other magnet is nearby.

Which method is **not** suitable?

A Hammering the bar.

B Heating the bar to a very high temperature.

C Slowly taking the bar out of a coil that carries an alternating current.

D Slowly taking the bar out of a coil that carries a direct current.

27 A plastic rod is rubbed with a dry cloth. The rod becomes positively charged.

Why has the rod become positively charged?

A It has gained electrons.

B It has gained neutrons.

C It has lost electrons.

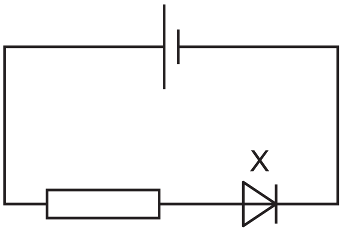
D It has lost neutrons.

28 A circuit contains a cell of electromotive force (e.m.f.) of 2.0 V. The current in the circuit is 2.0 A.

How much energy is converted by the cell in 2.0 minutes?

A 2.0 J **B** 4.0 J **C** 8.0 J **D** 480 J

29 The circuit diagram shows a cell connected in series to a resistor and a component X.



What is component X?

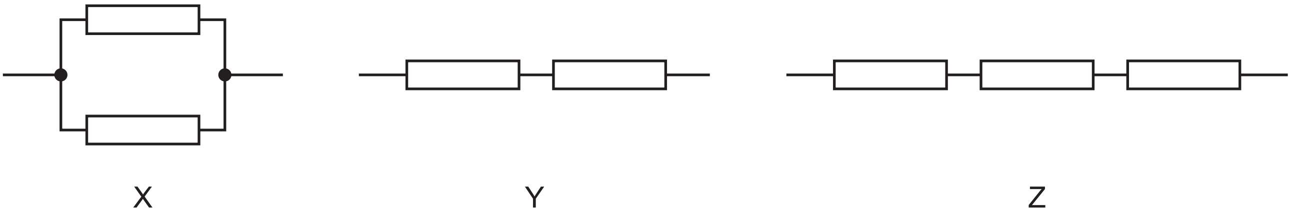
A bell

B diode

C heater

D thermistor

30 Identical resistors are connected together to form arrangements X, Y and Z.



What is the correct order of the resistances of the arrangements from the largest to the smallest?

A X $\rightarrow$ Y $\rightarrow$ Z

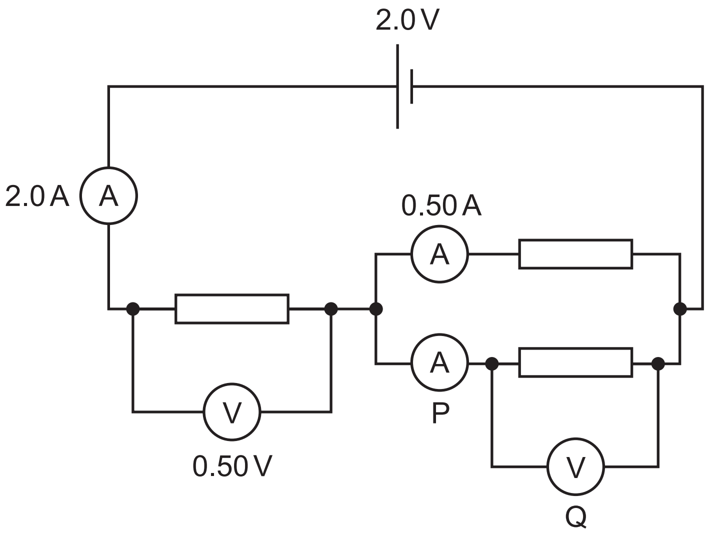
B Y $\rightarrow$ X $\rightarrow$ Z

C Z $\rightarrow$ X $\rightarrow$ Y

D Z $\rightarrow$ Y $\rightarrow$ X

31 A circuit contains a cell of electromotive force (e.m.f.) 2.0 V, three resistors, three ammeters and two voltmeters. One ammeter is labelled P and one voltmeter is labelled Q.

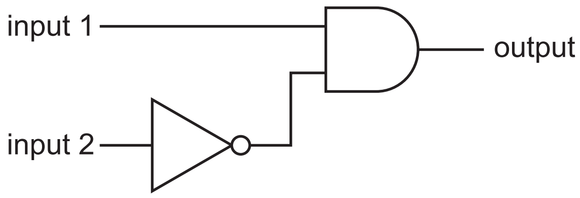
The readings on the other two ammeters and on the other voltmeter are shown.



What is the reading on ammeter P and what is the reading on voltmeter Q?

	reading on P / A	reading on Q / V
A	1.5	1.5
B	1.5	2.5
C	2.5	1.5
D	2.5	2.5

32 There are two inputs and one output for the combination of logic gates shown.



Which truth table represents the operation of this combination of logic gates?

A

input 1	input 2	output
0	0	0
0	1	0
1	0	1
1	1	1

B

input 1	input 2	output
0	0	0
0	1	0
1	0	1
1	1	0

C

input 1	input 2	output
0	0	1
0	1	1
1	0	0
1	1	0

D

input 1	input 2	output
0	0	1
0	1	0
1	0	1
1	1	1

33 Where must a fuse be connected in a mains electric circuit?

A the earth wire only

B the live wire only

C the neutral wire only

D the live wire and the earth wire

34 A student investigates the output voltage induced across a coil of wire by a bar magnet.

When will the induced voltage have the greatest value?

A The student slowly moves the bar magnet into the coil of wire.

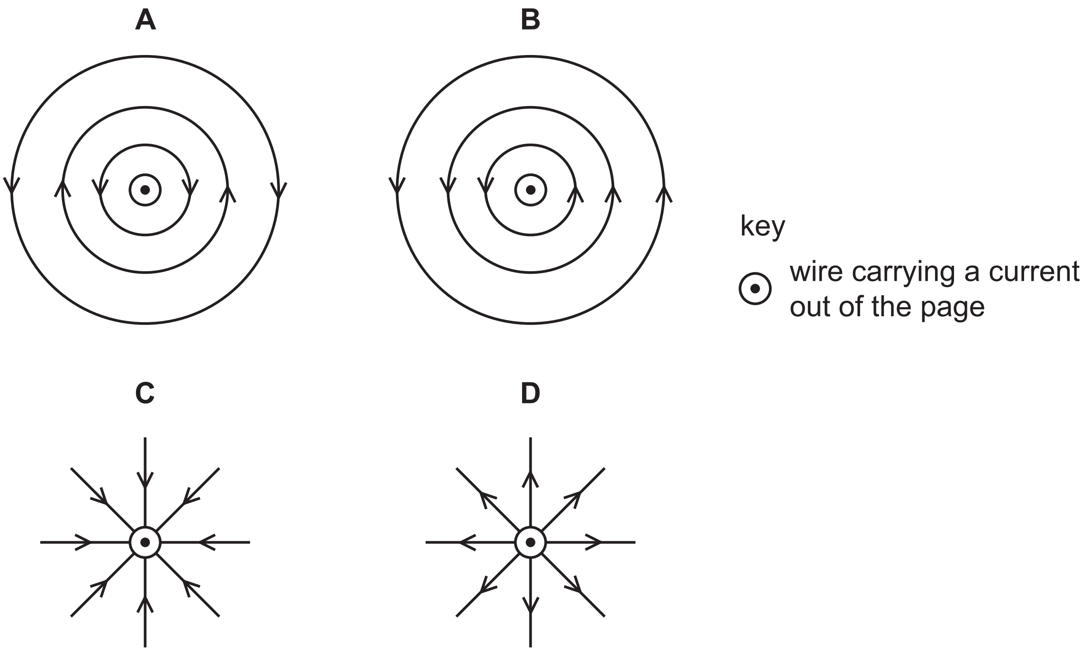
B The student leaves the bar magnet stationary in the coil of wire.

C The student quickly removes the bar magnet from the coil of wire.

D The student places the bar magnet at rest outside the coil of wire.

35 There is a current in a wire. The direction of the current is out of the page.

Which diagram shows the magnetic field pattern produced?



36 Diagram 1 shows a coil of wire P between the poles of a magnet. The ends of coil P are connected to a battery by slip rings.

Diagram 2 shows a coil of wire Q between the poles of a different magnet. The ends of coil Q are connected to a battery by a split-ring commutator.

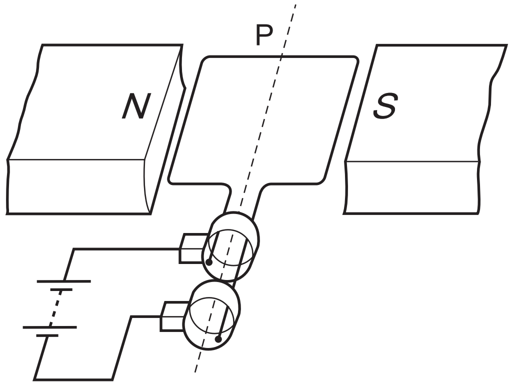


diagram 1

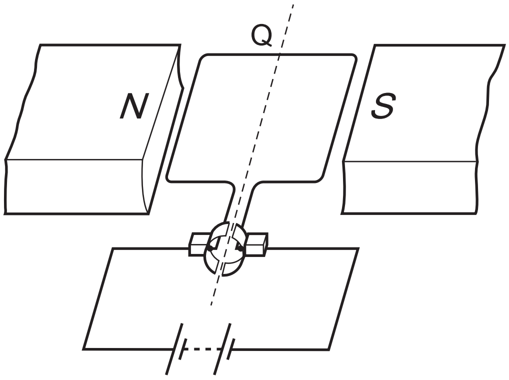
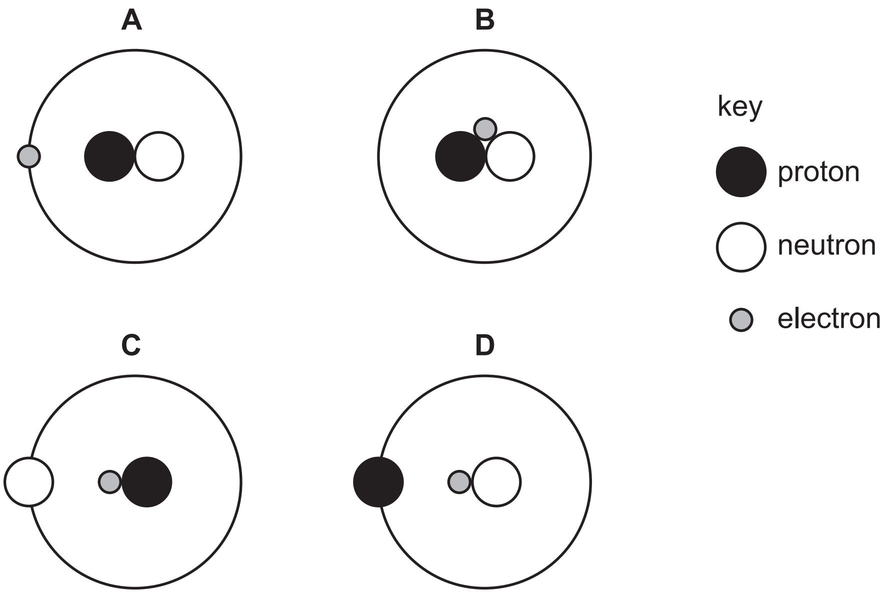


diagram 2

What happens to coils P and Q?

	coil P	coil Q
A	continuously turns anticlockwise	makes one quarter turn anticlockwise then stops
B	continuously turns clockwise	makes one quarter turn clockwise then stops
C	makes one quarter turn anticlockwise then stops	continuously turns anticlockwise
D	makes one quarter turn clockwise then stops	continuously turns clockwise

37 Which diagram shows a possible structure of a neutral atom?



38 The scattering of particles by a thin gold foil provided scientists with evidence for the nuclear atom.

Which particles were scattered by the gold nuclei in the thin foil?

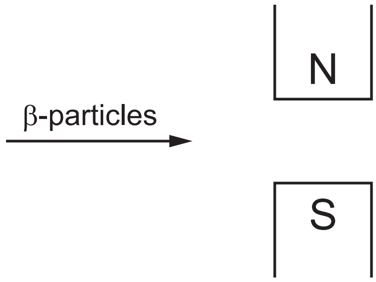
A α-particles

B β-particles

C neutrons

D protons

39 The diagram shows β-particles being directed between the poles of a magnet.



In which direction will the particles be deflected?

A into the page

B out of the page

C towards the bottom of the page

D towards the top of the page

40 Why are some radioactive sources stored in boxes made from lead?

A Lead absorbs emissions from the radioactive sources.

B Lead decreases the half-life of radioactive sources.

C Lead increases the half-life of radioactive sources.

D Lead repels emissions from the radioactive sources.

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PHYSICS **0625/22**

Paper 2 Multiple Choice (Extended) **October/November 2019**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

9597730633

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

This document consists of **14** printed pages and **2** blank pages.

1 A student measures the dimensions of a cylindrical glass beaker.

For which measurement should she use a micrometer screw gauge?

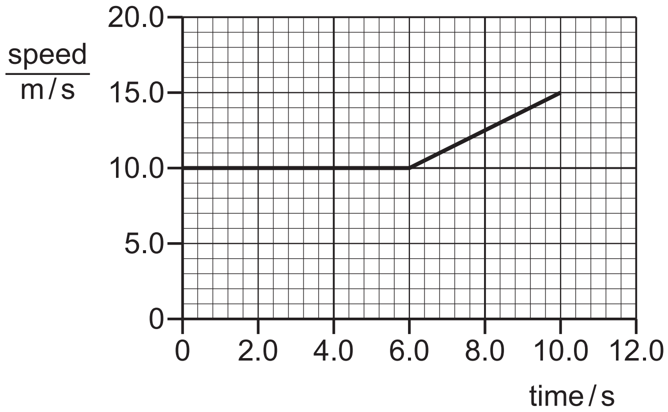
A circumference of the beaker

B diameter of the beaker

C height of the beaker

D thickness of the glass wall of the beaker

2 The graph shows how the speed of a car varies during part of a journey.



What is the acceleration of the car between 6.0 s and 10.0 s?

A 0.50 m/s^2 **B** 0.80 m/s^2 **C** 1.25 m/s^2 **D** 1.50 m/s^2

3 A car travels at an average speed of 60 km/h for 15 minutes.

How far does the car travel in 15 minutes?

A 4.0 km **B** 15 km **C** 240 km **D** 900 km

4 A box is placed on the ground. An upward force of 15 N is needed to lift the box at constant speed.

Which row correctly describes the box?

	mass of the box	weight of the box
A	1.5 kg	15 N
B	15 N	1.5 kg
C	15 N	150 kg
D	150 kg	15 N

5 The table gives the mass and the volume of three objects P, Q and R.

object	mass / g	volume / cm^3
P	23	36
Q	170	720
R	240	340

Which objects can float in a liquid of density 0.85 g / cm^3?

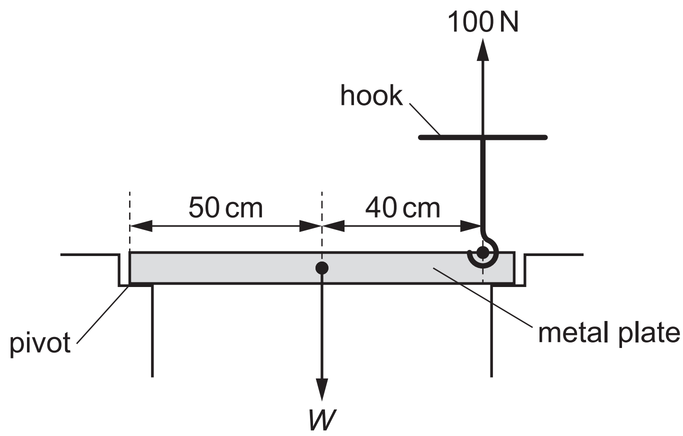
A P and Q only

B P and R only

C Q and R only

D P, Q and R

6 A hook is used to lift a metal plate, as shown.



An upward force of 100 N is needed to lift the metal plate about the pivot, as shown.

What is the weight *W* of the metal plate?

A 80 N **B** 100 N **C** 180 N **D** 225 N

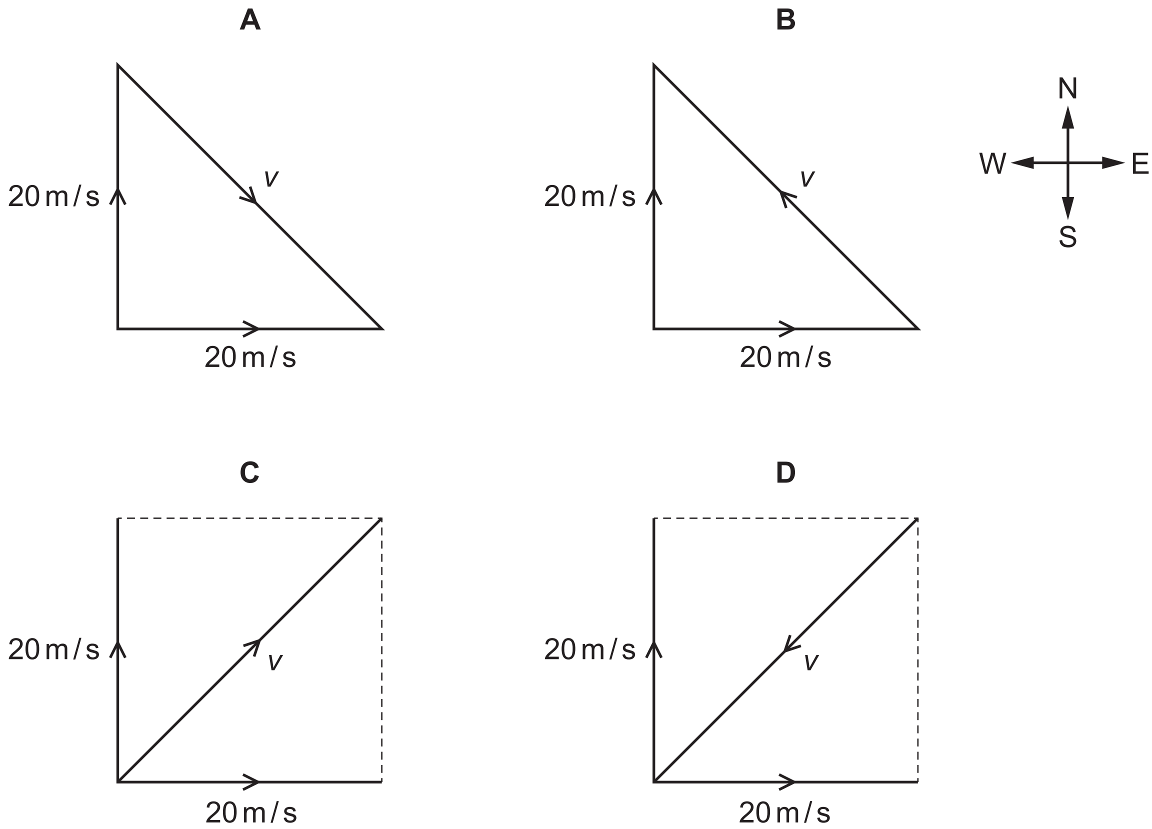
7 What is the unit of the moment of a force?

A N **B** N / kg **C** N / m **D** N m

8 A ship travels due North through still water at a speed of 20 m / s.

It enters a channel where there is a current in the water from West to East. The speed of the current is 20 m / s.

Which diagram shows the resultant velocity *v* of the ship?



9 A ball is at rest on the ground. A boy kicks the ball. The boy's boot is in contact with the ball for 0.040 s.

The average force on the ball is 200 N. The ball leaves the boy's boot with a speed of 20 m / s.

Which row gives the impulse of the boot on the ball and the average acceleration of the ball?

	impulse on ball N s	average acceleration of ball m/s^2
A	8	0.8
B	8	500
C	5000	0.8
D	5000	500

10 An object P of mass 80 g collides with another object Q of mass 40 g.

After the collision, P and Q stick together and then travel on together.

Before the collision, P is travelling at a speed of 6.0 m / s and Q is at rest.

What is the speed of P and Q after the collision?

A 2.0 m / s **B** 3.0 m / s **C** 4.0 m / s **D** 6.0 m / s

11 Brakes are used to slow down a moving car.

Into which form of energy is most of the kinetic energy converted as the car slows down?

A chemical

B elastic

C thermal

D sound

12 A box of mass 8.0 kg is lifted from the ground and placed on a shelf. The box gains 100 J of potential energy.

The box falls off the shelf. Air resistance can be ignored.

At what speed does the box hit the ground?

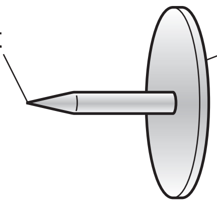
A 3.5 m / s **B** 5.0 m / s **C** 25 m / s **D** 28 m / s

13 A car is moving along a straight horizontal road. The car has 1.6 MJ of kinetic energy. The car accelerates for 20 s until the kinetic energy of the car increases to 2.5 MJ.

What is the minimum average power developed by the car engine for this acceleration?

A 45 W **B** 205 W **C** 45 kW **D** 205 kW

14 A drawing pin (thumb tack) has a sharp point at one end and a flat surface at the other end.



The pin is pushed into a wooden board.

How do the pressure and the force at the sharp point compare with the pressure and the force on the flat surface?

	force at the sharp point	pressure at the sharp point
A	greater than on the flat surface	greater than on the flat surface
B	greater than on the flat surface	less than on the flat surface
C	the same as on the flat surface	greater than on the flat surface
D	the same as on the flat surface	less than on the flat surface

15 The density of mercury is $13\,600\,\text{kg/m}^3$.

What is the pressure at the bottom of a column of mercury that has a height of 75.0 cm?

A 1.02×10^4 Pa

B 1.02×10^5 Pa

C 1.02×10^6 Pa

D 1.02×10^7 Pa

16 Which row describes the arrangement and the motion of the molecules in a gas?

	arrangement	motion
A	far apart	move freely
B	far apart	vibrate only
C	tightly packed	move freely
D	tightly packed	vibrate only

17 A bubble of air of volume $3.0\,\text{mm}^3$ is under water. The bubble is at a depth where the pressure of the air inside the bubble is four times atmospheric pressure.

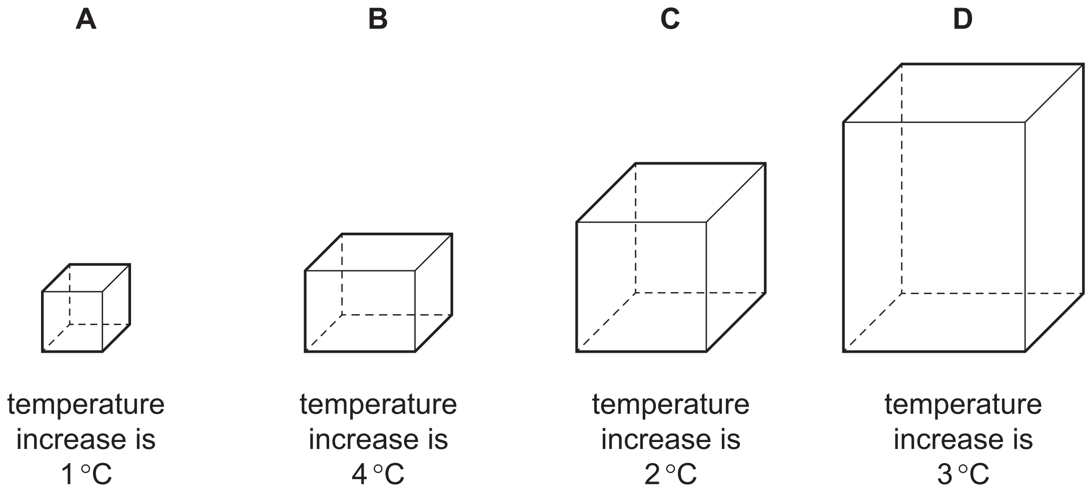
The temperature of the air in the bubble stays the same as it rises to the surface.

What is the volume of the air in the bubble as it reaches the surface?

A $3.0\,\text{mm}^3$ **B** $9.0\,\text{mm}^3$ **C** $12\,\text{mm}^3$ **D** $15\,\text{mm}^3$

18 The same quantity of thermal energy is supplied to each of four blocks. Each block is made from a different material.

Which block has the greatest thermal capacity?



19 A liquid turns into a gas. This occurs only at one particular temperature, and the change happens throughout the liquid.

What is this process called?

A boiling

B condensation

C evaporation

D fusion

20 In a cold country, a bicycle has been left outside all night. The cyclist finds the plastic hand grips feel less cold to the touch than the steel handlebars.

Which row correctly describes the temperature and the property of the two materials?

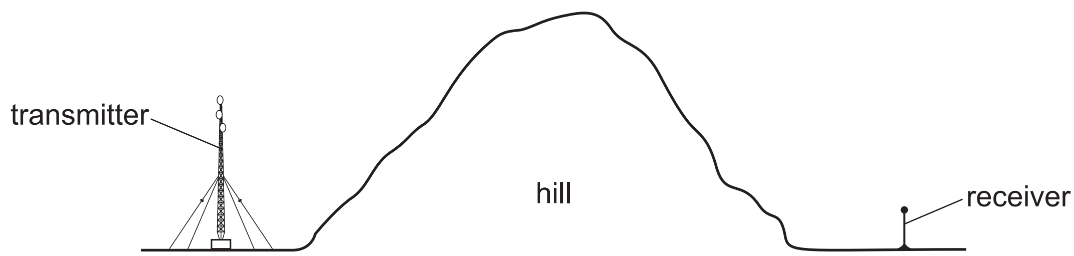
	the temperature of the two materials	the property of the two materials
A	the temperature of the steel is much lower than that of the plastic	the plastic is a better thermal conductor than the steel
B	the temperature of the steel is much lower than that of the plastic	the steel is a better thermal conductor than the plastic
C	the steel and the plastic are both at the same temperature	the plastic is a better thermal conductor than the steel
D	the steel and the plastic are both at the same temperature	the steel is a better thermal conductor than the plastic

21 The diagram shows a tent made from a new material.

What type of material should the tent be made of to reflect the radiant energy from the Sun?

	material texture	material surface colour
A	dull	black
B	dull	white
C	shiny	black
D	shiny	white

22 A large hill blocks the direct path between a transmitter of radio waves and a receiver, as shown.

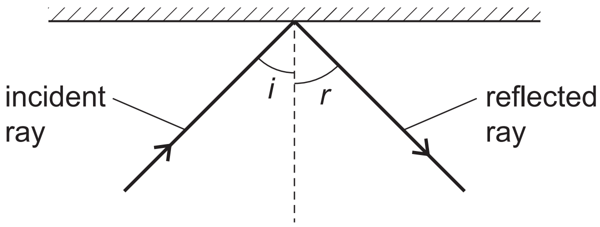


The receiver picks up the signal from the transmitter even though the radio waves do not travel through the hill.

Which row is correct?

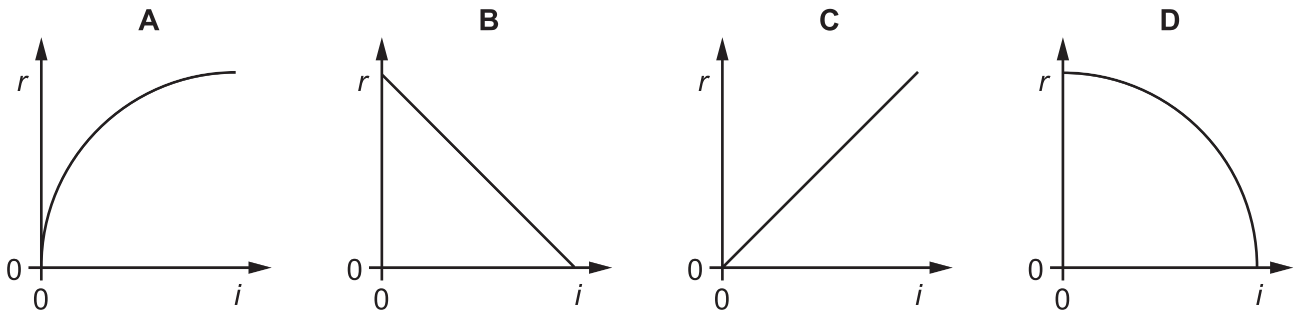
	A possible way for this to happen is	A stronger signal is received using
A	diffraction round the hill.	longer wavelengths.
B	diffraction round the hill.	shorter wavelengths.
C	refraction round the hill.	longer wavelengths.
D	refraction round the hill.	shorter wavelengths.

23 A ray of light is incident on a plane mirror. A student measures the angle of incidence *i* and the angle of reflection *r*.



The student varies the angle of incidence and then plots a graph of *r* against *i*.

What does the graph look like?



24 What is monochromatic light?

A light of a single amplitude

B light of a single frequency

C light of more than one colour

D light which travels with constant velocity

25 The diagram shows the electromagnetic spectrum.

γ-rays	X-rays	ultraviolet	visible light	infrared	microwaves	radio waves

increasing .... →

A word is missing from the label below the spectrum.

Which word is missing?

A amplitude

B frequency

C speed

D wavelength

26 Which row gives a possible set of values for the speed of sound in ice, in water and in steam?

	speed of sound in ice m/s	speed of sound in water m/s	speed of sound in steam m/s
A	500	1500	4000
B	1500	4000	500
C	4000	500	1500
D	4000	1500	500

27 A steel bar is placed in an East-West direction for it to be demagnetised. No other magnet is nearby.

Which method is **not** suitable?

A Hammering the bar.

B Heating the bar to a very high temperature.

C Slowly taking the bar out of a coil that carries an alternating current.

D Slowly taking the bar out of a coil that carries a direct current.

28 A plastic rod is rubbed with a dry cloth. The rod becomes positively charged.

Why has the rod become positively charged?

A It has gained electrons.

B It has gained neutrons.

C It has lost electrons.

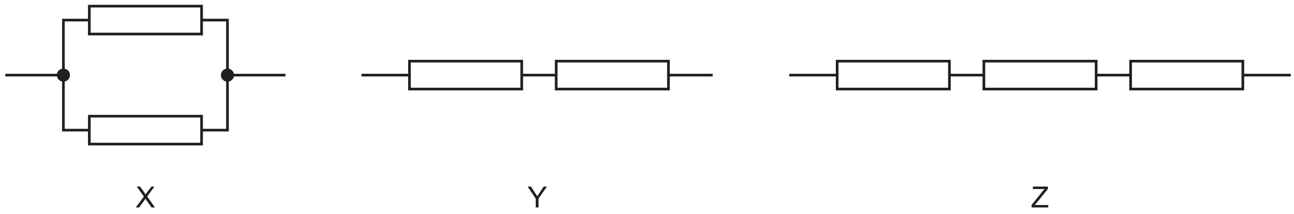
D It has lost neutrons.

29 There is a current of 2.0 A in a resistor for 30 s. The potential difference (p.d.) across the resistor is 12 V.

How much energy is transferred in the resistor?

A 1.25 J **B** 5.0 J **C** 180 J **D** 720 J

30 Identical resistors are connected together to form arrangements X, Y and Z.



What is the correct order of the resistances of the arrangements from the largest to the smallest?

A X → Y → Z

B Y → X → Z

C Z → X → Y

D Z → Y → X

31 Resistors of 1.0 Ω, 2.0 Ω and 3.0 Ω are connected in parallel with a cell.

Which statement is correct?

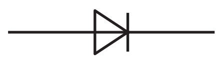
A The current in each resistor is different but the potential difference (p.d.) across each resistor is the same.

B The current in each resistor is the same but the potential difference across each resistor is different.

C The potential difference across the 3.0 Ω is greater than the potential difference across the 1.0 Ω resistor.

D The sum of the potential differences across each resistor is equal to the electromotive force (e.m.f.) of the cell.

32 The diagram shows a circuit component.



What is it used for?

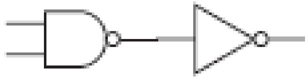
A to allow current in one direction only

B to change the direction of the current

C to emit light when there is a current

D to increase the size of the current

33 Which single logic gate behaves the same as the combination of logic gates shown?



A AND B NOR C NOT D OR

34 Where must a fuse be connected in a mains electric circuit?

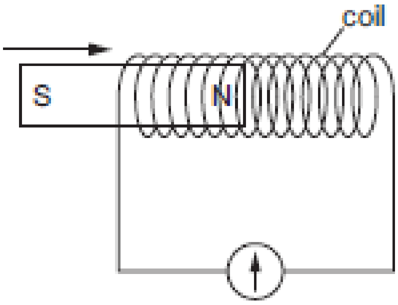
A the earth wire only

B the live wire only

C the neutral wire only

D the live wire and the earth wire

35 The N-pole of a magnet is moved into a coil of wire connected to a galvanometer.



The needle of the galvanometer moves.

Which situation **must** give a smaller galvanometer reading?

A Use a coil with fewer turns and a stronger magnet.

B Use a coil with fewer turns and a weaker magnet.

C Use a coil with more turns and a stronger magnet.

D Use a coil with more turns and a weaker magnet.

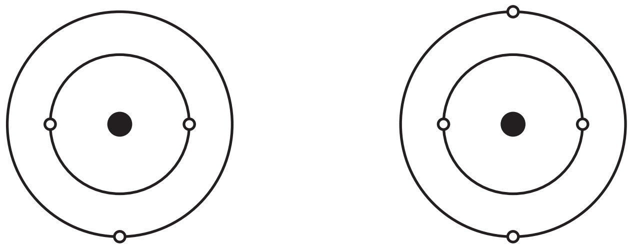
36 A step-down transformer is 100% efficient. It has an input voltage of 240 V a.c. and an output voltage of 60 V a.c.

The current in the primary coil is 0.50 A.

What is the current in the secondary coil?

A 0.13 A B 0.50 A C 2.0 A D 8.0 A

37 The diagrams show the simple atomic structure for two neutral atoms X and Y of different elements.



Which row is correct?

	atom with more electrons	atom with a more positively charged nucleus
A	X	X
B	X	Y
C	Y	X
D	Y	Y

38 Plutonium-238 decays by the emission of an α-particle.

Which equation represents the decay of a plutonium-238 nucleus?

A $^{238}_{94}Pu \rightarrow \, ^{238}_{95}U + \, ^{0}_{-1}\alpha$

B $^{238}_{94}Pu \rightarrow \, ^{234}_{92}U + \, ^{4}_{2}\alpha$

C $^{238}_{94}Pu \rightarrow \, ^{234}_{92}U + \, ^{2}_{4}\alpha$

D $^{238}_{94}Pu \rightarrow \, ^{242}_{96}U + \, ^{4}_{2}\alpha$

39 A radioactive isotope has a half-life of 8 days.

A detector close to a sample of this isotope gives a count rate of 200 counts per minute.
Without the source, the background count is 20 counts per minute.

What is the count rate due to the source after 8 days?

A 80 counts per minute

B 90 counts per minute

C 100 counts per minute

D 110 counts per minute

40 Why are some radioactive sources stored in boxes made from lead?

A Lead absorbs emissions from the radioactive sources.

B Lead decreases the half-life of radioactive sources.

C Lead increases the half-life of radioactive sources.

D Lead repels emissions from the radioactive sources.

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PHYSICS **0625/23**

Paper 2 Multiple Choice (Extended) **October/November 2019**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

* 5 6 3 8 8 3 4 0 7 2 *

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
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There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **14** printed pages and **2** blank pages.

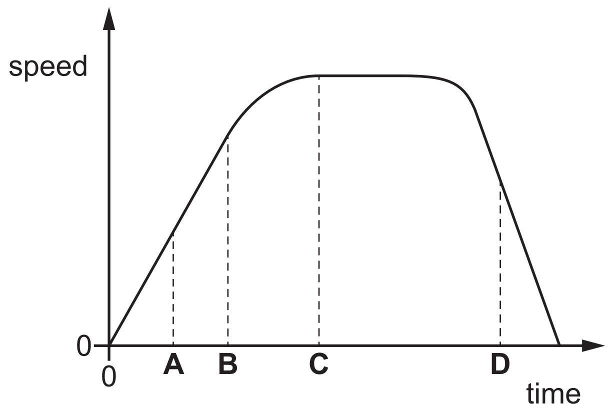
Cambridge Assessment International Education

1 Which is the best apparatus to use to measure the thickness of a coin?

- **A** balance
- **B** ruler with a millimetre scale
- **C** micrometer screw gauge
- **D** pressure gauge

2 The graph shows how the speed of an object varies with time.

At which labelled time is the object decelerating?



3 A car travels at an average speed of 60 km / h for 15 minutes.

How far does the car travel in 15 minutes?

A 4.0 km **B** 15 km **C** 240 km **D** 900 km

4 Which equation shows the relationship between the weight W and the mass m of an object?

- **A** $W = \frac{m}{g}$
- **B** $W = mg$
- **C** $W = m + g$
- **D** $W = \frac{g}{m}$

5 A box of mass 2.0 kg is pulled across a horizontal floor by a force of 6.0 N.

The frictional force acting on the box is 1.0 N.

What is the acceleration of the box?

A $0.40\,m/s^2$ **B** $2.5\,m/s^2$ **C** $3.0\,m/s^2$ **D** $3.5\,m/s^2$

6 Four hollow glass spheres P, Q, R and S each have a mass of 72 g.

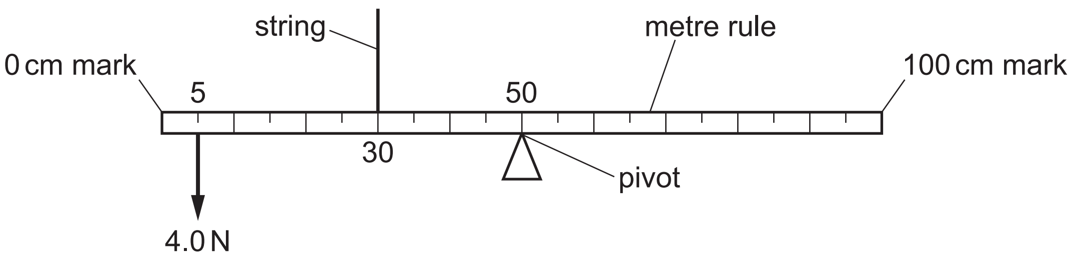
Their volumes are given in the table.

	volume / cm^3
P	55
Q	65
R	75
S	85

Which spheres sink in a liquid of density 0.9 g / cm^3?

A P, Q and R **B** Q, R and S **C** R and S only **D** S only

7 The diagram shows a uniform metre rule. The rule is pivoted at its mid-point. A downward force of 4.0 N acts on the rule at the 5 cm mark. The rule is held by a string at the 30 cm mark. The rule is in equilibrium.



What is the upward force that the string exerts on the rule?

A 0.67 N **B** 4.0 N **C** 6.0 N **D** 9.0 N

8 A ship sails due North at a speed of 20 m / s. A current in the water begins to move from East to West. The speed of this current is 20 m / s.

What is the magnitude of the resultant velocity of the ship?

A 0 m / s **B** 20 m / s **C** 28 m / s **D** 40 m / s

9 The momentum of a body is changed by a force acting on it for a period of time.

Which action increases the change in momentum?

A doubling the force and halving the time

B doubling the force for the same time

C halving both the force and time

D halving the force and doubling the time

10 A toy train P of mass 0.50 kg is travelling along a straight track with a velocity of 3.0 m / s. It collides with a stationary train Q of mass 1.0 kg. The two trains then stick together.

What is the velocity of the combined trains?

A 1.0 m / s in the same direction as P was travelling originally

B 1.0 m / s in the reverse direction to that in which P was travelling originally

C 1.5 m / s in the same direction as P was travelling originally

D 1.5 m / s in the reverse direction to that in which P was travelling originally

11 Brakes are used to slow down a moving car.

Into which form of energy is most of the kinetic energy converted as the car slows down?

A chemical

B elastic

C thermal

D sound

12 A force of 25 N acts on an object. The work done by the force is 400 J.

How far does the object move in the direction of the force?

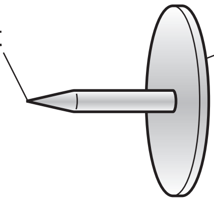
A 6.3 cm　　**B** 16 cm　　**C** 16 m　　**D** 10 km

13 A car is moving along a straight horizontal road. The car has 1.6 MJ of kinetic energy. The car accelerates for 20 s until the kinetic energy of the car increases to 2.5 MJ.

What is the minimum average power developed by the car engine for this acceleration?

A 45 W　　**B** 205 W　　**C** 45 kW　　**D** 205 kW

14 A drawing pin (thumb tack) has a sharp point at one end and a flat surface at the other end.



The pin is pushed into a wooden board.

How do the pressure and the force at the sharp point compare with the pressure and the force on the flat surface?

	force at the sharp point	pressure at the sharp point
A	greater than on the flat surface	greater than on the flat surface
B	greater than on the flat surface	less than on the flat surface
C	the same as on the flat surface	greater than on the flat surface
D	the same as on the flat surface	less than on the flat surface

15 Which row compares the separation and the motion of the molecules of a hot gas with those of a cool liquid? (Both the gas and the liquid are at the same pressure.)

	separation	motion
A	greater for a gas	faster for a gas
B	greater for a gas	slower for a gas
C	smaller for a gas	faster for a gas
D	smaller for a gas	slower for a gas

16 A fixed mass of gas has a volume of $25\,cm^3$. The pressure of the gas is 100 kPa.

The volume of the gas is slowly decreased by $15\,cm^3$ at constant temperature.

What is the change in pressure of the gas?

A 67 kPa **B** 150 kPa **C** 170 kPa **D** 250 kPa

17 A liquid turns into a gas. This occurs only at one particular temperature, and the change happens throughout the liquid.

What is this process called?

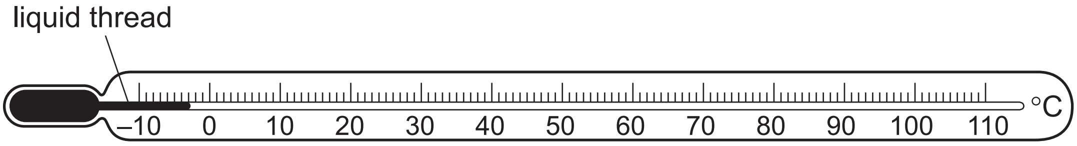
A boiling

B condensation

C evaporation

D fusion

18 The diagram shows a liquid-in-glass thermometer.



When the temperature of the thermometer rises, the changes produced cause the liquid thread to move to the right.

Why does this happen when the temperature of the thermometer rises?

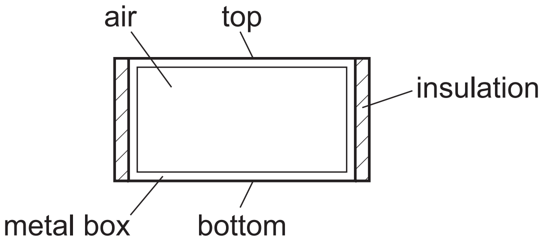
A Gases contract and liquids expand.

B Gases contract and solids expand.

C Liquids expand more than gases.

D Liquids expand more than solids.

19 A sealed metal box contains a fixed mass of air. The sides of the box are insulated.



A scientist investigates the thermal conductivity of air. She measures how quickly thermal energy passes between the top and bottom of the box.

Which row gives the correct procedure and conclusion?

	procedure	conclusion
A	heat bottom surface	air is a good thermal conductor
B	heat bottom surface	air is a poor thermal conductor
C	heat top surface	air is a good thermal conductor
D	heat top surface	air is a poor thermal conductor

20 In a cold country, the ground is covered in snow. There is a pile of black sand outdoors and its temperature is the same as that of the snow. A man sprinkles a thin layer of this sand over the snow.

Why does the black sand help to melt the snow during the day?

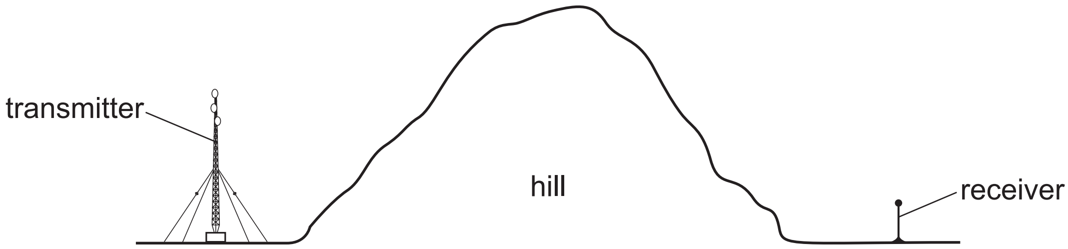
A Any thermal energy still left in the sand will melt the snow.

B The black sand is a good absorber of the infrared radiation from the Sun.

C The black sand is a good conductor of thermal energy.

D The black sand lowers the melting point of the snow.

21 A large hill blocks the direct path between a transmitter of radio waves and a receiver, as shown.



The receiver picks up the signal from the transmitter even though the radio waves do not travel through the hill.

Which row is correct?

	A possible way for this to happen is	A stronger signal is received using
A	diffraction round the hill.	longer wavelengths.
B	diffraction round the hill.	shorter wavelengths.
C	refraction round the hill.	longer wavelengths.
D	refraction round the hill.	shorter wavelengths.

22 A person stands 1.0 m in front of a plane mirror. The mirror is moved away from the person at a speed of 1.0 m / s.

Which statement is correct?

A The image moves away from the person at a speed of 1.0 m / s.

B The image moves away from the person at a speed of 2.0 m / s.

C The image moves towards the person at a speed of 1.0 m / s.

D The image moves towards the person at a speed of 2.0 m / s.

23 White light is refracted and dispersed when it enters a glass prism from air.

Which colour has the lowest speed as it moves through the glass prism?

A blue light

B orange light

C red light

D violet light

24 The diagram shows the electromagnetic spectrum.

γ-rays	X-rays	ultraviolet	visible light	infrared	microwaves	radio waves

increasing .... →

A word is missing from the label below the spectrum.

Which word is missing?

A amplitude

B frequency

C speed

D wavelength

25 Which row gives a possible set of values for the speed of sound in ice, in water and in steam?

	speed of sound in ice / m/s	speed of sound in water / m/s	speed of sound in steam / m/s
A	500	1500	4000
B	1500	4000	500
C	4000	500	1500
D	4000	1500	500

26 A steel bar is placed in an East-West direction for it to be demagnetised. No other magnet is nearby.

Which method is **not** suitable?

A Hammering the bar.

B Heating the bar to a very high temperature.

C Slowly taking the bar out of a coil that carries an alternating current.

D Slowly taking the bar out of a coil that carries a direct current.

27 A plastic rod is rubbed with a dry cloth. The rod becomes positively charged.

Why has the rod become positively charged?

A It has gained electrons.

B It has gained neutrons.

C It has lost electrons.

D It has lost neutrons.

28 There is a current of 3.0 A in a resistor for time *t*. During time *t*, a charge of 120 C flows through the resistor.

What is time *t*?

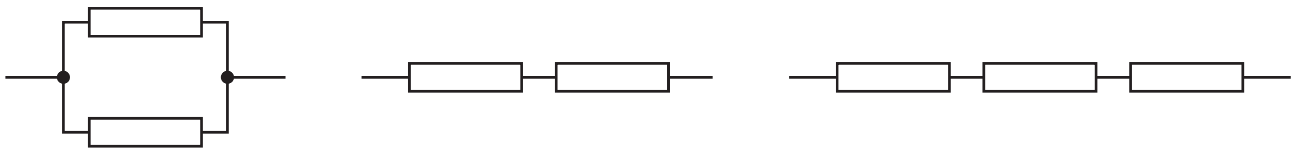
A 0.025 minutes

B 0.025 s

C 40 minutes

D 40 s

29 Identical resistors are connected together to form arrangements X, Y and Z.



X Y Z

What is the correct order of the resistances of the arrangements from the largest to the smallest?

A X → Y → Z

B Y → X → Z

C Z → X → Y

D Z → Y → X

30 Resistors of resistance 1.0 Ω, 2.0 Ω and 3.0 Ω are connected in parallel across the terminals of a cell.

Which statement is correct?

A The currents in the resistors are equal.

B The sum of the currents in the three resistors is equal to the current in the cell.

C The sum of the potential differences (p.d.'s) across the resistors is equal to the electromotive force (e.m.f.) of the cell.

D The potential difference across the 3.0 Ω resistor is greater than the potential difference across the other two resistors.

31 Diagram 1 shows a circuit containing an a.c. power supply, an unknown component X and a fixed resistor.

The graph in diagram 2 shows how the potential difference (p.d.) across the resistor varies with time.

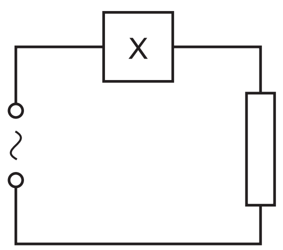


diagram 1

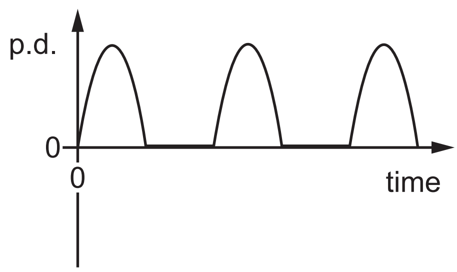


diagram 2

What is component X?

A thermistor

B relay coil

C diode

D light-dependent resistor

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32 An AND gate has two inputs and one output.

Which truth table represents the action of the AND gate?

A

input 1	input 2	output
0	0	0
0	1	1
1	0	1
1	1	1

B

input 1	input 2	output
0	0	0
0	1	0
1	0	0
1	1	1

C

input 1	input 2	output
0	0	1
0	1	1
1	0	1
1	1	0

D

input 1	input 2	output
0	0	1
0	1	0
1	0	0
1	1	0

33 Where must a fuse be connected in a mains electric circuit?

A the earth wire only

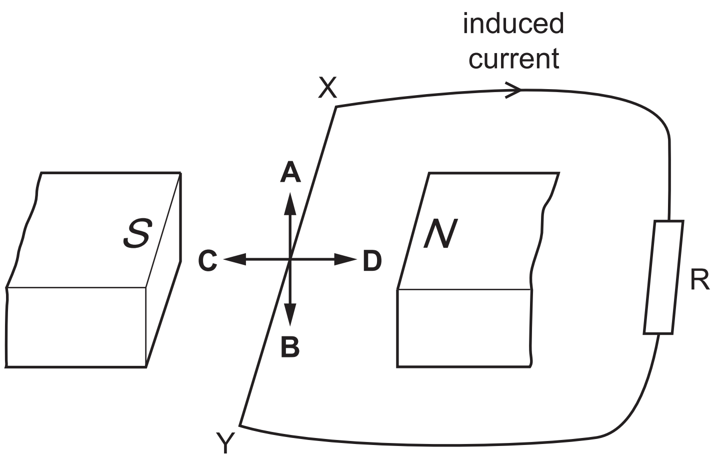
B the live wire only

C the neutral wire only

D the live wire and the earth wire

34 A wire XY is connected to a resistor R. The wire is moved in the magnetic field between two magnetic poles.

In which direction must the wire be moved so that the induced current is in the direction shown?



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35 A step-up transformer produces a 60 V a.c. output from a 12 V a.c. input.

There are 50 turns on the secondary coil.

How many turns are there on the primary coil?

A 5 **B** 10 **C** 50 **D** 250

36 An a.c. generator contains a coil that rotates at a rate of 4500 revolutions per minute.

What is the frequency of the alternating current?

A 1.25 Hz **B** 75 Hz **C** 150 Hz **D** 4500 Hz

37 Why are some radioactive sources stored in boxes made from lead?

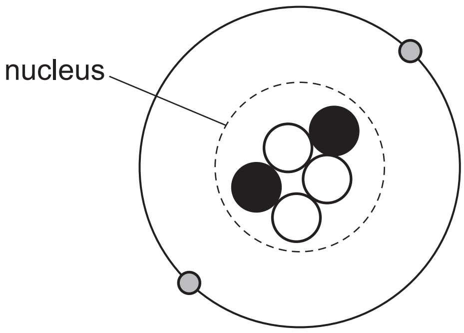
A Lead absorbs emissions from the radioactive sources.

B Lead decreases the half-life of radioactive sources.

C Lead increases the half-life of radioactive sources.

D Lead repels emissions from the radioactive sources.

38 The diagram represents a neutral atom.



Which row identifies each type of particle in the diagram?

			
A	electron	neutron	proton
B	electron	proton	neutron
C	neutron	electron	proton
D	proton	electron	neutron

39 A thin metal foil is placed in a vacuum. α-particles are fired at the foil and most go straight through. A very small proportion of the α-particles are deflected through large angles.

What does this provide evidence for?

A α-particles are very small.

B There are negative electrons in each atom.

C There is a tiny nucleus in each atom.

D There are neutrons in each atom.

40 The background count rate measured by a radiation counter is 40 counts per minute.

With the counter close to a radioactive source, the counter reading is 960 counts per minute.

The half-life of the source is 20 minutes.

What is the counter reading one hour later?

A 115 counts per minute

B 120 counts per minute

C 155 counts per minute

D 160 counts per minute

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Cambridge IGCSE

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CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

3507567167

PHYSICS **0625/31**

Paper 3 Theory (Core) **October/November 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m/s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **20** printed pages.

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Cambridge Assessment International Education

[Turn over

1 Fig. 1.1 shows a plastic water barrel. The barrel is full of water.

Fig. 1.1

(a) The water barrel contains $0.050\,m^3$ of pure water. The density of pure water is $1000\,kg/m^3$.

Calculate the mass of pure water in the barrel.

mass of water = ... kg [3]

(b) The density of sea water is $1030\,kg/m^3$. The density of the plastic is $1000\,kg/m^3$. Use this information and the information in **(a)** to state and explain whether the full barrel will float in sea water.

statement ....

explanation ....

....

....
[2]

[Total: 5]

2 Four students P, Q, R and S each attempt to measure the time period (the time for one complete oscillation) of a pendulum. The arrows in Fig. 2.1 show the movements of the pendulum that each student times.

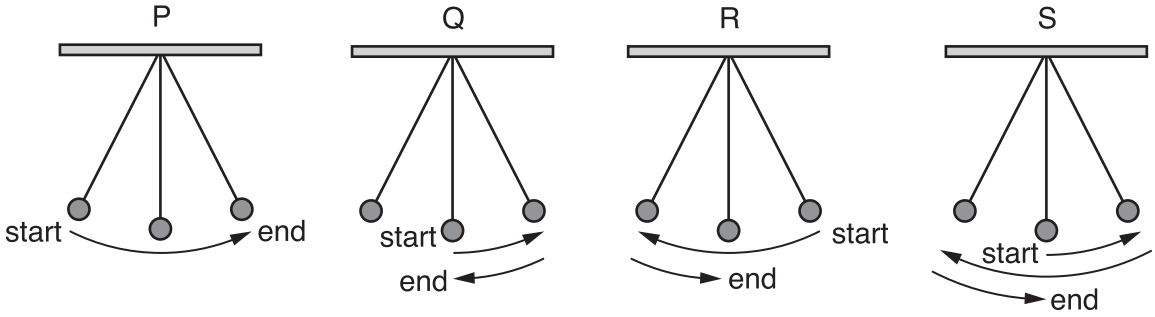

Fig. 2.1

(a) State the student who has chosen the correct movement for one period of a pendulum.

student .... [1]

(b) Another student uses a stopwatch to measure the time taken for 50 periods of a pendulum. Fig. 2.2 shows the time taken on the stopwatch.

Fig. 2.2

Calculate the time for one period of the pendulum. Give your answer to 3 significant figures.

time for one period = ... s [3]

(c) The student measures the displacement of the pendulum bob from its rest position. The displacement is 16.5 cm, as shown in Fig. 2.3.

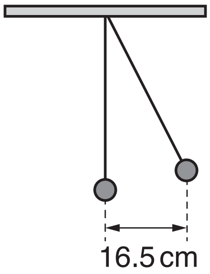

Fig. 2.3

State the displacement in millimetres.

displacement = ... mm [1]

[Total: 5]

3 Fig. 3.1 shows a spring with no load attached. Fig. 3.2 shows the same spring with a load attached.

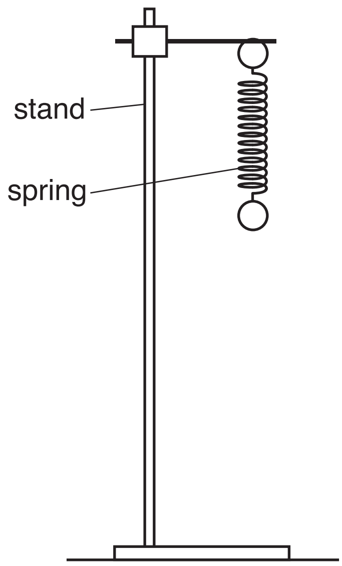

Fig. 3.1

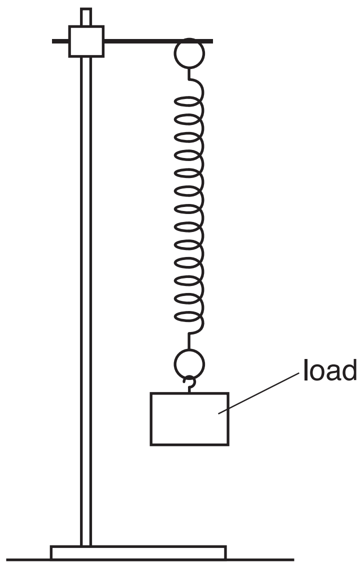

Fig. 3.2

(a) Describe how a student can determine the extension of the spring. You may draw on Fig. 3.1 and Fig. 3.2 as part of your answer.

....

....

....

....

.... [3]

(b) The student plots a graph of load against extension, as shown in Fig. 3.3.

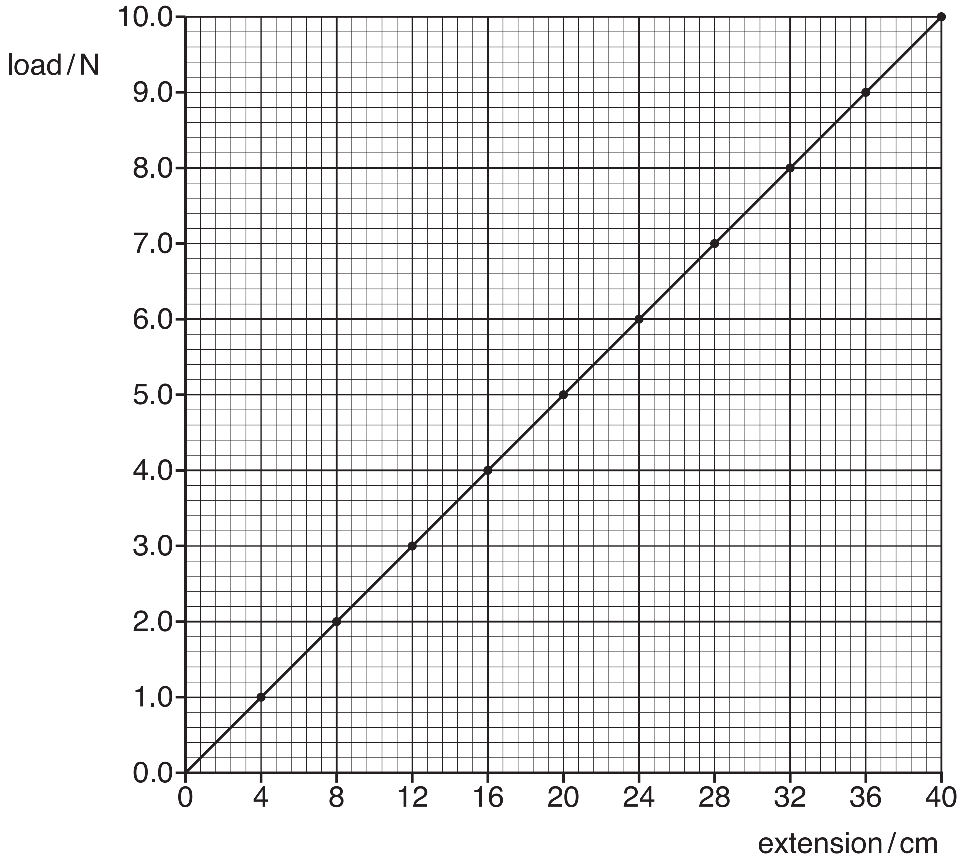

Fig. 3.3

(i) Determine the extension produced by a load of 7.5 N.

extension = ... cm [1]

(ii) Determine the load that would produce an extension of 10.0 cm.

load = ... N [1]

(c) Calculate the mass that has a weight of 6.0 N.

mass = ... kg [3]

[Total: 8]

4 Fig. 4.1 shows a tractor fitted with a device for breaking up soil in a field.

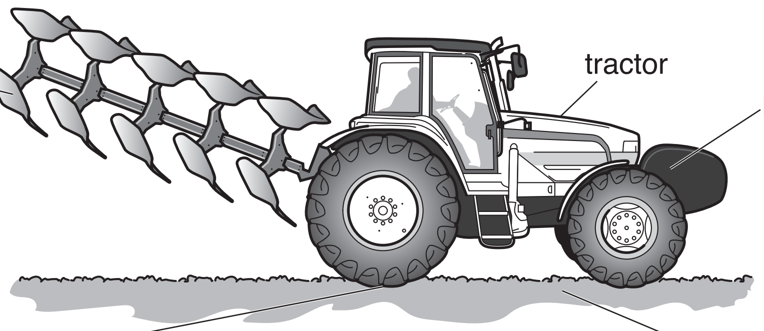

Fig. 4.1

(a) (i) The tractor has a heavy weight at the front. Explain why the heavy weight is needed.

....

.... [1]

(ii) Fig. 4.2 represents the weight of the device and its distance from the pivot.

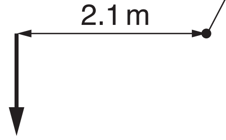

Fig. 4.2

Calculate the moment of the weight of the device about the pivot. State the unit.

moment = ... [4]

(b) Fig. 4.3 shows a tractor fitted with narrow tyres and the same tractor fitted with wide tyres.

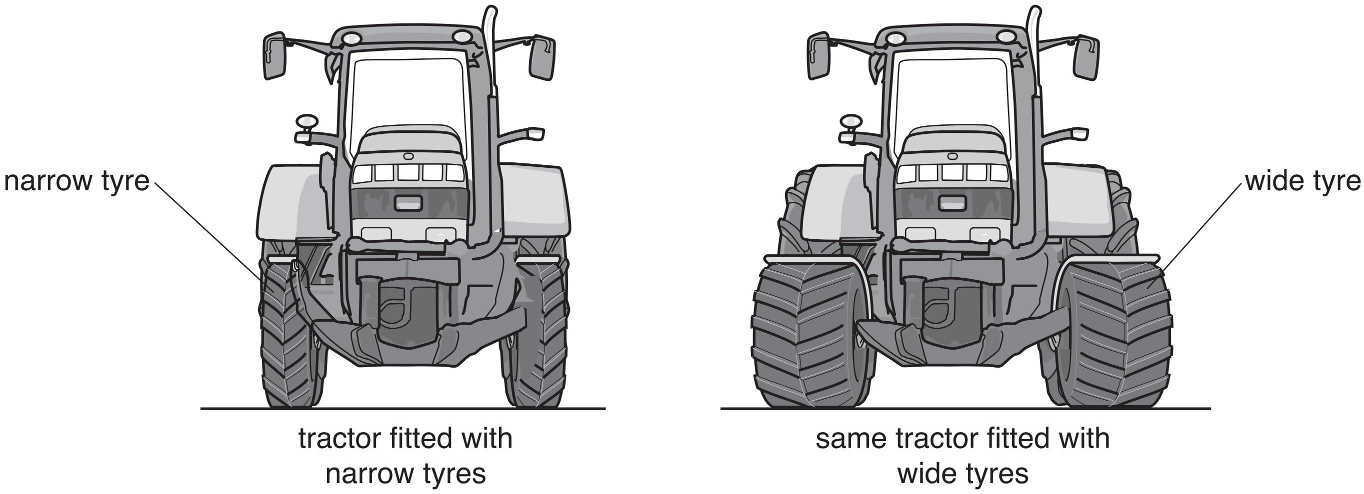

Fig. 4.3 (view from the front)

Explain why wide tyres are more suitable for the tractor on soft soil.

....

....

....

.... [3]

[Total: 8]

5 Here are some statements about energy and energy resources.

Some statements are correct. Put a tick (✓) in the box alongside each of these.

- [ ] Building hydroelectric power stations has an impact on the environment.
- [ ] Burning fossil fuels produces atmospheric pollution.
- [ ] Wind turbines are turned using gravitational potential energy.
- [ ] Coal and crude oil are sources of renewable energy.
- [ ] Geothermal energy is obtained from hot rocks below the ground.

[3]

[Total: 3]

6 Fig. 6.1 shows a mirror periscope. The periscope is used to view a golfer over the heads of other people. The periscope has two plane mirrors each at an angle of 45° to the vertical.

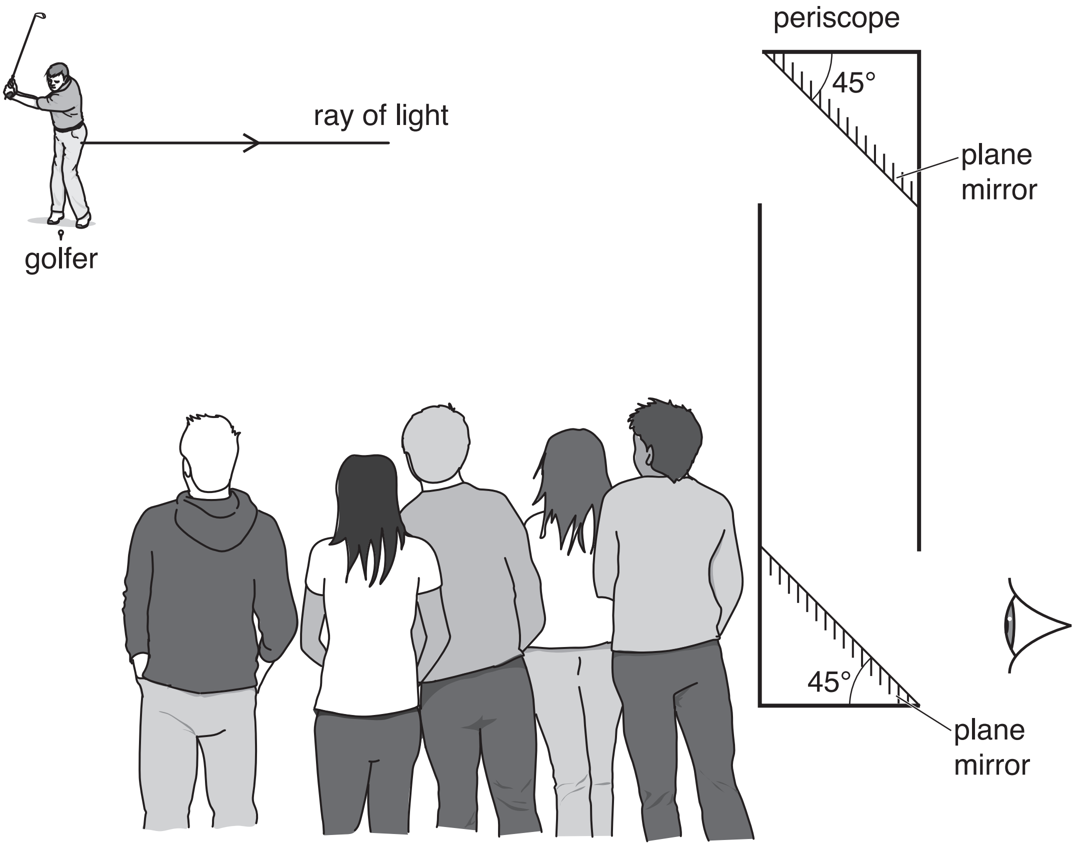

Fig. 6.1 (not to scale)

(a) (i) On Fig. 6.1:

1. Continue the ray of light from the golfer towards the upper mirror of the periscope

2. Draw and label the normal at the point where the ray strikes the mirror.

[1]

(ii) On Fig. 6.1, continue the ray of light after reflection at the upper mirror until it leaves the periscope. [1]

(iii) State the law of reflection used to deduce the position of the ray of light after striking the mirrors.

.... [1]

(b) Fig. 6.2 shows three rays of red light each entering a semi-circular glass block.

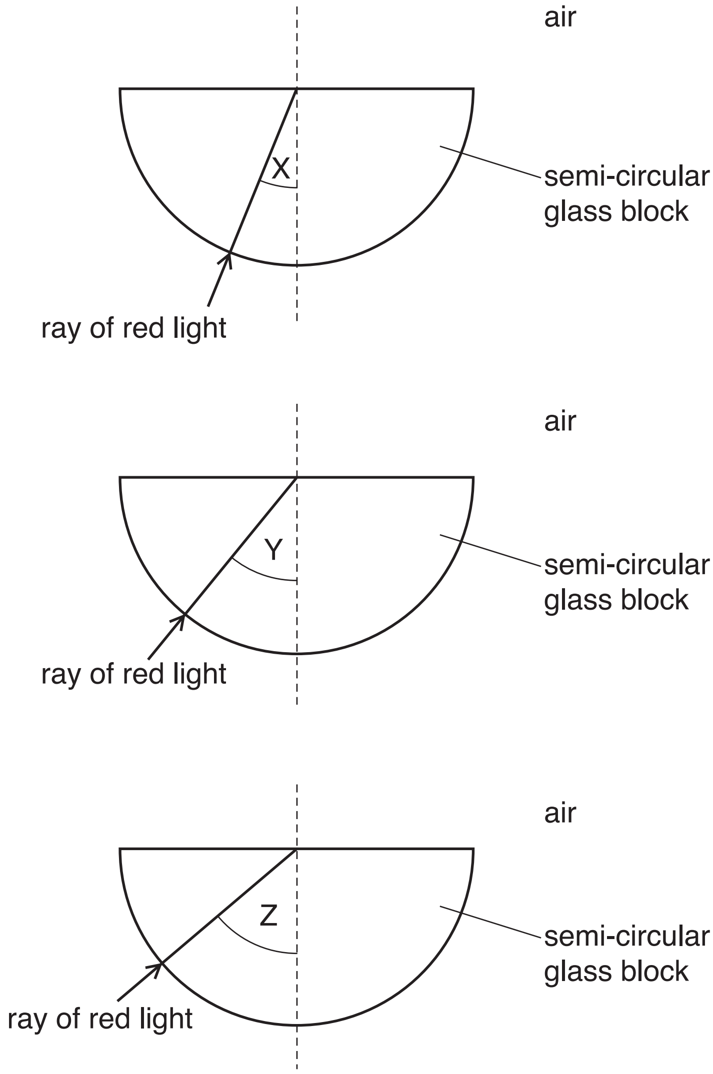

Fig. 6.2

Table 6.1

angle of incidence	description
X	less than the critical angle
Y	equal to the critical angle
Z	greater than the critical angle

Using the information in Table 6.1, draw on Fig. 6.2 to complete the path of each ray of red light. [3]

[Total: 6]

7 An object, OX, is placed in front of a converging lens.

Fig. 7.1 shows a ray of light from the object passing through the lens.

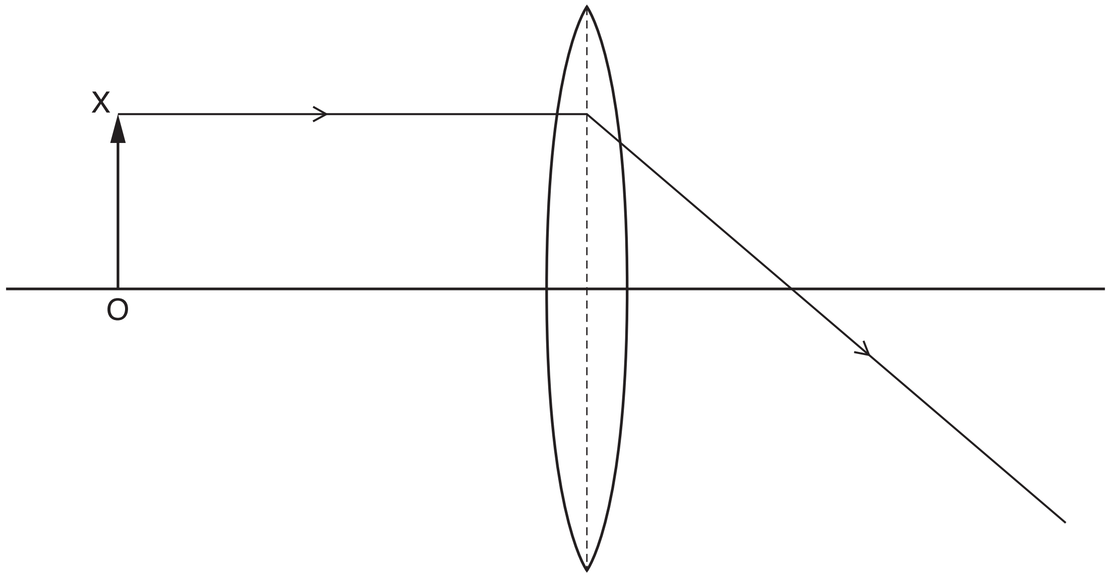

Fig. 7.1

(a) **(i)** The lens forms an image of object OX.

On Fig. 7.1, draw another ray from X to locate the position of the image. [1]

(ii) On Fig. 7.1, draw an arrow to represent the image of OX and label it I. [1]

(iii) On Fig. 7.1, mark a principal focus for the lens and label it F. [1]

(iv) On Fig. 7.1, measure and record the focal length of the lens.

focal length = ... cm [1]

(b) Describe the image I.

Choose words from the list. Tick (✓) **two** boxes.

- ☐ enlarged
- ☐ diminished
- ☐ same size
- ☐ inverted
- ☐ upright

[2]

[Total: 6]

8 **(a)** Fig. 8.1 shows a student listening to the sound produced by a tuning fork.

Fig. 8.1

(i) State how the tuning fork produces the sound.

.... [1]

(ii) Complete the following sentence. Choose a word from the box.

electromagnetic	longitudinal	transverse

A sound wave is .... [1]

(iii) A loudspeaker produces a sound with a frequency of 25 kHz.

A student with healthy ears cannot hear this sound. Explain why.

....

.... [2]

(b) Fig. 8.2 represents a sound wave travelling in air.

Fig. 8.2 (drawn full size)

(i) The air particles are moving. On Fig. 8.2, draw **two** arrows in opposite directions to show the movement of the air particles. [1]

(ii) Use Fig. 8.2 to determine the wavelength of the sound wave.

wavelength = ... cm [1]

(c) Describe a method of using water waves to demonstrate refraction.

....

....

....

....

....

.... [4]

[Total: 10]

9 A student is experimenting with magnets and electric charges.

(a) The student places a bar magnet on a piece of paper, as shown in Fig. 9.1.

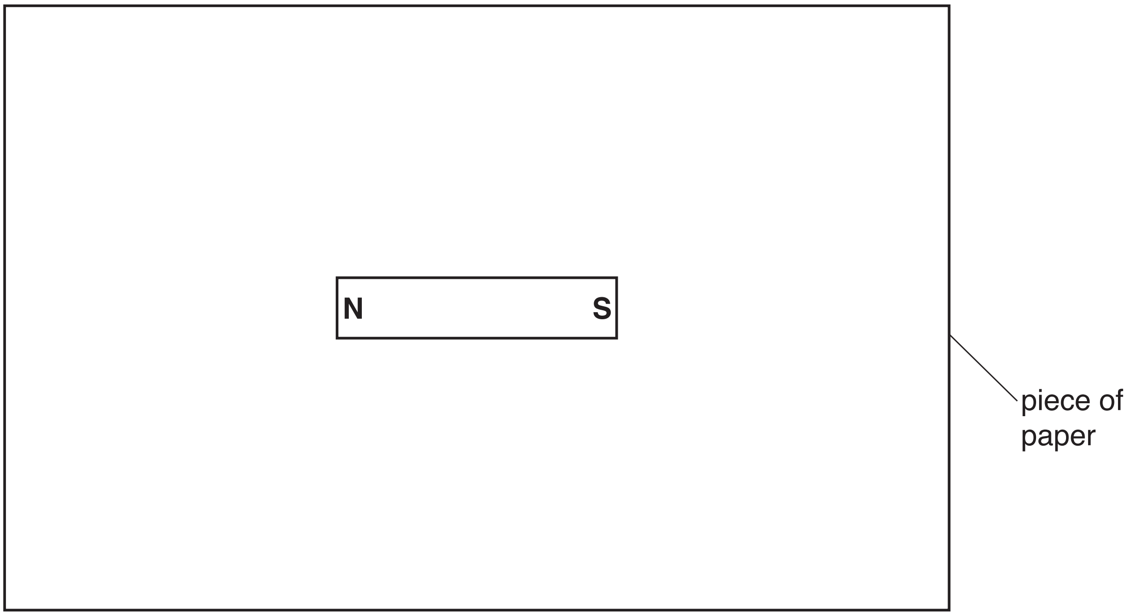

Fig. 9.1

Show the pattern of magnetic field lines around the bar magnet.

Draw **two** lines above the magnet and **two** lines below the magnet. Start and finish each line at a pole. Include **one** arrow to show the direction of the magnetic field. [3]

(b) The student rubs a plastic rod with a dry cloth. The plastic rod becomes positively charged.

Explain why the friction between the plastic and the cloth causes the plastic to become positively charged.

....

....

....

.... [2]

(c) The student investigates the forces between two pairs of objects.

Fig. 9.2 and Fig. 9.3 show the pairs of objects.

State whether there is a force of attraction, a force of repulsion, or no force between the pairs of objects. Draw a **ring** around **one** phrase for each pair of objects.

1. two positively charged spheres

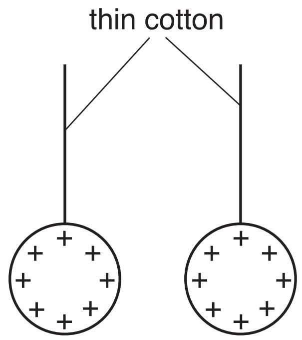

Fig. 9.2

force of attraction **force of repulsion** **no force**

2. a bar magnet and a bar of copper metal

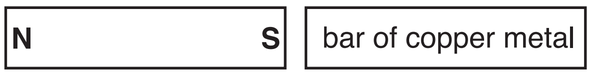

Fig. 9.3

force of attraction **force of repulsion** **no force**

[2]

[Total: 7]

10 A teacher is investigating the resistance of a lamp.

Fig. 10.1 shows part of the circuit she uses. The circuit is incomplete.

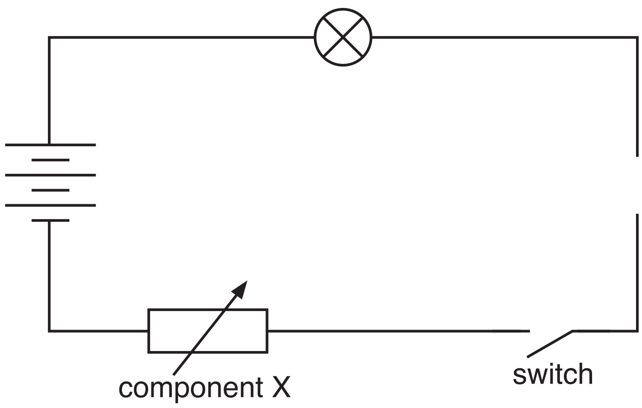

Fig. 10.1

(a) (i) To determine the resistance of the lamp, the teacher adds two meters to her circuit.

On Fig. 10.1, draw circuit symbols to show each meter correctly connected in the circuit. [3]

(ii) When the current in the lamp is 0.25 A, the potential difference (p.d.) across the lamp is 4.5 V. Calculate the resistance of the lamp.

resistance = ... Ω [3]

(b) (i) State the name of component X.

.... [1]

(ii) Describe and explain how the teacher uses component X to investigate the resistance of the lamp.

....

....

....

.... [2]

[Total: 9]

11 A student is experimenting with electromagnetic effects.

(a) Describe an experiment, using any standard laboratory equipment, to demonstrate electromagnetic induction. You may draw a diagram.

....

....

....

.... [3]

(b) Fig. 11.1 shows a transformer connected to an input voltage of 12 V a.c.

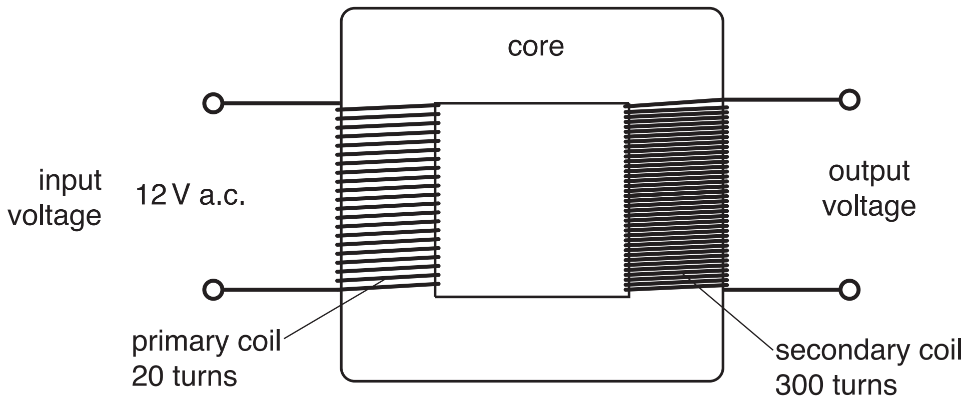

Fig. 11.1

(i) State the name of a suitable material for the core of the transformer.

.... [1]

(ii) Explain how the diagram in Fig. 11.1 shows a step-up transformer.

....

.... [1]

(iii) Using the information in Fig. 11.1, calculate the output voltage of the transformer.

output voltage = ...V [3]

[Total: 8]

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12 A teacher carries out two experiments at the same time.

(a) In the first experiment the count rate for a sample of a radioactive isotope is measured every 30 seconds for 6 minutes.

The results are shown in Table 12.1.

Table 12.1

time / minutes	count rate counts / second
0.0	1246
0.5	1036
1.0	941
1.5	810
2.0	686
2.5	621
3.0	550
3.5	468
4.0	421
4.5	368
5.0	318
5.5	280
6.0	242

Estimate the half-life of the radioactive isotope. Use the information in the table.

half-life = ... minutes [1]

(b) In the second experiment the teacher repeats the procedure with another sample of the same radioactive isotope. The mass of the second sample is greater than that of the first sample.

Suggest a value for the count rate for this sample at the start of the experiment.

count rate = ... counts / second [1]

(c) One type of particle emitted during radioactive decay is an α-particle (alpha particle).

Describe:

(i) the nature of an α-particle

.... [1]

(ii) the ionising ability of an α-particle

.... [1]

(iii) the penetrating ability of an α-particle.

.... [1]

[Total: 5]

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CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

1097389924

PHYSICS **0625/32**

Paper 3 Theory (Core) **October/November 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = $10\,m/s^2$).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **19** printed pages and **1** blank page.

DC (LK/TP) 172323/6

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[Turn over

1 Fig. 1.1 shows a water tank that is leaking. Drops of water fall from the tank at a constant rate.

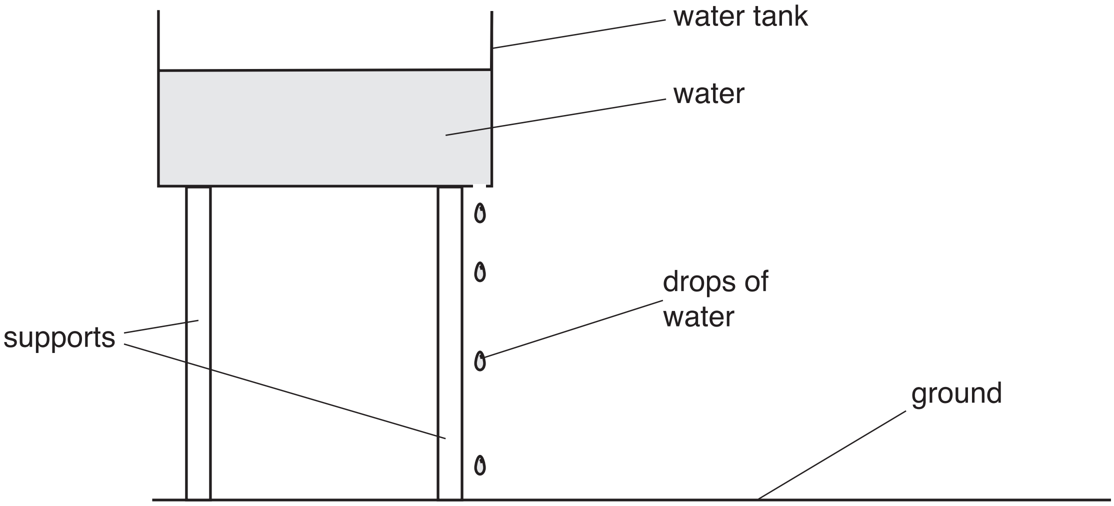

Fig. 1.1 (NOT to scale)

(a) A student uses a stopwatch to determine the time between two drops hitting the ground.

He sets the stopwatch to zero. He starts the stopwatch when the first drop hits the ground.

He stops the stopwatch after a further 30 drops have hit the ground.

The reading on the stopwatch is recorded and shown in Fig. 1.2.

Fig. 1.2

(i) State the time taken for 30 drops to hit the ground.

time = ... s [1]

(ii) Calculate the average time between two drops hitting the ground.

time = ... s [2]

(iii) Explain why the student measures the time for 30 drops to hit the ground instead of measuring the time for one drop to hit the ground.

....

.... [1]

(b) Fig. 1.1 shows that the drops get further apart as they get close to the ground.

State why the drops get further apart.

....

.... [1]

(c) In another experiment the student determines the speed of a falling weight at different times. The speed–time graph for his results is shown in Fig. 1.3.

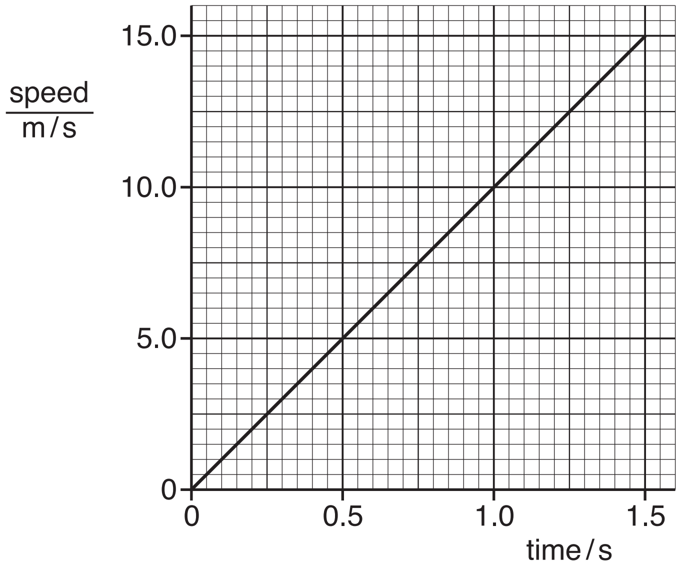

Fig. 1.3

Calculate the distance fallen by the weight in the first 1.5 s.

distance = ... m [3]

[Total: 8]

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2 **(a)** A student has an irregularly shaped piece of metal, a beaker of water and a measuring cylinder, as shown in Fig. 2.1.

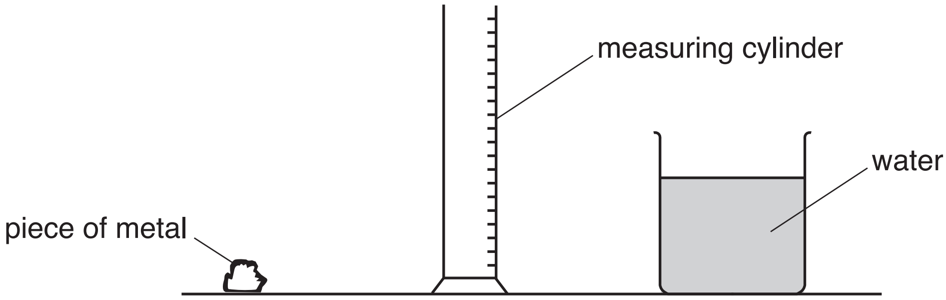


Fig. 2.1

Describe how the student can accurately determine the volume of the piece of metal using the equipment provided.

....

....

....

....

....

.... [4]

(b) The student measures the mass of the piece of metal. Its mass is 146 g.

(i) State the name of the instrument used to measure the mass.

.... [1]

(ii) The volume of the piece of metal is 20 cm^3.
Calculate the density of the metal. State the unit.

density = ... [4]

[Total: 9]

3 **(a)** Fig. 3.1 shows the horizontal forces acting on a swimmer.

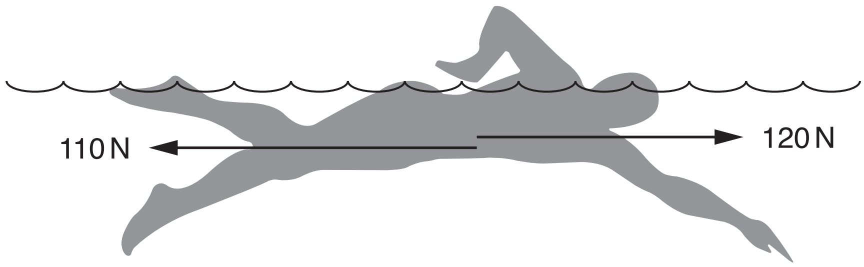


Fig. 3.1

(i) Calculate the size and direction of the resultant horizontal force on the swimmer.

size of resultant horizontal force = ... N

direction of resultant horizontal force = ...

[1]

(ii) State the name of the 110 N force on the swimmer.

.... [1]

(iii) Fig. 3.2 shows the horizontal forces acting on the swimmer as he moves forwards a short time later.

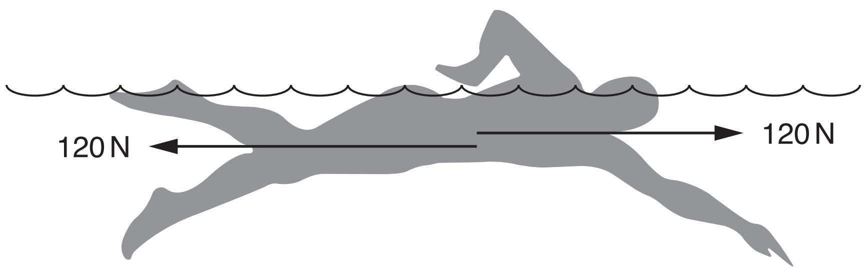


Fig. 3.2

Describe and explain the motion of the swimmer.

....

.... [2]

(b) Another swimmer weighs 700 N. He stands on a diving board, as shown in Fig. 3.3.

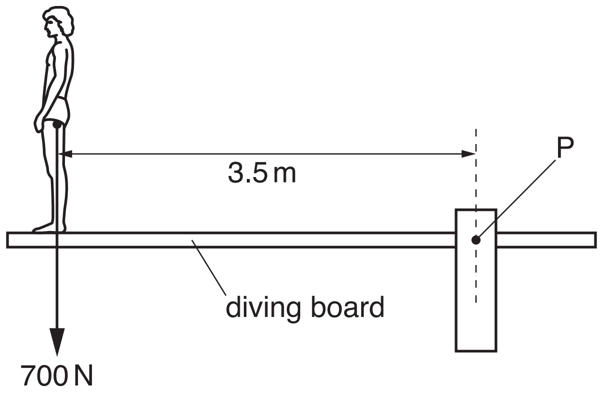


Fig. 3.3

Calculate the moment of the swimmer's weight about point P.

moment = ... N m [3]

[Total: 7]

4 **(a)** Fig. 4.1 shows a metal triangle suspended from a thread.

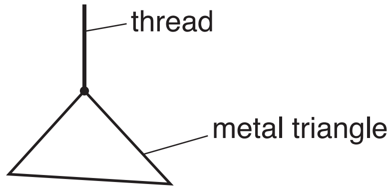


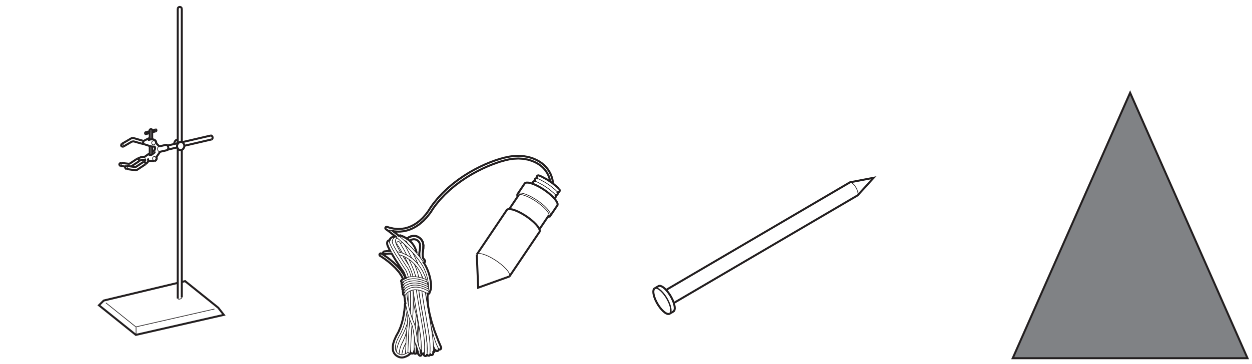
Fig. 4.1

Complete the sentence. Choose the correct word or phrase from the box.

above	below	to the left of	to the right of

The metal triangle will come to rest with its centre of mass directly .... the point of suspension. [1]

(b) A student finds the centre of mass of a shape made of thin card. Fig. 4.2 shows the equipment.



clamp stand and clamp | plumbline | nail or pin | shape made of thin card

Fig. 4.2 (NOT to scale)

Describe how the student finds the centre of mass of the card. Choose from these sentences.

A A line is drawn on the card showing the position of the string.

B A pin held in a clamp is put through the hole in the card.

C The centre of mass is where the lines cross on the card.

D The process is repeated using holes near the other two edges.

Complete the flow chart. Write the letter for the correct sentence in each box.

A small hole is made near one edge of the card

↓

[ ]

↓

The plumbline is attached to the pin

↓

[ ]

↓

[ ]

↓

[ ]

[3]

[Total: 4]

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5 **(a)** Energy sources used to generate electricity are shown in the box.

gas	oil	tides	waves	wind

Which energy sources are non-renewable?

Draw a ring around **each** energy source that is non-renewable. [1]

(b) The diagram shows a geothermal power station.

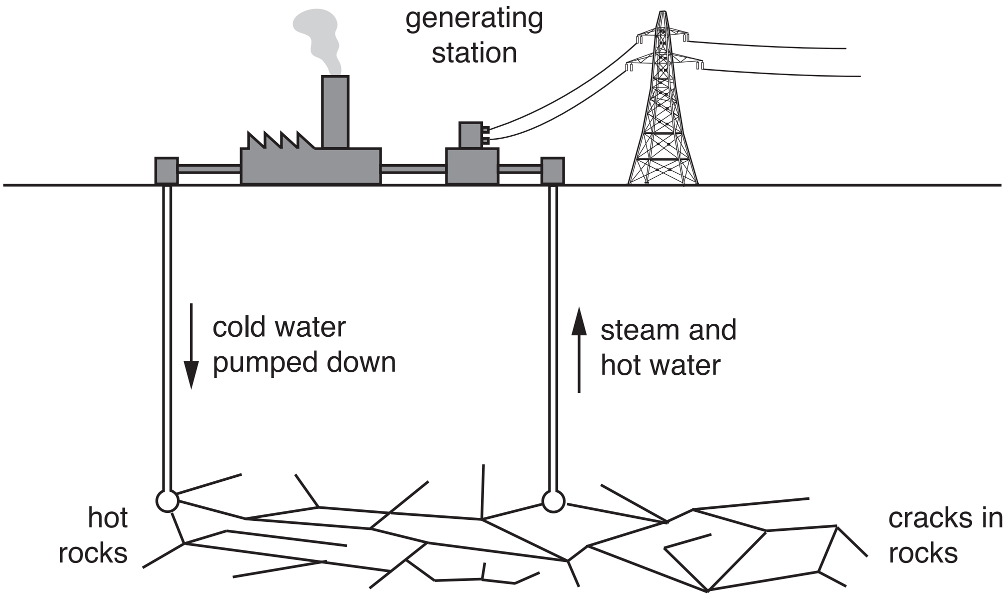

Fig. 5.1

Describe how the geothermal power station generates electricity.

....

....

....

....

....

.... [4]

[Total: 5]

6 (a) Fig. 6.1 shows a liquid-in-glass thermometer.

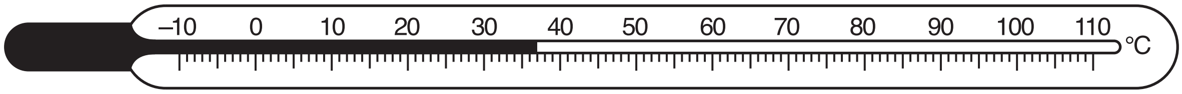

Fig. 6.1

(i) State the name of a liquid used in liquid-in-glass thermometers.

.... [1]

(ii) The thermometer is calibrated using two fixed points.

State the values of these fixed points.

.... °C and .... °C [1]

(b) A student heats some water in a metal can, as shown in Fig. 6.2.

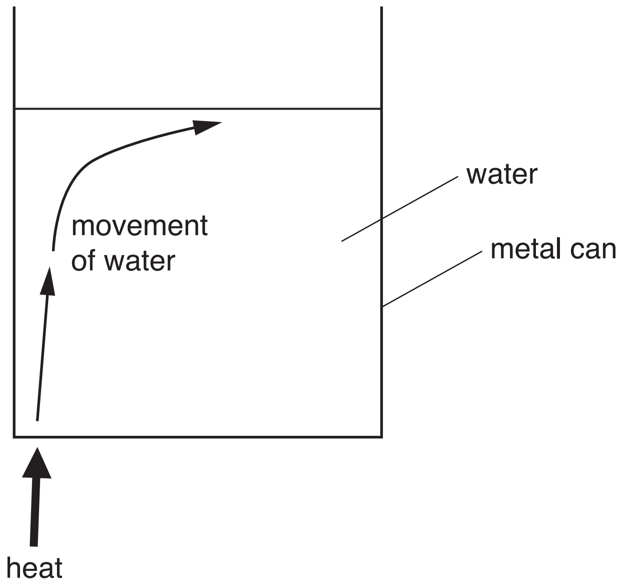

Fig. 6.2

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(i) Complete the sentence. Choose a word from the box.

conduction	convection	radiation

Thermal (heat) energy moves through the metal can by .... [1]

(ii) Describe how thermal energy is transferred throughout the water. Include your ideas about density changes.

....

....

....

....

....

....

.... [3]

[Total: 6]

7 All matter is made up of atoms and molecules.

(a) Describe the arrangement, separation and motion of gas molecules.

arrangement ....

separation ....

motion ....
[3]

(b) The motion of smoke particles in air can be observed using a smoke cell and microscope. Fig. 7.1 shows the arrangement.

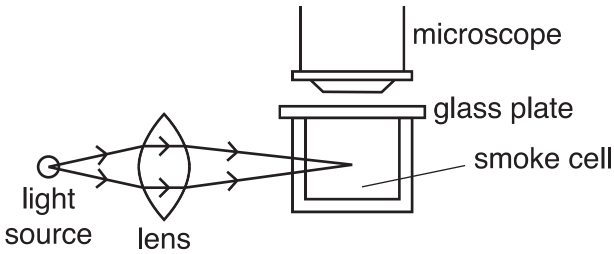

Fig. 7.1

Smoke is placed inside the glass smoke cell. Light enters from the side of the smoke cell.

A student looks through the microscope. She sees tiny spots of light moving. Each spot of light is a smoke particle.

Fig. 7.2 represents the path of a smoke particle seen in the eyepiece of the microscope.

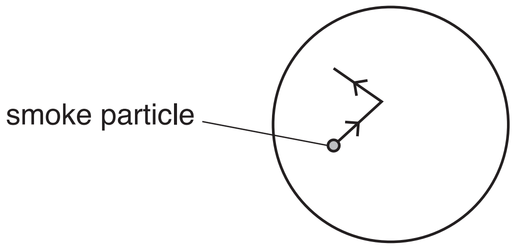

Fig. 7.2

(i) On Fig. 7.2, continue the path of the smoke particle. [2]

(ii) State the term used to describe the movement of the smoke particle.

.... [1]

[Total: 6]

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8 Fig. 8.1 is a partially completed ray diagram.

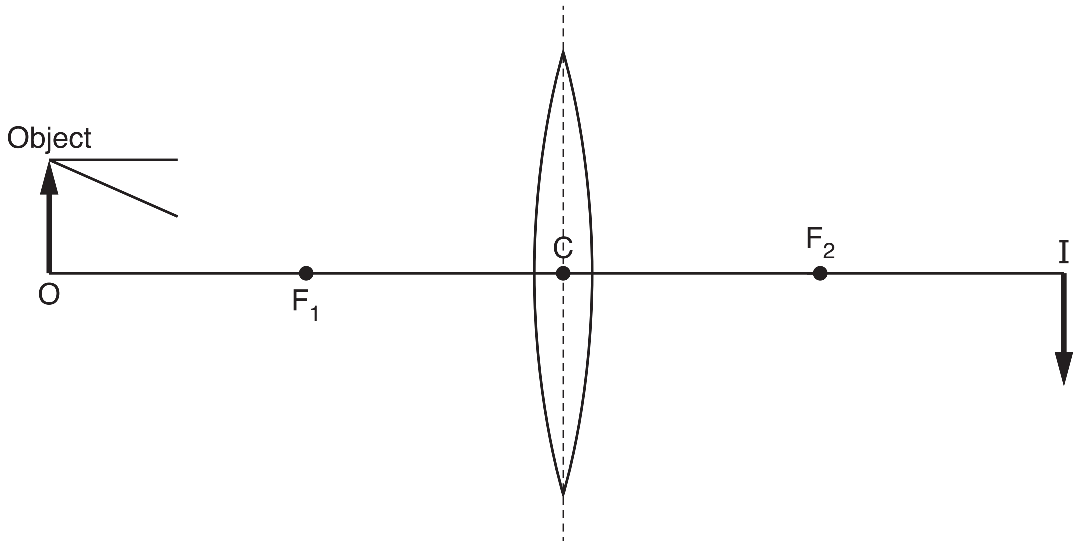

Fig. 8.1

The object is at O and its image is at I.

(a) Which distance is the focal length of the lens? Tick **one** box.

☐ C to F_1

☐ O to C

☐ F_2 to I

☐ O to I [1]

(b) On Fig. 8.1, extend the **two** rays from the arrowhead on the object until both reach the position of the image. [3]

(c) The object is moved a small distance **away** from the lens. State the effect, if any, this has on the position and size of the image.

position ....

size ....
[2]

[Total: 6]

9 A boat race starts on the sea, but close to land. Fig. 9.1 shows the boats at the start of the race.

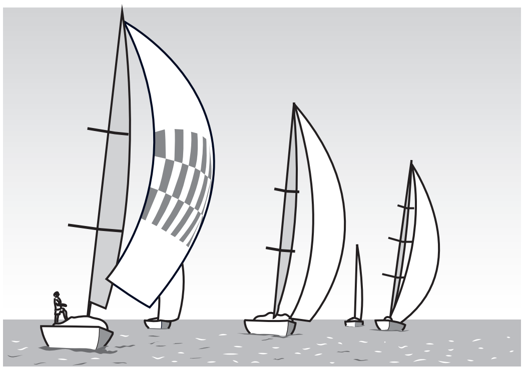

Fig. 9.1

On the land, a cannon produces a loud bang to start the race. There is a flash of light at the same time as the bang.

(a) **(i)** At the start of the race, the sailors watch for the flash of light from the cannon.

Suggest why the sailors watch for the flash of light rather than listen for the bang.

....

.... [1]

(ii) One of the sailors is 500 m from the cannon. She measures a time difference of 1.6 seconds between seeing the flash of light and hearing the bang.

Calculate the speed of sound.

speed of sound = ... m / s [3]

(iii) The value of the speed of sound obtained in **(a)(ii)** is lower than expected.

Suggest a reason for this difference.

....

.... [1]

(b) The race is held close to a part of the coast with high cliffs. A sailor hears a second bang shortly after the first bang.

State the term for the second bang and explain how it is produced.

term ....

explanation ....
[2]

[Total: 7]

10 A circuit is made from two lamps, a cell and a switch, as shown in Fig. 10.1.

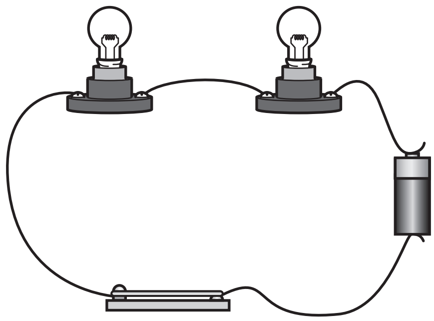

Fig. 10.1

(a) **(i)** Draw the circuit symbol for a cell.

[1]

(ii) State the term used for the arrangement of lamps in the circuit in Fig. 10.1.

.... [1]

(iii) The switch is closed and the lamps light.

State the name of the charged particles that are flowing through the wires

.... [1]

(b) Fig. 10.2 represents a different type of circuit.

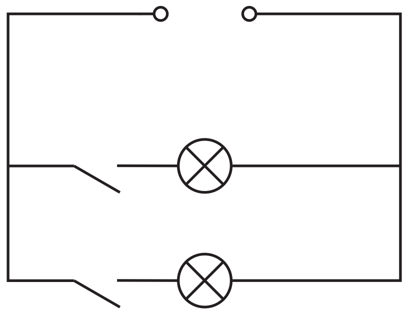

Fig. 10.2

(i) Compare Fig. 10.1 and Fig. 10.2. State **two** advantages of the type of circuit shown in Fig. 10.2 with the type of circuit shown in Fig. 10.1.

1. ....

2. ....
[2]

(ii) The potential difference across the power source in Fig. 10.2 is 3.0 V. The combined resistance of the two lamps is 12 Ω. Calculate the size of the current in the circuit.

current = ... A [3]

[Total: 8]

11 **(a)** Identify which of the following metals can be permanently magnetised. Place a tick (✓) in the box next to any correct metal.

☐ aluminium

☐ copper

☐ steel

☐ tungsten

[1]

(b) Two metal rods are thought to be permanent magnets. Describe the test you would carry out to confirm that both rods are permanent magnets.

....

....

.... [2]

(c) **(i)** Describe how to make an electromagnet. You may draw a labelled diagram to help your answer.

....

....

....

.... [3]

(ii) Suggest **two** factors that affect the strength of the magnetic field of an electromagnet.

1 ....

2 ....

[2]

[Total: 8]

12 A radioactive substance decays by emitting an α-particle.

(a) The nuclide notation for an α-particle is

$$ {}^{4}_{2}\alpha $$

(i) State the term given to the number 4, written in the nuclide notation.

.... [1]

(ii) State the term given to the number 2, written in the nuclide notation.

.... [1]

(b) Fig. 12.1 shows the decay curve for a radioactive material.

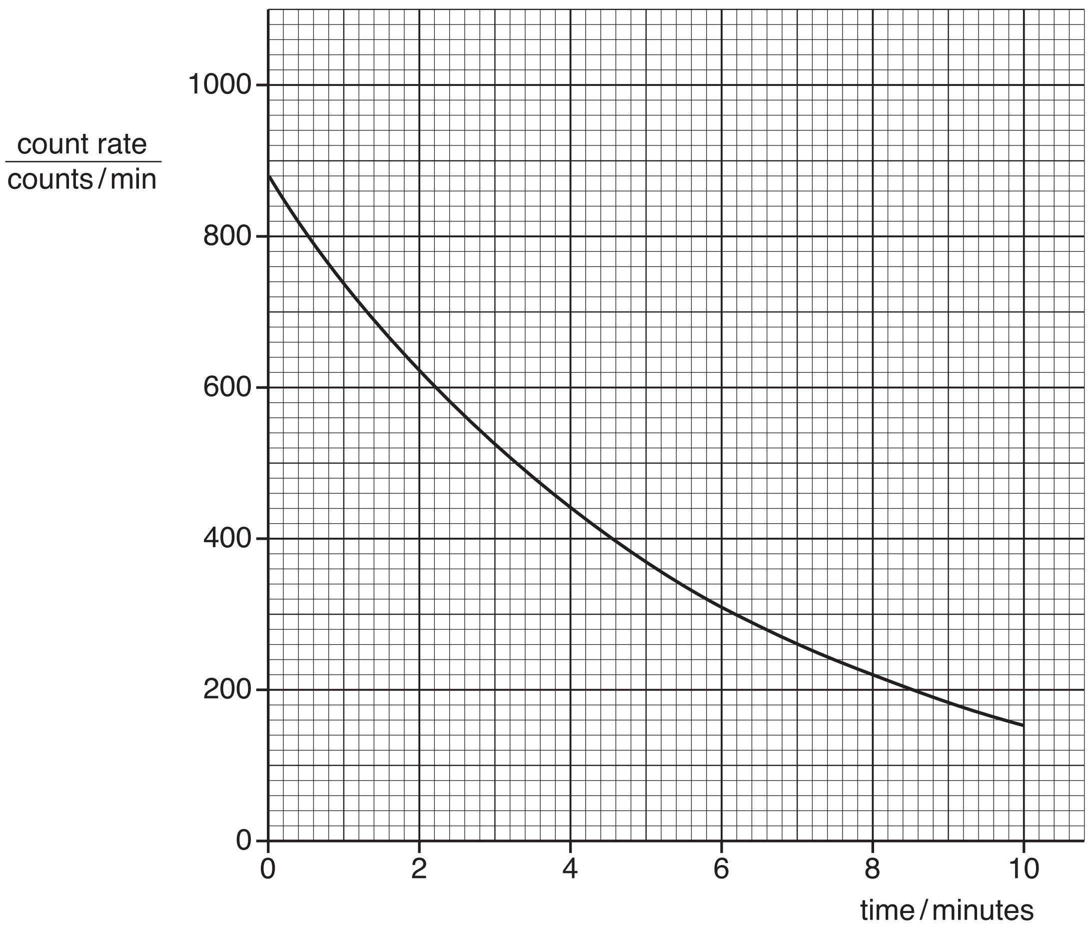

Fig. 12.1

(i) Use information from the graph in Fig. 12.1 to determine the half-life of the material. Clearly show how you used the graph to obtain your answer.

half-life = ... minutes [3]

(ii) Another radioactive material with the same half-life has an initial count rate of 600 counts / min. On Fig. 12.1 sketch the decay curve for this material. [1]

[Total: 6]

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Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

5830106124

PHYSICS **0625/33**

Paper 3 Theory (Core) **October/November 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m/s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **15** printed pages and **1** blank page.

DC (LEG/CB) 172322/6

Cambridge Assessment International Education

1 **(a)** A student uses a stopwatch in a timing experiment.

Fig. 1.1 shows the stopwatch readings.

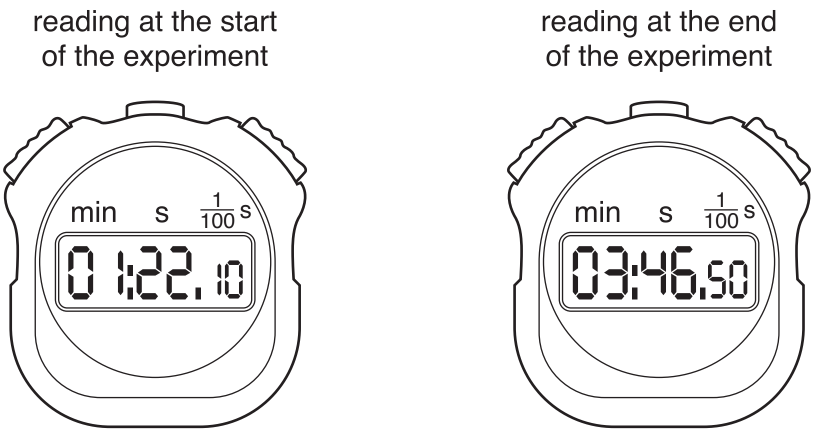


Fig. 1.1

Calculate the time interval between the two readings.

time interval = ... s [2]

(b) A device has a light-emitting diode (LED) that flashes briefly at regular intervals.

Describe how to determine accurately the average time for each interval, using a stopwatch.

....

....

....

....

....

.... [4]

[Total: 6]

2 A student reviews some data about athletes and footballers.

(a) An athlete runs 12 km in 1.5 hours.

Calculate the athlete's average speed in km / h.

average speed = ... km / h [3]

(b) Fig. 2.1 shows the speed-time graph for a footballer for the first 15.0 seconds of a game.

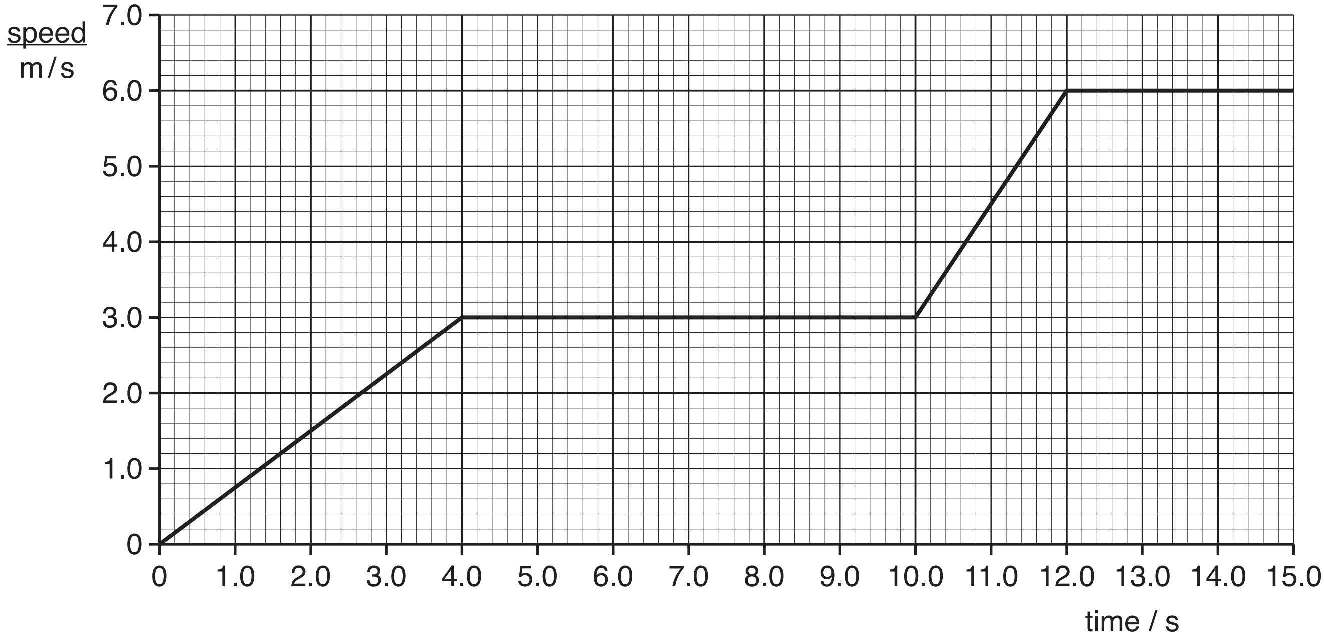


Fig. 2.1

(i) Use the graph in Fig. 2.1 to calculate the distance travelled by the footballer during the first 4.0 seconds.

distance = ... m [3]

(ii) Use the graph in Fig. 2.1 to determine when the footballer is moving with greatest acceleration.

Between .... s and .... s

Give a reason for your answer.

....

....
[2]

(c) Another footballer has a mass of 72 kg.

Calculate the weight of this footballer.

weight = ... N [3]

[Total: 11]

3 A model aircraft is flying through air. Fig. 3.1 shows the forces acting on the model aircraft. The weight of the model aircraft is 15.0 N.

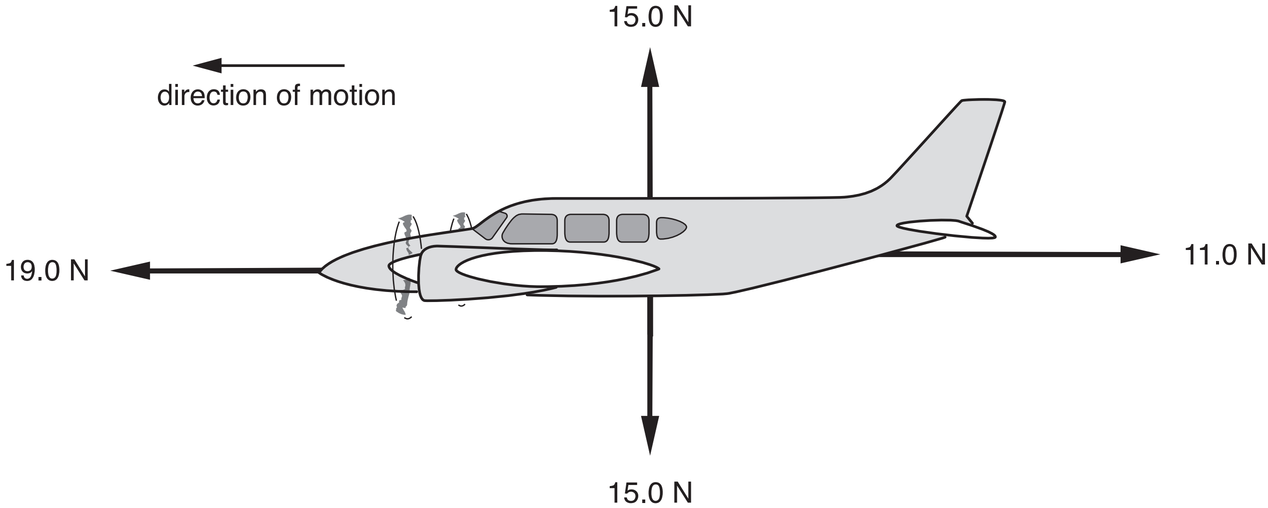


Fig. 3.1

(a) **(i)** Determine the size and direction of the resultant **horizontal** force acting on the model aircraft.

size of resultant horizontal force = ... N

direction of resultant horizontal force = ...
[1]

(ii) Describe the change in the motion of the model aircraft.

....

.... [2]

(b) The horizontal forces acting on the model aircraft become balanced.

Suggest how the horizontal forces acting on the model aircraft have changed.

....

.... [1]

[Total: 4]

4 **(a)** A man is working on a platform. He uses a rope to raise a bag from the ground to the platform as shown in Fig. 4.1.

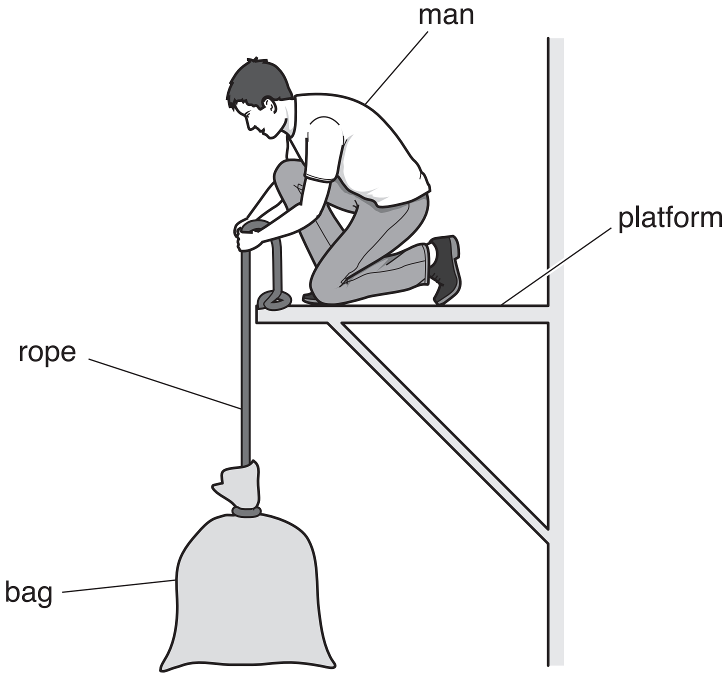


Fig. 4.1

(i) State the type of energy gained by the bag as it is lifted at constant speed.

.... [1]

(ii) The man then lifts a second bag from the ground to the platform. The first bag weighs 100 N and the second bag weighs 150 N.

On which bag of materials does the man do more work?

....

Explain your answer.

....

....
[1]

(iii) The man wants to determine his useful power as he lifts one of the bags. He knows the weight of the bag. State the **two** other quantities he needs to know.

1 ....

2 ....
[2]

(b) The statements describe processes in a coal-fired power station. They are **not** in the correct order.

A Thermal energy boils water.

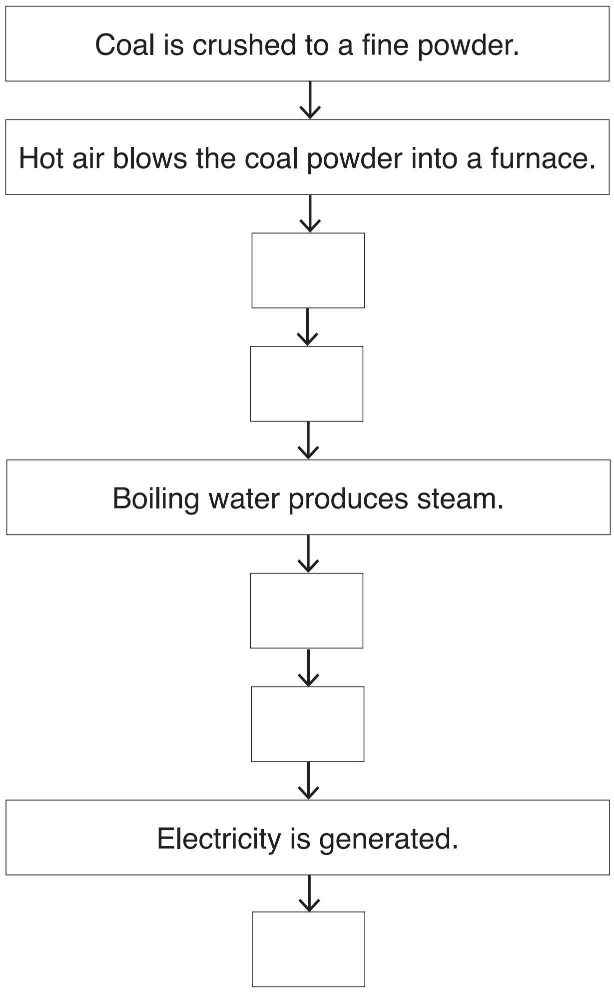
B Coal burns to produce thermal (heat) energy.

C Electricity is transmitted to a step-up transformer.

D A turbine turns coils in a magnetic field.

E Steam turns a turbine.

Use the letters A, B, C, D and E to complete the flow chart explaining how the power station works.



[3]

[Total: 7]

5 **(a)** The arrows on Fig. 5.1 represent changes of state.

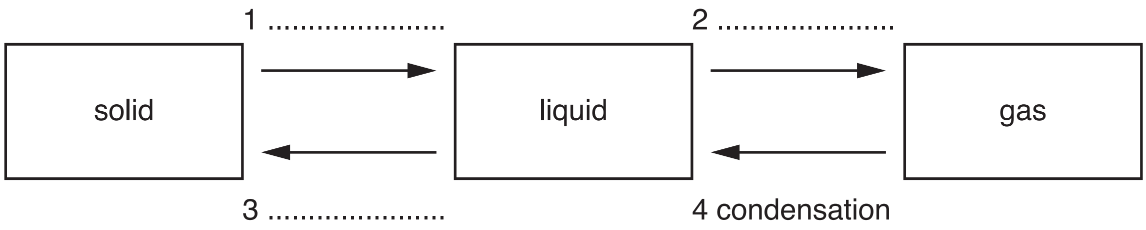


Fig. 5.1

One of the arrows is labelled. Label each of the other arrows with the correct change of state. Write the change of state on the dotted lines next to each arrow. [3]

(b) A beaker contains some liquid with a low boiling point. The beaker is placed onto a small amount of water, as shown in Fig. 5.2.

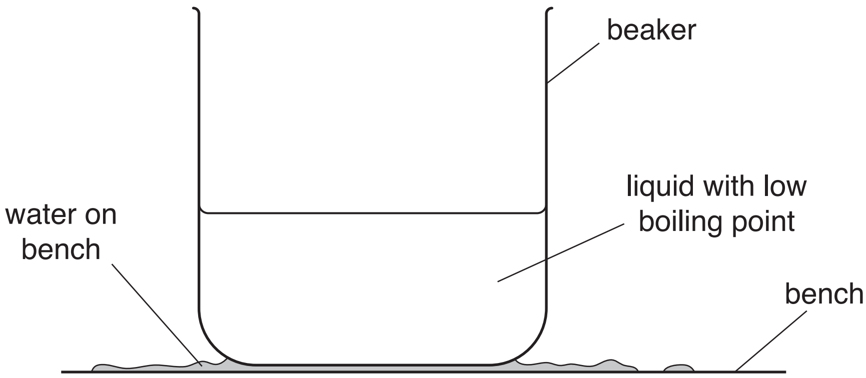


Fig. 5.2

The liquid in the beaker evaporates quickly. The water on the bench cools and turns to ice.

Explain why the water cools.

....

....

....

....

.... [3]

[Total: 6]

6 **(a)** Fig. 6.1 represents a transverse wave drawn full size. Point X represents a point on the wave.

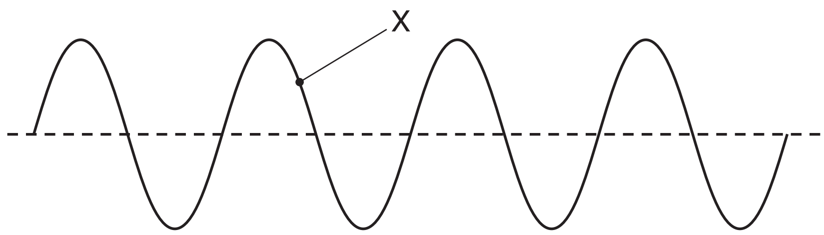


Fig. 6.1

(i) On Fig. 6.1, mark clearly the directions in which point X moves. [1]

(ii) Use Fig. 6.1 to measure the wavelength of the wave.

wavelength = ... cm [1]

(iii) The frequency of the wave is increased. Describe how the wave pattern in Fig. 6.1 would be different.

....

.... [1]

(b) **(i)** Place a tick in a box next to any transverse wave.

☐ light

☐ sound

☐ radio [1]

(ii) State a type of wave that **cannot** travel in a vacuum.

.... [1]

[Total: 5]

7 **(a)** Complete the sentences. Add the missing word to each of the blank spaces.

The unit of temperature is called the ....

The physical property that varies with temperature in a liquid-in-glass thermometer is the

.... of the liquid.

[2]

(b) A student has a thermometer without a marked scale.
To produce a scale for the thermometer, the student must use two fixed points.
Give the temperature value for each fixed point and describe what happens to water at each of these temperatures.

Lower fixed point ....

....

Upper fixed point ....

....

[4]

[Total: 6]

8 Fig. 8.1 shows a ray of light travelling through a glass block and then reflecting from a mirror.

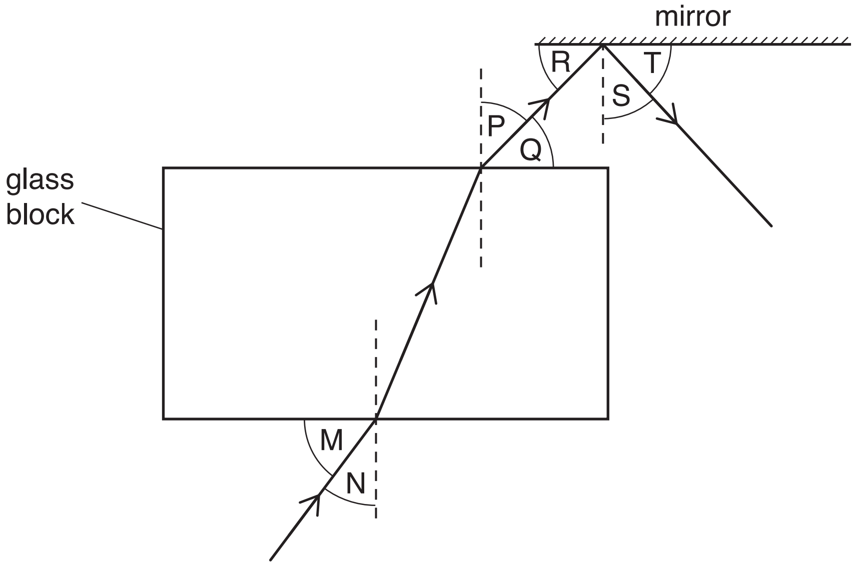


Fig. 8.1

(a) State the term used for the dashed lines drawn in Fig. 8.1.

.... [1]

(b) Use Fig. 8.1 to identify the three angles in the list. Place the correct letter in the box to indicate each angle.

☐ angle of incidence

☐ angle of reflection

☐ angle of refraction [3]

(c) The ray of light in Fig. 8.1 changes direction as it enters the glass block. State the name of this effect and explain why it happens.

name of effect ....

explanation ....

....

....
[2]

[Total: 6]

9 Two bar magnets are placed next to each other as shown in Fig. 9.1.

Fig. 9.1

Magnet A is slowly moved towards magnet B. This causes magnet B to move away from magnet A.

(a) **(i)** On Fig. 9.1, suggest the poles of each bar magnet.

Label N and S on each of the magnets. [1]

(ii) State the term used to describe the direction of the forces acting between magnet A and magnet B.

.... [1]

(iii) Magnet B is removed and replaced with a steel bar of the same size.

Describe what happens when magnet A is slowly moved towards the steel bar.

....

.... [1]

(b) A student makes an electromagnet. He places an iron rod inside a coil of wire and connects the coil to a d.c. power supply, as shown in Fig. 9.2.

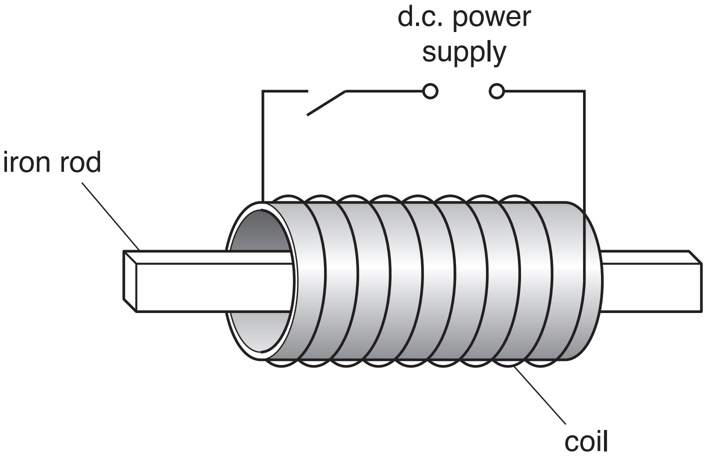


Fig. 9.2

(i) The switch is closed so there is a current in the coil. The S pole of a bar magnet is placed near to each end of the iron rod in turn.
Suggest what happens at each end of the iron rod and give a reason for your predictions.

Suggestions ....

....

....

reason ....

....
[2]

(ii) The student removes the iron rod from the coil. The student places a steel rod inside the coil. He closes the switch and the steel rod becomes a magnet. He then opens the switch.

The student removes the steel rod and moves it close to the iron rod.

Describe and explain what happens as the two rods are moved close together.

....

....

.... [2]

(iii) State **one** use for an electromagnet.

.... [1]

[Total: 8]

10 Fig. 10.1 shows the symbol for an electrical component.

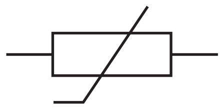


Fig. 10.1

(a) State the name of the component shown in Fig. 10.1.

.... [1]

(b) The resistance of the component shown in Fig. 10.1 varies with temperature. Fig. 10.2 shows a graph of resistance against temperature for the component.

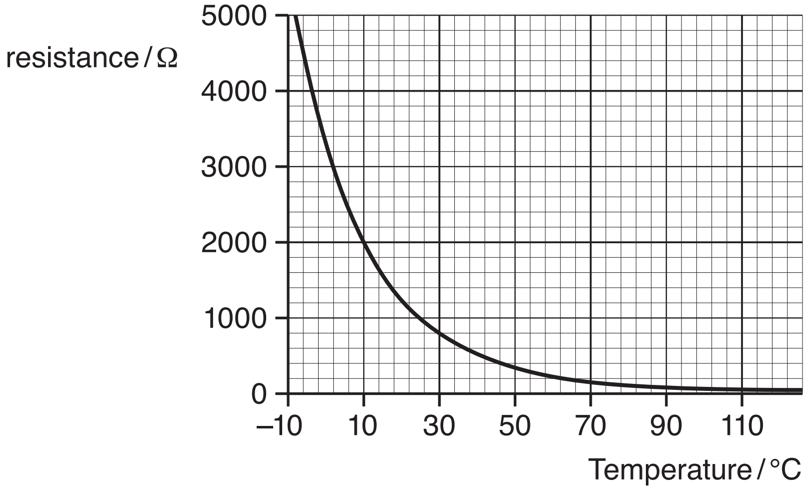


Fig. 10.2

(i) Use Fig. 10.2 to determine the resistance of the component at a temperature of 10 °C.

.... Ω [1]

(ii) At another temperature, the resistance of the component is 800 Ω.
Calculate the current in the component when it is connected to a 12.0 V supply.

current = ... A [3]

[Total: 5]

11 Fig. 11.1 shows a diagram of an electrical device. The diagram is **not** complete. The coil rotates in a magnetic field when connected to a d.c. power supply.

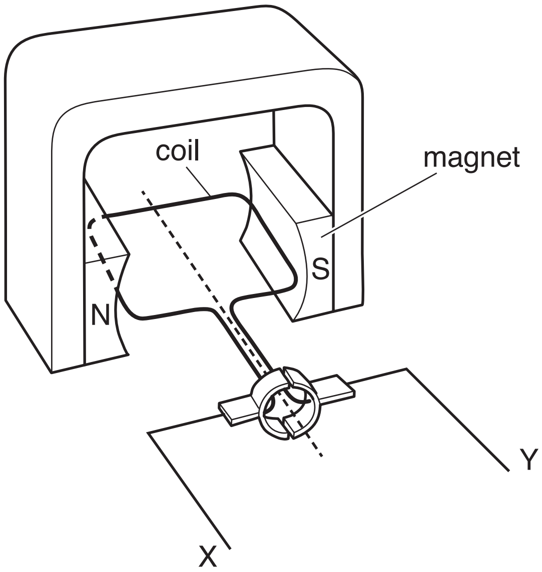


Fig. 11.1

(a) **(i)** Explain the meaning of the term *d.c.*

....

.... [1]

(ii) Complete the diagram in Fig. 11.1 by drawing the symbols for two cells in series **and** a switch to make a circuit. [2]

(b) **(i)** State the name of the electrical device shown in Fig. 11.1.

.... [1]

(ii) State **two** changes to the electrical device that will make the coil in the device rotate faster.

1. ....

2. ....

[2]

[Total: 6]

12 Fig. 12.1 shows the nuclide notation for three isotopes of an element.

$$ {}^{1}_{1}\mathbf{X} \qquad {}^{2}_{1}\mathbf{Y} \qquad {}^{3}_{1}\mathbf{Z} $$

Fig. 12.1

(a) **(i)** Describe how the nuclide notation shows that each isotope is of the same element.

....

.... [1]

(ii) Describe how the nuclide notation shows the differences between the isotopes.

....

.... [1]

(b) Radioactive sources emit radiation when they decay. State the names of **three** types of radioactive emission.

1 ....

2 ....

3 ....
[2]

(c) Radioactive emissions have differing characteristics. One characteristic is their ionising effect.

Complete the statement about ionisation, using words from the box. The words can be used once, more than once or not at all.

electrons	**negatively**	**neutrons**	**positively**	**neutrally**	**protons**

When atoms are ionised,

.... may be removed, leaving .... charged atoms (ions), or

.... may be gained, forming .... charged atoms (ions). [4]

(d) Polonium-210 has a half-life of 140 days. A sample of polonium-210 has 8.0×10^{10} atoms. Calculate the number of polonium-210 atoms remaining in the sample after 280 days.

number of atoms = ... [2]

[Total: 10]

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Cambridge International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

0431991628

PHYSICS **0625/41**

Paper 4 Theory (Extended) **October/November 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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DC (NH/CGW) 174867/3

Cambridge Assessment International Education

[Turn over

1 A car accelerates from rest at time $t = 0$ to its maximum speed.

Fig. 1.1 is the speed-time graph for the first 25 s of its motion.

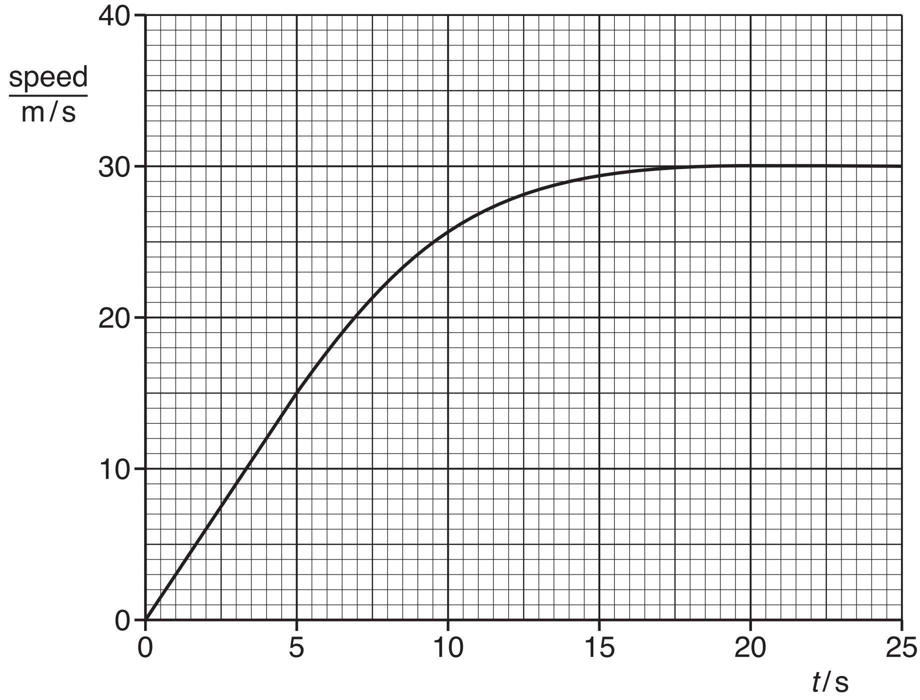

Fig. 1.1

(a) The mass of the car is 2300 kg.

For the time between $t = 0$ and $t = 5.0$ s, determine:

(i) the acceleration of the car

acceleration = ... [2]

(ii) the resultant force acting on the car.

resultant force = ... [2]

(b) Describe the motion of the car between $t = 10\,s$ and $t = 15\,s$. Explain how Fig. 1.1 shows this.

....

....

....

.... [3]

(c) Between $t = 10\,s$ and $t = 15\,s$, the force exerted on the car due to the engine remains constant.

Suggest and explain why the car moves in the way shown by Fig. 1.1.

....

....

.... [2]

[Total: 9]

2 **(a)** State **two** properties of an object that may be changed by the action of forces.

1. ....

2. ....
[2]

(b) A chest expander is a piece of equipment used by athletes in a gym. Fig. 2.1 shows a chest expander that consists of five identical springs connected in parallel between two handles.

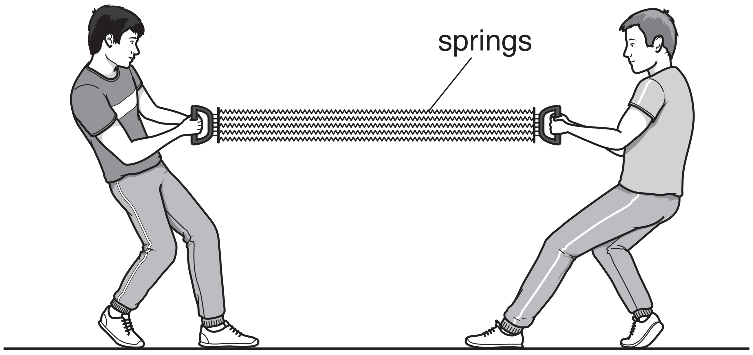

Fig. 2.1

Each spring has an unstretched length of 0.63 m.

Two athletes are stretching the chest expander by pulling on the two handles in opposite directions.

(i) The springs obey Hooke's law.

Explain what is meant by this statement.

....

....

.... [2]

(ii) Each athlete pulls the handle towards himself with a force of 1300 N.

1. State the tension in each spring.

tension = ... [1]

2. The chest expander stretches and each spring is now 0.94 m long.

Calculate the spring constant k of each spring.

k = ... [2]

(iii) State the energy changes taking place as the two athletes use their muscles to stretch the chest expander.

....

....

.... [2]

[Total: 9]

3 Fig. 3.1 shows a shooting competition, where air rifles fire soft metal pellets at distant targets.

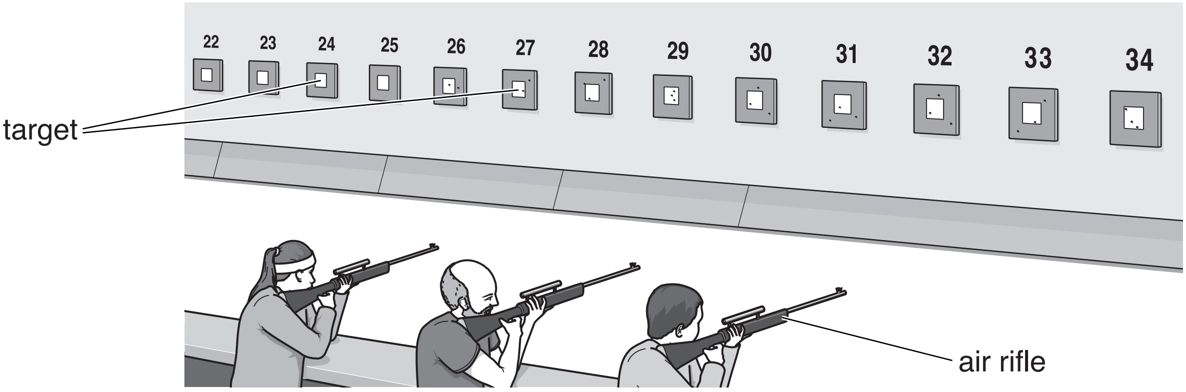

Fig. 3.1

When an air rifle is fired, it exerts an impulse of 0.019 N s on the pellet.

(a) Define *impulse*.

....

.... [1]

(b) The pellet has a mass of 1.1×10^{-4} kg.

Determine:

(i) the speed with which the pellet leaves the rifle

speed = ... [2]

(ii) the kinetic energy of the pellet as it leaves the rifle.

kinetic energy = ... [3]

(c) The pellet melts when it strikes the target.

Describe how the molecular structure of the liquid metal differs from that of the solid metal.

....

....

....

.... [3]

[Total: 9]

4 Fig. 4.1 shows a loudspeaker that is producing a sound wave in air of frequency 15 000 Hz.

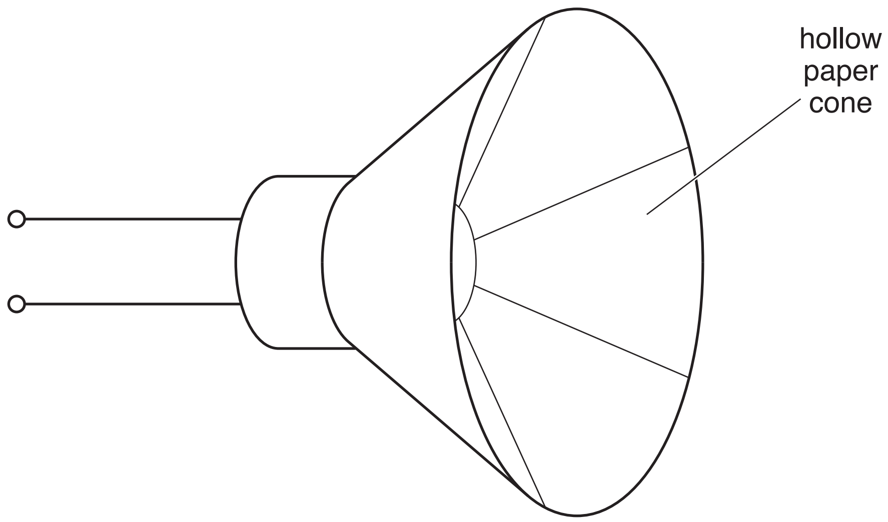

Fig. 4.1

(a) Describe how the cone of the loudspeaker produces this sound.

....

....

....

.... [3]

(b) The speed of sound in air is 330 m/s.

Calculate the wavelength of this sound.

wavelength = ... [2]

(c) The loudspeaker is placed a considerable distance to the left of a barrier with a gap. The width of the gap is double the wavelength of the sound. Sound from the loudspeaker reaches the barrier and passes through the gap.

Fig. 4.2 shows the gap in the barrier.

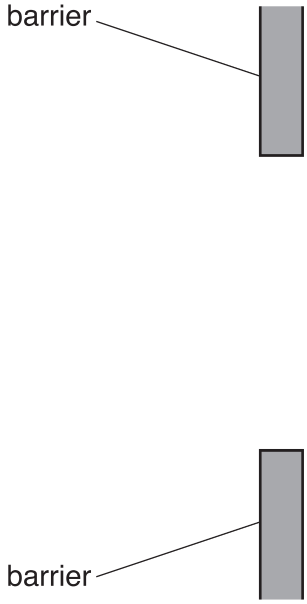

Fig. 4.2 (not to scale)

On Fig. 4.2, sketch a diagram that represents the sound wave as a series of wavefronts

- travelling towards the barrier
- in the gap
- and travelling away from the barrier.

[3]

[Total: 8]

5 Fig. 5.1 shows a sphere that is negatively charged. The sphere is attached to a plastic stand.

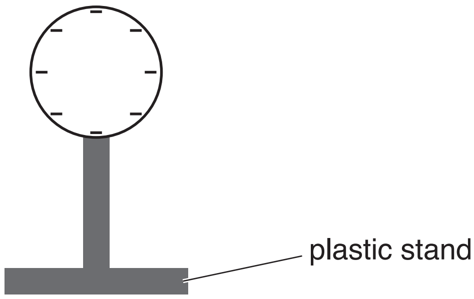

Fig. 5.1

(a) On Fig. 5.1, draw arrows to indicate the pattern and direction of the electric field in the region surrounding the sphere. [2]

(b) A smaller, uncharged metal sphere S is suspended by a plastic thread and brought close to the negatively charged sphere. Fig. 5.2 shows the two spheres.

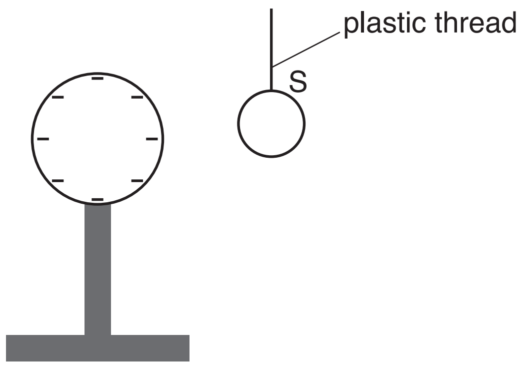

Fig. 5.2

(i) By drawing on Fig. 5.2, indicate the distribution of charge on S. [2]

(ii) State what happens to S.

....

.... [1]

(iii) An earth wire is then touched against S.

Describe what happens in the wire and state how this affects the charge on S.

....

....

.... [2]

(c) The metal sphere S is an electrical conductor. The plastic thread is an electrical insulator.

Explain this difference by referring to the structures of the two materials.

....

....

.... [2]

[Total: 9]

6 Fig. 6.1 shows a shower that takes in cold water. The water passes through an electric water heater and emerges from the showerhead at a higher temperature.

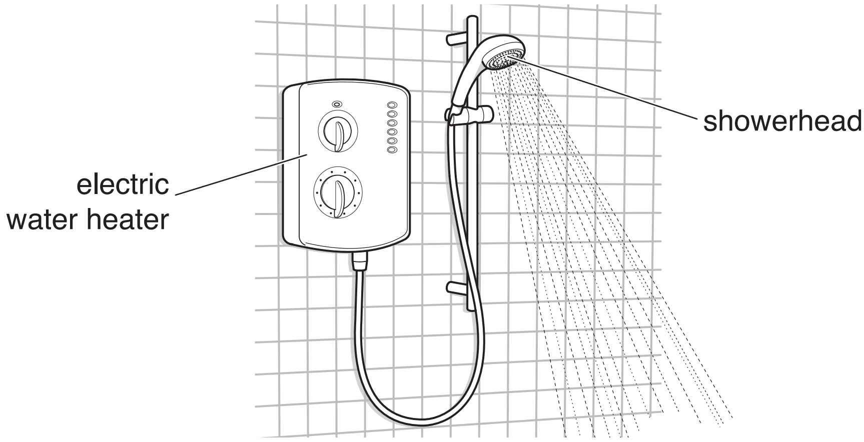

Fig. 6.1

The power of the heater is 9000 W.

(a) The shower is powered by a 230 V electricity supply.

(i) Calculate the current in the heater when it is switched on.

current = ... [2]

(ii) Suggest a suitable rating for the fuse in the heater circuit.

fuse rating = ... [1]

(b) The specific heat capacity of water is 4200 J / (kg °C). The initial temperature of the cold water is 16 °C.

Determine the maximum mass of water that can be heated to a temperature of 35 °C in 1.0 s.

mass = ... [4]

(c) A safety control in the shower switches off the shower when the water becomes dangerously hot. The control uses a thermocouple thermometer to measure the temperature of the heated water.

(i) Describe the structure of a thermocouple thermometer. Include a diagram in your answer.

....

....

.... [2]

(ii) Suggest **one** reason why a thermocouple thermometer is suitable for this purpose.

....

.... [1]

[Total: 10]

7 The resistance of a 1.0 m length of resistance wire is 7.6 Ω. A length of this wire is taped to a metre rule. A crocodile clip is connected to one end of the resistance wire exactly at the 0 m mark of the rule. Fig. 7.1 shows the crocodile clip connected to terminal P.

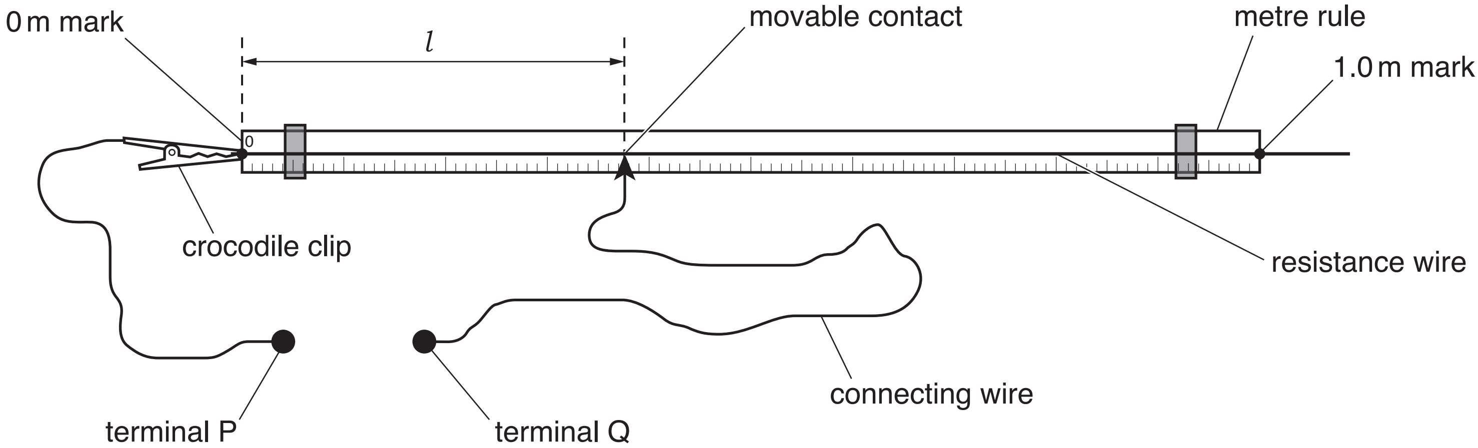

Fig. 7.1

A second terminal Q is connected to a movable contact using a long length of connecting wire. The movable contact is in contact with the resistance wire at a length l from the 0 m mark on the rule.

The movable contact is placed at different points on the resistance wire. The resistance R of the length l of the wire depends on l.

(a) On Fig. 7.2, sketch a graph to show how R varies with l for values of l between l = 0 and l = 1.0 m. Mark appropriate values on the axes of the graph.

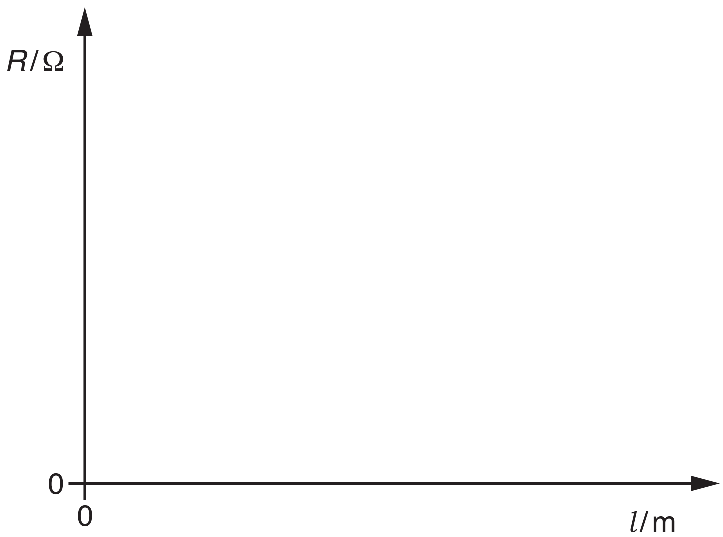

Fig. 7.2

[2]

(b) Fig. 7.3 shows a battery of electromotive force (e.m.f.) 12 V connected across the 1.0 m length of the resistance wire.

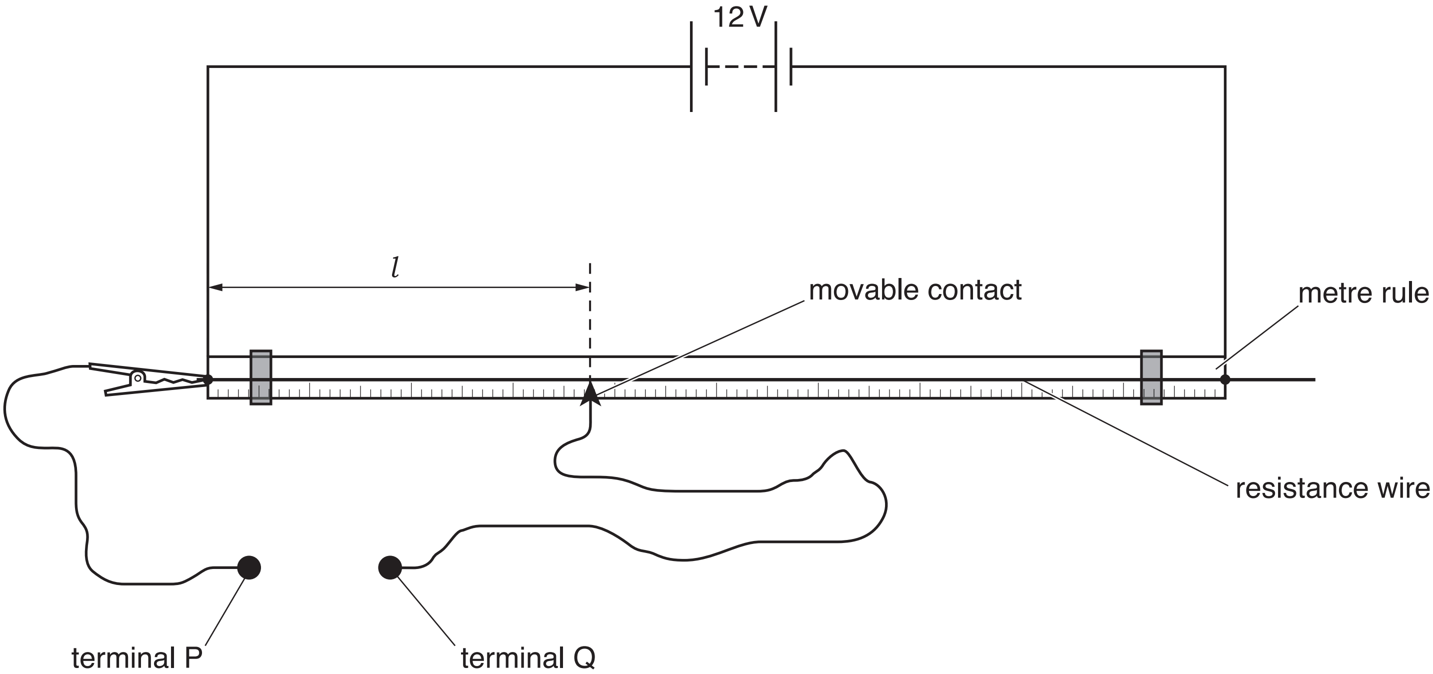

Fig. 7.3

(i) State what is meant by *electromotive force* (*e.m.f.*).

....

....

.... [2]

(ii) Calculate:

1. the current in the resistance wire

current = ... [2]

2. the potential difference (p.d.) between terminal P and terminal Q when l = 0.35 m

p.d. = ... [1]

3. the charge that passes through the resistance wire in 5.5 minutes.

charge = ... [2]

[Total: 9]

8 Fig. 8.1 shows a ray of red light incident on one side of a glass prism in air.

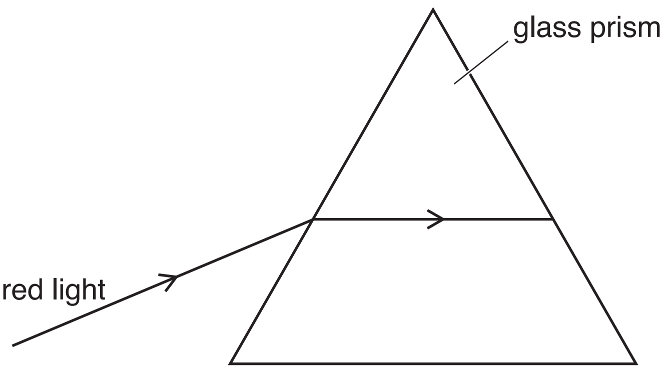

Fig. 8.1

For red light, the refractive index of glass is n_R.

(a) The angle of incidence is 53° and the angle of refraction in the glass is 30°.

(i) Calculate n_R.

n_R = ... [2]

(ii) On Fig. 8.1, sketch a line to indicate the path of the red light when it emerges from the glass prism. Label this path R. [1]

(iii) Explain why the quantity *refractive index* does not have a unit.

....

.... [1]

(b) For violet light, the refractive index n_V of glass is slightly larger than n_R.

(i) A ray of violet light is incident on the prism along the same path as the ray of red light.

On Fig. 8.1, sketch a line to indicate the path of the violet light in the prism and when it emerges into the air. Label this path V. [1]

(ii) When a ray of white light is incident on the prism, dispersion produces a continuous spectrum of coloured light.

State how the speed of light in glass depends on its frequency. Explain how this is shown by the dispersion of white light in the prism.

statement ....

explanation ....

....

[3]

[Total: 8]

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9 **(a)** The chemical symbol of the element lithium is Li. The proton number of lithium is 3.

Fig. 9.1 is a representation of a nucleus of a radioactive isotope of lithium that is about to decay.

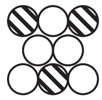

Fig. 9.1

(i) Write down, using nuclide notation, the symbol that represents this isotope of lithium.

.... [1]

(ii) This isotope of lithium decays by β-particle emission to form another nucleus.

Complete Fig. 9.2 to represent this decay by:

- using the same representation as in Fig. 9.1 and in the space after the arrow, draw a diagram of the nucleus formed by the decay
- writing the name of the particle that is identical to a β-particle on the answer line provided.

Fig. 9.2

[3]

(b) A radiation detector is set up in a laboratory where there are no radioactive samples.

On **six** separate occasions, the detector is switched on for 1.0 minute and the background count is recorded. The counts are:

23 27 25 24 20 25

(i) State why the readings are **not** all identical.

.... [1]

(ii) Suggest a possible source for this background radiation.

.... [1]

(iii) A sample containing only one radioactive isotope is brought into the laboratory. The half-life of the isotope is 15 hours.

The sample is placed near to the radiation detector in this laboratory. The detector is switched on and, after 1.0 minute, a count of 440 is recorded.

The sample is left next to the detector and the experiment is repeated 45 hours later.

The detector is switched on for 1.0 minute.

Predict the reading for the count obtained on this occasion.

reading .... [3]

[Total: 9]

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CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

6524394752

PHYSICS **0625/42**

Paper 4 Theory (Extended) **October/November 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
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Electronic calculators may be used.
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Cambridge Assessment International Education

[Turn over

1 Fig. 1.1 is the top view of a rectangular paddling pool of constant depth. The pool is filled with sea water.

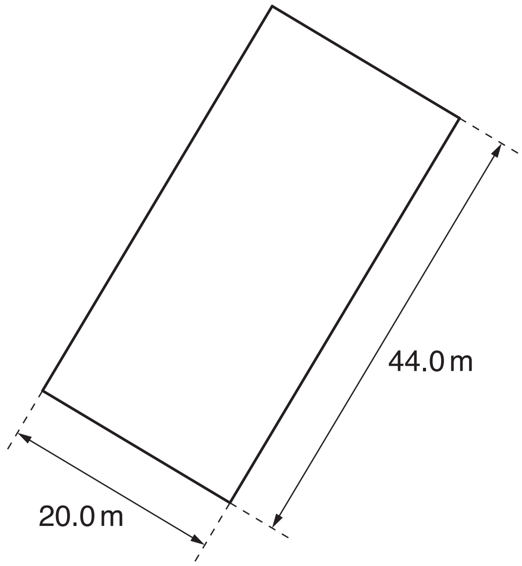

Fig. 1.1 (not to scale)

(a) The volume of the sea water in the pool is 264 m^3.

Calculate the depth of the pool.

depth = ... [3]

(b) The mass of the sea water in the pool is 2.70×10^5 kg.
Calculate the density of the sea water. Give your answer to 3 significant figures.

density = ... [2]

(c) Calculate the pressure due to the sea water at the bottom of the pool.

pressure = ... [2]

(d) State a suitable instrument for measuring the dimensions given in Fig. 1.1.

.... [1]

[Total: 8]

2 **(a)** State the **two** conditions which must be true for an object to be in equilibrium.

condition 1 ....

condition 2 ....
[2]

(b) Fig. 2.1 shows a uniform metre rule PQ in equilibrium.

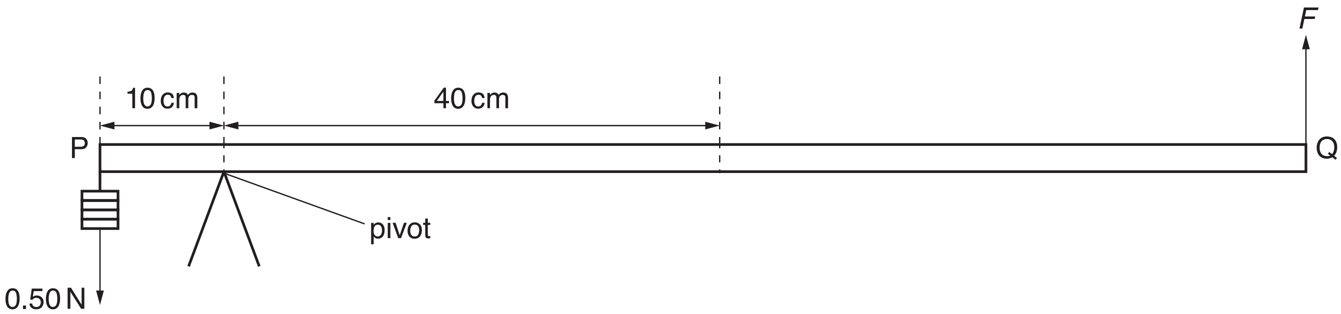

Fig. 2.1

The distance PQ is 100 cm. The mass of the metre rule is 0.12 kg and its weight is *W*.

(i) On Fig 2.1, draw and label:

1. an arrow to show the force *W* acting on PQ at the centre of mass

2. an arrow to show the force *R* acting on PQ at the pivot.
[2]

(ii) By taking moments about the pivot, calculate *F*.

F = ... [4]

(iii) Calculate *R*.

R = ... [2]

[Total: 10]

3 Fig. 3.1 shows a gas contained in a cylinder enclosed by a piston.

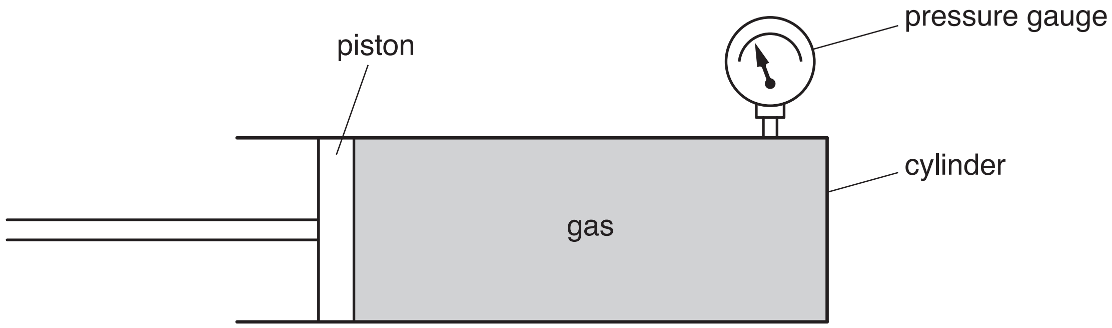

Fig. 3.1

(a) Describe, in terms of momentum of the molecules, how a pressure is exerted on the walls of the cylinder.

....

....

....

....

.... [3]

(b) The piston is pushed into the cylinder. The volume decreases from 820 cm^3 to 330 cm^3 . The pressure gauge measures the pressure after compression as 20 000 Pa. The temperature remains constant.

Calculate the value of the pressure before the gas was compressed.

pressure = ... [3]

[Total: 6]

4 **(a)** A student carries out an experiment to determine the thermal capacity of a metal block. The block is heated by an electric heater for 23 minutes. The current in the heater is 3.0 A at a potential difference (p.d.) of 12 V.
The temperature of the block rises from 20 °C to 70 °C.

Calculate the thermal capacity of the block.

thermal capacity = ... [4]

(b) **1.** Two metal spheres of different diameters are heated to 900 °C in a hot oven. The two spheres are removed from the oven.

State and explain any difference in the initial rates of emission of radiation of thermal energy between the two spheres.

....

....

....

2. One hot sphere is now heated in a hotter oven.

State and explain any effect on the rate of emission of radiation of thermal energy from that sphere when it is removed from the hotter oven.

....

....
[3]

[Total: 7]

5 **(a)** One difference between a longitudinal wave and a transverse wave is that a longitudinal wave consists of compressions and rarefactions.

(i) Explain the terms compression and rarefaction using ideas about particles.

compression ....

....

....

rarefaction ....

....

....
[2]

(ii) Describe **one** other way in which longitudinal wave motion differs from transverse wave motion.

Longitudinal wave motion ....

....

....

Transverse wave motion ....

....

....
[2]

(b) **(i)** A sound wave of frequency 0.120 kHz travels through a rock at a speed of 3500 m/s.

Calculate the wavelength of the wave.

wavelength = ... [3]

(ii) The wave travels from the rock into the air.

State and explain whether the wave will be audible to a healthy human ear.

statement ....

explanation ....

....
[2]

[Total: 9]

6 **(a)** Fig. 6.1 shows an empty container and an observer's eye. There is a small coin at position O. The observer is unable to see the coin.

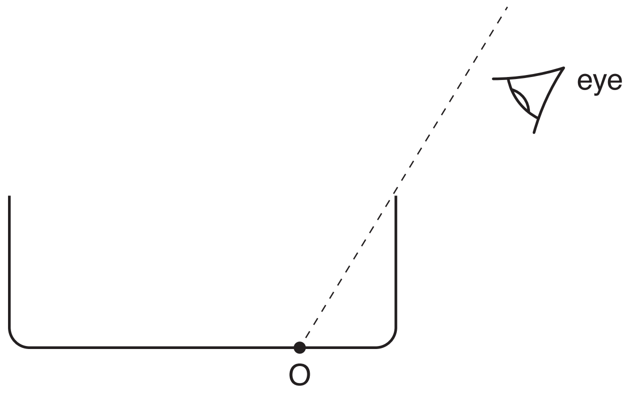

Fig. 6.1

The observer and the coin stay in the same position and the container is filled with water. The observer can now see the coin.

(i) Explain why the coin can be seen by the observer.

....

.... [2]

(ii) State the name of the wave process which occurs as the light passes from the water into the air.

.... [1]

(iii) Explain why the image of the coin is a virtual image.

.... [1]

(b) State the speed of light in air.

.... [1]

(c) The refractive index of water is 1.3.

Calculate the speed of light in water.

speed of light in water = ... [3]

[Total: 8]

7 **(a)** Fig. 7.1 shows a coil of wire wound on a thin plastic cylinder. The plastic has no effect on any magnetic field. The galvanometer is extremely sensitive.

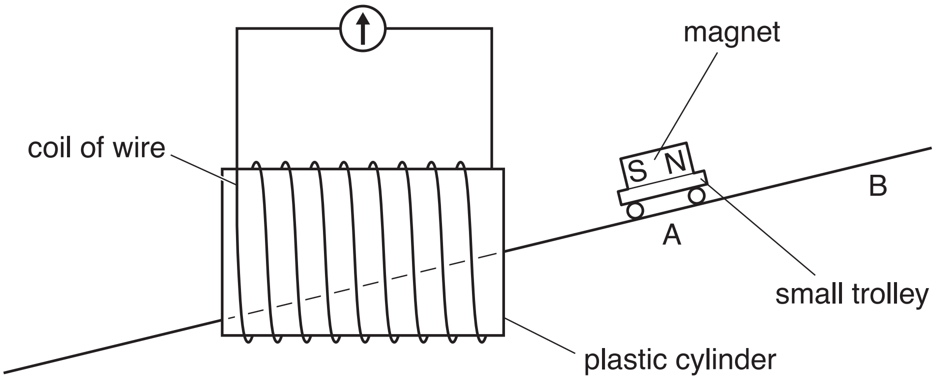

Fig. 7.1

A magnet is fixed to a small trolley that runs without friction on a track through the cylinder and coil.

(i) The trolley is released from point A so it runs through the coil from right to left.

State and explain what is observed on the galvanometer.

....

....

.... [2]

(ii) The trolley is now released from point B so it runs through the coil from right to left again.

State what is observed on the galvanometer and explain why it is different to your answer in **(a)(i)**.

....

....

.... [2]

(b) Fig. 7.2 shows an extension lead used to supply power to a 3 kW electric heater on a cool evening.

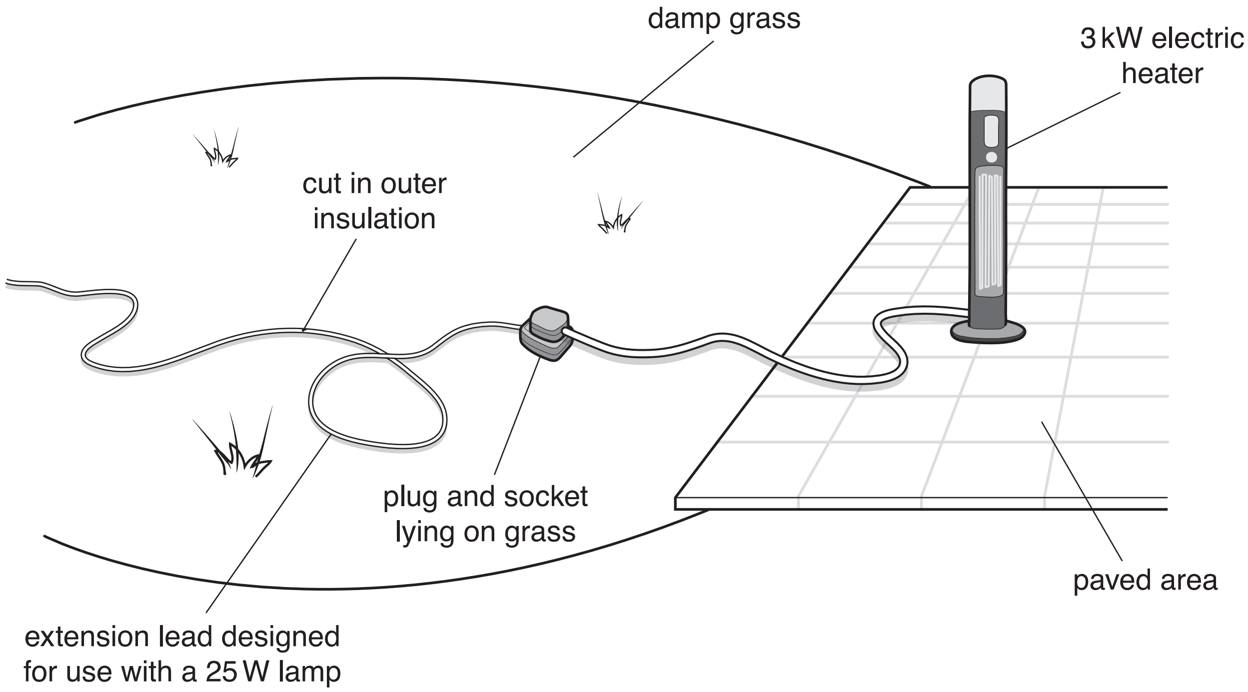

Fig. 7.2

State and explain three dangers with this arrangement.

danger 1 ....

....

....

danger 2 ....

....

....

danger 3 ....

....

....
[4]

[Total: 8]

8 **(a)** A wire of length 2.0 m and cross-sectional area 0.40 mm^2 has a resistance of 0.14 Ω.

Calculate the resistance of another wire of the same material of length 3.0 m and cross-sectional area 0.90 mm^2.

resistance = ... Ω [4]

(b) A student is designing a digital electronic circuit. Fig. 8.1 shows her partly completed design.

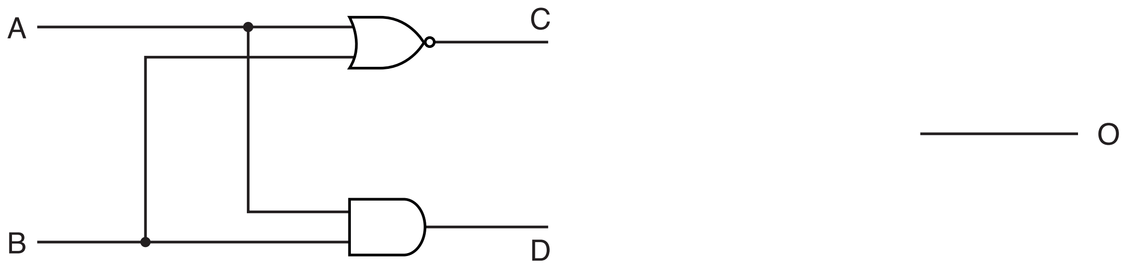

Fig. 8.1

(i) Table 8.1 is a truth table.
Complete the columns in this truth table to show the values for input B in the circuit.

Table 8.1

Input A	Input B	Point C	Point D	Output O
1		0	0	1
0		0	0	1
1		0	1	0
0		1	0	0

[2]

(ii) The column O in the truth table shows the desired output values for the circuit.

On Fig. 8.1, complete the circuit to achieve these output values. Label any gate used. [2]

[Total: 8]

9 **(a)** Describe what is meant by the term *electric field*.

....

.... [1]

(b) Fig. 9.1 shows two parallel conducting plates connected to a battery.

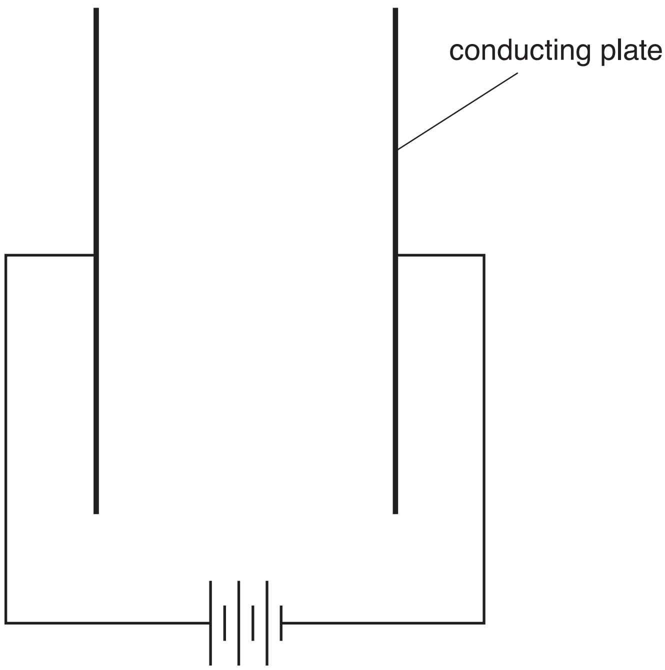

Fig. 9.1

On Fig. 9.1, draw **five** lines to show the electric field pattern between the two plates. [2]

(c) When fully charged, a 1.2 V rechargeable battery can deliver a current of 210 mA for 10 hours.

(i) Calculate the charge that can be delivered by the fully charged battery.

charge = ... [3]

(ii) Calculate the energy stored in the battery when fully charged.

energy stored = ... [2]

(iii) State the type of energy stored when the battery is charged.

.... [1]

[Total: 9]

10 **(a)** The nucleus of a hydrogen atom is a proton. The mass of a proton is *m* and the size of the charge on a proton is *e*.
Complete Table 10.1. Express your answers in terms of *m* and *e*. Three spaces have already been completed.

Table 10.1

particle or emission	mass	charge
proton	*m*	*e*
neutron	*m*	
γ-ray		
nucleus of helium-4 (^4_2He)		

[4]

(b) Many schools and colleges use radioactive isotopes for teaching and research. Describe how these radioactive isotopes are handled, used and stored in a safe way.

....

....

....

....

....

.... [3]

[Total: 7]

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0333479926

PHYSICS **0625/43**

Paper 4 Theory (Extended) **October/November 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **15** printed pages and **1** blank page.

DC (PQ/SG) 174869/4

Cambridge Assessment International Education

[Turn over

1 Fig. 1.1 is the top view of a tank in an aquarium. The tank is filled with salt water.

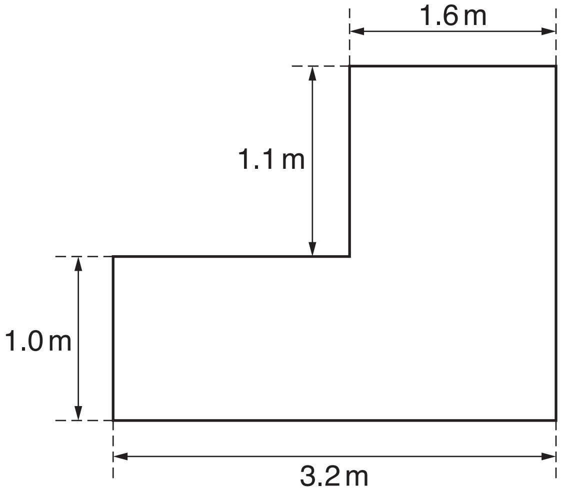

Fig. 1.1 (not to scale)

The depth of the water in the tank is 2.0 m.

(a) Calculate the volume of the water in the tank.

volume = ... [3]

(b) The density of the water in the tank is $1.1 \times 10^3\,kg/m^3$.

Calculate the mass of the water in the tank.

mass = ... [2]

(c) Calculate the pressure due to the water at a level of 0.80 m above the base of the tank.

pressure = ... [3]

[Total: 8]

2 **(a)** **(i)** State, in words, the equation that defines the *moment of a force*.

....

.... [2]

(ii) State what is meant by the *moment of a force*.

.... [1]

(iii) *Force* is a vector quantity.

Explain what is meant by the term *vector*.

....

.... [1]

(b) Fig. 2.1 shows a tower crane used to lift a load on a construction site.

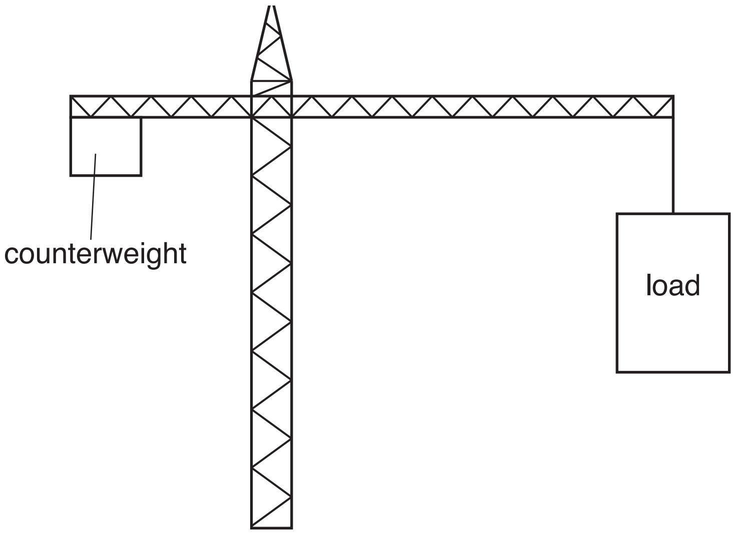

Fig. 2.1

Explain how the counterweight prevents the crane from toppling over.

....

....

.... [2]

[Total: 6]

3 **(a)** Fig. 3.1 shows a waterfall.

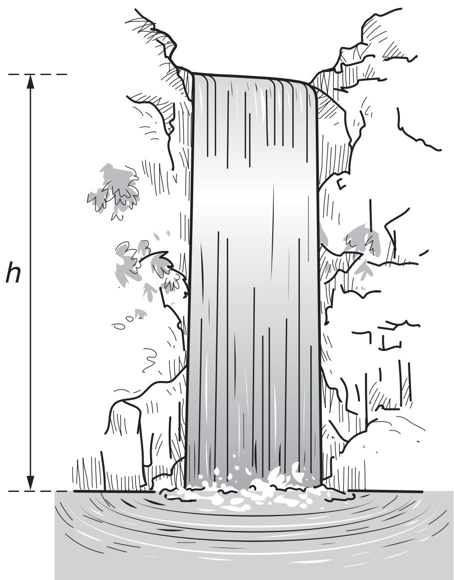

Fig. 3.1

(i) Describe the main energy transfer which is taking place as the water falls.

.... [2]

(ii) The speed of the water as it hits the bottom is 21 m/s.

Calculate the height *h* of the waterfall.

height = ... [3]

(iii) State and explain any assumption you made in **(ii)**.

.... [1]

(b) The Sun is the source of energy for most energy resources used to produce electricity.

State **two** energy resources that have another source for their energy.

1. ....

2. ....

[2]

[Total: 8]

4 Solids have a fixed shape. Liquids adapt to the shape of their container. Gases fill their container.

Explain in terms of forces between molecules and arrangement of molecules, why solids, liquids and gases have these properties.

Solids ....

....

....

Liquids ....

....

....

Gases ....

....

....
[6]

[Total: 6]

5 An electric kettle contains water at a temperature of 19 °C. The kettle has a power rating of 3.0 kW and is switched on for 3.5 minutes.

(a) Calculate the energy supplied to the kettle by the electricity supply.

electrical energy = ... [3]

(b) At 3.5 minutes, the temperature of the water reaches 100 °C. The volume of the water in the kettle is 1700 cm^3 and its density is 1.0 g / cm^3. The specific heat capacity of water is 4200 J / (kg °C).

Calculate the thermal energy gained by the water.

thermal energy = ... [5]

(c) Calculate the efficiency of the kettle.

efficiency = ... [2]

[Total: 10]

6 Fig. 6.1 represents wavefronts of a sound wave travelling in air from left to right.

Fig. 6.1

(a) State the name given to the:

(i) region around A in the diagram .... [1]

(ii) region around B in the diagram. .... [1]

(b) On Fig. 6.1, draw a double-headed arrow to show **one** wavelength. [1]

(c) The loudness of the sound increases at the same pitch.

State and explain any change there would be in the pattern of wavefronts shown in Fig. 6.1.

....

....

....

.... [3]

(d) The wave passes into water.

State and explain any change in the pattern of wavefronts shown in Fig. 6.1.

....

....

....

.... [3]

[Total: 9]

7 **(a)** Fig. 7.1 shows the position of a converging lens, its principal axis and an object O.

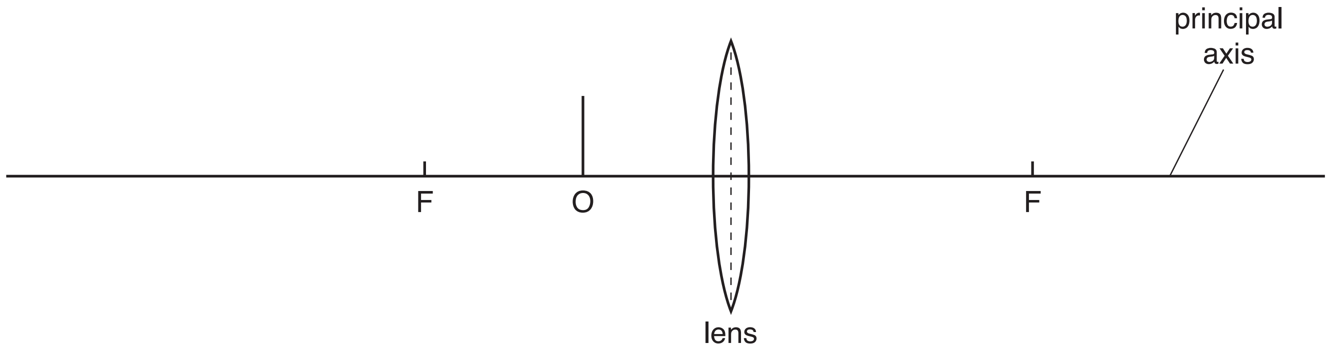

Fig. 7.1

Each principal focus of the lens is labelled F.

On Fig. 7.1, draw a ray diagram to locate the position of the image formed by the lens.

Label the image I. [3]

(b) Describe the nature of the image I.

.... [2]

(c) Images formed by lenses sometimes have coloured edges.

Suggest a reason for this.

....

.... [1]

[Total: 6]

8 **(a)** Fig. 8.1 shows a negatively charged conducting sphere.

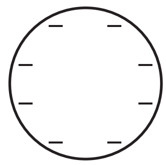

Fig. 8.1

On Fig. 8.1, draw the electric field pattern around the sphere. [2]

(b) The current in an electrical device is 0.21 A.

Calculate the charge that flows during a 75 s period of time.

charge = ... [2]

[Total: 4]

9 Fig. 9.1 shows a circuit containing an LED and two resistors in parallel, each of resistance *R*.

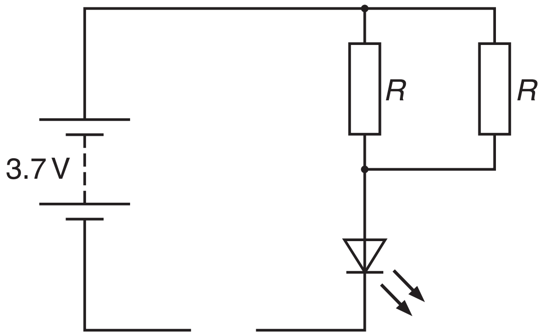

Fig. 9.1

The normal operating voltage of the LED is 2.1 V and the normal current is 0.19 A.

(a) (i) The potential difference (p.d.) across the LED is measured with a voltmeter.

On Fig. 9.1, draw the symbol for this voltmeter connected to the circuit. [1]

(ii) The current in the LED is measured with an ammeter.

On Fig. 9.1, draw the symbol for this ammeter connected to the circuit. [1]

(b) Calculate the value of *R* when the LED is operating normally.

R = ... [5]

[Total: 7]

10 (a) A magnet and a coil are attached separately to a door and a door frame as shown in Fig. 10.1.

The purpose of the arrangement is to activate a circuit connected to an LED indicator when the door is opening or closing. This will provide a visual indication that the door is being used.

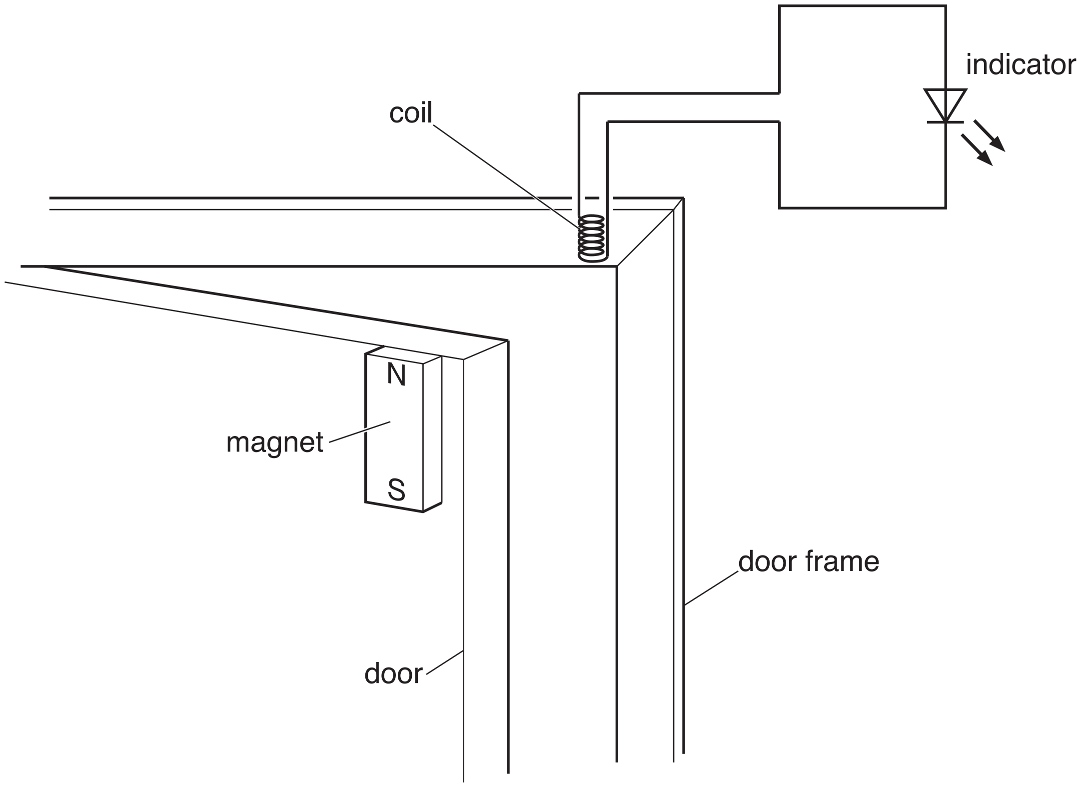

Fig. 10.1

Initially, the door is closed and then it is opened.

(i) Explain why the indicator comes on and then goes off when the door is opened.

....

....

.... [2]

(ii) The door shuts. The indicator comes on more brightly but for a shorter time than it did in **(i)**. Suggest and explain why this happens.

....

....

.... [2]

(b) A circuit breaker is recommended for use with an electric lawnmower.

State **two** reasons for this recommendation.

reason 1 ....

....

reason 2 ....

....
[2]

[Total: 6]

11 (a) The circles shown in Fig. 11.1 represent three gold nuclei. Three α-particles are approaching the gold nuclei.

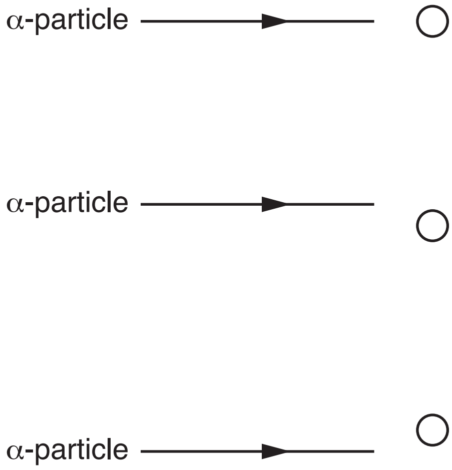

Fig. 11.1

On Fig. 11.1, complete the path of each α-particle. [3]

(b) A detector of radioactivity in a laboratory indicates an average of 16 counts / min when no radioactive samples are present. A radioactive sample of half-life 1.5 days is placed close to the detector, which indicates a count rate of 208 counts / min.

Calculate the count rate that is indicated 6 days later.

count rate = ... counts / min [4]

(c) The waste from nuclear power stations includes the isotopes technetium-99, tin-126 and selenium-79. These isotopes are radioactive with half-lives of many thousands of years.

State **three** economic and environmental consequences of producing this waste.

....

....

....

....

....

....

.... [3]

[Total: 10]

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CANDIDATE NAME												
CENTRE NUMBER							CANDIDATE NUMBER					

0485289887

PHYSICS **0625/51**

Paper 5 Practical Test **October/November 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
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DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and 15 minutes on question 4.
Electronic calculators may be used.
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At the end of the examination, fasten all your work securely together.
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Cambridge Assessment International Education

1 In this experiment, you will determine the weight of a metre rule using a balancing method.

Carry out the following instructions, referring to Fig. 1.1.

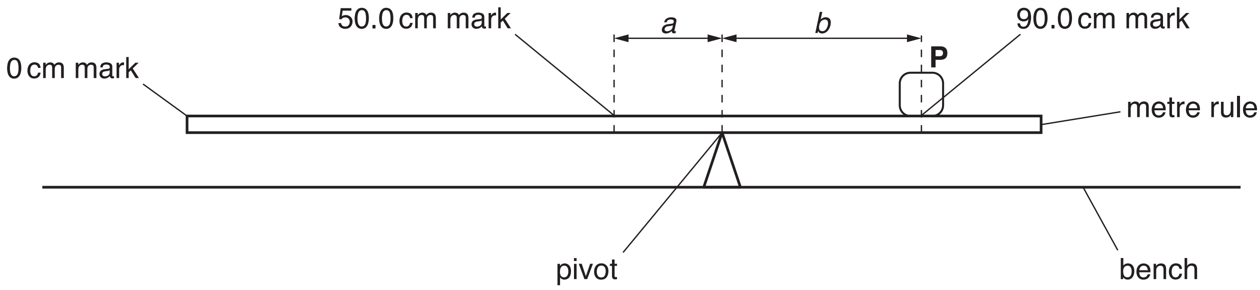


Fig. 1.1

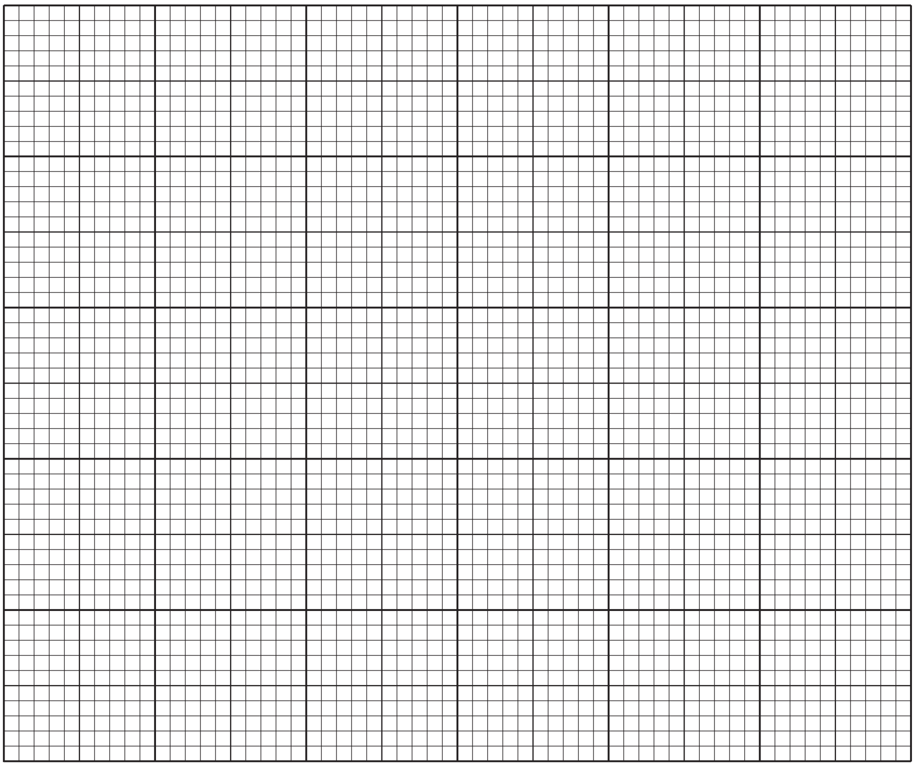
(a)
- Place the metre rule on the pivot. Place the load **P**, labelled **1.5 N**, on the metre rule at the 90.0 cm mark. Keep **P** at the 90.0 cm mark and adjust the position of the metre rule on the pivot so that the metre rule is as near as possible to being balanced.
- In Table 1.1, record the distance *a* from the 50.0 cm mark to the pivot.
- In Table 1.1, record the distance *b* from the 90.0 cm mark to the pivot.
- Calculate $\frac{a}{b}$. Record its value in Table 1.1.
- Repeat the procedure using the loads labelled **1.2 N**, **1.0 N**, **0.8 N** and **0.5 N**.

Table 1.1

Weight of load **P** / N	*a* / cm	*b* / cm	$\frac{a}{b}$
1.5			
1.2			
1.0			
0.8			
0.5			

[3]

(b) Plot a graph of Weight of Load **P** / N (y-axis) against $\frac{a}{b}$ (x-axis). You do **not** need to begin your axes at the origin, (0,0).



[4]

(c) Determine the gradient G of the graph. Show clearly on the graph how you obtained the necessary information.

G = ... [2]

(d) The gradient G is numerically equal to the weight W of the metre rule.

Write down the value of W to an appropriate number of significant figures for this experiment. Include the unit.

W = ... [2]

[Total: 11]

2 In this experiment, you will investigate the resistance of lamps.

The circuit shown in Fig. 2.1 has been set up for you.

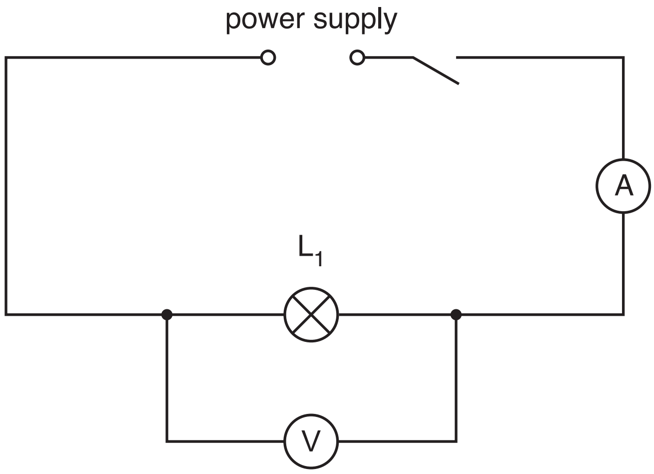


Fig. 2.1

(a) (i) Close the switch. Measure and record the potential difference (p.d.) V_1 across the lamp L_1 and the current I_1 in the circuit. Open the switch.

V_1 = ...

I_1 = ... [2]

(ii) Calculate the resistance R_1 of the lamp L_1 using the equation $R_1 = \frac{V_1}{I_1}$.

R_1 = ... [1]

(b) Disconnect the voltmeter.

Connect the lamp L_2 in series with the lamp L_1.

Connect the voltmeter across the two lamps L_1 and L_2. Close the switch.

- Measure and record the p.d. V_2 across lamps L_1 and L_2 and the current I_2 in the circuit. Open the switch.

V_2 = ...

I_2 = ...

- Calculate the combined resistance R_2 of lamps L_1 and L_2 connected in series, using the equation $R_2 = \frac{V_2}{I_2}$.

R_2 = ...

[1]

(c) Disconnect the voltmeter.

Connect the lamp L_3 in series with lamps L_1 and L_2.

Connect the voltmeter across all three lamps. Close the switch.

- Measure and record the potential difference V_3 across the three lamps and the current I_3 in the circuit. Open the switch.

V_3 = ...

I_3 = ...

- Calculate the combined resistance R_3 of lamps L_1, L_2 and L_3 connected in series, using the equation $R_3 = \frac{V_3}{I_3}$.

R_3 = ...

[2]

(d) A student suggests that the resistance R_3 of the three lamps connected in series should be given by the equation $R_3 = 3 \times R_1$.

State whether your results agree with this suggestion. Justify your answer by reference to your results.

statement ....

justification ....

....

.... [2]

(e) Complete the circuit diagram in Fig. 2.2 to show:

- three lamps connected in parallel
- a voltmeter connected to measure the potential difference across the lamps
- a variable resistor connected to control the current in all three lamps.

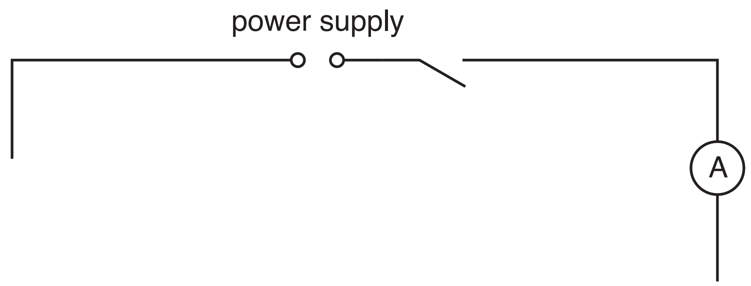


Fig. 2.2

[3]

[Total: 11]

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3 In this experiment, you will investigate the cooling of water.

(a) Use the thermometer to measure room temperature θ_R.

θ_R = ... [1]

(b)
- Pour 200 cm^3 of hot water into the beaker. Place the thermometer in the beaker.
- Measure the temperature θ of the hot water in the beaker and immediately start the stopclock.
- Record this temperature in Table 3.1 at time $t = 0$.
- Continue recording the temperature θ of the water every 60 s until you have a total of six sets of readings of time and temperature in Table 3.1.
- Complete the column headings in Table 3.1.

Table 3.1

t/	θ/
0	

[2]

(c)
- Calculate the decrease in temperature $\Delta\theta_1$ during the **first** 120 s.

$\Delta\theta_1$ = ...

- Calculate the decrease in temperature $\Delta\theta_2$ during the **last** 120 s.

$\Delta\theta_2$ = ...
[1]

(d) **(i)** Tick the box to show your conclusion from the results in **(c)**.

☐ The average rate of cooling is greater in the first 120 s than the average rate of cooling in the last 120 s.

☐ The average rate of cooling is less in the first 120 s than the average rate of cooling in the last 120 s.

☐ The average rate of cooling is the same in the first 120 s as in the last 120 s.

[1]

(ii) Justify your conclusion in **(d)(i)** by reference to the results.

....

....

.... [2]

(e) Suggest **two** ways in which you could reduce the rate of loss of thermal energy from the beaker in this type of experiment.

1 ....

....

2 ....

....

[2]

(f) Draw a diagram of a measuring cylinder being used to determine the volume of water poured into the measuring cylinder. Show clearly the water level and draw a straight line showing the line of sight required to obtain an accurate reading of the volume of water.

[2]

[Total: 11]

4 A student investigates the time taken for metal balls to stop moving after being released on a curved track. Fig. 4.1 shows the shape of the track. The track is flexible, so the shape of the curve can be changed.

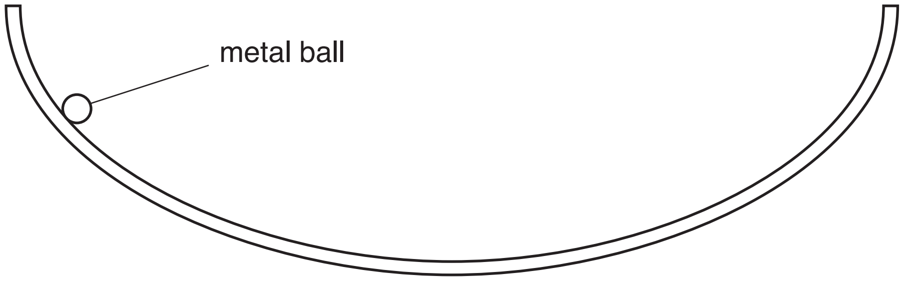

Fig. 4.1

The following apparatus is available:

a selection of metal balls of different masses
the flexible track
clamps to hold the track
a stopwatch
a tape measure
a metre rule

The student can also use other apparatus and materials that are usually available in a school laboratory.

Plan an experiment to investigate a factor that affects the time taken for metal balls to stop moving after being released on a curved track. You are **not** required to carry out this investigation.

In your plan, you should:

- describe how you would expect the balls to move
- explain how you would carry out the investigation
- state which variables you would keep constant and which variable you would change
- draw a table, or tables, with column headings, to show how you would display your readings (you are **not** required to enter any readings in the table)
- explain how you would use your readings to reach a conclusion.

You may add to the diagram in Fig. 4.1 if it helps your explanation.

[7]

[Total: 7]

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CANDIDATE NAME	

CENTRE NUMBER							CANDIDATE NUMBER					

9354553539

PHYSICS **0625/52**

Paper 5 Practical Test **October/November 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and about 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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1 In this experiment, you will investigate a pendulum. Carry out the following instructions, referring to Fig. 1.1 and Fig. 1.2.

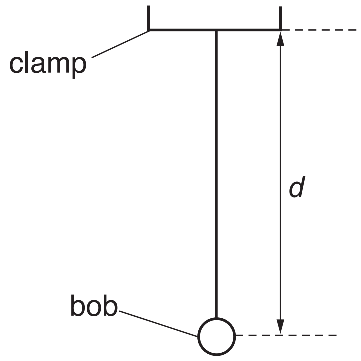


Fig. 1.1

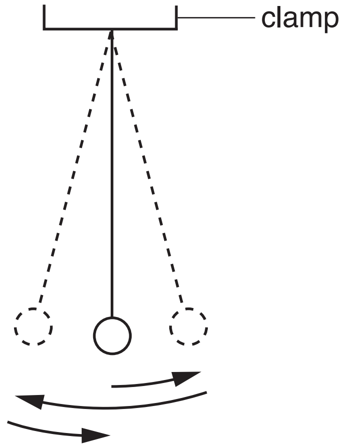


Fig. 1.2

A pendulum has been set up for you as shown in Fig. 1.1.

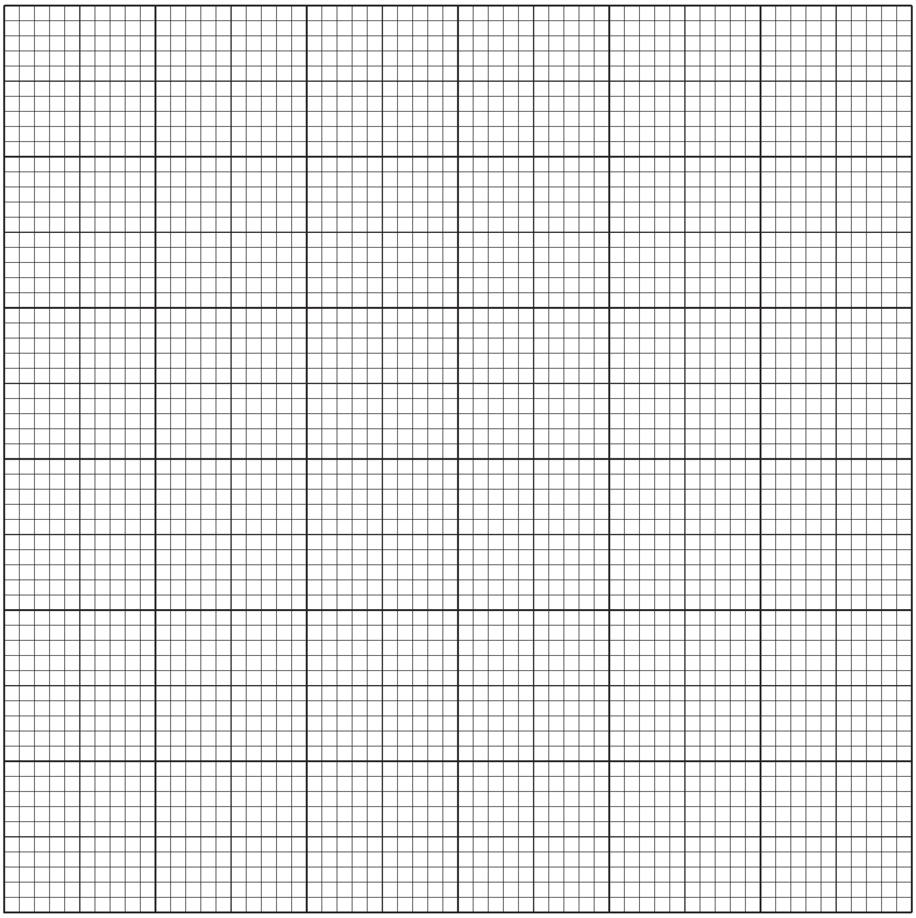
(a)
- Adjust the length of the pendulum until the distance *d* measured to the centre of the bob is 50.0 cm.
- Displace the bob slightly and release it so that it swings. Fig. 1.2 shows one complete oscillation of the pendulum.
- Measure, and record in Table 1.1, the time *t* for 20 complete oscillations.
- Calculate, and record in Table 1.1, the period *T* of the pendulum. The period is the time for one complete oscillation.
- Calculate T^2. Record its value in Table 1.1.
- Repeat the procedure using d = 60.0 cm, 70.0 cm, 80.0 cm and 100.0 cm.

Table 1.1

d / cm	t / s	T / s	T^2 / s^2
50.0			
60.0			
70.0			
80.0			
100.0			

[4]

(b) Plot a graph of T^2/s^2 (y-axis) against d/cm (x-axis). You do **not** need to start your axes at the origin (0,0).



[4]

(c) Determine the gradient G of the line. Show clearly on the graph how you obtained the necessary information.

G = ... [1]

(d) Calculate the acceleration of free fall g in m/s^2 using the equation $g = \frac{0.395}{G}$, where G is your gradient from **(c)**.

Write down the value of g to a suitable number of significant figures for this experiment.

g = ...m/s^2 [2]

[Total: 11]

2 In this experiment, you will determine the resistance of a resistance wire.

Carry out the following instructions, referring to Fig. 2.1.

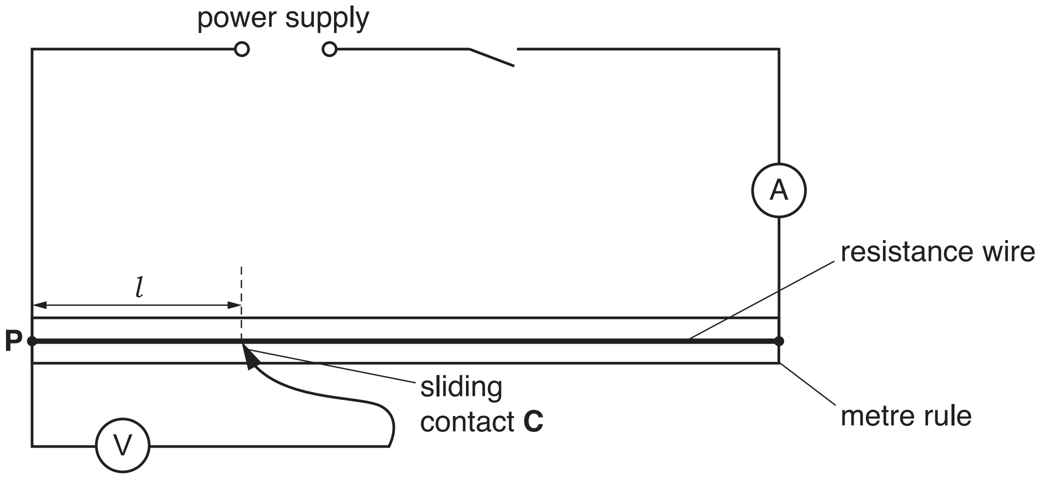


Fig. 2.1

(a) **(i)** Close switch.

Measure and record the current I in the circuit.

I = ... [2]

(ii)
- Place the sliding contact **C** at a distance l = 20.0 cm from **P**.
- Measure, and record in Table 2.1, the potential difference V across the length l of the resistance wire.
- Calculate, and record in Table 2.1, the resistance R of 20.0 cm of the resistance wire. Use the equation $R = \frac{V}{I}$.
- Repeat the procedure using l values of 40.0 cm, 60.0 cm, 80.0 cm and 100.0 cm.
- Open switch.

Table 2.1

l/cm	V/V	R/Ω
20.0		
40.0		
60.0		
80.0		
100.0		

[4]

(b) Look carefully at the values of l and R in Table 2.1.

(i) Tick **one** box to show your conclusion from the results.

☐ R is constant within the limits of experimental accuracy.

☐ R is directly proportional to l within the limits of experimental accuracy.

☐ R decreases as l increases.

☐ There is no simple relationship between R and l.

[1]

(ii) Justify your conclusion by reference to your results.

....

....

.... [1]

(c) **(i)** Use the values in Table 2.1 to estimate the potential difference V_e across 50.0 cm of the resistance wire.

V_e = ... [1]

(ii) Calculate the resistance of 50.0 cm of the resistance wire using the equation $R = \frac{V_e}{I}$.

Use the value of current I from part **(a)**. Give your answer to a suitable number of significant figures for this experiment and include the unit.

R = ... [2]

[Total: 11]

3 In this experiment, you will determine the focal length f of a lens.

Carry out the following instructions referring to Fig. 3.1.

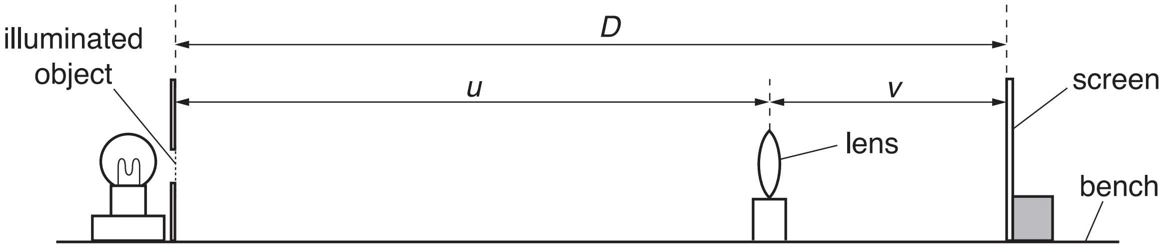


Fig. 3.1

(a)
- Place the screen a distance $D = 80.0\,\text{cm}$ from the illuminated object.
- Place the lens between the object and the screen so that the lens is very close to the screen.
- Move the lens slowly away from the screen until a clearly focused image is formed on the screen.

(i) Measure, and record in Table 3.1, the distance u between the centre of the lens and the illuminated object. [1]

(ii) Measure, and record in Table 3.1, the distance v between the centre of the lens and the screen. [1]

(iii) Calculate, and record in Table 3.1, the focal length f of the lens using the equation $f = \dfrac{uv}{D}$. [1]

(b) Keep the screen at the distance D = 80.0 cm from the illuminated object.

- Move the lens slowly away from the screen. The image will go out of focus.
- Continue to move the lens slowly further away from the screen until another clearly focused (and now magnified) image is formed on the screen.
- Measure, and record in Table 3.1, the distance u between the centre of the lens and the illuminated object.
- Measure, and record in Table 3.1, the distance v between the centre of the lens and the screen.
- Calculate, and record in Table 3.1, the focal length f of the lens using the equation $f = \dfrac{uv}{D}$.

[2]

Table 3.1

u/cm	v/cm	f/cm

(c) Calculate the average value f_A of the focal length of the lens. Give your answer to a suitable number of significant figures for this experiment.

f_A = ... cm [2]

(d) State **one** precaution that you would take to obtain accurate readings in this experiment.

....

.... [1]

(e) Another student wants to obtain more measurements for u and for v to check the value for the focal length f of this lens. The student moves the screen a distance of 40.0 cm to the right.

(i) Calculate the new value for the distance D between the illuminated object and the screen.

D = ... cm [1]

(ii) The student moves the lens to a new position which is a distance from the object u = 22.2 cm. He observes the image on the screen and says it is clearly focussed at a distance v = 97.9 cm.

Calculate the new value of the focal length f of the lens using $f = \frac{uv}{D}$.

f = ... cm [1]

(iii) State and explain briefly whether the values for f_A and f in **(e)(ii)** are the same within the limits of experimental accuracy.

....

....

.... [1]

[Total: 11]

4 A student investigates the time taken for ice cubes in a container to melt using different insulating materials on the container.

The following apparatus is available:

a copper container
a variety of insulating materials that can be wrapped around the copper container
a thermometer
a stopwatch
a supply of ice cubes

The student can also use other apparatus and materials that are usually available in a school laboratory.

Plan an experiment to investigate the time taken for ice cubes to melt using different insulating materials.

You are **not** required to carry out this investigation.

In your plan, you should:

- draw a diagram of the apparatus used
- explain briefly how you would carry out the investigation
- state the key variables that you would control
- draw a table, or tables, with column headings, to show how you would display your readings (you are **not** required to enter any readings in the table)
- explain how you would use your readings to reach a conclusion.

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[Total: 7]

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Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

9524381544

PHYSICS **0625/53**

Paper 5 Practical Test **October/November 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name in the spaces at the top of the page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You are advised to spend about 20 minutes on each of questions 1 to 3, and about 15 minutes on question 4.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
3	
4	
Total	

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This document consists of **11** printed pages and **1** blank page.

DC (SC/CB) 176072/2

Cambridge Assessment International Education

[Turn over

1 In this experiment, you will investigate how the resistance of a filament lamp changes as the potential difference (p.d.) across it changes.

The circuit has been set up for you.
Carry out the following instructions, referring to Fig. 1.1.

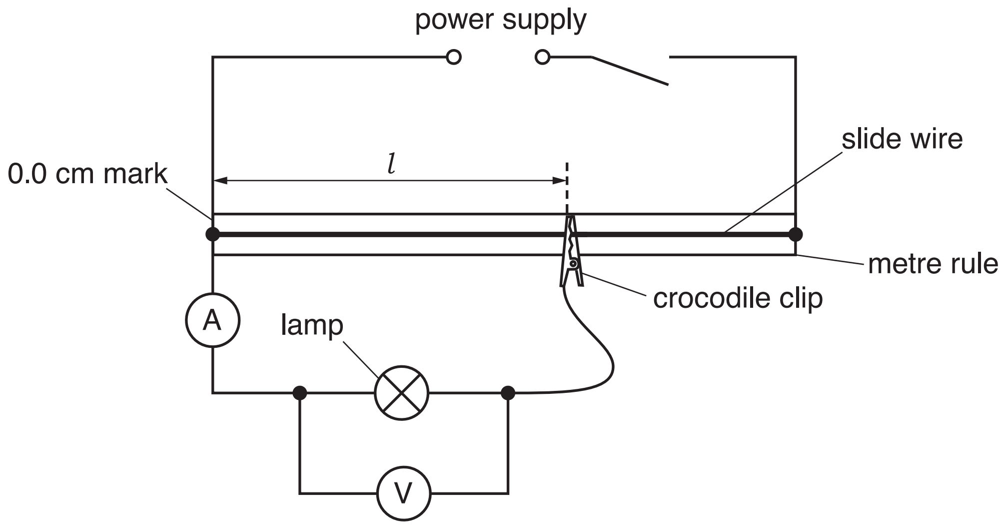

Fig. 1.1

(a)

- Close the switch.
- Adjust the position of the crocodile clip, so that the length l of the slide wire connected is 20.0 cm.
- Record in Table 1.1 the value of the p.d. V and the current I for the lamp.
- Move the crocodile clip and record values of V and I for l = 40.0 cm, 60.0 cm, 80.0 cm and 100.0 cm.
- Open the switch.

[2]

Table 1.1

l/cm	V/V	I/A	R/Ω
20.0			
40.0			
60.0			
80.0			
100.0			

(b) Calculate, and record in Table 1.1, the resistance R of the lamp at each value of l.
Use the equation $R = \frac{V}{I}$. [1]

(c) Plot a graph of R/Ω (y-axis) against V/V (x-axis).

[4]

(d) State what the shape of the graph tells you about how the resistance of the lamp changes with the temperature of the filament.

Justify your statement using your results from the graph and your observation of the brightness of the lamp as the length of the slide wire changes.

statement ....

justification ....

....
[2]

(e) In this type of experiment, it is possible to change the current and potential difference for the lamp by using a variable resistor instead of a slide wire.

On Fig. 1.2, complete the circuit diagram to show a variable resistor used for this purpose.

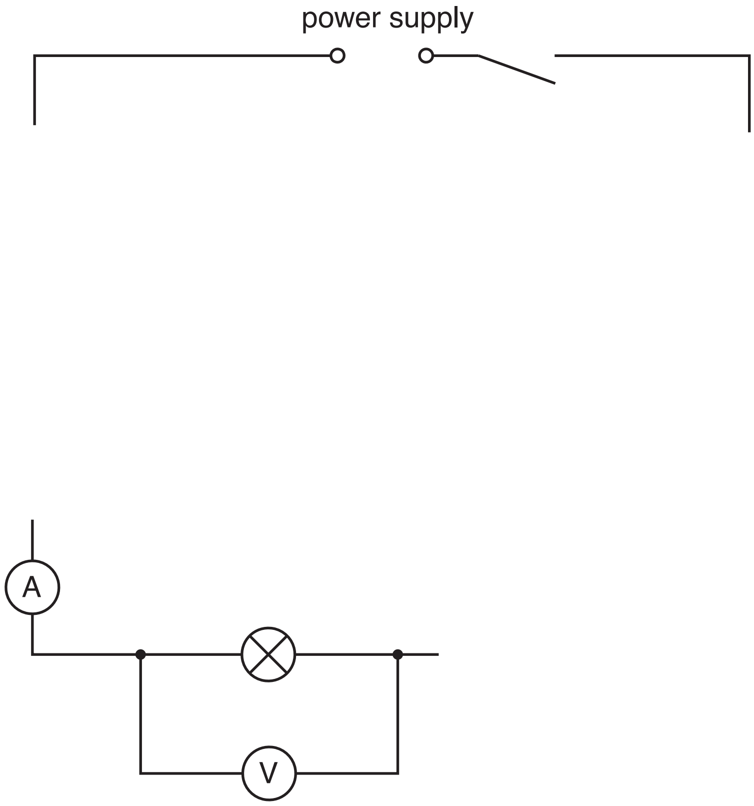

Fig. 1.2

[2]

[Total: 11]

2 In this experiment you will determine the focal length of a converging lens by two different methods.

Carry out the following instructions, referring to Fig. 2.1.

Fig. 2.1

(a)

- Arrange the apparatus as shown in Fig. 2.1 and switch on the lamp.
- Set the distance u between the illuminated triangle and the lens to 25.0 cm.
- Place the screen near the lens.
- Move the screen until a sharp image of the triangle is seen on the screen.

Method 1

(i) Measure the distance v between the lens and the screen as indicated in Fig. 2.1.

v = ... [1]

(ii) Calculate a value f_1 for the focal length of the lens, using the equation $f_1 = \dfrac{uv}{(u + v)}$.

f_1 = ... [2]

(iii) Briefly describe a technique to obtain an image on the screen that is as sharp as possible in this experiment.

....

....

.... [1]

Method 2

(b) **Keep the screen and lens in the same place so that *u* and *v* are the same as in (a).**

(i) Measure h_I, the height of the image of the triangle on the screen.

h_I = ...

Measure h_O, the height of the illuminated triangle, as indicated in Fig. 2.1.

h_O = ...
[1]

(ii) Calculate a value M for the magnification, using the equation $M = \frac{h_I}{h_O}$.

M = ... [1]

(iii) Calculate a second value f_2 for the focal length of the lens, using the equation $f_2 = \frac{v}{(M + 1)}$.

f_2 = ... [1]

(c) A student suggests that f_1 and f_2 should be equal.
State whether your results support this suggestion. Justify your statement with reference to your results.

statement ....

justification ....

....
[2]

(d) State **one** precaution that could be taken to ensure that the measurements in the experiment can be taken as reliably as possible.

....

.... [1]

(e) Suggest which of **Method 1** or **Method 2** is likely to give the more accurate value for the focal length.
Explain the reason for your choice.

suggestion ....

explanation ....

....

....
[1]

[Total: 11]

3 In this experiment you will investigate the behaviour of a spring.

A stand and spring have been set up for you as shown in Fig. 3.1.

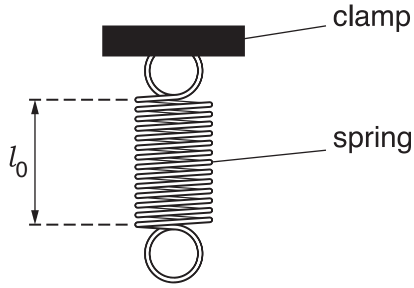

Fig. 3.1

(a) **(i)** Measure the length l_0 of the spring without any load.

l_0 = ... cm [1]

(ii) Describe **two** precautions that could be taken when measuring the length of the stationary spring, to ensure an accurate reading. You may draw a diagram.

1 ....

....

2 ....

....

[2]

(b) Carry out the following instructions, referring to Fig. 3.2.

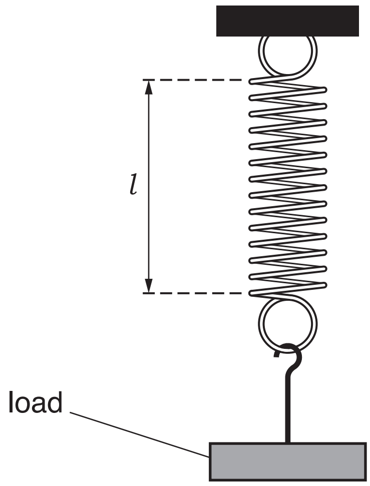

Fig. 3.2

- Hang a load L = 1.0 N on the spring as shown in Fig. 3.2.
- Measure, and record in Table 3.1, the stretched length l of the spring.
- Repeat the process for L values of 2.0 N and 3.0 N.

Table 3.1

L / N	l / cm	e / cm
1.0		
2.0		
3.0		

[1]

(c) Calculate, and record in Table 3.1, the extension e of the spring for each load L.
Use your values from **(a)** and **(b)** and the equation $e = (l - l_0)$.

[1]

(d)

- Remove load L from the spring. Suspend object **X** from the spring. Measure the stretched length l_X of the spring.

l_X = ... cm

- Estimate the weight W_X of object **X**.
Explain how you obtained your answer.

....

....

....

W_X = ... N
[2]

(e) **(i)** A student suggests that e is directly proportional to L.
State whether your results support this suggestion.
Use values from your results in Table 3.1 to justify your statement.

statement ....

justification ....

....

....
[2]

(ii) The student wishes to plot a graph of L against e to test if the two quantities are proportional.
State how her graph line could show that e is directly proportional to L.

....

....

.... [2]

[Total: 11]

4 A student is investigating ways of slowing the rate of cooling of hot liquids in a container.
The student knows that a lid will reduce the rate of cooling. He wants to find out if the thickness of the lid makes any difference to the rate of cooling.

Plan an experiment which will enable him to compare the effects of lids of different thicknesses.
You are **not** required to carry out the experiment.

In your plan, you should:

- list the apparatus needed
- explain briefly how you would carry out the investigation, including the measurements to be taken
- state any key variables that would need to be kept the same
- draw a suitable table or tables, with column headings, to show how the readings would be displayed (you are **not** required to enter any readings in the table)
- explain how you would use your readings to reach a conclusion.

You may draw a diagram if it helps to explain your plan.

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[Total: 7]

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Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

1100468699

PHYSICS **0625/61**

Paper 6 Alternative to Practical **October/November 2019**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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DC (PQ/TP) 176070/2

Cambridge Assessment International Education

[Turn over

1 A student determines the weight of a metre rule using a balancing method.

Fig. 1.1. shows the apparatus.

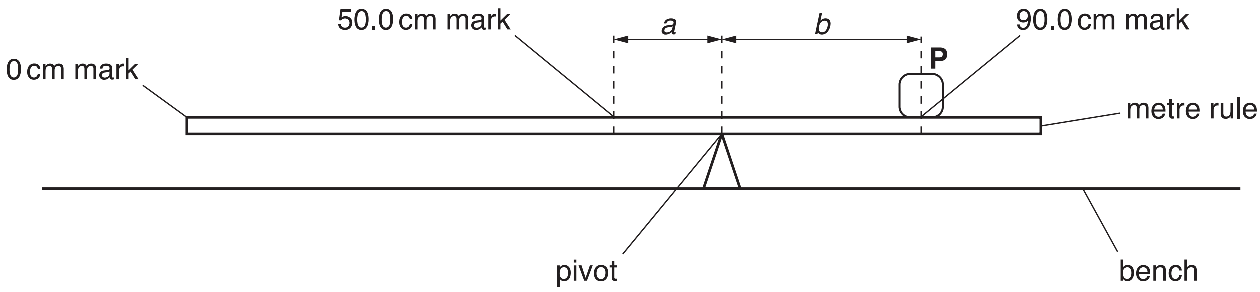

Fig. 1.1

(a)
- The student places the metre rule on the pivot.
- He places the load **P**, labelled **1.5 N**, on the metre rule at the 90.0 cm mark.
- Keeping **P** at the 90.0 cm mark, he adjusts the position of the metre rule on the pivot so that the metre rule is as near as possible to being balanced.
- In Table 1.1, he records the distance *a* from the 50.0 cm mark to the pivot.

(i) Calculate, and record in Table 1.1, the distance *b* between the centre of load **P** and the pivot. [1]

(ii) Calculate $\frac{a}{b}$. Record its value in Table 1.1. [1]

(b) The student repeats the procedure using loads of 1.2 N, 1.0 N, 0.8 N and 0.5 N. The readings and results are shown in Table 1.1.

Table 1.1

Weight of load, **P** / N	*a* / cm	*b* / cm	$\frac{a}{b}$
1.5	23.1		
1.2	21.2	18.8	1.13
1.0	18.9	21.1	0.900
0.8	16.8	23.2	0.724
0.5	12.5	27.5	0.455

Plot a graph of weight of load **P** / N (y-axis) against $\frac{a}{b}$ (x-axis). You do **not** need to begin your axes at the origin, (0,0).

[4]

(c) Determine the gradient G of the graph. Show clearly on the graph how you obtained the necessary information.

G = ... [2]

(d) The gradient G is numerically equal to the weight W of the metre rule. Write down the value of W to an appropriate number of significant figures for this experiment. Include the unit.

W = ... [2]

(e) The student has assumed that the centre of mass of the metre rule is at the 50.0 cm mark. Explain briefly how you would find as accurately as possible the position of the centre of mass of the metre rule. No extra apparatus or materials are available.

....

....

.... [1]

(f) Briefly state the main difficulty that you would have when carrying out this type of balancing experiment.

....

.... [1]

[Total: 12]

2 A student investigates the resistance of lamps.

She uses the circuit shown in Fig. 2.1.

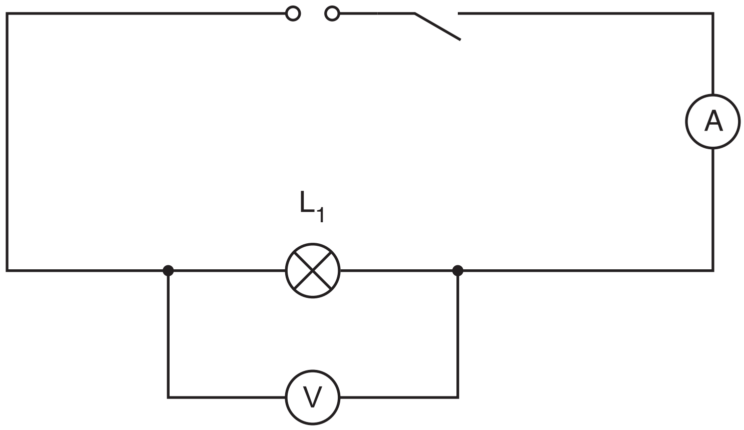

Fig. 2.1

(a) She records the potential difference V_1 across the lamp L_1 and the current I_1 in the circuit. The meters are shown in Fig. 2.2 and Fig. 2.3.

(i) Write down the meter readings.

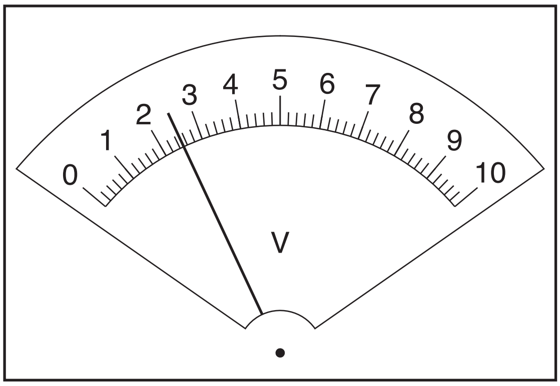

Fig. 2.2

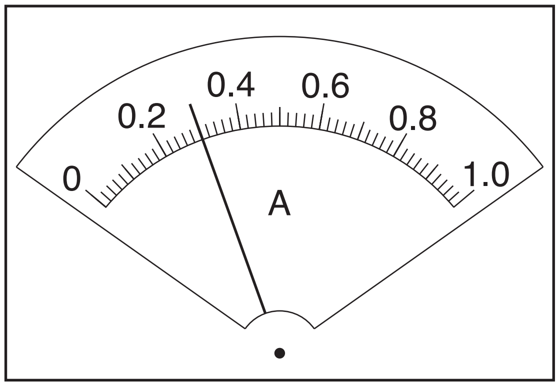

Fig. 2.3

V_1 = ...

I_1 = ...
[3]

(ii) Calculate the resistance R_1 of the lamp L_1 using the equation $R_1 = \frac{V_1}{I_1}$.

R_1 = ... [1]

(b) The student connects a lamp L_2 in series with lamp L_1.

She records the potential difference V_2 across lamps L_1 and L_2 and the current I_2 in the circuit.

V_2 = ...2.4 V............

I_2 = ...0.21 A............

Calculate the combined resistance R_2 of lamps L_1 and L_2 connected in series, using the equation $R_2 = \frac{V_2}{I_2}$.

R_2 = ...

[1]

(c) She connects a lamp L_3 in series with lamps L_1 and L_2.

She records the potential difference V_3 across the three lamps and the current I_3 in the circuit.

She calculates the combined resistance R_3.

V_3 = ...2.4 V............

I_3 = ...0.17 A............

R_3 = ...14.1 Ω............

A student suggests that the resistance R_3 of the three lamps connected in series should be given by the equation $R_3 = 3 \times R_1$. State whether the results agree with this suggestion. Justify your answer by reference to the results.

statement ....

justification ....

....

....

[2]

(d) Complete the circuit diagram in Fig. 2.4 to show:

- the three lamps connected in parallel
- the voltmeter connected to measure the potential difference across the lamps
- a variable resistor connected to control the current in all three lamps.

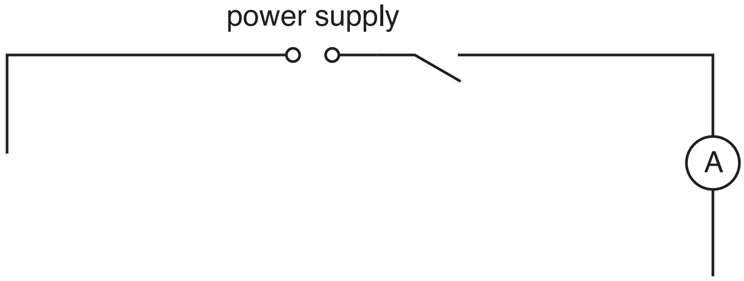

Fig. 2.4

[3]

[Total: 10]

3 A student investigates the cooling of water.

(a) The thermometer in Fig. 3.1 shows room temperature θ_R at the beginning of the experiment. Record θ_R.

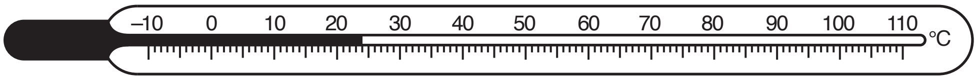

Fig. 3.1

θ_R = ... [1]

(b) • The student pours 200 cm^3 of hot water into a beaker. He places a thermometer in the water.

• He measures the temperature θ of the hot water in the beaker.

• He immediately starts the stopclock and continues recording the temperature of the water every 60 s. The temperature readings are shown in Table 3.1.

Table 3.1

t/	θ/
0	95
	89
	85
	81
	78

(i) Complete the time column in Table 3.1. [1]

(ii) Complete the column headings in Table 3.1. [1]

(c) • Calculate the decrease in temperature $\Delta\theta_1$ during the **first** 120 s.

$\Delta\theta_1$ = ...

• Calculate the decrease in temperature $\Delta\theta_2$ during the **last** 120 s.

$\Delta\theta_2$ = ...
[1]

(d) **(i)** Tick the box to show your conclusion from the results in **(c)**.

☐ The average rate of cooling is greater in the first 120 s than the average rate of cooling in the last 120 s.

☐ The average rate of cooling is less in the first 120 s than the average rate of cooling in the last 120 s.

☐ The average rate of cooling is the same in the first 120 s as the last 120 s.

[1]

(ii) Justify your conclusion in **(d)(i)** by reference to the results.

....

....

.... [2]

(e) Suggest **two** ways in which the student could reduce the rate of loss of thermal energy from the beaker in this type of experiment.

1 ....

2 ....

[2]

(f) Draw a diagram of a measuring cylinder being used to determine the volume of water. Show clearly the water level and draw, with a ruler, a straight line showing the line of sight required to obtain an accurate reading of the volume of water.

[2]

[Total: 11]

4 A student is investigating the time taken for metal balls to stop moving after being released on a curved track. Fig. 4.1 shows the shape of the track. The track is flexible, so the shape of the curve can be changed.

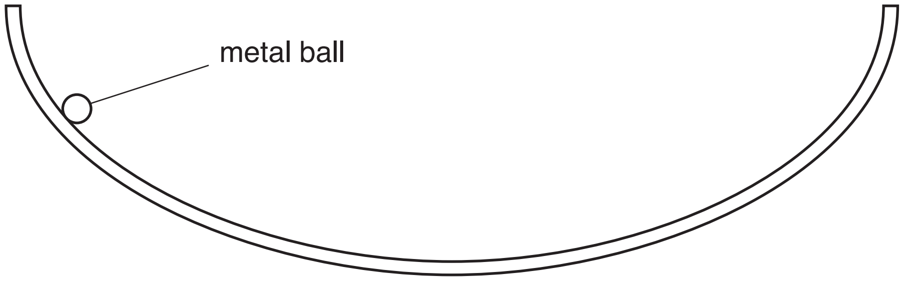

Fig. 4.1

The following apparatus is available:

a selection of metal balls of different masses
the flexible track
clamps to hold the track
a stopwatch
a tape measure
a metre rule

The student can also use other apparatus and materials that are usually available in a school laboratory.

Plan an experiment to investigate a factor that affects the time taken for metal balls to stop moving after being released on a curved track.

In your plan, you should:

- state how you would expect the balls to move
- explain how you would carry out the investigation
- state which variables you would keep constant and which variable you would change
- draw a table, or tables, with column headings, to show how you would display your readings (you are **not** required to enter any readings in the table)
- explain how you would use your readings to reach a conclusion.

You may add to the diagram in Fig. 4.1 if it helps your explanation.

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Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

9783901804

PHYSICS **0625/62**

Paper 6 Alternative to Practical **October/November 2019**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

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1 A student investigates a pendulum. Fig. 1.1 and Fig. 1.2 show some of the apparatus used.

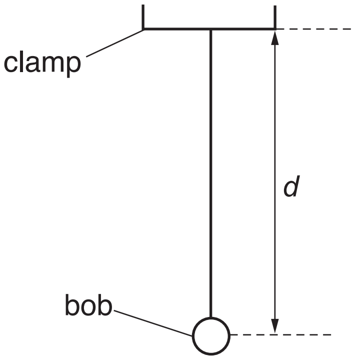


Fig. 1.1

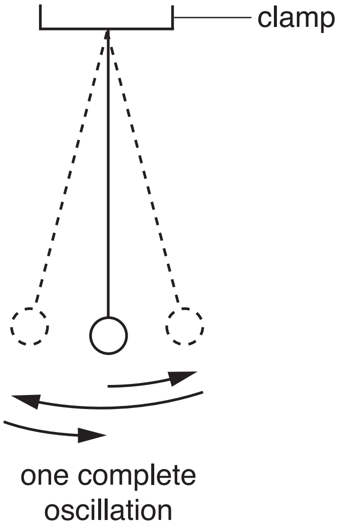


Fig. 1.2

(a) The student adjusts the length of the pendulum until the distance d, measured to the centre of the bob, is 50.0 cm. State one precaution that you would take to obtain the length of 50.0 cm as accurately as possible.

....

.... [1]

(b) The student displaces the bob slightly and releases it so that it swings. Fig. 1.2 shows one complete oscillation of the pendulum.

(i) He measures the time t for 20 complete oscillations. The time t is shown on the stopwatch in Fig. 1.3.

Fig. 1.3

In the first row of Table 1.1, record the time t shown in Fig. 1.3. [1]

(ii) Calculate, and record in Table 1.1, the period T of the pendulum. The period is the time for one complete oscillation. [1]

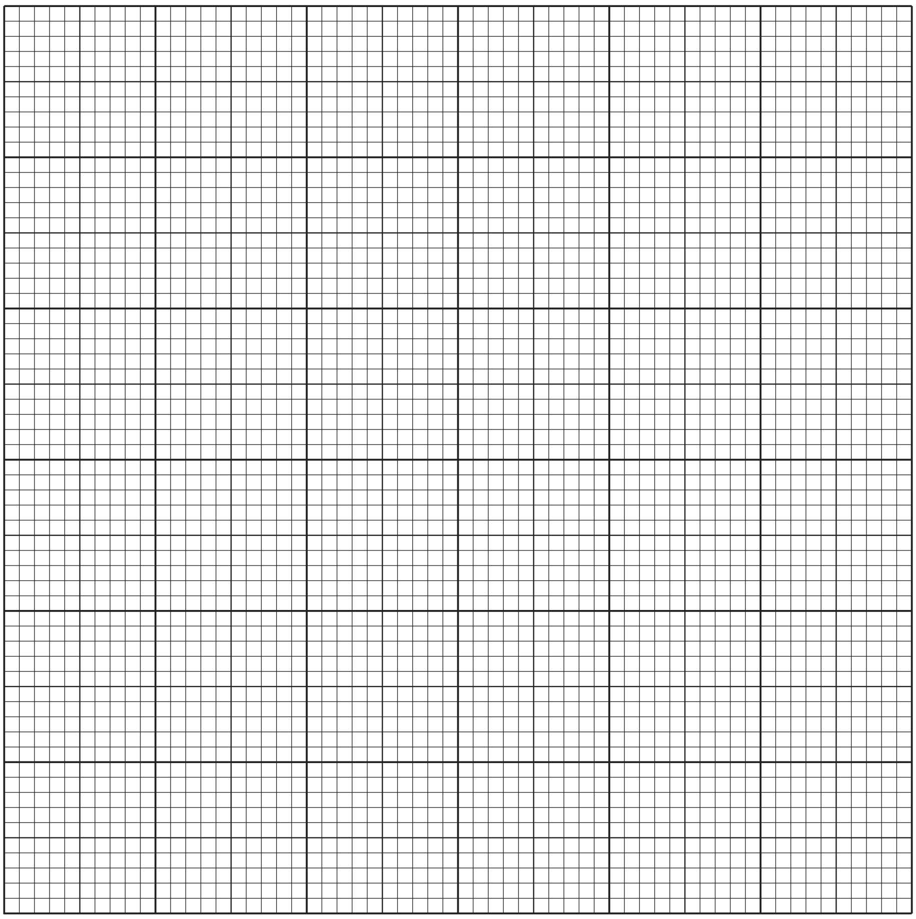
(iii) Calculate T^2. Record its value in Table 1.1. [1]

(c) The student repeats the procedure in **(b)** using d = 60.0 cm, 70.0 cm, 80.0 cm and 100.0 cm. The readings are shown in Table 1.1.

Table 1.1

d / cm	t / s	T / s	T^2 / s^2
50.0			
60.0	30.00	1.50	2.25
70.0	33.20	1.66	2.76
80.0	35.80	1.79	3.20
100.0	39.80	1.99	3.96

Plot a graph of T^2 / s^2 (y-axis) against d / cm (x-axis). You do **not** need to start your axes at the origin (0,0).



[4]

(d) Determine the gradient G of the line. Show clearly on the graph how you obtained the necessary information.

G = ... [2]

(e) Calculate the acceleration of free fall g in m/s^2 using the equation $g = \frac{0.395}{G}$, where G is your gradient from **(d)**.

Write down the value of g to a suitable number of significant figures for this experiment.

g = ...m/s^2 [2]

[Total: 12]

2 A student determines the resistance of a resistance wire.

She uses the circuit shown in Fig. 2.1.

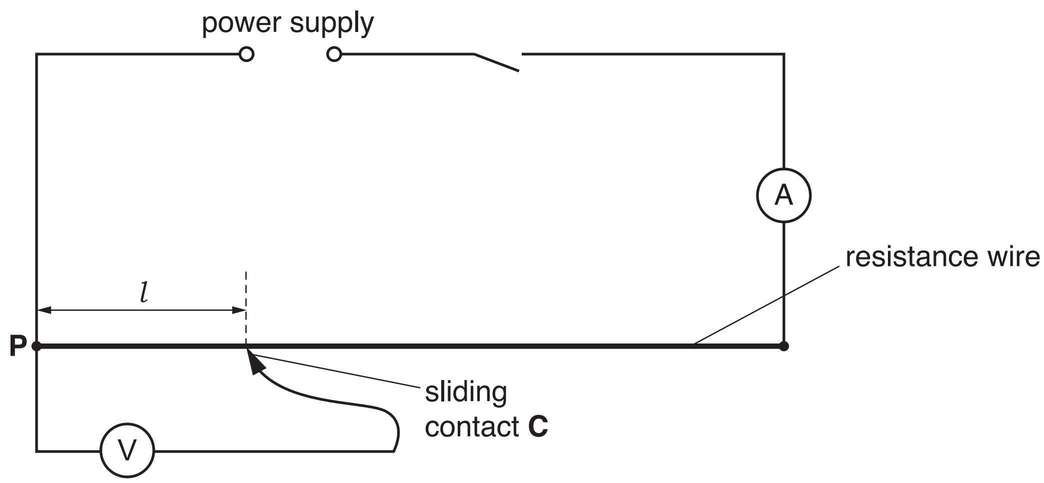


Fig. 2.1

(a) She measures the current I in the circuit. Write down the current reading shown in Fig. 2.2.

I = ... [2]

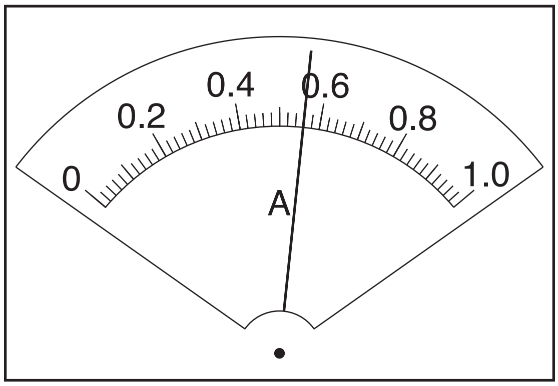


Fig. 2.2

(b) She places the sliding contact **C** at a distance l = 20.0 cm from **P**.

She records the potential difference V across the length l of the resistance wire.

She repeats the procedure using l values of 40.0 cm, 60.0 cm, 80.0 cm and 100.0 cm.

The readings are shown in Table 2.1.

Table 2.1

l / cm	V /	R /
20.0	0.60	
40.0	1.10	1.96
60.0	1.71	3.05
80.0	2.30	4.11
100.0	2.78	4.96

(i) Calculate, and record in Table 2.1, the resistance R of 20.0 cm of the resistance wire. Use the equation $R = \frac{V}{I}$.

[2]

(ii) Complete the column headings in Table 2.1. [1]

(c) Look carefully at the values of l and R in Table 2.1.

(i) Tick **one** box to show your conclusion from the results.

☐ R is constant within the limits of experimental accuracy.

☐ R is directly proportional to l within the limits of experimental accuracy.

☐ R decreases as l increases.

☐ There is no simple relationship between R and l.

[1]

(ii) Justify your conclusion by reference to the results.

....

....

.... [1]

(d) **(i)** Use the values in Table 2.1 to estimate the potential difference V_e across 50.0 cm of the resistance wire.

V_e = ... [1]

(ii) Calculate the resistance of 50.0 cm of the resistance wire using the equation $R = \frac{V_e}{I}$.

Use the value of current I from part **(a)**. Give your answer to a suitable number of significant figures for this experiment and include the unit.

R = ... [2]

(e) In this type of experiment, it is sensible to keep the temperature of the resistance wire as close to room temperature as possible. Suggest **one** simple way to minimise the rise in temperature of the resistance wire.

....

.... [1]

[Total: 11]

3 A student determines the focal length *f* of a lens.

Fig. 3.1 shows the set-up.

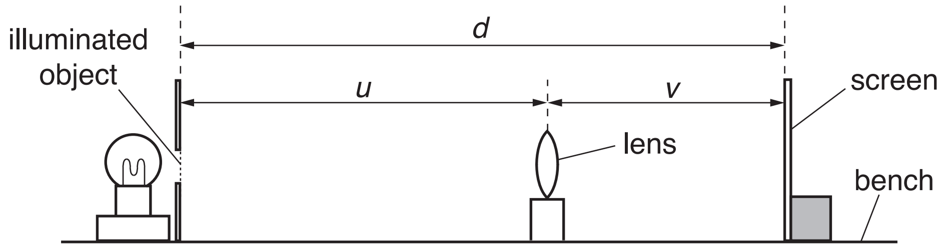


Fig. 3.1

(a) • He places the screen at a fixed distance from the illuminated object.

• He places the lens between the object and the screen so that the lens is very close to the screen.

• He moves the lens slowly away from the screen until a clearly focused image is formed on the screen.

• He measures the distance *u* between the object and the centre of the lens and the distance *v* between the centre of the lens and the screen. The readings are shown in Table 3.1.

(i) On Fig. 3.1, measure the distance *d* between the illuminated object and the screen.

d = ... [1]

(ii) Fig. 3.1 is drawn 1/10th actual size. Calculate the actual distance *D* between the illuminated object and the screen.

D = ... [1]

(b) Calculate, and record in Table 3.1, the focal length *f* of the lens using the equation $f = \frac{uv}{D}$. [1]

(c) • The student keeps the screen at the same fixed distance *D* from the illuminated object.

• He moves the lens slowly away from the screen. The image goes out of focus.

• He continues to move the lens slowly away from the screen until another clearly focused image is formed on the screen.

• He records the new readings of *u* and *v* in Table 3.1.

(i) Calculate, and record in Table 3.1 the new value for the focal length *f* of the lens using the equation $f = \frac{uv}{D}$. [1]

Table 3.1

u/cm	v/cm	f/cm
59.8	20.4	
19.8	60.0	

(ii) Calculate the average value f_A of the focal length of the lens. Give your answer to a suitable number of significant figures for this experiment.

f_A = ... cm [2]

(d) State **one** precaution that you would take to obtain accurate readings in this experiment.

....

.... [1]

(e) Another student wants to obtain more measurements for u and for v to check the value for the focal length f of the lens. The student moves the screen a distance of 40.0 cm to the right.

(i) Calculate the new value for the distance D between the illuminated object and the screen.

D = ... cm [1]

(ii) The student moves the lens to a new position which is a distance from the object u = 22.2 cm. He observes the image on the screen and says it is clearly focussed at a distance v = 97.9 cm.

Calculate the new value of the focal length f of the lens using $f = \frac{uv}{D}$.

f = ... cm [1]

(iii) State and explain briefly whether the values for f_A and f in **(e)(ii)** are the same within the limits of experimental accuracy.

....

....

.... [1]

[Total: 10]

4 A student investigates the time taken for ice cubes in a container to melt using different insulating materials on the container.

The following apparatus is available:

a copper container
a variety of insulating materials that can be wrapped round the copper container
a thermometer
a stopwatch
a supply of ice cubes

The student can also use other apparatus and materials that are usually available in a school laboratory.

Plan an experiment to investigate the time taken for ice cubes to melt using different insulating materials.

In your plan, you should:

- draw a diagram of the apparatus used
- explain briefly how you would carry out the investigation
- state the key variables that you would control
- draw a table, or tables, with column headings, to show how you would display your readings (you are **not** required to enter any readings in the table)
- explain how you would use your readings to reach a conclusion.

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.... [7]

[Total: 7]

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Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

6736931972

PHYSICS **0625/63**

Paper 6 Alternative to Practical **October/November 2019**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **13** printed pages and **3** blank pages.

DC (SC/CB) 176068/2

Cambridge Assessment International Education

1 A student investigates how the resistance of a filament lamp changes with the potential difference (p.d.) across it.
He uses the circuit shown in Fig. 1.1.

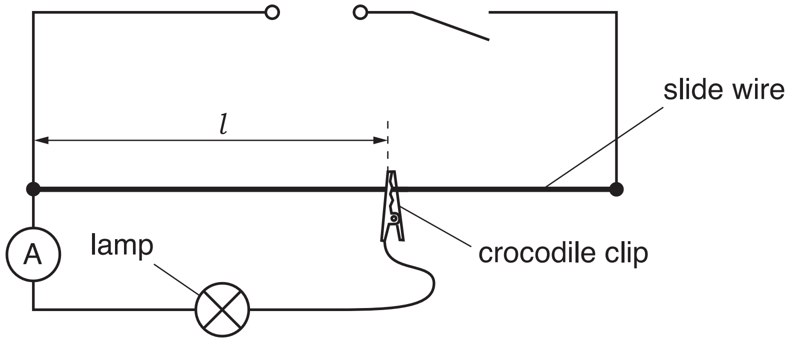

Fig. 1.1

(a) On Fig. 1.1, draw the symbol for a voltmeter connected to measure the potential difference across the lamp. [1]

(b) The student connects the crocodile clip to a length l = 20.0 cm of the slide wire.
He measures the potential difference V and the current I for the lamp.

(i) Record the voltmeter and ammeter readings shown in Fig. 1.2 for a value of l = 20.0 cm.

V = ...

I = ...
[1]

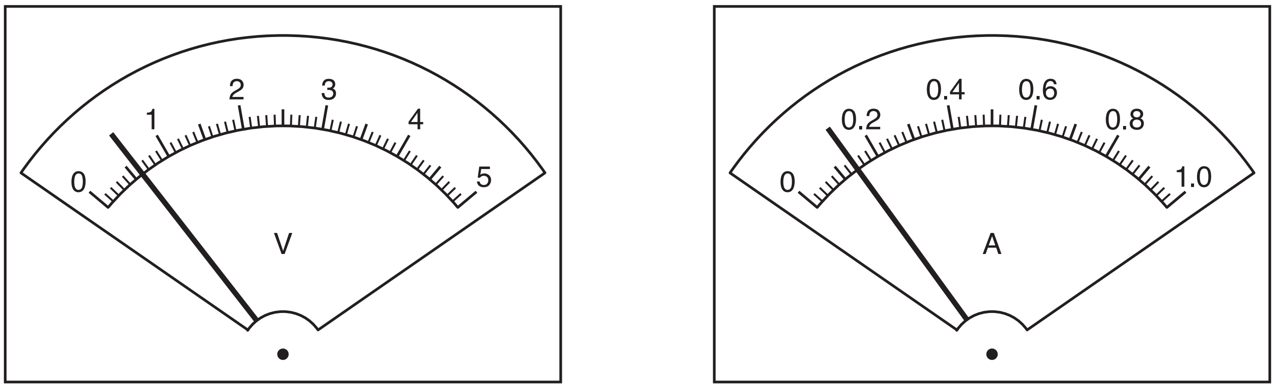

Fig. 1.2

(ii) Calculate, and record in Table 1.1, the resistance R of the lamp at l = 20.0 cm.

Use your readings from **(b)(i)** and the equation $R = \frac{V}{I}$. [1]

Table 1.1

l/cm	R/Ω
20.0	
40.0	7.5
60.0	10
80.0	12
100.0	13

(c) The student connects the crocodile clip to other lengths l of the slide wire.
He measures the potential difference V and the current I for the lamp and calculates the resistance each time. His results are shown in Table 1.1.

Plot a graph of R/Ω (y-axis) against l/cm (x-axis).

[4]

(d) The student notices that the lamp is very dim when $l = 20.0\,\text{cm}$ but becomes very bright when $l = 100.0\,\text{cm}$.

State what the shape of the graph tells you about how the resistance of the lamp changes with the temperature of the filament.
Justify your statement using your results from the graph.

statement ....

justification ....

....
[2]

(e) In this type of experiment, it is possible to change the current in the lamp by using a variable resistor instead of a slide wire.

On Fig. 1.3, complete the circuit diagram to show a variable resistor used for this purpose.

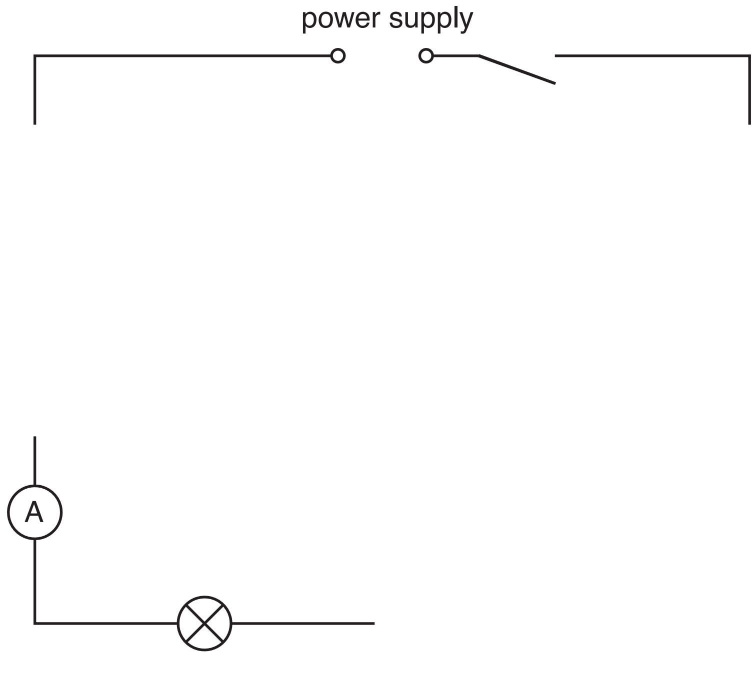

Fig. 1.3

[2]

[Total: 11]

2 Some students determine the focal length of a converging lens by two different methods.

They use the apparatus shown in Fig. 2.1.

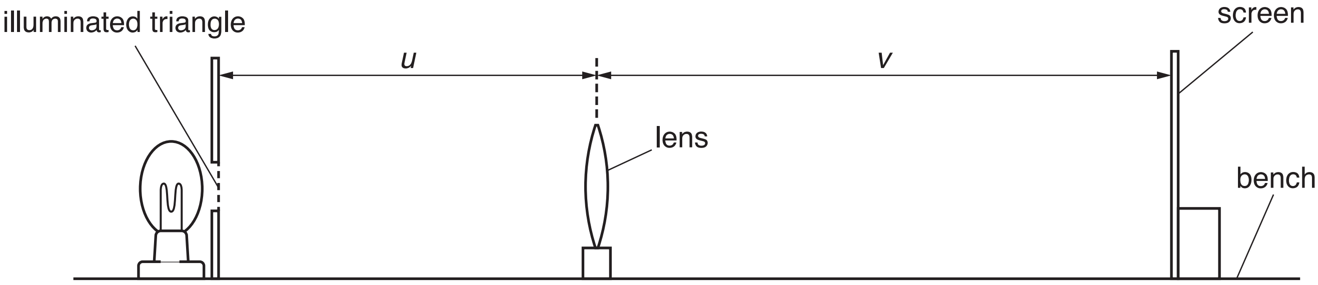

Fig. 2.1

(a) A student sets the distance *U* between the illuminated triangle and the lens.
She moves the screen until a sharp image of the triangle is seen on the screen.

Method 1

(i) On Fig. 2.1, measure the distance *u* between the illuminated triangle and the lens.

u = ...

On Fig. 2.1, measure the distance *v* between the lens and the screen.

v = ...
[1]

(ii) Fig. 2.1 is drawn to 1/5th scale.

Calculate the actual distance *U* between the illuminated triangle and the lens in the experiment.

U = ...

Calculate the actual distance *V* between the lens and the screen in the experiment.

V = ...
[1]

(iii) Calculate a value f_1 for the focal length of the lens, using the equation $f_1 = \frac{UV}{(U + V)}$.

f_1 = ... [1]

(iv) Briefly describe a technique to obtain an image on the screen that is as sharp as possible in this experiment.

....

....

.... [1]

Method 2

(b) (i) On Fig. 2.2, measure h_O, the height of the illuminated triangle.

h_O = ...

On Fig. 2.3, measure h_I, the height of the image on the screen.

h_I = ...
[1]

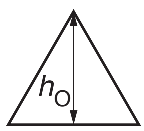

Fig. 2.2

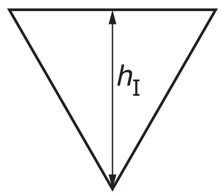

Fig. 2.3

(ii) Calculate a value for the magnification M, using the equation $M = \frac{h_I}{h_O}$.

M = ... [1]

(iii) Calculate a second value f_2 for the focal length of the lens, using the equation $f_2 = \frac{V}{(M+1)}$ and the value of V from **(a)(ii)**.

f_2 = ... [1]

(c) A student suggests that f_1 and f_2 should be equal.
State whether the results support this suggestion. Justify your statement with reference to the results.

statement ....

justification ....

....
[2]

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(d) State **one** precaution that could be taken to ensure that the measurements in the experiment are taken as reliably as possible.

....

.... [1]

(e) Suggest which of **Method 1** or **Method 2** is likely to give the more accurate value for the focal length.
Explain the reason for your choice.

suggestion ....

explanation ....

....

....
[1]

[Total: 11]

3 The class is investigating the behaviour of a spring, and then using the spring to determine the weight of an object.

The apparatus is shown in Fig. 3.1.

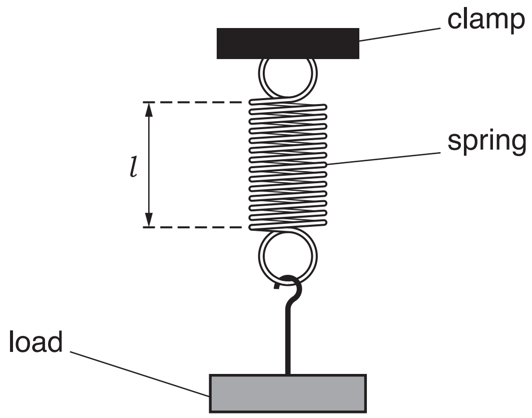

Fig. 3.1

(a) The stretched length l of the spring, indicated in Fig. 3.1, is to be measured.

Describe **two** precautions that could be taken when measuring the length of the stationary spring, to ensure an accurate reading. You may draw a diagram.

1 ....

....

2 ....

....
[2]

(b)

- A student measures the length l_0 of the spring without any load.

l_0 = ...2.1.......................... cm

- Various loads L are hung on the spring.
The stretched length l of the spring for each load is recorded in Table 3.1.

Table 3.1

L/N	l/cm	e/cm
1.0	6.3	
2.0	10.5	
3.0	14.7	

- Calculate, and record in Table 3.1, the extension e of the spring for each load L.
Use the equation $e = (l - l_0)$.

[1]

(c) The loads are removed and an object **X** is suspended from the spring.

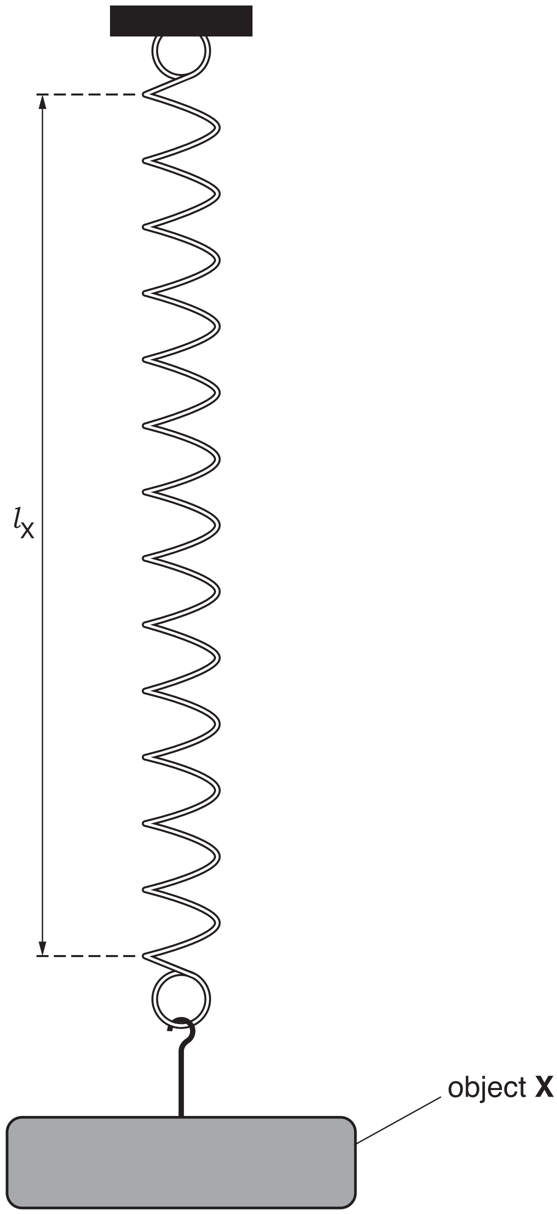

Fig. 3.2

(i) Measure the stretched length l_X of the spring on Fig. 3.2.

l_X = ... cm [1]

(ii) Estimate the weight W_X of object **X**.
Explain how you obtained your answer.

....

....

....

W_X = ... N
 [2]

(d) A student measures the weight of a different load using a similar method. He gives the weight as 4.532 N.
Explain why this is not a suitable number of significant figures for this experiment.

....

....

.... [1]

(e) **(i)** Another student suggests that *e* is directly proportional to *L*.
State whether the results support her suggestion.
Use values from the results in Table 3.1 to justify your statement.

statement ....

justification ....

....

....
[2]

(ii) The student wishes to plot a graph of *L* against *e* to test if the two quantities are directly proportional.
State how her graph line could show that *e* is directly proportional to *L*.

....

....

.... [2]

[Total: 11]

4 A student is investigating ways of slowing the rate of cooling of hot liquids in a container.
The student knows that a lid will reduce the rate of cooling. He wants to find out if the thickness of the lid makes any difference to the rate of cooling.

Plan an experiment which will enable him to compare the effects of lids of different thicknesses.

In your plan, you should:

- list the apparatus needed
- explain briefly how you would carry out the investigation, including the measurements to be taken
- state any key variables that would need to be kept the same
- draw a suitable table or tables, with column headings, to show how the readings would be displayed (you are **not** required to enter any readings in the table)
- explain how you would use your readings to reach a conclusion.

You may draw a diagram if it helps to explain your plan.

....

....

....

....

....

....

[7]

[Total: 7]

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PHYSICS **0625/01**

Paper 1 Multiple Choice (Core) **For examination from 2020**

MARK SCHEME

Maximum Mark: 40

Specimen

This document consists of **2** printed pages.

Question Number	*Key*	*Question Number*	*Key*
1	**D**	21	**B**
2	**C**	22	**C**
3	**B**	23	**C**
4	**C**	24	**D**
5	**B**	25	**A**
6	**B**	26	**A**
7	**C**	27	**B**
8	**A**	28	**C**
9	**C**	29	**D**
10	**D**	30	**B**
11	**B**	31	**B**
12	**D**	32	**B**
13	**A**	33	**A**
14	**D**	34	**C**
15	**D**	35	**B**
16	**B**	36	**C**
17	**D**	37	**D**
18	**C**	38	**B**
19	**D**	39	**B**
20	**C**	40	**C**

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CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

* 0 1 2 3 4 5 6 7 8 9 *

PHYSICS **0625/01**

Paper 1 Multiple Choice (Core) **For examination from 2020**

SPECIMEN PAPER

45 minutes

Additional materials: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, centre number and candidate number on the answer sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate answer sheet.

Read the instructions on the answer sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m/s^2).

1 Which quantity is measured in newtons?

A density

B energy

C pressure

D weight

2 A measuring cylinder is used to measure the volume of a quantity of water.

Which measuring technique would **not** improve the accuracy of the measurement?

A making sure that the measuring cylinder is vertical

B making sure that the water surface is at eye level

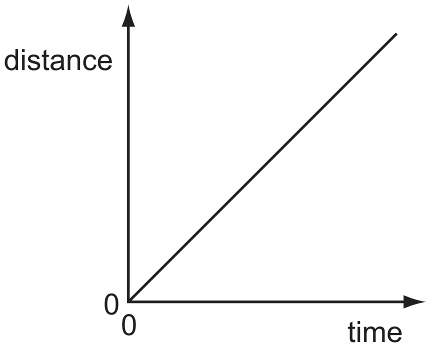
C reading the top of the water meniscus

D using the smallest measuring cylinder available that will contain all the water

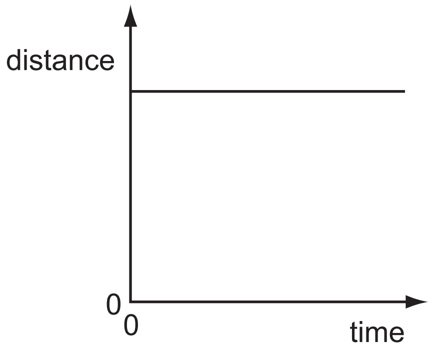
3 Two distance-time graphs and two speed-time graphs are shown.

Which graph represents an object that is at rest?

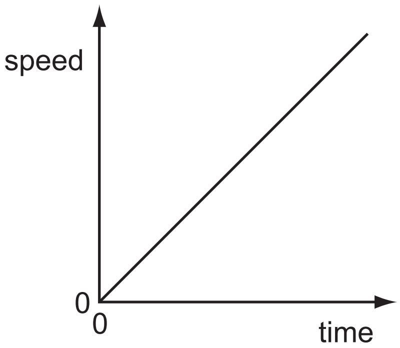
A



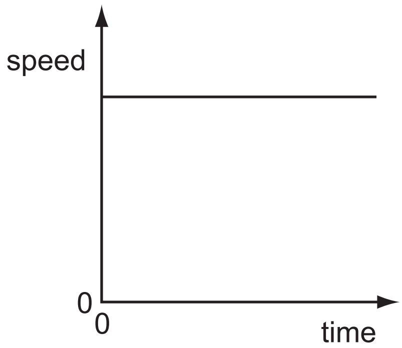
B



C



D

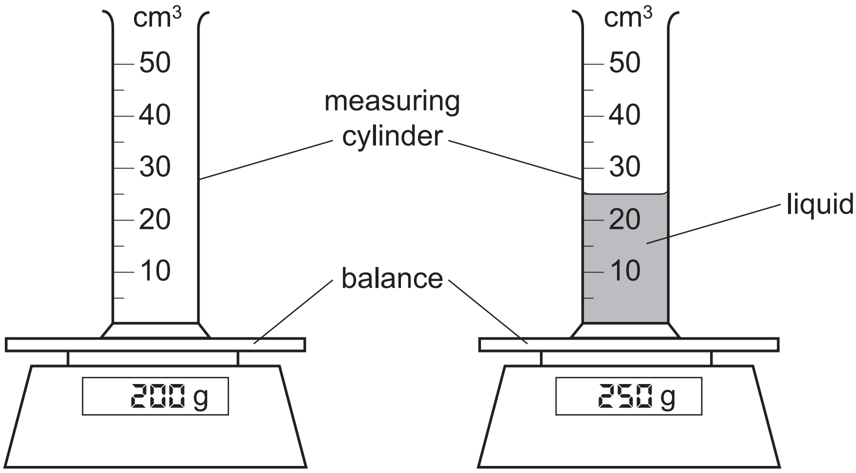


4 An astronaut in an orbiting spacecraft experiences a force due to gravity. This force is less than when she is on the Earth's surface.

Compared with being on the Earth's surface, how do her mass and her weight change when she goes into orbit?

	mass in orbit	weight in orbit
A	decreases	decreases
B	decreases	unchanged
C	unchanged	decreases
D	unchanged	unchanged

5 The diagram shows an experiment to find the density of a liquid.



What is the density of the liquid?

A 0.5 g/cm^3 **B** 2.0 g/cm^3 **C** 8.0 g/cm^3 **D** 10.0 g/cm^3

6 An experiment is carried out to measure the extension of a rubber band for different loads.

The results are shown below.

load/N	0	1.0	2.0	3.0
length/cm	15.2	16.2		18.6
extension/cm	0	1.0	2.1	3.4

Which figure is missing from the table?

A 17.2 **B** 17.3 **C** 17.4 **D** 17.6

7 Which statement about an object moving in a straight line through air is correct?

A When it accelerates, the resultant force acting on it is zero.

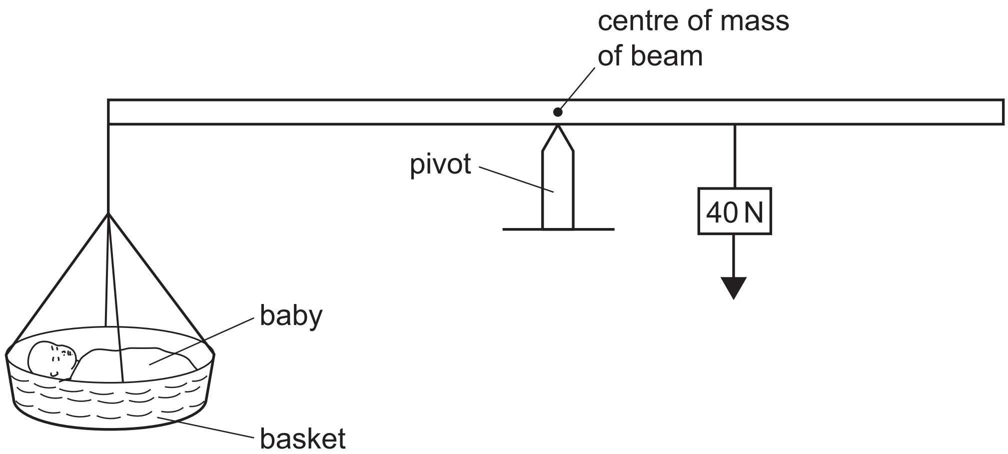
B When it moves at a steady speed, the air resistance acting on it is zero.

C When it moves at a steady speed, the resultant force acting on it is zero.

D When it moves, there is a resultant force acting on it.

8 The diagram shows a balance being used to find the weight of a baby. The weight of the basket can be ignored.

At equilibrium, the pivot is nearer to the 40 N balancing weight than to the baby.



What is the weight of the baby?

A less than 40 N

B 40 N

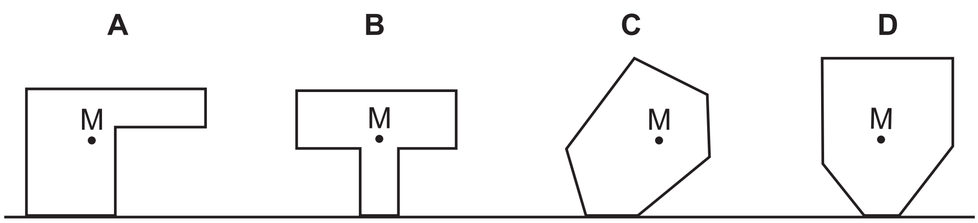
C more than 40 N

D impossible to tell without a scale on the beam

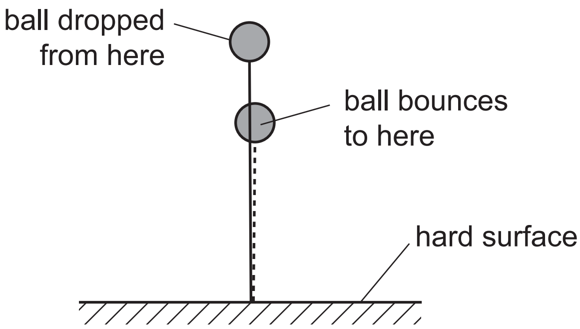
9 The diagram shows four objects on a flat surface.

The centre of mass of each object is marked M.

Which object is about to fall over?



10 A ball is dropped on to a hard surface and bounces. It does not bounce all the way back to where it started, and so has not regained all of its original gravitational potential energy.



Which statement accounts for the loss of gravitational potential energy?

A Energy was destroyed as the ball hit the ground.

B Energy was destroyed as the ball travelled through the air.

C The chemical energy and elastic energy of the ball have increased.

D The internal (heat) energy of the ball and its surroundings has increased.

11 Which energy resource is used to boil water to generate electricity?

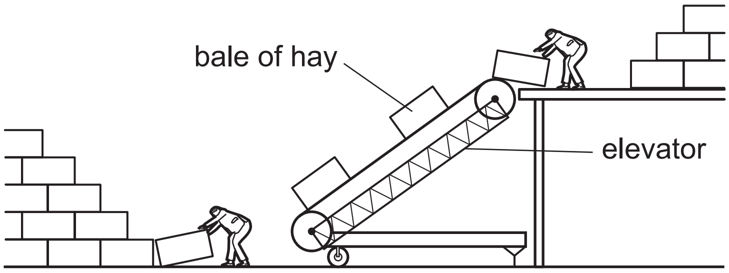
A hydroelectric

B nuclear fission

C tides

D waves

12 Two farmers use an electrically powered elevator to lift bales of hay. All the bales of hay have the same mass.

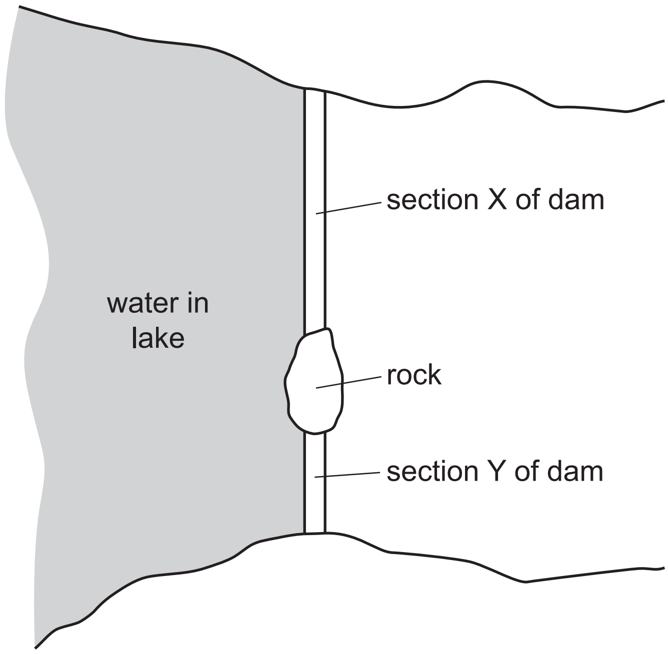


As sunset approaches, they increase the speed of the elevator so that more bales are lifted up in a given time.

How does this affect the work done in lifting each bale and the useful output power of the elevator?

	work done in lifting each bale	useful output power of the elevator
A	increases	decreases
B	increases	increases
C	no change	decreases
D	no change	increases

13 A dam across a lake is divided into two sections by a rock. Section X is longer than section Y but the two sections are otherwise identical. The water in the lake by the dam is the same depth everywhere. The diagram shows a view from above of the lake and the dam.



The water creates a total force on each section of the dam and an average pressure on each section of the dam.

Which statement is correct?

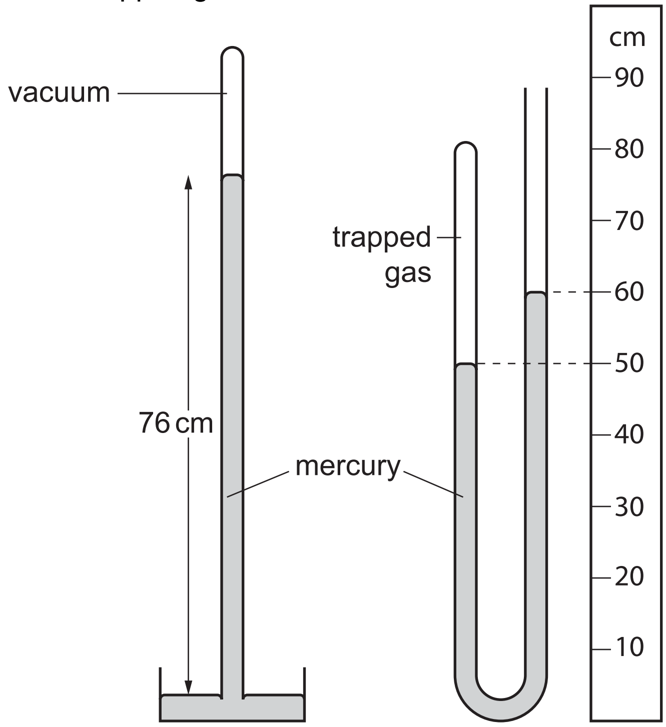
A The average pressure on X equals the average pressure on Y.

B The average pressure on X is less than the average pressure on Y.

C The total force on X equals the total force on Y.

D The total force on X is less than the total force on Y.

14 The diagram shows a simple mercury barometer alongside a mercury manometer. The manometer contains some trapped gas.



What is the pressure of the trapped gas?

A 10 cm of mercury

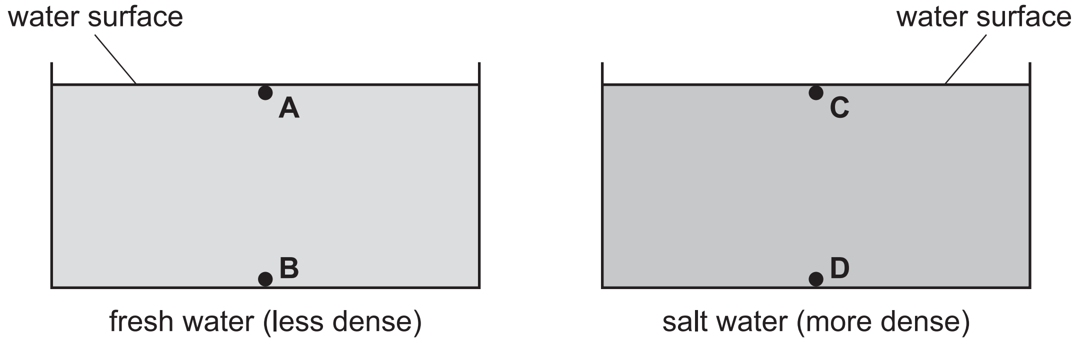
B 50 cm of mercury

C 66 cm of mercury

D 86 cm of mercury

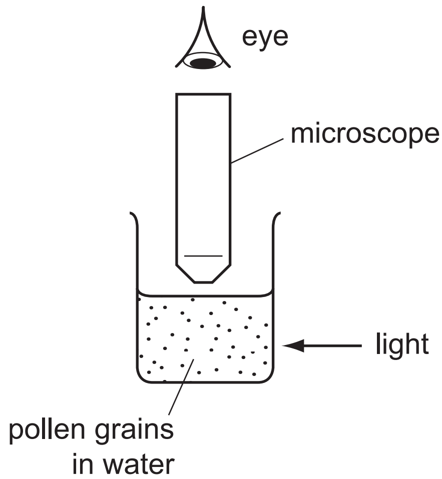
15 The diagrams show two swimming pools. One contains fresh water and the other contains salt water. Salt water is more dense than fresh water.

At which labelled point is the pressure the greatest?



16 Very small pollen grains are suspended in a beaker of water. A bright light shines from the side.

Small, bright dots of light are seen through a microscope. The dots move in rapidly changing, random directions.



What are the bright dots?

A pollen grains being hit by other pollen grains

B pollen grains being hit by water molecules

C water molecules being hit by other water molecules

D water molecules being hit by pollen grains

17 A sealed gas cylinder is left outside on a hot, sunny day.

What happens to the average speed of the gas molecules and to the pressure of the gas in the cylinder as the temperature of the gas rises?

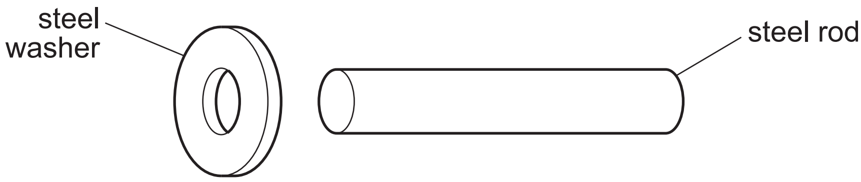
	average speed of gas molecules	pressure of gas in cylinder
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

18 A pool of water evaporates. As molecules escape, the temperature of the water left in the pool changes.

From where do the molecules escape and what is the effect on the temperature of the water in the pool?

	molecules escape from	temperature of water in the pool
A	all parts of the liquid	decreases
B	all parts of the liquid	increases
C	only the liquid surface	decreases
D	only the liquid surface	increases

19 An engineer wants to fix a steel washer on to a steel rod. The rod is just too big to fit into the hole of the washer.



How can the engineer fit the washer on to the rod?

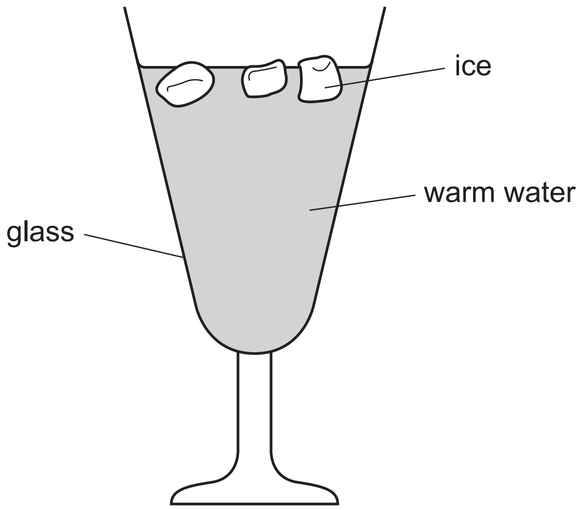
A Cool the washer and then place it over the rod.

B Cool the washer and rod to the same temperature and then push them together.

C Heat the rod and then place it in the hole in the washer.

D Heat the washer and then place it over the rod.

20 The diagram shows some ice being used to lower the temperature of some warm water.



What is the main process by which the water at the bottom of the glass becomes cool?

A condensation

B conduction

C convection

D radiation

21 Which list contains only transverse waves?

A infra-red waves, light waves, sound waves

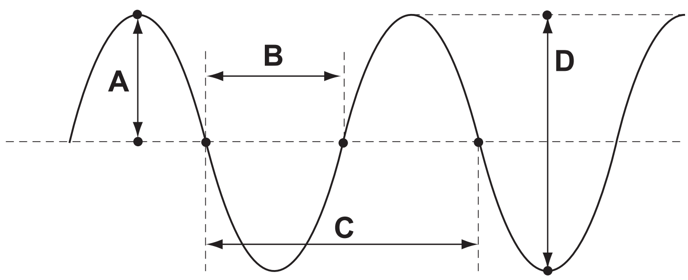
B infra-red waves, light waves, ultraviolet waves

C infra-red waves, sound waves, ultraviolet waves

D light waves, sound waves, ultraviolet waves

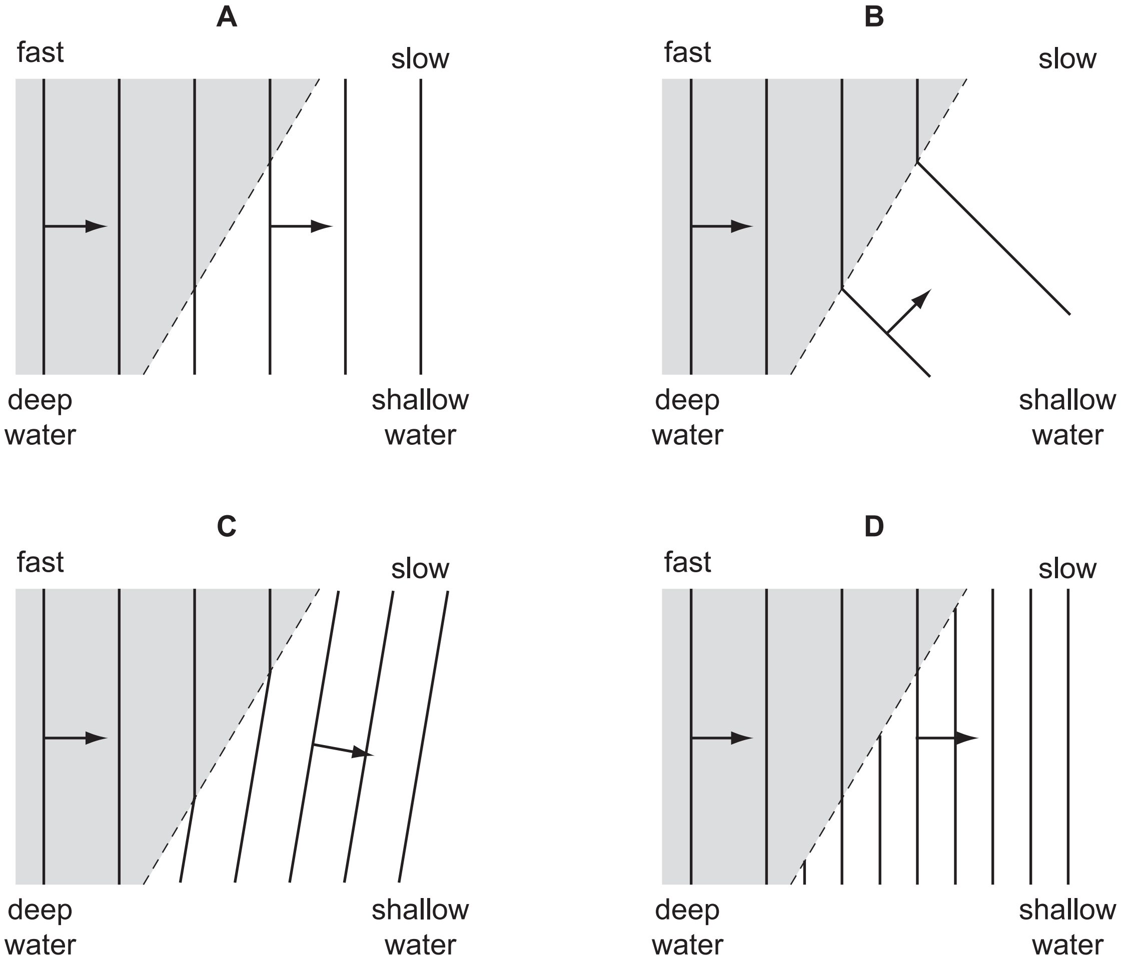
22 The diagram shows a wave.

Which labelled distance is the wavelength?



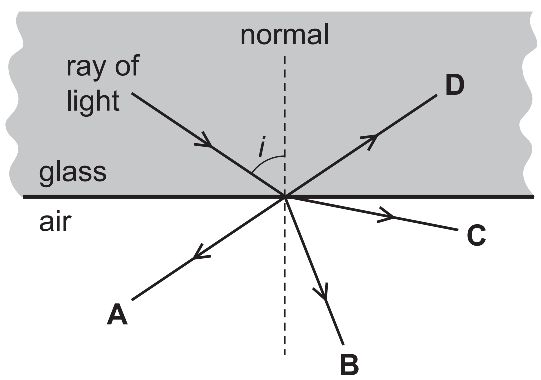
23 The diagrams show water waves that move more slowly after passing into shallow water.

Which diagram shows what happens to the waves?



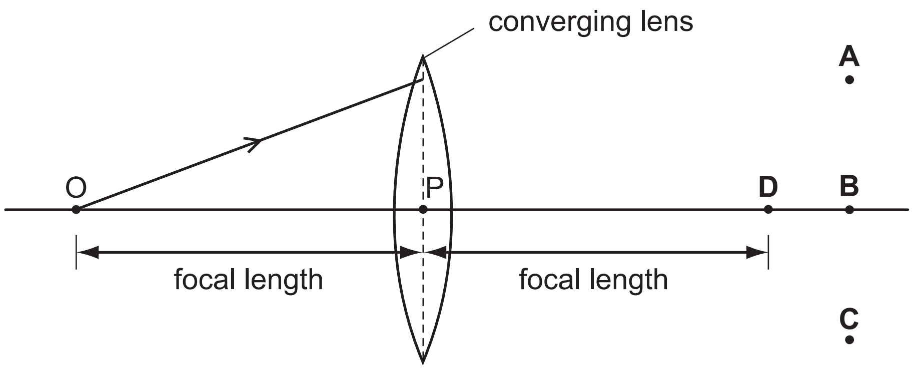
24 The diagram shows a ray of light incident on the edge of a piece of glass. The angle *i* is greater than the critical angle.

Which arrow shows the direction of the ray after it leaves the edge of the glass?

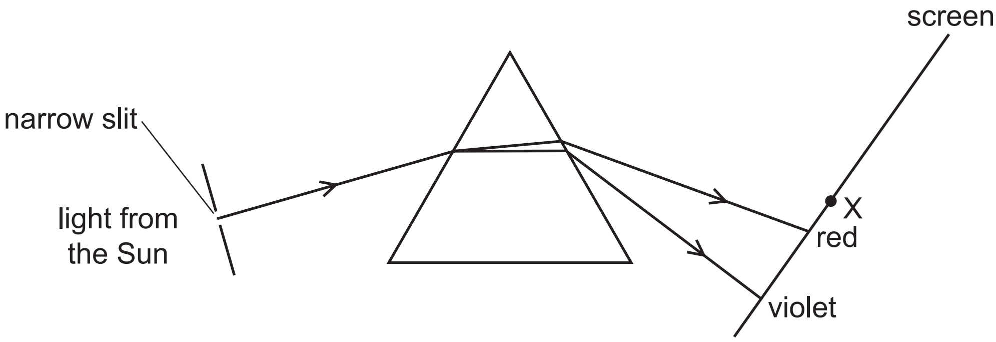


25 In the diagram, the distance OP is the focal length of the converging lens. One ray of light from O is shown.

Through which point will this ray pass, after refraction by the lens?



26 Light from the Sun passes through a prism and a spectrum is produced on a screen.



A thermometer placed at X shows a large temperature increase.

Which type of radiation causes this temperature increase?

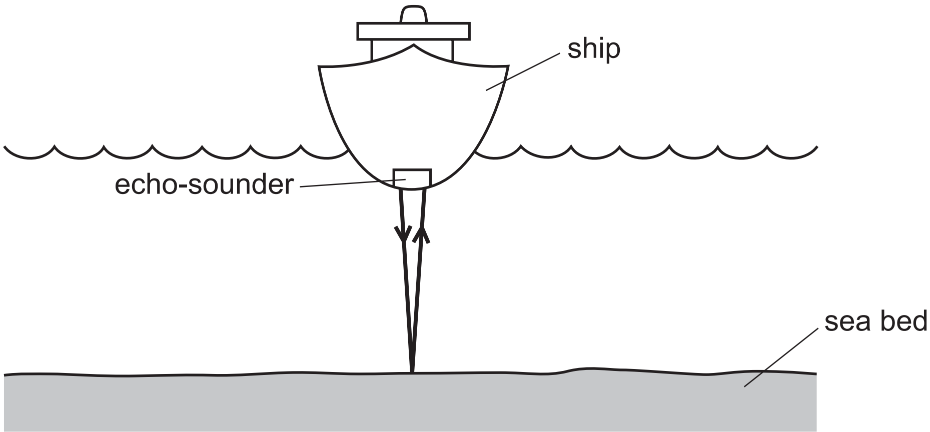
A infra-red

B microwave

C ultraviolet

D visible light

27 An echo-sounder on a ship produces a pulse of sound. The echo is received by the echo-sounder after two seconds.



The speed of sound in sea-water is 1500 m / s.

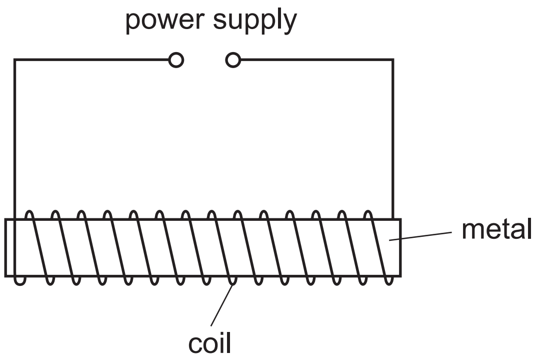
What is the depth of the sea-water below the ship?

A 750 m **B** 1500 m **C** 3000 m **D** 6000 m

28 Which frequency produces a sound that can be heard by a person?

A 2 Hz **B** 10 Hz **C** 2 kHz **D** 30 kHz

29 The diagram shows apparatus that can be used to make a magnet.



Which metal and which power supply are used to make a **permanent** magnet?

	metal	power supply
A	iron	6 V a.c.
B	iron	6 V d.c.
C	steel	6 V a.c.
D	steel	6 V d.c.

30 A polythene rod repels an inflated balloon hanging from a nylon thread.

Why do the rod and balloon repel?

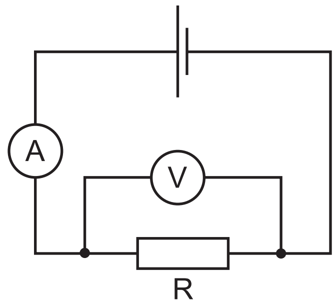
A The rod and the balloon have opposite charges.

B The rod and the balloon have like charges.

C The rod is charged but the balloon is not.

D The balloon is charged but the rod is not.

31 A circuit is set up to determine the resistance of a resistor R. The meter readings are 2.0 A and 3.0 V.



What is the resistance of the resistor R?

A 0.67 Ω **B** 1.5 Ω **C** 5.0 Ω **D** 6.0 Ω

32 A student uses a length of wire as a resistor. He makes a second resistor from the same material.

To be certain of making a second resistor of higher resistance, he should use a piece of wire that is

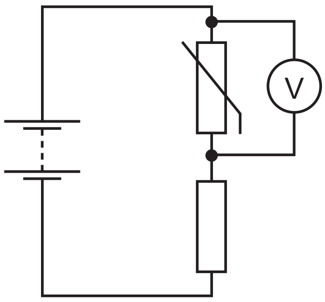
A longer and thicker.

B longer and thinner.

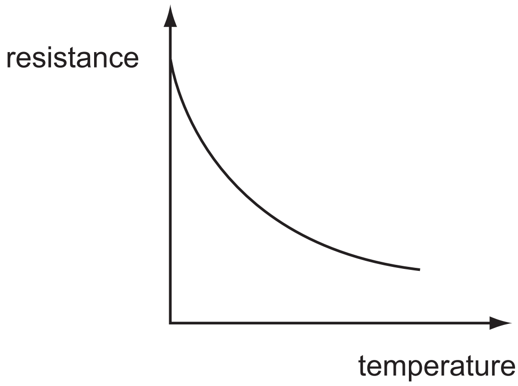
C shorter and thicker.

D shorter and thinner.

33 The circuit diagram shows a thermistor in a potential divider. A voltmeter is connected across the thermistor.



The graph shows how the resistance of the thermistor changes with temperature.

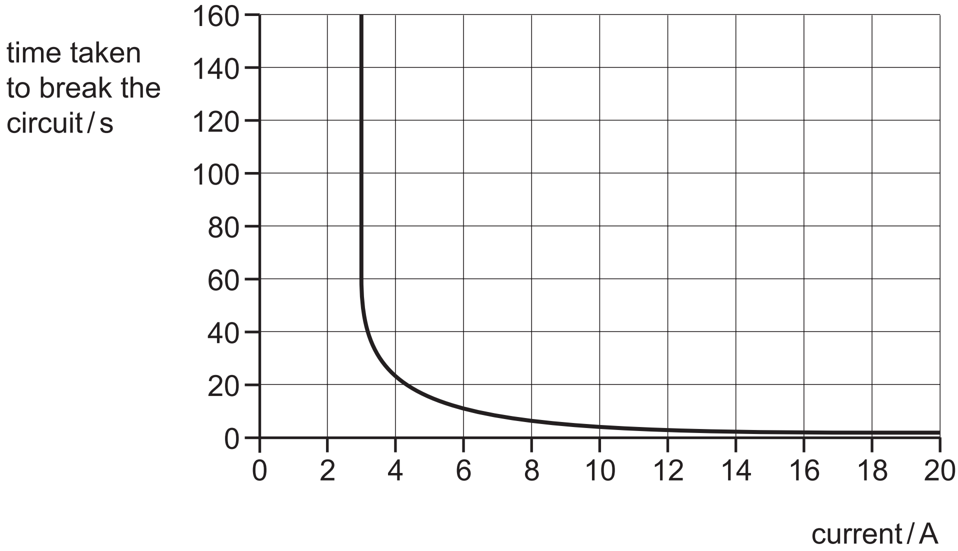


As the thermistor becomes warmer, what happens to its resistance and what happens to the reading on the voltmeter?

	resistance	voltmeter reading
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

34 A circuit-breaker is designed to protect a circuit which usually carries a current of 2 A.

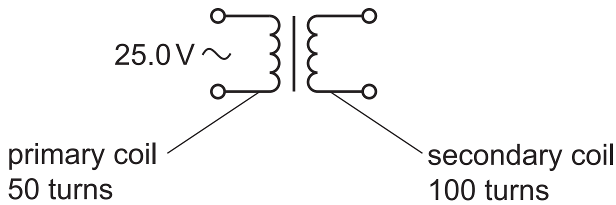
The time taken to break the circuit depends on the current, as shown in the graph.



What happens when the current in the circuit is 2 A and what happens when the current is 18 A?

	when the current is 2 A	when the current is 18 A
A	the circuit breaks in less than 5 seconds	the circuit breaks in less than 5 seconds
B	the circuit breaks in less than 5 seconds	the circuit does not break
C	the circuit does not break	the circuit breaks in less than 5 seconds
D	the circuit does not break	the circuit does not break

35 A transformer has 50 turns on its primary coil and 100 turns on its secondary coil. An alternating voltage of 25.0 V is connected across the primary coil.

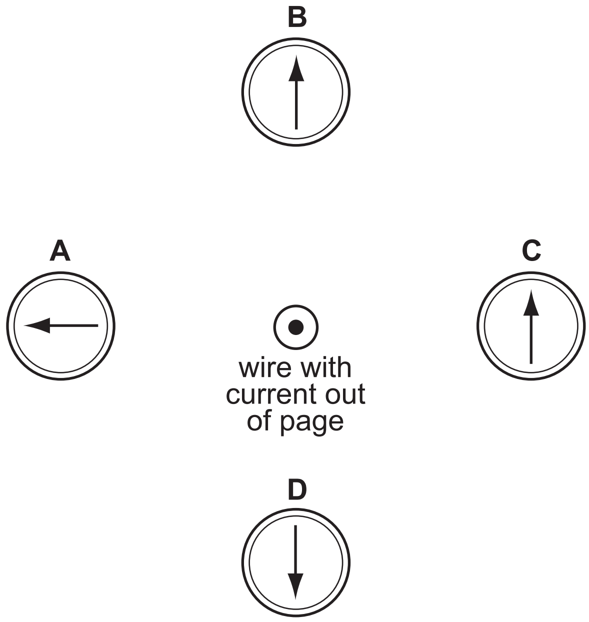


What is the voltage across the secondary coil?

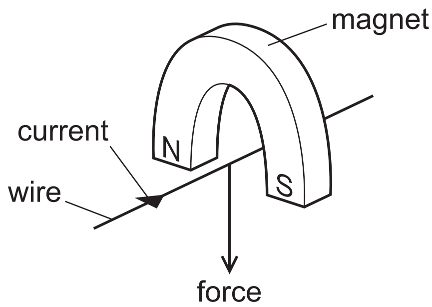
A 12.5 V **B** 50.0 V **C** 100 V **D** 200 V

36 A wire perpendicular to the page carries an electric current in a direction out of the page. There are four compasses near the wire.

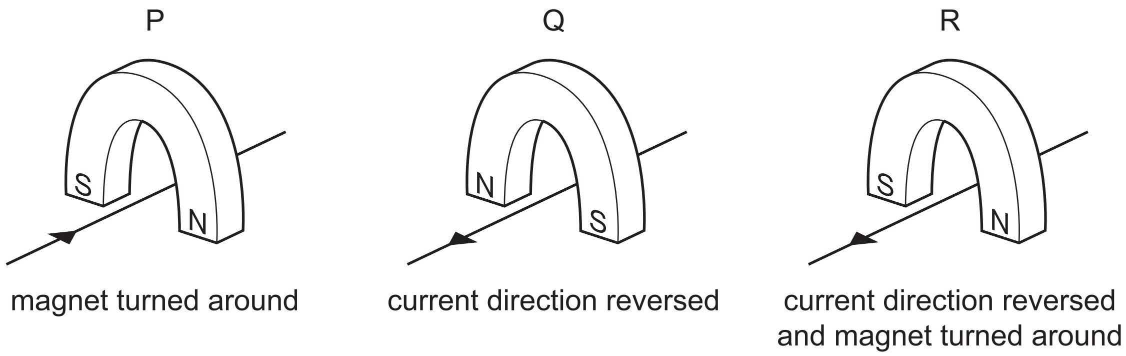
Which compass shows the direction of the magnetic field caused by the current?



37 A wire is placed between the poles of a horseshoe magnet. There is a current in the wire in the direction shown, and this causes a force to act on the wire.



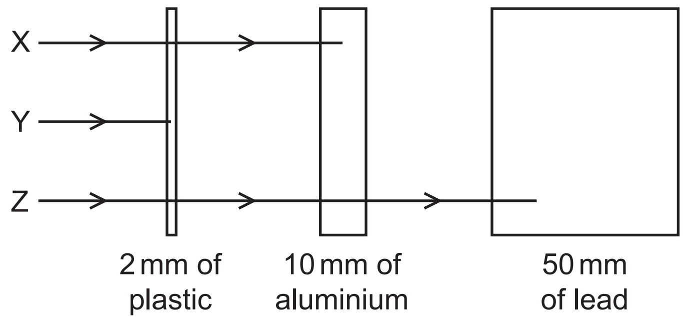
Three other arrangements, P, Q and R, of the wire and magnet are set up as shown.



Which arrangement or arrangements will cause a force in the same direction as the original arrangement?

A P, Q and R **B** P and Q only **C** P only **D** R only

38 The diagram shows the paths of three different types of radiation, X, Y and Z.



Which row in the table correctly identifies X, Y and Z?

	X	Y	Z
A	α-particles	β-particles	γ-rays
B	β-particles	α-particles	γ-rays
C	β-particles	γ-rays	α-particles
D	γ-rays	α-particles	β-particles

39 A particular nuclide has the symbol $^{37}_{17}Cl$.

What is true for atoms of this nuclide?

A There are 17 nucleons in the nucleus.

B There are 17 protons in the nucleus.

C There are 37 electrons in the nucleus.

D There are 37 neutrons in the nucleus.

40 A powder contains 400 mg of a radioactive isotope that emits α-particles.

The half-life of the isotope is 5 days.

What mass of this isotope remains after 10 days?

A 0 mg **B** 40 mg **C** 100 mg **D** 200 mg

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PHYSICS **0625/02**

Paper 2 Multiple Choice (Extended) **For examination from 2020**

MARK SCHEME

Maximum Mark: 40

Specimen

This document consists of **2** printed pages.

[Turn over

Question Number	*Key*	*Question Number*	*Key*
1	**A**	21	**A**
2	**B**	22	**C**
3	**B**	23	**C**
4	**C**	24	**C**
5	**B**	25	**D**
6	**B**	26	**D**
7	**B**	27	**B**
8	**C**	28	**D**
9	**A**	29	**B**
10	**C**	30	**B**
11	**C**	31	**C**
12	**D**	32	**C**
13	**A**	33	**A**
14	**A**	34	**C**
15	**D**	35	**B**
16	**B**	36	**A**
17	**D**	37	**D**
18	**D**	38	**A**
19	**C**	39	**D**
20	**A**	40	**C**

Cambridge Assessment International Education

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CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

0123456789

PHYSICS **0625/02**

Paper 2 Multiple Choice (Extended) **For examination from 2020**

SPECIMEN PAPER

45 minutes

Additional materials: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, centre number and candidate number on the answer sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate answer sheet.

Read the instructions on the answer sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m/s^2).

This document consists of **23** printed pages and **1** blank page.

1 Which quantity is measured in newton seconds (N s)?

A impulse

B moment

C power

D work done

2 Which measurement can be made using a micrometer screw gauge?

A the air pressure of a tyre

B the diameter of a wire

C the turning effect of a spanner

D the wavelength of microwaves

3 A parachutist is falling at terminal velocity, without her parachute open.

She now opens her parachute.

What is the direction of her motion, and what is the direction of her acceleration, immediately after she opens her parachute?

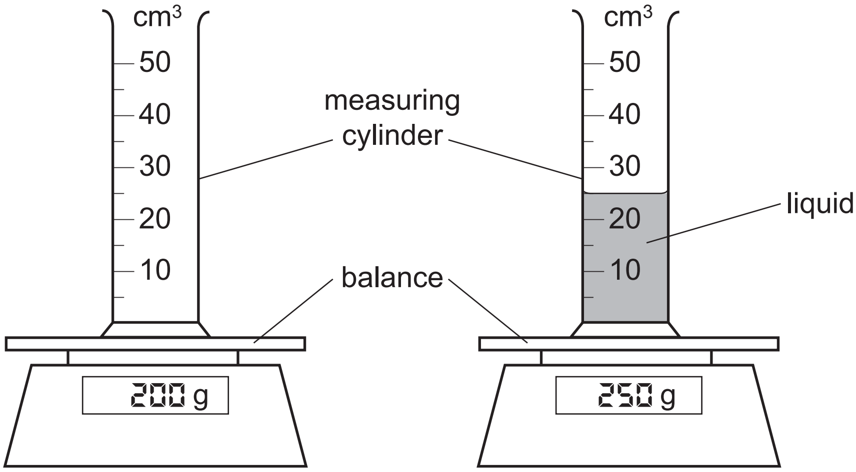
	direction of motion of the parachutist	direction of acceleration of the parachutist
A	downwards	downwards
B	downwards	upwards
C	upwards	downwards
D	upwards	upwards

4 An astronaut in an orbiting spacecraft experiences a force due to gravity. This force is less than when she is on the Earth's surface.

Compared with being on the Earth's surface, how do her mass and her weight change when she goes into orbit?

	mass in orbit	weight in orbit
A	decreases	decreases
B	decreases	unchanged
C	unchanged	decreases
D	unchanged	unchanged

5 The diagram shows an experiment to find the density of a liquid.



What is the density of the liquid?

A $0.5\,g/cm^3$ **B** $2.0\,g/cm^3$ **C** $8.0\,g/cm^3$ **D** $10.0\,g/cm^3$

6 An experiment is carried out to measure the extension of a rubber band for different loads.

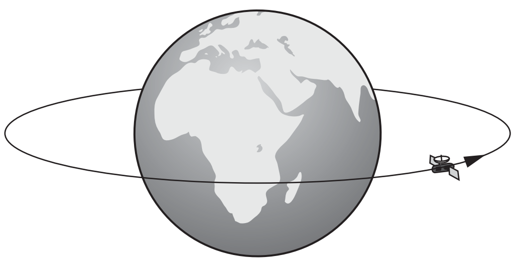
The results are shown below.

load / N	0	1.0	2.0	3.0
length / cm	15.2	16.2		18.6
extension / cm	0	1.0	2.1	3.4

Which figure is missing from the table?

A 17.2 **B** 17.3 **C** 17.4 **D** 17.6

7 The diagram shows a satellite that is moving at a uniform rate in a circular orbit around the Earth.



Which statement describes the motion of this satellite?

A It is accelerating because its speed is changing.

B It is accelerating because its velocity is changing.

C It is not accelerating but its speed is changing.

D It is not accelerating but its velocity is changing.

8 Which statement about an object moving in a straight line through air is correct?

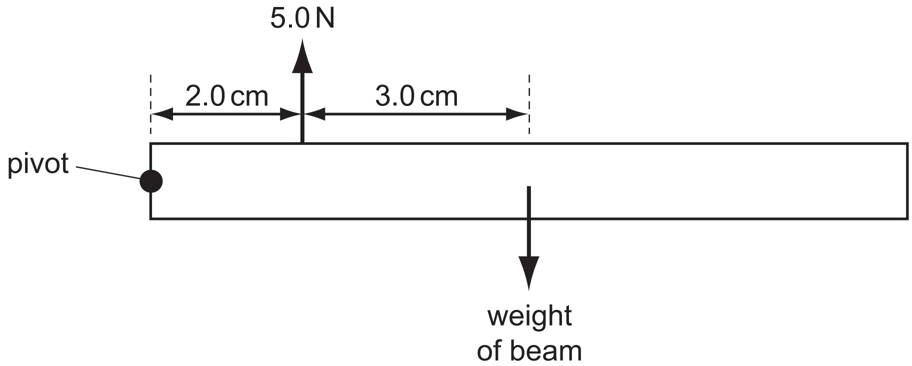
A When it accelerates, the resultant force acting on it is zero.

B When it moves at a steady speed, the air resistance acting on it is zero.

C When it moves at a steady speed, the resultant force acting on it is zero.

D When it moves, there is a resultant force acting on it.

9 A beam pivoted at one end has a force of 5.0 N acting vertically upwards on it as shown. The beam is in equilibrium.



What is the weight of the beam?

A 2.0 N **B** 3.0 N **C** 3.3 N **D** 5.0 N

10 A car has a mass of 1000 kg and a momentum of 12 000 kg m/s.

What is its kinetic energy?

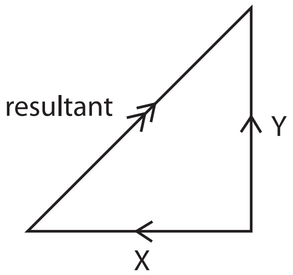
A 6 kJ

B 12 kJ

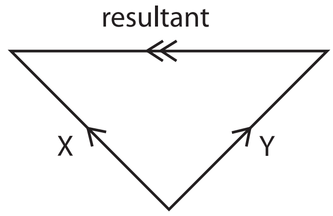
C 72 kJ

D 144 kJ

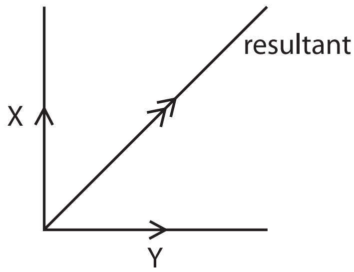
11 Which diagram shows two forces X and Y with their resultant force?



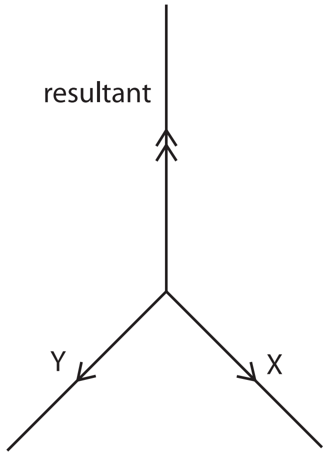
A



B

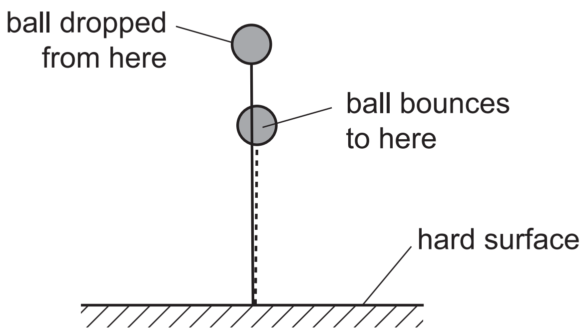


C



D

12 A ball is dropped on to a hard surface and bounces. It does not bounce all the way back to where it started, and so has not regained all of its original gravitational potential energy.



Which statement accounts for the loss of gravitational potential energy?

A Energy was destroyed as the ball hit the ground.

B Energy was destroyed as the ball travelled through the air.

C The chemical energy and elastic energy of the ball have increased.

D The internal (heat) energy of the ball and its surroundings has increased.

13 The Sun is the original source of energy for many of our energy resources.

Which energy resource **does not** originate from the Sun?

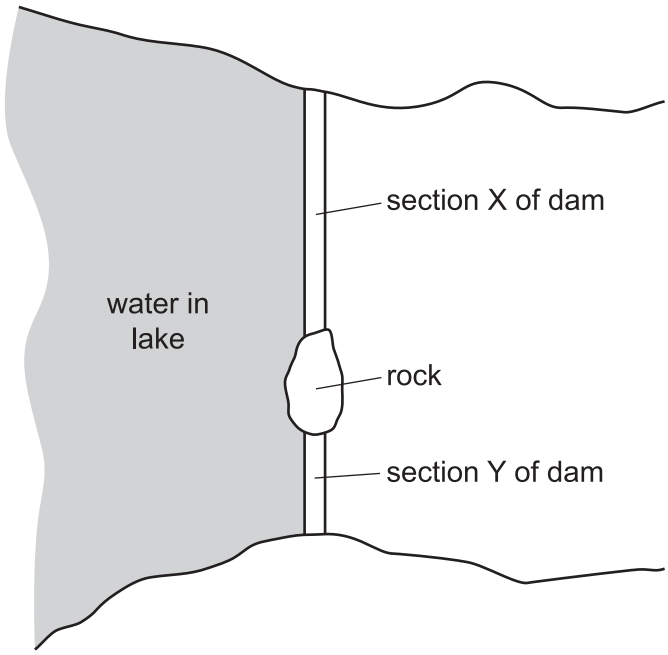
A geothermal

B hydroelectric

C waves

D wind

14 A dam across a lake is divided into two sections by a rock. Section X is longer than section Y but the two sections are otherwise identical. The water in the lake by the dam is the same depth everywhere. The diagram shows a view from above of the lake and the dam.



The water creates a total force on each section of the dam and an average pressure on each section of the dam.

Which statement is correct?

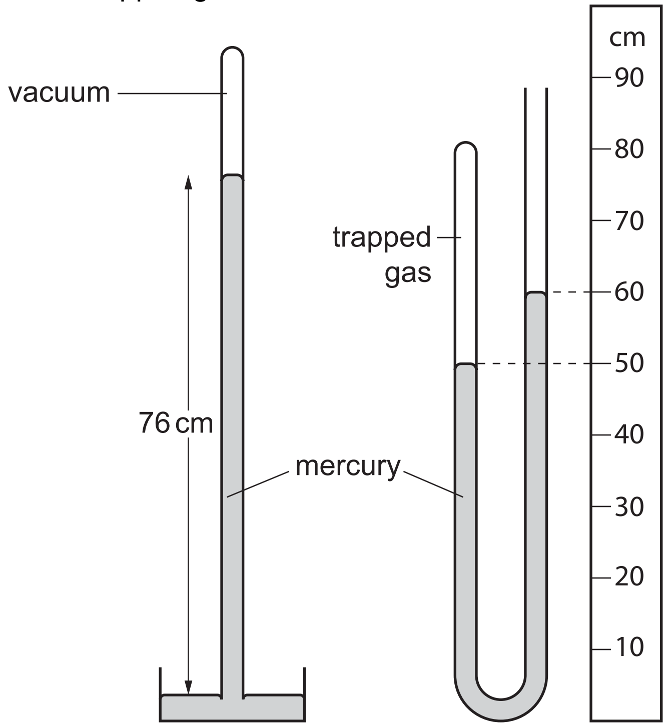
A The average pressure on X equals the average pressure on Y.

B The average pressure on X is less than the average pressure on Y.

C The total force on X equals the total force on Y.

D The total force on X is less than the total force on Y.

15 The diagram shows a simple mercury barometer alongside a mercury manometer. The manometer contains some trapped gas.



What is the pressure of the trapped gas?

A 10 cm of mercury

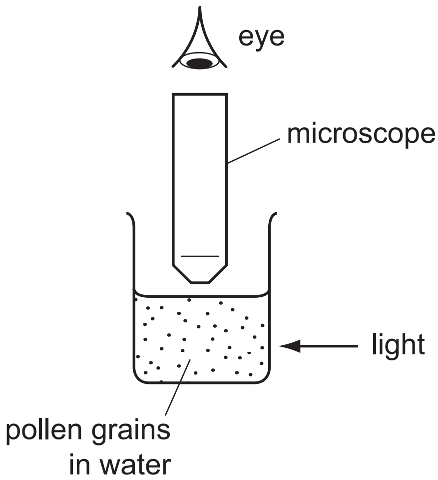
B 50 cm of mercury

C 66 cm of mercury

D 86 cm of mercury

16 Very small pollen grains are suspended in a beaker of water. A bright light shines from the side.

Small, bright dots of light are seen through a microscope. The dots move in rapidly changing, random directions.



What are the bright dots?

A pollen grains being hit by other pollen grains

B pollen grains being hit by water molecules

C water molecules being hit by other water molecules

D water molecules being hit by pollen grains

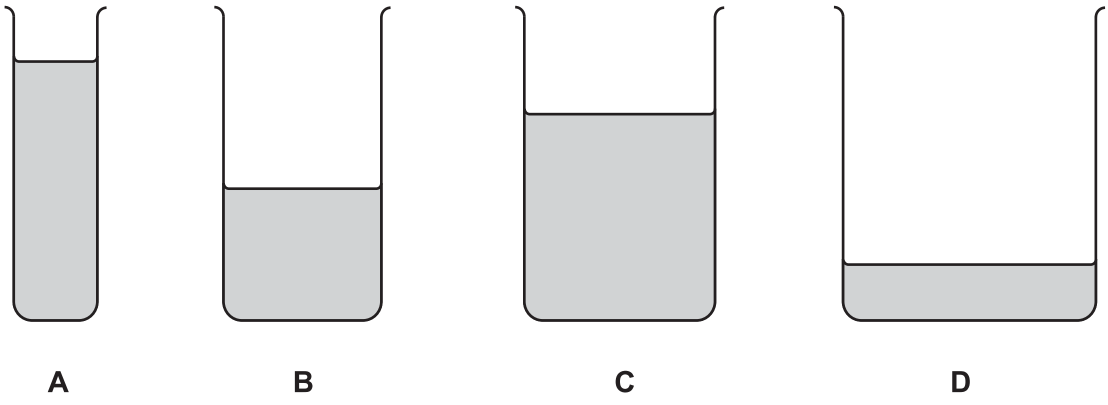
17 A sealed gas cylinder is left outside on a hot, sunny day.

What happens to the average speed of the gas molecules and to the pressure of the gas in the cylinder as the temperature of the gas rises?

	average speed of gas molecules	pressure of gas in cylinder
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

18 The diagram shows four beakers **A**, **B**, **C** and **D**. The beakers contain different amounts of the same liquid at the same temperature. The beakers are left next to each other on a laboratory bench overnight. The diagrams are all drawn to the same scale.

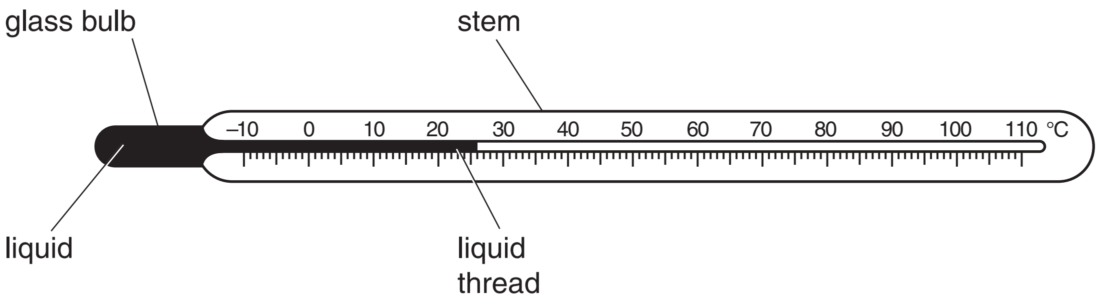
From which beaker does the largest quantity of liquid evaporate?



19 Which line in the table shows the relative expansion of the three states of matter from the most expansion to the least expansion?

	most expansion				least expansion
A	solids	>	liquids	>	gases
B	solids	>	gases	>	liquids
C	gases	>	liquids	>	solids
D	gases	>	solids	>	liquids

20 The diagram shows a liquid-in-glass thermometer.



Which two features both affect the sensitivity of the thermometer?

A mass of liquid and diameter of liquid thread

B mass of liquid and length of stem

C thickness of glass bulb and diameter of liquid thread

D thickness of glass bulb and length of stem

21 A student wishes to calculate the specific heat capacity of copper.

He has a block of copper and an electrical heater. He knows the power of the heater.

Which other apparatus does he need?

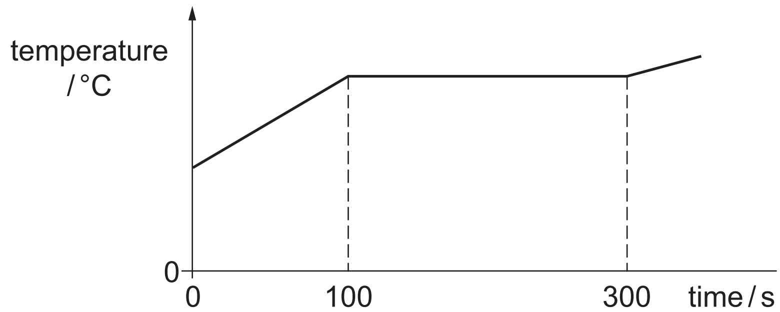
	balance	stop watch	thermometer
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

key
✓ = needed
✗ = not needed

22 A mass of 0.20 kg of a substance is initially solid.

It is heated at a steady rate of 500 W.

The graph shows how the temperature of the substance changes with time.



What is the specific latent heat of fusion of the substance?

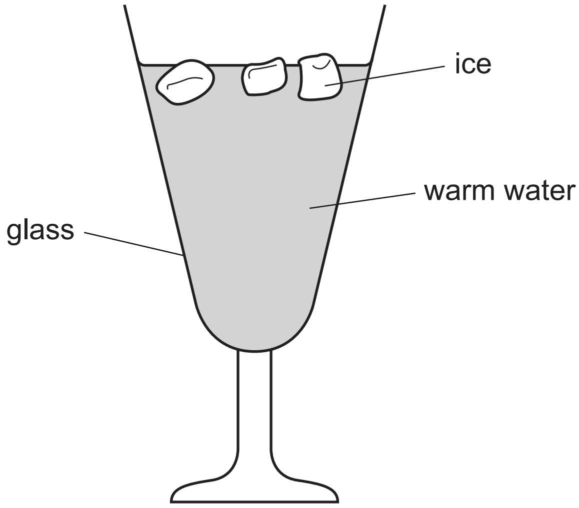
A 20 000 J / kg

B 30 000 J / kg

C 500 000 J / kg

D 750 000 J / kg

23 The diagram shows some ice being used to lower the temperature of some warm water.



What is the main process by which the water at the bottom of the glass becomes cool?

A condensation

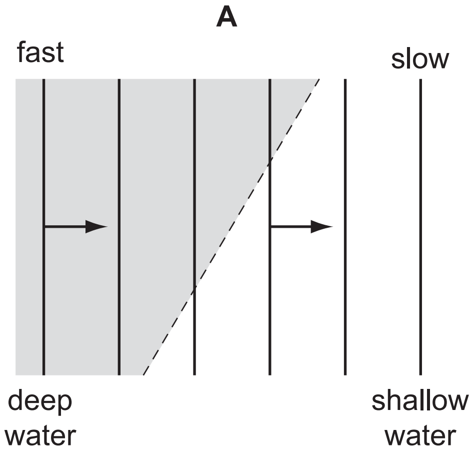
B conduction

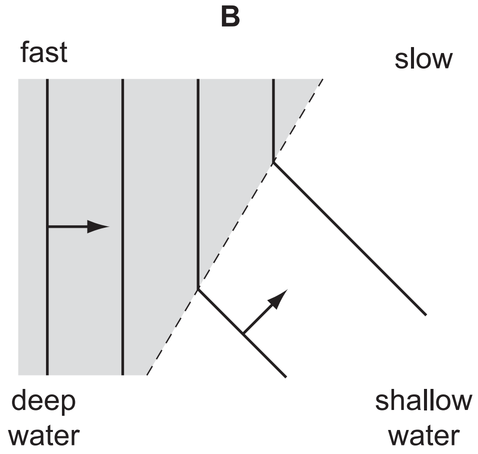
C convection

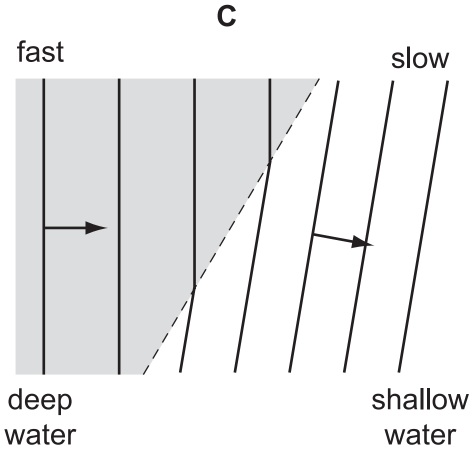
D radiation

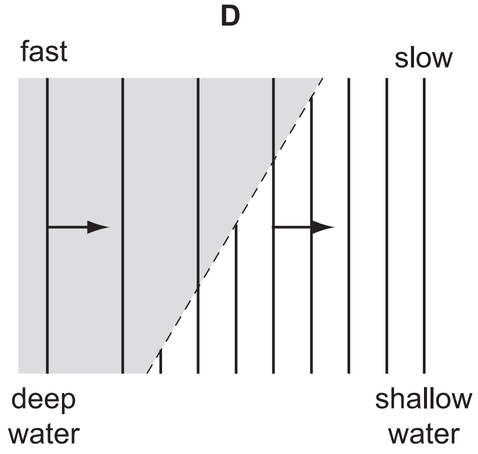
24 The diagrams show water waves that move more slowly after passing into shallow water.

Which diagram shows what happens to the waves?

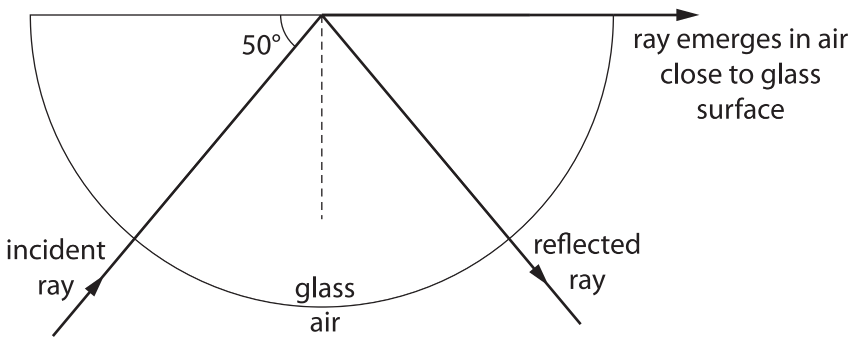








25 The diagram shows a ray of monochromatic light passing through a semi-circular glass block.

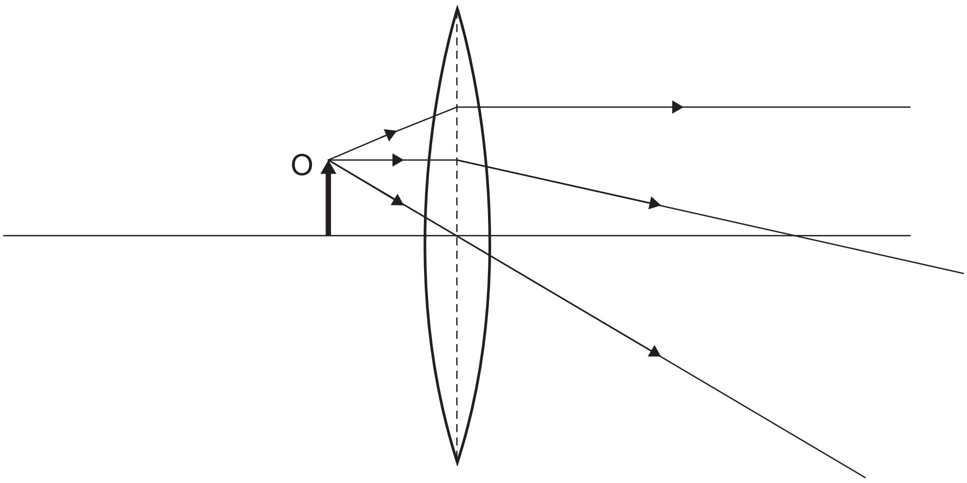


What is the refractive index of the glass?

A 0.64 **B** 0.77 **C** 1.31 **D** 1.56

26 An object O is placed close to a thin converging lens.

The diagram represents three rays from the top of O passing through the lens.



Which type of image is produced by the lens when the object O is in this position?

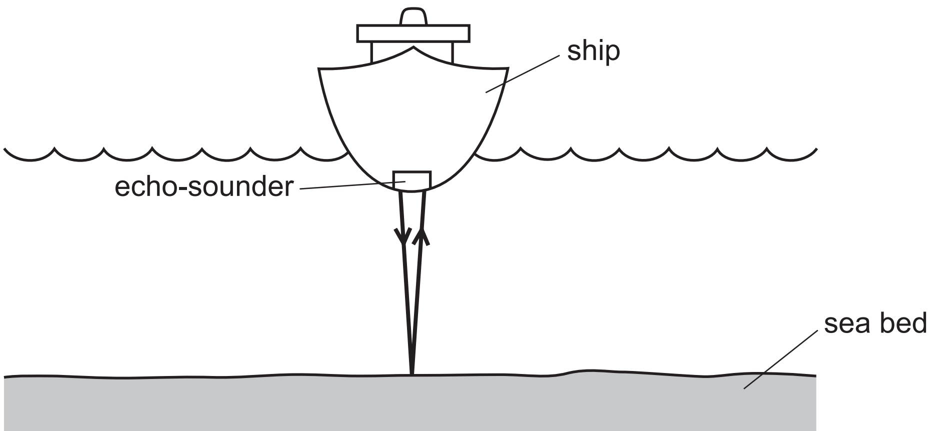
A real and diminished

B real and enlarged

C virtual and diminished

D virtual and enlarged

27 An echo-sounder on a ship produces a pulse of sound. The echo is received by the echo-sounder after two seconds.

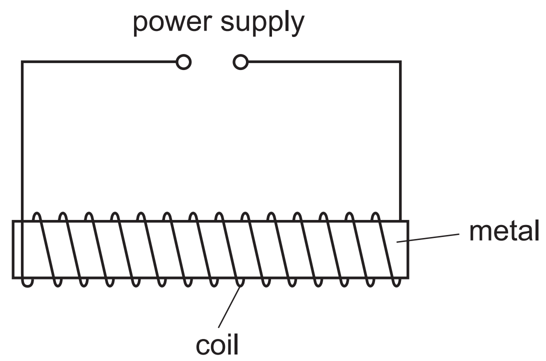


The speed of sound in sea-water is 1500 m / s.

What is the depth of the sea-water below the ship?

A 750 m **B** 1500 m **C** 3000 m **D** 6000 m

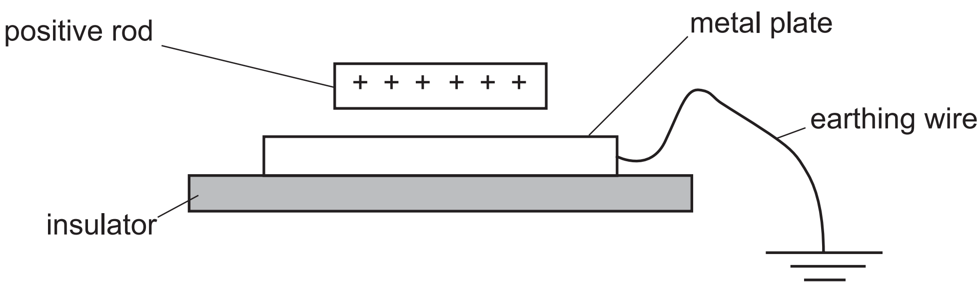
28 The diagram shows apparatus that can be used to make a magnet.



Which metal and which power supply are used to make a **permanent** magnet?

	metal	power supply
A	iron	6 V a.c.
B	iron	6 V d.c.
C	steel	6 V a.c.
D	steel	6 V d.c.

29 A positively charged plastic rod is placed just above a thick metal plate. The metal plate rests on an insulator and is connected to the earth by a wire.



A student disconnects the earthing wire and then removes the positively charged rod.

The experiment is repeated. This time the student removes the positively charged rod and then removes the earthing wire.

Which statement is correct?

A When the earthing wire is disconnected first, the metal plate becomes positively charged.

B When the earthing wire is disconnected first, the metal plate becomes negatively charged.

C When the plastic rod is removed first, the metal plate becomes positively charged.

D When the plastic rod is removed first, the metal plate becomes negatively charged.

30 The resistance of a wire depends on its length l and on its cross-sectional area *A*.

The resistance is

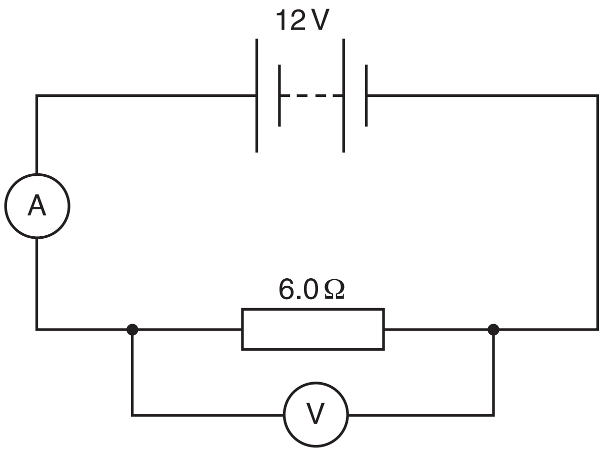
A directly proportional to l and directly proportional to *A.*

B directly proportional to l and inversely proportional to *A.*

C inversely proportional to l and directly proportional to *A.*

D inversely proportional to l and inversely proportional to *A.*

31 In the circuit shown, the ammeter reads 2.0 A and the voltmeter reads 12 V.



How much energy is transferred by the resistor in 10 seconds?

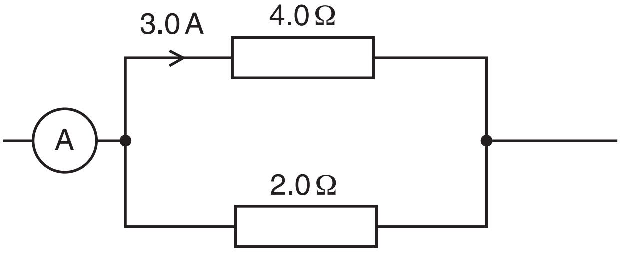
A 2.4 J

B 14.4 J

C 240 J

D 1440 J

32 The diagram shows part of an electrical circuit.



The current in the 4.0 Ω resistor is 3.0 A.

What is the current in the ammeter?

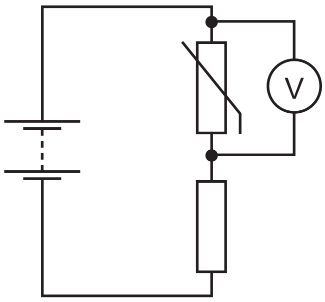
A 4.5 A

B 6.0 A

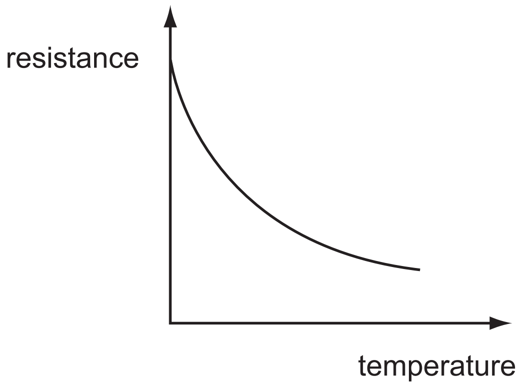
C 9.0 A

D 12.0 A

33 The circuit diagram shows a thermistor in a potential divider. A voltmeter is connected across the thermistor.



The graph shows how the resistance of the thermistor changes with temperature.

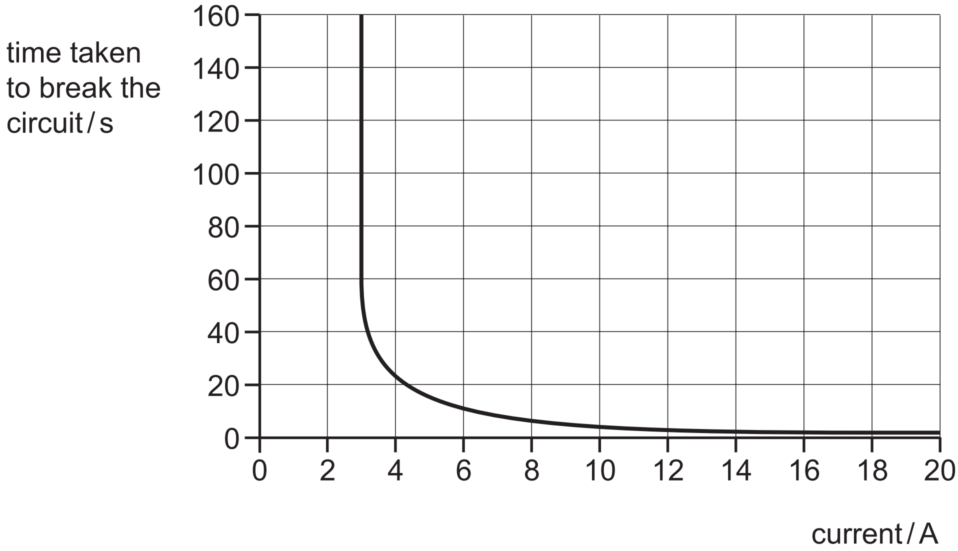


As the thermistor becomes warmer, what happens to its resistance and what happens to the reading on the voltmeter?

	resistance	voltmeter reading
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

34 A circuit-breaker is designed to protect a circuit which usually carries a current of 2 A.

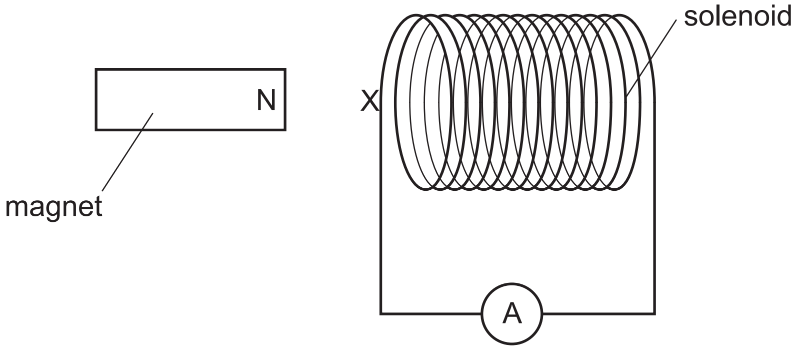
The time taken to break the circuit depends on the current, as shown in the graph.



What happens when the current in the circuit is 2 A and what happens when the current is 18 A?

	when the current is 2 A	when the current is 18 A
A	the circuit breaks in less than 5 seconds	the circuit breaks in less than 5 seconds
B	the circuit breaks in less than 5 seconds	the circuit does not break
C	the circuit does not break	the circuit breaks in less than 5 seconds
D	the circuit does not break	the circuit does not break

35 A solenoid is connected in series with a sensitive ammeter. The N pole of a magnet is placed next to one end of the solenoid, marked X.

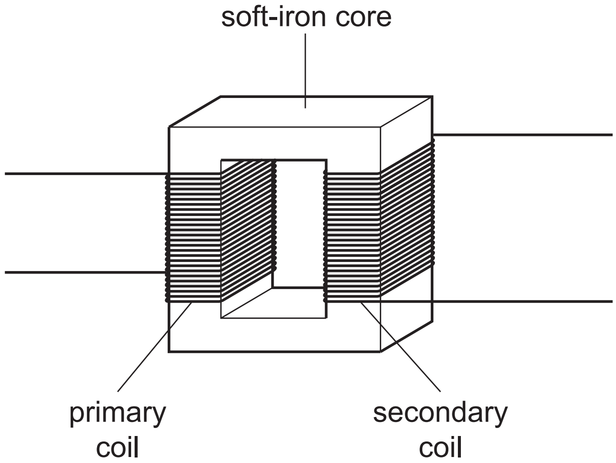


First, the N pole of the magnet is pushed towards X, then the magnet is pulled away from X. During both stages the ammeter deflects.

Which type of magnetic pole is induced at X during these two stages?

	as N pole moves towards X	as N pole moves away from X
A	N pole	N pole
B	N pole	S pole
C	S pole	N pole
D	S pole	S pole

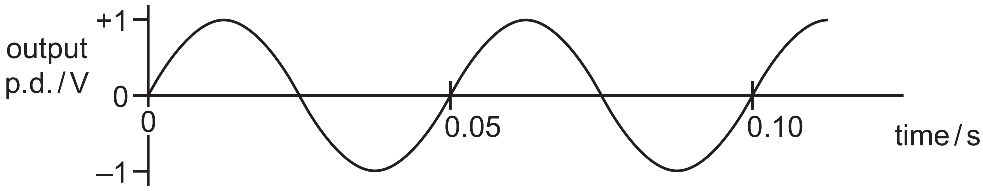
36 The diagram shows a transformer.



Which row describes the magnetic field in the soft-iron core and the magnetic field in the secondary coil when the transformer is operating?

	magnetic field	
	in soft-iron core	in secondary coil
A	changing	changing
B	changing	constant
C	constant	changing
D	constant	constant

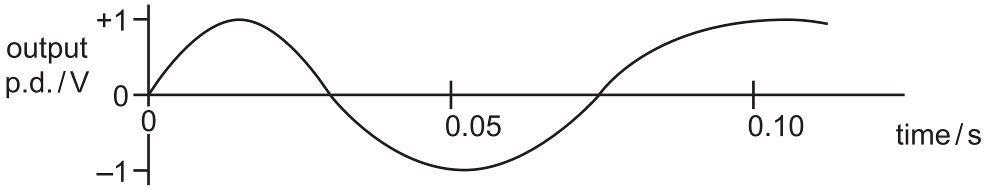
37 The graph shows the output of an a.c. generator. The coil in the generator rotates 20 times in one second.



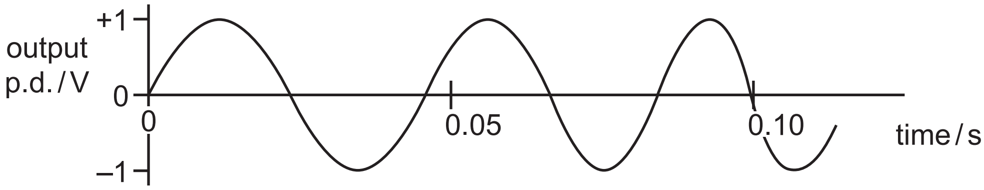
The speed of rotation of the coil steadily increases.

Which graph best shows how the output changes?

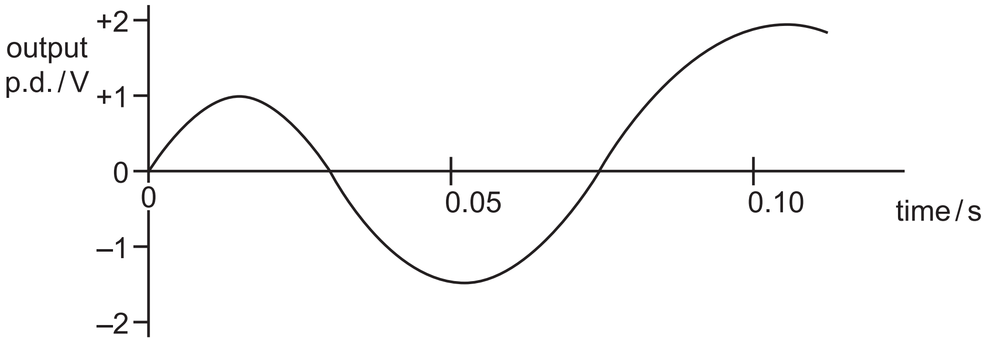
A



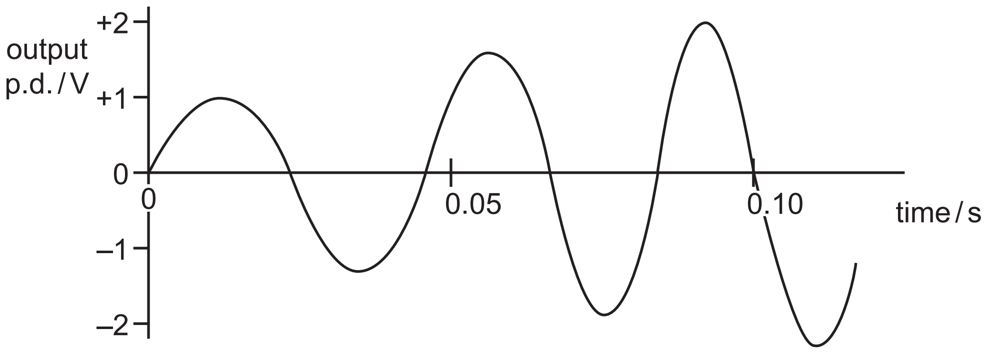
B



C

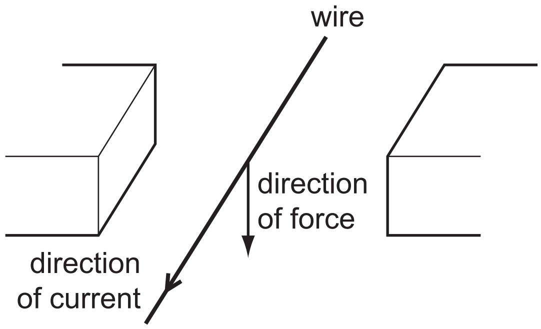


D



38 The diagram shows a wire placed between two magnetic poles of equal strength.

A current passes through the wire in the direction shown. The current causes a downward force on the wire.



What is the arrangement of the magnetic poles?

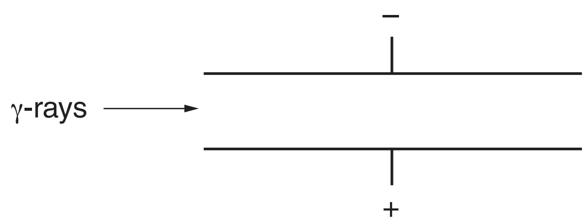
A

B

C

D

39 A beam of γ-rays passes between two charged metal plates as shown in the diagram.



How do the γ-rays pass between the two charged plates?

A The rays are deflected in a direction perpendicular to the page

B The rays are deflected towards the negative plate.

C The rays are deflected towards the positive plate.

D The rays will continue in the same direction.

40 A powder contains 400 mg of a radioactive isotope that emits α-particles.

The half-life of the isotope is 5 days.

What mass of this isotope remains after 10 days?

A 0 mg **B** 40 mg **C** 100 mg **D** 200 mg

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Cambridge IGCSE®

PHYSICS **0625/03**

Paper 3 Theory (Core) **For examination from 2020**

MARK SCHEME

Maximum Mark: 80

Specimen

This document consists of **6** printed pages.

mark scheme abbreviations

( )	the word, phrase or unit in brackets is not required but is in the mark scheme for clarification
accept	accept the response
AND	both responses are necessary for the mark to be allowed
c.a.o.	correct answer only
e.c.f.	error carried forward; marks are awarded if a candidate has carried an incorrect value forward from earlier working, provided the subsequent working is correct
ignore	this response is to be disregarded and does not negate an otherwise correct response
NOT	do not allow
note:	additional marking guidance
/ OR	alternative responses for the same marking point
owtte	or words to that effect
<u>underline</u>	mark is not allowed unless the underlined word or idea is used by candidate
units	there is a maximum of one unit penalty per question unless otherwise indicated
any [number] from:	accept the [number] of valid responses
max	indicates the maximum number of marks

1	**(a)**	**(i)**	15 (m/s)	[1]
		(ii)	0 (m/s)	[1]
	(b)		constant OR nothing	[1]
	(c)		area of triangle OR area under graph OR appropriate equation of motion ½ × 30 × 5 75 (m)	[1] [1] [1]
	(d)		speed = distance/time in any form, letters, words, numbers 750/30 25 (m/s)	[1] [1] [1]
2	**(a)**		1500 (N)	[1]
	(b)		second box ticked	[1]
	(c)		slows down / speed decreases / decelerates resultant force in direction opposing motion / resultant is –500 N / 500 N backwards	[1] [1]
	(d)		any one from: <u>increased</u> wind / air resistance OR headwind) rough(er) ground OR flat tyre OR <u>increased</u> road resistance/friction) brakes applied) ignore increased speed / changed car shape / increased load ignore driver decided to stop	[max 1]
3	**(a)**	**(i)**	plumb-line (name or description) OR set-square and (horiz.) bench OR spirit level	[1]
		(ii)	line joining A and D AND line joining B and E intersection clearly labelled G	[1] [1]
	(b)		use of $W = m\,g$ in any form, letters, words, numbers evidence of conversion of g to kg (can be given from final answer) 1.2 (N) (note: 1200 gains 2 marks)	[1] [1] [1]

4	**(a)**	turning effect OR force × distance (from fulcrum)	[1]
	(b)	**(i)** A AND idea of bigger distance from hinge / pivot	[1]
		(ii) the door closes	[1]
5	**(a)**	(molecules) close together / touching / strong forces holding molecules together	[1]
		(molecules) vibrate / are not free to move around	[1]
	(b)	temperature (of wax) increases (as time increases)	[1]
		between 4 and 8 minutes the temperature stays the same	[1]
		because the wax is melting (between 4 and 8 minutes)	[1]
		temperature increases again / after 8 minutes	[1]
		wax has all melted / is all liquid (after 8 minutes)	[1]
6	**(a)**	less pollution / reduced carbon (dioxide) emissions (compared to fossil fuels) OR other <u>environmental</u> reason	[1]
	(b)	any three from: output expected from wind turbine energy use by factory wind is intermittent whether <u>location</u> has suitable amount of wind cost / time to recoup cost of turbine whether location / noise will cause nuisance to neighbours	[max 3]
		valid discussion of at least one factor from list above, linking it to the decision	[1]
7	**(a)**	increase in kinetic energy due to motion	[1]
		increase in gravitational potential energy	[1]
		due to increase in height	[1]
		increase in strain / elastic energy of pole because it is bent	[1]
	(b)	total energy remains constant (note: can be implied by second mark)	[1]
		gravitational potential energy lost = kinetic energy gained (+ thermal energy / heating)	[1]
8	**(a)**	beard tip to cross perpendicular to mirror	[1]
		distance beard tip to mirror = distance mirror to cross B	[1]
	(b)	incident ray from beard tip to mirror and reflected ray along line from eye to cross B or angles of incidence and reflection are approximately the same	[1]
		arrows from beard to eye	[1]
	(c)	angles *i* and *r* correctly labelled	[1]

9	**(a)**		radio OR television	[1]
			ultraviolet	[1]
	(b)		"long wavelength" written at left end of spectrum	[1]
	(c)		cooking / ovens / grills / heating / remote-controls / burglar alarms	[1]
			cancer treatment / medical imaging / sterilisation / use as a tracer	[1]
10	**(a)**	**(i)**	150 + 200 or 350 (Ω) seen or implied by correct final answer	[1]
			use of $I = V/R$ in any form or 12/candidate's resistance seen or 12/350 implied by correct answer	[1]
			0.034 to at least 2 sig. figs.	[1]
			A or mA as appropriate	[1]
		(ii)	candidate's **(i)** × 200 or proportion or potential divider calculation	[1]
			6.9 (V) to at least 2 sig. figs.	[1]
		(iii)	variable resistor symbol drawn in suitable position on circuit	[1]
	(b)	**(i)**	parallel	[1]
		(ii)	brighter	[1]
			p.d. / voltage (across lamp) is greater	[1]
11	**(a)**	**(i)**	at least two continuous loops either side of magnet, from one pole to the other	[1]
			at least one arrow, not contradicted, showing direction N to S	[1]
		(ii)	magnet which operates when there is a current OR coil wrapped round iron bar	[1]
	(b)	**(i)**	alternating current changes direction OR direct current is in one direction only	[1]
		(ii)	mention of magnetic field	[1]
			<u>changing</u> magnetic field / flux linkage, however expressed OR field lines being cut etc.	[1]
			induced emf / current / electricity	[1]
12	**(a)**		break up of unstable nuclei	[1]
			emission of ionising radiation / alpha / beta / gamma	[1]
	(b)		only half-life ticked	[1]
	(c)	**(i)**	clear statement of start point (can be inferred from markings on graph)	[1]
			clear halving	[1]
			2 minutes	[1]
		(ii)	550/2 OR 1100/4 OR 2200/8 e.c.f. **(c) (i)**	[1]
			275 (counts / min) e.c.f. **(c) (i)**	[1]

(d) (i) any two from:
emissions (from radioactive substances) are ionising
(ionising) radiation can damage cells / body tissue / burns
risk of cancer
risk of radiation sickness
risk of mutations / damage to offspring [max 2]

(ii) any two different examples from:
use of gloves
tweezers
lead / concrete
maintain distance
minimise exposure time [max 2]

Cambridge Assessment International Education

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CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

0123456789

PHYSICS **0625/03**

Paper 3 Theory (Core) **For examination from 2020**

SPECIMEN PAPER

1 hour 15 minutes

Candidates answer on the question paper.

No additional materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m/s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **20** printed pages.

1 Fig. 1.1 shows how the speed of an object varies during a period of 30 s.

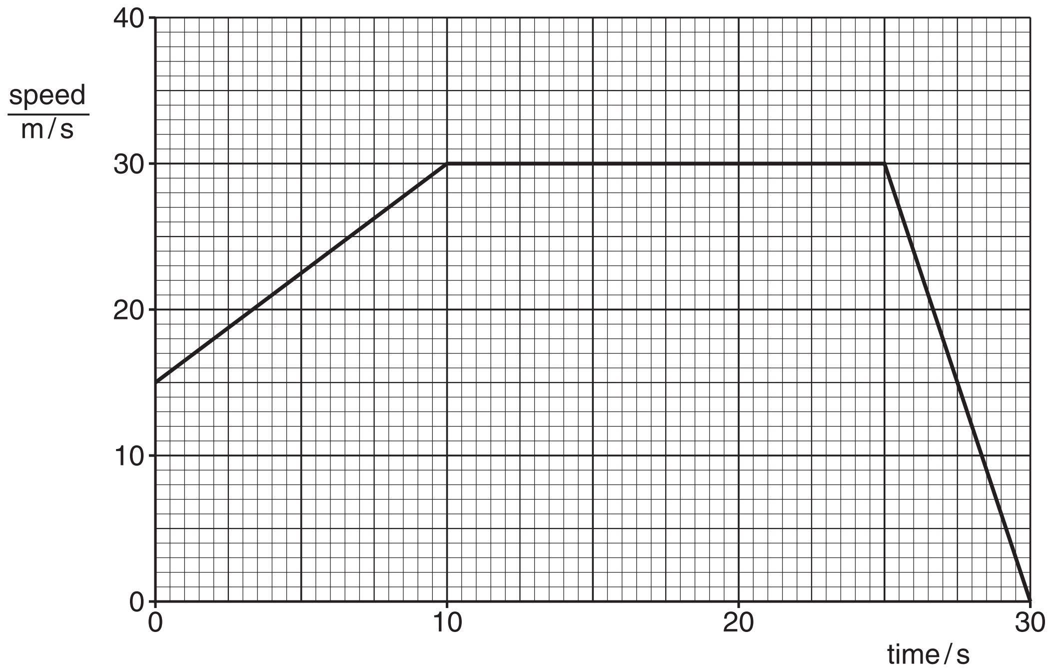

Fig. 1.1

(a) State the speed of the object

(i) at the start, time = 0 s,

speed = ... m/s

(ii) at the end, time = 30 s.

speed = ... m/s
[2]

(b) Describe what, if anything, is happening to the speed during the period 10 s to 25 s.

.... [1]

(c) Determine the distance travelled in the last 5 s.

distance = ... m [3]

(d) The total distance travelled during the 30 s is 750 m.

Calculate the average speed of the object during the 30 s.

average speed = ... m / s [3]

[Total: 9]

2 The car in Fig. 2.1 is on a level road.

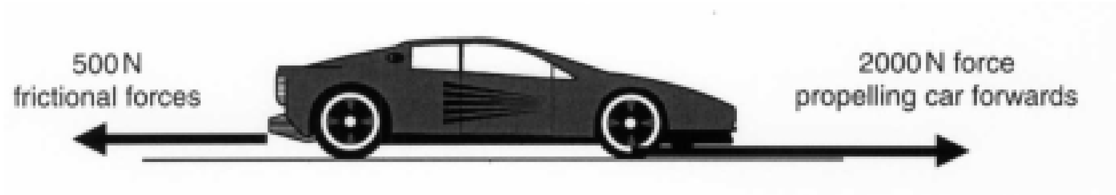

Fig. 2.1

(a) Calculate the magnitude of the resultant force on the car.

resultant force = ... N [1]

(b) Tick the box below that describes the motion of the car.

☐ travels forward at constant speed

☐ travels forward with increasing speed

☐ travels forward with decreasing speed

☐ travels backward at constant speed

☐ travels backward with increasing speed

☐ travels backward with decreasing speed

☐ remains at rest

[1]

(c) Later, the car is moving forwards and the frictional forces suddenly increase to 2500 N.
The forwards force remains constant at 2000 N.

Describe and explain what happens to the car.

....

.... [2]

(d) Suggest what might have caused the frictional forces in **(c)** to increase.

.... [1]

[Total: 5]

3 **(a)** In a laboratory experiment to find the centre of mass of a triangular piece of plastic, the plastic is freely suspended first from point A and then from point B, as shown in Figs. 3.1 and 3.2.

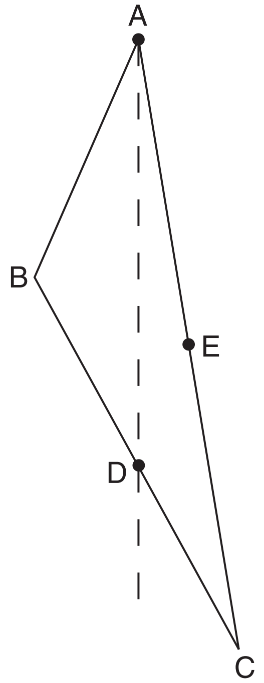

Fig. 3.1

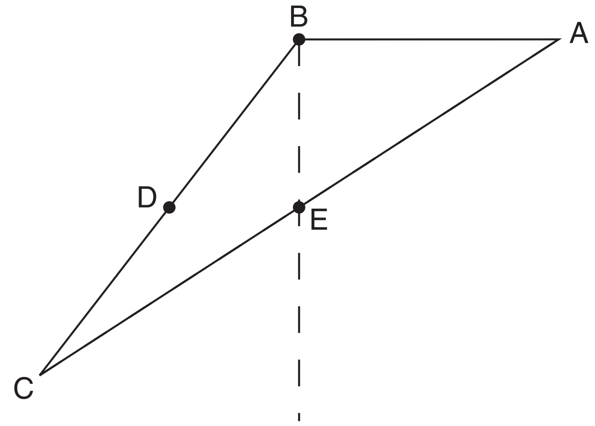

Fig. 3.2

When suspended from point A, point D is found to be vertically below A.

When suspended from point B, point E is vertically below B.

(i) What piece of apparatus might be used to determine the vertical lines from A and from B?

.... [1]

(ii) **On Fig. 3.3 below**, draw construction lines to find the position of the centre of mass of the piece of plastic. Label this point clearly with the letter G.

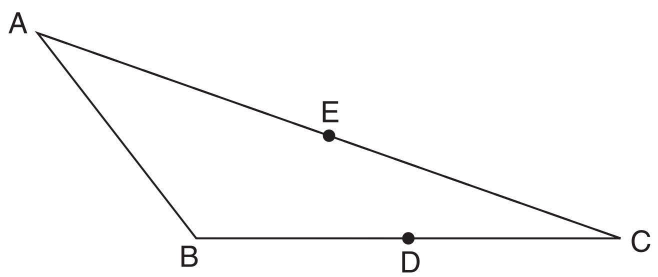

Fig. 3.3

[2]

(b) The piece of plastic has a mass of 120 g.

Calculate the weight of the piece of plastic.

weight = ... N [3]

[Total: 6]

4 **(a)** State what is meant by the *moment* of a force.

....

.... [1]

(b) A warehouse worker is about to close a large door, as shown in Fig. 4.1.

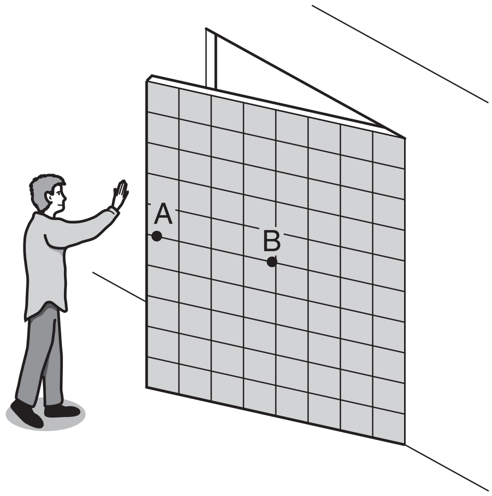

Fig. 4.1

(i) State, with a reason, which of the two positions, A or B, will enable him to close the door with least force.

....

....

.... [1]

(ii) On another occasion, with the door in the position shown in Fig. 4.1, two workers each push on the door with the same force at the same time. One worker pushes at A, from the side seen in Fig. 4.1. The other worker pushes at B, from the other side of the door.

Which way does the door move, if at all? Tick one box.

☐ the door closes

☐ the door opens

☐ the door remains in the same position

[1]

[Total: 3]

5 A student gently heats a sample of solid wax in a test-tube, as shown in Fig. 5.1. The temperature of the wax is measured every minute.

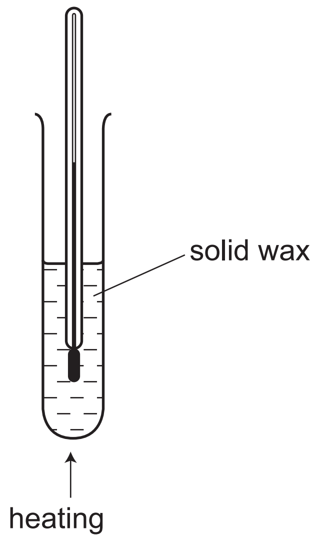

Fig. 5.1

(a) Describe the structure of the solid wax in terms of the arrangement and motion of the wax molecules.

....

....

.... [2]

(b) The student's data is shown below.

time / minutes	0	1	2	3	4	5	6	7	8	9	10
temperature / °C	35	40	45	49	50	50	50	50	50	53	56

Use the data to describe and explain what is happening to the wax during this period.

....

....

....

....

....

....

.... [5]

[Total: 7]

6 The owner of a small factory suggests installing a wind turbine to generate some of the electricity needed by the factory.

(a) Give one environmental reason for using a wind turbine.

.... [1]

(b) Discuss **three** of the factors that the owner will need to consider when deciding whether to install a wind turbine.

....

....

....

....

....

.... [4]

[Total: 5]

7 Fig. 7.1 shows a stationary pole vaulter holding a straight pole. Fig. 7.2 shows him during the vault with the pole bent.

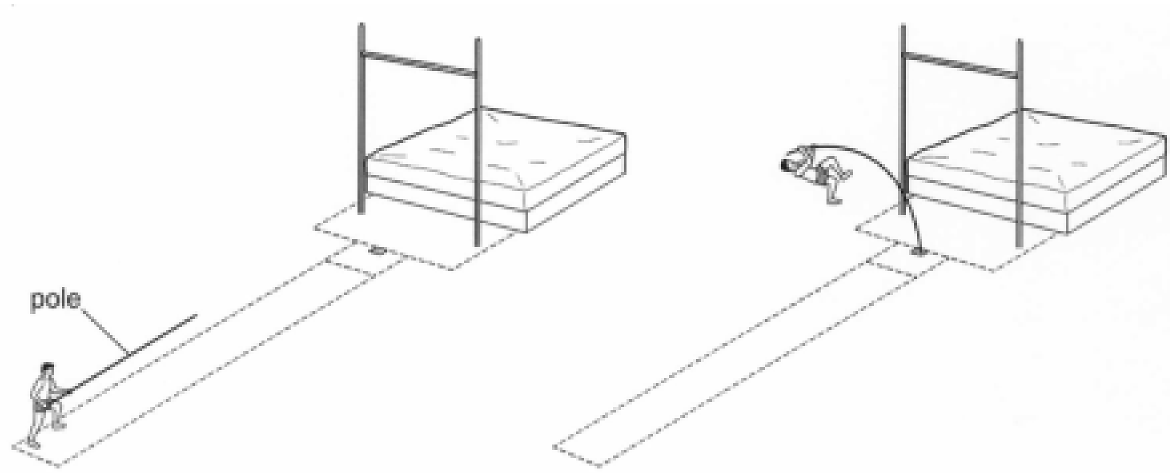

Fig. 7.1 **Fig. 7.2**

(a) Identify the energy changes that have taken place, for the pole vaulter and for the pole, between the situations shown in Figs. 7.1 and 7.2. State the evidence for these changes.

....

....

....

....

....

.... [4]

(b) The pole vaulter releases the pole and clears the bar.

Explain how the principle of conservation of energy applies as he falls from his maximum height.

....

....

.... [2]

[Total: 6]

8 A man looks at his reflection in a vertical mirror. This is shown from the side in Fig. 8.1.

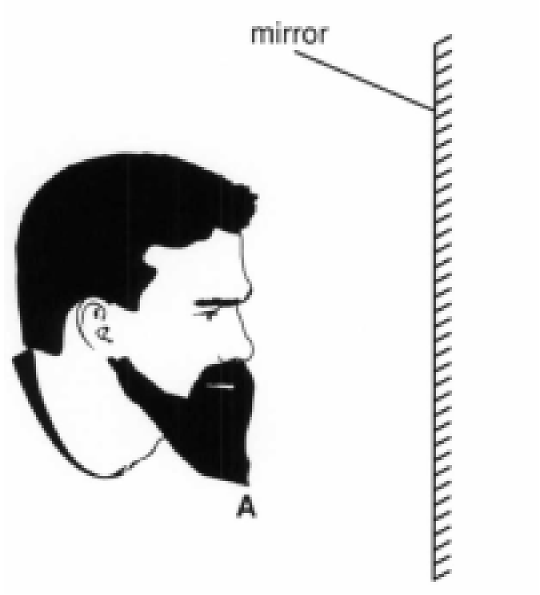

Fig. 8.1

(a) On Fig. 8.1, accurately mark with a **clear cross** where the image of the tip **A** of the man's beard will be. Label the cross **B**. [2]

(b) On Fig. 8.1, accurately draw a ray from the tip of the man's beard that reflects from the mirror and goes into his eye. Use arrows to show the direction of the ray. [2]

(c) On Fig. 8.1, mark the angles of incidence and reflection at the mirror using the letters *i* and *r*. [1]

[Total: 5]

9 Fig. 9.1 represents the regions of the electromagnetic spectrum.

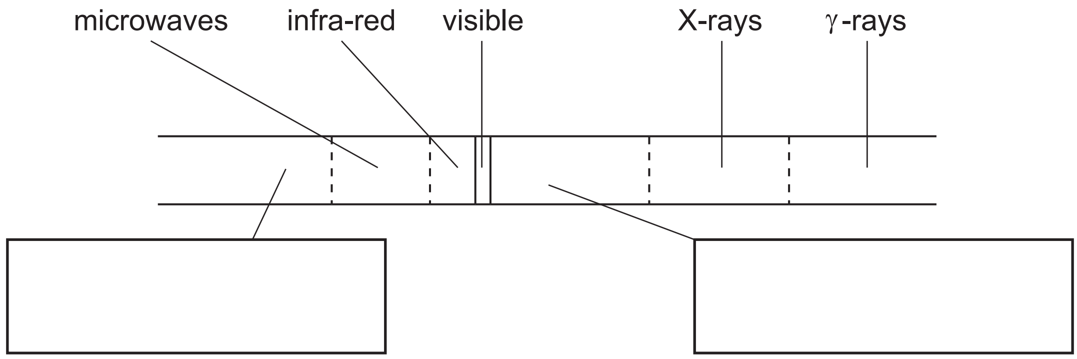

Fig. 9.1

(a) Two of the regions have not been named in Fig. 9.1.

In the two boxes below the spectrum, write the names of these regions. [2]

(b) Write "long wavelength" next to the long wavelength end of the electromagnetic spectrum. [1]

(c) State one use for the radiation of each of the following regions.

infra-red ....

γ-rays ....

[2]

[Total: 5]

10 **(a)** A student connects the circuit shown in Fig. 10.1.

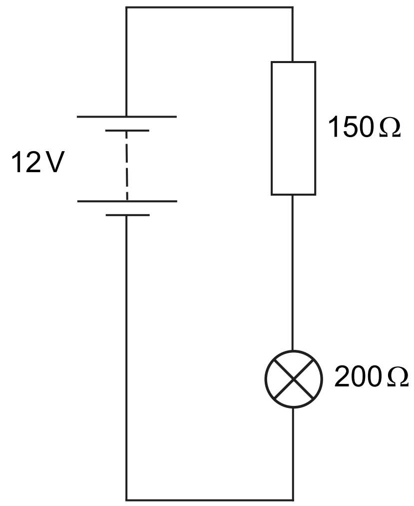

Fig. 10.1

(i) Calculate the current in the circuit.

current = ... [4]

(ii) Calculate the potential difference (p.d.) across the lamp.

p.d. = ... V [2]

(iii) Draw on Fig. 10.1 to suggest how the circuit may be modified so that the brightness of the lamp can be controlled. [1]

(b) The circuit is re-arranged as shown in Fig. 10.2.

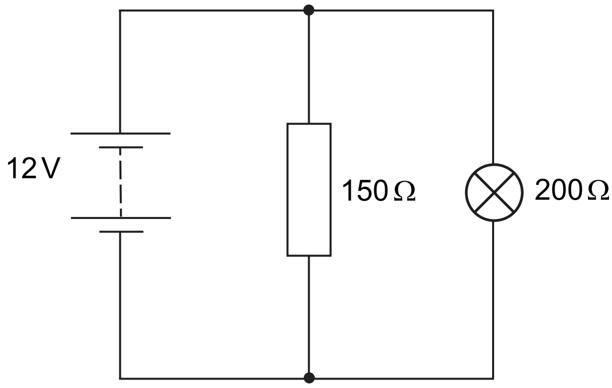

Fig. 10.2

(i) What word is used to describe this new arrangement of the components?

.... [1]

(ii) Predict and explain how the brightness of the lamp compares to the lamp in Fig. 10.1.

....

....

.... [2]

[Total: 10]

11 (a) Fig. 11.1 represents a permanent magnet.

Fig. 11.1

(i) Carefully draw on Fig. 11.1 to show the pattern and direction of magnetic field lines around the magnet. [2]

(ii) What is an *electromagnet*?

....

.... [1]

(b) An iron bar has many turns of wire wrapped around it, as shown in Fig. 11.2. The wire is connected to an alternating current supply. Some more wire is made into a flat coil and connected across a low voltage lamp.

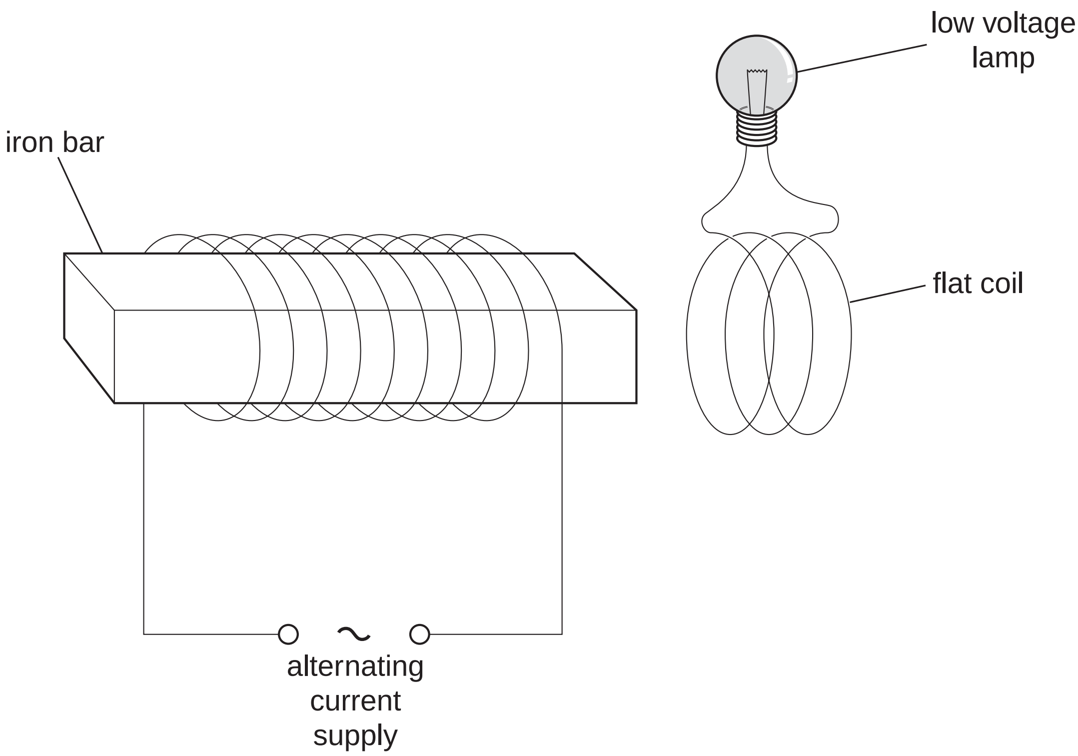

Fig. 11.2

(i) Explain how alternating current (a.c.) is different from direct current (d.c.).

....

.... [1]

(ii) When the flat coil is held close to the end of the iron bar, the lamp glows.

Explain why this happens.

....

....

....

....

.... [3]

[Total: 7]

12 **(a)** What is meant by *radioactive decay*?

....

....

.... [2]

(b) Fig. 12.1 shows two samples of the same radioactive substance. The substance emits β-particles.

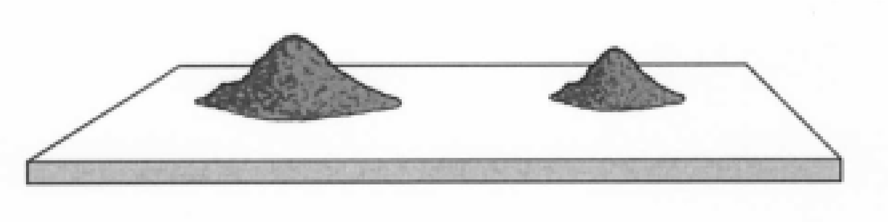

Fig. 12.1

Put a tick alongside any of the following quantities which is the same for both samples.

☐ the half-life

☐ the mass

☐ the number of atoms decaying each second

☐ the number of β-particles emitted each second

[1]

(c) Fig. 12.2 shows the decay curve for a particular radioactive substance.

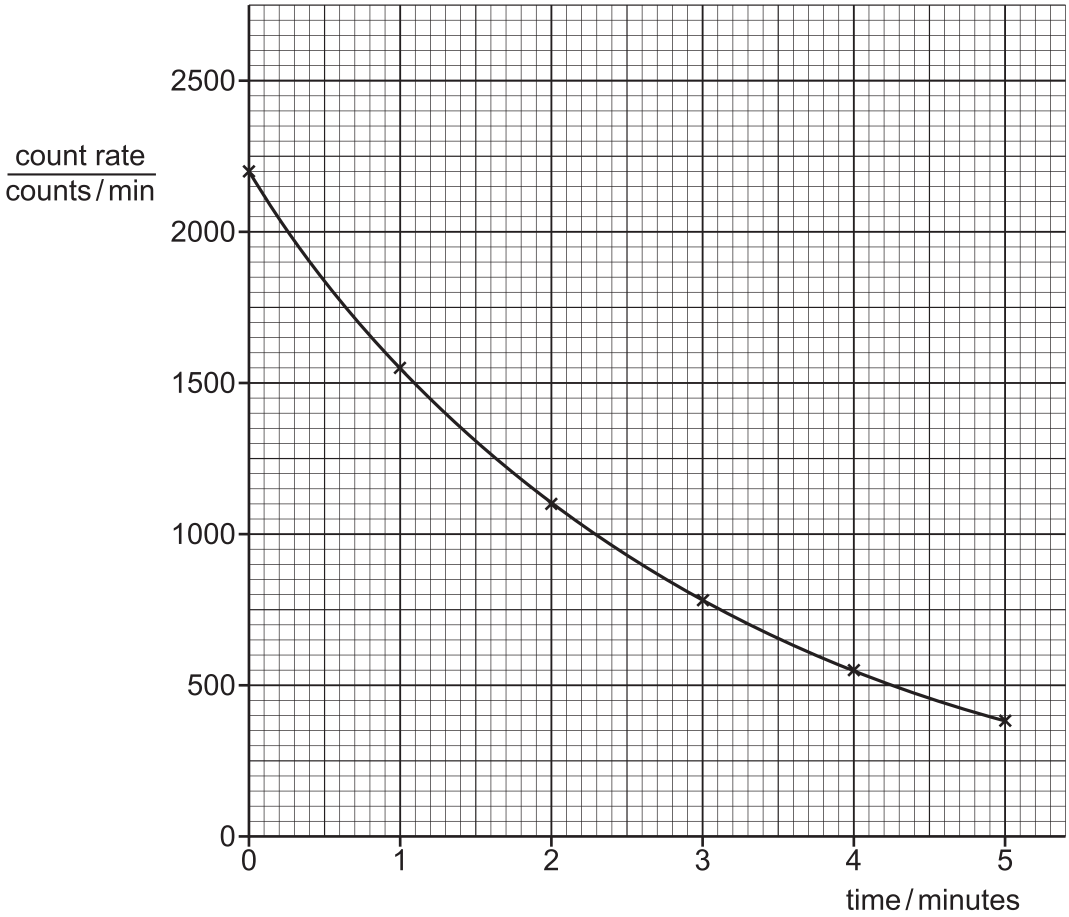

Fig. 12.2

(i) Select and use numbers from the graph to deduce the half-life of the radioactive substance.

half-life = ... minutes [3]

(ii) Predict the value of the count rate at a time of 6 minutes from the start of the measurements. Show your working.

count rate = ... counts/min [2]

(d) People handling radioactive substances need to take certain safety precautions.

(i) Explain why safety precautions are necessary.

....

.... [2]

(ii) State **two** safety precautions used by people handling radioactive substances.

1. ....

2. ....

[2]

[Total: 12]

Cambridge IGCSE®

PHYSICS **0625/04**

Paper 4 Theory (Extended) **For examination from 2020**

MARK SCHEME

Maximum Mark: 80

Specimen

This document consists of **6** printed pages.

mark scheme abbreviations

( )	the word, phrase or unit in brackets is not required but is in the mark scheme for clarification
accept	accept the response
AND	both responses are necessary for the mark to be allowed
c.a.o.	correct answer only
e.c.f.	error carried forward; marks are awarded if a candidate has carried an incorrect value forward from earlier working, provided the subsequent working is correct
ignore	this response is to be disregarded and does not negate an otherwise correct response
NOT	do not allow
note:	additional marking guidance
/ OR	alternative responses for the same marking point
owtte	or words to that effect
<u>underline</u>	mark is not allowed unless the underlined word or idea is used by candidate
units	there is a maximum of one unit penalty per question unless otherwise indicated
any [number] from:	accept the [number] of valid responses
max	indicates the maximum number of marks

1	(a)	speed × time in any form, symbols, numbers or words OR any area under graph used or stated	[1]
		13 (m/s) OR 24 (s) seen or used in correct context	[1]
		312 m (2 or 3 sig. figs.)	[1]
	(b)	rate of change of speed OR gradient of graph OR 18/12	[1]
		18 (m/s) OR 12 (s) seen or used in correct context	[1]
		1.5 m/s^2	[1]
	(c)	same gradient / slope OR equal speed changes in equal times OR allow graph symmetrical	[1]
2	(a)	*mgh* OR 36 × 10 × 2.4	[1]
		864 J OR N m (2 or 3 sig. figs.)	[1]
	(b)	(*P* =) *E*/*t* in any form, words, symbols or numbers OR 864 / 4.4	[1]
		196 W OR J / s (2 or 3 sig. figs.)	[1]
	(c)	evidence that candidate understands the principle of energy conservation, expressed in words or as an equation (e.g. total energy is constant OR initial energy = final energy) or implied by statement accounting for difference	[1]
		some energy is dissipated into the surroundings OR difference due to increase in internal energy/heating/thermal energy (of belt, motor, surroundings) owtte note: do not accept kinetic energy / sound / friction if no mention of heating	[1]
	(d)	increase in potential energy of mass is greater OR work done/energy used (to raise mass) is greater	[1]
		t = *E*/*P* OR *P* = *E*/*t* in any form, words or symbols AND power is constant	[1]
		speed reduced / time taken is longer	[1]
3	(a)	*p* = *mv* in any form, words or symbols	[1]
		0.16 kg m / s OR N s	[1]
	(b)	use of principle of conservation of momentum in words, symbols or numbers	[1]
		use of combined mass 0.5(0) + 0.3(0) OR 0.8(0) (kg)	[1]
		0.2(0) m / s	[1]

4 **(a)** three valid features listed without explanation [1]

any three features <u>explained</u> from:

copper/metal is a <u>good</u> conductor (of heat)
NOT of electricity

black is <u>good</u> absorber/<u>bad</u> reflector
ignore emitter

insulating material will <u>reduce</u> heat lost/conducted away (from pipes/sheet)
NOT <u>prevents</u> heat loss owtte

glass/trapping of air reduces/prevents convection/warm air being blown away

glass produces greenhouse effect/reference to far and near I.R. [max 3]

(b) 38 – 16 OR 22 [1]
$mc\theta$ OR 250 × 4200 × candidate's temperature difference [1]
2.31×10^7 (J) e.c.f. from previous line [1]
9.24×10^7 J OR e.c.f. from previous line × 4 correctly evaluated [1]
no unit penalty if J seen anywhere in **(b)** clearly applied to an energy

(c) valid <u>explanation</u> relating to at least one of the reasons below: [1]
note: if no explanation, this mark is not awarded even if more than three reasons are given

any three reasons from:
which direction roof faces
estimate output of panels
household needs / whether household will use all hot water
cost of panel / installation
time to recoup cost
whether roof is shaded
relevant environmental consideration (e.g. not using wood or other fuel to heat water) [max 3]

(d) nuclei join together, accept hydrogen for nuclei
to produce a different element / helium (and energy) [2]

5 **(a)** **(i)** any one from:
(molecules) move randomly / in random directions
(molecules) have high speeds
(molecules) collide with each other / with walls [max 1]

(ii) collisions with walls/rebounding causes change in momentum (of molecules) [1]
force is rate of change of momentum / force needed to change momentum [1]

(b) **(i)** $p_1V_1 = p_2V_2$ OR 300 × 100 (× 0.12) = p_2 × 0.40 (× 0.12) [1]

750 kPa [1]

(ii) (molecules) collide with walls more often owtte
OR more collisions with walls per second or per unit time owtte [1]
greater force per unit area [1]

6 **(a)** clear attempt at semi circles, at least 3 [1]
same wavelength as incoming wavefronts, by eye [1]

(b) speed ÷ wavelength or 20 ÷ 2.5 or $v = f\lambda$ [1]
8 Hz or 8 s^{-1} or 8 waves/second [1]

(c) candidate's **(b)** OR "the same" OR nothing [1]

(d) low frequency signals have longer wavelength (than high frequency signals) OR
high frequency signals have shorter wavelength [1]

low frequency signals / long wavelength signals diffract more OR
low frequency / short wavelength signals diffract less [1]

7 **(a)** rheostat/<u>variable</u> resistor AND
control/vary/change/ limit the current /resistance/power/ voltage <u>across heater</u> [1]

(b) (I =) P/V any form, words or numbers [1]
(I =) 1.25 (A) seen anywhere [1]
(V =) 6.0 – 3.6 OR 2.4 seen anywhere [1]
(R =) V/I in any form words or numbers [1]
1.92 Ω (2 or 3 sig. figs.) [1]
note: credit will also be given for alternative approaches

(c) battery running down/going flat/energy <u>of battery</u> used up OR V or e.m.f. less
OR more/increasing resistance (of heater) NOT resistance of X increases [1]
use of relationship between I and V or R OR the current decreases [1]

8 **(a)** output of A: 1, 1, 0, 0 c.a.o. [1]
output of B: 0, 1, 0, 0 e.c.f. from candidate's output of A [1]

(b) dark AND hot owtte
note: must be consistent with answer to **(a)** [1]

(c) B cannot provide enough power / current for lamp, or equivalent
OR allows remote lamp [2]
note: statement of function of a relay without reference to context gains 1 mark

9 **(a)** electrons / negative charges <u>move</u> towards the rod / to R (ignore just "attracted")
ignore any mention of positive charges moving
any mention of positive electrons = 0 [1]

(b) negative charges (are) close(r) (to the rod) [1]
attraction between opposite charges greater than repulsion between like charges [1]

(c) coulomb [1]

10 γ rays [1]
(γ rays) detected at B [1]
(γ rays) not deflected by field / not charged [1]
charged particles / β particles (accept α for charged particles) [1]
β particles detected at C [1]
reference to direction of deflection / LH rule [1]
no α-particles OR only background detected at A [1]

11 **(a)** top bent down to R of layer [1]
middle straight on [1]
bottom deflected back to left [1]

(b) **(i)** deflection greater than 90°/the bottom one [1]

(ii) positive ignore numbers [1]

(iii) nothing/vacuum/space/electrons [1]

(c) 2 AND 2 [1]

Cambridge Assessment International Education

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CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

PHYSICS **0625/04**

Paper 4 Theory (Extended) **For examination from 2020**

SPECIMEN PAPER

1 hour 15 minutes

Candidates answer on the question paper.

No additional materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m / s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **17** printed pages and **1** blank page.

1 Fig. 1.1 shows the speed-time graph for a car travelling along a straight road.

The graph shows how the speed of the car changes as the car passes through a small town.

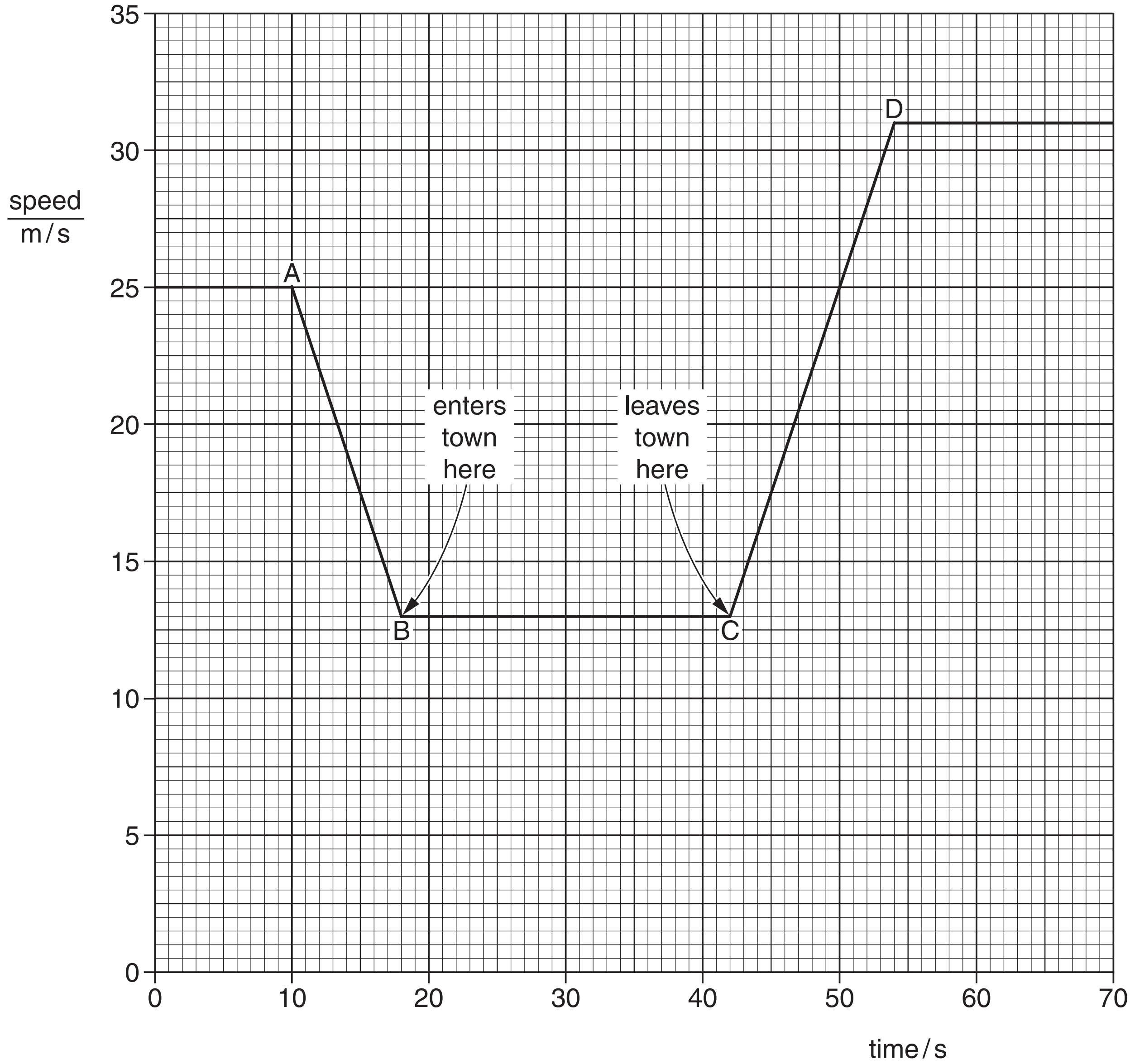

Fig. 1.1

(a) Calculate the distance between the start of the town and the end of the town.

distance = ... [3]

(b) Calculate the acceleration of the car between C and D.

acceleration = ... [3]

(c) State how the graph shows that the deceleration of the car has the same numerical value as its acceleration.

....

.... [1]

[Total: 7]

2 Fig. 2.1 shows a conveyor belt transporting a package to a raised platform. The belt is driven by a motor.

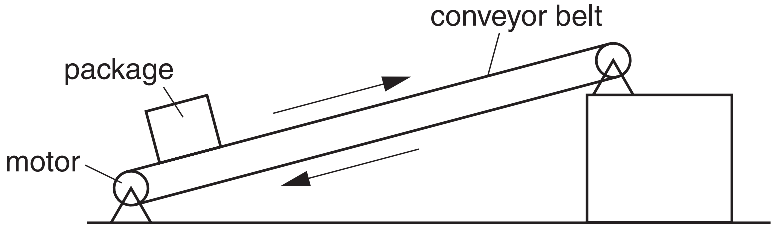

Fig. 2.1

(a) The mass of the package is 36 kg.

Calculate the increase in the gravitational potential energy (g.p.e.) of the package when it is raised through a vertical height of 2.4 m.

increase in g.p.e. = ... [2]

(b) The package is raised through the vertical height of 2.4 m in 4.4 s.

Calculate the power needed to raise the package.

power = ... [2]

(c) The electrical power supplied to the motor is much greater than the answer to **(b)**.

Explain how the principle of conservation of energy applies to this system.

....

....

.... [2]

(d) Assume that the power available to raise packages is constant. A package of mass greater than 36 kg is raised through the same height.

Suggest and explain the effect of this increase in mass on the operation of the conveyer belt.

....

....

....

....

.... [3]

[Total: 9]

3 The engine of an unpowered toy train is rolling at a constant speed on a level track, as shown in Fig. 3.1. The engine collides with a stationary toy truck, and joins with it.

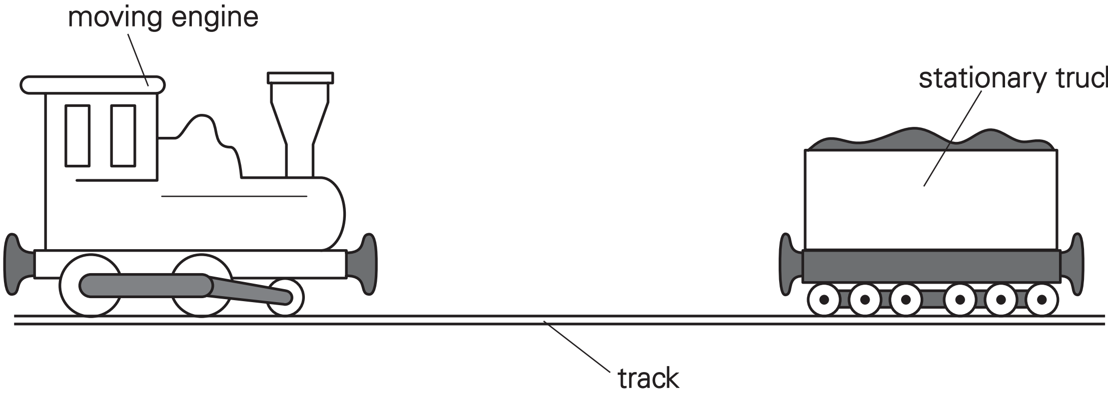

Fig. 3.1

Before the collision, the toy engine is travelling at 0.32 m/s. The mass of the engine is 0.50 kg.

(a) Calculate the momentum of the toy engine before the collision.

momentum = ... [2]

(b) The mass of the truck is 0.30 kg.

Using the principle of conservation of momentum, calculate the speed of the joined engine and truck immediately after the collision.

speed = ... [3]

[Total: 5]

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4 A solar panel is mounted on the roof of a house. Fig. 4.1 shows a section through part of the solar panel.

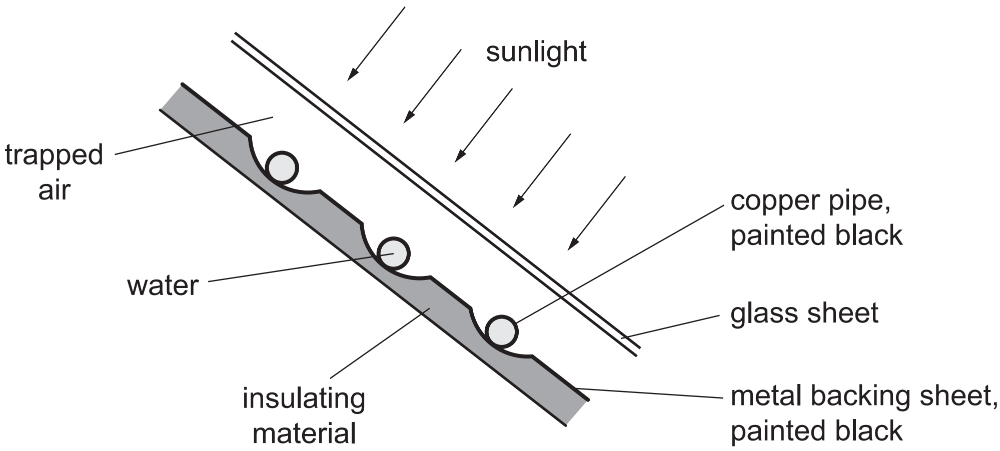

Fig. 4.1

A pump makes water flow through the copper pipes. The water is heated by passing through the solar panel.

(a) Select and explain **three** features of the solar panel that maximise the final temperature of the water.

....

....

....

....

....

....

....

....

.... [4]

(b) During one day, 250 kg of water is pumped through the solar panel. The temperature of this water rises from 16 °C to 38 °C.

The water absorbs 25 % of the energy incident on the solar panel. The specific heat capacity of water is 4200 J / (kg °C).

Calculate the energy incident on the solar panel during that day.

energy = ... [4]

(c) The solar panel in Fig. 4.1 is designed to heat water.

A person is deciding whether to install solar panels on her house.

List and explain **three** pieces of information she needs to consider in order to make her decision.

....

....

....

....

....

....

.... [4]

(d) The Sun releases energy as a result of nuclear fusion.

State the meaning of *nuclear fusion*.

....

.... [2]

[Total: 14]

5 Fig. 5.1 shows a gas contained in a cylinder enclosed by a piston.

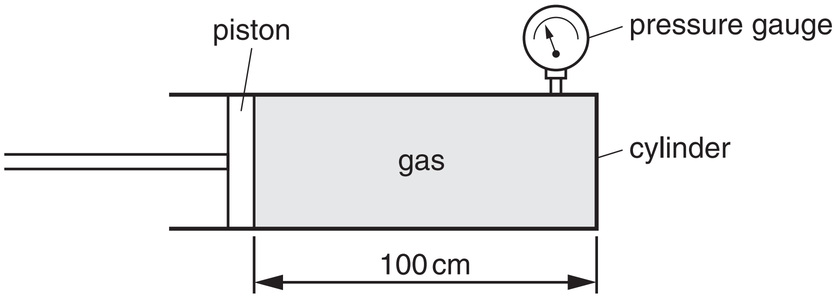

Fig. 5.1

At first, the length of cylinder containing the gas is 100 cm. The pressure of the gas, shown by the pressure gauge, is 300 kPa. The area of cross-section of the cylinder is $0.12\,m^2$.

(a) (i) Describe the motion of the molecules of the gas.

....

....

.... [1]

(ii) Use the idea of momentum to explain how the molecules exert a force on the walls of the cylinder.

....

....

....

.... [2]

(b) The piston is moved so that the new length of cylinder occupied by the gas is 40 cm. The temperature of the gas is unchanged.

(i) Calculate the new pressure of the gas.

pressure = ... [2]

(ii) Explain, in terms of the behaviour of the molecules, why the pressure has changed.

....

....

.... [2]

[Total: 7]

6 Fig. 6.1 shows a scale drawing of plane wavefronts approaching a gap in a barrier.

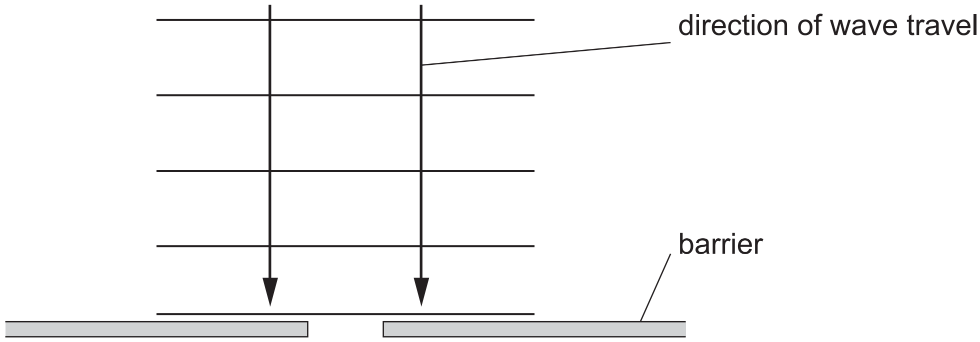

Fig. 6.1

(a) On Fig. 6.1, draw the pattern of the wavefronts after the wave has passed through the gap. [2]

(b) The wave approaching the barrier has a wavelength of 2.5 cm and a speed of 20 cm/s.

Calculate the frequency of the wave.

frequency = ... [2]

(c) State what happens, if anything, to the frequency of the wave as it passes through the gap.

.... [1]

(d) Explain, in terms of diffraction, why a car radio may pick up low frequency radio signals but not pick up high frequency radio signals when the car is travelling behind a hill.

....

....

.... [2]

[Total: 7]

7 The circuit of Fig. 7.1 includes an immersion heater and a 6.0 V battery.

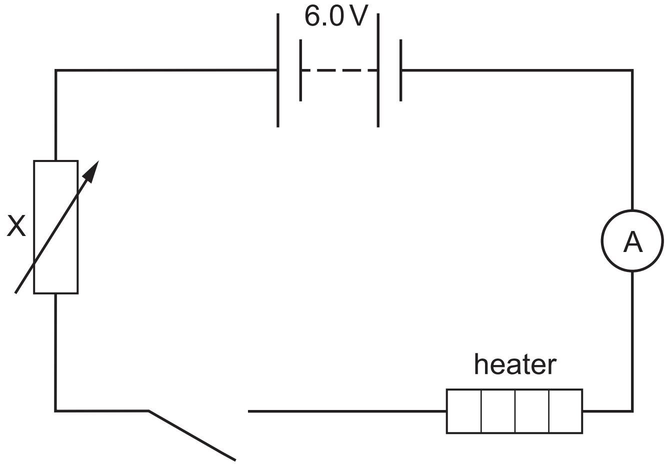

Fig. 7.1

(a) State the name and purpose of component X.

name ....

purpose ....
[1]

(b) The heater is designed to work from a 3.6 V supply. It has a power rating of 4.5 W at this voltage.

By considering the current in the heater, calculate the resistance of component X when there is the correct potential difference across the heater.

resistance = ... [5]

(c) Some time after the heater is switched on, the ammeter reading is seen to have decreased.

Suggest why this happens.

....

.... [2]

[Total: 8]

8 Fig. 8.1 is a schematic diagram of an electronic circuit controlling a lamp.

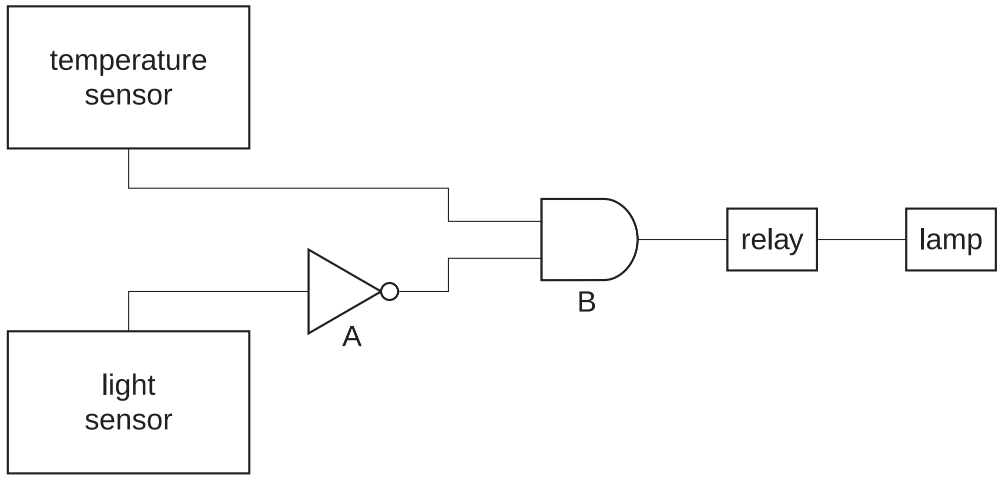

Fig. 8.1

The output of the temperature sensor is high (logic 1) when it detects raised temperatures. The output of the light sensor is high (logic 1) when it detects raised light levels.

The lamp is lit when the input to the relay is high (logic 1).

(a) Complete the truth table by giving the outputs of A and B.

output of light sensor	output of temperature sensor	output of A	output of B
0	0		
0	1		
1	0		
1	1		

[2]

(b) State the conditions under which the lamp is lit.

.... [1]

(c) Suggest why B is connected to a relay, rather than directly to the lamp.

....

.... [2]

[Total: 5]

9 A plastic rod is rubbed with a cloth and becomes positively charged. After charging, the rod is held close to the suspended table-tennis ball shown in Fig. 9.1. The table-tennis ball is covered with metal paint and is uncharged.

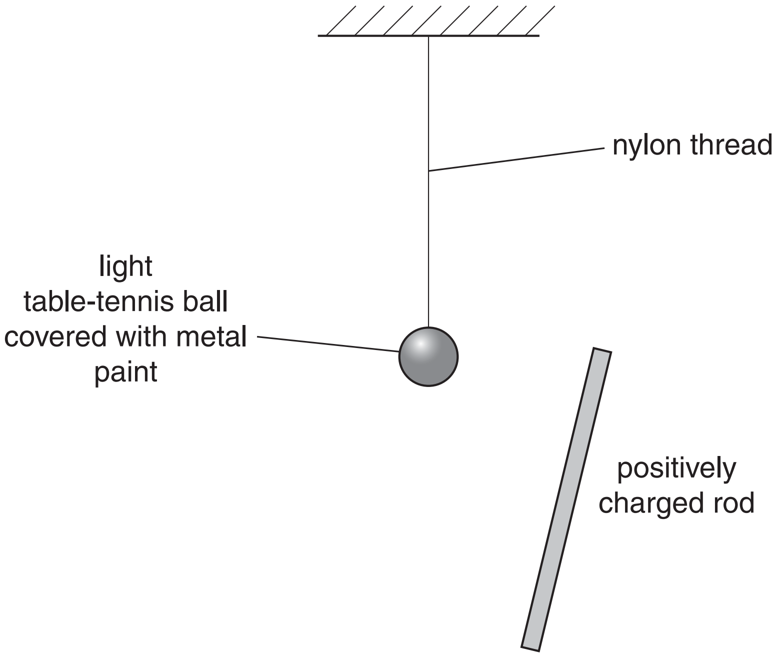

Fig. 9.1

(a) Describe what happens to the charges in the metal paint on the ball as the positively charged rod is brought close to the ball.

....

....

.... [1]

(b) The ball is attracted towards the charged rod.

Explain why this happens, given that the ball is uncharged.

....

....

.... [2]

(c) State the unit in which electric charge is measured.

.... [1]

[Total: 4]

10 Emissions from a radioactive source pass through a hole in a lead screen and into a magnetic field, as shown in Fig. 10.1. The experiment is carried out in a vacuum.

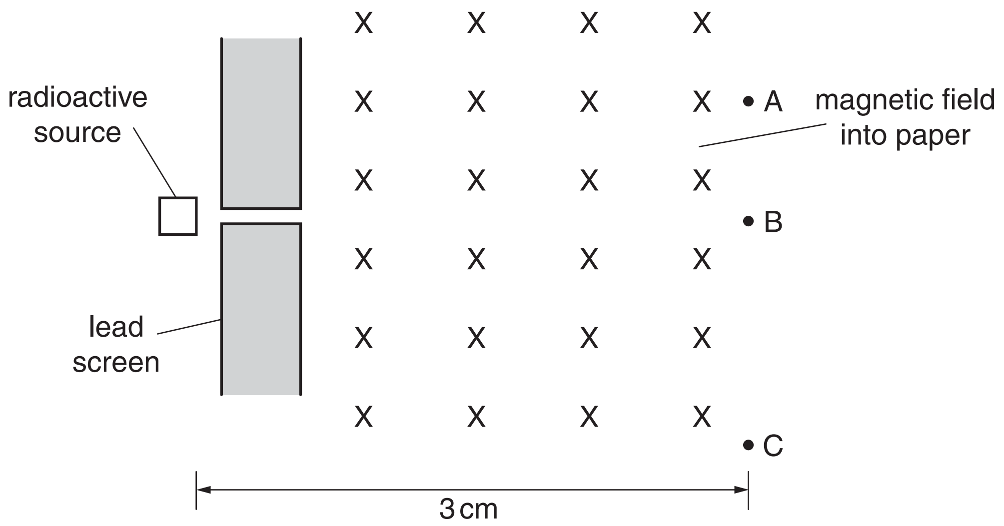

Fig. 10.1

Radiation detectors are placed at A, B and C. They give the following readings:

A	B	C
32 counts / min	543 counts / min	396 counts / min

The radioactive source is then completely removed, and the readings become:

A	B	C
33 counts / min	30 counts / min	31 counts / min

From the data given for positions A, B and C, deduce the type of emissions coming from the radioactive source. Explain your reasoning.

....

....

....

....

....

....

....

....

.... [7]

[Total: 7]

11 In Geiger and Marsden's α-particle scattering experiment, α-particles were directed at a very thin gold foil.

Fig. 11.1 shows five of the nuclei of the atoms in one layer in the gold foil. Also shown are the paths of three α-particles directed at the foil.

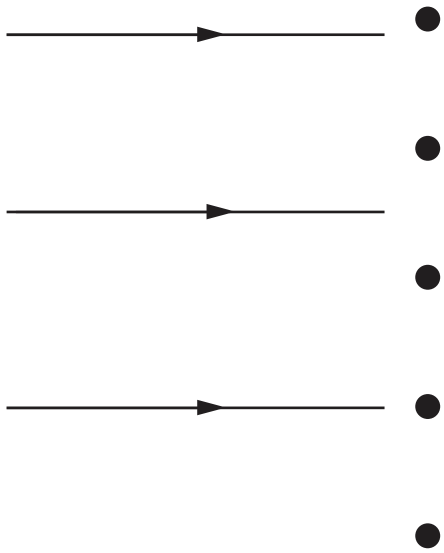

Fig. 11.1

(a) On Fig.11.1, complete the paths of the three α-particles. [3]

(b) (i) State the result of the experiment that shows that an atom consists of a very tiny, charged core, containing almost all the mass of the atom.

....

.... [1]

(ii) State the sign of the charge on this core. .... [1]

(iii) State what occupies the space between these charged cores.

.... [1]

(c) The nuclide notation for an α-particle is ${}^{4}_{2}\alpha$.
State the number of protons and neutrons in an α-particle

protons = ...

neutrons = ... [1]

[Total: 7]

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CANDIDATE NAME												
CENTRE NUMBER							CANDIDATE NUMBER					

PHYSICS **0625/05**

Paper 5 Practical Test **For examination from 2020**

SPECIMEN PAPER

1 hour 15 minutes

Candidates answer on the question paper.

Additional materials: As listed in the confidential instructions.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **9** printed pages and **1** blank page.

1 In this experiment, you will determine the mass of a load using a balancing method.

Carry out the following instructions referring to Fig. 1.1.

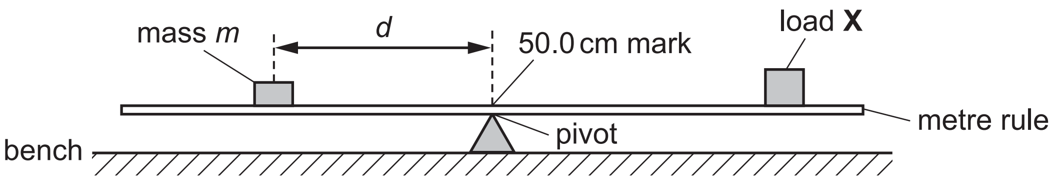

Fig. 1.1

The load **X** has been taped to the metre rule so that its centre is exactly over the 90.0 cm mark. **Do not move this load.**

(a)
- Place a mass of 40 g on the rule and adjust its position so that the rule is as near as possible to being balanced with the 50.0 cm mark exactly over the pivot as shown in Fig. 1.1.
- Record in Table 1.1 the distance *d* from the centre of the 40 g mass to the 50.0 cm mark on the rule.
- Repeat the steps above using masses of 50 g, 60 g, 70 g and 80 g to obtain a total of five sets of readings. Record the readings in the table.
- For each value of *d* calculate $\frac{1}{d}$ and enter the values in the table.

Table 1.1

m / g	d / cm	$\frac{1}{d} \Big/ \frac{1}{\text{cm}}$
40		
50		
60		
70		
80		

[3]

(b) State how you overcame **one** difficulty you had in obtaining accurate results.

....

....

.... [2]

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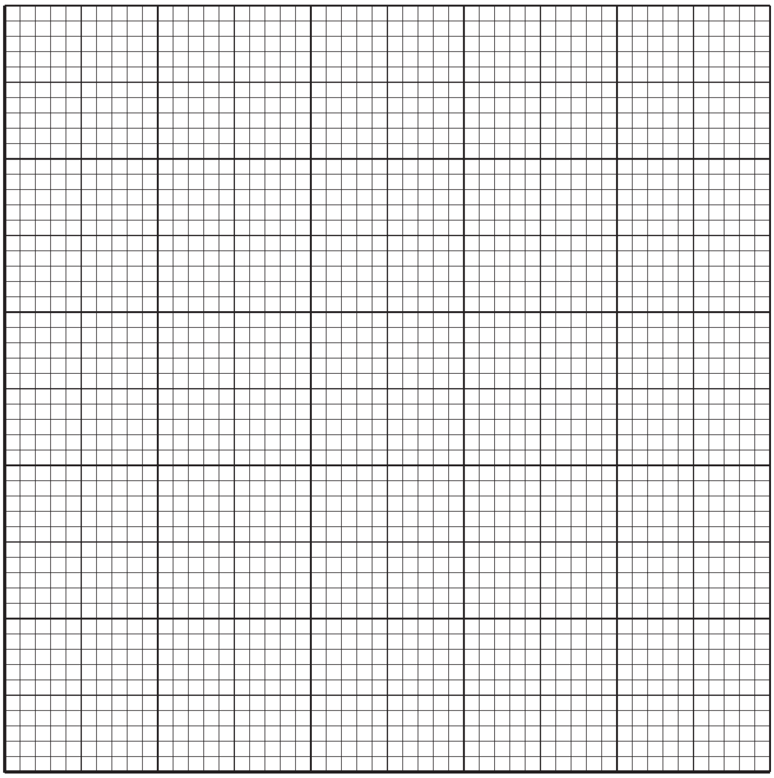
(c) Plot a graph of m/g (y-axis) against $\frac{1}{d}\Big/\frac{1}{\text{cm}}$ (x-axis).



[4]

(d) Determine the gradient G of the graph. Show clearly on the graph how you obtained the necessary information.

G = ... [1]

(e) Determine the mass μ, in grams, of the load **X**. Use the equation $\mu = \frac{G}{40.0}$.

μ = ...g [1]

[Total: 11]

2 In this experiment, you will investigate the effect of a layer of cotton wool on the cooling of water in a test-tube.

(a) Carry out the following instructions referring to Fig. 2.1. You are provided with a supply of hot water.

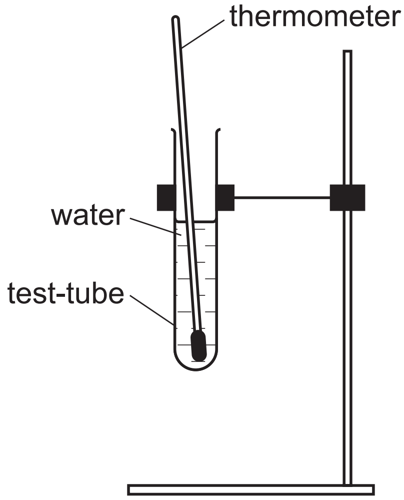


Fig. 2.1

- Pour hot water into the test-tube until it is about two thirds full of water. Place the thermometer in the water.
- When the thermometer reading stops rising, measure the temperature θ of the water in the test-tube and immediately start the stopclock. Record θ in Table 2.1 at time t = 0 s.
- Record in the table the temperature θ of the water every 30 s until you have a total of seven readings.
- Remove the thermometer and pour away the water from the test-tube. Wrap the cotton wool around the test-tube and secure it with the elastic bands. Repeat the steps above.
- Complete the time and temperature column headings in the table.

Table 2.1

t /	tube without cotton wool θ /	tube with cotton wool θ /
0		
30		
60		
90		
120		
150		
180		

[3]

(b) Write a conclusion to this investigation, stating in which experiment the cooling was more rapid. Explain your answer by reference to your readings and any relevant science.

....

....

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....

....

.... [3]

(c) Discuss the quality of your results, and suggest **two** improvements to the experiment which would allow a more certain conclusion to be drawn.

quality of results: ....

....

improvements: ....

....

....

....
[3]

(d) This experiment is being carried out by students in many different countries, using identical apparatus.

Suggest **two** differences in the conditions in the various laboratories that might lead to differences in their results.

1. ....

2. ....
[2]

[Total: 11]

3 In this experiment, you will investigate the effect of the length of resistance wire in a circuit on the potential difference across a lamp.

The circuit has been set up for you.

(a) Fig. 3.1 shows the circuit without the voltmeter.

Draw on the circuit diagram the voltmeter as it is connected in the circuit. [2]

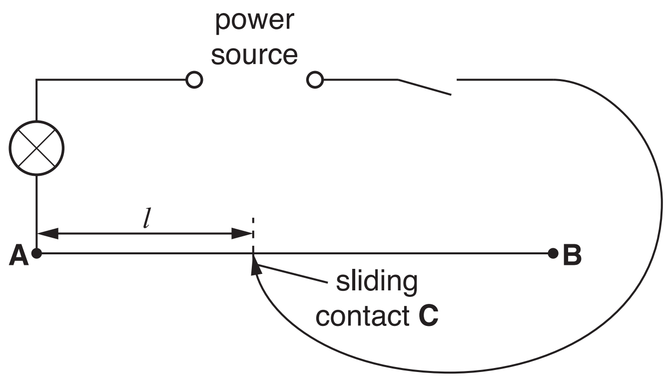

Fig. 3.1

(b) • Switch on and place the sliding contact **C** on the resistance wire at a distance l = 0.150 m from end **A**. Record the value of l and the potential difference V across the lamp in Table 3.1. Switch off.

• Repeat the instructions above using four different values of l to give a good range of data. Record all the values of l and V in Table 3.1.

Table 3.1

l / m	V / V

[4]

(c) How does increasing length l affect the brightness of the lamp?

.... [1]

(d) A student suggests that the potential difference V across the lamp is directly proportional to the length l of resistance wire in the circuit.

State whether you agree with this suggestion. Justify your answer by reference to your results.

statement ....

justification ....

....

....

[2]

(e) Suggest a practical reason why, if you were to repeat this experiment, the repeat readings may be slightly different from those you recorded in Table 3.1.

....

.... [1]

(f) State one safety precaution that you would take when carrying out experiments like this with resistance wires.

.... [1]

[Total: 11]

4 A student's plastic bottle of water tips over in class.

Plan an experiment to investigate how the quantity of water in a plastic bottle affects its stability.

The plastic bottle holds up to 2000 cm^3 of water and has a height of 42 cm.

Write a plan for the experiment, including:

- the apparatus needed
- instructions for carrying out the experiment
- the values you will use for the quantity of water
- how you will make sure your results are as accurate as possible
- the graph you will plot from your results

A diagram is not required, but you may add to Fig. 4.1, or draw your own diagram, if it helps to explain your plan.

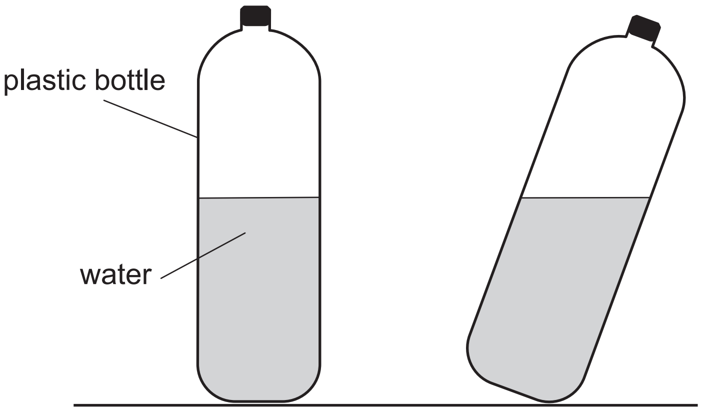

Fig. 4.1

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....[7]

[Total: 7]

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PHYSICS	**0625/05**
Paper 5 Practical Test	**For examination from 2020**
MARK SCHEME	
Maximum Mark: 40	

Specimen

This document consists of **4** printed pages.

mark scheme abbreviations

( )	the word, phrase or unit in brackets is not required but is in the mark scheme for clarification
accept	accept the response
AND	both responses are necessary for the mark to be allowed
c.a.o.	correct answer only
e.c.f.	error carried forward; marks are awarded if a candidate has carried an incorrect value forward from earlier working, provided the subsequent working is correct
ignore	this response is to be disregarded and does not negate an otherwise correct response
NOT	do not allow
note:	additional marking guidance
/ OR	alternative responses for the same marking point
owtte	or words to that effect
<u>underline</u>	mark is not allowed unless the underlined word or idea is used by candidate
units	there is a maximum of one unit penalty per question unless otherwise indicated
any [number] from:	accept the [number] of valid responses
max	indicates the maximum number of marks

1 **(a)** table:
5 d values in cm (all < 50), recorded to nearest mm [1]
d values 30.0, 24.0, 20.0, 17.1, 15.0 each to ± 1.0 cm [1]
1/d values correct (note: at least 2 significant figures) [1]

(b) any one difficulty and corresponding solution from:
rule won't balance exactly
allowing to tip one way then the other and take average

finding position of centre of the mass on the rule
marking centre of mass so it can be read against rule
OR take average of right hand and left hand readings for mass position

mass or rule slides
suitable means for preventing mass or rule sliding

OR other suitable difficulty and solution [max 2]

(c) graph:
axes labelled with quantity and unit [1]
scales suitable, plots occupying at least half grid [1]
plots all correct to ½ square (take centre of plot if large) [1]
well-judged thin line (≤ ½ square) [1]

(d) triangle <u>method</u> used and <u>shown</u> (any indication on graph) using at least half line (can be seen in calculation) [1]

(e) μ = 27 – 33 (g) to 2 or 3 significant figures [1]

2 **(a)** table:
t in s, both θ in ºC (words or symbols) [1]
both tubes temperatures decreasing and to consistent precision [1]
both tubes temperatures decreasing at decreasing rate [1]

(b) statement matches readings (expect tube without cotton wool cooled most rapidly OR no significant difference) [1]
justified by reference to temperature <u>differences</u> and <u>time</u> [1]
relevant science, consistent with readings and conclusion
(e.g. therefore cotton wool is a good/not a good insulator OR most cooling is due to convection or radiation etc.) [1]

(c) quality poor due to small temperature differences [1]

any two improvements from:
increase initial temperature of water
ensure initial temperatures are identical (if they weren't)
use a lid
stir to eliminate differences between top and bottom of the water
use thicker insulation
use more sensitive thermometer or datalogger [max 2]

(d) any two from:
laboratory temperature
draughts / open windows
accept temperature of hot water source [max 2]

3 **(a)** correct symbol [1]
correct position [1]

(b) table:
5 l values range at least 50 cm [1]
5 l values range at least 70 cm [1]
V values all < 2.5 V and decreasing with increasing length [1]
all *V* values to at least 0.1 V and same precision (same no. of decimal places) [1]

(c) (brightness) decreases (as length increases) [1]

(d) statement: no (must match readings) [1]
justification matches statement and by reference to results
e.g. V/l not constant, *V* increases as l decreases, *V* does not double when l doubles [1]

(e) any one from:
width of sliding contact
achieving exact same position on wire
accept heating changes resistance of wire
accept other sensible practical reason [max 1]
NOT human error

(f) do not touch (bare/hot) wire
OR do not allow C to touch terminal between lamp and supply [1]

4 apparatus:
measuring cylinder/jug OR ruler OR balance (to measure amount of water) [1]

protractor OR rule to measure height of raised surface
OR other means of measuring angle of tilt
OR newtonmeter to apply variable force
OR other method of applying quantifiable force [1]

instructions:
method of tilting or applying variable force and measuring point at which bottle topples [1]

attention to accuracy, any two from:
just starts to topple
slowly
repeats / more than 10 values for quantity of water
very large protractor
or any other suitable precaution which would improve accuracy of data [2]

values:
at least 5 values with range at least 1500 cm^3 or 30 cm or 1500 g, approximately evenly spaced [1]

graph:
plot of measured variable (angle or height or force) against quantity of water (volume or height or mass) (accept vice versa) [1]

Cambridge Assessment International Education

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PHYSICS **0625/06**

Paper 6 Alternative to Practical **For examination from 2020**

MARK SCHEME

Maximum Mark: 40

Specimen

This document consists of **4** printed pages.

mark scheme abbreviations

( )	the word, phrase or unit in brackets is not required but is in the mark scheme for clarification
accept	accept the response
AND	both responses are necessary for the mark to be allowed
c.a.o.	correct answer only
e.c.f.	error carried forward; marks are awarded if a candidate has carried an incorrect value forward from earlier working, provided the subsequent working is correct
ignore	this response is to be disregarded and does not negate an otherwise correct response
NOT	do not allow
note:	additional marking guidance
/ OR	alternative responses for the same marking point
owtte	or words to that effect
<u>underline</u>	mark is not allowed unless the underlined word or idea is used by candidate
units	there is a maximum of one unit penalty per question unless otherwise indicated
any [number] from:	accept the [number] of valid responses
max	indicates the maximum number of marks

1 **(a)** table:
at least 2 d values correct: 30.0, 24.2, 19.8, 17.2, 15.0 (cm) to $\pm$ 0.5 cm
(accept values 50–d) [1]
rule readings subtracted from 50 cm [1]
all 5 d values correct: 30.0, 24.2, 19.8, 17.2, 15.0 (cm) to $\pm$ 0.2 cm [1]
$1/d$ values correct (note: at least 2 significant figures) [1]

(b) any one difficulty and corresponding solution from:
difficulty obtaining balance as rule tips one way then the other
allow to tip one way then the other and take average

mass obscuring marks on rule
mark centre of the mass so it can be read against rule
OR take average of right hand and left hand readings for mass position

mass sliding off rule
OR rule sliding off pivot
suitable means for preventing mass or rule sliding [max 2]

(c) graph:
axes labelled with quantity and unit [1]
scales suitable, plots occupying at least half grid [1]
plots all correct to ½ square (take centre of plot if large) [1]
well-judged thin line (≤ ½ square) [1]

(d) triangle <u>method</u> used and <u>shown</u> (any indication on graph) using at least half line
(can be seen in calculation) [1]

(e) μ = 27 – 33 (g) to 2 or 3 significant figures [1]

2 **(a)** 23 (°C) [1]

(b) any one from:
wait for thermometer reading to stop rising
eye level with top of (mercury) thread owtte
stir water [max 1]

(c) s, °C, °C, words or symbols AND
30, 60, 90, 120, 150, 180 [1]

(d) uninsulated (owtte) OR no significant difference [1]
justified by reference to temperature <u>differences</u> and <u>time</u> [1]
relevant science, consistent with readings and conclusion
(e.g. therefore cotton wool is a good/not a good insulator OR most cooling is due to convection or radiation etc.) [1]

(e) quality poor due to small temperature differences [1]

any two improvements from:
increase initial temperature of water
ensure initial temperatures are identical
use a lid
stir to eliminate differences between top and bottom of the water
use thicker insulation
use more sensitive thermometer or datalogger [max 2]

(f) any two from:
laboratory temperature
draughts/open windows
accept temperature of hot water source [max 2]

(g) 5–50 cm^3 [1]

3 **(a)** correct symbol [1]
correct position [1]

(b) table:
1.68 (V) [1]

(c) (brightness) decreases (as length increases) [1]

(d) statement: no [1]
justification matches statement and by reference to results
e.g. V / l not constant, as l increases V decreases, V does not double as l doubles [1]

(e) any one from:
width of sliding contact
achieving exact same position on wire
accept heating changes resistance of wire
accept other sensible practical reason [max 1]
NOT human error

(f) do not touch (bare/hot) wire
OR do not allow C to touch terminal between lamp and supply [1]

4 **(a)** apparatus:
measuring cylinder/jug OR ruler OR balance (to measure amount of water) [1]
protractor OR rule to measure height of raised surface
OR other means of measuring angle of tilt
OR newtonmeter to apply variable force
OR other method of applying <u>quantifiable</u> force [1]

instructions:
method of tilting or applying variable force and measuring point at which bottle topples [1]

attention to accuracy, any two from:
<u>just</u> starts to topple
slowly
repeats / more than 10 values for quantity of water
very large protractor
or any other suitable precaution which would improve accuracy of data [max 2]

values:
at least 5 values with range at least 1500 cm^3 or 30 cm or 1500 g, approximately evenly spaced [1]

graph:
plot of measured variable (angle or height or force) against quantity of water (volume or height or mass) (accept vice versa) [1]

(b) 20° [1]

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CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

0123456789

PHYSICS **0625/06**

Paper 6 Alternative to Practical **For Examination from 2020**

SPECIMEN PAPER

1 hour

Candidates answer on the question paper.

No additional materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **11** printed pages and **3** blank pages.

1 A student is determining the mass of a load using a balancing method.

Fig. 1.1 shows the apparatus.

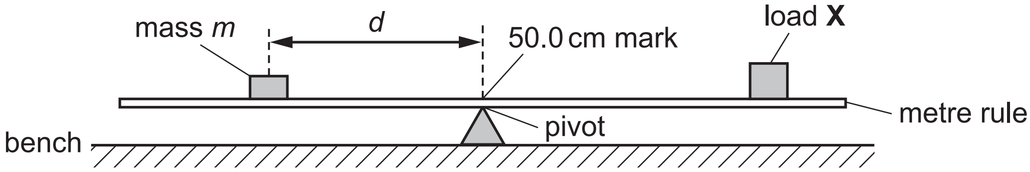


Fig. 1.1

The load **X** has been taped to the metre rule so that its centre is exactly over the 90.0 cm mark. It is not moved during the experiment.

A mass m of 40 g is placed on the rule and its position adjusted so that the rule is as near as possible to being balanced with the 50.0 cm mark exactly over the pivot. Fig. 1.2(a) shows part of the rule when it is balanced.

The procedure is repeated for a range of masses. Fig. 1.2(b) – (e) shows the rule when balanced for values of m of 50 g, 60 g, 70 g and 80 g.

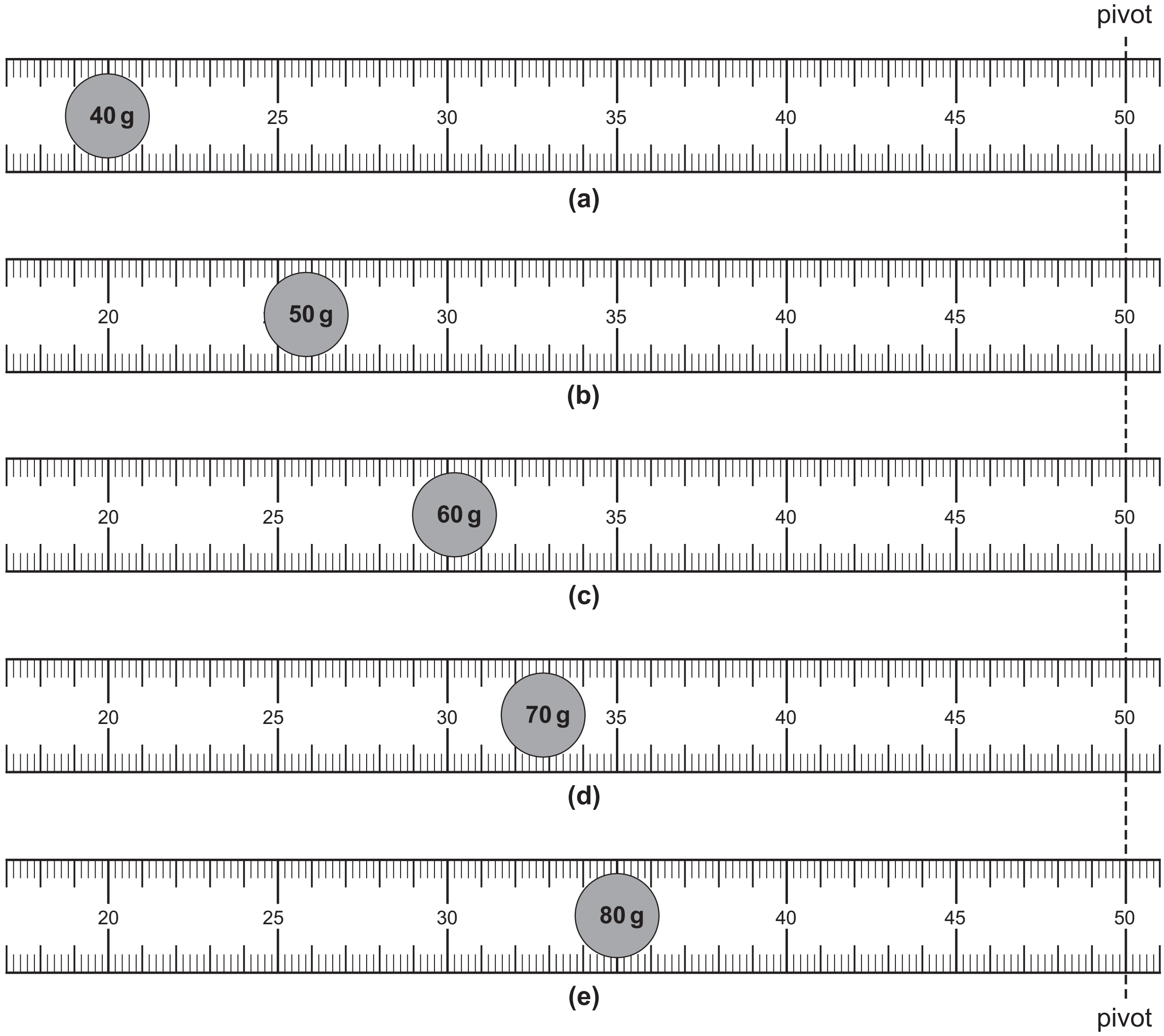


Fig. 1.2

(a) **(i)** Use Fig. 1.2 to determine d, the distance between the mass and the pivot at balance, for each value of m. Record your results in Table 1.1. [3]

Table 1.1

m / g	d / cm	$\frac{1}{d} \Big/ \frac{1}{\text{cm}}$
40		
50		
60		
70		
80		

(ii) For each value of d, calculate $1/d$ and record it in the table. [1]

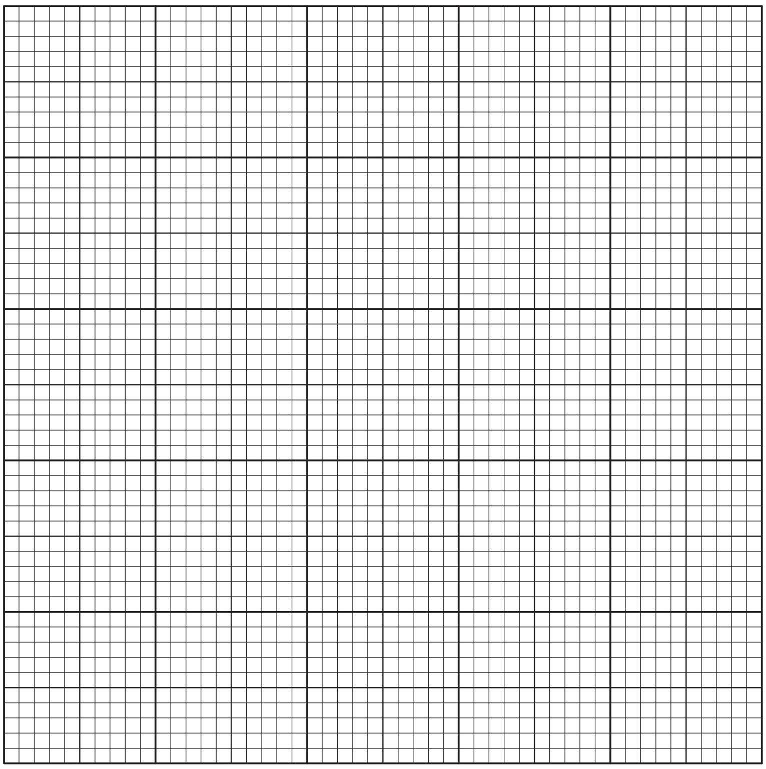
(b) Describe one difficulty the student might have when carrying out this experiment, and how he might overcome this difficulty.

....

....

.... [2]

(c) Plot a graph of m / g (y-axis) against $\frac{1}{d} \Big/ \frac{1}{\text{cm}}$ (x-axis).



[4]

(d) Determine the gradient G of the graph. Show clearly on the graph how you obtained the necessary information.

G = ... [1]

(e) Determine the mass μ, in grams, of the load **X**. Use the equation $\mu = \frac{G}{40.0}$.

μ = ... g [1]

[Total: 12]

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2 A student is investigating the effect of a layer of cotton wool on the cooling of a test-tube of water.

Fig. 2.1 shows the apparatus.

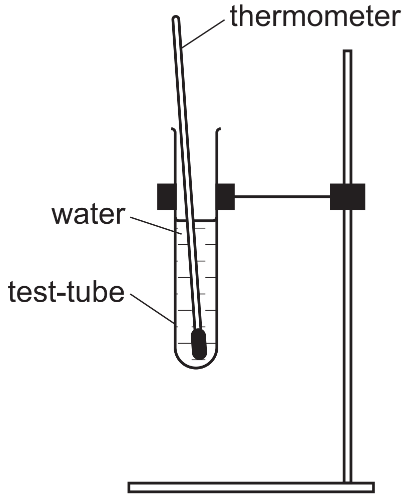

Fig. 2.1

(a) Record room temperature θ_R, as shown on the thermometer in Fig. 2.2.

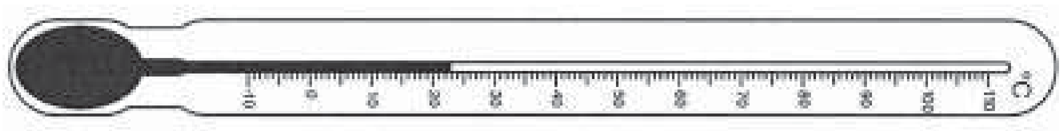

Fig. 2.2

θ_R = ... [1]

(b) A student pours hot water into the test-tube until it is about two thirds full of water and places the thermometer in the water.

She measures the initial temperature θ of the hot water and immediately starts a stopclock.

Suggest one precaution the student takes to make sure that her temperature reading is as accurate as possible.

....

.... [1]

(c) The student records in Table 2.1 the time t and the temperature θ of the water every 30 s. She removes the thermometer and pours away the water from the test-tube.

She then wraps cotton wool insulation around the test-tube and repeats the procedure.

Complete the time column and the column headings in Table 2.1.

Table 2.1

t /	tube without cotton wool θ /	tube with cotton wool θ /
0	79	80
	65	67
	58	60
	55	57
	53	56
	52	55
	51	54

[1]

(d) Write a conclusion to this investigation, stating in which experiment the cooling is more rapid. Explain your answer by reference to the readings and any relevant science.

....

....

....

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....

....

....

.... [3]

(e) Discuss the quality of the results, and suggest **two** improvements to the experiment which would allow a more certain conclusion to be drawn.

quality of results: ....

....

improvements: ....

....

....

....

[3]

(f) This experiment is being carried out by students in many different countries, using identical apparatus.

Suggest **two** differences in the conditions in the various laboratories that might lead to differences in their results.

1. ....

2. ....
[2]

(g) Estimate the volume of water that a test-tube can hold.

volume = ... [1]

[Total: 12]

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3 A student is investigating the effect of the length of resistance wire in a circuit on the potential difference across a lamp.

(a) Fig. 3.1 shows the circuit without a voltmeter.

Complete the circuit diagram to show a voltmeter connected in the circuit to measure the potential difference across the lamp. [2]

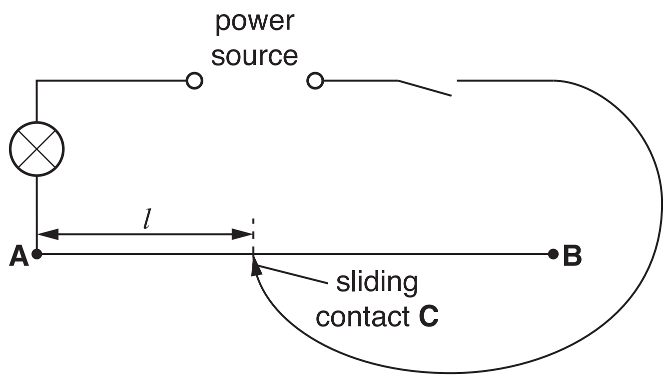

Fig. 3.1

(b) The student switches on and places the sliding contact **C** on the resistance wire at a distance l = 0.200 m from end **A**.

The voltmeter reading is shown in Fig. 3.2.

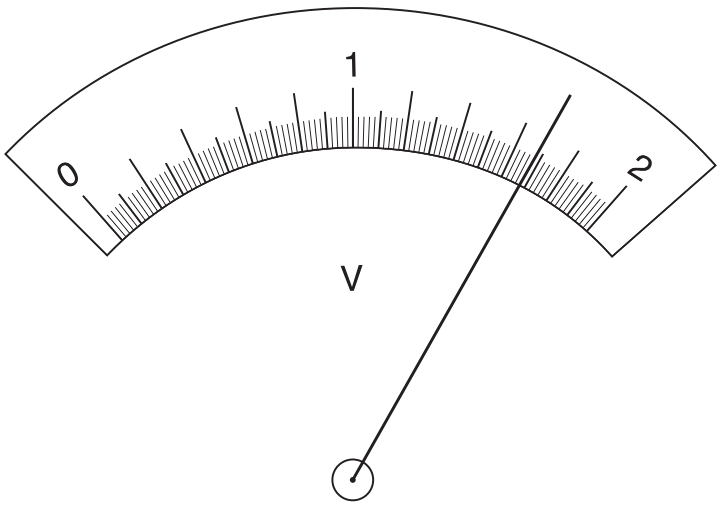

Fig. 3.2

Record the voltmeter reading in Table 3.1.

Table 3.1

l / m	V / V
0.200	
0.400	1.43
0.600	1.25
0.800	1.11
1.000	1.00

[1]

(c) The student repeats the procedure using a range of values of l. Table 3.1 shows the readings.

Use the results for the potential difference across the lamp to predict how increasing the length l affects the brightness of the lamp.

.... [1]

(d) The student suggests that the potential difference V across the lamp is directly proportional to the length l of resistance wire in the circuit.

State whether you agree with this suggestion. Justify your answer by reference to the results.

statement ....

justification ....

....

....

[2]

(e) The student repeats the experiment.

Suggest a practical reason why the repeat readings may be slightly different from those recorded in Table 3.1.

....

.... [1]

(f) State one safety precaution that you would take when carrying out experiments like this with resistance wires.

.... [1]

[Total: 8]

4 A student's plastic bottle of water tips over in class.

Plan an experiment to investigate how the quantity of water in a plastic bottle affects its stability.

The plastic bottle holds up to 2000 cm^3 of water and has a height of 42 cm.

(a) Write a plan for the experiment, including:

- the apparatus needed
- instructions for carrying out the experiment
- the values you will use for the quantity of water
- how you will make sure your results are as accurate as possible
- the graph you will plot from your results

A diagram is not required, but you may add to Fig. 4.1, or draw your own diagram, if it helps to explain your plan.

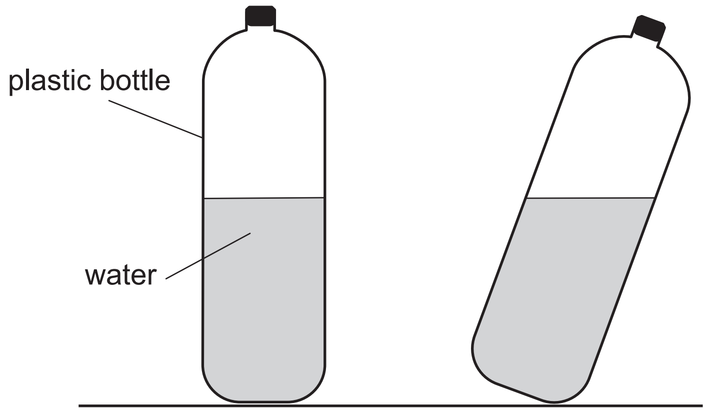

Fig. 4.1

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....[7]

(b) On Fig. 4.1, measure the angle through which the bottle has been tilted.

angle = ... [1]

[Total: 8]

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PHYSICS **0625/05**

Paper 5 Practical Test **For examination from 2020**

SPECIMEN CONFIDENTIAL INSTRUCTIONS

This document gives details of how to prepare for and administer the practical exam.

The information in this document and the identity of any materials supplied by Cambridge International are confidential and must NOT reach candidates either directly or indirectly.

The supervisor must complete the report at the end of this document and return it with the scripts.

If you have any queries regarding these Confidential Instructions, contact Cambridge International stating the centre number, the syllabus and component number and the nature of the query.

by email: info@cambridgeinternational.org
by phone: +44 1223 553554
by fax: +44 1223 553558

This document consists of **8** printed pages.

General information about practical exams

Centres must follow the guidance on science practical exams given in the *Cambridge Handbook*.

Safety

Supervisors must follow national and local regulations relating to safety and first aid.

Only those procedures described in the question paper should be attempted.

Supervisors must inform candidates that materials and apparatus used in the exam should be treated with caution. Suitable eye protection should be used where necessary.

The following hazard codes are used in these confidential instructions, where relevant:

C	corrosive	**MH**	moderate hazard
HH	health hazard	**T**	acutely toxic
F	flammable	**O**	oxidising
N	hazardous to the aquatic environment		

Hazard data sheets relating to substances used in this exam should be available from your chemical supplier.

Before the exam

- The packets containing the question papers must **not** be opened before the exam.
- It is assumed that standard school laboratory facilities, as indicated in the *Guide to Planning Practical Science*, will be available.
- Spare materials and apparatus for the tasks set must be available for candidates, if required.

During the exam

- It must be made clear to candidates at the start of the exam that they may request spare materials and apparatus for the tasks set.
- Where specified, the supervisor **must** perform the experiments and record the results as instructed. This must be done **out of sight** of the candidates, using the same materials and apparatus as the candidates.
- Any assistance provided to candidates must be recorded in the supervisor's report.
- If any materials or apparatus need to be replaced, for example, in the event of breakage or loss, this must be recorded in the supervisor's report.

After the exam

- The supervisor must complete a report for each practical session held and each laboratory used.
- Each packet of scripts returned to Cambridge International must contain the following items:
  - the scripts of the candidates specified on the bar code label provided
  - the supervisor's results relevant to these candidates
  - the supervisor's reports relevant to these candidates
  - seating plans for each practical session, referring to each candidate by candidate number
  - the attendance register.

Specific information for this practical exam

During the exam, the supervisor (NOT the invigilator) must do the experiments in Questions 1, 2 and 3 and record the results on a spare copy of the question paper, clearly labelled 'supervisor's results'.

Question 1

Items to be supplied by the centre (per set of apparatus unless otherwise specified)

(i) Metre rule with a mm scale (see note 1 below).

(ii) Triangular block to act as a pivot for the metre rule. This block is to stand on the bench.

(iii) 30 g mass (see note 2 below).

(iv) A selection of masses so that candidates can use masses of 40 g, 50 g, 60 g, 70 g and 80 g (eight 10 g slotted masses would be suitable).

Notes

1 The metre rule should balance on the pivot when the 50 cm mark is approximately over the pivot.

2 The 30 g mass is to be taped to the metre rule so that its centre is at the 90.0 cm mark. The value of the mass is not to be given or to be visible to the candidates. Label this mass **X**.

Action at changeover

Check that the 30 g mass remains correctly taped to the metre rule.

During the exam, the supervisor (NOT the invigilator) must do the experiments in Questions 1, 2 and 3 and record the results on a spare copy of the question paper, clearly labelled 'supervisor's results'.

Question 2

Items to be supplied by the centre (per set of apparatus, unless otherwise specified)

(i) Thermometer: –10 °C to 110 °C, graduated in 1 °C intervals.

(ii) Test-tube (approximate size between 25 and 50 cm^3).

(iii) Cotton wool (sufficient to wrap completely around the test-tube as shown in Fig. 2.1). Fresh cotton wool is required for each candidate. Spare cotton wool should be available.

(iv) Two elastic bands (these will be used by the candidate to secure the cotton wool around the test-tube). Spares should be available.

(v) Clamp, boss and stand.

(vi) Stopclock, stopwatch or wall-mounted clock showing seconds. Candidates will be required to take readings at 30 s intervals. They may use their own wrist watch facility if they wish. The question will refer to a stopclock.

(vii) Supply of hot water.

(viii) Supply of paper towels to mop up any spillages of water.

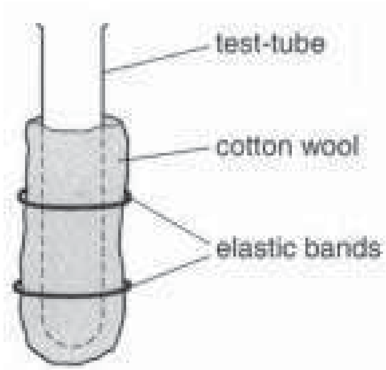

Fig. 2.1

Notes

1 The hot water is to be supplied for each candidate by the Supervisor. The water temperature should be maintained at a temperature as hot as is reasonably possible.

2 Candidates should be warned of the dangers of burns or scalds when using very hot water.

3 The clamp, boss and stand should be set up with the test-tube held in the clamp.

4 The candidates must be provided with the means easily and safely to pour hot water into the test-tube.

5 Candidates will be required to refill their test-tube during the experiment.

During the exam, the supervisor (NOT the invigilator) must do the experiments in Questions 1, 2 and 3 and record the results on a spare copy of the question paper, clearly labelled 'supervisor's results'.

Action at changeover

Empty the test-tube. Remove the cotton wool from the tube. Supply fresh cotton wool. Check the supply of hot water.

Question 3

Items to be supplied by the centre (per set of apparatus unless otherwise specified)

(i) Power source of approximately 1.5–2.0 V. Where candidates are supplied with a power source with a variable output voltage, the voltage setting should be set by the Supervisor and fixed (e.g. taped).

(ii) Voltmeter capable of measuring the supply p.d. with a minimum precision of 0.1 V.

(iii) Switch. The switch may be an integral part of the power supply.

(iv) Approximately 105 cm of straight, bare constantan wire, diameter 0.45 mm (26 swg) or 0.38 mm (28 swg) or 0.32 mm (30 swg), taped to a metre rule at three places (between the 5 cm and 10 cm marks, the 45 cm and 50 cm marks and the 85 cm and 90 cm marks). The zero end of the rule is to be labelled **A**, the other end is to be labelled **B**.

(v) Two suitable terminals (e.g. crocodile clips) attached to the constantan wire at end **A** of the metre rule so that connections can be made to the circuit shown in Fig. 3.1.

(vi) Sliding contact, labelled **C**. This may be a jockey or a small screwdriver connected to a lead by means of a crocodile clip.

(vii) 2.5 V, 0.2 A lamp in a suitable holder.

(viii) Sufficient connecting leads to set up the circuit shown in Fig. 3.1.

Notes

1 The circuit shown in Fig. 3.1 must be set up for the candidates.

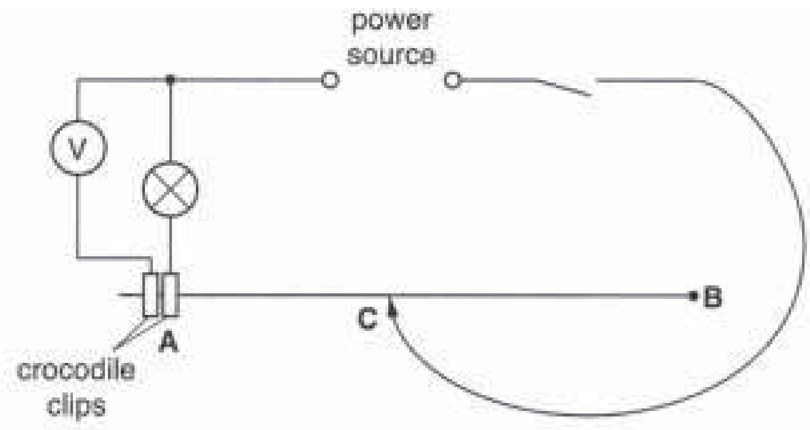

Fig. 3.1

During the exam, the supervisor (NOT the invigilator) must do the experiments in Questions 1, 2 and 3 and record the results on a spare copy of the question paper, clearly labelled 'supervisor's results'.

2 As an alternative to **(iv)** and **(v)** a standard 100 cm potentiometer is acceptable.

Action at changeover

Check that the circuit is connected correctly. If cells are used, check that they are adequately charged.

Question 4

No apparatus is required for this question.

Supervisor's report

Syllabus and component number					/		
Centre number							

Centre name ....

Time of the practical session ....

Laboratory name/number ....

Give details of any difficulties experienced by the centre or by candidates (include the relevant candidate names and candidate numbers).

You must include:

- any difficulties experienced by the centre in the preparation of materials
- any difficulties experienced by candidates, e.g. due to faulty materials or apparatus
- any specific assistance given to candidates.

Space for supervisor to record results, if relevant, e.g. temperature of the laboratory; results for Question 1.

Declaration

1 Each packet that I am returning to Cambridge International contains the following items:

- ☐ the scripts of the candidates specified on the bar code label provided
- ☐ the supervisor's results relevant to these candidates
- ☐ the supervisor's reports relevant to these candidates
- ☐ seating plans for each practical session, referring to each candidate by candidate number
- ☐ the attendance register

2 Where the practical exam has taken place in more than one practical session, I have clearly labelled the supervisor's results, supervisor's reports and seating plans with the time and laboratory name/number for that practical session.

3 I have included details of difficulties relating to this practical session experienced by the centre or by candidates.

4 I have reported any other adverse circumstances affecting candidates, e.g. illness, bereavement or temporary injury, directly to Cambridge International on a *special consideration form*.

Signed .... (supervisor)

Name (in block capitals) ....