



Grade thresholds – November 2017

Cambridge IGCSE Biology (0610)

Grade thresholds taken for Syllabus 0610 (Biology) in the November 2017 examination.

	maximum raw mark available	minimum raw mark required for grade:						
		A	B	C	D	E	F	G
Component 11	40	–	–	26	23	20	17	14
Component 12	40	–	–	26	23	20	17	14
Component 13	40	–	–	27	24	21	18	15
Component 21	40	35	30	25	22	19	16	13
Component 22	40	34	29	25	22	19	16	13
Component 23	40	33	29	25	22	19	16	13
Component 31	80	–	–	55	48	42	37	32
Component 32	80	–	–	47	40	32	25	18
Component 33	80	–	–	52	45	38	31	24
Component 41	80	47	38	30	26	21	17	13
Component 42	80	52	44	36	31	26	21	16
Component 43	80	46	38	31	26	22	17	12
Component 51	40	29	25	21	18	15	11	7
Component 52	40	25	20	16	13	11	9	7
Component 53	40	31	26	22	19	16	14	12
Component 61	40	31	27	23	20	17	13	9
Component 62	40	24	20	16	14	12	10	8
Component 63	40	32	28	24	20	17	15	13

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	161	139	117	96	83	70	56	42
BY	22, 42, 52	161	140	119	99	85	72	59	46
BZ	23, 43, 53	157	137	117	98	85	72	59	46
CX	21, 41, 61	163	141	119	98	85	72	58	44

Grade thresholds continued
Cambridge IGCSE Biology (0610)

Option	Combination of Components	A*	A	B	C	D	E	F	G
CY	22, 42, 62	159	139	119	99	86	73	60	47
CZ	23, 43, 63	157	138	119	100	86	73	60	47
FX	11, 31, 51	–	–	–	128	113	98	83	68
FY	12, 32, 52	–	–	–	113	97	81	68	51
FZ	13, 33, 53	–	–	–	127	111	95	80	65
GX	11, 31, 61	–	–	–	130	115	100	85	70
GY	12, 32, 62	–	–	–	113	97	82	67	52
GZ	13, 33, 63	–	–	–	129	112	96	81	66



BIOLOGY

0610/51

Paper 5 Practical Test

October/November 2017

CONFIDENTIAL INSTRUCTIONS

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The Supervisor should make sure the Supervisor's Report is fully completed and a copy is enclosed with each packet of scripts.

It is assumed that the ordinary apparatus of a science laboratory will be available, including a supply of purified water (distilled or deionised).

If arrangements are made for different sessions for different groups of candidates, care must be taken to ensure that the different groups of candidates are effectively isolated so that **no information passes between them.**

All specimens should carry only the code letters and numbers as indicated and their identity should not be revealed to the candidates.

Supervisors should ensure that all specimens have the correct identity attached to the specimen and that these are **not** removed during the examination.

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.

Supervisors are advised to remind candidates that **all** substances in the examination should be treated with caution. Pipette fillers and eye protection should be used where necessary.

In accordance with COSHH (Control of Substances Hazardous to Health) Regulations, operative in the UK, a hazard appraisal of the examination has been carried out.

The following codes are used where relevant:

C corrosive	MH moderate hazard
HH health hazard	T acutely toxic
F flammable	O oxidising
N hazardous to the aquatic environment	

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Question 1

Each candidate should be provided with:

- (i) five Petri dishes with lids
- (ii) 20 cm³ of distilled water in a container labelled **water**
- (iii) 20 cm³ of 2% citric acid in a container labelled **B**
- (iv) 20 cm³ of 2% ethanoic acid in a container labelled **C**
- (v) 20 cm³ of 1% sodium chloride in a container labelled **D**
- (vi) 20 cm³ of 1% sodium hydrogencarbonate in a container labelled **E**
- (vii) a marker pen suitable for marking glassware and plastic
- (viii) one apple, large enough to cut a minimum of six slices, each approximately 30 mm × 10 mm × 5 mm in size
Do not use bruised or damaged apples.
- (ix) one white tile, large enough to place the apple slices on
- (x) 15 cm or 30 cm ruler with a mm scale
- (xi) knife or scalpel suitable for cutting and peeling the apple
- (xii) spatula for crushing the apple slices
- (xiii) container labelled **waste**
- (xiv) beaker labelled **waste liquid**
- (xv) five pieces of Universal Indicator paper 1–14 range, each piece a minimum of 15 mm in length, placed in a dish or on a piece of paper labelled **Universal Indicator paper**
- (xvi) one Universal Indicator chart with pH values, in a dish or on a piece of paper labelled **Universal Indicator chart**
- (xvii) paper towels
- (xviii) view of a clock or timer that allows the candidate to time minutes accurately

Preparation of solutions

HH 2% citric acid

Add 20 g of citric acid to 250 cm³ of distilled water. Stir until the citric acid dissolves. Add more distilled water to make up to a final volume of 1 dm³.

The solution can be made two days before the examination and stored in a cool place.

C, F 2% ethanoic acid

safety glasses and gloves should be used

Measure 20 cm³ of glacial ethanoic acid and add it to 230 cm³ of distilled water. Add the diluted ethanoic acid to 750 cm³ of distilled water to make up to a final volume of 1 dm³. **Note: for safety reasons add the acid to the water.**

The solution can be made a week before the examination and stored in a cool place.

White vinegar can be used as an alternative to 2% ethanoic acid. Brown coloured vinegar is not suitable.

1% sodium chloride solution

Add 10 g of sodium chloride to 250 cm³ of distilled water. Stir until the sodium chloride dissolves. Add more distilled water to make up to a final volume of 1 dm³.

The solution can be made a week before the examination and stored in a cool place.

1% sodium hydrogencarbonate solution

Add 10 g of sodium hydrogencarbonate to 250 cm³ of distilled water. Stir until the sodium hydrogencarbonate dissolves. Add more distilled water to make up to a final volume of 1 dm³.

The solution should be made just before the examination.

Baking powder can be used as an alternative to solid sodium hydrogencarbonate.

Before the examination the Supervisor should carry out part of the investigation to test different varieties of apple. A 30 mm × 10 mm × 5 mm slice of peeled apple should be crushed on a tile and left uncovered. The crushed apple should start to turn brown within 10 minutes and should be obviously brown in colour within 20 minutes.

The rate at which crushed apple turns brown is very variable. In general, green skinned apples with firm flesh turn brown faster. Of the European varieties tested, Granny Smith, Golden Delicious and Bramley were suitable.

As apple varieties are named differently in different parts of the world, Centres must ensure that they test apples in sufficient time.

The Supervisor (**not** the invigilator) should carry out the practical aspects of Question 1 and record their results in the space in the Supervisor's Report. This must be done during the examination, using the same apparatus as the candidates but **out of sight** of the candidates.

Question 2

No laboratory equipment is required

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SUPERVISOR'S REPORT

The Supervisor or Teacher responsible for the subject should provide the following information.

- 1** Was any difficulty experienced in providing the necessary materials? If so, give brief details.

.....

- 2** Give details of any difficulties experienced by particular candidates, giving names and candidate numbers. Reference should be made to:

- (a)** difficulties with specimens or materials;

.....

- (b)** accidents to apparatus or materials;

.....

- (c)** assistance provided in the case of colour blindness;

.....

- (d)** any other information that is likely to assist the Examiner, especially if this cannot be discovered from the scripts.

.....

Other cases of individual hardship, e.g. illness or disability, should be reported direct to Cambridge on the normal Special Consideration Form as detailed in the Handbook for Centres.

- 3** During the examination, the Supervisor should, **out of sight of the candidates**, carry out the practical aspects of **Question 1** using the same apparatus and reagents as the candidates. Results should be recorded in the space on page 8 (**not** on a spare question paper). Attach extra sheets if necessary.

The Invigilator should **not** carry out **Question 1**.

Question 1 results:

- 4 A plan of work benches, giving details of the candidate numbers of the places occupied by the candidates for each session, must be enclosed with the scripts.

Declaration (to be signed by the Supervisor)

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

Signed

Name (IN BLOCK CAPITALS)

Centre number

Centre name

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All specimens should carry only the code letters and numbers as indicated and their identity should not be revealed to the candidates.

Supervisors should ensure that all specimens have the correct identity attached to the specimen and that these are **not** removed during the examination.

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.

Supervisors are advised to remind candidates that **all** substances in the examination should be treated with caution. Pipette fillers and eye protection should be used where necessary.

In accordance with COSHH (Control of Substances Hazardous to Health) Regulations, operative in the UK, a hazard appraisal of the examination has been carried out.

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Question 1

Each candidate should be provided with:

- (i) six test-tubes
 - (ii) 25 cm³ of 1% starch solution in a container labelled **starch solution**
 - HH (iii) 5 cm³ of 1% bacterial amylase in a container labelled **1% amylase**
 - HH (iv) 5 cm³ of 2% bacterial amylase in a container labelled **2% amylase**
 - HH (v) 5 cm³ of 3% bacterial amylase in a container labelled **3% amylase**
 - (vi) test-tube rack or other means of supporting six test-tubes
 - (vii) large beaker able to hold six test-tubes and suitable to be used as a water-bath
 - (viii) tripod, gauze and Bunsen burner or other means of maintaining a water-bath at 60 °C
 - (ix) thermometer –10 °C to +100 °C
 - (x) a supply of water at 60 °C is needed throughout the practical
- Candidates have been instructed to raise their hand when they are ready for hot water.
- (xi) one 5 cm³ syringe
 - (xii) three 1 cm³ syringes
 - (xiii) dry white tile
 - (xiv) 10 cm³ of iodine solution in a bottle with a dropper, labelled **iodine solution**
 - (xv) means of writing on glassware, e.g. waterproof marker pen
 - (xvi) glass rod
 - (xvii) 250 cm³ of distilled water in a container labelled **water for washing**
 - (xviii) container for waste water labelled **waste water**
 - (xix) paper towels
 - (xx) view of a clock or timer that allows the candidate to time minutes and seconds
 - (xxi) gloves and suitable eye protection

Solution preparation:*1% starch solution*

Heat 10 g of soluble starch in 200 cm³ of distilled water until the liquid clears. Allow the solution to cool and add distilled water to make up to 1 dm³.

The solution should be freshly made.

amylase solutions

These concentrations are based on using concentrated bacterial amylase obtained from a biological supplier.

HH 1% Put 2.5 cm³ of bacterial amylase into a beaker. Add distilled water to make up to a final volume of 250 cm³.

HH 2% Put 5.0 cm³ of bacterial amylase into a beaker. Add distilled water to make up to a final volume of 250 cm³.

HH 3% Put 7.5 cm³ of bacterial amylase into a beaker. Add distilled water to make up to a final volume of 250 cm³.

These solutions should be freshly made.

iodine solution

A commercially prepared iodine solution suitable for standard food tests can be used.

Alternatively it can be made as follows:

Wear eye protection, disposable gloves and work in a well-ventilated room.

Put 8 g of potassium iodide (KI) into a beaker and moisten the potassium iodide with a few drops of distilled water.

Add 2.54 g of iodine (I₂) to the moistened potassium iodide. Add a small volume of water and stir. When no more iodine appears to dissolve, add some more water and stir. Keep repeating this procedure until all the iodine has dissolved. Do not exceed a total volume of 1 dm³.

If necessary add more distilled water to make up to the total final volume of 1 dm³.

Before the examination the Supervisor should carry out part of the investigation to test the amylase activity. 5 cm³ of starch solution and 1 cm³ of 1% amylase should be heated separately in a water-bath at 60 °C. After three minutes the solutions should be mixed together and small samples of the contents tested at one minute intervals using iodine solution. If the mixture is still blue-black after five minutes, reduce the concentration of the starch solution and re-test until the solution remains brown at five minutes.

Question 2

No laboratory equipment required.

- (i) ruler marked in mm

The Supervisor (**not** the invigilator) should carry out the practical aspects of Question 1 and record their results in the space in the Supervisor's Report. This must be done during the examination, using the same apparatus as the candidates but **out of sight** of the candidates.

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The Invigilator should **not** carry out **Question 1**.

Question 1 results:

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Declaration (to be signed by the Supervisor)

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Signed

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Centre number

Centre name

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BIOLOGY

0610/53

Paper 5 Practical Test

October/November 2017

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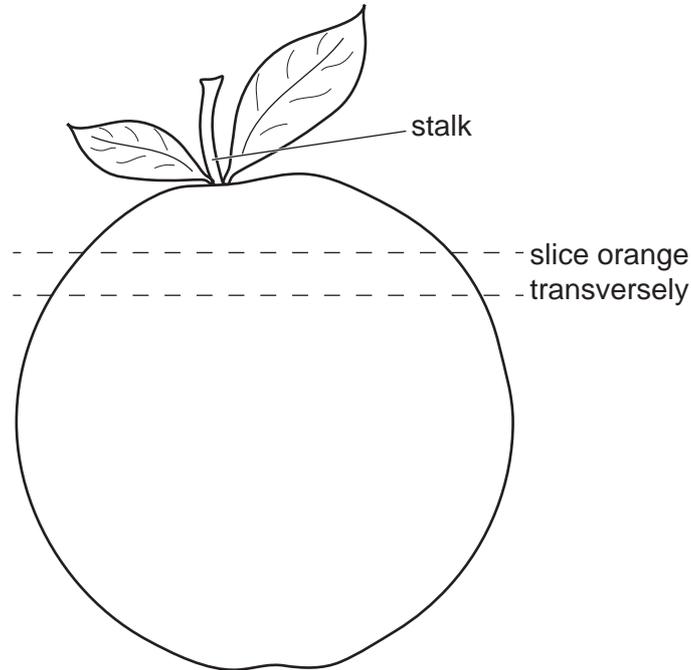
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Question 1

Each candidate should be provided with:

- (i) a 1 cm thick slice of orange which has been cut from the fruit transversely to show the segments. It should be presented on a white tile labelled **orange slice for question 1(f)**.



- (ii) three different *Citrus* spp. fruits e.g. orange, lemon, lime, grapefruit. These should be cut into quarters. Each student should be provided with enough pieces of fruit to obtain at least 5 cm³ of juice from each type of fruit when it is squeezed. Students will raise their hand to request more fruit if 5 cm³ of juice is not obtained from the initial supply of fruit provided. Quarters should be presented in dishes labelled with the common name of each fruit.
- (iii) three containers to collect the juice e.g. beakers or plastic cups
- (iv) one glass marker pen
- (v) three large test-tubes
- (vi) one 25 cm³ measuring cylinder
- (vii) four 2 cm³ syringes without needles
- (viii) one 250 cm³ glass beaker labelled **water-bath**
- (ix) a supply of hot water at 90 °C. Candidates will raise their hand when they are ready for hot water to half-fill their water-bath.
- (x) 10 cm³ of Benedict's solution (as normally used for food testing) provided in a 100 cm³ glass beaker and labelled **reducing sugar test solution**
- (xi) view of a timer or clock to measure minutes accurately
- (xii) paper towels
- (xiii) a container labelled **washing water** half-filled with tap water
- (xiv) an empty container labelled **waste water**

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- (xv) suitable eye protection

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Question 2

Each candidate should be provided with:

- (i) one ruler (with mm scale)

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The Invigilator should **not** carry out **Question 1**.

- 4 A plan of work benches, giving details of the candidate numbers of the places occupied by the candidates for each session, must be enclosed with the scripts.

Declaration (to be signed by the Supervisor)

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

Signed

Name (IN BLOCK CAPITALS)

Centre number

Centre name

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BIOLOGY

0610/11

Paper 1 Multiple Choice (Core)

October/November 2017

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.

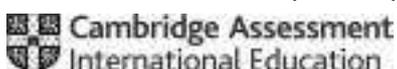
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This document consists of **3** printed pages.



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

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



BIOLOGY

0610/12

Paper 1 Multiple Choice (Core)

October/November 2017

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

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



BIOLOGY

0610/13

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

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



BIOLOGY

0610/21

Paper 2 Multiple Choice (Extended)

October/November 2017

MARK SCHEME

Maximum Mark: 40

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

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



BIOLOGY

0610/22

Paper 2 Multiple Choice (Extended)

October/November 2017

MARK SCHEME

Maximum Mark: 40

Published

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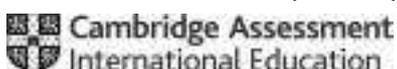
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Question	Answer	Marks
1	B	1
2	A	1
3	B	1
4	A	1
5	D	1
6	B	1
7	A	1
8	A	1
9	A	1
10	B	1
11	A	1
12	B	1
13	B	1
14	B	1
15	C	1
16	B	1
17	D	1
18	A	1
19	B	1
20	C	1
21	A	1
22	A	1
23	A	1
24	B	1
25	A	1
26	D	1
27	C	1
28	D	1

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

BIOLOGY

0610/23

Paper 2 Multiple Choice (Extended)

October/November 2017

MARK SCHEME

Maximum Mark: 40

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

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



BIOLOGY

0610/31

Paper 3 Theory (Core)

October/November 2017

MARK SCHEME

Maximum Mark: 80

Published

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Mark schemes will use these abbreviations

- ; separates marking points
- / alternatives
- I ignore
- R reject
- A accept (for answers correctly cued by the question, or guidance for examiners)
- AW alternative wording (where responses vary more than usual)
- AVP any valid point
- ecf credit a correct statement / calculation that follows a previous wrong response or reverse argument
- ora the word / phrase in brackets is not required, but sets the context
- () actual word given must be used by candidate (grammatical variants excepted)
- underline indicates the maximum number of marks that can be given
- max

Question	Answer				Marks	Guidance
1	key	name of insect	letter		4	1 correct = 1 mark 2 correct = 2 marks 3 correct = 3 marks 4 or 5 correct = 4 marks
1 (a)	body is long and thin	go to 2				
1 (b)	body is short and rounded	go to 3				
2 (a)	body has a spotted pattern	A. <i>oculatus</i>	D			
2 (b)	body has a plain pattern	P. <i>pyralis</i>	E			
3 (a)	no visible antennae	C. <i>lunaris</i>	C			
3 (b)	visible antennae	go to 4				
4 (a)	body has a striped pattern	G. <i>lineatum</i>	A			
4 (b)	body has a dotted pattern	C. <i>septempunctata</i>	B			

Question	Answer	Marks	Guidance
2(a)	a group of organisms of one <u>species</u> ; living in the same area, at the same time ;	2	
2(b)(i)	phytoplankton / algae ;	1	
2(b)(ii)	limpets / zooplankton / mussels / fish ;	1	
2(b)(iii)	phytoplankton → zooplankton → fish → seagull ;	1	

Question	Answer	Marks	Guidance
2(b)(iv)	<p><i>starfish</i></p> <ol style="list-style-type: none"> 1. (population) increases ; 2. lack of predators / fewer sharks, to eat starfish ; <p><i>limpets</i></p> <ol style="list-style-type: none"> 3. (population) decreases ; 4. increased predation / more starfish or more octopus to eat them ; 	4	
2(b)(v)	<p>(more) hunting ; (named) pollution / contamination ; starvation / decreased food supply / competition for (food) ; disease ; more predators ; habitat destruction ; introduced / alien species ;</p>	2	<p>A. over-harvesting / fishing (for sharks) A. death of starfish / octopus</p>
2(c)	(the) Sun ;	1	
2(d)	<p>(A) condensation ; (B) evaporation ; (C) transpiration / evaporation / evapotranspiration ; (D) precipitation ;</p>	4	

Question	Answer	Marks	Guidance												
3(a)	<table border="1"> <thead> <tr> <th>natural</th> <th>chemical</th> <th>barrier</th> <th>surgical</th> </tr> </thead> <tbody> <tr> <td>abstinence</td> <td>contraceptive pill</td> <td>condom</td> <td>female sterilisation</td> </tr> <tr> <td>monitoring body temperature</td> <td>IUD</td> <td>diaphragm</td> <td>vasectomy</td> </tr> </tbody> </table> ; ; ; ; ; ; ; ; ; ;	natural	chemical	barrier	surgical	abstinence	contraceptive pill	condom	female sterilisation	monitoring body temperature	IUD	diaphragm	vasectomy	4	8 correct = 4 marks 7 or 6 correct = 3 5 or 4 correct = 2 2 correct = 1 1 correct = 0 A IUD in barrier column
natural	chemical	barrier	surgical												
abstinence	contraceptive pill	condom	female sterilisation												
monitoring body temperature	IUD	diaphragm	vasectomy												
3(b)	hormones ; ovary ; egg cells ;	3													
3(c)(i)	human immunodeficiency virus ;	1													
3(c)(ii)	<i>transmission</i> breast, milk / feeding ; mother to unborn child / through placenta / birth ; blood / blood transfusion / organ transplants ; injecting drugs / contaminated or sharing needles / contaminated or sharing syringes ; <i>idea of via, vaginal / seminal / sexual, fluids</i> OR sexual intercourse / sex, without a condom (protection) ;	2													

Question	Answer	Marks	Guidance
3(c)(iii)	<p><i>control</i> ref. to education ;</p> <p>needle exchange / not sharing needles / use sterile needles / AW ;</p> <p>free / use, condoms / femidoms ;</p> <p>free testing (for individuals) ;</p> <p>screening of, blood / blood products / AW ;</p> <p>antiretroviral / ARV, drugs ;</p> <p><i>idea of avoiding blood to blood contact ;</i></p>	2	A barrier methods / protection, during sex (ual intercourse)

Question	Answer	Marks	Guidance
4(a)	<p>A ;</p> <p>C ;</p> <p>D ;</p> <p>F ;</p>	4	
4(b)	<p>fewer / less ;</p> <p>sticky ;</p> <p>heavier / denser ;</p> <p>spiky ;</p> <p>larger ;</p>	2	1 scent
4(c)	<p><u>meiosis</u> ;</p>	1	

Question	Answer	Marks	Guidance
4(d)	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; justify-content: space-around; width: 100%;"> <div style="border: 1px solid black; padding: 2px;">ovary</div> <div style="border: 1px solid black; padding: 2px;">petal</div> <div style="border: 1px solid black; padding: 2px;">sepal</div> <div style="border: 1px solid black; padding: 2px;">stigma</div> </div> <div style="display: flex; justify-content: space-around; width: 100%; margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px;">where ovules are produced</div> <div style="border: 1px solid black; padding: 2px;">where pollen is produced</div> <div style="border: 1px solid black; padding: 2px;">protects the flower when in bud</div> <div style="border: 1px solid black; padding: 2px;">often coloured to attract insects</div> <div style="border: 1px solid black; padding: 2px;">where pollen is deposited</div> </div> </div>	4	

Question	Answer	Marks	Guidance
5(a)(i)	palisade (mesophyll) ; guard (cell) ;	2	
5(a)(ii)	chloroplast ;	1	
5(b)	cell membrane circled ; cytoplasm circled ; nucleus circled ;	3	minus 1 mark for each additional circled structure
5(c)	carbon dioxide and water ;	1	

Question	Answer	Marks	Guidance
5(d)	leaf A bigger/larger, surface (area) OR bigger/thicker / more, mesophyll (layer / cells) ; absorbs more light / more chlorophyll / more chloroplasts / more gas exchange / more stomata ;	2	

Question	Answer	Marks	Guidance
6(a)		3	1 mark for each correctly linked drug
6(b)(i)	66–70 ;	1	
6(b)(ii)	10(%) ;	1	

Question	Answer	Marks	Guidance
6(b)(iii)	increases and decreases / after 20 years old it decreases ; peaks in the 16–20 year old age group / AW ; any correct reference to description of fluctuation at 51–65 year olds ; data quote with units ;	3	
6(c)	bacterial ;	1	

Question	Answer	Marks	Guidance
7(a)(i)	warm, dry air ;	1	
7(a)(ii)	0.4 (mm per min) ; ;	2	If no correct answer 4÷10 for 1 mark
7(a)(iii)	(air bubble) moves, further / faster ;	1	
7(b)	root (hair cell) ; by osmosis ;	2	

Question	Answer	Marks	Guidance
7(c)	(water) evaporates ; from (surface of mesophyll) cells ; water vapour diffuses ; through stomata ; <u>xylem</u> ;	3	
7(d)		1	

Question	Answer	Marks	Guidance
8(a)	carbohydrates ; fats / lipids ; protein ; vitamins / named vitamin ; minerals / name mineral ; fibre ;	3	
8(b)	small intestine ;	1	
8(c)	(A) <u>ureter</u> ; (B) bladder ; (C) <u>urethra</u> ;	3	

Question	Answer						Marks	Guidance
8(d)	changes in the body	urine volume		urine concentration		2	1 mark for each correct row	
increase in body temperature		increases	decreases	increases	decrease			
increase in exercise		✓	✓					
increase in water uptake	✓		✓		✓			



BIOLOGY

0610/32

Paper 3 Theory (Core)

October/November 2017

MARK SCHEME

Maximum Mark: 80

Published

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Mark schemes abbreviations

- ; separates marking points
- / alternatives
- I I reject
- R **A** (for answers correctly cued by the question, or guidance for examiners)
- **A** alternative wording (where responses vary more than usual)
- AW any valid point
- AVP credit a correct statement/calculation that follows a previous wrong response
- **ecf** or reverse argument
- **ora** the word/phrase in brackets is not required, but sets the context
- () underline actual word given must be used by candidate (grammatical variants excepted)
- max indicates the maximum number of marks that can be given

Question	Answer	Marks	Guidance
1		5	<p>1 mark for each correct line up to max 5</p> <p>deduct a mark for each incorrect line when more than 5 are drawn</p> <p>A link between addiction and nicotine link between liver damage and heroin</p>

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Question	Answer	Marks	Guidance
2(a)	<p>(A) petal ;</p> <p>(B) anther / stamen ;</p> <p>(C) stigma / filament ;</p> <p>(D) ovule ;</p>	4	<p>I style / carpel</p> <p>I ovum / ovary / seed</p>

Question	Answer					Marks	Guidance													
2(b)	structure	how a wind-pollinated flower differs from the flower in Fig. 2.1	reason for difference	<table border="1"> <tr> <td>anther</td> <td>loosely attached</td> <td>easily shaken by wind to release pollen</td> </tr> <tr> <td>petals</td> <td>small / absent / dull / inconspicuous / not colourful / green / not wide / not long ;</td> <td>no need to attract pollinators / insects not required ;</td> </tr> <tr> <td>stigma</td> <td>large / feathery / long / protruding / exposed / hairy / wide / tall / thick ;</td> <td>(large surface area) to, catch / trap / receive, pollen ;</td> </tr> <tr> <td>pollen</td> <td>smooth / light / small / more / not sticky ;</td> <td>easily carried (by wind) / higher chance of pollination ;</td> </tr> </table>			anther	loosely attached	easily shaken by wind to release pollen	petals	small / absent / dull / inconspicuous / not colourful / green / not wide / not long ;	no need to attract pollinators / insects not required ;	stigma	large / feathery / long / protruding / exposed / hairy / wide / tall / thick ;	(large surface area) to, catch / trap / receive, pollen ;	pollen	smooth / light / small / more / not sticky ;	easily carried (by wind) / higher chance of pollination ;	6	AW throughout scent / nectary
anther	loosely attached	easily shaken by wind to release pollen																		
petals	small / absent / dull / inconspicuous / not colourful / green / not wide / not long ;	no need to attract pollinators / insects not required ;																		
stigma	large / feathery / long / protruding / exposed / hairy / wide / tall / thick ;	(large surface area) to, catch / trap / receive, pollen ;																		
pollen	smooth / light / small / more / not sticky ;	easily carried (by wind) / higher chance of pollination ;																		

Question	Answer	Marks	Guidance
3	femidom ; vagina ; sperm ; surgical ; sperm duct ; chemical ;	6	

Question	Answer	Marks	Guidance
4(a)(i)	13 (days) ;	1	
4(a)(ii)	flower food prolongs the life of the flower / petals take longer to drop off if the plant has flower food / ora ;	1	A flowers in water for water only I growth
4(b)(i)	xylem ;	1	I vascular bundle / vein A tracheid
4(b)(ii)	source of energy / energy released ; by respiration ; AVP ; e.g. use of glucose to form other (named) molecules	2	A correct, word / symbol equation for respiration for max 1
4(b)(iii)	an organism that gets its energy ; from, dead / waste, (organic) material ;	2	

Question	Answer	Marks	Guidance
5(a)	(R) epidermis ; (S) palisade ; (T) guard cell / cytoplasm ; (V) stoma / stomata ;	4	
5(b)	1 photosynthesis ; 2 carbon dioxide and water (substrate) / AW ; 3 glucose and oxygen (produced) ; 4 <u>energy</u> needed comes from light / light <u>energy</u> converted to chemical energy ; 5 chlorophyll / chloroplasts, traps / absorb, the light (energy) ; 6 carbon dioxide from the air / water from the soil ;	4	A mp2 and mp3 in a correct, word / symbol equation A sun / sunlight mp5 must be stated (not inferred by being placed on an arrow in an equation) I from the roots

Question	Answer	Marks	Guidance																								
6(a)	<table border="1"> <thead> <tr> <th></th> <th>name of insect</th> <th>letter on Fig. 6.1</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>Melolontha</td> <td>J</td> </tr> <tr> <td>3</td> <td>Cyriopalus</td> <td>E</td> </tr> <tr> <td>4</td> <td>Trigonopterus</td> <td>F</td> </tr> <tr> <td>5</td> <td>Ceutorhyncus</td> <td>K</td> </tr> <tr> <td></td> <td>Stephanorrhina</td> <td>H</td> </tr> <tr> <td></td> <td>Attagenus</td> <td>G</td> </tr> </tbody> </table>		name of insect	letter on Fig. 6.1	1			2	Melolontha	J	3	Cyriopalus	E	4	Trigonopterus	F	5	Ceutorhyncus	K		Stephanorrhina	H		Attagenus	G	5	5 or 6 correct = 5 4 correct = 4 3 correct = 3 2 correct = 2 1 correct = 1
	name of insect	letter on Fig. 6.1																									
1																											
2	Melolontha	J																									
3	Cyriopalus	E																									
4	Trigonopterus	F																									
5	Ceutorhyncus	K																									
	Stephanorrhina	H																									
	Attagenus	G																									
6(b)(i)	jointed legs / exoskeleton / segmented body ;	1																									
6(b)(ii)	any two from: crustacean ; myriapods ; arachnids / chelicerata ;	2	1 centipedes / millipede 1 individual species names																								

Question	Answer	Marks	Guidance								
7(a)(i)	<table border="1"> <tr> <td>role in the food web</td> <td>name of the organism</td> </tr> <tr> <td>a producer</td> <td>algae ;</td> </tr> <tr> <td>a primary consumer</td> <td>shrimp / mayfly (larvae) / blackfly (larvae) ;</td> </tr> <tr> <td>an organism that is both a secondary and a tertiary consumer</td> <td>trout ;</td> </tr> </table>	role in the food web	name of the organism	a producer	algae ;	a primary consumer	shrimp / mayfly (larvae) / blackfly (larvae) ;	an organism that is both a secondary and a tertiary consumer	trout ;	3	
role in the food web	name of the organism										
a producer	algae ;										
a primary consumer	shrimp / mayfly (larvae) / blackfly (larvae) ;										
an organism that is both a secondary and a tertiary consumer	trout ;										
7(a)(ii)	six ;	1									
7(a)(iii)	(the) Sun ;	1									
7(b)	<p><i>kingfisher</i>: numbers decrease ; lack of, food or energy / starvation / migration ;</p> <p><i>shrimps</i>: number decrease ; (leeches will increase as not eaten by trout so) more leeches will eat (more) shrimp / more predators (of the shrimp);</p>	4									
7(c)	<p>arrow from caddisfly larva to duck (name in a box) ;</p> <p>arrow from aquatic plant (name in a box) to duck ;</p>	2									

Question	Answer				Marks	Guidance
8(a)(i)	liver ;				1	
8(a)(ii)	amino acids ;				1	
8(b)	letter on Fig. 8.1	name of structure	function of structure		6	
	L	renal artery	transports blood to the kidney			
	M	ureter;	transports urine / urea, from kidney / to bladder ;			
	N	bladder ;	stores / keeps urine / urea ;			
	P	vena cava ;	transport blood to the heart / carries deoxygenated blood ;			
8(c)	water ; salt(s) / (named mineral) ions ; AVP ; ;				2	1 glucose / proteins A mineral(s) e.g. hormones / vitamins / ammonia / creatinine
8(d)(i)	lung(s) ;				1	A gills
8(d)(ii)	blood / plasma ;				1	A red blood cell I blood vessels

Question	Answer	Marks	Guidance
9(a)	impaired judgement / reduced self-control / reduced inhibitions ; increased / slower, reaction time ; depressant ; reduced coordination / blurred vision / double vision ; AVP ;	2	AW throughout I liver damage / high blood pressure
9(b)	1 number of deaths (for, men / women) increases and decreases ; 2 male deaths increase until 2006 and decrease from 2008 ; 3 female deaths increase until 2008 then decrease / AW ; 4 reference to plateau (in men or women) / AW ; 5 both decrease from 2008 ; 6 number of male deaths (always) higher than number of female deaths / ora ;	3	e.g. drowsiness / dizziness / brain damage
9(c)(i)	17 (per 100 000 population) ;	1	
9(c)(ii)	63 ;;	2	A 9×7 or $\frac{9 \times 700\,000}{100\,000} = 1\text{mark}$

Question	Answer	Marks	Guidance
9(c)(iii)	<p><i>decreases because:</i></p> <ol style="list-style-type: none"> 1 education / campaigns / people more aware (of dangers) ; 2 ref to economic reason / price of alcohol has increased ; 3 legislation / car drivers breathalysed and fined / alcohol banned in public places ; 4 social, awareness / pressures ; 5 AVP ; e.g. better health care / safer cars <p>OR</p> <p><i>increases because:</i></p> <ol style="list-style-type: none"> 1 addiction / people disregard their health ; 2 people unaware of dangers ; 3 more alcohol, available / affordable ; 4 more advertising (of alcoholic products) ; 5 peer / social, pressure ; 	2	AW throughout

Question	Answer	Marks	Guidance
10(a)(i)	adrenaline ;	1	
10(a)(ii)	wide pupils ; increased, heart / pulse, rate ; increased breathing rate ; increased size of respiratory passages / AW ; increased level of glucose in blood ; AVP ;	2	e.g. increased blood pressure / increased alertness / redistribution of blood / reduced pain perception AW



BIOLOGY

0610/33

Paper 3 Theory (Core)

October/November 2017

MARK SCHEME

Maximum Mark: 80

Published

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- ora actual word given must be used by candidate (grammatical variants excepted)
- () indicates the maximum number of marks that can be given
- underline
- max

Question	Answer	Marks	Guidance												
1(a)	any 2 from feathers / beak / wings / hard-shelled eggs / two legs ;;	2													
1(b)	<table border="1"> <thead> <tr> <th>name of bird</th> <th>letter</th> </tr> </thead> <tbody> <tr> <td>pied avocet</td> <td>A</td> </tr> <tr> <td>Andean avocet</td> <td>B</td> </tr> <tr> <td>common sandpiper</td> <td>C</td> </tr> <tr> <td>banded stilt</td> <td>E</td> </tr> <tr> <td>whimbrel</td> <td>D</td> </tr> </tbody> </table> ;;; ;;;	name of bird	letter	pied avocet	A	Andean avocet	B	common sandpiper	C	banded stilt	E	whimbrel	D	4	4 or 5 correct = 4 marks 3 correct = 3 marks 2 correct = 2 marks 1 correct = 1 mark
name of bird	letter														
pied avocet	A														
Andean avocet	B														
common sandpiper	C														
banded stilt	E														
whimbrel	D														
1(c)(i)	idea of long legs allow them to wade in shallow water ; idea of long beaks to, dig up / catch their prey ; AVP ;	2													
1(c)(ii)	natural selection ;	1	A adaptation / evolution / survival of the fittest												

Question	Answer	Marks	Guidance																												
2(a)(i)	H ;	1																													
2(a)(ii)	bladder ;	1																													
2(b)	(ureter) carries, urine/urea, from the kidneys /to the bladder ; (urethra) carries, urine/urea, from the bladder to the outside ;	2	A transports urine for 1 mark only																												
2(c)(i)	amino acids ;	1	R if more than one answer																												
2(c)(ii)	liver ;	1																													
2(d)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2">rest day</th> <th colspan="2">race day</th> </tr> <tr> <th>water input from /cm³</th> <th>water loss from /cm³</th> <th>water input from /cm³</th> <th>water loss from /cm³</th> </tr> </thead> <tbody> <tr> <td>respiration 400</td> <td>faeces 100</td> <td>respiration 500</td> <td>faeces 100</td> </tr> <tr> <td>food 500</td> <td>skin 400</td> <td>food 500</td> <td>skin 1900</td> </tr> <tr> <td>drink 1500</td> <td>breathing 400</td> <td>drink 2000</td> <td>breathing 600</td> </tr> <tr> <td></td> <td>urine 1500</td> <td></td> <td>urine 400</td> </tr> <tr> <td>Total 2400</td> <td>Total 2400</td> <td>Total 3000</td> <td>Total 3000</td> </tr> </tbody> </table> ; ;	rest day		race day		water input from /cm ³	water loss from /cm ³	water input from /cm ³	water loss from /cm ³	respiration 400	faeces 100	respiration 500	faeces 100	food 500	skin 400	food 500	skin 1900	drink 1500	breathing 400	drink 2000	breathing 600		urine 1500		urine 400	Total 2400	Total 2400	Total 3000	Total 3000	2	4 correct = 2 2 or 3 correct = 1 1 correct = 0
rest day		race day																													
water input from /cm ³	water loss from /cm ³	water input from /cm ³	water loss from /cm ³																												
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food 500	skin 400	food 500	skin 1900																												
drink 1500	breathing 400	drink 2000	breathing 600																												
	urine 1500		urine 400																												
Total 2400	Total 2400	Total 3000	Total 3000																												
2(e)	increased volume (of urine) ; (urine is) more dilute /less concentrated ;	2																													

Question	Answer	Marks	Guidance																								
3(a)	<table border="1"> <thead> <tr> <th>action</th> <th>chronic obstructive pulmonary disease</th> <th>coronary heart disease</th> <th>HIV infection</th> <th>liver disease</th> <th>lung cancer</th> </tr> </thead> <tbody> <tr> <td>drinking alcohol</td> <td></td> <td>(✓)</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>injecting heroin</td> <td></td> <td>(✓)</td> <td>✓</td> <td>(✓)</td> <td></td> </tr> <tr> <td>smoking tobacco</td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td>✓</td> </tr> </tbody> </table>	action	chronic obstructive pulmonary disease	coronary heart disease	HIV infection	liver disease	lung cancer	drinking alcohol		(✓)		✓		injecting heroin		(✓)	✓	(✓)		smoking tobacco	✓	✓			✓	3	
action	chronic obstructive pulmonary disease	coronary heart disease	HIV infection	liver disease	lung cancer																						
drinking alcohol		(✓)		✓																							
injecting heroin		(✓)	✓	(✓)																							
smoking tobacco	✓	✓			✓																						
3(b)	contains nicotine ; addictive / withdrawal symptoms / AW ;	2																									
3(c)(i)	woman's blood alcohol reaches a higher peak ; woman's blood alcohol reaches its peak later / slower ; woman's blood alcohol takes longer to return to the original level / AW ; after 12 minutes the woman's blood alcohol is higher than the man's ;	2																									
3(c)(ii)	70 ;	1																									
3(c)(iii)	20 ;	1	ecf from 3(c)(ii)																								
3(c)(iv)	differences in size / ref. to enzyme activity / metabolism / genetic predisposition / age / more active liver / AVP ;	1	A different food intake / tolerance to alcohol																								

Question	Answer	Marks	Guidance
4(a)	G as first letter ; E D F in the middle ; A as the last letter ;	3	A EFD
4(b)	barrier ; surgical ; chemical ;	3	
4(c)(i)	(infection transmitted) via exchange of (named)body fluids ; during sexual contact ;	2	
4(c)(ii)	AIDS ;	1	
4(c)(iii)	(contaminated) blood transfusions /organ transplants /sharing needles /breast feeding /birth /blood to blood contact /AVP ;	1	R saliva

Question	Answer	Marks	Guidance
5(a)(i)	pollen (grains) ;	1	
5(a)(ii)	ovules ;	1	
5(a)(iii)	anthers ;	1	
5(a)(iv)	stigma ;	1	
5(b)	<p><i>insect - pollinated</i></p> <p>petal shape / landing platform / mimicry AW ; colour ; nectar / nectaries ; guideline ; sticky / spikey / large, pollen ; anthers / stamens enclosed ;</p> <p><i>wind - pollinated</i></p> <p>small / no petals ; exposed anther / stigma ; feathery stigma ; loosely attached anthers ; large quantity of pollen ; smooth / light, pollen ;</p>	4	<p>max 3 from either section.</p> <p>! scent / smell ! any ref to seeds</p>
5(c)	(suitable) temperature ; oxygen ; water ;	2	

Question	Answer	Marks	Guidance
6(a)	(they are) producers ; makes its own food ; ref to photosynthesis ; animals / consumers cannot make their own food / get food from plants ;	3	
6(b)(i)	desert plants → kangaroo rat / lizard → snake → hawk ;	1	R if more or less than 4 organisms given
6(b)(ii)	hawk ; snake ; fox ;	2	
6(c)	<i>scorpions</i> population decrease ; less food ; <i>desert plants</i> population increases ; idea of less predation / less herbivores / primary consumers to eat them / AW ;	4	

Question	Answer	Marks	Guidance
7(a)(i)	chlorophyll ;	1	
7(a)(ii)	palisade (mesophyll) ;	1	A guard cell/ spongy mesophyll cell
7(b)(i)	cuticle ;	1	
7(b)(ii)	(upper) epidermis ;	1	
7(c)	<i>xylem</i> water / mineral ions ; <i>phloem</i> sugars ;	2	A other correctly named molecules e.g. sucrose / amino acids
7(d)(i)	stomata ;	1	
7(d)(ii)	carbon dioxide ;	1	A water vapour
7(d)(iii)	oxygen ;	1	

Question	Answer	Marks	Guidance
8(a)(i)	hormones ;	1	
8(a)(ii)	pancreas ;	1	
8(a)(iii)	reduce blood, sugar / glucose, concentration ;	1	
8(b)	blood / plasma ;	1	
8(c)(i)	changing the genetic material (of an organism) ; by, removing / changing / inserting individual genes ;	2	
8(c)(ii)	herbicide resistance / pest resistance / production of vitamins / drought resistance / frost resistance / AVP ;	1	

Question	Answer	Marks	Guidance
9(a)(i)	(male) black (fur) (female) white (fur) ;	1	
9(a)(ii)	bb ;	1	
9(a)(iii)	Bb ;	1	
9(b)(i)	BB and Bb ;	1	
9(b)(ii)	3 (black) : 1 (white) ;	1	



BIOLOGY

0610/41

Paper 4 Theory (Extended)

October/November 2017

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks	Guidance
1(a)(i)	absorption (of digested food / water) / movement of (small) molecules (from small intestine) into blood ;	1	
1(b)	<p>1 goblet cells labelled P ;</p> <p>2 shaped described / produces mucus ;</p> <p>3 lacteal / lymph vessel / lymphatic vessel, labelled Q ;</p> <p>4 description / transports fatty acids / fats;</p> <p>5 capillaries / blood vessel, labelled R ;</p> <p>6 thin / one cell thick, walls / carries products of digestion ;</p> <p>7 microvilli / epithelia labelled S ;</p> <p>8 for <i>microvilli</i> accept – large surface area / thin, for diffusion / absorption ;</p>	4	
1(c)(i)	<p>watery faeces / AW ;</p> <p>dehydration / described ;</p> <p>loss of, salts / ions / electrolytes ;</p> <p>cramps / stomach pain ;</p> <p>death ;</p>	2	<p>A water not absorbed from faeces</p> <p>I nutrients</p>
1(c)(ii)	oral rehydration therapy ;	1	A antibiotics
1(d)(i)	(blood) plasma ;	1	
1(d)(ii)	assimilation ;	1	
1(d)(iii)	protein ; named proteins ;;	2	<p>A (poly)peptides e.g. (named) enzymes, antibodies, insulin, fibrinogen, haemoglobin, glucagon</p> <p>I hormones</p>

Question	Answer	Marks	Guidance
2(a)	watch chest / abdomen, rise and fall / use a spirometer ; ref. to time / in one minute ;	2	
2(b)	exercise will increase breathing rate ; after exercise the breathing rate, will start decreasing / levels off ;	2	
2(c)	<i>description</i> carbon dioxide constant / at 4.7% , before exercise ; carbon dioxide highest / higher, at 6.0% / (immediately) after exercise ; decreases ; falls below resting level / AW ; comparative data quote ; <i>explanation</i> removal of excess carbon dioxide ; more energy used during exercise means higher rates of respiration ; aerobic respiration releases carbon dioxide ; oxygen not supplied fast enough (from lung / heart) / more oxygen required by muscles ; <u>oxygen debt</u> ; <u>anaerobic</u> respiration (in muscles) ; (produces) lactic acid / lactate ; lactic acid is, broken down / respired / converted to glucose / converted to carbon dioxide ;	6	A 4.6%.
2(d)(i)	safety risk (not to over exercise) ; CHD could change the expected result (for healthy people) ; she does not show (named) risk factor ;	1	A suitable suggestion related to CHD I 'danger' unqualified
2(d)(ii)	prevents blocked arteries / prevents thrombus formation ; lowers blood pressure ; lowers cholesterol / lowers fats / reduces risk of atheroma ; weight loss / using fats / avoids obesity ; lowers stress ; (heart) muscle stronger / lower (resting) pulse ;	3	A increased stroke volume

Question	Answer	Marks	Guidance
3(a)	scent ; nectar ; 'honey' guides ; colourful petals ; large petals ; pollen (as source of food) ;	3	I sticky pollen / stigma I stigma / anther, inside flower A mimicry
3(b)	pollen lands on stigma ; pollen tube grows ; through style ; to ovary ; (<i>pollen nucleus / male gamete</i>) enters ovule ; through micropyle ; pollen and ovule / egg, <u>nuclei</u> fuse ;	5	
3(c)(i)	a version / type, of a <u>gene</u> ;	1	A alternative form of a <u>gene</u>
3(c)(ii)	test cross ;	1	
3(c)(iii)	<i>parental phenotypes</i> tall x dwarf <i>parental genotypes</i> TT ; x tt ; <i>gametes</i> T T x t t ; <i>offspring genotype</i> Tt ; <i>offspring phenotype</i> (100%) tall		A ecf from parental genotypes.
3(c)(iv)	tt ; so that no dominant allele is present / all alleles are recessive / AW ; recessive alleles only expressed if no dominant allele present ;	2	A homozygous recessive

Question	Answer	Marks	Guidance
4(a)(i)	<u>stem</u> (cells) ;	1	
4(a)(ii)	nucleus / nucleolus / nuclear membrane ; cell membrane ; cytoplasm ; ribosomes ; mitochondria ; endoplasmic reticulum / ER ; vesicle / vacuole ; AVP ;	2	R large permanent vacuole A Golgi apparatus, lysosome, centrioles
4(a)(iii)	(transmit impulses) from one (distant) part of the body to another / AW ; so (impulse) is fast / AW ;	1	
4(b)(i)	motor (neurones) ;	1	
4(b)(ii)	muscle ; gland ;	1	

Question	Answer			Marks	Guidance
4(c)(i)	letter from Fig. 4.1	name	description	5	one mark per correct row
E	mitochondrion / mitochondria ;	component of the cell that releases energy during aerobic respiration	chemicals that transmit signals from one neurone to the next neurone		
H	neurotransmitters	the gap between two neurones	the sac in which neurotransmitters are transported to the cell membrane		
J	synapse ;	the molecules that the neurotransmitters bind to	the structure that controls the activities in the cell		
F/G	vesicle ;	receptors ;	nucleus ;		
K	receptors ;	nucleus ;			
M	nucleus ;				
4(c)(ii)	brain / spinal cord / central nervous system / CNS ;			1	
4(d)	diffusion ; from high concentration to low concentration / down a concentration gradient ; direction described ; AVP ;			3	
4(e)	nerves faster / hormones slower ; nerve impulses are a short lived response / ora ;			1	

Question	Answer	Marks	Guidance
5(a)	$C_6H_{12}O_6 + 6O_2 \rightarrow$; $6H_2O + 6CO_2$;	2	max one mark if not balanced
5(b)(i)	sugar beet ; (one of three crops that) falls with appropriate temperature range / ora ; sugar beet / corn requirement for rainfall, is in the range ; wheat requires more rainfall ; corn / wheat, has a lower productivity / energy yield ; appropriate use of data ;	3	wheat and corn also grow in suitable temp.(ecf) A sugar beet has a higher energy yield than wheat (or corn).
5(b)(ii)	stunted / reduced / no, growth / yield ; used to make amino acids / proteins ; amino acids converted to proteins ; named molecule containing nitrogen ;	3	e.g. DNA, enzymes, chlorophyll
5(b)(iii)	$200 \div 0.0001$ $2\,000\,000 \div 2 \times 10^6$;	1	
5(b)(iv)	less land required ; crops can be used as food (rather than fuel) ; less habitat destruction / less deforestation ; less disruption to food chains / greater diversity maintained ; comparison of algae yield with any crop from Table 5.1, with units ; AVP ;	3	
5(c)	development that provides for the needs of an (increasing) human (population) ; without harming the natural environment / ecosystems / habitat ;	2	

Question	Answer	Marks	Guidance
6(a)(i)	genetic material ; protein coat ; parasitic / pathogenic ; only reproduce in a host / do not show (other) features of living organisms / AW ; very small ; they are not cellular / absence of named organelle ; AVP ; cannot be killed / cannot be treated, with antibiotics.	2	A DNA / RNA A virus are non-living.
6(a)(ii)	active immunity ; harmless / dead / weakened / attenuated pathogen / microorganisms ; injected / ingested ; ref. to antigens ; (antigen) triggers antibody production ; by lymphocytes ; memory cells (are produced) ; rapid response to reinfection ; long-term immunity ; prevention of spread person to person e.g. no host for pathogen / herd ref to programmes of mass vaccination ; AVP ;	5	.
6(b)	shape / size / AW ; genetic material (sequence / type) ; host species / type of disease it causes ; AVP ;	1	



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0610/42

Paper 4 Theory (Extended)

October/November 2017

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Question	Answer	Marks	Guidance
1(a)(i)	carbon dioxide / CO ₂ / water / H ₂ O (vapour) ; (respiring / all) cells / tissues / mitochondria / named tissue(s) / named organ(s) ;	2	R alveoli / lungs
1(a)(ii)	urea ; toxic / poisonous / harmful / waste / AW ;	2	A ammonia / ammonium / creatin(ine) / uric acid / urine
1(b)(i)	glomerulus ;	1	A ball / knot / AW, of capillaries A Bowman's capsule / basement membrane
1(b)(ii)	red (blood) cells / erythrocytes ; phagocytes ; lymphocytes ; named plasma proteins ; ; platelets ;	2	e.g. albumen / fibrinogen / insulin / glucagon / thrombin / antibodies / clotting factors
1(c)(i)	microvilli – E ; nucleus – A ; mitochondrion – C ;	3	
1(c)(ii)	stores / contains, chromosomes / genes / alleles / genetic information / DNA ; controls the (activity / reactions of the) cell ; controls how cells, develop / divide / reproduce / grow ; <i>idea that it stores instructions for, making proteins / protein synthesis / making RNA ;</i> AVP ;	1	I 'controls movement of cell' I giving instructions unqualified A 'codes for protein' e.g. making ribosome(s)
1(c)(iii)	small intestine / duodenum / ileum ;	1	A villi / jejunum / tongue / liver / egg cell / white blood cells / ear / nose

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Question	Answer	Marks	Guidance
1(c)(iv)	<p>(microvilli give a) large surface area ; for diffusion / described as movement down a concentration gradient ;</p> <p>lots of, mitochondria / C ; C / mitochondria, are the site of (aerobic) respiration ; C / mitochondria, provide energy / make ATP ; energy / ATP, is needed for active transport ; (active transport needed for) movement against concentration gradient ;</p> <p>ref to carrier proteins (in cell membrane) ; AVP ;</p>	4	<p>mp2 is linked to mp1</p> <p>R 'produces energy' e.g. substances pass to blood to maintain concentration gradient</p>

Question	Answer	Marks	Guidance
2(a)	prevents contamination / transmission, of (named) pathogen / toxin ; prevents, infection / spreading of disease / illness ; ora	2	
2(b)	1 low (concentration) of lactic acid in blood at, rest / the start / before ; 2 lactic acid (concentration) increases, steeply / quickly / AW, during exercise ; 3 reaches a peak / increases and decreases ; 4 decreases steeply, then gradually after exercise ; 5 any use of figures ; <i>explanation</i> 6 oxygen, demand increases / does not reach muscles fast enough / AW ; 7 <u>anaerobic respiration</u> ; 8 provides / releases, energy ; 9 anaerobic respiration produces lactic acid ; 10 lactic acid diffuses from muscles into the blood ; 11 lactic acid is, broken down / respired / oxidised / converted to glucose / AW ; 12 in the liver ; 13 ref. to <u>oxygen debt</u> ;	6	e.g. peak at 13.2 mmol dm ⁻³ at 15 minutes ± 0.2 mmol A produces ATP R produce / makes, energy
2(c)(i)	P 12 (km h ⁻¹) and Q 10 (km h ⁻¹) ;	1	One mark only both must be right
2(c)(ii)	<i>idea that trained athlete / P</i> , has a higher level of (aerobic) fitness (than Q) ; difference in, gender / age / height / mass / lung capacity / lung mass / stroke volume / muscle type ; AVP ;	1	A P , is fitter than Q / has trained more than Q e.g. ref to genetics but not different genes

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Question	Answer	Marks	Guidance
2(c)(iii)	<ol style="list-style-type: none"> 1 increase in demand for energy ; 2 increase in (aerobic) respiration ; 3 increase in demand for oxygen ; 4 increase in carbon dioxide (concentration) ; 5 decrease in pH / increase in acid, in the blood ; 6 detected by the, brain / chemoreceptors ; 7 (brain stimulates) an increase in breathing rate / faster breathing ; 8 (brain stimulates) an increase in depth of breathing / AW ; 9 ref to negative feedback in correct context ; 	4	<p>A 'needs' more energy</p> <p>e.g. rate of breathing remains high until carbon dioxide concentration returns to, normal / set point</p>

Question	Answer	Marks	Guidance
3(a)	<ol style="list-style-type: none"> 1 (immediate / steep) increase in numbers / no lag phase ; 2 exponential / log, phase ; 3 decelerating phase / described as increase slowing down ; 4 stationary phase / plateau / levels off / remains constant ; 5 levels, at 1.6 to 1.65 million / from between 1850 and 1875 ; 	3	

Question	Answer	Marks	Guidance
3(b)	<p>population increases</p> <ol style="list-style-type: none"> 1 more births than deaths ; 2 more sheep are imported ; 3 more food needed for increasing human population ; 4 idea that more sheep needed for, export/ economy of Tasmania ; <p>population remains constant</p> <ol style="list-style-type: none"> 5 idea that population reaches, carrying capacity / described ; 6 number of births = number of deaths / culling for meat / AW ; 7 any ref to <u>limiting factor(s)</u> in correct context in either increase or plateau ; 8 any example of a limiting factor ; <p>resources food supply water supply space / area of land for grazing / AW disease predators competitors</p>	3	<p>e.g. maximum that the land can support</p> <p>! drought / floods / any other natural disaster</p>
3(c)	<ol style="list-style-type: none"> 1 idea that farmer, chooses / selects (animals that are best adapted to conditions) ; 2 appropriate named feature(s) ; 3 selected animals bred together / (cross) breed them ; 4 select the offspring that show the features required ; 5 repeat, the selection and breeding / the process ; 6 idea that imports (male) sheep with desired features to mate with flock ; 7 uses artificial insemination ; 	4	
3(d)	<p>providing for the needs of (the increasing) humans (population) ;</p> <p>without harm to the (natural) environment/ ecosystem(s) / habitat/ biodiversity ;</p>	2	<p>A examples of development, e.g. roads / houses / cities / urbanisation / AW</p>

Question	Answer	Marks	Guidance												
4(a)	<p>little / less / AW / no, variation / (genetic) diversity ; ref to becoming homozygous ; less chance of, surviving / adapting / evolving, to, changing conditions / new environments / (new) disease ; risk of extinction ; increase chance of genetic disease ; adapted variety spreads / AW ; only one plant needed / no mate required ; R if 'asexual reproduction' is given greater chance of pollination / ensures pollination occurs ; <i>idea that reproduction / fertilisation, successful if no other plants (of same species) nearby ;</i> less wastage of pollen ; not dependent on (named) agent of pollination ; AVP ; no hybrid vigour / smaller gene pool</p>	4	<p>A fewer alleles ref to gene(s) R cloning / uniform(ity)</p> <p>A increased risk of abnormalities / genetic 'weakness' / AW</p> <p>A gametes no wastage</p>												
4(b)(i)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="width: 30%;">term</td> <td>example in <i>P. sativum</i></td> </tr> <tr> <td>dominant trait</td> <td>purple flowers</td> </tr> <tr> <td>recessive allele</td> <td>b ;</td> </tr> <tr> <td>phenotype</td> <td>(flower) colour / purple (flowers) / white (flowers) ;</td> </tr> <tr> <td>homozygous genotype</td> <td>BB and / or bb ;</td> </tr> <tr> <td>heterozygous genotype</td> <td>Bb ;</td> </tr> </tbody> </table>	term	example in <i>P. sativum</i>	dominant trait	purple flowers	recessive allele	b ;	phenotype	(flower) colour / purple (flowers) / white (flowers) ;	homozygous genotype	BB and / or bb ;	heterozygous genotype	Bb ;	4	
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recessive allele	b ;														
phenotype	(flower) colour / purple (flowers) / white (flowers) ;														
homozygous genotype	BB and / or bb ;														
heterozygous genotype	Bb ;														

Question	Answer	Marks	Guidance
4(b)(ii)	<p>purple flowers x white flowers purple flowers x white flowers</p> <p>parental phenotype</p> <p>parental genotype Bb x bb BB x bb ;</p> <p>genotypes of gametes B b + b (b) B B + b (b) ;</p> <p>offspring genotypes Bb bb Bb (Bb);</p> <p>offspring phenotypes purple flowers, white flowers ; purple flowers ;</p>	5	
4(c)(i)	<p>test cross 1</p> <p>GG x GG / GG x Gg A GG on its own R GG x gg ;</p> <p>test cross 2</p> <p>Gg x Gg ;</p>	2	A Gg on its own
4(c)(ii)	<p>white plants are, homozygous recessive / gg ;</p> <p>(white plants / no chlorophyll) cannot, photosynthesise / produce own food ;</p> <p>(therefore white plants) do not grow into mature plants / do not produce flowers / die before reproducing / AW ;</p>	2	I cannot survive unqualified

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Question	Answer	Marks	Guidance
5(a)	<i>Helicobacter</i> ;	1	
5(b)	circular DNA / chromosome ; plasmid(s) ; cell membrane ; cell wall (not made of cellulose) ; cytoplasm ; capsule ; (small) ribosomes ; flagella ; AVP ;	2	A naked, DNA / chromosome I cilia e.g. pili
5(c)(i)	antibiotic(s) ;	1	
5(c)(ii)	(stomach / hydrochloric / gastric) acid / HC// mucus ;	1	
5(d)	<i>active immunity</i> 1 exposure to <u>antigen</u> ; ora 2 after, infection by pathogen / vaccination ; 3 immune response occurs / antibodies produced ; <i>passive immunity</i> 4 <u>antibodies</u> acquired from another individual ; 5 e.g. by breast milk / injection of antibodies ; 6 active is, permanent / long-term (immunity) ; ora 7 ref to memory cells, in active / not in passive ; 8 response is slow on first exposure in active ; ora	4	

Question	Answer	Marks	Guidance																		
6(a)	<table border="1"> <thead> <tr> <th>blood vessel</th> <th>name of blood vessel</th> <th>oxygenated / deoxygenated</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>hepatic portal vein</td> <td>deoxygenated ;</td> </tr> <tr> <td>B</td> <td>(inferior) vena cava</td> <td>deoxygenated ;</td> </tr> <tr> <td>C</td> <td>pulmonary vein</td> <td>oxygenated ;</td> </tr> <tr> <td>D</td> <td>aorta</td> <td>oxygenated ;</td> </tr> <tr> <td>E</td> <td>femoral artery</td> <td>oxygenated ;</td> </tr> </tbody> </table>	blood vessel	name of blood vessel	oxygenated / deoxygenated	A	hepatic portal vein	deoxygenated ;	B	(inferior) vena cava	deoxygenated ;	C	pulmonary vein	oxygenated ;	D	aorta	oxygenated ;	E	femoral artery	oxygenated ;	4	
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E	femoral artery	oxygenated ;																			
6(b)(i)	<p>chemical / substance, made by a gland ; travels in the blood (plasma) ; alters the activity of one or more specific target organs ;</p>	2	<p>I proteins R enzymes A alters activity of / affects, target organ(s) A controls</p>																		
6(b)(ii)	<ol style="list-style-type: none"> 1 controls blood, glucose / sugar, concentration / level ; 2 increased, uptake / respiration, of glucose ; 3 (stimulates cells to) convert glucose to <u>glycogen</u> ; 4 <i>idea that</i> target organs are, muscle / liver ; 5 (so) decreases blood glucose concentration ; 6 ref to, negative feedback / homeostasis ; 	3																			
6(c)	<ol style="list-style-type: none"> 1 shunt vessels, constrict / close / AW ; 2 less blood flow through shunt vessels ; 3 arterioles, widen / dilate / relax ; 4 <u>vasodilation</u> (in context of arteries and arterioles) ; 5 more blood flow (through capillaries) near the surface of the skin / AW ; 6 (more) heat loss from blood (by radiation) ; 	3	<p>R if in context of capillaries / veins A 'blood vessels'</p>																		



BIOLOGY

0610/43

Paper 4 Theory (Extended)

October/November 2017

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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This document consists of **10** printed pages.

Mark schemes will use these abbreviations

- ; separates marking points
- / alternatives
- I ignore
- R reject
- A accept (for answers correctly cued by the question, or guidance for examiners)
- AW alternative wording (where responses vary more than usual)
- AVP any valid point
- ecf credit a correct statement / calculation that follows a previous wrong response or reverse argument
- ora the word / phrase in brackets is not required, but sets the context
- () actual word given must be used by candidate (grammatical variants excepted)
- underline indicates the maximum number of marks that can be given
- max

Question	Answer	Marks	Guidance							
1(a)	carbon dioxide / CO ₂ ; water (vapour) ;	1								
1(b)	<ol style="list-style-type: none"> 1 B are cilia ; 2 C is mucus ; 3 C/D, are goblet cells ; 4 E is cartilage ; 5 B / cilia, waft / beat, mucus / C (up / out of, the airway) ; 6 C / D / goblet cells, secrete, mucus / C ; 7 C / mucus, traps, particles / pathogens ; 8 B / C / D / AW, prevent infections ; 9 E / cartilage, keeps the, airway / trachea, open ; 	6	max 2 marks for labels A prevent collapse							
1(c)(i)	<table border="1" style="width: 100%; text-align: center;"> <tr> <td>U</td> <td>P</td> <td>T</td> <td>S</td> <td>Q</td> <td>R</td> <td>V</td> </tr> </table>	U	P	T	S	Q	R	V	2	
U	P	T	S	Q	R	V				
1(c)(ii)	<ol style="list-style-type: none"> 1 for, gas exchange / diffusion / movement of CO₂ <u>and</u> O₂ ; 2 short distance (for diffusion / gas exchange) ; 3 fast (gas exchange / diffusion) ; 	2								
1(d)	<ol style="list-style-type: none"> 1 haemoglobin is, abnormal / rigid / AW ; 2 abnormal haemoglobin carries less oxygen (than normal haemoglobin) ; ora 3 red blood cells are, sickle shaped / AW ; 4 (sickle cells) stick together / clot (in blood vessels) ; 5 fewer red blood cells ; 	3	<p>A abnormal haemoglobin does not carry O₂</p> <p>A not biconcave</p> <p>A blocked vessels / stuck / more red blood cells broken down</p>							

Question	Answer	Marks	Guidance
2(a)(i)	<p>1 exercise will increase heart rate (from resting rate) ;</p> <p>2 after exercise heart rate will, remain high / start decreasing ;</p> <p>OR</p> <p>3 there is no effect of exercise on heart rate ; is the null hypothesis ;</p>	2	A before exercise heart rate will be lower
2(a)(ii)	<p>1 fingers on, wrist / neck / artery ;</p> <p>2 number beats over a period of time / bpm ;</p> <p>3 use a heart rate monitor / AW ;</p> <p>4 contact of sensor with skin ;</p>	2	
2(b)	<p>1 lack of, blood supply / oxygen / glucose to heart, wall / muscle / tissues / cells ;</p> <p>2 less / no, (aerobic) respiration / described ;</p> <p>3 (heart) tissue / cells, die ;</p> <p>4 heart (muscle) cannot contract ;</p>	2	A more anaerobic
2(c)	<p><i>description</i></p> <p>1 no difference between groups at 0 months ;</p> <p>2 HRR in A increases and B increases and then decreases ;</p> <p>3 (at) 3 months, little difference between groups / group B higher ;</p> <p>4 (at) 6 months / at end, group A higher HRR (than group B) ;</p> <p>5 comparative data quote with units ;</p> <p><i>explanation</i></p> <p>6 (regular) exercise improves, HRR / fitness ;</p> <p>7 exercise, strengthens heart muscle / increases, stroke volume / cardiac output ;</p> <p>8 <i>idea that anaerobic respiration / oxygen debt reduces HRR ; ora</i></p> <p>9 given plan has better long term effect / without given plan better short term effect ;</p> <p>10 patients may stick to given plan better (than their plan) ; ora</p> <p>11 without a given plan patients probably started with a higher intensity plan ; ora</p> <p>12 given plan may be better designed (to improve HRR long term) ; ora</p>	6	<p>A fitness or HR for HRR throughout</p> <p>A both groups increase HRR overall</p>

Question	Answer	Marks	Guidance
2(d)	<p>1 reduced, salt / (saturated) fats / cholesterol ;</p> <p>2 stop smoking ;</p> <p>3 reduce stress ;</p> <p>4 AVP ; e.g. / medication qualified / control diabetes / reduced alcohol / reduce blood pressure</p>	1	

Question	Answer	Marks	Guidance
3(a)(i)	DNA ;	1	A correct elements I RNA
3(a)(ii)	<p>parental phenotypes resistant x not disease-resistant</p> <p>parental genotypes Rr ; x rr ;</p> <p>gametes R r x r (r) ;</p> <p>offspring genotype Rr and rr ;</p> <p>offspring phenotype resistant and not resistant / AW ;</p>	5	ecf from previous line above throughout
3(b)(i)	heterozygous, plant / parent, carry the not-resistant / r, allele ; some offspring would be, not-resistant / rr / homozygous recessive ; using heterozygotes results in profit loss / AW ;	2	A homozygous dominant = no r allele / only R A therefore all offspring are disease-resistant
3(b)(ii)	<p>paint pollen onto selected trees / AW ;</p> <p>isolate plants / cover flowers, of unselected trees ;</p> <p>identify not disease resistant trees ;</p> <p>AVP ; remove not-resistant trees</p>	1	A artificial pollination
3(b)(iii)	human choice (rather than environmental pressures) / AW ; less, diversity / variation ; faster change ; AVP ; e.g. mating is not random	2	A named features for human use A reduced fitness (of species)

Question	Answer	Marks	Guidance
4(a)(i)	(species) M ;	1	
4(a)(ii)	(species L) because most stable ;	1	
4(a)(iii)	300(%) ; ;	2	<i>If no answer or wrong answer award one mark for working: (2000–500) / 500 × 100</i>
4(b)	increased, predation ; disease ; lack of food ; migration ; (named) relevant pollution ; ; (named) relevant environmental change ; ; introduction of new species ;	2	I competition unqualified A new predators A competition for food e.g. eutrophication / rubbish / acid rain e.g. habitat loss / el Niño / global warming / climate change / hurricane / tsunami
4(c)(i)	(larger holes) allow, more / small / immature, fish through ; ora nets more specific to target species / prevents by-catch ;	1	

Question	Answer	Marks	Guidance
4(c)(ii)	<ol style="list-style-type: none"> 1 education / awareness ; Accept commercials / advertising / tax consumer 2 reduced demand (to eat from unsustainable fish stocks) / public pressure / campaigning ; 3 steps taken by fisherman voluntarily / AW ; 4 (legal) quotas / treaties / licenses / laws / restricted catch weight ; 5 ensuring sustainable population size / recovery of, endangered / specific, species ; 6 no-catch zones / nursery zones / protected areas / MPAs ; ora 7 overflow of target species / increase in population outside zone / breeding recovery ; 8 limited fishing season ; 9 stock recovery / optimises breeding seasons ; 10 fines ; 11 discourage / punish, poor practice ; 12 restocking / captive breeding and release ; 13 increases gene pool / number of young / reproductively-viable, fish ; 14 fish farming ; 15 alternative source of fish ; 	4	<p>max 3 for methods only explanations must be linked to correct method</p> <p>e.g. use of better fishing methods</p> <p>MPA = marine protected areas</p> <p>A patrols / policing</p>

Question	Answer	Marks	Guidance
4(d)	<p>1 guillemots / gulls / squid / seals, <u>reduce</u> in numbers ;</p> <p>2 guillemots / gulls, become extinct ; Accept ref to alternative food sources for any other named species</p> <p>3 because their food / energy, source has reduced / (intraspecific) competition for their food increases ;</p> <p>4 zooplankton, might increase / stay same / decrease <u>and</u> valid explanation ;</p> <p>5 phytoplankton decrease because zooplankton increase ; 6</p>	4	<p>mp4 examples of <i>valid explanations</i>: increase leads to less cod predation decrease leads to more squid predation stay same leads to balance squid and cod predation</p>
4(e)	development providing the needs of increasing human population ; without harming the, environment ;	2	

Question	Answer	Marks	Guidance
5(a)(i)	<p>respiration ;</p> <p>aerobic (respiration) ;</p> <p>release energy / make ATP ;</p>	2	<p>A respiration using oxygen A provide energy R produce / generate, energy</p>
5(a)(ii)	<p>different composition of cell wall ;</p> <p>no, chlorophyll / chloroplasts / heterotrophic ;</p> <p>extracellular digestion / saprophytic / decomposer / AW ;</p> <p>hyphae / mycelium ;</p> <p>no (central) vacuole ;</p> <p>AVP ;</p>	2	<p>A not, autotrophic / photosynthetic / AW A enzymes secreted from cells to digest food I spores e.g. multinucleate / reproduction by budding</p>

Question	Answer	Marks	Guidance
5(b)	respiration / fermentation ; carbon dioxide released ; (bubbles / carbon dioxide) causes, dough / bread, to rise ; (yeast produces) enzymes ; enzymes / amylase, digest starch ; AVP ;	3	e.g. yeast, are not toxic / does not produce toxins / reproduce rapidly / can be stored dry / are single celled / cheap
5(c)(i)	(fungus) grown / put, in fermenters ; aerobic conditions / AW ; (provide) sugars / nitrogen source / nutrients ; purification / filtration, of product / penicillin ; batch culture / AW ; sterile conditions ; AVP ;	3	A bioreactors A bubble air through e.g. ammonia / amino acids / protein e.g. described maintenance of culture / penicillin produced, when sugar source decreases / in stationary phase A fermentation conditions such as stirring / use of water jacket / controlling temp / pH etc.
5(c)(ii)	bacteria are made of cells ; ora	1	A viruses are not alive / do not have a cell wall
5(d)	mechanical barriers ; example of mechanical barriers ;; chemical barriers ; example of chemical barriers ;; blood clotting ;	max 3	A physical barriers / dead layer of cells for skin e.g. skin / hairs in nose / ear wax A mucus as mechanical or chemical e.g. mucus / stomach acid / vaginal acid / tears / lysozymes A scab
Question	Answer	Marks	Guidance
6(a)(i)	X – sensory; Y – motor / effector ;	2	

Question	Answer	Marks	Guidance
6(a)(ii)	sweat glands ; blood vessels ; hair erector muscles ;	1	
6(a)(iii)	<u>negative feedback</u> ;	1	
6(b)(i)	shunt vessels, constrict / close / AW ; more / redirect, blood flow to skin (capillaries) ; heat from blood, lost / radiates ; vasodilation (of arterioles) ;	3	A vasoconstriction A heat loss from blood vessels
6(b)(ii)	sweat, secreted / made (by sweat glands) ; evaporative (cooling) ; hair erector muscles relax ; (hairs lie flat) so that less (air) insulation / allows more air movement (across skin) ;	3	A less air trapped
6(c)(i)	quick(er) (response) ; long-term response is not required ;	1	
6(c)(ii)	insulin ; <u>glucagon</u> ; ADH ; AVP ;	2	



BIOLOGY

0610/51

Paper 5 Practical Test

October/November 2017

MARK SCHEME

Maximum Mark: 40

Published

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This document consists of **9** printed pages.

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- ora the word / phrase in brackets is not required, but sets the context
- () actual word given must be used by candidate (grammatical variants excepted)
- underline indicates the maximum number of marks that can be given
- max

Question	Answer	Marks	Guidance
1(a)(i)	one table drawn with appropriate number of columns ; correct column and row headings with appropriate units (pH and intensity/ minutes) ; pH recorded for each solution ; colour of apple slices recorded by intensity for 0 and 10 minutes (numerical values not words) ; colour of apple slices recorded by intensity for 20 minutes (numerical values not words) ; suitable trend ;	6	I control if added to table R if units in data cell I units in data cells A if the correct data is not linked to a time
1(a)(ii)	2 and/or 3, 7, then 8 and/or 9 ;	1	A B and C in either order, A, D and E in either order
1(a)(iii)	to compare (what happens to the apple) with the solution and with no solution / at different pH values and no pH / with different pH values and the air / with the solution and with the air ;	1	I for comparison unqualified A to see what happens to the crushed apple when it is not exposed to the solution A to observe what would happen without the effect of pH A idea that the control shows that the liquid (or change in pH) is causing the results (and not the air)
1(a)(iv)	lemon juice ; has low pH/ is acidic / (lemon juice has a pH of 2 and) previous experiment showed that apple won't go brown at pH2 ;	2	A olive oil A (olive oil) keeps out air / oxygen A enzyme doesn't work / denatured at pH2

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Question	Answer	Marks	Guidance												
1(b)(i)	<table border="1"> <tr> <td>variable</td> <td>controlled by</td> </tr> <tr> <td>volume / amount / mass, of solution / named solution / liquid</td> <td>adding 20 cm³</td> </tr> <tr> <td>(same / one) apple</td> <td>all slices cut from the same apple</td> </tr> <tr> <td>time soaking in solution</td> <td>all soaked for 2 mins</td> </tr> <tr> <td>observation time / time intervals</td> <td>left for 20 min / results checked every 10 minutes</td> </tr> <tr> <td>;</td> <td>;</td> </tr> </table>	variable	controlled by	volume / amount / mass, of solution / named solution / liquid	adding 20 cm ³	(same / one) apple	all slices cut from the same apple	time soaking in solution	all soaked for 2 mins	observation time / time intervals	left for 20 min / results checked every 10 minutes	;	;	2	<p>1 mark for the variable, 1 mark for method of controlling which must related</p> <p>I temperature</p> <p>I time unqualified unless explanation clarifies</p> <p>A time apple was left in the Petri dish A oxygen / air exposure time</p>
variable	controlled by														
volume / amount / mass, of solution / named solution / liquid	adding 20 cm ³														
(same / one) apple	all slices cut from the same apple														
time soaking in solution	all soaked for 2 mins														
observation time / time intervals	left for 20 min / results checked every 10 minutes														
;	;														
1(b)(ii)	oxygen is needed (from the air) for the reaction ;	1	<p>A to expose the apple to oxygen I air</p>												

Question	Answer	Marks	Guidance												
1(c)	any 1 from: idea that it is a qualitative/subjective, method/judged by eye/ similar browning looks the same / AW ;	1	A there are more than three shades of brown												
1(d)	any pair from: <table border="1"> <tr> <td><i>error</i></td> <td><i>improvement</i></td> </tr> <tr> <td>amount of apple not the same / cutting inaccurate</td> <td>use same mass / weight / use a set volume of crushed apple</td> </tr> <tr> <td>crushing uneven</td> <td>use a blender / mortar and pestle</td> </tr> <tr> <td>idea some may have more time in solution than others</td> <td>test each separately</td> </tr> <tr> <td>some apple exposed to air while others being crushed</td> <td>test each separately</td> </tr> <tr> <td>only one slice of apple per solution</td> <td>have at least two more replicates</td> </tr> </table> ; ;	<i>error</i>	<i>improvement</i>	amount of apple not the same / cutting inaccurate	use same mass / weight / use a set volume of crushed apple	crushing uneven	use a blender / mortar and pestle	idea some may have more time in solution than others	test each separately	some apple exposed to air while others being crushed	test each separately	only one slice of apple per solution	have at least two more replicates	2	A (cut to the same size) by using a cutter / ruler, slicer, cutting instrument / AW
<i>error</i>	<i>improvement</i>														
amount of apple not the same / cutting inaccurate	use same mass / weight / use a set volume of crushed apple														
crushing uneven	use a blender / mortar and pestle														
idea some may have more time in solution than others	test each separately														
some apple exposed to air while others being crushed	test each separately														
only one slice of apple per solution	have at least two more replicates														

Question	Answer	Marks	Guidance
1(e)	<p>1 ref to using at least three temperatures ;</p> <p>2 stated temperatures or a description ;</p> <p>3 method described to maintain temperature(s) ;</p> <p>4 methodology described e.g. ref to leaving the enzyme and substrate separately to reach a set temperature ;</p> <p>5 ref to constant pH/experiment carried out at the optimum pH;</p> <p>6 and 7 <i>controlled variables any two from:</i> same concentration of enzyme / same concentration of substrate / same volume of enzyme / same volume of substrate ;;</p> <p>8 leaving for 20 minutes/leaving for a set time /check at stated time intervals ;</p> <p>9 ref to substrate at optimum temperature turning brown first or having the highest colour intensity value ;</p> <p>10 repeat (at least) twice ;</p> <p>11 AVP e.g. repeat the investigation at temperatures near the optimum to obtain a more accurate optimum temperature ;</p>	6	<p>A ref. to measuring time for brown colour to appear</p> <p>A optimum temperature shows the darkest colour</p>

Question	Answer	Marks	Guidance
1(f)(i)	<p>A(xes) – labelled with units (time/minutes and percentage of enzyme activity remaining) ;</p> <p>S(cale) – suitable, even scale and data occupies at least half the grid ;</p> <p>P(lot) – all points plotted accurately $\pm\frac{1}{2}$ square ;</p> <p>L(ines) – each line drawn with a ruler point to point or smoothed line ;</p> <p>Lines labelled or a key shown ;</p>	5	
1(f)(ii)	<p>for both fruits the enzyme activity decreased as time went on ;</p> <p>the apricot enzyme shows the greatest reduction after 15 minutes ;</p> <p>avocado retains enzyme activity for longer after heating than the apricot ;</p>	1	<p>A apricot enzymes are the most easily destroyed by heat/ denatured faster/ ora ;</p>

Question	Answer	Marks	Guidance
2(a)(i)	<p>red blood cells do not have a nucleus / white blood cells have a nucleus ;</p> <p>red blood cells, have a light area in the centre / are biconcave ;</p> <p>there are more red blood cells / fewer white blood cells ;</p> <p>red blood cells contents not granular AW / white blood cells contents granular ;</p> <p>red blood cells smaller than phagocytes / ora ;</p> <p>red blood cells are overlapping / white blood cells do not overlap ;</p>	2	
2(a)(ii)	<p>O single clear lines on both cell membranes and <u>no</u> shading in the nucleus ;</p> <p>S monocyte larger than 2.5 cm and neutrophil larger than 2cm provided ;</p> <p>D1 monocyte is larger than the neutrophil ;</p> <p>D2 neutrophil nucleus has two distinct parts joined by a narrow section, larger part at least twice the size of the smaller part ;</p>	4	

Question	Answer			Marks	Guidance		
2(b)(i)	type of blood cell	diameters /mm	average diameter /mm	3	mp1 for header units mp2 for six measurements mp3 for three correct averages from candidates results		
red blood cell	13±1 12±1	12.5±1	lymphocyte			12±1 11±1	11.5±1
phagocyte	22±1 18±1	20.0±1	;;;				
2(b)(ii)	8 or 9 (µm) ;;;	3				A ecf from 2(b)(i)	



BIOLOGY

0610/52

Paper 5 Practical Test

October/November 2017

MARK SCHEME

Maximum Mark: 40

Published

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This document consists of **10** printed pages.

Mark schemes will use these abbreviations

- ; separates marking points
- / alternatives
- I ignore
- R reject
- A accept (for answers correctly cued by the question, or guidance for examiners)
- AW alternative wording (where responses vary more than usual)
- AVP any valid point
- ecf credit a correct statement / calculation that follows a previous wrong response or reverse argument
- ora the word / phrase in brackets is not required, but sets the context
- () actual word given must be used by candidate (grammatical variants excepted)
- underline indicates the maximum number of marks that can be given
- max

Question	Answer	Marks	Guidance
1 (a)(i)	<p>table drawn with minimum two columns and a line between heading and data ;</p> <p>appropriate column / row headings and appropriate units for percentage concentration of amylase time for starch to be digested / minutes ;</p> <p>three correct amylase concentration recorded in any order;</p> <p>table shows 2 columns for each concentration with times recorded;</p> <p>correct trend shown by results ;</p>	5	<p>R if units in body of table</p> <p>I units in the body of the table</p> <p>(expect 3% faster 2% faster 1%)</p>
1 (a)(ii)	idea that iodine remains brown / yellow / orange / no longer changes colour;	1	
1 (a)(iii)	<p>(remove a sample from each of the test-tubes and) add (equal volume of) Benedict's solution ;</p> <p>heat (in a water-bath) ;</p>	2	

Question	Answer	Marks	Guidance												
1(b)(i)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; padding: 2px;"><i>variable</i></th> <th style="text-align: left; padding: 2px;"><i>controlled by</i></th> </tr> </thead> <tbody> <tr> <td style="padding: 2px;">(volume of) starch (solution)</td> <td style="padding: 2px;">5 cm³/ same volume</td> </tr> <tr> <td style="padding: 2px;">(concentration of) starch solution</td> <td style="padding: 2px;">same concentration / used throughout</td> </tr> <tr> <td style="padding: 2px;"><u>volume</u> of enzyme / amylase</td> <td style="padding: 2px;">1 cm³ used</td> </tr> <tr> <td style="padding: 2px;">temperature</td> <td style="padding: 2px;">kept at 55–60 °C</td> </tr> <tr> <td style="padding: 2px;">time</td> <td style="padding: 2px;">3 minutes for incubation / 5 minutes for testing the enzyme</td> </tr> </tbody> </table> <p style="margin-left: 40px;">; ;</p>	<i>variable</i>	<i>controlled by</i>	(volume of) starch (solution)	5 cm ³ / same volume	(concentration of) starch solution	same concentration / used throughout	<u>volume</u> of enzyme / amylase	1 cm ³ used	temperature	kept at 55–60 °C	time	3 minutes for incubation / 5 minutes for testing the enzyme	2	<p>one mark for the variable, one mark for method of controlling which must related</p> <p>! amount of enzyme</p> <p>! same temperature</p>
<i>variable</i>	<i>controlled by</i>														
(volume of) starch (solution)	5 cm ³ / same volume														
(concentration of) starch solution	same concentration / used throughout														
<u>volume</u> of enzyme / amylase	1 cm ³ used														
temperature	kept at 55–60 °C														
time	3 minutes for incubation / 5 minutes for testing the enzyme														
1(b)(ii)	so the contents of all the test-tubes reach the same temperature / AW ;	1													
1(b)(iii)	to show that there is no starch in the enzyme solution / to show enzyme does not react with starch / AW ;	1													

Question	Answer	Marks	Guidance
1(c)(i)	<p>idea of judging the colour of the endpoint by eye ;</p> <p>idea of doing several procedures at the same time ;</p> <p>idea that only one drop for both spots of iodine (might give different volumes) ;</p> <p>idea that 1 drop for both spots (could cause contamination);</p> <p>idea of: two samples needed at the same time with the same rod, (then there will be a difference in the actual time) ;</p> <p>idea of: size of drops (from either starch or iodine) added varies ;</p>	2	

Question	Answer	Marks	Guidance																
1 (c)(ii)	<table border="1"> <tr> <td><i>e.g. of error</i></td> <td><i>improvement</i></td> </tr> <tr> <td>judging colour by eye</td> <td>have a standard colour for comparison</td> </tr> <tr> <td>timing and sampling at same time</td> <td>start timer then mix and sample and note time when first sample taken</td> </tr> <tr> <td>one drop for two samples</td> <td>use a dropper with enough for both samples / have two glass rods</td> </tr> <tr> <td>contamination</td> <td>use separate glass rods</td> </tr> <tr> <td>doing two samples at the same time</td> <td>take a sample from each tube at the same time with different glass rod / do trials separately</td> </tr> <tr> <td>size of drop for either</td> <td>use a syringe / pipette</td> </tr> <tr> <td>time not long enough for enzyme to work</td> <td>keep going until all starch has gone</td> </tr> </table>	<i>e.g. of error</i>	<i>improvement</i>	judging colour by eye	have a standard colour for comparison	timing and sampling at same time	start timer then mix and sample and note time when first sample taken	one drop for two samples	use a dropper with enough for both samples / have two glass rods	contamination	use separate glass rods	doing two samples at the same time	take a sample from each tube at the same time with different glass rod / do trials separately	size of drop for either	use a syringe / pipette	time not long enough for enzyme to work	keep going until all starch has gone	1	improvement must match one of the errors from 1(c)(i)
<i>e.g. of error</i>	<i>improvement</i>																		
judging colour by eye	have a standard colour for comparison																		
timing and sampling at same time	start timer then mix and sample and note time when first sample taken																		
one drop for two samples	use a dropper with enough for both samples / have two glass rods																		
contamination	use separate glass rods																		
doing two samples at the same time	take a sample from each tube at the same time with different glass rod / do trials separately																		
size of drop for either	use a syringe / pipette																		
time not long enough for enzyme to work	keep going until all starch has gone																		
1 (d)(i)	300 (mg) ;;;	3	if answer incorrect one mark for correct unit and one mark for correct working: (3 × 2 × 0.5) ÷ 3cm ³ is max 2																
1 (d)(ii)	3.4 ;	1	ecf from 1(d)(i)																

Question	Answer	Marks	Guidance
1(d)(iii)	<p>A(xes) – labelled with units ;</p> <p>S(cale) – even scale ;</p> <p>P(lot) – all given points plotted accurately $\pm 1/2$ square ;</p> <p>L(ines) – each line drawn (with a ruler) point to point / smooth free-hand curve through points ;</p>	4	

Question	Answer	Marks	Guidance																		
2(a)(i)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;"><i>feature</i></th> <th style="width: 25%;"><i>epidermis cell</i></th> <th style="width: 25%;"><i>guard cell</i></th> </tr> </thead> <tbody> <tr> <td>shape</td> <td>wavy outline</td> <td>oval/bean, shaped /AW ;</td> </tr> <tr> <td>chloroplasts / cell inclusions</td> <td>absent</td> <td>present ;</td> </tr> <tr> <td>cell wall</td> <td>thin</td> <td>thick / thick on inside edge ;</td> </tr> <tr> <td>cell size</td> <td>large</td> <td>small ;</td> </tr> <tr> <td>cell arrangement</td> <td>not paired</td> <td>pairs ;</td> </tr> </tbody> </table>	<i>feature</i>	<i>epidermis cell</i>	<i>guard cell</i>	shape	wavy outline	oval/bean, shaped /AW ;	chloroplasts / cell inclusions	absent	present ;	cell wall	thin	thick / thick on inside edge ;	cell size	large	small ;	cell arrangement	not paired	pairs ;	2	one mark per correct row
<i>feature</i>	<i>epidermis cell</i>	<i>guard cell</i>																			
shape	wavy outline	oval/bean, shaped /AW ;																			
chloroplasts / cell inclusions	absent	present ;																			
cell wall	thin	thick / thick on inside edge ;																			
cell size	large	small ;																			
cell arrangement	not paired	pairs ;																			
2(a)(ii)	<p>outline single clear continuous lines, no shading, 2 cells drawn ;</p> <p>drawing occupies at least 50 mm along X–Y ;</p> <p>stoma width is about one sixth of total width of XY ;</p> <p>cell walls drawn as double line not too wide ;</p>	4																			
2(b)	<p>(diameter of guard cells and stomata) value within the range of 31 – 34 mm ;</p> <p>line drawn on candidates diagram and measurement ± 1 mm;</p> <p>calculated magnification ;</p>	3																			

Question	Answer	Marks	Guidance
2(c)	<p>absorption (rate) is lower than transpiration 09:00 to 18:00 / during the day / during the light ora ;</p> <p>absorption (rate) is higher than transpiration from 18:00 to 06:00 / at night / in the dark ora ;</p> <p>absorption peaks at 18.00 and transpiration peaks between 14:00 to 16:00 / absorption rate peaks after transpiration rate ora ;</p> <p>transpiration rate increases faster than absorption rate ;</p> <p>comparative data quote for both curves ;</p> <p>rate of absorption and rate transpiration are equal between 08:00 to 09:00 / at 18:00 ;</p>	2	<p>A times in am and pm equivalents</p> <p>A some variation in the 09:00 time</p>

Question	Answer	Marks	Guidance
2(d)	<ol style="list-style-type: none"> 1 ref. to using at least 3 temperatures / humidity ; 2 ref. to (three) values for temperature / humidity ; 3 ref. to means of obtaining the different temperatures / humidity; 4 ref. to checking that the apparatus does not leak ; 5 ref. to one controlled variable ; 6 ref. to second controlled variable; 7 ref. to measuring distance moved (by the air) along capillary ; 8 ref. to fixed time / timing for a fixed distance ; 9 ref. to refilling capillary between measurements ; 10 ref. to at least two replicates ; 11 use same shoot / same number of leaves / same area of leaves ; 12 AVP ; e.g. detail of apparatus set up e.g. cutting shoot underwater / drying leaves allow apparatus to equilibrate before taking any readings 	6	<p>A high, medium and low for humidity and temperature</p> <p>e.g. for mp 5 and mp 6: light intensity, light wavelength, wind speed, temperature or humidity</p>

BIOLOGY

0610/53

Paper 5 Practical Test

October/November 2017

MARK SCHEME

Maximum Mark: 40

Published

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- underline indicates the maximum number of marks that can be given
- max

Question	Answer	Marks	Guidance										
1(a)(i)	three named fruits <u>and</u> three volumes;	1											
1(a)(ii)	table drawn with (ruled) lines, appropriate columns and (heading) underlined ; suitable headings ; six colours recorded ; colour change recorded for at least one fruit ;	4											
1(a)(iii)	Benedict's (reagent) ;	1											
1(a)(iv)	fruit(s) that show colour change from table in 1(a)(ii) ;	1											
1(a)(v)	idea of looking for colour change (as the starting colour may not be blue) ;	1											
1(b)	<table border="1"> <tbody> <tr> <td><i>variable</i></td> <td><i>controlled by</i></td> </tr> <tr> <td>volume of fruit juice</td> <td>measuring 2 cm³ for all</td> </tr> <tr> <td>volume of Benedict's</td> <td>measuring 2 cm³ for all</td> </tr> <tr> <td>time in water-bath</td> <td>five minutes in water-bath</td> </tr> <tr> <td>;</td> <td>;</td> </tr> </tbody> </table>	<i>variable</i>	<i>controlled by</i>	volume of fruit juice	measuring 2 cm ³ for all	volume of Benedict's	measuring 2 cm ³ for all	time in water-bath	five minutes in water-bath	;	;	2	one mark for the variable, one mark for method of controlling which must related
<i>variable</i>	<i>controlled by</i>												
volume of fruit juice	measuring 2 cm ³ for all												
volume of Benedict's	measuring 2 cm ³ for all												
time in water-bath	five minutes in water-bath												
;	;												

Question	Answer	Marks	Guidance																
1(c)	<table border="1"> <tr> <td>error</td> <td>improvement</td> </tr> <tr> <td>temperature of water-bath</td> <td>any method of keeping the temperature the same</td> </tr> <tr> <td>judging colour by eye</td> <td>colour standard / colorimeter</td> </tr> <tr> <td>idea of age of fruit differs</td> <td>use fruit of the same age / ripeness</td> </tr> <tr> <td>Benedict's and juice mixed at different times</td> <td>test each fruit separately</td> </tr> <tr> <td>no replicates / repeats</td> <td>at least <u>two</u> more, replicates / repeats, needed</td> </tr> <tr> <td>method of extraction</td> <td>use blender / juicer</td> </tr> <tr> <td>more than one fruit used</td> <td>use only one fruit</td> </tr> </table>	error	improvement	temperature of water-bath	any method of keeping the temperature the same	judging colour by eye	colour standard / colorimeter	idea of age of fruit differs	use fruit of the same age / ripeness	Benedict's and juice mixed at different times	test each fruit separately	no replicates / repeats	at least <u>two</u> more, replicates / repeats, needed	method of extraction	use blender / juicer	more than one fruit used	use only one fruit	4	one mark for error, one mark for improvement which must match
error	improvement																		
temperature of water-bath	any method of keeping the temperature the same																		
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no replicates / repeats	at least <u>two</u> more, replicates / repeats, needed																		
method of extraction	use blender / juicer																		
more than one fruit used	use only one fruit																		
1(d)	<p>add biuret ;</p> <p>(blue) to lilac / mauve / purple / violet for positive test ;</p>	2																	
1(e)	<p>any six from:</p> <ol style="list-style-type: none"> 1 at least two temperatures / or stated temperatures ; 2 use of water-bath ; 3 same volume juice ; 4 same fruit used ; 5 same time / stated time ; 6 add DCPIP ; 7 measure number of drops of DCPIP ; 8 control (no vitamin C / water) ; 9 repeats ; 10 safety ; 	6	<p>A iodine titration method if independent variable is time heated:</p> <ol style="list-style-type: none"> 1 stated temperature > 80°C 2 use of water-bath ; 3 time intervals (at least two) ; 4 same volume juice ; 5 same fruit used ; 6 add DCPIP ; 7 measure number of drops of DCPIP ; 8 control (no vitamin C / water) ; 9 repeats ; 10 safety ; 																

Question	Answer	Marks	Guidance
1(f)	O single clear lines with no shading ; S at least 80 mm in diameter ; D1 inner star shape shown ; D2 8–16 segments shown ;	4	

Question	Answer	Marks	Guidance
2(a)(i)	18.4 ; ;	2	working $\frac{18 + 17 + 19 + 20 + 18}{5} / \frac{92}{5} = 1$ mark
2(a)(ii)	5 circled on Table 2.1 ; 12.8 ;	2	ecf if incorrect result circled A 12.7
2(a)(iii)	A (xes) – labelled with units ; S (cale) – even scales on both axes ; P (lot) – all points plotted accurately \pm half a small square ; L (ines) – line ;	4	
2(a)(iv)	low concentrations increase root growth ; high concentrations decrease root growth ; 0.4% identified as the concentration that produces longest root growth ; correct data quote with units ;	3	ecf for incorrect graph

Question	Answer	Marks	Guidance
2(b)	(length of MN) 30 ± 1 mm ; 0.25 mm ;;	3	ecf for incorrect measurement



BIOLOGY

0610/61

Paper 6 Alternative to Practical

October/November 2017

MARK SCHEME

Maximum Mark: 40

Published

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Question	Answer	Marks	Guidance																														
1(a)(i)	<p>one table drawn with appropriate number of columns ;</p> <p>correct column and row headings with appropriate units (pH and intensity / minutes) ;</p> <p>pH recorded for each solution ;</p> <p>colour of apple slices recorded by intensity for 0 and 10 minutes (numerical values not words) ;</p> <p>colour of apple slices recorded by intensity for 20 minutes (numerical values not words) ;</p>	5	<p>I control if added to table</p> <p>R if units in data cell</p> <p>I units in data cells</p> <p>A if the correct data is not linked to a time e.g.</p> <table border="1"> <thead> <tr> <th>(solution)</th> <th>pH</th> <th colspan="3">(colour) intensity (at time) / minutes</th> </tr> <tr> <td>A</td> <td>7</td> <td>0</td> <td>10</td> <td>20</td> </tr> <tr> <td>B</td> <td>2</td> <td>1</td> <td>2</td> <td>2</td> </tr> <tr> <td>C</td> <td>3</td> <td>1</td> <td>1</td> <td>1</td> </tr> <tr> <td>D</td> <td>8</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>E</td> <td>9</td> <td>1</td> <td>2</td> <td>3</td> </tr> </thead></table>	(solution)	pH	(colour) intensity (at time) / minutes			A	7	0	10	20	B	2	1	2	2	C	3	1	1	1	D	8	1	2	3	E	9	1	2	3
(solution)	pH	(colour) intensity (at time) / minutes																															
A	7	0	10	20																													
B	2	1	2	2																													
C	3	1	1	1																													
D	8	1	2	3																													
E	9	1	2	3																													
1(a)(ii)	2 and / or 3, 7, then 8 and / or 9 ;	1	A B and C in either order, A, D and E in either order																														

Question	Answer	Marks	Guidance										
1(a)(iii)	to compare (what happens to the apple) with the solution and with no solution / at different pH values and no pH / with different pH values and the air / with the solution and with the air ;	1	<p>I for comparison unqualified</p> <p>A to see what happens to the crushed apple when it is not exposed to the solution</p> <p>A to observe what would happen without the effect of pH</p> <p>A idea that: the control shows that the liquid (or change in pH) is causing the results (and not the air)</p>										
1(a)(iv)	lemon juice ; has low pH / is acidic / (lemon juice has a pH of 2 and) previous experiment showed that apple won't go brown at pH2 ;	2	<p>A olive oil as keeps out air / oxygen for 2 marks. Olive oil or lemon juice with wrong explanation = 1 mark. Accept enzyme doesn't work (denatured) at pH2</p>										
1(b)(i)	<table border="1"> <tr> <td><i>variable</i></td> <td><i>controlled by</i></td> </tr> <tr> <td>volume / amount / mass, of solution / named solution / liquid</td> <td>adding 20 cm³</td> </tr> <tr> <td>(same / one) apple</td> <td>all slices cut from the same apple</td> </tr> <tr> <td>time soaking in solution</td> <td>all soaked for 2 mins</td> </tr> <tr> <td>observation time / time intervals</td> <td>left for 20 min / results checked every 10 minutes</td> </tr> </table> <p>;</p>	<i>variable</i>	<i>controlled by</i>	volume / amount / mass, of solution / named solution / liquid	adding 20 cm ³	(same / one) apple	all slices cut from the same apple	time soaking in solution	all soaked for 2 mins	observation time / time intervals	left for 20 min / results checked every 10 minutes	2	<p>one mark for the variable, one mark for method of controlling which must related</p> <p>I temperature</p> <p>I time unqualified unless explanation clarifies</p> <p>A time apple was left in the Petri dish</p> <p>A oxygen/air exposure time</p>
<i>variable</i>	<i>controlled by</i>												
volume / amount / mass, of solution / named solution / liquid	adding 20 cm ³												
(same / one) apple	all slices cut from the same apple												
time soaking in solution	all soaked for 2 mins												
observation time / time intervals	left for 20 min / results checked every 10 minutes												
1(b)(ii)	oxygen is needed (from the air) for the reaction ;	1	<p>A to expose the apple to oxygen</p> <p>I air</p>										
1(b)(iii)	using / cutting (with a knife or scalpel) and cutting away from the hand / cutting on a surface ;	1	<p>I wearing gloves / supervision / blunt knives</p> <p>A cutting carefully / using a slicer / AW</p>										

Question	Answer	Marks	Guidance														
1(c)	any 1 from: idea that it is a qualitative / subjective, method / judged by eye / similar browning looks the same / AW ;	1	A there are more than three shades of brown														
1(d)	<table border="1"> <tr> <td><i>any pair from</i></td> <td><i>improvement</i></td> </tr> <tr> <td><i>error</i></td> <td></td> </tr> <tr> <td>amount of apple not the same / cutting inaccurate</td> <td>use same mass / weight / use a set volume of crushed apple</td> </tr> <tr> <td>crushing uneven</td> <td>use a blender / mortar and pestle</td> </tr> <tr> <td>idea some may have more time in solution than others</td> <td>test each separately</td> </tr> <tr> <td>some apple exposed to air while others being crushed</td> <td>test each separately</td> </tr> <tr> <td>only one slice of apple per solution ;</td> <td>have at least two more replicates ;</td> </tr> </table>	<i>any pair from</i>	<i>improvement</i>	<i>error</i>		amount of apple not the same / cutting inaccurate	use same mass / weight / use a set volume of crushed apple	crushing uneven	use a blender / mortar and pestle	idea some may have more time in solution than others	test each separately	some apple exposed to air while others being crushed	test each separately	only one slice of apple per solution ;	have at least two more replicates ;	2	A (cut to the same size) by using a cutter / ruler, slicer, cutting instrument / AW
<i>any pair from</i>	<i>improvement</i>																
<i>error</i>																	
amount of apple not the same / cutting inaccurate	use same mass / weight / use a set volume of crushed apple																
crushing uneven	use a blender / mortar and pestle																
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some apple exposed to air while others being crushed	test each separately																
only one slice of apple per solution ;	have at least two more replicates ;																

Question	Answer	Marks	Guidance
1(e)	<p>1 ref to using at least three temperatures ;</p> <p>2 stated temperatures or a description ;</p> <p>3 method described to maintain temperature(s) ;</p> <p>4 methodology described e.g. ref to leaving the enzyme and substrate separately to reach a set temperature ;</p> <p>5 ref to constant pH/experiment carried out at the optimum pH;</p> <p>6 and 7 <i>controlled variables any two from:</i> same concentration of enzyme / same concentration of substrate / same volume of enzyme / same volume of substrate ;;</p> <p>8 leaving for 20 minutes /leaving for a set time /check at stated time intervals ;</p> <p>9 ref to substrate at optimum temperature turning brown first or having the highest colour intensity value ;</p> <p>10 repeat (at least) twice ;</p> <p>11 AVP e.g. repeat the investigation at temperatures near the optimum to obtain a more accurate optimum temperature ;</p>	6	<p>A ref. to measuring time for brown colour to appear</p> <p>A optimum temperature shows the darkest colour</p>

Question	Answer	Marks	Guidance
1(f)(i)	<p>A(xes) – labelled with units (time/minutes and percentage of enzyme activity remaining) ;</p> <p>S(cale) – suitable, even scale and data occupies at least half the grid ;</p> <p>P(lot) – all points plotted accurately $\pm \frac{1}{2}$ square ;</p> <p>L(ines) – each line drawn with a ruler point to point or smoothed line ;</p> <p>Lines labelled or a key shown ;</p>	5	
1(f)(ii)	<p>for both fruits, the enzyme activity decreased as time went on ;</p> <p>the apricot enzyme shows the greatest reduction after 15 minutes ;</p> <p>avocado retains enzyme activity for longer after heating than the apricot ;</p>	1	A apricot enzymes are the most easily destroyed by heat/denatured faster/ ora ;

Question	Answer	Marks	Guidance
2(a)(i)	<p>red blood cells do not have a nucleus/white blood cells have a nucleus ;</p> <p>red blood cells, have a light area in the centre /are biconcave ;</p> <p>there are more red blood cells/fewer white blood cells ;</p> <p>red blood cells contents not granular AW/white blood cells contents granular ;</p> <p>red blood cells smaller than phagocytes/ ora ;</p> <p>red blood cells are overlapping/white blood cells do not overlap ;</p>	2	

Question	Answer	Marks	Guidance												
2(a)(ii)	<p>O single clear lines on both cell membranes and <u>no</u> shading in the nucleus ;</p> <p>S monocyte larger than 2.5 cm and neutrophil larger than 2 cm provided ;</p> <p>D1 monocyte is larger than the neutrophil ;</p> <p>D2 neutrophil nucleus has two distinct parts joined by a narrow section, larger part at least twice the size of the smaller part ;</p>	4													
2(b)(i)	<table border="1"> <thead> <tr> <th>type of blood cell</th> <th>diameters / mm</th> <th>average diameter / mm</th> </tr> </thead> <tbody> <tr> <td>red blood cell</td> <td>13±1 12±1</td> <td>12.5±1</td> </tr> <tr> <td>lymphocyte</td> <td>12±1 11±1</td> <td>11.5±1</td> </tr> <tr> <td>phagocyte</td> <td>22±1 18±1</td> <td>20.0±1</td> </tr> </tbody> </table> <p>;;;</p>	type of blood cell	diameters / mm	average diameter / mm	red blood cell	13±1 12±1	12.5±1	lymphocyte	12±1 11±1	11.5±1	phagocyte	22±1 18±1	20.0±1	3	<p>mp1 for header units</p> <p>mp2 for six measurements</p> <p>mp3 for three correct averages from candidates results</p>
type of blood cell	diameters / mm	average diameter / mm													
red blood cell	13±1 12±1	12.5±1													
lymphocyte	12±1 11±1	11.5±1													
phagocyte	22±1 18±1	20.0±1													
2(b)(ii)	8 or 9 (μm) ;;;	3	A ecf from 2(b)(i)												



BIOLOGY

0610/62

Paper 6 Alternative to Practical

October/November 2017

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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This document consists of **8** printed pages.

Mark schemes will use these abbreviations

- ; separates marking points
- / alternatives
- I ignore
- R reject
- A accept (for answers correctly cued by the question, or guidance for examiners)
- AW alternative wording (where responses vary more than usual)
- AVP any valid point
- ecf credit a correct statement / calculation that follows a previous wrong response or reverse argument
- ora the word / phrase in brackets is not required, but sets the context
- () actual word given must be used by candidate (grammatical variants excepted)
- underline indicates the maximum number of marks that can be given
- max

Question	Answer	Marks	Guidance
1(a)(i)	<p>table drawn with minimum two columns and a line between heading and data ;</p> <p>appropriate column / row headings and appropriate units for percentage concentration of amylase time for starch to be digested / minutes ;</p> <p>three correct amylase concentrations recorded (either order) ;</p> <p>three correct timings recorded ;</p> <p>six correct timings recorded ;</p>	5	<p>R if units in body of table</p> <p>I units in the body of the table</p>
1(a)(ii)	<p>drops (for B at 3, 4 and 5 min) have merged / AW ;</p> <p>results for C have different end times ;</p> <p>results for C are different at 3 min ;</p> <p>no repeats ;</p>	1	<p>any one from:</p> <p>A at 4 / 5 mins</p> <p>I enzyme will be denatured by high temperature / results qualitative / subjective / no control / human error</p>
1(a)(iii)	<p>(remove a sample from each of the test-tubes and) add (equal volume of) Benedict's solution ;</p> <p>heat (in a water-bath) ;</p>	2	

Question	Answer	Marks	Guidance														
1(b)(i)	<table border="1"> <tr> <td><i>variable</i></td> <td><i>controlled by</i></td> </tr> <tr> <td>volume/amount of starch (solution)</td> <td>5 cm³/ same volume , used in each</td> </tr> <tr> <td>concentration /amount of starch (solution)</td> <td>same concentration of starch solution/used in each</td> </tr> <tr> <td>concentration / amount of iodine</td> <td>same iodine solution used in each</td> </tr> <tr> <td>volume of enzyme/ amylase</td> <td>1 cm³ used</td> </tr> <tr> <td>temperature</td> <td>(maintained at) 60°C</td> </tr> <tr> <td>time</td> <td>3 minutes for equilibration /testing for, 7/8/9/10, minutes</td> </tr> </table>	<i>variable</i>	<i>controlled by</i>	volume/amount of starch (solution)	5 cm ³ / same volume , used in each	concentration /amount of starch (solution)	same concentration of starch solution/used in each	concentration / amount of iodine	same iodine solution used in each	volume of enzyme/ amylase	1 cm ³ used	temperature	(maintained at) 60°C	time	3 minutes for equilibration /testing for, 7/8/9/10, minutes	2	<p>one mark for the variable, one mark for method of controlling which must related</p> <p>1 amount of enzyme</p> <p>1 same temperature</p>
<i>variable</i>	<i>controlled by</i>																
volume/amount of starch (solution)	5 cm ³ / same volume , used in each																
concentration /amount of starch (solution)	same concentration of starch solution/used in each																
concentration / amount of iodine	same iodine solution used in each																
volume of enzyme/ amylase	1 cm ³ used																
temperature	(maintained at) 60°C																
time	3 minutes for equilibration /testing for, 7/8/9/10, minutes																
1(b)(ii)	so the contents of all the test-tubes reach the same temperature / AW ;	1															
1(b)(iii)	to show that there is no starch in the enzyme solution / amylase does not react with starch / AW ;	1															

Question	Answer	Marks	Guidance														
1 (c)(i)	<p>idea of judging the colour of the endpoint by eye ;</p> <p>idea of doing several procedures at the same time ;</p> <p>idea of using one drop for both spots of iodine ;</p> <p>idea that 1 drop for both spots (could cause contamination);</p> <p>idea of: two samples needed at the same time with the same rod, (then there will be a difference in the actual time) ;</p> <p>idea of: size of drops (from either starch or iodine) added varies ;</p>	2															
1 (c)(ii)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #e0e0e0; width: 25%;"><i>e.g. of error</i></td> <td style="width: 75%;"><i>improvement</i></td> </tr> <tr> <td style="background-color: #e0e0e0;">judging colour by eye</td> <td>have a standard colour for comparison / use colorimeter</td> </tr> <tr> <td style="background-color: #e0e0e0;">timing and sampling at same time</td> <td>start timer then mix and sample and note time when samples taken / AW</td> </tr> <tr> <td style="background-color: #e0e0e0;">one drop for two samples / one glass rod</td> <td>use two rods / pipette</td> </tr> <tr> <td style="background-color: #e0e0e0;">contamination</td> <td>use two rods / pipette</td> </tr> <tr> <td style="background-color: #e0e0e0;">two samples at the same time</td> <td>use two glass rods or do trials separately</td> </tr> <tr> <td style="background-color: #e0e0e0;">drop size (for either iodine of drop from glass rod)</td> <td>use a pipette / syringe</td> </tr> </table> <p>;</p>	<i>e.g. of error</i>	<i>improvement</i>	judging colour by eye	have a standard colour for comparison / use colorimeter	timing and sampling at same time	start timer then mix and sample and note time when samples taken / AW	one drop for two samples / one glass rod	use two rods / pipette	contamination	use two rods / pipette	two samples at the same time	use two glass rods or do trials separately	drop size (for either iodine of drop from glass rod)	use a pipette / syringe	1	improvement must match one of the errors from 1(c)(i)
<i>e.g. of error</i>	<i>improvement</i>																
judging colour by eye	have a standard colour for comparison / use colorimeter																
timing and sampling at same time	start timer then mix and sample and note time when samples taken / AW																
one drop for two samples / one glass rod	use two rods / pipette																
contamination	use two rods / pipette																
two samples at the same time	use two glass rods or do trials separately																
drop size (for either iodine of drop from glass rod)	use a pipette / syringe																

Question	Answer	Marks	Guidance
1(d)(i)	300 (mg) ;;;	3	if answer incorrect one mark for correct unit and one mark for correct working: (3 × 2 × 0.5) ÷ 3cm ³ is max 2
1(d)(ii)	3.4 ;	1	ecf from 1(d)(i)
1(d)(iii)	A (xes) – labelled with units ; S (cale) – even scale ; P (lot) – all given points plotted accurately ±½ square ; L (ines) – each line drawn (with a ruler) point to point / smooth free-hand curve through points ;	4	

Question	Answer	Marks	Guidance																		
2(a)(i)	<table border="1"> <thead> <tr> <th>feature</th> <th>epidermis cell</th> <th>guard cell</th> </tr> </thead> <tbody> <tr> <td>shape</td> <td>wavy outline</td> <td>oval/bean, shaped /AW ;</td> </tr> <tr> <td>chloroplasts / cell inclusions</td> <td>absent</td> <td>present ;</td> </tr> <tr> <td>cell wall</td> <td>thin</td> <td>thick/thick on inside edge ;</td> </tr> <tr> <td>cell size</td> <td>large</td> <td>small ;</td> </tr> <tr> <td>cell arrangement</td> <td>not paired</td> <td>in pairs ;</td> </tr> </tbody> </table>	feature	epidermis cell	guard cell	shape	wavy outline	oval/bean, shaped /AW ;	chloroplasts / cell inclusions	absent	present ;	cell wall	thin	thick/thick on inside edge ;	cell size	large	small ;	cell arrangement	not paired	in pairs ;	2	one mark per correct row
feature	epidermis cell	guard cell																			
shape	wavy outline	oval/bean, shaped /AW ;																			
chloroplasts / cell inclusions	absent	present ;																			
cell wall	thin	thick/thick on inside edge ;																			
cell size	large	small ;																			
cell arrangement	not paired	in pairs ;																			

Question	Answer	Marks	Guidance
2(a)(ii)	<p>outline single clear continuous lines, no shading, 2 cells drawn ; drawing occupies at least 50 mm along X–Y ; stoma width is about one sixth of total width of XY ; cell walls drawn as double line not too wide ;</p>	4	
2(b)	<p>(diameter of guard cells and stomata) value within the range of 31–34 mm ; line drawn on candidates diagram and measurement ± 1 mm ; calculated magnification ;</p>	3	
2(c)	<p>absorption (rate) is lower than transpiration 09:00 to 18:00 / during the day / during the light ora ; absorption (rate) is higher than transpiration from 18:00 to 06:00 / at night / in the dark ora ; absorption peaks at 18.00 and transpiration peaks between 14:00 to 16:00 / absorption rate peaks after transpiration rate ora ; transpiration rate increases faster than absorption rate ; comparative data quote for both curves ; rate of absorption and rate transpiration are equal between 08:00 to 09:00 / at 18:00 ;</p>	2	<p>A times in am and pm equivalents A some variation in the 09:00 time</p>

Question	Answer	Marks	Guidance
2(d)	<ol style="list-style-type: none"> 1 ref. to using at least 3 temperatures / humidity ; 2 ref. to (three) values for temperature / humidity ; 3 ref. to means of obtaining the different temperatures / humidity; 4 ref. to checking that the apparatus does not leak ; 5 ref. to one controlled variable ; 6 ref. to second controlled variable; 7 ref. to measuring distance moved (by the air) along capillary ; 8 ref. to fixed time / timing for a fixed distance ; 9 ref. to refilling capillary between measurements ; 10 ref. to at least two replicates ; 11 use same shoot / same number of leaves / same area of leaves ; 12 AVP ; e.g. detail of apparatus set up e.g. cutting shoot underwater / drying leaves allow apparatus to equilibrate before taking any readings 	6	<p>A high, medium and low for humidity and temperature</p> <p>e.g. for mp 5 and mp 6: light intensity, light wavelength, wind speed, temperature or humidity</p>



BIOLOGY

0610/63

Paper 6 Alternative to Practical

October/November 2017

MARK SCHEME

Maximum Mark: 40

Published

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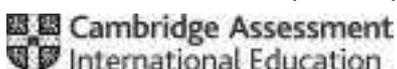
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This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **6** printed pages.



Mark schemes will use these abbreviations

- ; separates marking points
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- I ignore
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- A accept (for answers correctly cued by the question, or guidance for examiners)
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- () actual word given must be used by candidate (grammatical variants excepted)
- underline indicates the maximum number of marks that can be given
- max

Question	Answer	Marks	Guidance												
1(a)(i)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;"></th> <th style="width: 35%;">type of fruit</th> <th style="width: 50%;">volume of juice / cm³</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">orange</td> <td style="text-align: center;">13</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">grapefruit</td> <td style="text-align: center;">18</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">lemon</td> <td style="text-align: center;">7</td> </tr> </tbody> </table>		type of fruit	volume of juice / cm ³	1	orange	13	2	grapefruit	18	3	lemon	7	1	Ignore units in table A 13.0, 18.0, 7.0
	type of fruit	volume of juice / cm ³													
1	orange	13													
2	grapefruit	18													
3	lemon	7													
1(a)(ii)	<p>table drawn with (ruled) lines, appropriate columns and (heading) underlined ;</p> <p>suitable headings ;</p> <p>all colours recorded for start and end;</p>	3													
1(a)(iii)	Benedict's (reagent) ;	1													
1(a)(iv)	80 °C ;	1													
1(a)(v)	orange and grapefruit ;	1													
1(a)(vi)	idea of looking for colour change (as the starting colour may not be blue) ;	1													
1(b)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 70%;">variable</th> </tr> </thead> <tbody> <tr> <td>volume of fruit juice</td> <td>controlled by measuring 2 cm³ for all</td> </tr> <tr> <td>volume of Benedict's / solution</td> <td>measuring 2 cm³ for all</td> </tr> <tr> <td>time in water-bath</td> <td>five minutes in water-bath</td> </tr> <tr> <td>temperature</td> <td>thermostatically controlled / maintained water-bath</td> </tr> </tbody> </table>		variable	volume of fruit juice	controlled by measuring 2 cm ³ for all	volume of Benedict's / solution	measuring 2 cm ³ for all	time in water-bath	five minutes in water-bath	temperature	thermostatically controlled / maintained water-bath	2	one mark for the variable, one mark for method of controlling which must related		
	variable														
volume of fruit juice	controlled by measuring 2 cm ³ for all														
volume of Benedict's / solution	measuring 2 cm ³ for all														
time in water-bath	five minutes in water-bath														
temperature	thermostatically controlled / maintained water-bath														

Question	Answer	Marks	Guidance																				
1 (c)	<table border="1"> <tr> <td>error</td> <td>improvement</td> </tr> <tr> <td>temperature of water-bath</td> <td>any method of keeping the temperature the same</td> </tr> <tr> <td>judging colour by eye</td> <td>colour standard / colorimeter</td> </tr> <tr> <td>idea of age of fruit differs</td> <td>use fruit of the same age / ripeness</td> </tr> <tr> <td>Benedict's and juice mixed at different times</td> <td>test each fruit separately / get other people to add solutions</td> </tr> <tr> <td>no replicates / repeats</td> <td>at least <u>2</u> more replicates / repeats needed</td> </tr> <tr> <td>no control</td> <td>do with no vitamin C / water</td> </tr> <tr> <td>contamination</td> <td>wash apparatus</td> </tr> <tr> <td>no mixing</td> <td>method of mixing given</td> </tr> <tr> <td>solids in the juice</td> <td>Filter</td> </tr> </table>	error	improvement	temperature of water-bath	any method of keeping the temperature the same	judging colour by eye	colour standard / colorimeter	idea of age of fruit differs	use fruit of the same age / ripeness	Benedict's and juice mixed at different times	test each fruit separately / get other people to add solutions	no replicates / repeats	at least <u>2</u> more replicates / repeats needed	no control	do with no vitamin C / water	contamination	wash apparatus	no mixing	method of mixing given	solids in the juice	Filter	4	one mark for error, one mark for improvement which must match
error	improvement																						
temperature of water-bath	any method of keeping the temperature the same																						
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no control	do with no vitamin C / water																						
contamination	wash apparatus																						
no mixing	method of mixing given																						
solids in the juice	Filter																						
1 (d)	<p>add biuret ;</p> <p>(blue) to lilac / mauve / purple / violet for positive test ;</p>	2																					

Question	Answer	Marks	Guidance
1(e)	<p>any six from:</p> <ol style="list-style-type: none"> at least two temperatures / or stated temperatures ; use of water-bath ; same volume juice ; same fruit used ; same time / stated time ; add DCPIP ; measure number of drops of DCPIP ; control (no vitamin C / water) ; repeats ; safety ; 	6	<p>A iodine titration method if independent variable is time heated:</p> <ol style="list-style-type: none"> stated temperature > 80°C use of water-bath ; time intervals (at least two) ; same volume juice ; same fruit used ; add DCPIP ; measure number of drops of DCPIP ; control (no vitamin C / water) ; repeats ; safety ;
1(f)	<p>O single clear lines with no shading ;</p> <p>S at least 80 mm in diameter ;</p> <p>D1 inner star shape shown ;</p> <p>D2 8–16 segments shown ;</p>	4	

Question	Answer	Marks	Guidance
2(a)(i)	18.4 ;;	2	working $\frac{18 + 17 + 19 + 20 + 18}{5} / \frac{92}{5} = 1$ mark
2(a)(ii)	5 circled on Table 2.1 ; 12.8 ;	2	<p>ecf if incorrect result circled</p> <p>A 12.7</p>

Question	Answer	Marks	Guidance
2(a)(iii)	A (xes) – labelled with units ; S (cale) – even scales on both axes; P (lot) – all points plotted accurately \pm half a small square ; L (ines) – line ;	4	
2(a)(iv)	low concentrations increase root growth ; high concentrations decrease root growth ; 0.4% identified as the concentration that produces longest root growth ; correct data quote with units ;	3	ecf for incorrect graph
2(b)	(length of MN) 30 ± 1 mm ; 0.25 mm ;;	3	ecf for incorrect measurement



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

BIOLOGY

0610/11

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 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.

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This document consists of **15** printed pages and **1** blank page.

1 Which process in plant cells uses chlorophyll?

- A growth
- B nutrition
- C movement
- D respiration

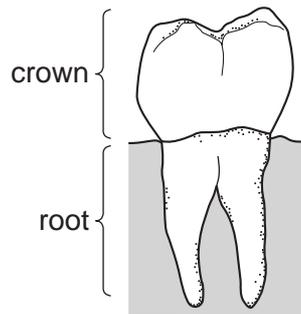
2 The table shows the scientific names of four members of the cat family.

common name	scientific name
leopard	<i>Panthera pardus</i>
lion	<i>Panthera leo</i>
ocelot	<i>Leopardus pardalis</i>
tiger	<i>Panthera tigris</i>

Which statement is correct?

- A All four cats are members of the same species.
- B The leopard and the ocelot are members of the same genus.
- C The leopard, lion and tiger are members of the same genus.
- D The leopard, lion and tiger are members of the same species.

3 The diagram shows a type of tooth.

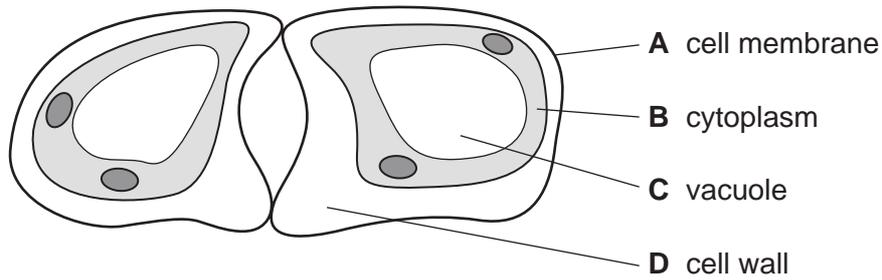


Use the key to identify the tooth.

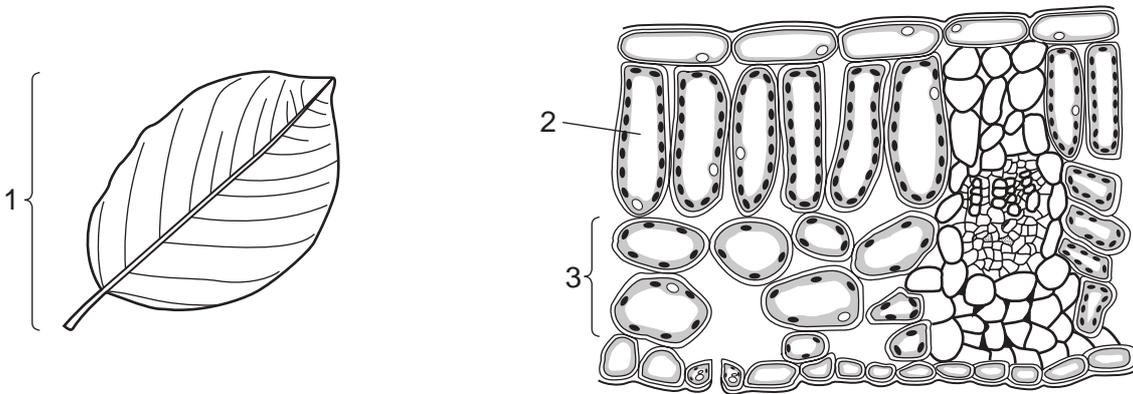
- 1 the root is divided into two parts go to 2
- the root is not divided into two parts go to 3
- 2 the height of the crown is greater than the length of the root **A**
- the height of the crown is less than the length of the root **B**
- 3 flattened crown **C**
- ridged crown **D**

4 The diagram shows a student's drawing of guard cells.

Which label is **not** correct?



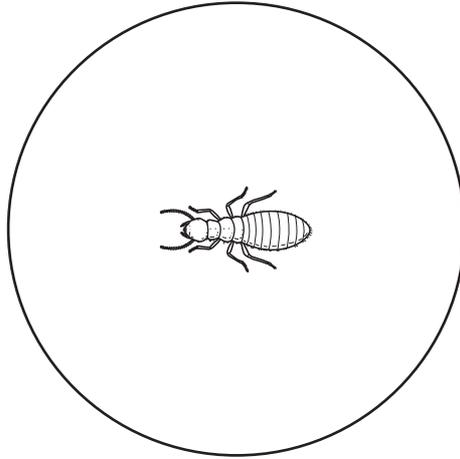
5 The diagrams show a leaf and its internal structure.



What are the levels of organisation of the labelled structures?

	1	2	3
A	cell	tissue	organ system
B	organ	cell	tissue
C	organ system	tissue	cell
D	tissue	cell	organ

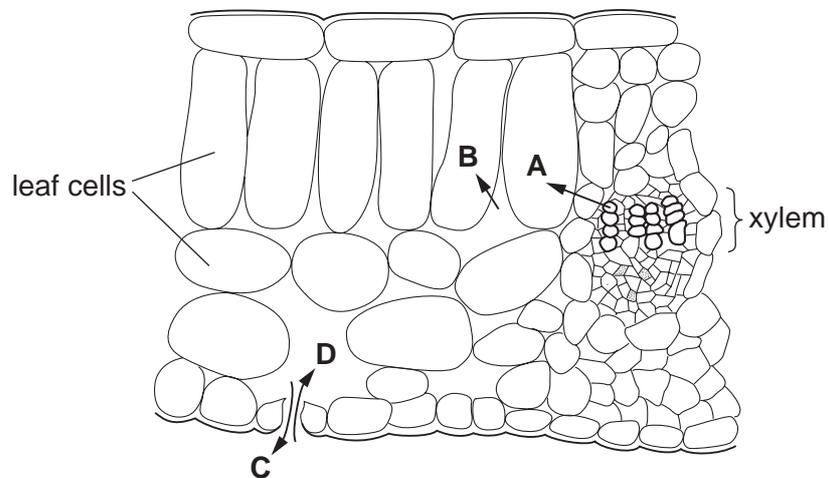
- 6 The diagram shows an insect as seen using the low power lens of a microscope.
The actual diameter of the circle is 0.3 cm.



What is the approximate size of this insect in millimetres?

- A 0.1 mm B 1.0 mm C 2.0 mm D 3.0 mm
- 7 The diagram shows part of a section through a leaf.

Which arrow represents the diffusion of oxygen during photosynthesis?



- 8 What helps to support plants?
- A pressure inwards on the cell vacuoles
B pressure inwards on the chloroplasts
C pressure outwards on the cell walls
D pressure outwards on the nuclei

9 Which of these is digested by protease?

A ■

B ●

C ■—■—■—■

D ●—●—●—●

key

■ amino acid

● glucose

— chemical bond

10 Which enzyme is used to produce clear apple juice?

A amylase

B lipase

C pectinase

D protease

11 What is the optimum pH for stomach enzymes?

A pH2

B pH7

C pH9

D pH12

12 What are the raw materials necessary for photosynthesis?

A carbon dioxide and water

B light and a suitable temperature

C oxygen and carbon dioxide

D water and a suitable temperature

13 In plants, which substance contains magnesium ions?

A cellulose

B chlorophyll

C haemoglobin

D starch

14 What must be increased in the diet of a person suffering from constipation?

A fats

B fibre

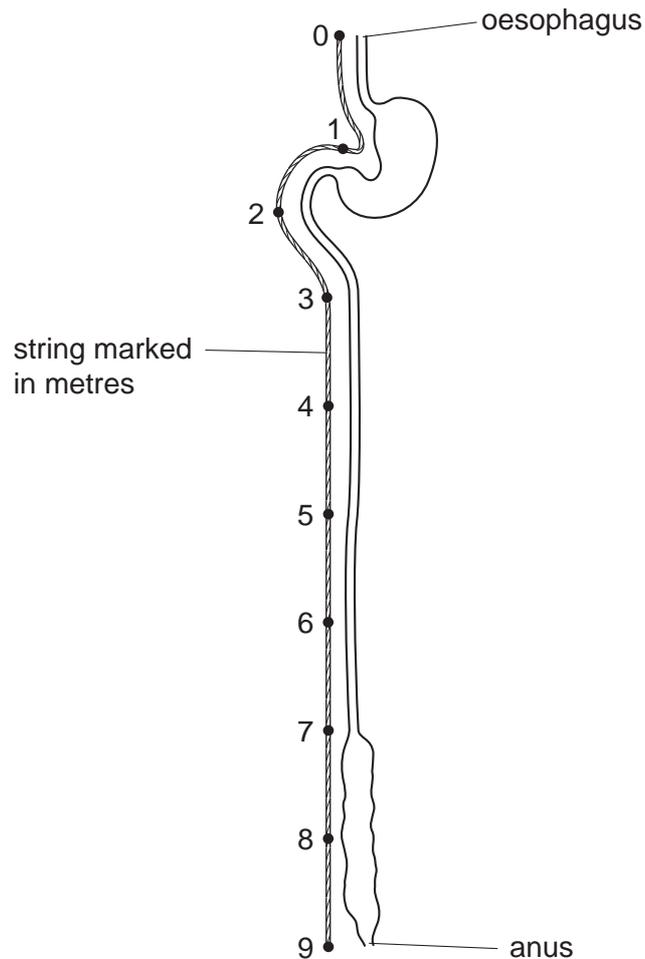
C iron

D protein

15 Which chemical reaction takes place in the mouth?

- A Fats are digested into fatty acids and glycerol.
- B Fats are digested into simpler sugars.
- C Starch is digested into simpler sugars.
- D Starch is digested into amino acids.

16 The diagram shows the human alimentary canal, with a string marked in metres beside it.



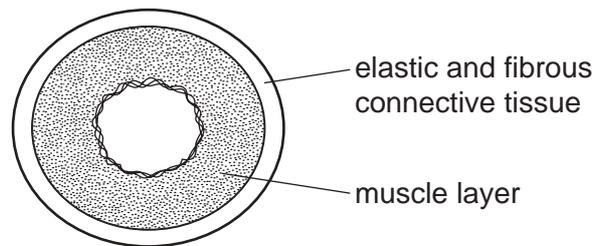
How long is the small intestine?

- A 2 m
- B 6 m
- C 8 m
- D 9 m

17 What is a description of transpiration?

- A exchange of gases between the leaf and the atmosphere
- B loss of water vapour from the leaves and stems of a plant
- C movement of water from the roots to the leaves
- D movement of water through the cells of the leaf

- 18 Which tissue transports water from the roots to the leaves in a plant?
- A cortex
 - B epidermis
 - C mesophyll
 - D xylem
- 19 On which organ is an ECG performed?
- A brain
 - B colon
 - C ear
 - D heart
- 20 The diagram shows a cross-section through a human blood vessel.



- Which type of blood vessel does the diagram show?
- A an artery
 - B a capillary
 - C a vein
 - D a ventricle
- 21 Which are both chemical barriers to the transmission of pathogens?
- A mucus and stomach acid
 - B mucus and white blood cells
 - C skin and hairs in the nose
 - D skin and stomach acid

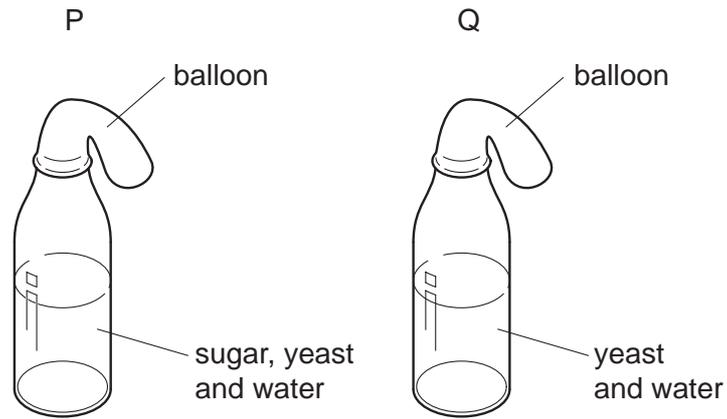
22 The table shows the approximate composition of inspired and expired air.

gas	percentage of gas in inspired air	percentage of gas in expired air
P	78.10	78.10
Q	20.90	16.00
R	variable	variable
S	0.04	4.00

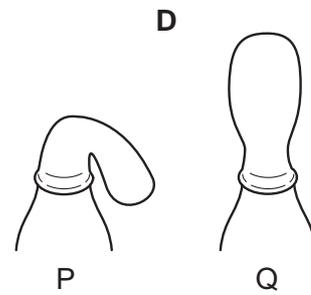
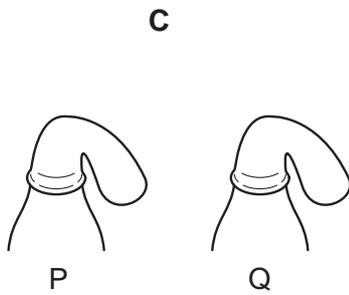
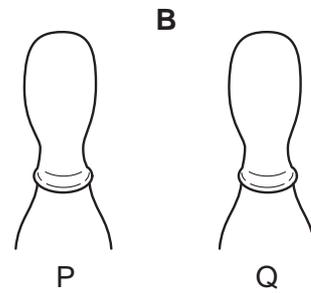
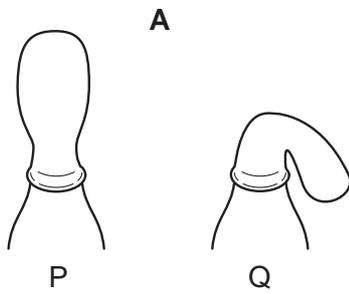
What is the name of gas S?

- A carbon dioxide
- B nitrogen
- C oxygen
- D water vapour

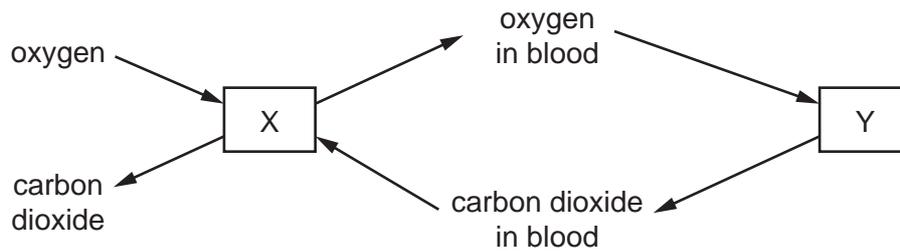
23 In an experiment to investigate anaerobic respiration, two bottles are set up in a warm room, as shown.



What would happen to each balloon after one day?



- 24 The diagram represents the exchange of gases during breathing and during respiration in the body.



What is represented by X and by Y?

	X	Y
A	lungs	air
B	lungs	body cells
C	body cells	air
D	body cells	lungs

- 25 The table shows information about urea.

Which row is correct?

	substance that urea is made from	organ that makes urea	organ that excretes urea
A	amino acids	kidney	bladder
B	amino acids	liver	kidney
C	fatty acids	kidney	bladder
D	fatty acids	liver	kidney

- 26 What is the most important function of sweating?

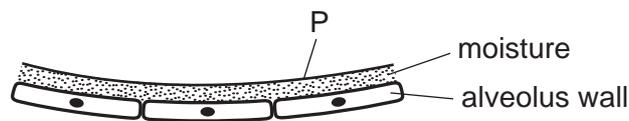
- A** to remove excess heat from the body
- B** to remove excess salts from the body
- C** to remove excess urea from the body
- D** to remove excess water from the body

- 27 What shows the order in which these structures are involved in a reflex action?
- A effector → motor neurone → relay neurone → sensory neurone → receptor
- B effector → sensory neurone → motor neurone → relay neurone → receptor
- C receptor → sensory neurone → relay neurone → motor neurone → effector
- D receptor → motor neurone → sensory neurone → relay neurone → effector
- 28 The diagram shows a person sweating in hot weather.



What part is played by sweat glands during the process of sweating?

- A effector
- B receptor
- C sense organ
- D stimulus
- 29 The diagram shows the gas exchange surface of a person who has just smoked a cigarette.
- Substance P can cause cancer.



What is substance P?

- A carbon dioxide
- B carbon monoxide
- C nicotine
- D tar

30 Which method of birth control works by preventing an egg from being released?

- A condom
- B contraceptive pill
- C monitoring body temperature
- D vasectomy

31 Which environmental factor is **not** always a requirement for seed germination?

- A light
- B oxygen
- C suitable temperature
- D water

32 Four processes involved in labour and birth are shown.

- 1 cutting the umbilical cord
- 2 contraction of muscles in the uterus wall
- 3 dilation of the cervix
- 4 passage of the baby through the vagina

In which sequence do these events normally occur?

- A 2 → 3 → 1 → 4
- B 2 → 3 → 4 → 1
- C 3 → 2 → 1 → 4
- D 3 → 2 → 4 → 1

33 In some mammals the allele for brown coat colour is dominant to the allele for white coat colour.

Which percentage of offspring will be white if a cross is made between two heterozygous mammals?

- A 0%
- B 25%
- C 50%
- D 100%

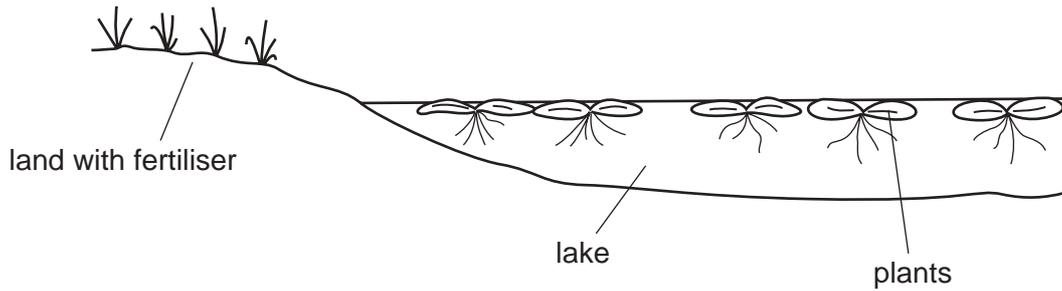
- 34 Which term is defined as a length of DNA that codes for a protein?
- A amino acid
 - B chromosome
 - C gene
 - D mutation
- 35 What makes tongue rolling an example of discontinuous variation?
- A A person can roll their tongue only when they are young.
 - B There are many different types of tongue rollers.
 - C Tongue rolling has to be learnt.
 - D Tongue rolling is something that a person either can or cannot do.
- 36 What is shown by the widest block in a pyramid of numbers for a grassland ecosystem?
- A all the consumers in the pyramid
 - B the carnivores in the pyramid
 - C the organisms at the top of the pyramid
 - D the producers in the pyramid
- 37 A food chain is shown.

potato plant → slug → hedgehog

By which process is energy transferred from the potato plant to the slug?

- A egestion
- B excretion
- C ingestion
- D photosynthesis

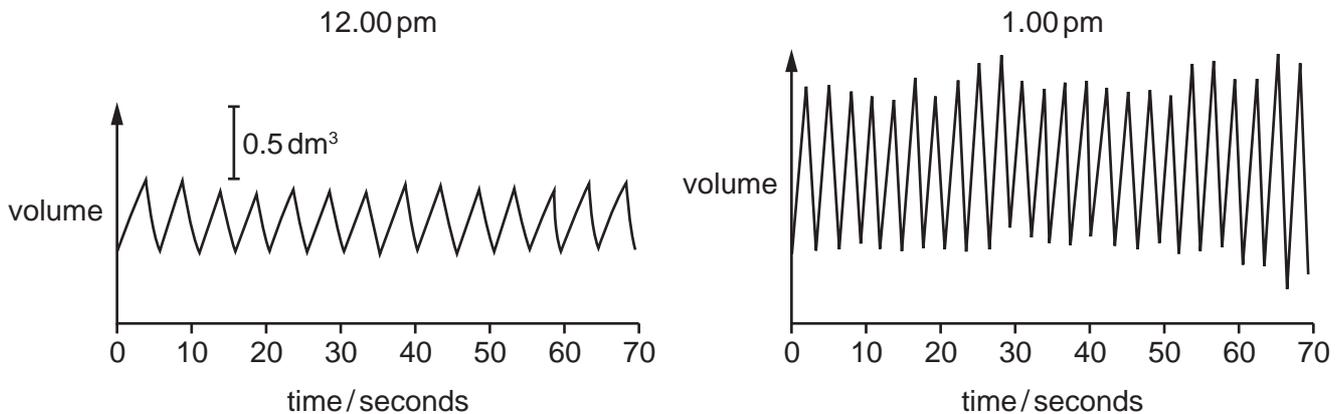
38 A farmer put some fertiliser on his field. Some of the fertiliser drained into a nearby lake.



What is the effect of the fertiliser on the growth of the crop plants in the field and the plants in the lake?

	crop plant growth	lake plant growth
A	decreased	decreased
B	decreased	increased
C	increased	decreased
D	increased	increased

39 The diagrams show the depth and rate of breathing in a person at 12.00 pm and 1.00 pm.



What happens to the person's breathing between 12.00 pm and 1.00 pm?

	depth of breathing	rate of breathing
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

40 The table shows the amount of carbon dioxide in the atmosphere in three different years.

year	1930	1980	1990
carbon dioxide/parts per million	300	330	370

What is the most likely cause of this change?

- A destruction of rainforests
- B increased use of fertilisers containing nitrogen
- C pollution of air by sulfur dioxide
- D rise in the sea level

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Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

BIOLOGY

0610/12

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 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.

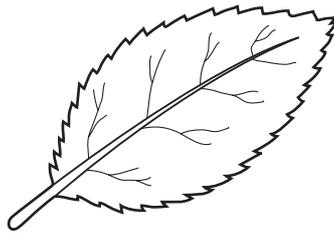
The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **14** printed pages and **2** blank pages.

- 1 Which process do living organisms use to remove excess carbon dioxide from their bodies?
- A** excretion
B movement
C nutrition
D respiration
- 2 When a donkey is bred with a zebra, a zebronkey is produced. Zebronkeys are not fertile animals.

Which statement is correct?

- A** Donkeys and zebras belong to different species because their offspring are not fertile.
B Donkeys and zebras belong to different species because they do not look exactly the same.
C Donkeys and zebras belong to the same species because they look alike.
D Donkeys and zebras belong to the same species because they produce offspring.
- 3 The diagram shows a leaf.

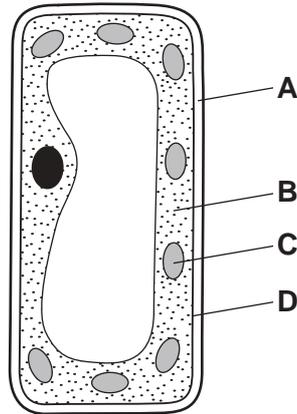


Use the key to identify the leaf.

- 1 leaf with several small leaflets go to 2
 leaf with one large leaf blade go to 3
- 2 leaflets are broad and flat **A**
 leaflets are narrow and hair-like **B**
- 3 leaf with a smooth edge **C**
 leaf with a toothed edge **D**

4 The diagram shows a cell from the leaf of a plant.

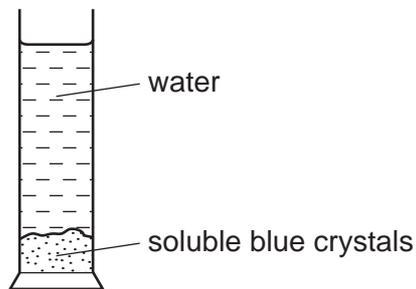
Which part contains the highest amount of magnesium?



5 What is a leaf?

- A a cell
- B an organ
- C an organ system
- D a tissue

6 An experiment is set up as shown.



After several hours, the water turns blue.

Which process causes this colour change to take place?

- A absorption
- B active transport
- C diffusion
- D osmosis

- 7 A cell has an actual length of 0.2 mm. A student wants to make a drawing of this cell so that it appears two hundred times bigger.

How long should the student draw this cell?

- A 4 mm B 0.04 cm C 40 mm D 40 cm

- 8 What are features of osmosis?

	diffusion is involved	requires cell walls	requires a partially permeable membrane
A	✓	x	✓
B	✓	x	x
C	x	✓	✓
D	x	✓	x

- 9 Which of these is digested by protease?

A ■

B ●

C ■—■—■—■

D ●—●—●—●

key

■ amino acid

● glucose

— chemical bond

- 10 Which chemical is used to test for the presence of protein in a food sample?

A Benedict's solution

B biuret solution

C DCPIP

D iodine solution

11 Four test-tubes were set up as shown in the table.

In which test-tube would starch be broken down the fastest?

	2 cm ³ starch suspension added	1 cm ³ of amylase added	1 cm ³ of boiled amylase added	temperature /°C	
A	✓	✓	x	5	key ✓ = present x = absent
B	✓	✓	x	35	
C	✓	x	✓	5	
D	✓	x	✓	35	

12 The average number of chloroplasts in four different types of cell taken from a plant is shown.

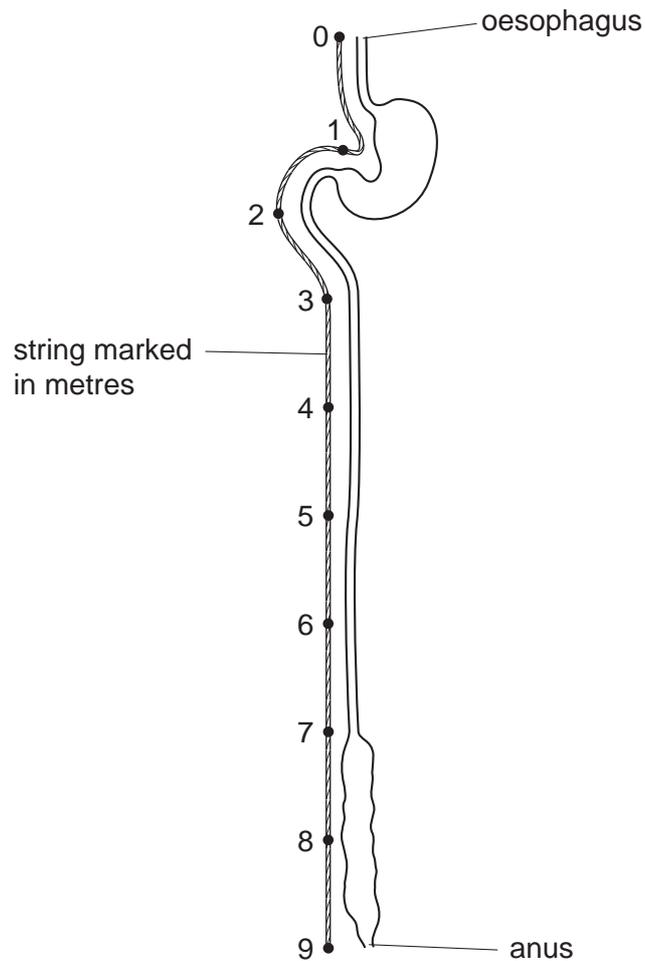
Which is a root hair cell?

- A** 0 **B** 47 **C** 370 **D** 920

13 What must be increased in the diet of a person suffering from constipation?

- A** fats
B fibre
C iron
D protein

14 The diagram shows the human alimentary canal, with a string marked in metres beside it.



How long is the small intestine?

- A** 2 m **B** 6 m **C** 8 m **D** 9 m

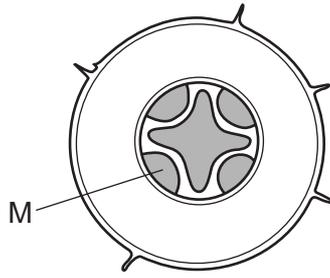
15 What could lead to obesity?

- A** energy consumption exceeding energy expenditure
B increased consumption of dietary fibre
C reduced consumption of fat
D reduced consumption of sugar

16 Which stage of nutrition takes place when food molecules become part of a body cell?

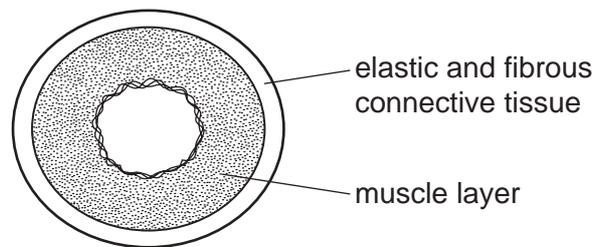
- A** absorption
B assimilation
C digestion
D ingestion

17 The diagram shows a transverse section through a plant organ.



What is M?

- A phloem in a root
 - B phloem in a stem
 - C xylem in a root
 - D xylem in a stem
- 18 What is a description of transpiration?
- A exchange of gases between the leaf and the atmosphere
 - B loss of water vapour from the leaves and stems of a plant
 - C movement of water from the roots to the leaves
 - D movement of water through the cells of the leaf
- 19 The diagram shows a cross-section through a human blood vessel.

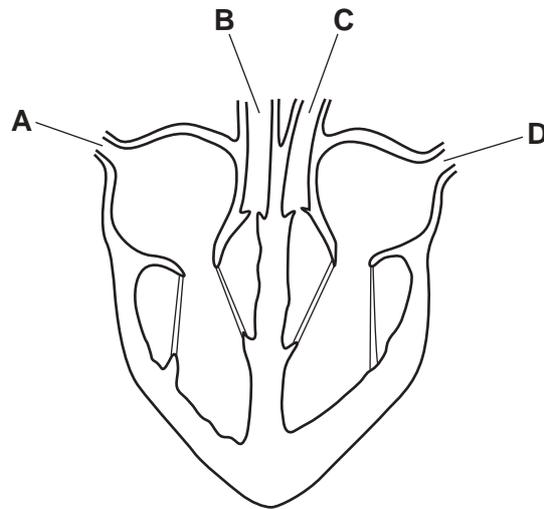


Which type of blood vessel does the diagram show?

- A an artery
- B a capillary
- C a vein
- D a ventricle

20 The diagram shows a section through a mammalian heart.

Which part carries blood directly from the lungs?



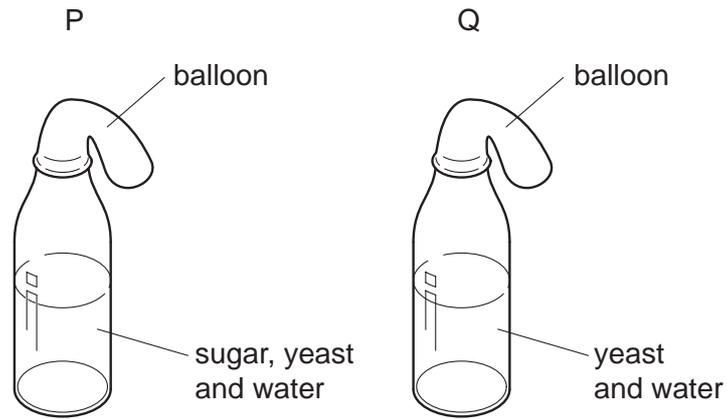
21 Which is a mechanical barrier to pathogens?

- A acid in the stomach
- B hairs in the nose
- C mucus in the trachea
- D phagocytosis in the blood

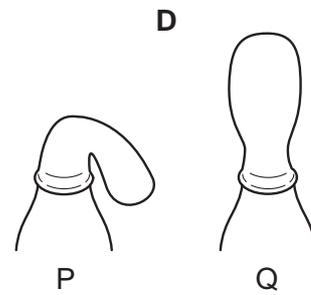
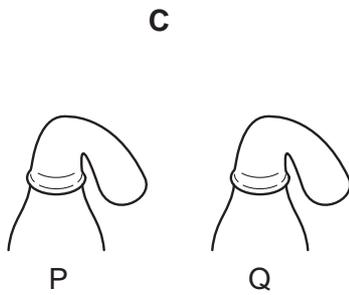
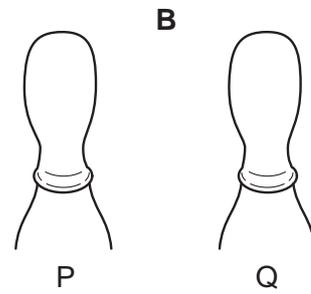
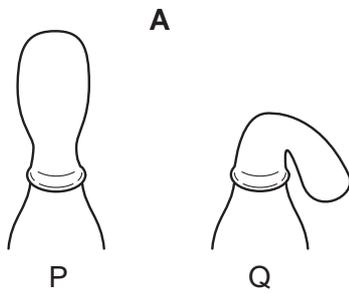
22 What is the approximate percentage of oxygen in exhaled air?

- A 0.04
- B 4.00
- C 16.00
- D 21.00

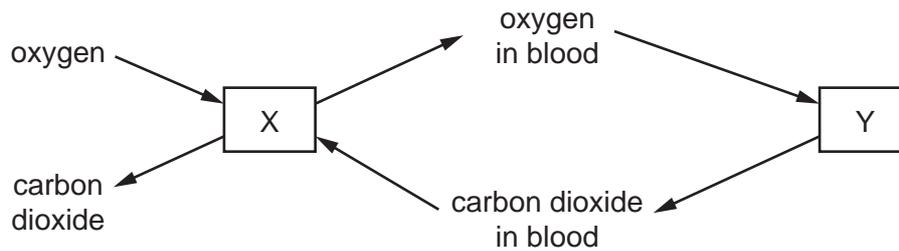
23 In an experiment to investigate anaerobic respiration, two bottles are set up in a warm room, as shown.



What would happen to each balloon after one day?



- 24 The diagram represents the exchange of gases during breathing and during respiration in the body.



What is represented by X and by Y?

	X	Y
A	lungs	air
B	lungs	body cells
C	body cells	air
D	body cells	lungs

- 25 What is the most important function of sweating?
- A** to remove excess heat from the body
 - B** to remove excess salts from the body
 - C** to remove excess urea from the body
 - D** to remove excess water from the body
- 26 What shows the order in which these structures are involved in a reflex action?
- A** effector → motor neurone → relay neurone → sensory neurone → receptor
 - B** effector → sensory neurone → motor neurone → relay neurone → receptor
 - C** receptor → sensory neurone → relay neurone → motor neurone → effector
 - D** receptor → motor neurone → sensory neurone → relay neurone → effector
- 27 Which acts as a sense organ?
- A** the gall bladder
 - B** the kidney
 - C** the skin
 - D** the ureter

28 The diagram shows a person sweating in hot weather.



What part is played by sweat glands during the process of sweating?

- A effector
 - B receptor
 - C sense organ
 - D stimulus
- 29 Which disease is caused by bacteria?
- A AIDS
 - B cholera
 - C obesity
 - D scurvy
- 30 Where does fertilisation occur in a flowering plant?
- A in the ovary
 - B in the pollen grain
 - C in the style
 - D on the stigma
- 31 Which method of birth control works by preventing an egg from being released?
- A condom
 - B contraceptive pill
 - C monitoring body temperature
 - D vasectomy

32 Which environmental factor is **not** always a requirement for seed germination?

- A light
- B oxygen
- C suitable temperature
- D water

33 In some plants, H is the dominant allele for hairy stems and h is the recessive allele for smooth stems.

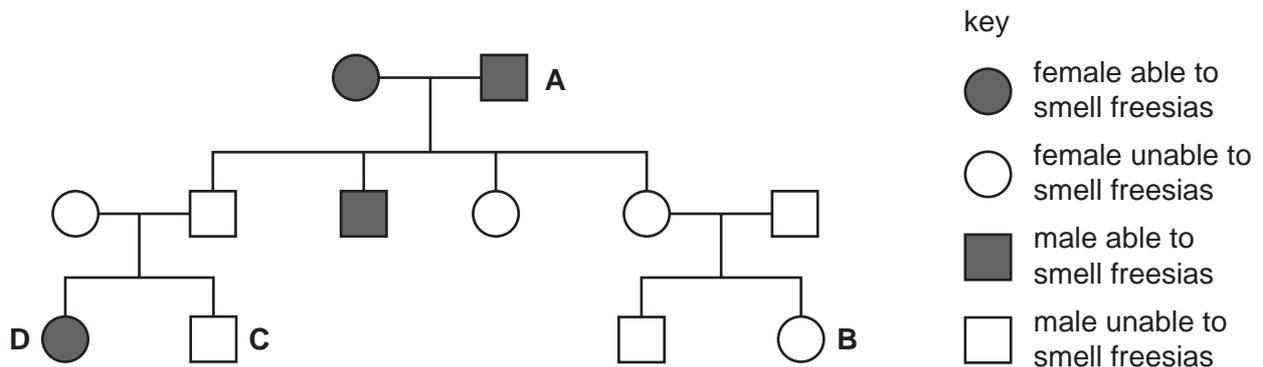
A pair of these plants produce 37 offspring, 18 with hairy stems and 19 with smooth stems.

What are the most likely genotypes of the parents?

- A $HH \times HH$
- B $Hh \times Hh$
- C $Hh \times hh$
- D $hh \times hh$

34 The family tree shows the inheritance of the ability to smell flowers called freesias. The allele for the ability to smell freesias is dominant.

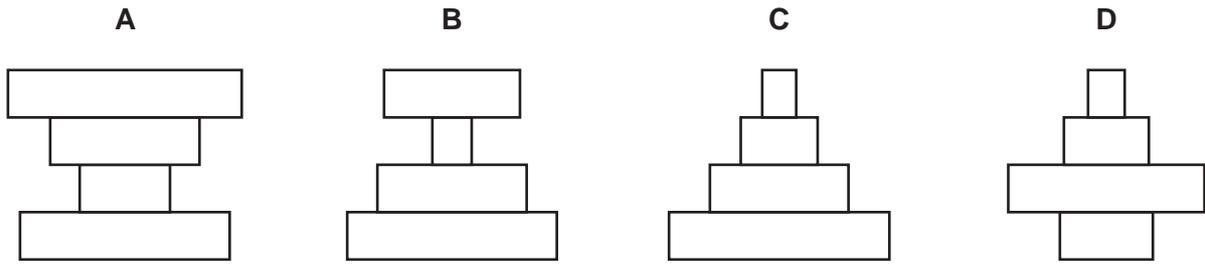
Which individual's symbol is **not** correct?



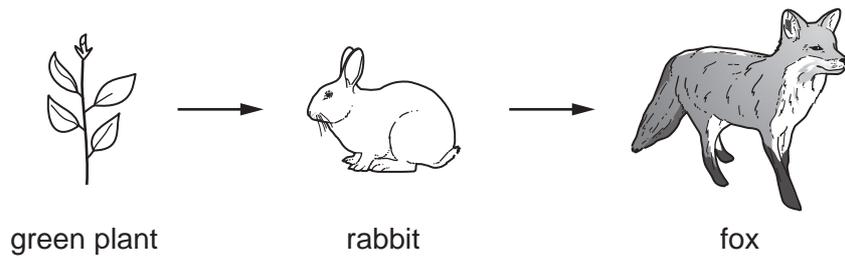
35 What is an example of continuous variation?

- A blood group
- B gender
- C height
- D tongue rolling

36 Which pyramid of numbers has more herbivores than producers?



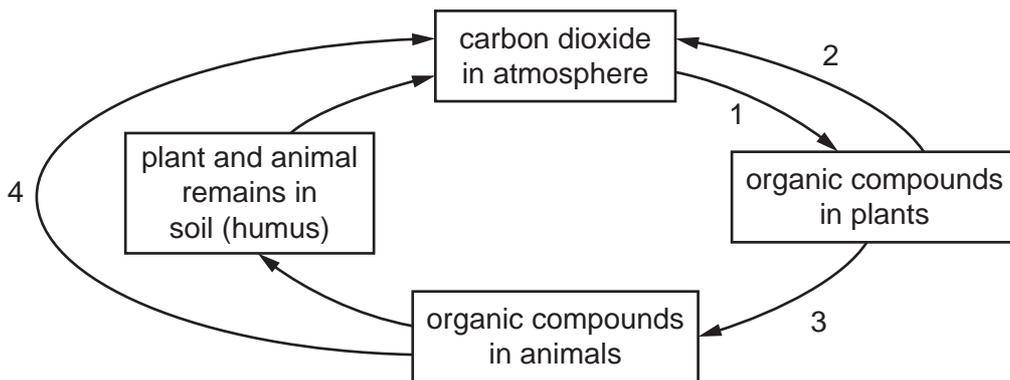
37 The diagram shows the flow of energy along a food chain.



Which process in the rabbit will allow energy to be passed on to the fox?

- A excretion
- B growth
- C movement
- D sensitivity

38 The diagram shows part of the carbon cycle.



Which two numbered arrows represent the process of respiration?

- A 1 and 2
- B 1 and 3
- C 2 and 4
- D 3 and 4

- 39 When making commercial apple juice, the fruit is crushed to separate cells and to release the cell contents. Chemical Q is found between the cells. It holds the cells together but it makes the extracted juice cloudy.

Which process is used to produce a clear juice?

- A adding more water to dissolve chemical Q
- B adding pectinase to digest chemical Q
- C boiling the juice to destroy chemical Q
- D crushing the apples to release chemical Q

- 40 The table shows the amount of carbon dioxide in the atmosphere in three different years.

year	1930	1980	1990
carbon dioxide / parts per million	300	330	370

What is the most likely cause of this change?

- A destruction of rainforests
- B increased use of fertilisers containing nitrogen
- C pollution of air by sulfur dioxide
- D rise in the sea level

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Cambridge International General Certificate of Secondary Education

BIOLOGY

0610/13

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 is recommended)

* 7 1 2 7 7 8 5 2 5 7 *

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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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Electronic calculators may be used.

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 Which process releases water and energy?

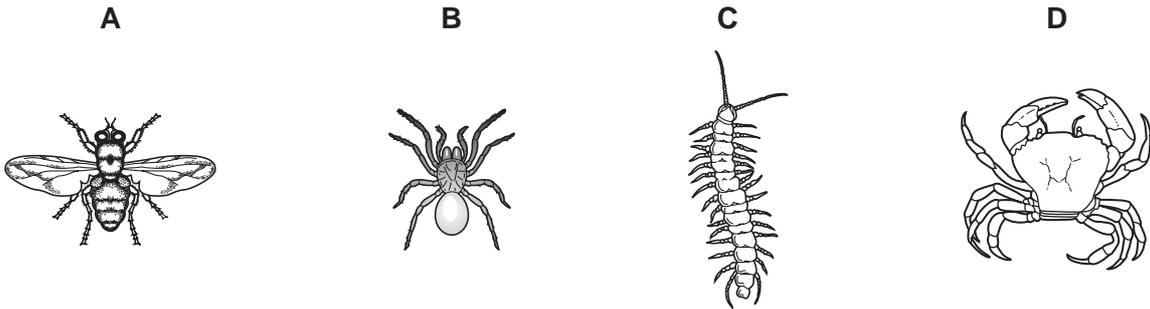
- A aerobic respiration
- B osmosis
- C photosynthesis
- D protein synthesis

2 The dire wolf is an extinct species of wolf.

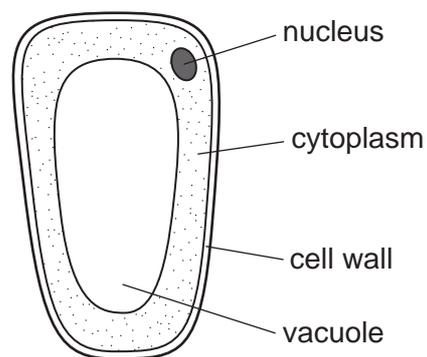
What is the correct scientific name for this wolf?

- A *Canis Dirus*
- B *canis dirus*
- C *Canis dirus*
- D *canis Dirus*

3 Which of the animals shown is a crustacean?



4 The diagram shows a type of plant cell.



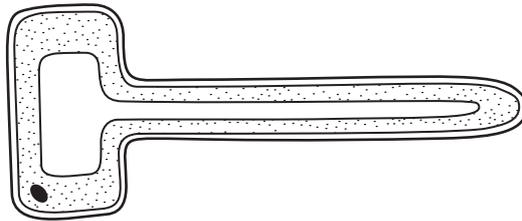
Where does this type of cell come from?

- A a root
- B cuticle
- C palisade mesophyll
- D spongy mesophyll

5 Which structures are found in a white blood cell?

	cell membrane	cell wall	chloroplast	large vacuole	cytoplasm	nucleus
A	✓	✓	x	x	x	x
B	✓	x	x	x	✓	✓
C	x	✓	x	x	x	✓
D	x	x	✓	✓	x	x

6 The diagram shows the structure of a plant cell.



This cell is part of a tissue which

- A** absorbs carbon dioxide from the air.
- B** absorbs ions from the soil.
- C** transports sucrose from leaves.
- D** transports water in stems.

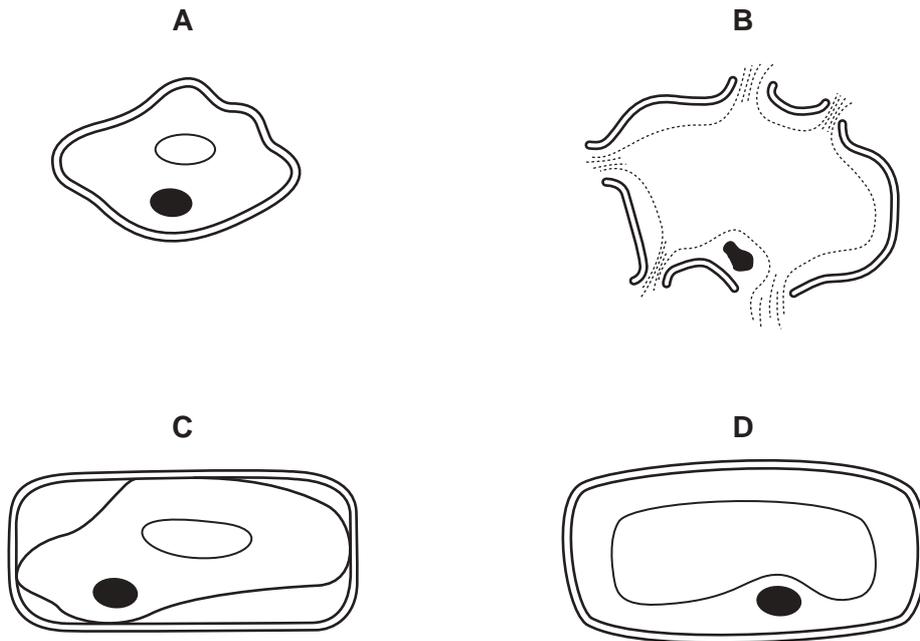
7 A student made the following statements about the movement of ions by active transport.

- 1 It is the net movement of particles from a low concentration to a high concentration.
- 2 It is the net movement of particles from a high concentration to a low concentration.
- 3 It requires the use of energy.
- 4 It can only take place in living, respiring cells.

Which statements are correct?

- A** 1, 3 and 4
- B** 1 and 4 only
- C** 2 and 4
- D** 2 only

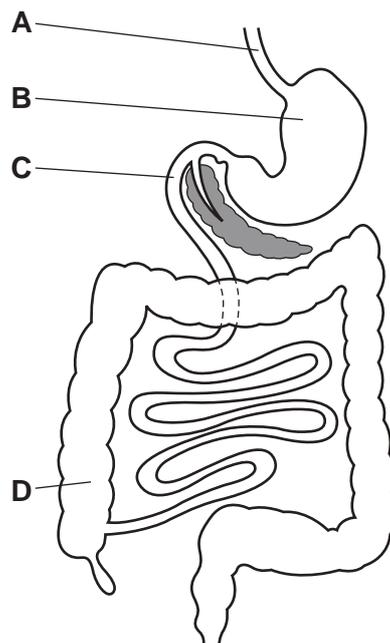
8 Which diagram shows the appearance of a plant cell after it is placed in pure water?



9 What is the colour change shown by Benedict's solution when heated with a reducing sugar?

- A blue to purple
- B blue to red
- C brown to blue-black
- D red to yellow

10 Into which part of the alimentary canal is the enzyme that digests starch secreted?



11 Which of these is digested by protease?

A ■

B ●

C ■—■—■—■

D ●—●—●—●

key

■ amino acid

● glucose

— chemical bond

12 What must be increased in the diet of a person suffering from constipation?

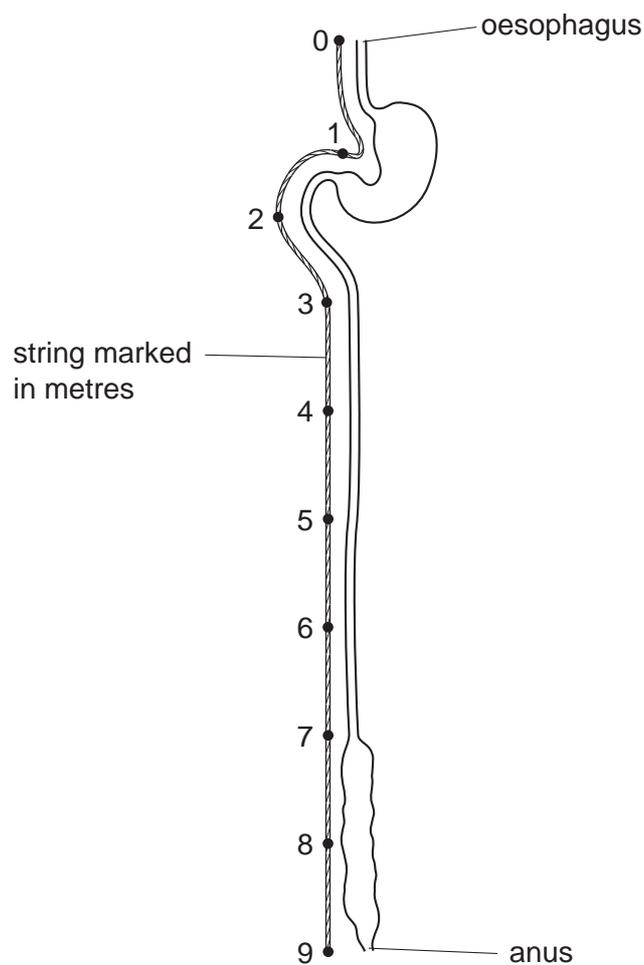
A fats

B fibre

C iron

D protein

13 The diagram shows the human alimentary canal, with a string marked in metres beside it.



How long is the small intestine?

A 2 m

B 6 m

C 8 m

D 9 m

14 A person has swollen, bleeding gums and slow wound healing.

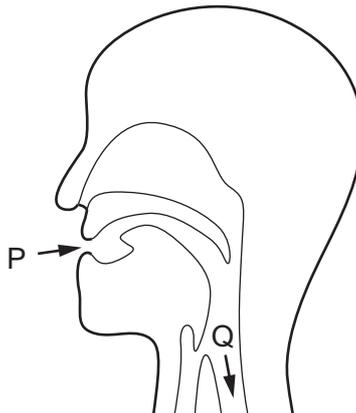
This could be caused by a lack of which nutrient in a diet?

- A calcium
- B fibre
- C iron
- D vitamin C

15 Which function is performed by the duodenum?

- A assimilation
- B digestion
- C egestion
- D ingestion

16 Solid food enters the mouth at P and enters the oesophagus at Q.



How does the food at Q differ from the food at P?

- A It contains less fibre.
- B It contains less vitamin D.
- C It contains less protein.
- D It contains less starch.

17 What is a description of transpiration?

- A exchange of gases between the leaf and the atmosphere
- B loss of water vapour from the leaves and stems of a plant
- C movement of water from the roots to the leaves
- D movement of water through the cells of the leaf

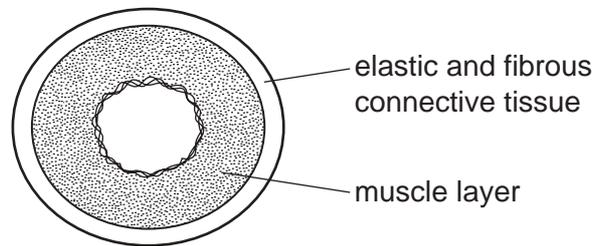
18 Which words correctly complete the following two sentences?

During transpiration, water moves from the1..... in a leaf and passes into2..... cells.

It then leaves the surface of these cells by3..... and4..... out of the stomata.

	1	2	3	4
A	phloem	xylem	osmosis	evaporates
B	stomata	guard	active transport	flows
C	xylem	mesophyll	diffusion	drains
D	xylem	mesophyll	evaporation	diffuses

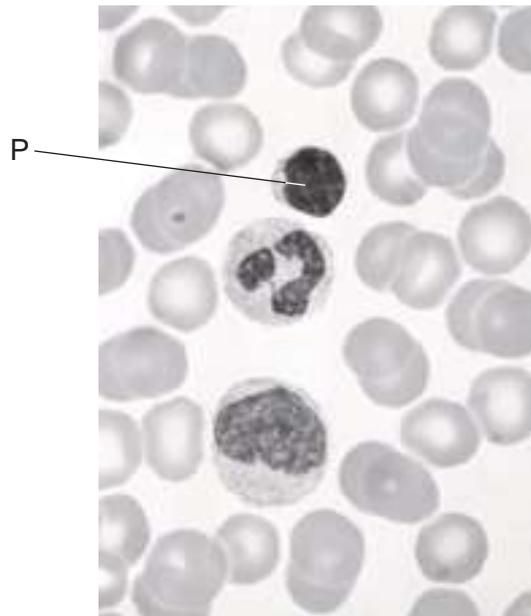
19 The diagram shows a cross-section through a human blood vessel.



Which type of blood vessel does the diagram show?

- A** an artery
- B** a capillary
- C** a vein
- D** a ventricle

20 The photomicrograph shows some blood cells.

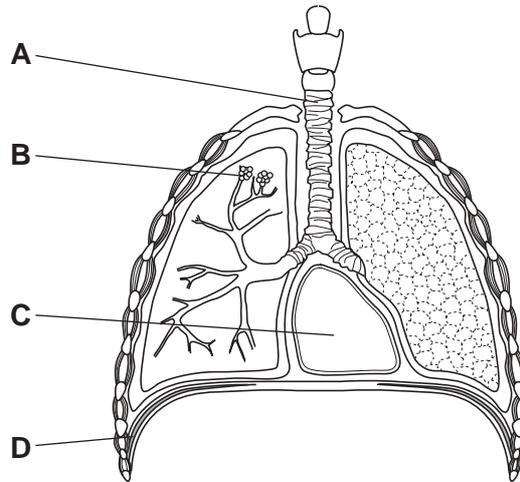


What is the function of cell P?

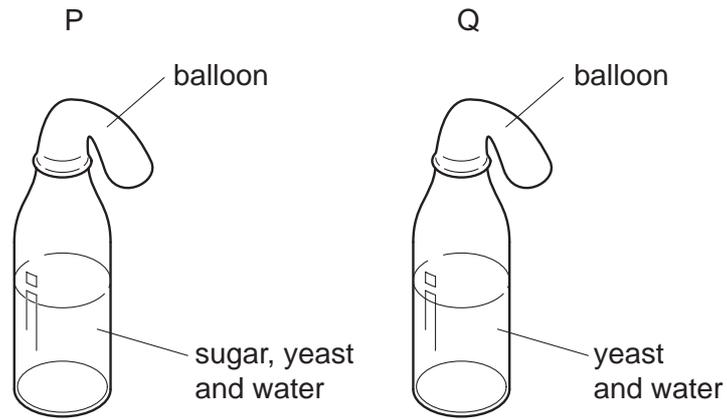
- A It carries carbon dioxide.
 - B It carries oxygen.
 - C It helps to clot blood.
 - D It produces antibodies.
- 21 What can be passed from one person to another during blood transfusion?
- A cholera
 - B chronic obstructive pulmonary disease (COPD)
 - C HIV
 - D scurvy

22 The diagram shows some structures in the human thorax (chest).

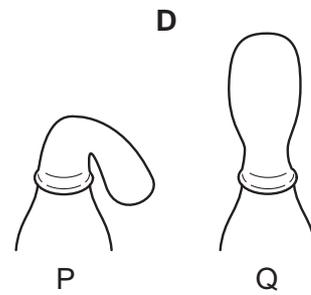
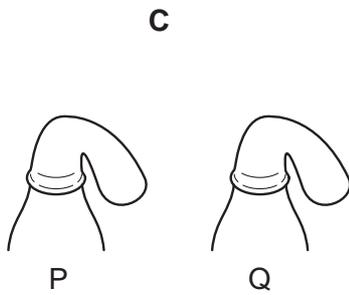
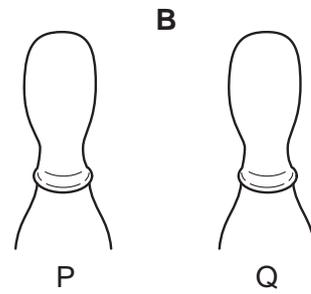
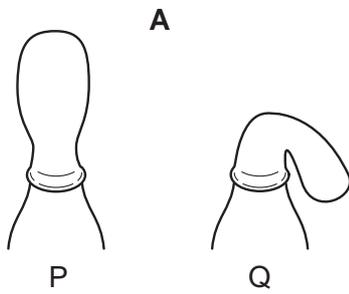
From which part does most oxygen pass directly into the blood?



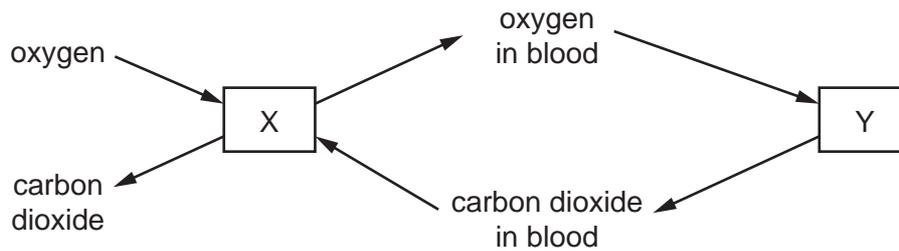
23 In an experiment to investigate anaerobic respiration, two bottles are set up in a warm room, as shown.



What would happen to each balloon after one day?



- 24 The diagram represents the exchange of gases during breathing and during respiration in the body.



What is represented by X and by Y?

	X	Y
A	lungs	air
B	lungs	body cells
C	body cells	air
D	body cells	lungs

- 25 What is the most important function of sweating?
- A** to remove excess heat from the body
 - B** to remove excess salts from the body
 - C** to remove excess urea from the body
 - D** to remove excess water from the body
- 26 A student begins to lose control of her bicycle while travelling down a hill at speed. The concentration of which substance will begin to increase rapidly in her blood?
- A** adrenaline
 - B** insulin
 - C** oestrogen
 - D** testosterone
- 27 What shows the order in which these structures are involved in a reflex action?
- A** effector → motor neurone → relay neurone → sensory neurone → receptor
 - B** effector → sensory neurone → motor neurone → relay neurone → receptor
 - C** receptor → sensory neurone → relay neurone → motor neurone → effector
 - D** receptor → motor neurone → sensory neurone → relay neurone → effector

28 The diagram shows a person sweating in hot weather.



What part is played by sweat glands during the process of sweating?

- A effector
- B receptor
- C sense organ
- D stimulus

29 Which row states the possible harmful effects of tobacco smoke?

	cancer	liver damage	coronary heart disease
A	✓	✓	✗
B	✓	✗	✓
C	✗	✓	✗
D	✗	✗	✓

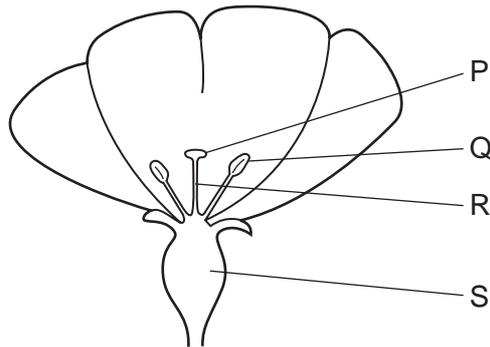
30 Which method of birth control works by preventing an egg from being released?

- A condom
- B contraceptive pill
- C monitoring body temperature
- D vasectomy

31 Which environmental factor is **not** always a requirement for seed germination?

- A light
- B oxygen
- C suitable temperature
- D water

32 The diagram shows half a flower.



After pollination, where would pollen grains be found?

- A P and Q
- B Q and R
- C R and S
- D S and P

33 A pure-breeding white rat was crossed with a pure-breeding black rat. All their offspring were black.

One of the offspring was bred with a pure-breeding white rat.

What is the most likely percentage of black rats in the offspring?

- A 25
- B 50
- C 75
- D 100

34 A tall pea plant is crossed with a short pea plant.

All the offspring plants are tall.

What are the genotypes of the tall parent plant and the offspring?

	tall parent	offspring
A	heterozygous	heterozygous
B	heterozygous	homozygous
C	homozygous	heterozygous
D	homozygous	homozygous

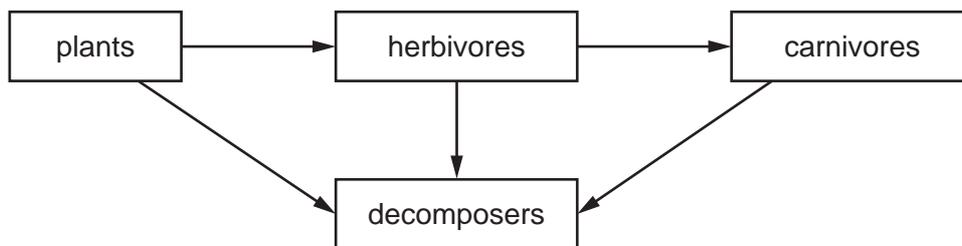
35 What is a mutation?

- A a change in appearance
- B a change in a gene
- C a change in behaviour
- D a change in the environment

36 Which two processes both result in increased water vapour in the atmosphere?

- A condensation and precipitation
- B condensation and transpiration
- C evaporation and transpiration
- D precipitation and evaporation

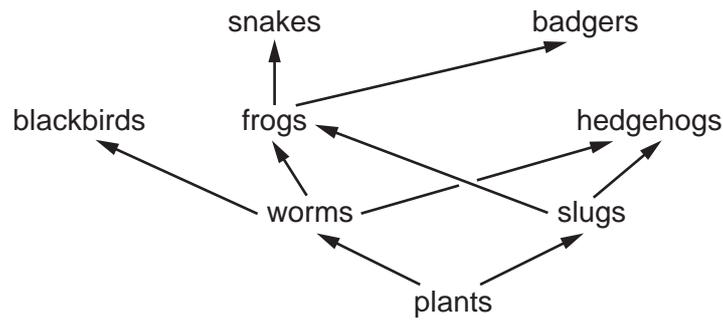
37 The diagram shows a food web.



What do the arrows represent?

- A the absorption of oxygen
- B the absorption of water
- C the flow of energy
- D the release of carbon dioxide

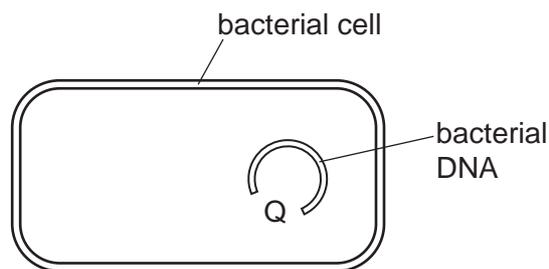
38 The diagram shows part of a food web.



What is most likely to increase the size of the frog population?

- A fewer hedgehogs
- B fewer slugs
- C more badgers
- D more blackbirds

39 The diagram shows a bacterial cell that will be used to produce human insulin.



What is inserted into gap Q?

- A a gene from a healthy human
- B cells from a human pancreas
- C DNA from another bacterium
- D molecules of human insulin

40 The table shows the amount of carbon dioxide in the atmosphere in three different years.

year	1930	1980	1990
carbon dioxide/parts per million	300	330	370

What is the most likely cause of this change?

- A destruction of rainforests
- B increased use of fertilisers containing nitrogen
- C pollution of air by sulfur dioxide
- D rise in the sea level

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BIOLOGY

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Paper 2 Multiple Choice (Extended)

October/November 2017

45 minutes

Additional Materials: Multiple Choice Answer Sheet
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This document consists of **15** printed pages and **1** blank page.

1 Which term is defined as all the chemical reactions that occur in cells?

- A photosynthesis
- B protein synthesis
- C respiration
- D metabolism

2 The diagram shows a section of DNA from a chimpanzee.



Which diagram shows a section of DNA from the organism that is most closely related to the chimpanzee?



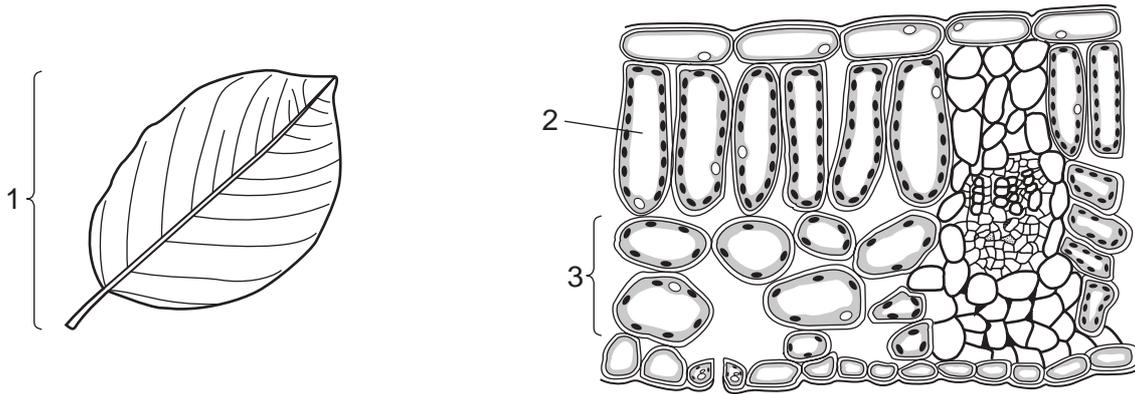
3 The length of a mitochondrion in a photomicrograph is 15 mm.

The actual length of the mitochondrion is 3 μm .

What is the magnification of the photomicrograph?

- A $\times 5$ B $\times 45$ C $\times 5000$ D $\times 45\,000$

4 The diagrams show a leaf and its internal structure.



What are the levels of organisation of the labelled structures?

	1	2	3
A	cell	tissue	organ system
B	organ	cell	tissue
C	organ system	tissue	cell
D	tissue	cell	organ

5 Different factors affect the rate of diffusion of molecules across a membrane.

Which row represents changes to factors that will increase the rate of diffusion?

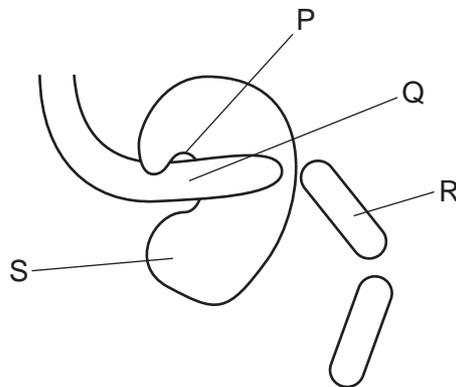
	concentration gradient across a membrane	thickness of membrane	surface area of membrane	temperature
A	decrease	decrease	increase	increase
B	decrease	increase	increase	decrease
C	increase	decrease	increase	increase
D	increase	increase	decrease	decrease

- 6 A red blood cell and a palisade mesophyll cell are placed in a solution which has a higher water potential than the cells.

What will happen to each cell?

	red blood cell	palisade mesophyll cell
A	bursts	bursts
B	bursts	gains mass
C	loses mass	gains mass
D	loses mass	loses mass

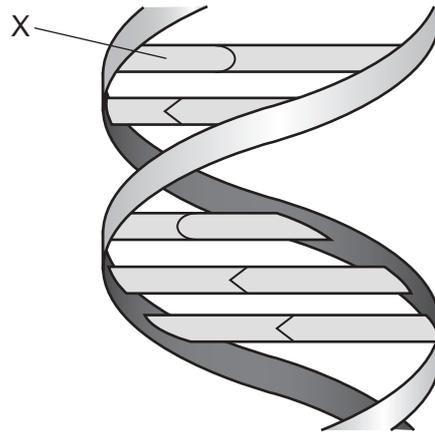
- 7 The diagram shows a protease molecule catalysing the break down of a protein molecule.



What are the parts labelled P, Q, R and S?

	enzyme	product	substrate	active site
A	P	Q	R	S
B	R	S	P	Q
C	S	P	Q	R
D	S	R	Q	P

- 8 The diagram shows the structure of part of a DNA molecule.



What does X represent?

- A amino acid
 - B base
 - C carbon
 - D protein
- 9 Which statement about enzymes is correct?
- A Enzymes become part of the product.
 - B Lowering the pH always slows down the reaction rate.
 - C Raising the temperature always increases the reaction rate.
 - D The specificity of an enzyme depends on the shape of its active site.
- 10 Which enzyme is used to produce clear apple juice?
- A amylase
 - B lipase
 - C pectinase
 - D protease
- 11 Which structure would be found in large numbers in cells that have a high energy requirement?
- A chloroplast
 - B endoplasmic reticulum
 - C large vacuole
 - D mitochondrion

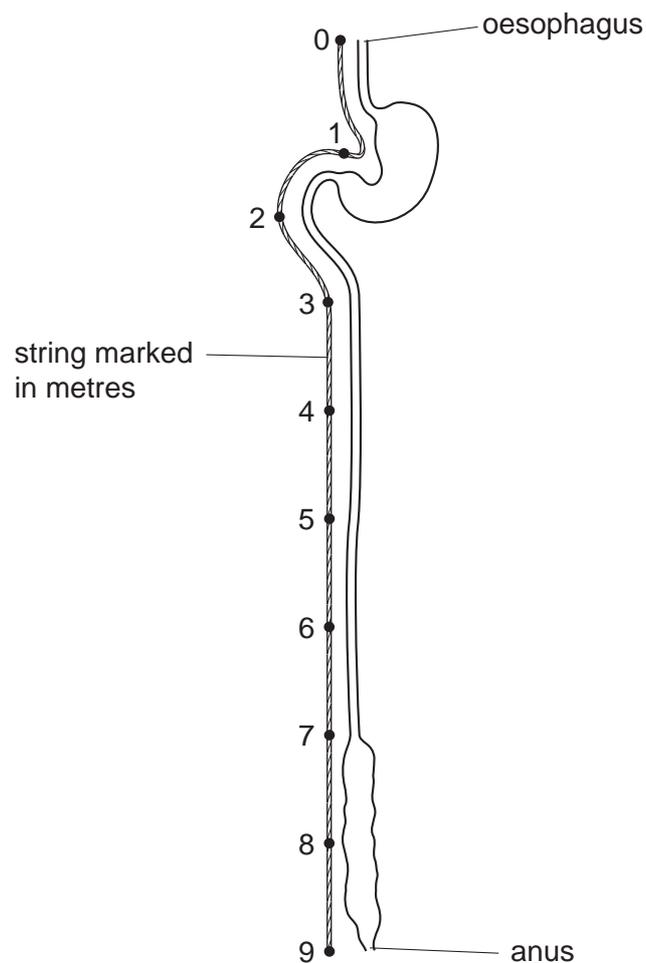
12 What must be increased in the diet of a person suffering from constipation?

- A fats
- B fibre
- C iron
- D protein

13 Which disease can be caused by a deficiency of iron in the diet?

- A anaemia
- B kwashiorkor
- C marasmus
- D rickets

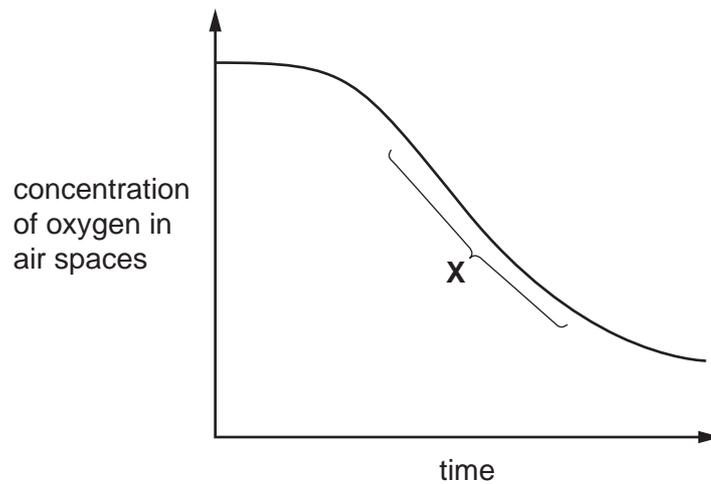
14 The diagram shows the human alimentary canal, with a string marked in metres beside it.



How long is the small intestine?

- A 2 m
- B 6 m
- C 8 m
- D 9 m

- 15 The graph shows the concentration of oxygen in the air spaces of a green leaf of a plant during a 12-hour period.

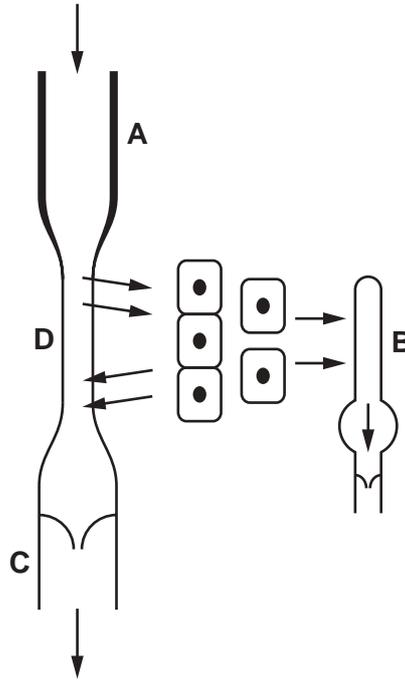


Which statement about carbon dioxide in the air spaces during time **X** is correct?

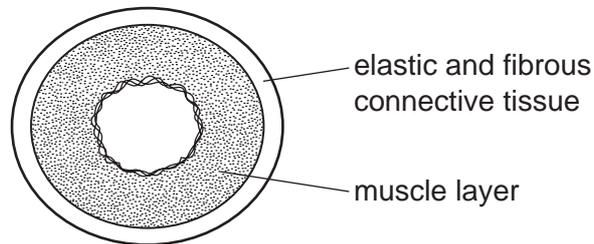
- A Carbon dioxide is being produced because the rate of photosynthesis is greater than the rate of respiration.
 - B Carbon dioxide is being produced because the rate of respiration is greater than the rate of photosynthesis.
 - C Carbon dioxide is being used because the rate of photosynthesis is greater than the rate of respiration.
 - D Carbon dioxide is being used because the rate of respiration is greater than the rate of photosynthesis.
- 16 What is a description of transpiration?
- A exchange of gases between the leaf and the atmosphere
 - B loss of water vapour from the leaves and stems of a plant
 - C movement of water from the roots to the leaves
 - D movement of water through the cells of the leaf

17 The diagram shows the vessels associated with the flow of fluids to and from body cells.

Which is the lymph vessel?



18 The diagram shows a cross-section through a human blood vessel.



Which type of blood vessel does the diagram show?

- A an artery
- B a capillary
- C a vein
- D a ventricle

19 Which are both chemical barriers to the transmission of pathogens?

- A mucus and stomach acid
- B mucus and white blood cells
- C skin and hairs in the nose
- D skin and stomach acid

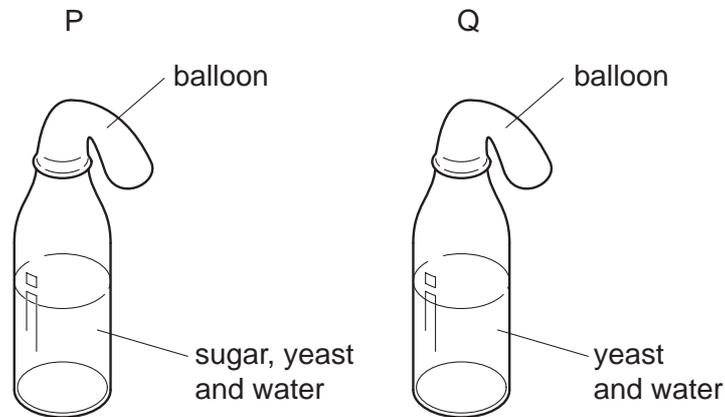
20 The table shows some of the changes that occur during breathing.

	from contracted to relaxed	from relaxed to contracted
diaphragm	P	X
external intercostals	Q	Y
internal intercostals	R	Z

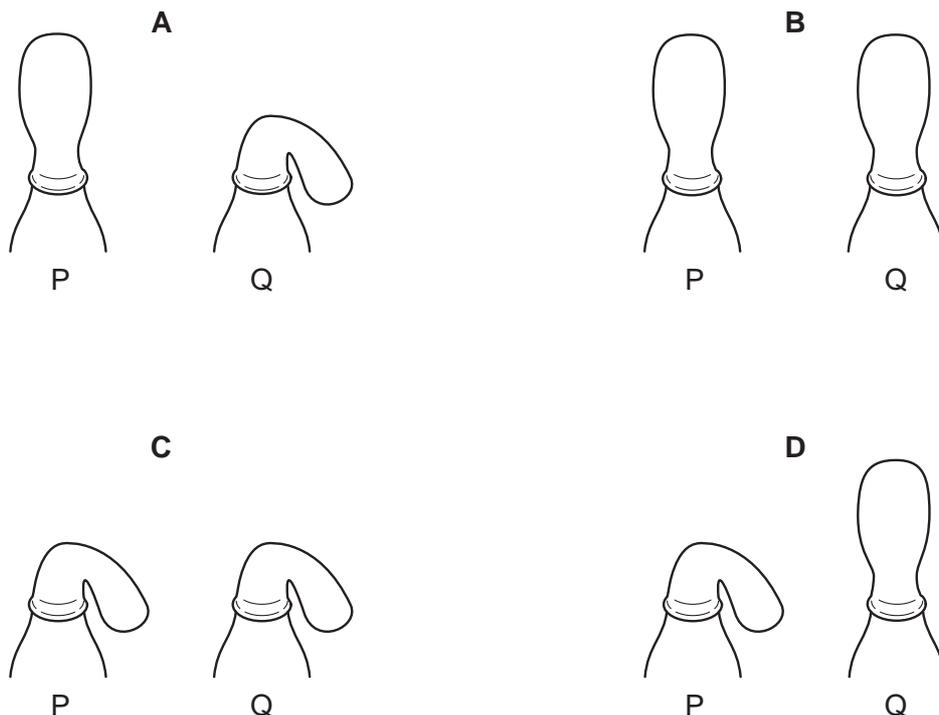
Which changes occur to cause inspiration?

- A** P, Q and Z **B** X, Q and R **C** X, Y and R **D** X, Y and Z

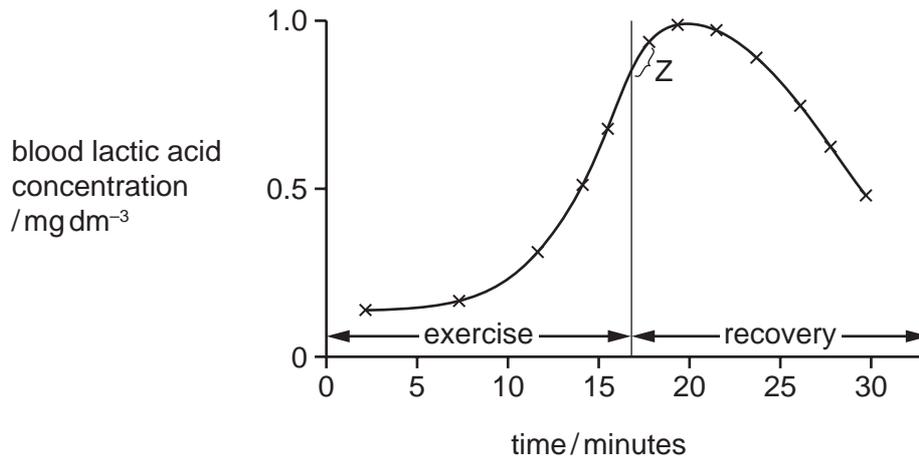
21 In an experiment to investigate anaerobic respiration, two bottles are set up in a warm room, as shown.



What would happen to each balloon after one day?



22 The graph shows the lactic acid concentration in blood during and after exercise.



The continuation of which process accounts for the shape of the graph at Z?

- A deep breathing
- B high heart rate
- C high rate of breathing
- D movement of lactic acid from the muscles

23 What is the most important function of sweating?

- A to remove excess heat from the body
- B to remove excess salts from the body
- C to remove excess urea from the body
- D to remove excess water from the body

24 Four effects of a specific hormone are listed.

- increased blood pressure
- increased blood glucose concentration
- increased rate of respiration
- reduced blood flow to the gut

What is this hormone?

- A adrenaline
- B glucagon
- C insulin
- D testosterone

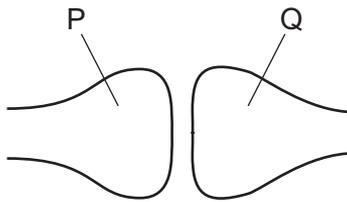
25 The diagram shows a person sweating in hot weather.



What part is played by sweat glands during the process of sweating?

- A effector
- B receptor
- C sense organ
- D stimulus

26 The diagram shows a synapse in a reflex arc.



What are the identities of the two neurones and in which direction does the neurotransmitter pass?

	neurone P	neurone Q	direction of passage of neurotransmitter
A	motor	relay	P → Q
B	motor	sensory	P → Q
C	relay	motor	Q → P
D	relay	sensory	Q → P

27 The immune system recognises pathogens and attacks them.

Which feature of pathogens triggers this response?

- A antibodies
- B antibiotics
- C antigens
- D memory cells

28 Which environmental factor is **not** always a requirement for seed germination?

- A light
- B oxygen
- C suitable temperature
- D water

29 Which row shows the adaptive features of sperm cells?

	flagellum	jelly coat	mitochondria
A	absent	absent	present
B	absent	present	absent
C	present	absent	present
D	present	present	absent

30 In some mammals the allele for brown coat colour is dominant to the allele for white coat colour.

Which percentage of offspring will be white if a cross is made between two heterozygous mammals?

- A 0%
- B 25%
- C 50%
- D 100%

31 Which term is defined as a length of DNA that codes for a protein?

- A amino acid
- B chromosome
- C gene
- D mutation

32 The following are involved in protein synthesis.

- 1 amino acids assembled in order
- 2 mRNA moves to the cytoplasm
- 3 mRNA passing through a ribosome
- 4 DNA in the nucleus

In which order do they become involved when proteins are made?

- A 1 → 3 → 2 → 4
- B 3 → 2 → 1 → 4
- C 4 → 2 → 3 → 1
- D 4 → 3 → 2 → 1

33 What makes tongue rolling an example of discontinuous variation?

- A A person can roll their tongue only when they are young.
- B There are many different types of tongue rollers.
- C Tongue rolling has to be learnt.
- D Tongue rolling is something that a person either can or cannot do.

34 The distribution of the sickle-cell allele in human populations varies in different areas of the world.

What is an explanation for this difference?

- A People that are heterozygous for the sickle-cell allele have a resistance to cholera.
- B People that are heterozygous for the sickle-cell allele have a resistance to malaria.
- C People that are heterozygous for the sickle-cell allele are more likely to suffer from anaemia.
- D People with sickle-cell anaemia have more alleles.

35 Nitrogen in the air cannot be used by plants until it is in the form of nitrates.

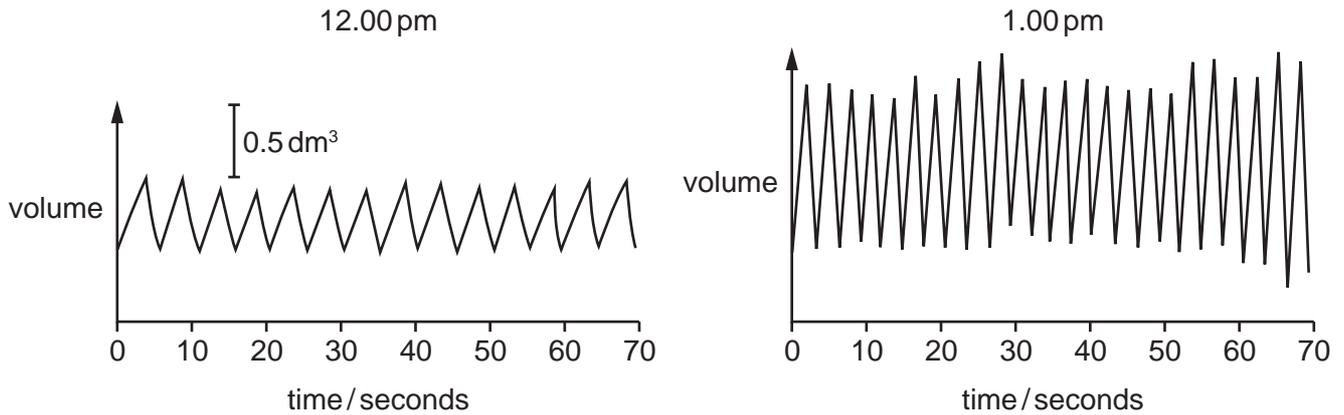
Which two processes convert nitrogen from the air into nitrates?

- A decomposition of faeces and nitrification
- B denitrification and lightning
- C nitrogen fixation by bacteria and denitrification
- D nitrogen fixation by bacteria and lightning

36 What is shown by the widest block in a pyramid of numbers for a grassland ecosystem?

- A all the consumers in the pyramid
- B the carnivores in the pyramid
- C the organisms at the top of the pyramid
- D the producers in the pyramid

37 The diagrams show the depth and rate of breathing in a person at 12.00 pm and 1.00 pm.



What happens to the person's breathing between 12.00 pm and 1.00 pm?

	depth of breathing	rate of breathing
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

38 Ligase enzymes are used in genetic engineering to

- A cut open plasmid DNA.
- B insert plasmids into bacteria.
- C isolate the DNA making up a human gene.
- D join human DNA to plasmid DNA.

39 What is **not** a reason for conservation programmes?

- A to introduce new species
- B to maintain nutrient cycles
- C to maintain resources
- D to protect vulnerable environments

40 Some examples of the waste products of human activity are discarded household rubbish, excess fertiliser, industrial chemicals and untreated sewage.

Which of these can **both** cause increased growth of aquatic plants?

- A chemical waste and discarded household rubbish
- B discarded household rubbish and excess fertiliser
- C excess fertiliser and untreated sewage
- D untreated sewage and chemical waste

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BIOLOGY

0610/22

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 is recommended)



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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.

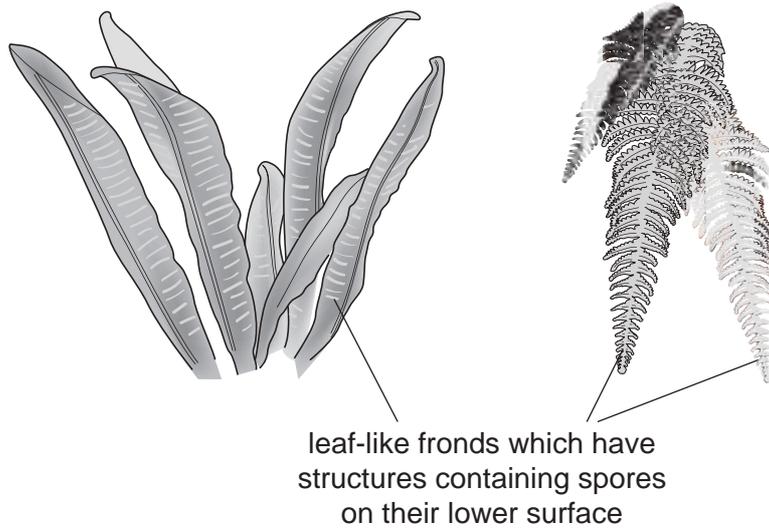
Any rough working should be done in this booklet.

Electronic calculators may be used.

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.

1 To which group do **both** the organisms shown in the diagram belong?



- A dicotyledons
- B ferns
- C fungi
- D monocotyledons

2 The diagram shows a section of DNA from a chimpanzee.

A	G	C	T	A	C	A	G	A	G
---	---	---	---	---	---	---	---	---	---

Which diagram shows a section of DNA from the organism that is most closely related to the chimpanzee?

A

A	G	C	T	A	C	A	G	A	T
---	---	---	---	---	---	---	---	---	---

B

A	G	C	T	A	C	A	G	T	T
---	---	---	---	---	---	---	---	---	---

C

A	T	C	A	A	C	A	G	T	T
---	---	---	---	---	---	---	---	---	---

D

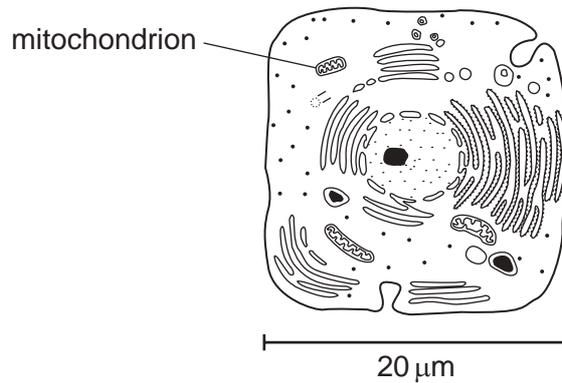
A	T	C	T	A	C	A	G	T	T
---	---	---	---	---	---	---	---	---	---

3 What is a leaf?

- A a cell
- B an organ
- C an organ system
- D a tissue

4 The diagram shows a magnified image of a human liver cell with a mitochondrion labelled. The actual size of the liver cell is $20\ \mu\text{m}$.

The image size of the liver cell is 40 mm and the image size of the mitochondrion is 4 mm.



What is the actual size of the mitochondrion shown in the diagram?

- A 0.002 mm
- B 0.02 mm
- C 0.2 mm
- D 2 mm

5 What would increase the rate of diffusion of oxygen into an animal cell?

- A decreasing the concentration gradient between the inside of the cell and the outside
- B decreasing the temperature of the cell and its surroundings
- C increasing the distance that the oxygen molecules have to travel
- D increasing the surface area of the cell membrane

- 6 A red blood cell and a palisade mesophyll cell are placed in a solution which has a higher water potential than the cells.

What will happen to each cell?

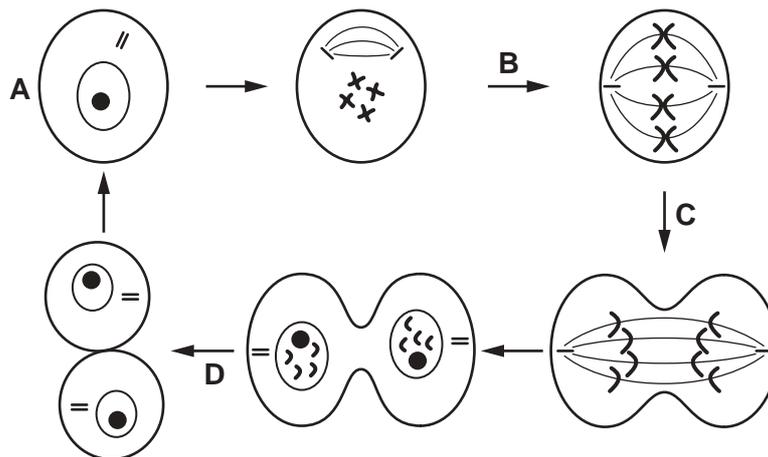
	red blood cell	palisade mesophyll cell
A	bursts	bursts
B	bursts	gains mass
C	loses mass	gains mass
D	loses mass	loses mass

- 7 Where in the alimentary canal is the enzyme trypsin found and what are the products of the reaction it catalyses?

	where trypsin is found	products
A	duodenum	amino acids
B	duodenum	fatty acids
C	ileum	proteins
D	stomach	amino acids

- 8 The diagram shows a cell before and during mitosis.

At which stage are the chromosomes copied?



9 Why does excessive heat decrease enzyme activity?

- A It changes the shape of the active site.
- B It changes the shape of the substrate and product molecules.
- C It increases the force of collisions between substrate and product molecules.
- D It increases the kinetic energy of the substrate molecules.

10 Four test-tubes were set up as shown in the table.

In which test-tube would starch be broken down the fastest?

	2 cm ³ starch suspension added	1 cm ³ of amylase added	1 cm ³ of boiled amylase added	temperature /°C	
A	✓	✓	x	5	key ✓ = present x = absent
B	✓	✓	x	35	
C	✓	x	✓	5	
D	✓	x	✓	35	

11 The average number of chloroplasts in four different types of cell taken from a plant is shown.

Which is a root hair cell?

- A 0 B 47 C 370 D 920

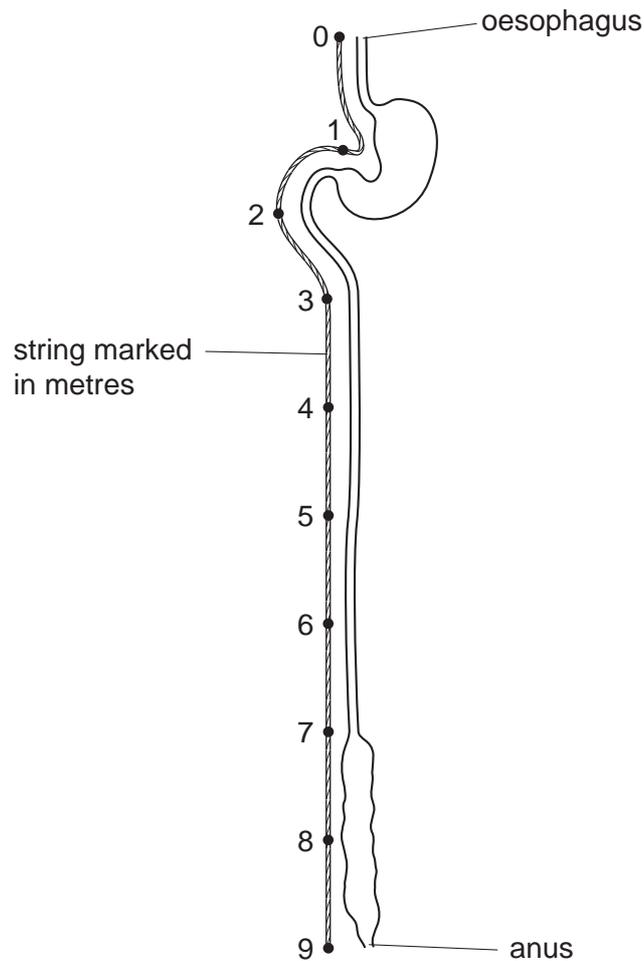
12 What must be increased in the diet of a person suffering from constipation?

- A fats
- B fibre
- C iron
- D protein

13 Which stage of nutrition takes place when food molecules become part of a body cell?

- A absorption
- B assimilation
- C digestion
- D ingestion

14 The diagram shows the human alimentary canal, with a string marked in metres beside it.



How long is the small intestine?

- A** 2 m **B** 6 m **C** 8 m **D** 9 m

15 What is the function of translocation?

- A** to move leaves towards the light for photosynthesis
B to move water into leaves for photosynthesis
C to transport amino acids for the growth of new leaves
D to transport starch to all parts of a plant

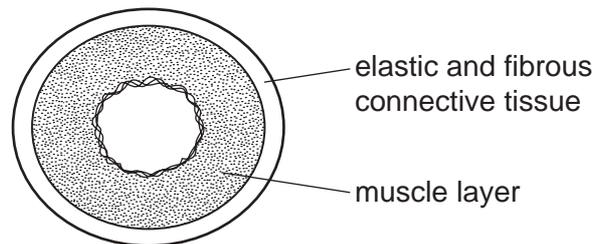
16 What is a description of transpiration?

- A** exchange of gases between the leaf and the atmosphere
B loss of water vapour from the leaves and stems of a plant
C movement of water from the roots to the leaves
D movement of water through the cells of the leaf

17 What happens as the blood flows from the atria into the ventricles of the heart?

	atrioventricular valves	muscle wall of the atria	muscle wall of the ventricles	semi-lunar valves
A	close	relax	contract	open
B	close	relax	relax	open
C	open	contract	contract	close
D	open	contract	relax	close

18 The diagram shows a cross-section through a human blood vessel.



Which type of blood vessel does the diagram show?

- A** an artery
- B** a capillary
- C** a vein
- D** a ventricle

19 Which is a mechanical barrier to pathogens?

- A** acid in the stomach
- B** hairs in the nose
- C** mucus in the trachea
- D** phagocytosis in the blood

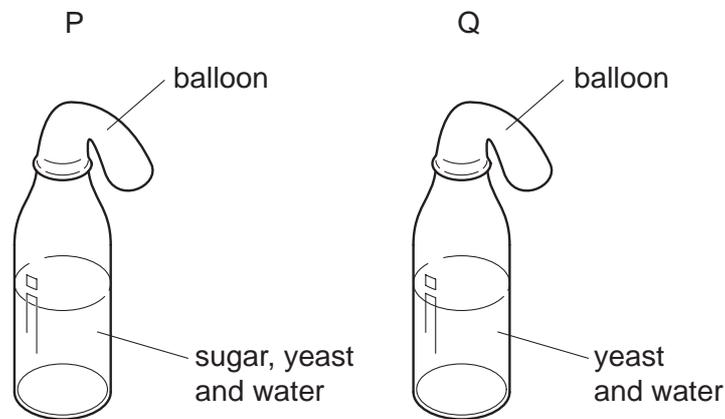
20 The table shows some of the changes that occur during breathing.

	from contracted to relaxed	from relaxed to contracted
diaphragm	P	X
external intercostals	Q	Y
internal intercostals	R	Z

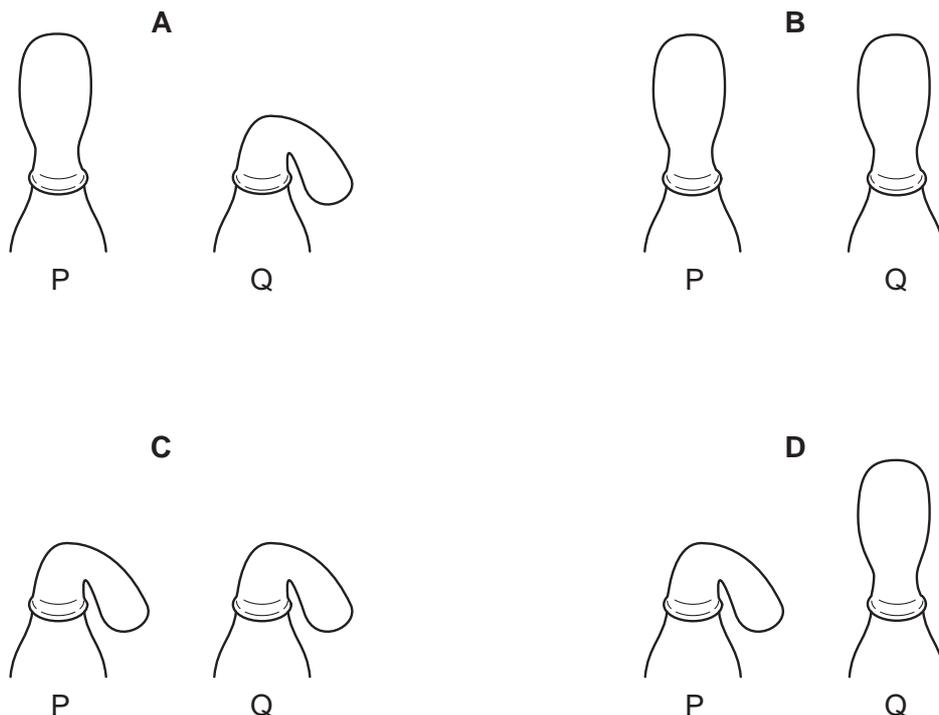
Which changes occur to cause inspiration?

- A** P, Q and Z **B** X, Q and R **C** X, Y and R **D** X, Y and Z

21 In an experiment to investigate anaerobic respiration, two bottles are set up in a warm room, as shown.



What would happen to each balloon after one day?



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22 Vigorous exercise can cause an oxygen debt.

Which process removes the oxygen debt?

- A aerobic respiration of lactic acid in the liver
- B a decrease in breathing rate
- C a decrease in heart rate
- D an increase in blood supply to the skin

23 What is the most important function of sweating?

- A to remove excess heat from the body
- B to remove excess salts from the body
- C to remove excess urea from the body
- D to remove excess water from the body

24 Which row shows the function of rod cells?

	have greater sensitivity to light	give colour vision
A	✓	✓
B	✓	x
C	x	✓
D	x	x

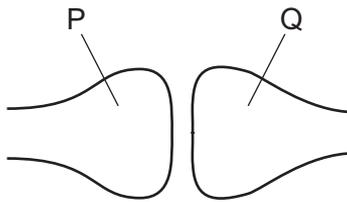
25 The diagram shows a person sweating in hot weather.



What part is played by sweat glands during the process of sweating?

- A effector
- B receptor
- C sense organ
- D stimulus

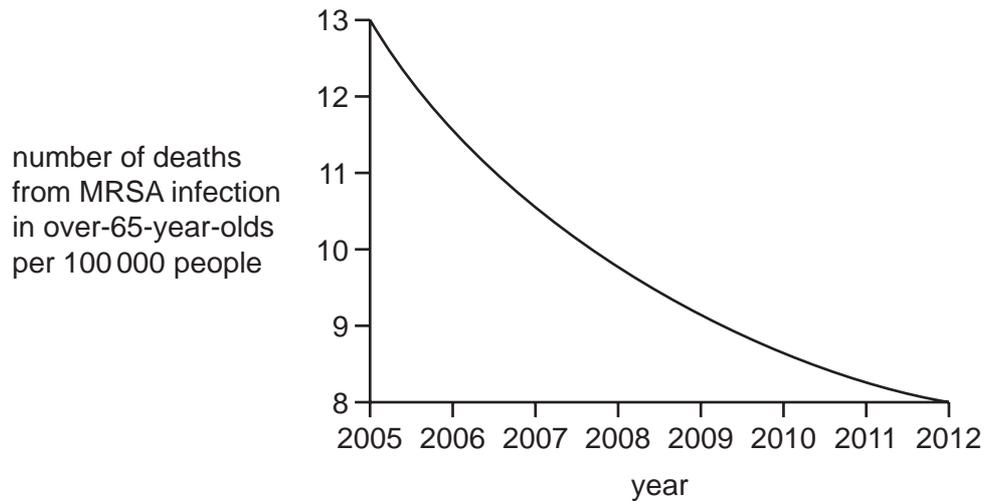
26 The diagram shows a synapse in a reflex arc.



What are the identities of the two neurones and in which direction does the neurotransmitter pass?

	neurone P	neurone Q	direction of passage of neurotransmitter
A	motor	relay	P → Q
B	motor	sensory	P → Q
C	relay	motor	Q → P
D	relay	sensory	Q → P

- 27 The graph shows the number of deaths from MRSA infection per 100 000 people in a population of over-65-year-olds from 2005 to 2012.



What is a possible explanation for the changes shown in the graph?

- A a decrease in the size of the population of over-65-year-olds
 - B antibiotics do not affect viruses
 - C more effective antibiotics are being used to treat infected people
 - D over-65-year-olds are immune to MRSA infection
- 28 After fertilisation, how many chromosomes are in the zygote?
- A half as many as in an ovum
 - B the same as in an ovum
 - C the same as in a sperm
 - D twice as many as in a sperm
- 29 Which environmental factor is **not** always a requirement for seed germination?
- A light
 - B oxygen
 - C suitable temperature
 - D water

- 30 In some plants, H is the dominant allele for hairy stems and h is the recessive allele for smooth stems.

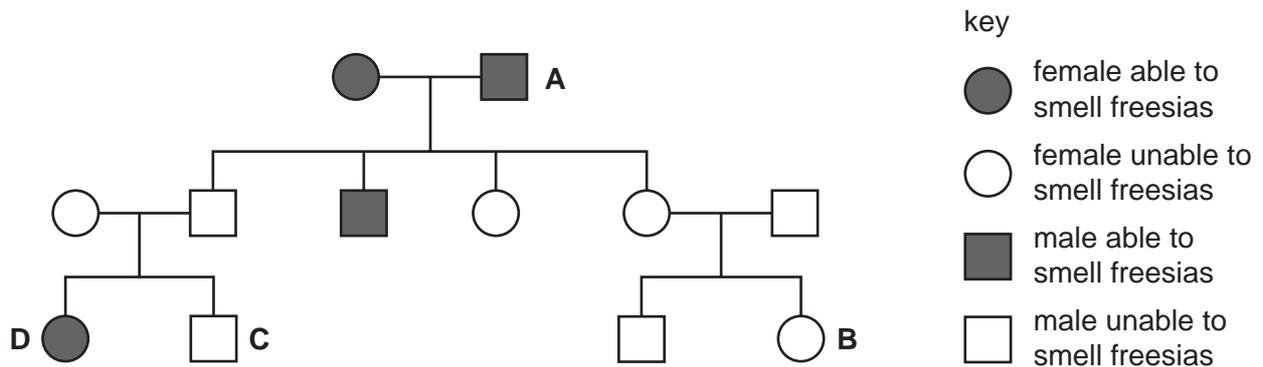
A pair of these plants produce 37 offspring, 18 with hairy stems and 19 with smooth stems.

What are the most likely genotypes of the parents?

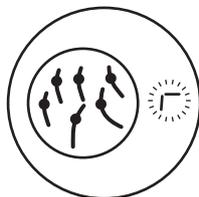
- A $HH \times HH$ B $Hh \times Hh$ C $Hh \times hh$ D $hh \times hh$

- 31 The family tree shows the inheritance of the ability to smell flowers called freesias. The allele for the ability to smell freesias is dominant.

Which individual's symbol is **not** correct?



- 32 The diagram shows a cell from an organism at the end of meiosis.



What is the diploid number for cells from this organism?

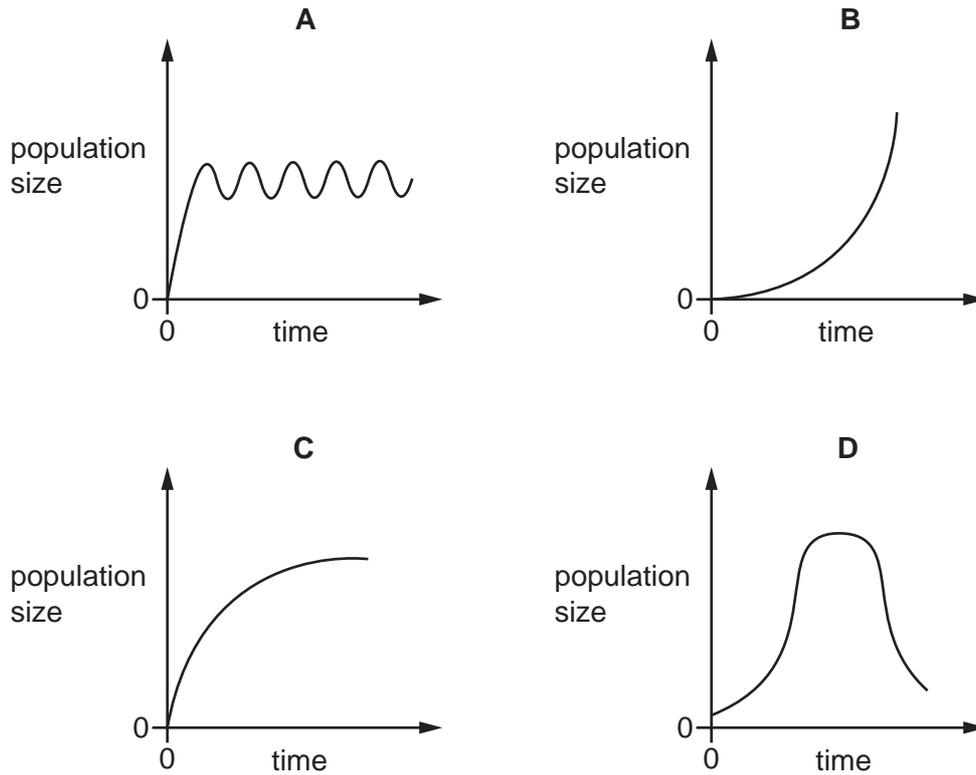
- A 3 B 6 C 12 D 24

- 33 When growing millet, farmers choose seeds from high-yielding plants.

Which biological practice is this an example of?

- A adaptation
 B artificial selection
 C evolution
 D natural selection

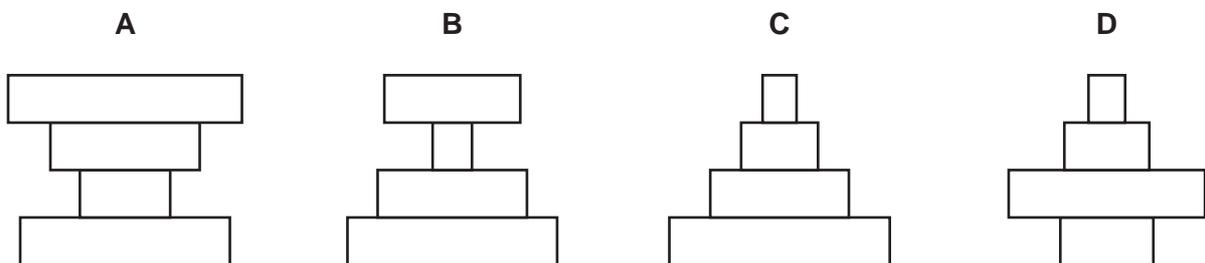
34 Which graph shows the growth of a population where there are no limiting factors?



35 What is defined as 'all of the populations of different species in an ecosystem'?

- A community
- B environment
- C habitat
- D trophic level

36 Which pyramid of numbers has more herbivores than producers?



- 37** Why are bacteria useful in biotechnology and genetic engineering?
- A** Bacteria do not have cell vacuoles.
 - B** Bacteria do not have mitochondria.
 - C** Bacteria have cell walls.
 - D** Bacteria share their genetic code with all other organisms.
- 38** Ligase enzymes are used in genetic engineering to
- A** cut open plasmid DNA.
 - B** insert plasmids into bacteria.
 - C** isolate the DNA making up a human gene.
 - D** join human DNA to plasmid DNA.
- 39** The action of which type of bacteria would cause soil to be lacking in nitrates?
- A** aerobic
 - B** denitrifying
 - C** nitrifying
 - D** nitrogen fixing
- 40** What is used to help sustain fish stocks?

	education	legal quotas	eating more fish	restocking
A	✓	✓	✓	✗
B	✓	✓	✗	✓
C	✓	✗	✓	✓
D	✗	✓	✓	✓

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BIOLOGY

0610/23

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 is recommended)



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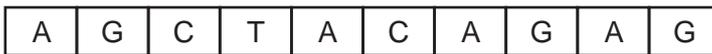
This document consists of **17** printed pages and **3** blank pages.

- 1 The plant *Mimosa pudica* has leaves that fold in when touched.

This demonstrates movement and which other characteristic?

- A excretion
- B growth
- C nutrition
- D sensitivity

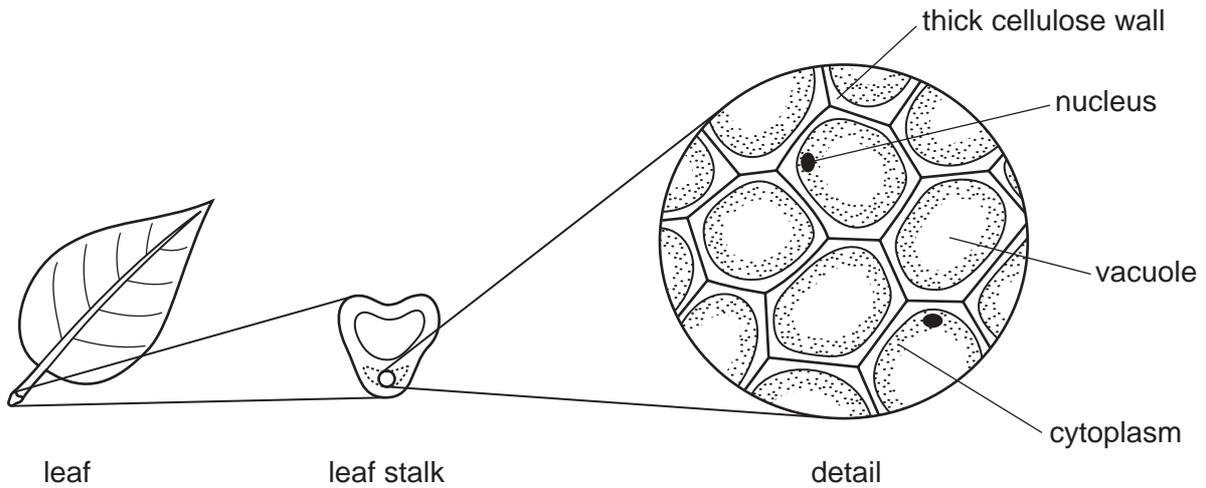
- 2 The diagram shows a section of DNA from a chimpanzee.



Which diagram shows a section of DNA from the organism that is most closely related to the chimpanzee?



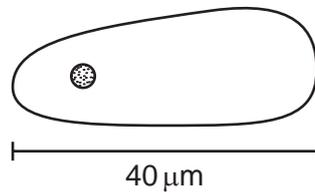
3 The diagrams show structures associated with a leaf.



What is the level of organisation of the part shown in detail?

- A cell
- B organ
- C organ system
- D tissue

4 The diagram shows a pollen grain of a rice plant. The size of the image is 40 mm



The actual length of the pollen grain is 40 μm.

By how many times has the diagram been magnified?

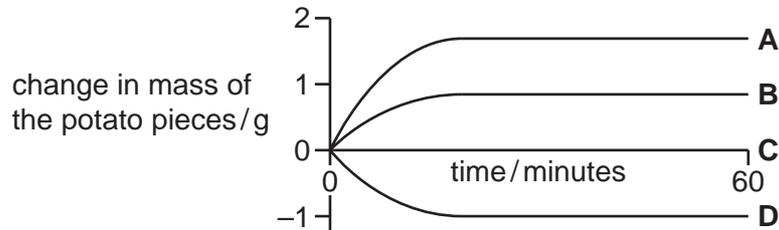
- A ×1
- B ×10
- C ×100
- D ×1000

- 5 Three equally sized pieces of potato were put into different concentrations of sucrose solution. One piece of potato was put into distilled water.

The concentrations of sucrose solution were 0.2 g dm^{-3} , 0.4 g dm^{-3} and 0.6 g dm^{-3} .

The graph shows the change in mass of the potato pieces over a period of 60 minutes.

Which piece of potato was put into distilled water?

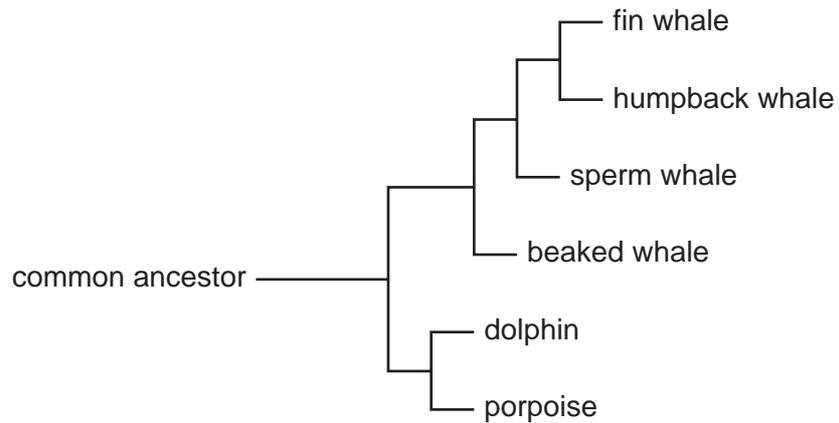


- 6 A red blood cell and a palisade mesophyll cell are placed in a solution which has a higher water potential than the cells.

What will happen to each cell?

	red blood cell	palisade mesophyll cell
A	bursts	bursts
B	bursts	gains mass
C	loses mass	gains mass
D	loses mass	loses mass

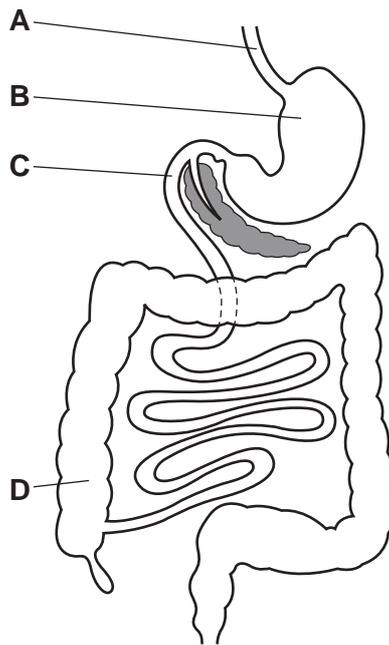
- 7 The diagram shows an evolutionary tree based on a computer-generated study of different sea mammals.



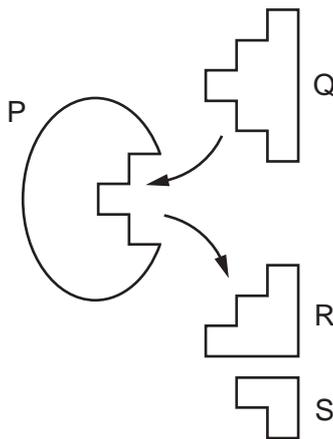
According to this evolutionary tree, which whale has DNA base sequences that are **least** shared with the other whales?

- A beaked whale
 - B fin whale
 - C humpback whale
 - D sperm whale
- 8 What is the colour change shown by Benedict's solution when heated with a reducing sugar?
- A blue to purple
 - B blue to red
 - C brown to blue-black
 - D red to yellow

9 Into which part of the alimentary canal is the enzyme that digests starch secreted?



10 The diagram shows an enzyme with its substrate and product molecules.

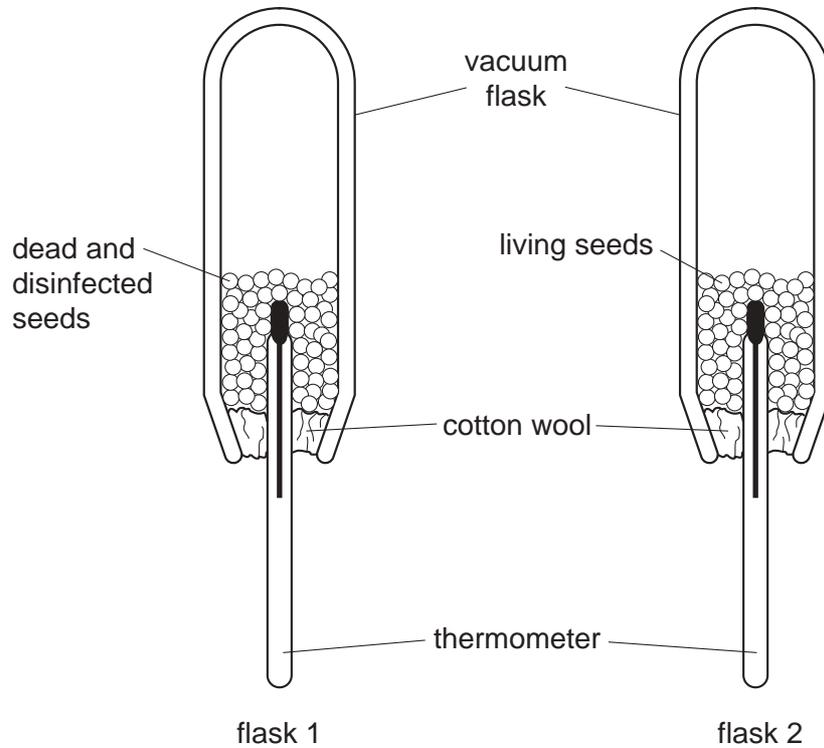


Which form an enzyme-substrate complex?

- A** P and Q **B** Q and R **C** R and S **D** S and P

- 11 The diagram shows the apparatus at the beginning of an investigation into temperature change during the germination of seeds. The temperature at the start of the investigation was 25 °C in both flasks.

After two days the temperature in flask 1 is 25 °C. The temperature in flask 2 is 28 °C.



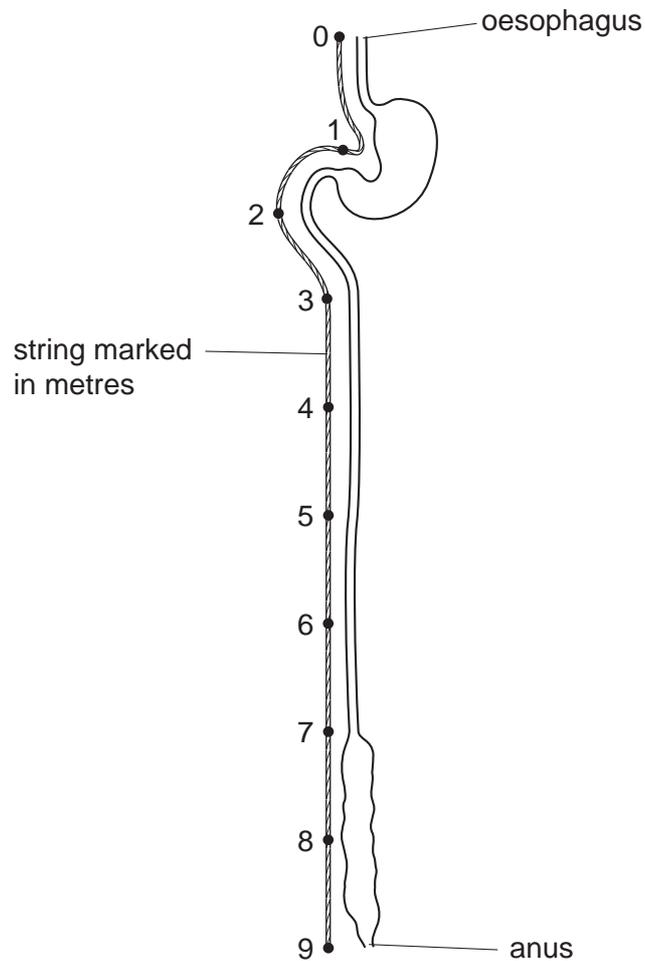
Which characteristic of living organisms is shown in this experiment?

- A excretion
 - B growth
 - C reproduction
 - D respiration
- 12 What must be increased in the diet of a person suffering from constipation?
- A fats
 - B fibre
 - C iron
 - D protein

13 Which substrate, enzyme and product are correctly named?

	substrate	enzyme	product
A	amino acids	trypsin	protein
B	amylase	maltose	glucose
C	lipase	lipid	fatty acids and glycerol
D	maltose	maltase	glucose

14 The diagram shows the human alimentary canal, with a string marked in metres beside it.



How long is the small intestine?

- A** 2m **B** 6m **C** 8m **D** 9m

15 What is **not** a use of water by plants?

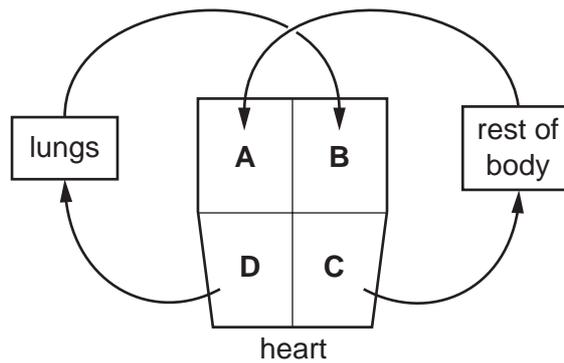
- A acting as a solvent
- B cooling the plant
- C dissolving cellulose cell walls
- D raw material in photosynthesis

16 What is a description of transpiration?

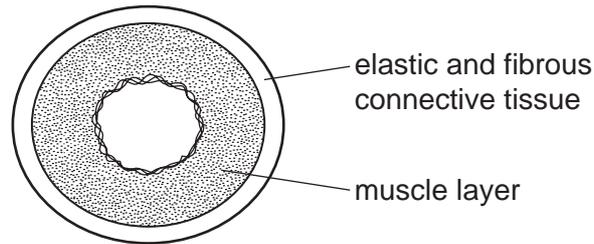
- A exchange of gases between the leaf and the atmosphere
- B loss of water vapour from the leaves and stems of a plant
- C movement of water from the roots to the leaves
- D movement of water through the cells of the leaf

17 The diagram represents the circulatory system of a mammal.

In which chamber of the heart are the muscle walls thickest?



18 The diagram shows a cross-section through a human blood vessel.



Which type of blood vessel does the diagram show?

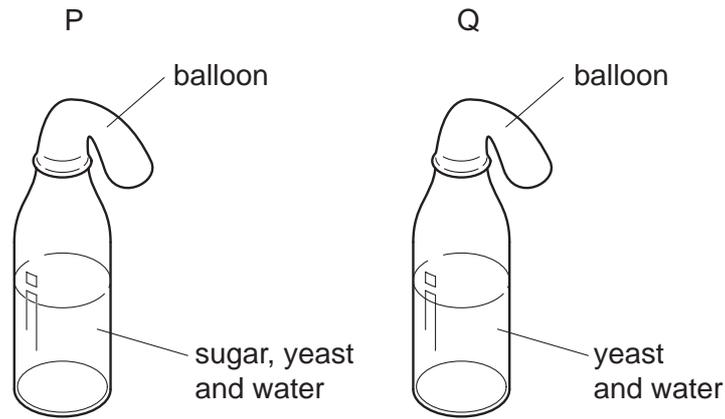
- A an artery
 - B a capillary
 - C a vein
 - D a ventricle
- 19 What can be passed from one person to another during blood transfusion?
- A cholera
 - B chronic obstructive pulmonary disease (COPD)
 - C HIV
 - D scurvy
- 20 The table shows some of the changes that occur during breathing.

	from contracted to relaxed	from relaxed to contracted
diaphragm	P	X
external intercostals	Q	Y
internal intercostals	R	Z

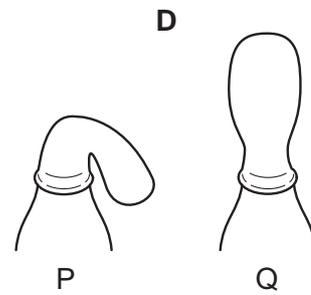
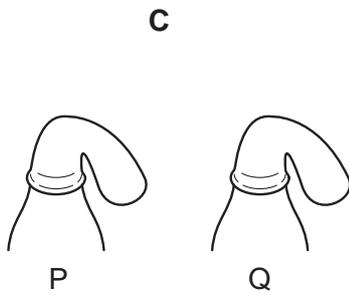
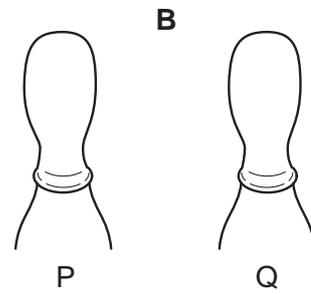
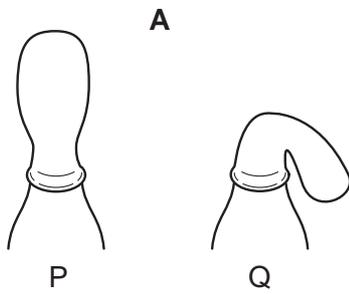
Which changes occur to cause inspiration?

- A P, Q and Z
- B X, Q and R
- C X, Y and R
- D X, Y and Z

21 In an experiment to investigate anaerobic respiration, two bottles are set up in a warm room, as shown.



What would happen to each balloon after one day?



22 Two pieces of an aquatic plant were placed into two different test-tubes, P and Q.

Each test-tube contained hydrogencarbonate indicator and was sealed and kept at 20°C.

Test-tube P was kept in the light and test-tube Q was kept in the dark.

The table shows the effect of carbon dioxide on the colour of the hydrogencarbonate indicator.

less carbon dioxide	more carbon dioxide
dark red	orange

What would the colour of the indicator be after 12 hours?

	P	Q
A	dark red	orange
B	dark red	dark red
C	orange	dark red
D	orange	orange

23 What is the most important function of sweating?

- A** to remove excess heat from the body
- B** to remove excess salts from the body
- C** to remove excess urea from the body
- D** to remove excess water from the body

24 A student begins to lose control of her bicycle while travelling down a hill at speed.

The concentration of which substance will begin to increase rapidly in her blood?

- A** adrenaline
- B** insulin
- C** oestrogen
- D** testosterone

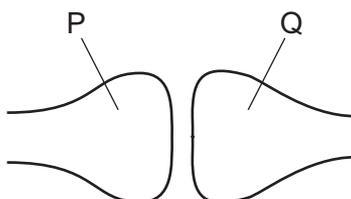
25 The diagram shows a person sweating in hot weather.



What part is played by sweat glands during the process of sweating?

- A effector
- B receptor
- C sense organ
- D stimulus

26 The diagram shows a synapse in a reflex arc.



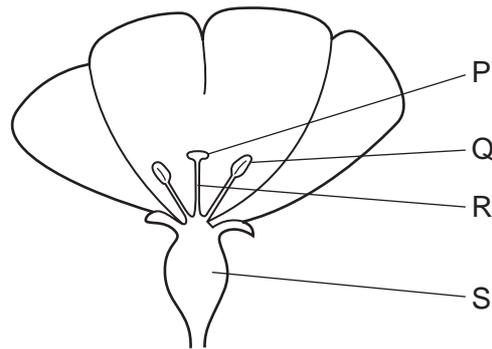
What are the identities of the two neurones and in which direction does the neurotransmitter pass?

	neurone P	neurone Q	direction of passage of neurotransmitter
A	motor	relay	P → Q
B	motor	sensory	P → Q
C	relay	motor	Q → P
D	relay	sensory	Q → P

27 Which process occurring at a synapse is prevented by the presence of heroin?

- A the binding of a neurotransmitter with receptors
- B the diffusion of a neurotransmitter across the gap
- C the formation of a neurotransmitter
- D the stimulation of vesicles by an impulse

28 The diagram shows half a flower.



After pollination, where would pollen grains be found?

- A** P and Q **B** Q and R **C** R and S **D** S and P

29 Which environmental factor is **not** always a requirement for seed germination?

- A** light
B oxygen
C suitable temperature
D water

30 A pure-breeding white rat was crossed with a pure-breeding black rat. All their offspring were black.

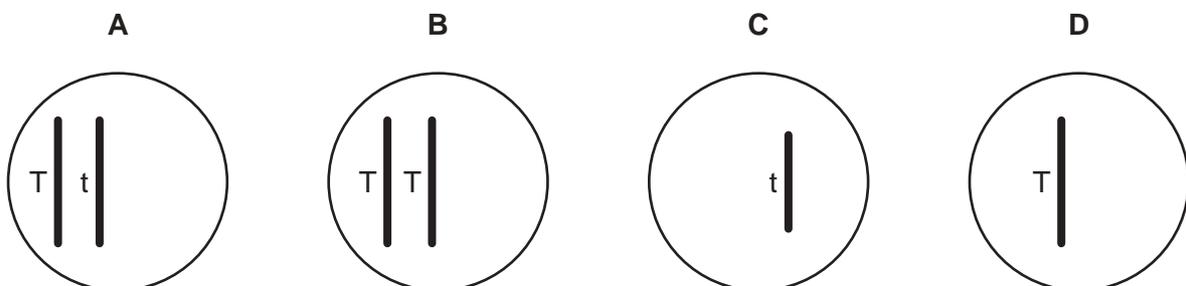
One of the offspring was bred with a pure-breeding white rat.

What is the most likely percentage of black rats in the offspring?

- A** 25 **B** 50 **C** 75 **D** 100

31 An organism is heterozygous for a gene with the alleles T and t.

Which diagram represents a diploid cell from this organism?

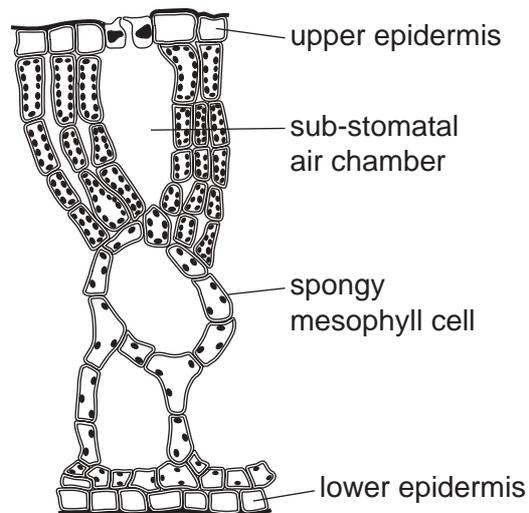


32 Red-green colour blindness is a sex-linked characteristic caused by a recessive allele.

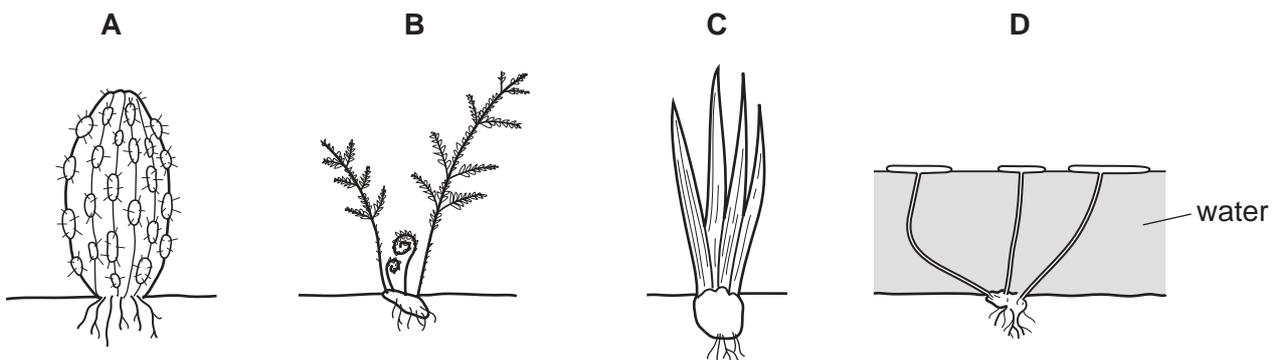
Which prediction can be made about the children of a woman who is colour-blind and a man with normal vision?

- A Boys will be colour-blind, girls will have a 50% chance of being colour-blind.
- B Boys will be colour-blind, girls will have normal vision.
- C Girls will be colour-blind, boys will have a 50% chance of being colour-blind.
- D Girls will be colour-blind, boys will have normal vision.

33 The diagram shows a vertical section through a leaf.



Which diagram shows the plant that the leaf was taken from?



34 What is a mutation?

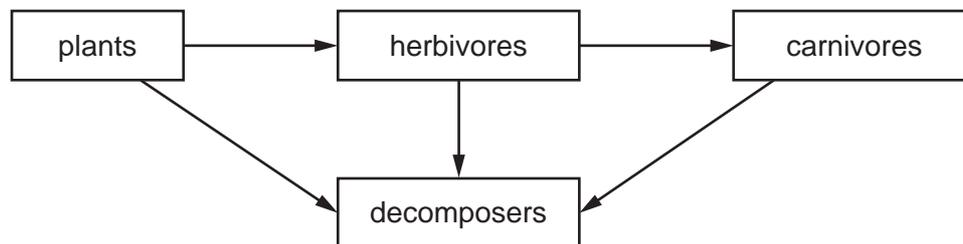
- A a change in appearance
- B a change in a gene
- C a change in behaviour
- D a change in the environment

- 35 The biomass at each trophic level in an ecosystem is measured. The results are shown in the table.

Which trophic level contains herbivores?

trophic level	mass/gm ⁻³
A	0.1
B	0.6
C	1.2
D	17.9

- 36 The diagram shows a food web.



What do the arrows represent?

- A the absorption of oxygen
 - B the absorption of water
 - C the flow of energy
 - D the release of carbon dioxide
- 37 Ligase enzymes are used in genetic engineering to
- A cut open plasmid DNA.
 - B insert plasmids into bacteria.
 - C isolate the DNA making up a human gene.
 - D join human DNA to plasmid DNA.
- 38 With which kingdoms do bacteria share the same genetic code?
- A animal, plant, fungus and protist
 - B animal, plant and fungus only
 - C animal and plant only
 - D animal only

39 What is a direct result of deforestation?

- A decreased leaching of mineral salts
- B increased loss of soil
- C increased production of methane
- D increased recycling of important minerals

40 The table shows the ability of three species of fish and their eggs to survive in water at different pH levels.

If the eggs do not survive offspring cannot be produced.

	pH						key
	6.5	6.0	5.5	5.0	4.5	4.0	
trout	✓	✓	✓	✓	✓	✗	✓ = survive ✗ = do not survive
sea bass	✓	✓	✓	✗	✗	✗	
perch	✓	✓	✓	✓	✗	✗	
fish eggs	✓	✓	✓	✗	✗	✗	

A lake at pH 6.0 contains breeding populations of all three fish.

If acid rain causes the pH to fall to 5.0, which outcome would be likely to occur?

- A Trout and perch will survive and produce offspring.
- B Trout and perch will survive but only perch will produce offspring.
- C Trout and perch will survive but produce no offspring.
- D Trout, sea bass and perch will survive but produce no offspring.

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BIOLOGY

0610/31

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.

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 **19** printed pages and **1** blank page.

1 Fig. 1.1 shows five different insects.

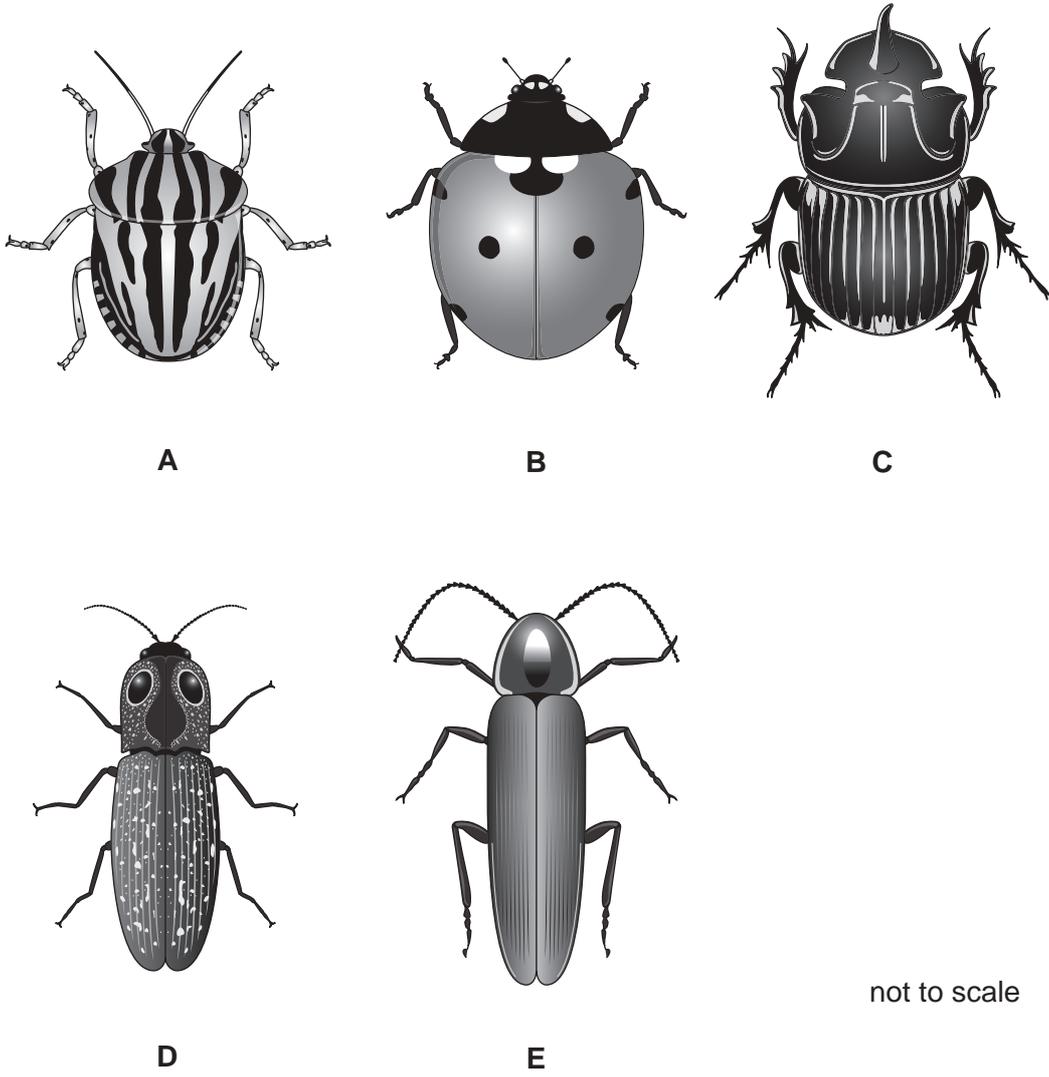


Fig. 1.1

Use the key to identify the insects in Fig. 1.1.

Write the letter for each insect in Table 1.1.

Table 1.1

	key	name of insect	letter
1	(a) body is long and thin	go to 2	
	(b) body is short and rounded	go to 3	
2	(a) body has a spotted pattern	<i>Alaus oculatus</i>	
	(b) body has a plain pattern	<i>Photinus pyralis</i>	
3	(a) no visible antennae	<i>Copris lunaris</i>	
	(b) visible antennae	go to 4	
4	(a) body has a striped pattern	<i>Graphosoma lineatum</i>	
	(b) body has a dotted pattern	<i>Coccinella septempunctata</i>	

[4]

[Total: 4]

2 (a) Define the term *population*.

.....

[2]

(b) Fig. 2.1 shows a marine food web.

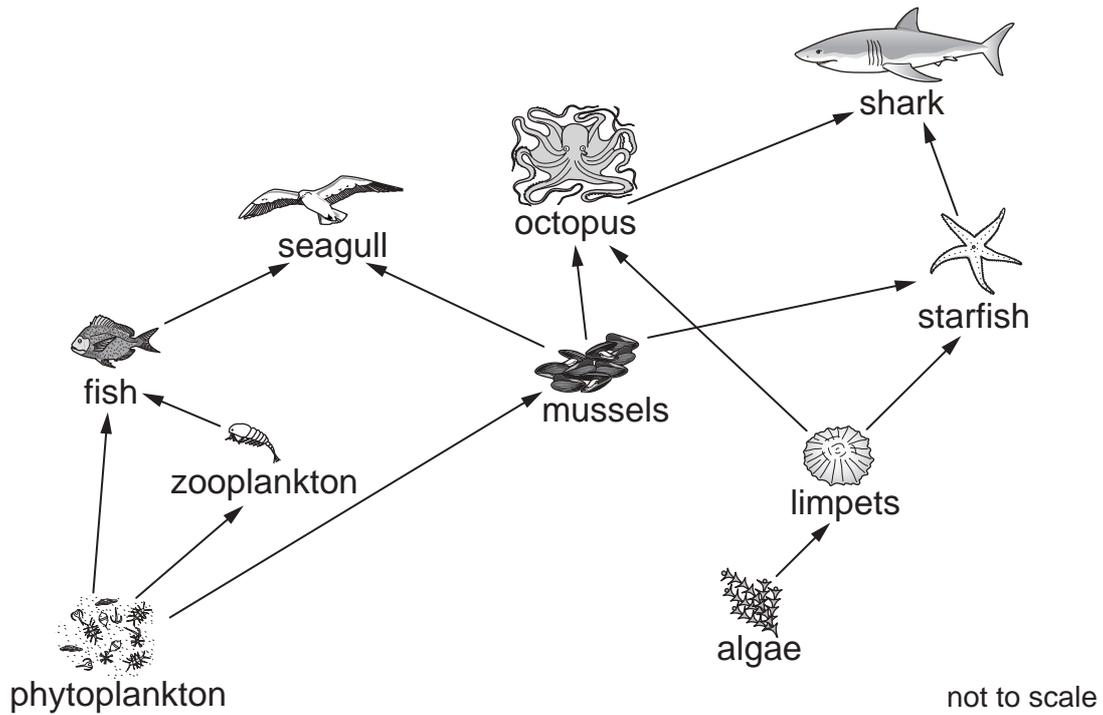


Fig. 2.1

Use Fig. 2.1 to answer these questions.

(i) State the name of **one** producer in this food web.

.....[1]

(ii) State the name of **one** herbivore in this food web.

.....[1]

(iii) Complete the food chain, containing four organisms, that ends with the seagull.

Write the names of the organisms in the boxes.



[1]

(iv) The shark population has decreased.

Explain what effect this might have on the populations of starfish and limpets.

starfish

.....

.....

limpets

.....

.....

[4]

(v) Suggest **two** factors that could decrease the shark population.

1

2

[2]

(c) State the principal source of energy for food webs.

.....[1]

(d) The sea forms an important part of the water cycle.

Fig. 2.2 shows the water cycle.

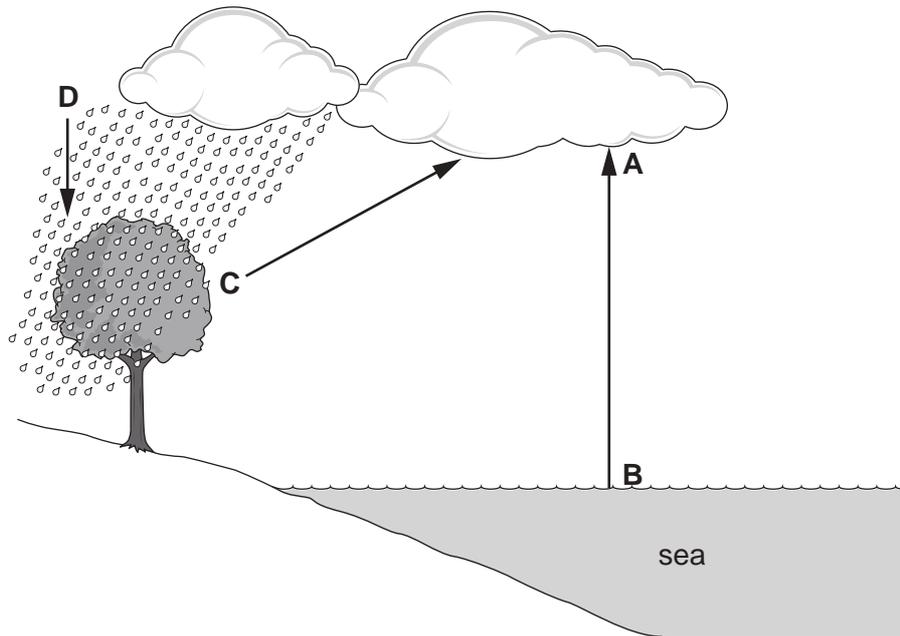


Fig. 2.2

State the names of the processes shown by the letters in Fig. 2.2.

A

B

C

D

[4]

[Total: 16]

- 3 (a) There are four different types of birth control method. These are shown in Table 3.1.

Complete Table 3.1 by writing each of the following examples of birth control in the correct column.

abstinence **condom** **contraceptive pill**
diaphragm **female sterilisation** **IUD**
monitoring body temperature **vasectomy**

Table 3.1

type of birth control method			
natural	chemical	barrier	surgical

[4]

- (b) Complete the sentences to state how the contraceptive pill works.

Choose your answers from the list.

Each of the words may be used once, more than once or not at all.

egg cells **enzymes** **hormones** **ovary**
ovules **sperm** **testes**

The contraceptive pill contains They work by preventing the
 releasing

[3]

(c) HIV is an example of a sexually transmitted infection.

(i) State what the letters HIV stand for.

.....[1]

(ii) Describe **two** ways that HIV can be transmitted.

1

2

[2]

(iii) Suggest **two** ways that the spread of HIV can be controlled.

1

.....

2

.....

[2]

[Total: 12]

4 Fig. 4.1 shows a lily flower.



Fig. 4.1

(a) State the letters that identify the parts of the flower in Fig. 4.1.

- anther
- filament
- petal
- stigma

[4]

(b) The lily flower is pollinated by insects.

State **two** ways that the pollen from the lily flower is different from the pollen of a wind-pollinated flower.

- 1
- 2

[2]

(c) Pollen contains the male gamete.

State the name of the process that produces gametes.

.....[1]

(d) The boxes on the left contain the names of parts of a flower.

The boxes on the right contain the functions of parts of a flower.

Draw one straight line to link each part of the flower with its function.

Draw **four** lines.

part of a flower

ovary

petal

sepal

stigma

function

where ovules are produced

where pollen is produced

protects the flower when in bud

often coloured to attract insects

where pollen is deposited

[4]

[Total: 11]

5 Fig. 5.1 shows a diagram of a cross-section of a leaf.

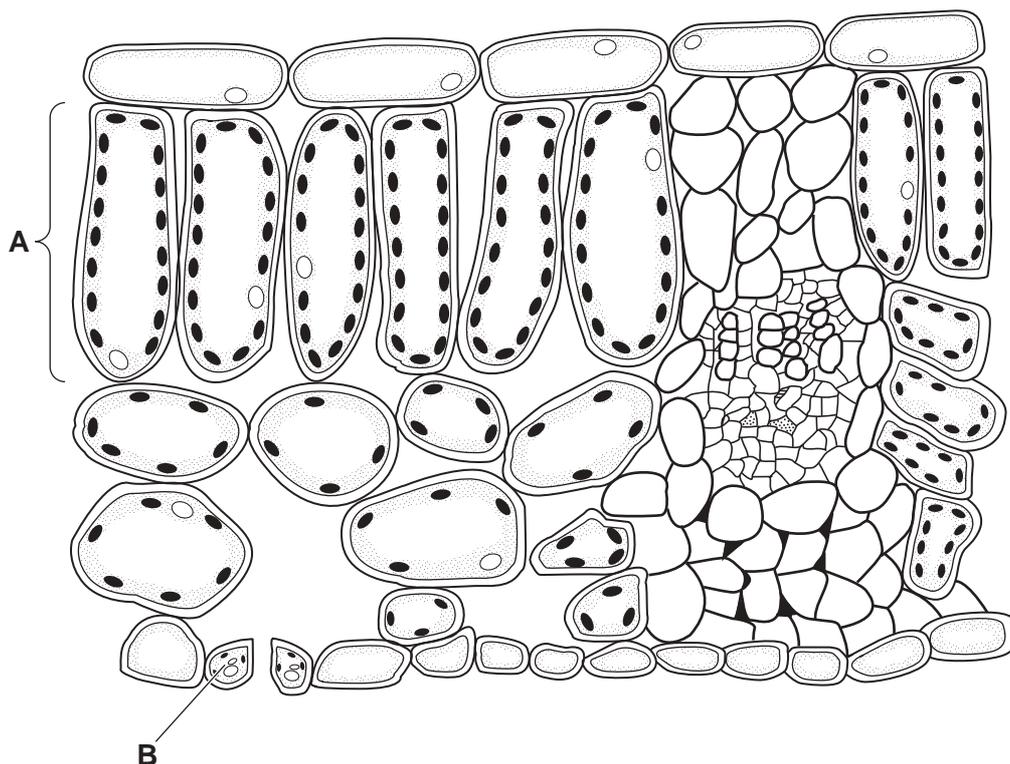


Fig. 5.1

(a) (i) Identify the parts labelled on Fig. 5.1 and state the names of
 tissue A
 cell B [2]

(ii) The cells in tissue A are adapted for photosynthesis.
 State where photosynthesis occurs in the cell.
 [1]

(b) Draw circles around the structures that are found in both plant **and** animal cells.

- | | | |
|---------------|-----------|-------------------|
| cell membrane | cell wall | cytoplasm |
| starch grains | nucleus | permanent vacuole |

[3]

(c) State the raw materials needed for photosynthesis.

.....[1]

(d) Fig. 5.2 shows two leaves from the same plant.

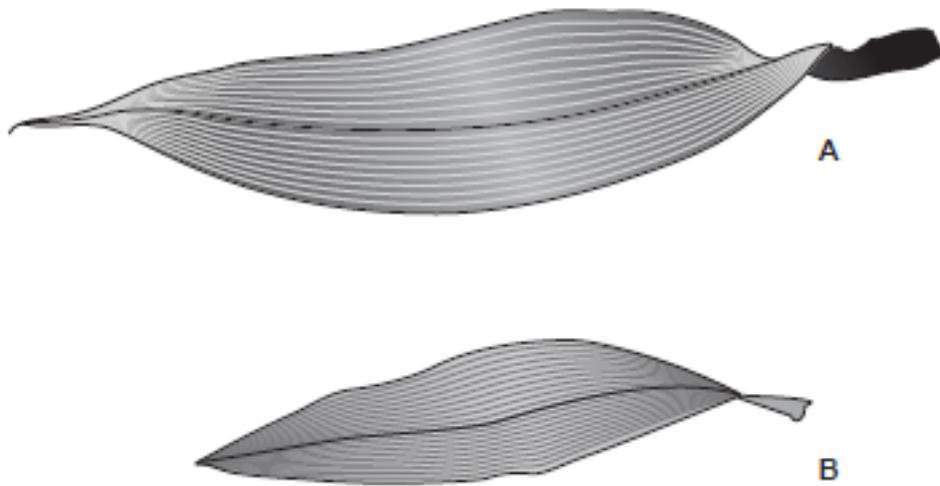


Fig. 5.2

Suggest which leaf carries out more photosynthesis and explain why.

.....

[2]

[Total: 9]

6 Drugs are substances that alter chemical reactions in the body.

(a) The boxes in the middle show the name of the drug.

The boxes on the left show the long-term risk of using the drug.

The boxes on the right show the short-term effect of using the drug.

Draw one straight line from the name of the drug to its long-term risk.

Draw another line from the name of the drug to its short-term effect.

Draw three lines on each side.

long-term risk	drug	short-term effect
lung cancer	alcohol	depressant
infections such as HIV	tobacco	reduces oxygen capacity of the blood
liver damage	heroin	

[3]

(b) Fig. 6.1 shows the percentage of people who misused drugs in a one-month period.

These data were taken from a survey of people of different ages.

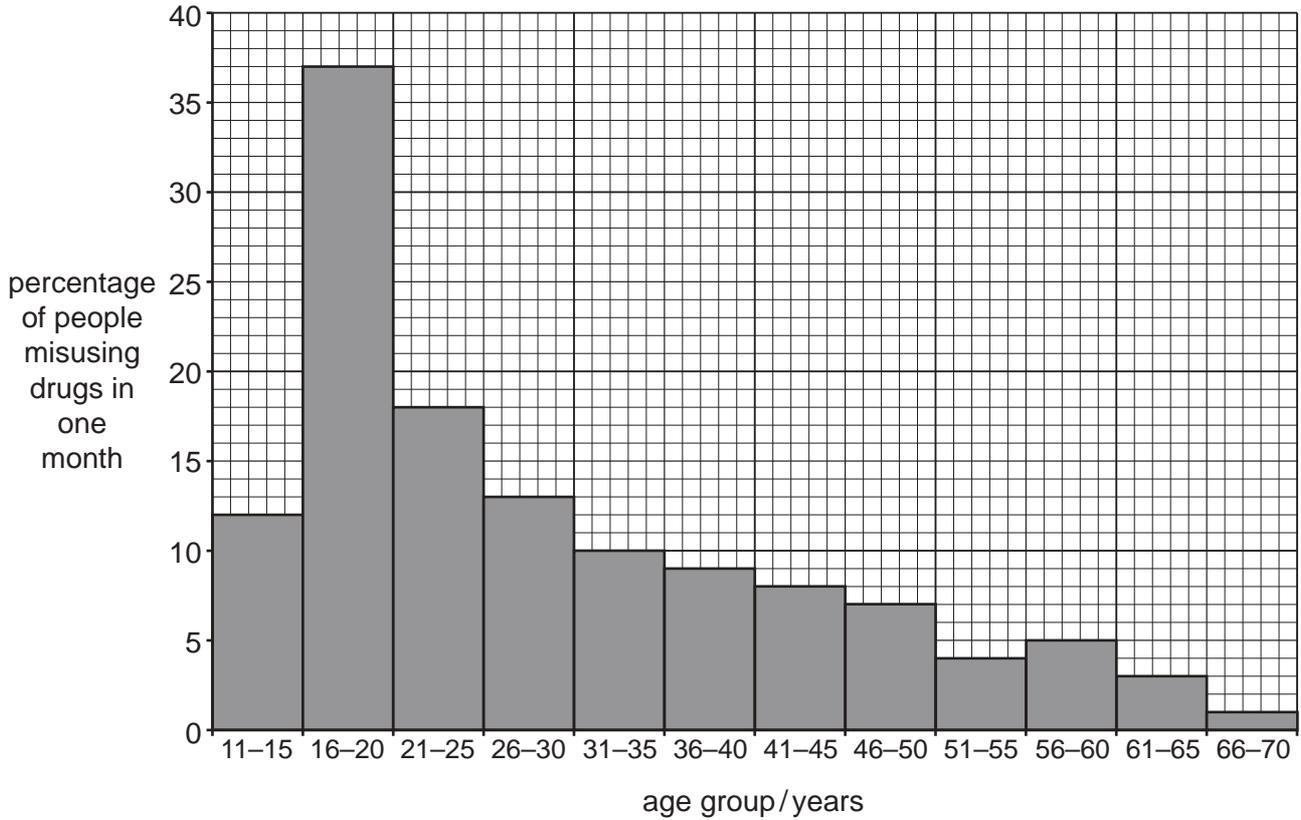


Fig. 6.1

Use the information in Fig. 6.1 to answer these questions.

- (i) State the age group that had the lowest percentage of people misusing drugs.
 years [1]
- (ii) State the percentage of 31–35 year-olds that misused drugs in one month.
% [1]
- (iii) Describe the results shown in Fig. 6.1.

 [3]

(c) Drugs can also be used for medicinal reasons. Antibiotics are an example of a medicinal drug.

State what type of infection a doctor might prescribe antibiotics for.

.....
.....[1]

[Total: 9]

7 Fig. 7.1 shows a potometer.

This equipment is used to measure the rate of water uptake in a leafy shoot.

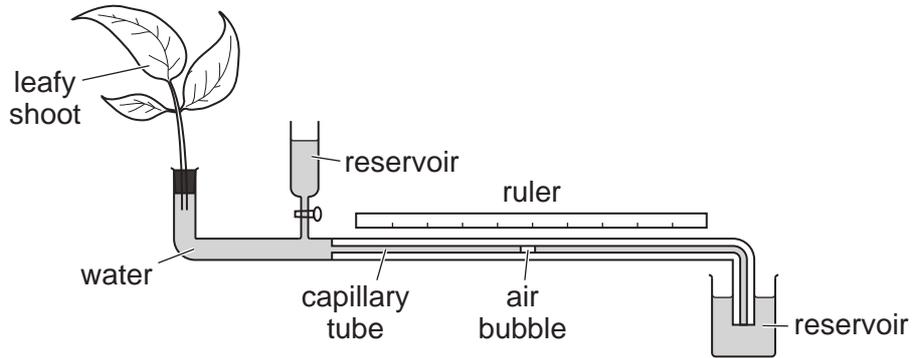


Fig. 7.1

(a) A leafy shoot in a potometer was exposed to different conditions.

The distance moved by the air bubble in 10 minutes was recorded.

Table 7.1 shows the results.

Table 7.1

conditions	distance moved in 10 minutes/mm
cool, damp air	4
cool, dry air	6
warm, damp air	10
warm, dry air	50

(i) State which conditions result in the greatest rate of water uptake in the shoot.

.....[1]

(ii) Calculate the rate of water uptake in millimetres per minute for the shoot in **cool, damp air**.

Show your working.

..... mm per min
[2]

(iii) The rate of water uptake is approximately equal to the rate of transpiration.

An increase in wind speed increases the rate of transpiration.

Suggest the effect that increasing wind speed would have on the movement of the air bubble.

.....
.....[1]

(b) State where **and** how water normally enters a plant.

.....
.....
.....[2]

(c) Describe how water is lost from a plant by transpiration.

.....
.....
.....
.....
.....
.....
.....
.....
.....[3]

(d) State the name of the tissue that transports water to the leaves.

.....[1]

[Total: 10]

8 Water is an important part of a balanced diet.

(a) State **three** other components of a balanced diet.

- 1
 - 2
 - 3
- [3]

(b) State where **most** water is absorbed in the alimentary canal.

.....[1]

(c) Excess water is removed in the urine.

Fig. 8.1 shows the organ system that excretes excess water.

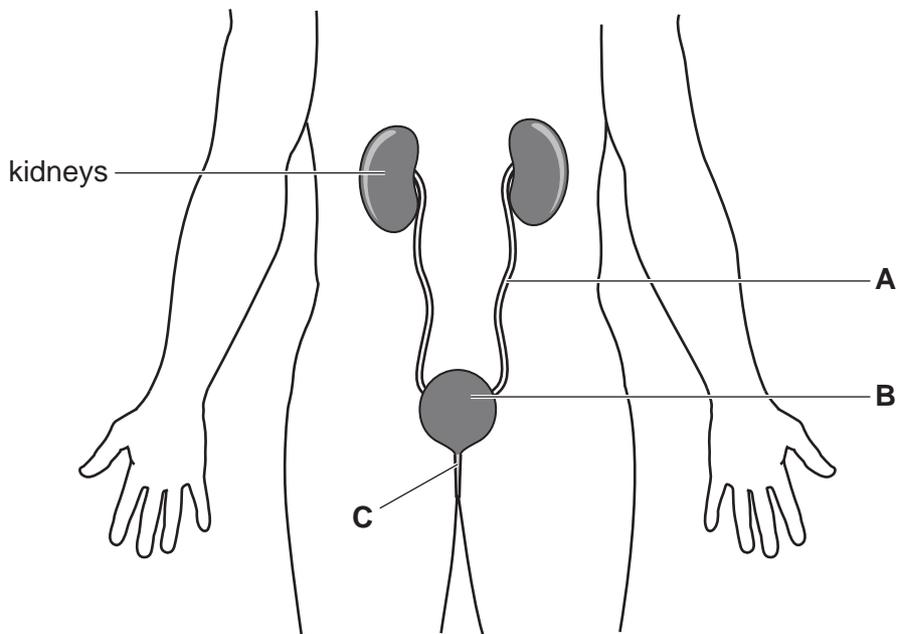


Fig. 8.1

State the names of the parts labelled **A**, **B** and **C**.

- A**
- B**
- C**

[3]

(d) The volume and the concentration of urine can vary.

Body temperature, exercise and water intake affect the volume and concentration of urine.

Table 8.1 shows three changes in the body.

Complete Table 8.1 by putting a tick in the boxes to show how each change affects the volume and concentration of the urine.

One example has been done for you.

Table 8.1

changes in the body	urine volume		urine concentration	
	increases	decreases	increases	decreases
increase in body temperature		✓	✓	
increase in exercise				
increase in water uptake				

[2]

[Total: 9]

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BIOLOGY

0610/32

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

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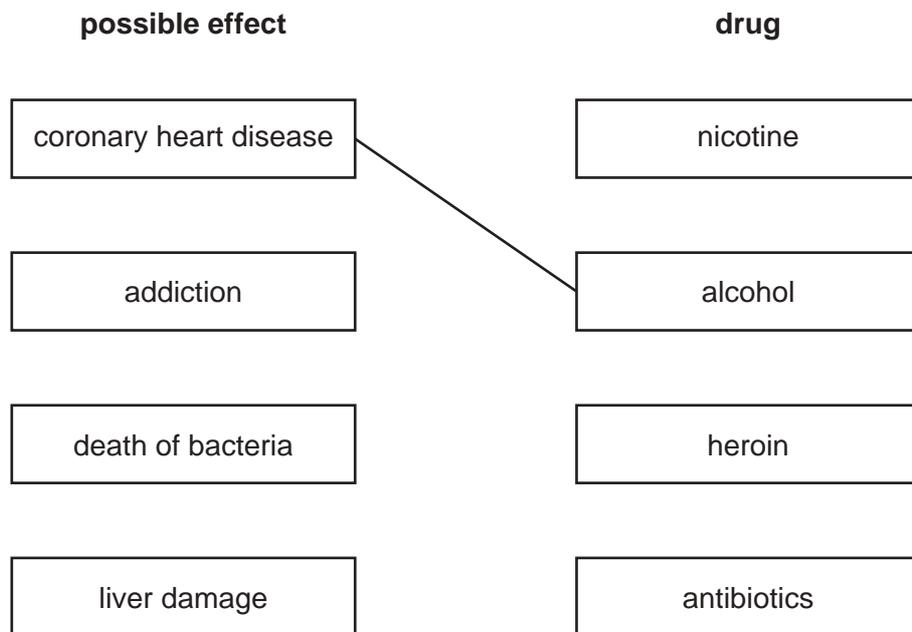
1 The boxes on the left contain possible effects of using some drugs.

The boxes on the right contain the names of some drugs.

Draw straight lines to link the effect with the drug **or** drugs responsible.

An example has been done for you.

Draw **five** lines.



[5]

[Total: 5]

2 Fig. 2.1 shows a section through a flower.

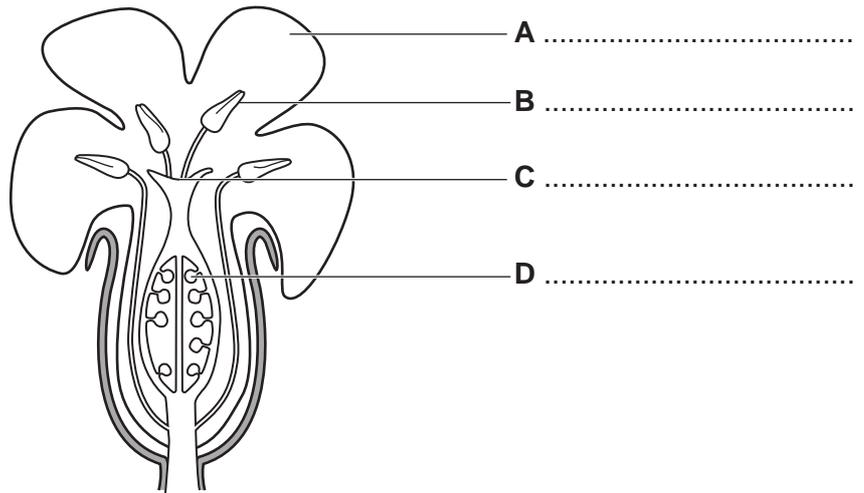


Fig. 2.1

(a) State the names of structures **A**, **B**, **C** and **D** on Fig. 2.1.

Write your answers on Fig. 2.1.

[4]

(b) The flower in Fig. 2.1 is pollinated by insects.

Complete Table 2.1 by describing **three** ways in which a wind-pollinated flower is different to the flower in Fig. 2.1.

Give a reason for each difference.

An example has been done for you.

Table 2.1

structure	how a wind-pollinated flower differs from the flower in Fig. 2.1	reason for difference
anther	loosely attached	easily shaken by wind to release pollen
petals		
stigma		
pollen		

[6]

3 Choose a word or a phrase from the list to complete the sentences about birth control.

Each word or phrase may be used once, more than once or not at all.

chemical	cervix	femidom	IUD
mechanical	mucus	sperm	sperm ducts
surgical	ureter	uterus	vagina

One barrier method of birth control uses a diaphragm.

Another barrier method uses a This is placed inside the

..... of the female to catch the

A vasectomy is a method of sterilising a man. It involves cutting

the

Taking a contraceptive pill is an example of a method of birth control.

[6]

[Total: 6]

4 (a) Students investigated the effect of “*Flower Food*” on cut flowers.

Ten flowers of the same species were placed into a container of water.

Ten flowers of the same species were placed into a container of water and *Flower Food*.

The students recorded the number of days until the first petal fell off each flower.

The results are shown in Fig. 4.1.

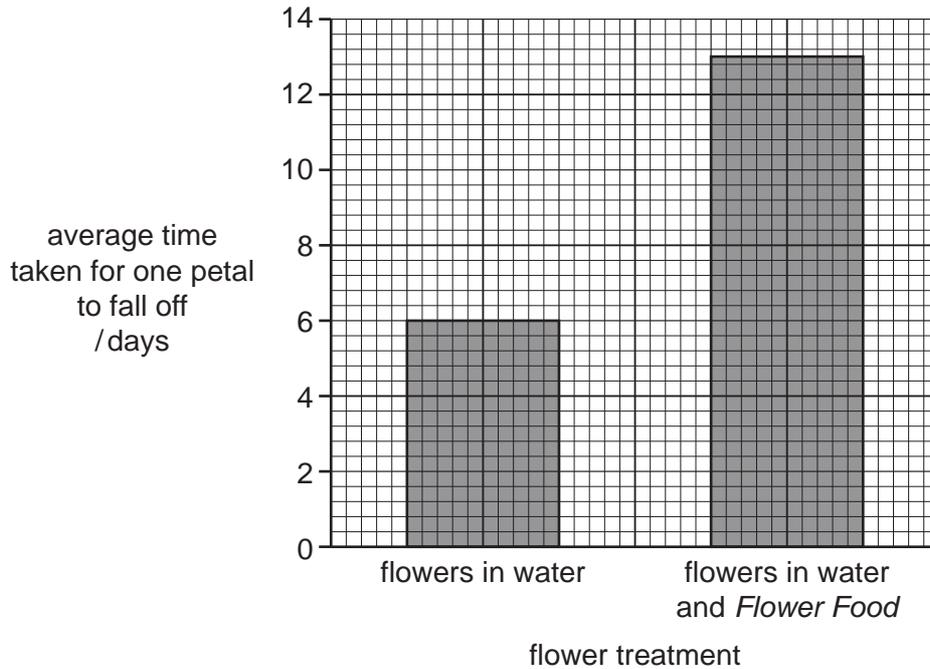


Fig. 4.1

(i) Use Fig. 4.1 to state the average time taken for one petal to fall off the flowers placed in water and *Flower Food*.

..... days [1]

(ii) State **one** conclusion for the results shown in Fig. 4.1.

.....
 [1]

(b) *Flower Food* contains the following chemicals:

- malic acid
- glucose
- fungicide
- bactericide

(i) Malic acid helps water to pass up the stem to the flower.

State the name of the tissue in the stem that transports water.

..... [1]

(ii) Explain how the glucose in the *Flower Food* is used by the flower.

.....
.....
.....
..... [2]

(iii) Bactericides and fungicides kill decomposers.

Define the term *decomposer*.

.....
.....
.....
..... [2]

[Total: 7]

5 Fig. 5.1 shows a section through a leaf.

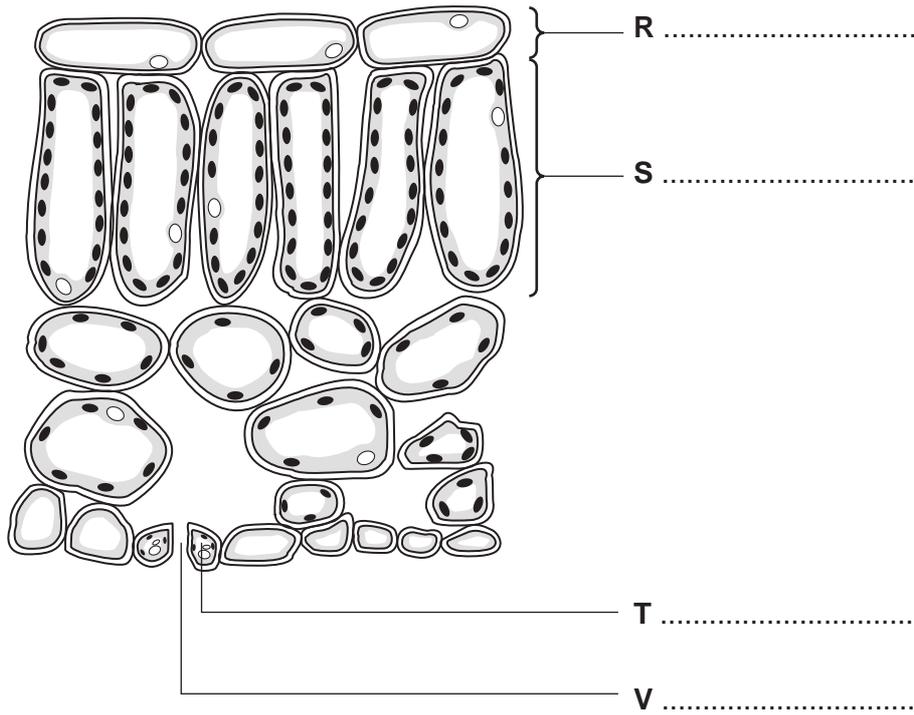


Fig. 5.1

(a) State the names of **R**, **S**, **T** and **V** on Fig. 5.1.

Write your answers on Fig. 5.1.

[4]

(b) The main function of leaves is to produce carbohydrates.

Describe how plants produce carbohydrates.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 8]

6 (a) Fig. 6.1 shows six insects.

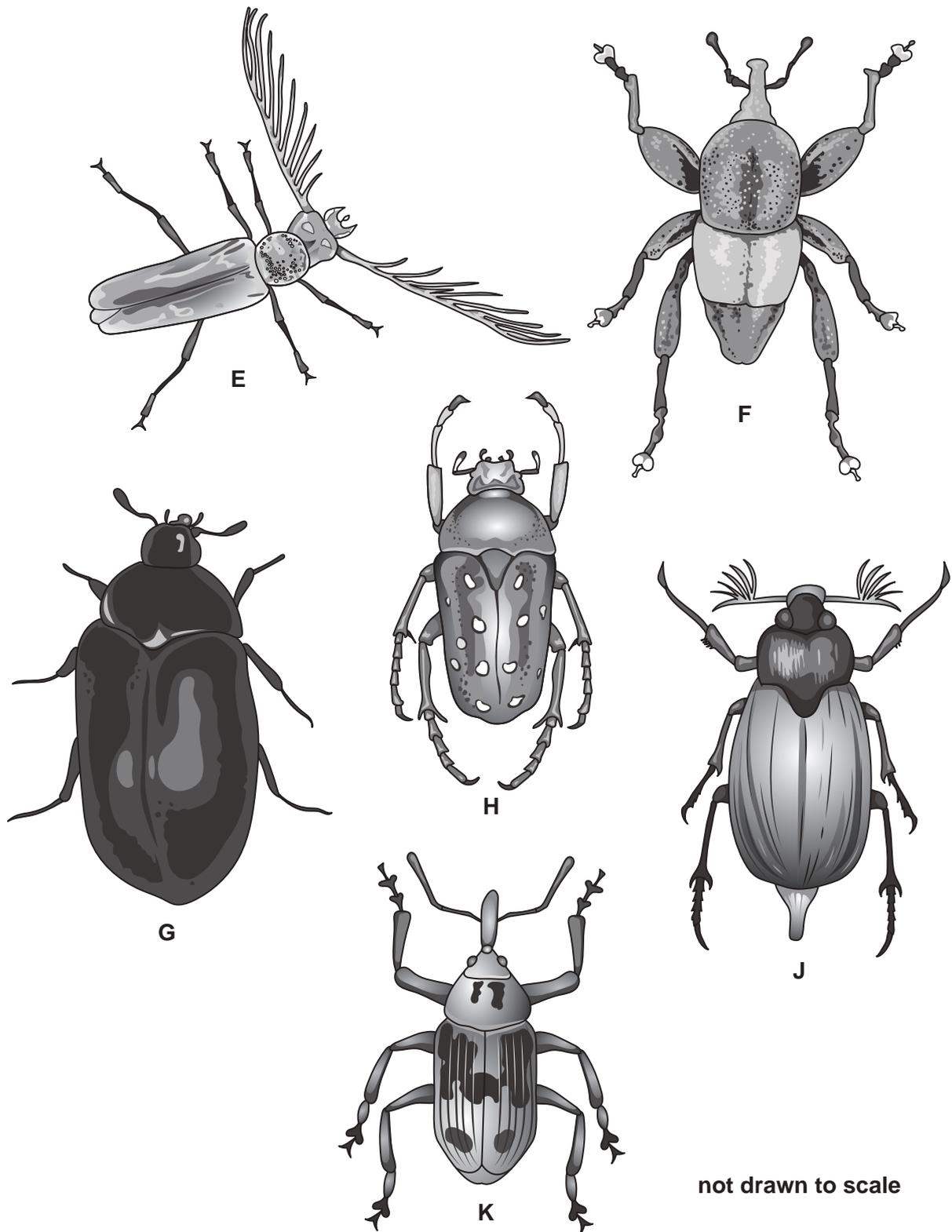


Fig. 6.1

Use the key to identify the insects in Fig. 6.1.

Write the letter for each insect in the key.

Key

description		name of insect	letter on Fig. 6.1
1	(a) has branched antenna	go to 2	
	(b) antenna not branched	go to 3	
2	(a) antenna branched at the end	<i>Melolontha</i>	
	(b) antenna branched all the way along	<i>Cyriopalus</i>	
3	(a) head has long thin projection	go to 4	
	(b) head does not have long thin projection	go to 5	
4	(a) abdomen has no spots	<i>Trigonopterus</i>	
	(b) abdomen with spots	<i>Ceutorhyncus</i>	
5	(a) front legs extend beyond the head	<i>Stephanorrhina</i>	
	(b) front legs do not extend beyond the head	<i>Attagenus</i>	

[5]

(b) Insects are arthropods.

(i) State **one** feature of **all** arthropods.

..... [1]

(ii) State the names of **two** other groups of arthropods.

1

2

[2]

[Total: 8]

7 Fig. 7.1 shows part of a food web in a river.

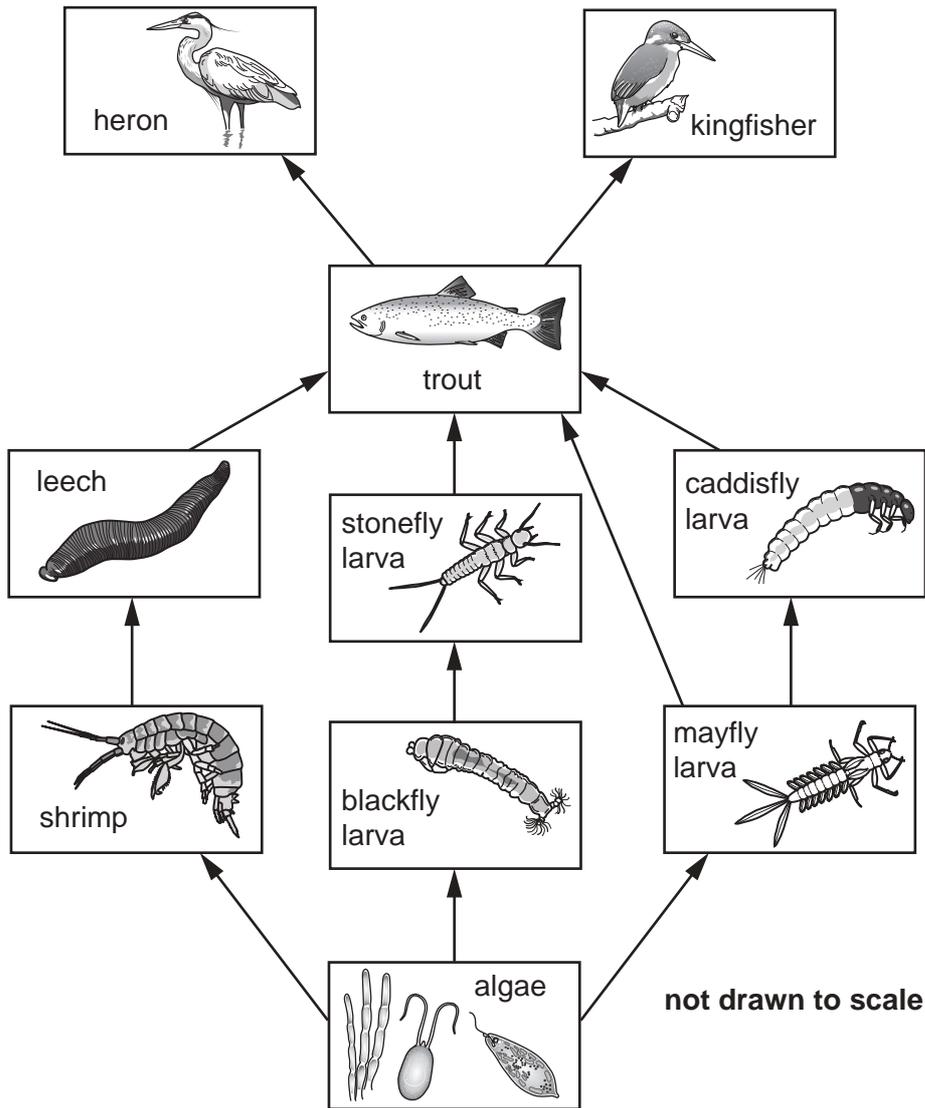


Fig. 7.1

(a) (i) Use the information from Fig. 7.1 to complete Table 7.1.

Table 7.1

role in the food web	name of the organism
a producer	
a primary consumer	
an organism that is both a secondary and a tertiary consumer	

[3]

(ii) State the number of carnivores present in Fig. 7.1.

..... [1]

(iii) State the name of the principal source of energy for the food web shown in Fig. 7.1.

..... [1]

(b) A disease killed all the trout.

Predict **and** explain how the death of the trout will affect the populations of kingfishers and shrimps.

kingfishers

.....

.....

.....

shrimps

.....

.....

.....

[4]

(c) Ducks eat aquatic plants and caddisfly larvae.

Add this information to Fig. 7.1 by drawing **two** new boxes and **two** arrows.

Do **not** draw the organisms.

[2]

[Total: 11]

8 (a) (i) State the name of the organ that produces urea.
 [1]

(ii) Urea is formed from an excess of one particular component of food.
 State the name of this component.
 [1]

(b) Fig. 8.1 shows the system that excretes urea.

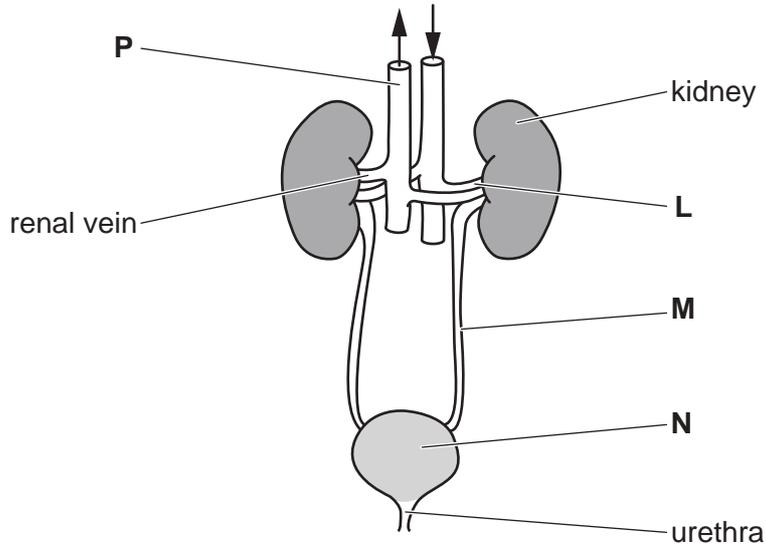


Fig. 8.1

Identify the structures **M**, **N** and **P** on Fig. 8.1.

State a function for each structure.

Write your answers in Table 8.1.

An example has been done for you.

Table 8.1

letter on Fig. 8.1	name of structure	function of structure
L	renal artery	transports blood to the kidney
M		
N		
P		

[6]

(c) Urea is a component of urine.

State the name of **two** other components of urine.

1

2

[2]

(d) Kidney cells produce carbon dioxide.

(i) State the name of the organ which excretes carbon dioxide.

..... [1]

(ii) State how carbon dioxide is transported around the body.

..... [1]

[Total: 12]

9 Alcohol is a drug.

(a) Excessive consumption of alcohol increases the risk of having an accident.

State **two** effects of alcohol on the body that increase the risk of having an accident.

1

.....

2

.....

[2]

Fig. 9.1 shows the number of alcohol-related deaths in a city between 1994 and 2012.

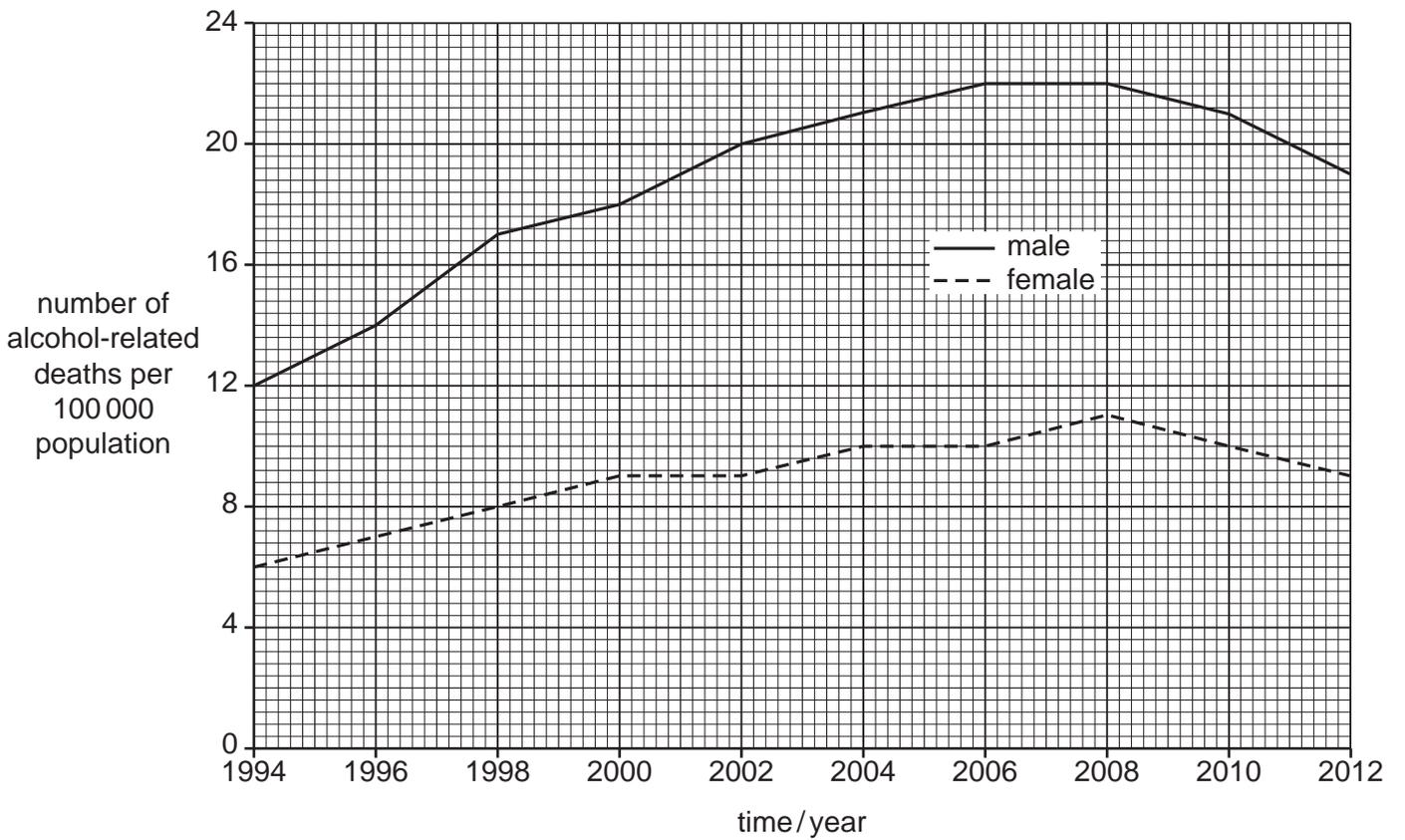


Fig. 9.1

(b) Describe **three** trends shown in Fig. 9.1.

.....
.....
.....
.....
.....
.....
.....
..... [3]

(c) (i) State the number of male alcohol-related deaths in 1998.

..... per 100 000 population [1]

(ii) The city has a population of 700 000.

There were 9 female per 100 000 population alcohol-related deaths in 2012.

Calculate the total number of female alcohol-related deaths in the city in 2012.

Show your working.

..... females [2]

(iii) Predict what may have happened to the number of alcohol-related deaths after 2012.

Give **two** reasons for your answer.

.....
.....
.....
.....
..... [2]

[Total: 10]

10 (a) (i) State the name of the hormone that is released into the blood stream in a frightening situation.

..... [1]

(ii) State **two** effects that this hormone will have on the body.

1

.....

2

.....

[2]

[Total: 3]

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BIOLOGY

0610/33

Paper 3 Theory (Core)

October/November 2017

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

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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 **20** printed pages.

1 Fig. 1.1 shows five species of birds that live near the water in habitats such as mudflats, marshes and shorelines.

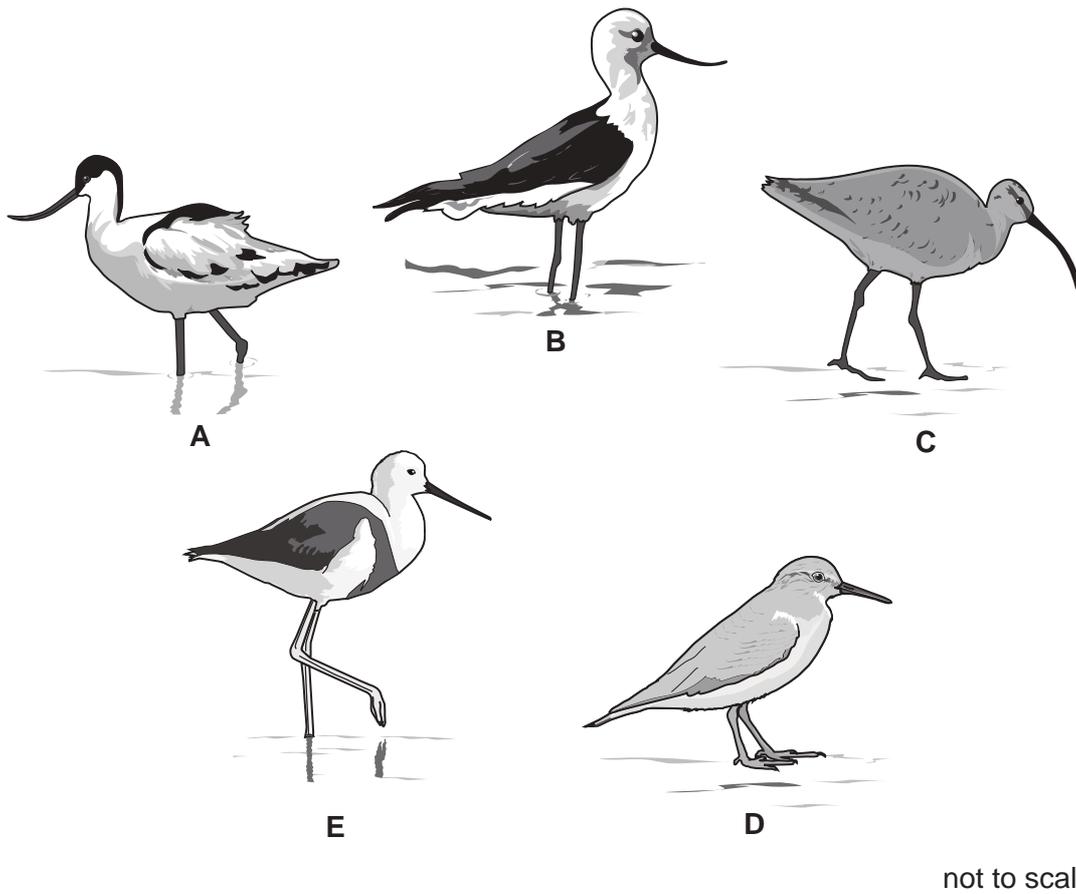


Fig. 1.1

(a) State **two** features that are characteristic of all birds.

1

2

[2]

(b) Fig. 1.2 is a key to identify the five birds in Fig. 1.1.

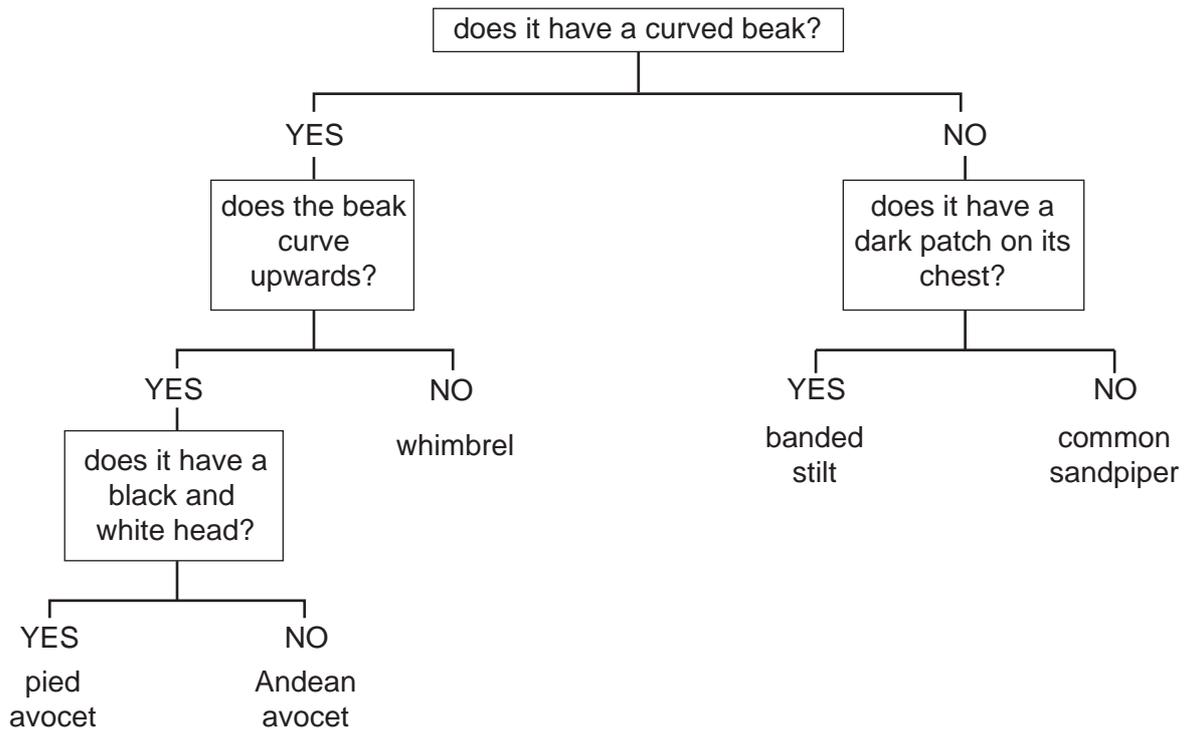


Fig. 1.2

Use the key to identify the five birds shown in Fig. 1.1.

Complete Table 1.1 by writing the letters **A, B, C, D** and **E** in the boxes next to the name of each bird.

Table 1.1

name of the bird	letter
pied avocet	
Andean avocet	
common sandpiper	
banded stilt	
whimbrel	

[4]

(c) Bird A in Fig. 1.1 feeds mainly on small animals found in the mud or in the water.

It has long legs and a long beak.

(i) Suggest how these features help it to survive in its habitat.

.....
.....
..... [2]

(ii) State the name of the process that has produced birds with these features.

..... [1]

[Total: 9]

2 Fig. 2.1 shows the system that excretes excess water from the body.

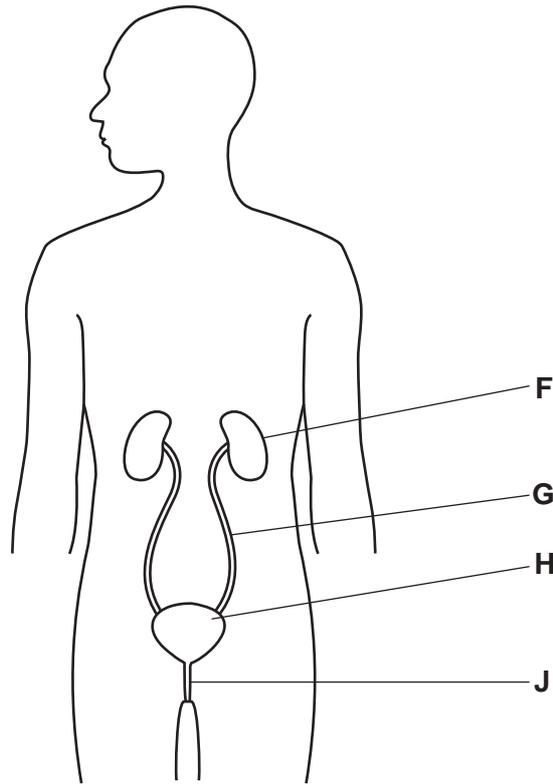


Fig. 2.1

(a) (i) Identify the letter on Fig. 2.1 that shows where urine is stored.

..... [1]

(ii) State the name of the organ where urine is stored.

..... [1]

(b) The ureter and the urethra are two parts of the organ system shown in Fig. 2.1.

Describe the function of these **two** structures.

ureter

.....

urethra

.....

[2]

(c) Urine contains urea.

(i) Circle the substance that is broken down to produce urea.

amino acids fatty acids hydrochloric acid lactic acid [1]

(ii) State the name of the organ that produces urea.

..... [1]

(d) A scientist compared the daily water intake and daily water loss from an athlete on two separate days.

The first set of results was collected on a day when the athlete was resting.

The second set of results was collected on the day of a long race.

The results are shown in Table 2.1.

Table 2.1

rest day		race day	
water input /cm ³	water loss /cm ³	water input /cm ³	water loss /cm ³
respiration 400	faeces 100	respiration 500	faeces 100
food 500	skin 400	food 500	skin
drink 1500	breathing 400	drink	breathing 600
	urine		urine 400
Total	Total 2400	Total 3000	Total 3000

Calculate the four missing values in Table 2.1.

Write your answers on the dotted lines in Table 2.1.

[2]

(e) A person drinks a large volume of water but does not exercise.

Describe the effect that increased water intake would have on the volume and concentration of urine produced.

.....

 [2]

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- 3 (a) Drinking excessive alcohol, injecting heroin and smoking tobacco can all do serious harm to the body.

Table 3.1 shows some of the risks of using these substances.

Complete Table 3.1 by putting ticks in the boxes to show the possible risks of using these substances.

Table 3.1

action	chronic obstructive pulmonary disease	coronary heart disease	HIV infection	liver disease	lung cancer
drinking excessive alcohol					
injecting heroin					
smoking tobacco					

[3]

- (b) Explain why many people find it difficult to stop smoking tobacco.

.....

.....

.....

.....

..... [2]

(c) A man and a woman drink the same volume of an alcoholic drink in 30 minutes.

Fig. 3.1 shows the change in their blood alcohol concentration over seven hours.

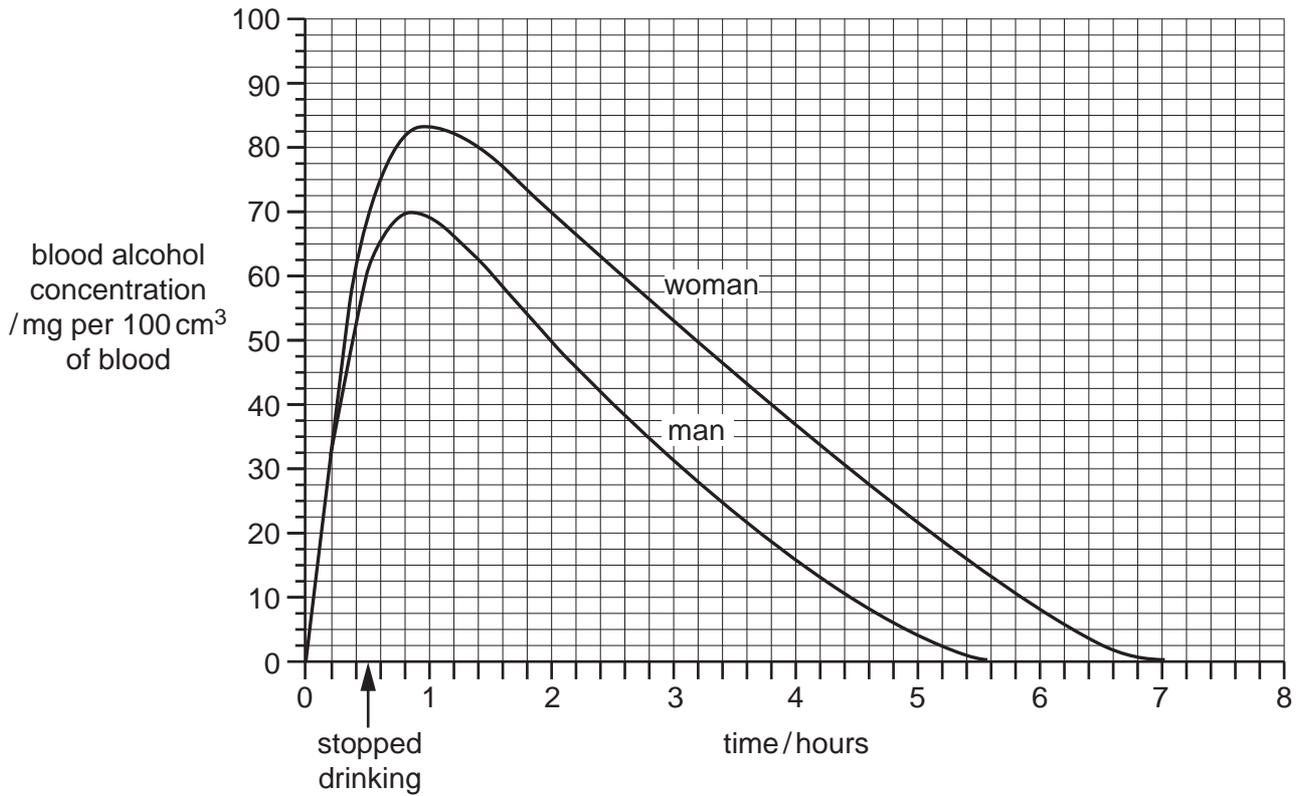


Fig. 3.1

(i) Describe **two** ways that the woman's blood alcohol concentration is different from the man's blood alcohol concentration in Fig. 3.1.

1

.....

.....

2

.....

.....

[2]

(ii) At two hours the blood alcohol concentration of the man was 50 mg per 100 cm³ of blood. State the blood alcohol concentration of the woman at two hours.

..... mg per 100 cm³ of blood. [1]

(iii) Calculate the difference between the man's and the woman's blood alcohol concentrations at two hours, using your answer to part 3(c)(ii).

..... mg per 100 cm³ of blood. [1]

(iv) Suggest **one** reason why the same volume of alcohol affected the man and the woman differently.

.....
.....
..... [1]

[Total: 10]

4 (a) The development of a new human life involves different stages.

These stages are labelled by the letters **A** to **G**.

The stages are **not** in the correct order.

- A** birth
- B** development of a fetus
- C** fertilisation
- D** formation of an embryo
- E** formation of a zygote
- F** implantation
- G** release of an egg cell

Put the seven stages in the correct order.

Write the letters in the spaces in the flow chart to show the correct order.

Two of the stages have been done for you.



[3]

(b) The list shows four different methods of birth control.

- natural**
- chemical**
- barrier**
- surgical**

State the name of the method that these types of birth control belong to:

use of a condom

vasectomy

use of a contraceptive pill

[3]

(c) HIV is an example of a sexually transmitted infection.

(i) Define the term *sexually transmitted infection*.

.....

.....

..... [2]

(ii) State the name of the disease that HIV can lead to.

.....

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(iii) Describe **one other** way that HIV can be transmitted.

.....
.....
..... [1]

[Total: 10]

5 (a) Most flowers contain male and female parts.

(i) State the name of the male gamete in plants.

..... [1]

(ii) State the name of the female gamete in plants.

..... [1]

(iii) State the name of the part of a flower that produces male gametes.

..... [1]

(iv) State the name of the part of a flower which receives the male gametes.

..... [1]

(b) Fig. 5.1 shows the flower of an aroid plant.

It is sometimes called the corpse flower because it smells of rotting meat.

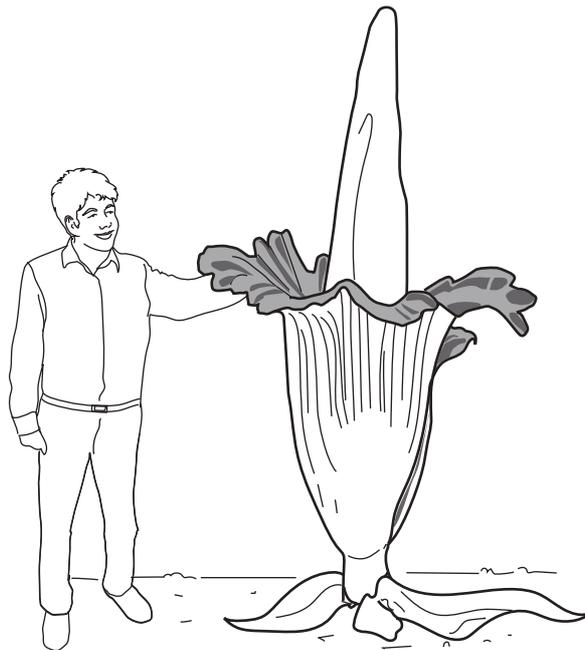


Fig. 5.1

The smell of the corpse flower attracts lots of insects.

The insects pollinate the flower.

Describe **other** ways insect-pollinated flowers and wind-pollinated flowers are adapted for pollination.

insect-pollinated flowers

.....

.....

.....

wind-pollinated flowers

.....

.....

.....

[4]

(c) The seeds of the corpse flower are dispersed by birds.

The seeds germinate and new corpse flowers grow.

State **two** environmental conditions that a seed requires for germination.

1

2

[2]

[Total: 10]

6 (a) Explain why plants are the start of most food webs.

.....

.....

.....

.....

..... [3]

(b) Fig. 6.1 is a desert food web.

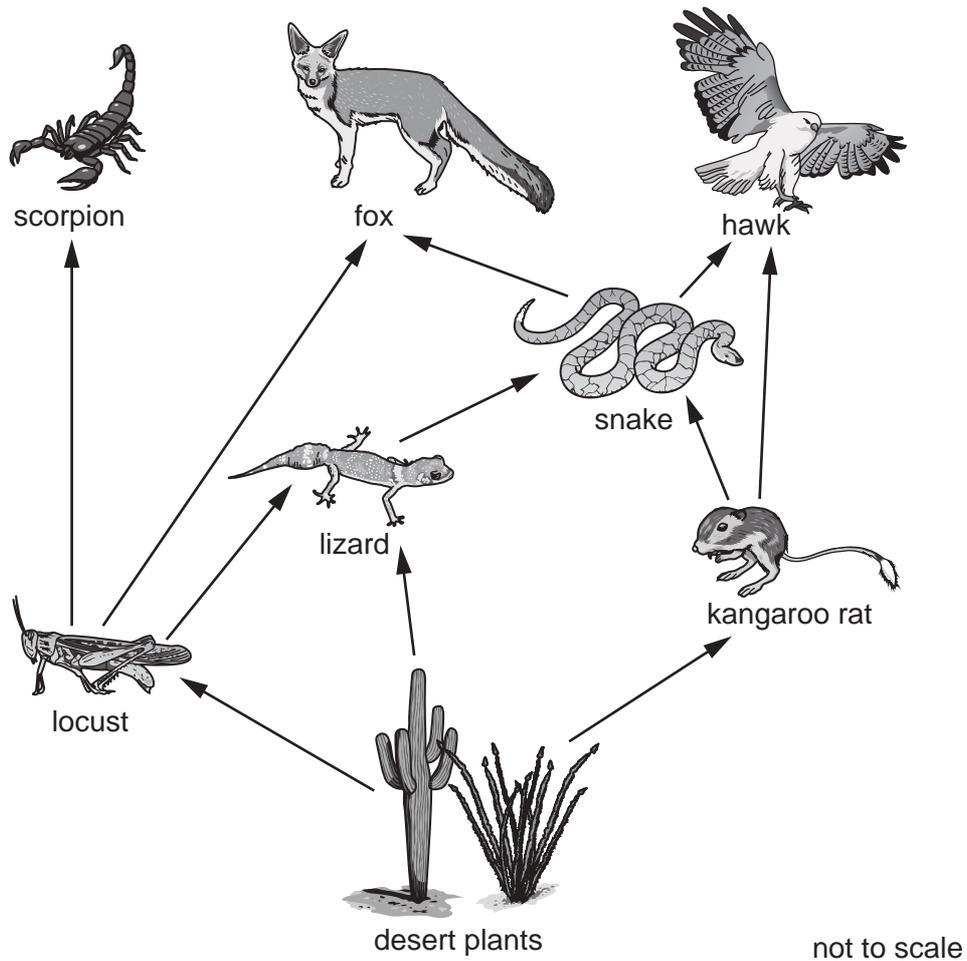


Fig. 6.1

(i) Use Fig. 6.1 to complete a food chain that has four different organisms and ends with the hawk.

Write the names of three missing organisms in the boxes.



[1]

(ii) State the names of **two** tertiary consumers in the food web in Fig. 6.1.

..... [2]

(c) The number of locusts in the food web in Fig. 6.1 suddenly decreases.

Explain what effect this would have on the population of scorpions and on the population of desert plants.

scorpions

.....

.....

.....

.....

desert plants

.....

.....

.....

.....

[4]

[Total: 10]

7 (a) The cells in the leaves of plants that make glucose contain a green substance.

(i) State the name of this green substance.

..... [1]

(ii) State the name of the cells that make glucose.

..... [1]

(b) Leaves contain different types of cells.

Fig. 7.1 represents a typical leaf.

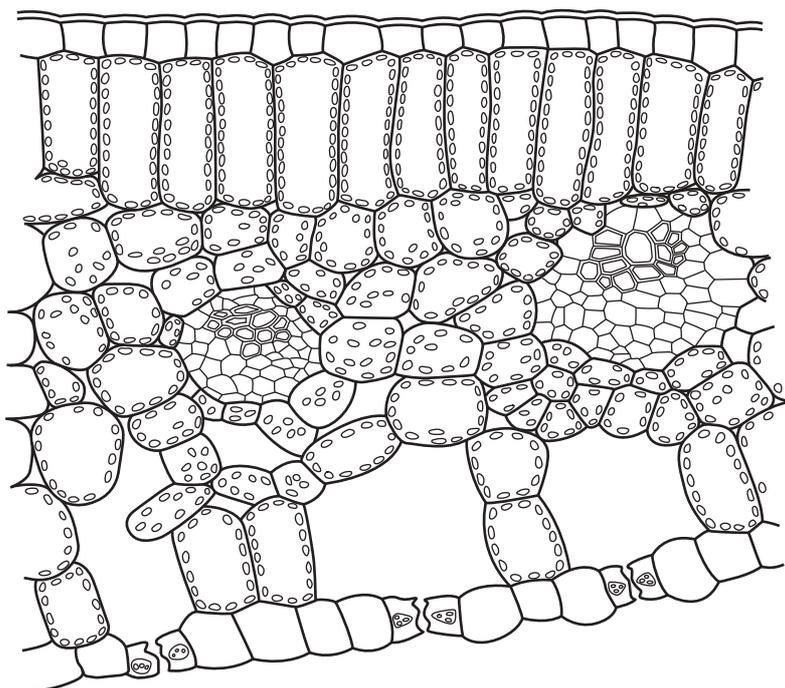


Fig. 7.1

(i) State the name of the thin, transparent layer of wax which covers the surface of most leaves.

..... [1]

(ii) State the name of the layer of cells that is beneath the layer of wax that covers the outer surface.

..... [1]

(c) Leaves contain two types of transport tissue, xylem and phloem.

State which substances are transported by:

xylem

phloem

[2]

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(d) The lower surface of most leaves has many pores.

The pores allow gases to move into and out of a leaf for photosynthesis.

(i) State the name of these pores.

..... [1]

(ii) State the name of the gas that is used for photosynthesis.

..... [1]

(iii) State the name of the gas that is produced by photosynthesis.

..... [1]

[Total: 9]

8 (a) A person with diabetes may be unable to make insulin.

(i) Insulin belongs to an important group of chemicals made by the body.

State the name of this group of chemicals.

..... [1]

(ii) State where insulin is produced in the body.

..... [1]

(iii) State the function of insulin.

.....
..... [1]

(b) A person with diabetes may need regular injections of insulin.

State how the insulin is transported to different parts of the body.

..... [1]

(c) Human insulin can be made by genetically engineered bacteria.

(i) Define the term *genetic engineering*.

.....
.....
..... [2]

(ii) State **one** example of genetic engineering in crop plants.

.....
..... [1]

[Total: 7]

- 9 Fig. 9.1 shows a cross between two guinea pigs. The male guinea pig is pure-breeding for black fur colour and the female guinea pig is pure-breeding for white fur colour.

The allele for black fur colour can be represented by **B** and the allele for white fur colour can be represented by **b**.

All four of their offspring had black fur.

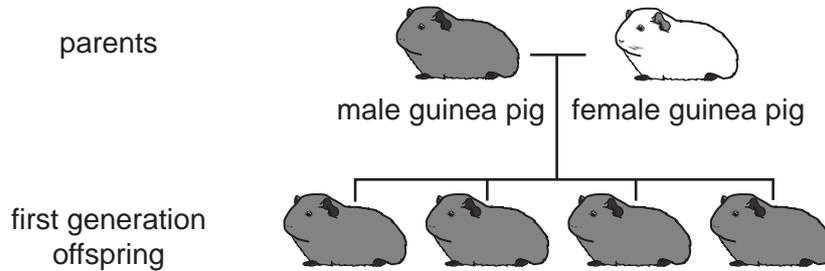


Fig. 9.1

- (a) (i) State the phenotypes of each of the parent guinea pigs in Fig. 9.1.
 phenotype of the male
 phenotype of the female [1]
- (ii) State the genotype of the female parent guinea pig.
 [1]
- (iii) All of the offspring are heterozygous.
 State the genotype of the heterozygous offspring.
 [1]

(b) Two of the first generation offspring were crossed.

They produced four second generation offspring.

These are labelled **A**, **B**, **C** and **D** in Fig. 9.2.

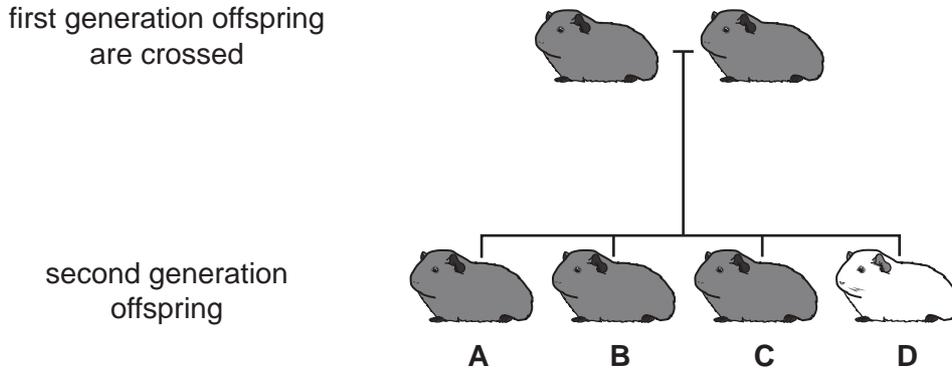


Fig. 9.2

(i) State **all** of the possible genotypes for the three offspring labelled **A**, **B** and **C**.

..... [1]

(ii) State the phenotypic ratio of the second generation of guinea pigs.

..... [1]

[Total: 5]

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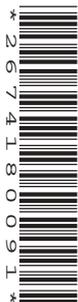
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BIOLOGY

0610/41

Paper 4 Theory (Extended)

October/November 2017

1 hour 15 minutes

Candidates answer on the Question Paper.

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1 Fig. 1.1 and Fig. 1.2 show two images of villi.

Fig. 1.1 shows a surface view of many villi viewed through a scanning electron microscope.

Fig. 1.2 shows a section of one villus viewed through a light microscope.

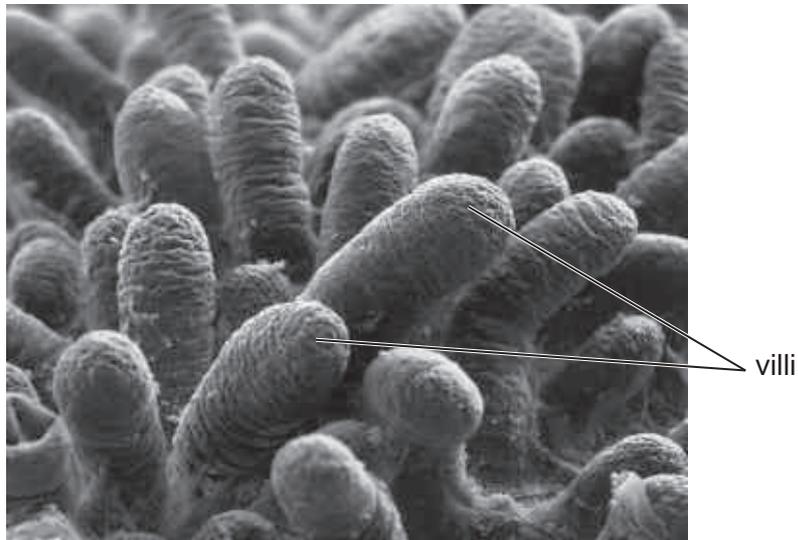


Fig. 1.1

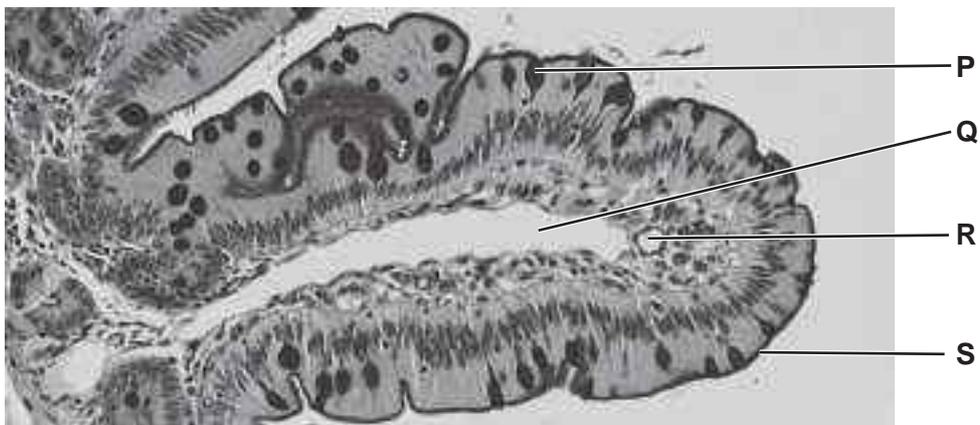


Fig. 1.2

(ii) The nutrients in the blood can be used to become part of cells.

State the name of this process.

.....[1]

(iii) Amino acids are an example of a type of nutrient transported in the blood.

State **two** examples of larger molecules found in cells that are made from amino acids.

1

2 [2]

[Total: 12]

2 A group of students planned an investigation to determine the effects of physical activity on breathing rate.

(a) Describe how the students could measure their breathing rates.

.....
.....
.....[2]

(b) The students measured their breathing rates before physical activity and every minute for five minutes after cycling around the school field.

Write a hypothesis for their investigation.

.....
.....
.....[2]

(c) Fig. 2.1 shows a woman on a stationary bicycle. The mask fitted over her nose and mouth measures the composition of the air she breathes out.

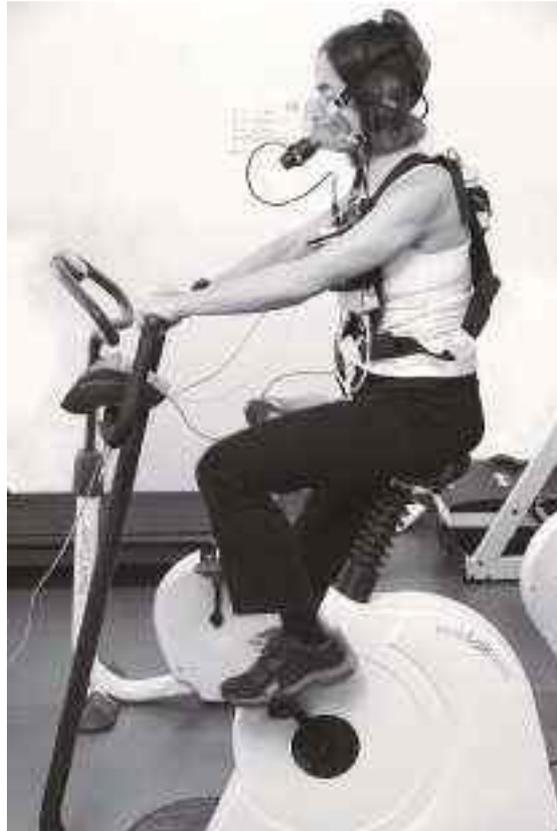


Fig. 2.1

Fig. 2.2 shows the concentration of carbon dioxide in the air expired by the woman in the five minutes after she stopped exercising.

The dashed line on the graph shows the concentration of carbon dioxide in her expired air when she was at rest, before she began to exercise.

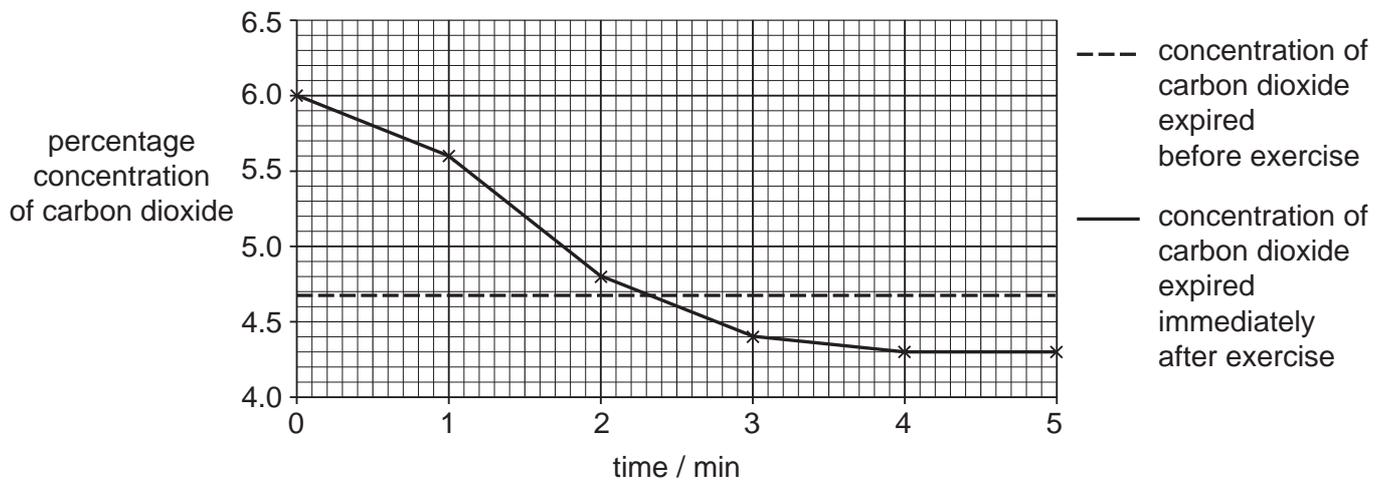


Fig. 2.2

(c) Following fertilisation, seeds will form.

In pea plants there are two alleles for height:

- tall (**T**)
- dwarf (**t**)

(i) Define the term *allele*.

.....

[1]

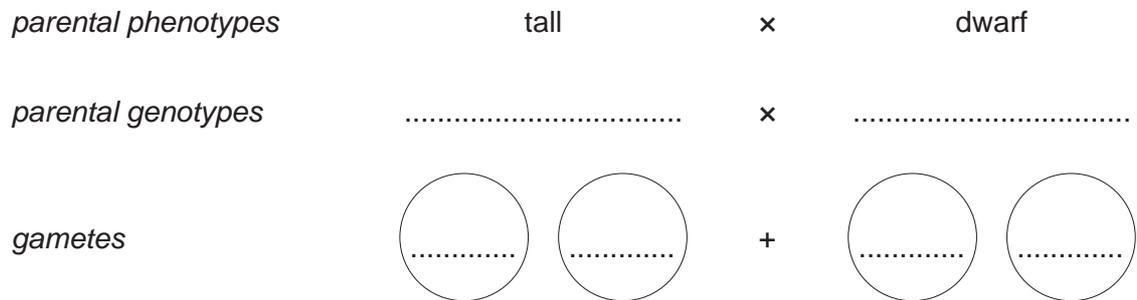
(ii) A farmer wanted to identify the genotype of tall pea plants as either homozygous dominant or heterozygous.

He used a homozygous recessive dwarf pea plant to determine the genotype of the tall pea plants.

State the name of this type of genetic cross.

.....[1]

(iii) Complete the genetic diagram to determine the genotype of the parent plant if all the offspring from the cross are tall plants.



offspring genotype

offspring phenotype

[4]

(iv) Another farmer wants to produce pure-breeding dwarf pea plants.

State the genotypes of both of the parent pea plants the farmer should use.

Give a reason for your choice.

genotypes

reason

.....

[2]

[Total: 16]

4 A neurone is a type of specialised animal cell.

(a) (i) Neurones develop from unspecialised cells.

State the name of these unspecialised cells.

.....[1]

(ii) All animal cells have some common features.

State **two** structural features common to all animal cells.

1

2

[2]

(iii) Most neurones are longer than other types of animal cell.

Suggest why most neurones are very long.

.....

.....[1]

(b) Some neurones connect to effector organs.

(i) State the name of the type of neurone that connects to an effector organ.

.....[1]

(ii) State **one** example of an effector organ.

.....[1]

(c) Fig. 4.1 shows parts of two neurones. The area in the dashed circle has been magnified.

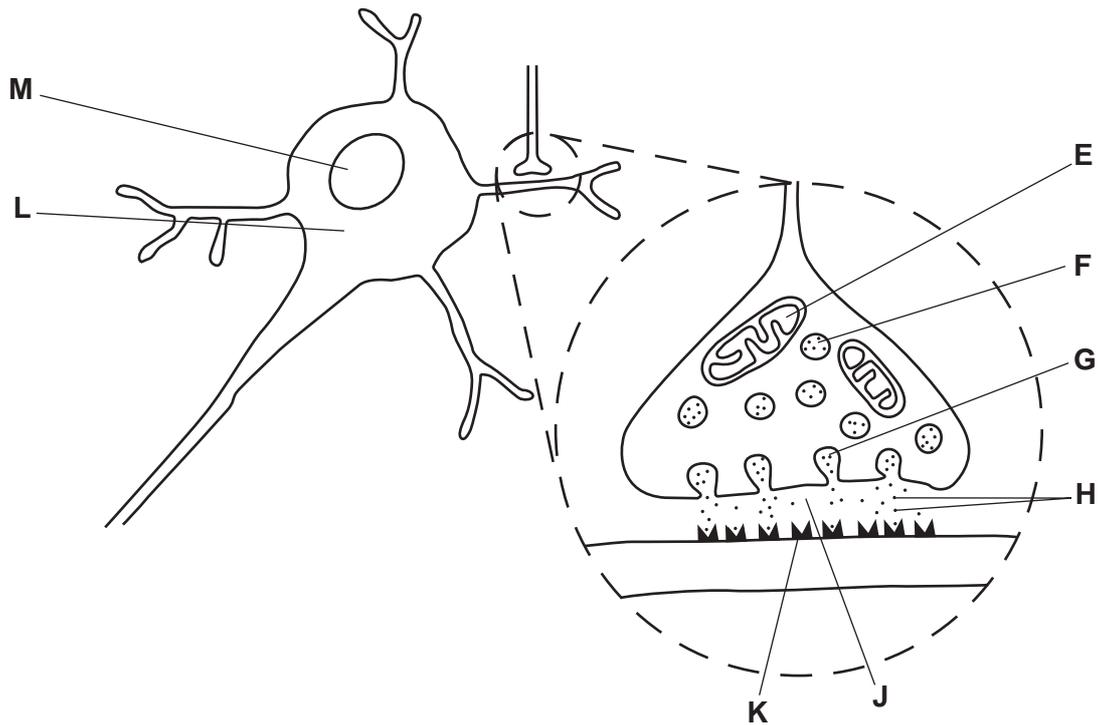


Fig. 4.1

(i) Complete Table 4.1. One row has been done for you.

Table 4.1

letter from Fig. 4.1	name	description
		component of the cell that releases energy during aerobic respiration
H	neurotransmitters	chemicals that transmit signals from one neurone to the next neurone
		the gap between two neurones
		the sac in which neurotransmitters are transported to the cell membrane
		the molecules that the neurotransmitters bind to
		the structure that controls the activities in the cell

[5]

(ii) State where in the body the neurones in Fig. 4.1 would be found.

.....[1]

(d) Describe how neurotransmitters move across the gap between two neurones.

.....
.....
.....
.....
.....[3]

(e) Nerves and hormones coordinate the functions of the body.

Suggest why blinking of the eyes is coordinated by nerves and not hormones.

.....
.....[1]

[Total: 16]

5 (a) Yeast can respire aerobically and anaerobically.

State the balanced chemical equation for aerobic respiration by yeast.

.....[2]

(b) When yeast respire anaerobically, ethanol is released.

Ethanol is a type of sustainable resource that can be produced from a wide range of crops. It can be used as a biofuel.

Table 5.1 summarises some information about crops that are used to make biofuel.

Table 5.1

crop	biofuel produced	energy yield /GJ per ha	optimum growth temperature/°C	optimum annual rainfall range/mm
wheat	ethanol	53–84	24	800–1200
corn	ethanol	63–76	18	360–1000
sugar beet	ethanol	110–122	18	360–1000
sugar cane	ethanol	110–140	28	800–1200
oil palm	oil	150–166	28	1100–2500

(i) Uruguay has an average temperature range of 12°C to 24°C and an average annual rainfall of 1000mm.

Suggest **and** explain which crop would be the **most** suitable crop to grow for producing biofuel in Uruguay.

Use the information in Table 5.1 to justify your choice.

.....

[3]

- (ii) Sugar cane requires soil with high concentrations of nitrogen and potassium.

Describe how the lack of nitrate ions would affect the production of sugar cane.

.....
.....
.....
.....
.....
.....
.....
.....[3]

- (iii) Researchers in Brazil are considering using microscopic algae that live in water to produce biofuels. They have found that algae can produce a maximum amount of energy of 200 GJ per m².

1 m² = 0.0001 ha

Convert the production of biofuel from algae into GJ per ha.

Space for working.

..... GJ per ha [1]

- (iv) Suggest why people who are concerned about the environment want countries to produce more biofuel from algae rather than the crops listed in Table 5.1.

.....
.....
.....
.....
.....
.....
.....
.....[3]

(c) Define the term *sustainable development*.

.....
.....
.....[2]

[Total: 14]

(b) Fig. 6.1 shows four different viruses.

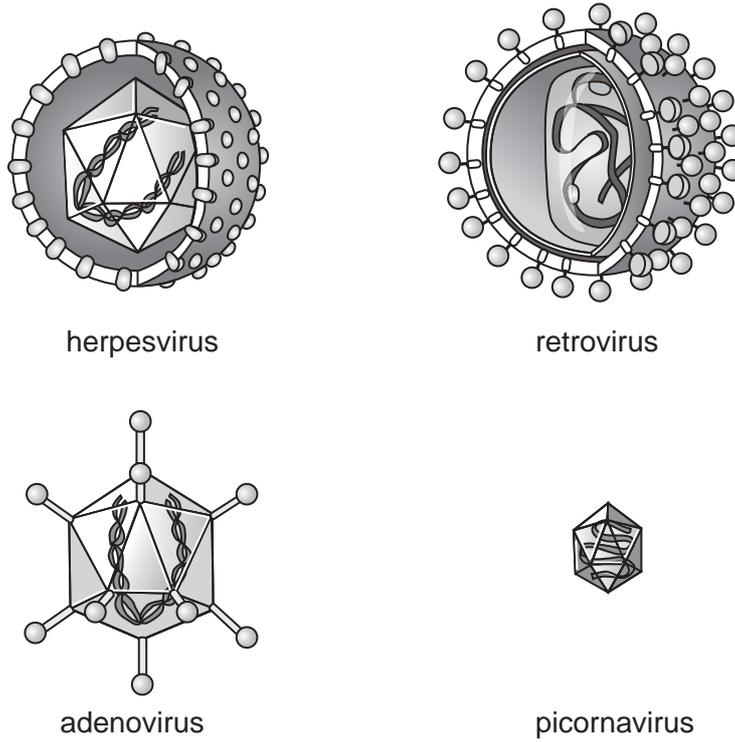


Fig. 6.1

Suggest **one** feature that could be used to classify viruses into groups.

.....
.....[1]

[Total: 8]

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BIOLOGY

0610/42

Paper 4 Theory (Extended)

October/November 2017

1 hour 15 minutes

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1 The lungs and the kidneys are part of the excretory system of mammals.

(a) (i) State the name of **one** substance that is excreted from the lungs and state where in the body it is produced.

name

site of production [2]

(ii) State the name of **one** excretory substance, that is removed by the kidneys, that contains nitrogen.

Explain why it is excreted.

name

explanation

..... [2]

(b) Blood is filtered as it flows through the kidneys.

(i) State the name of the structure within a kidney that filters the blood.

..... [1]

(ii) State **two** components of blood that do **not** pass through the filter.

1

2

[2]

- (c) The filtrate which is formed from the blood in the kidneys contains many useful substances, which are reabsorbed into the blood.

Fig. 1.1 is a photomicrograph of a cross-section of some of the cells that carry out reabsorption.

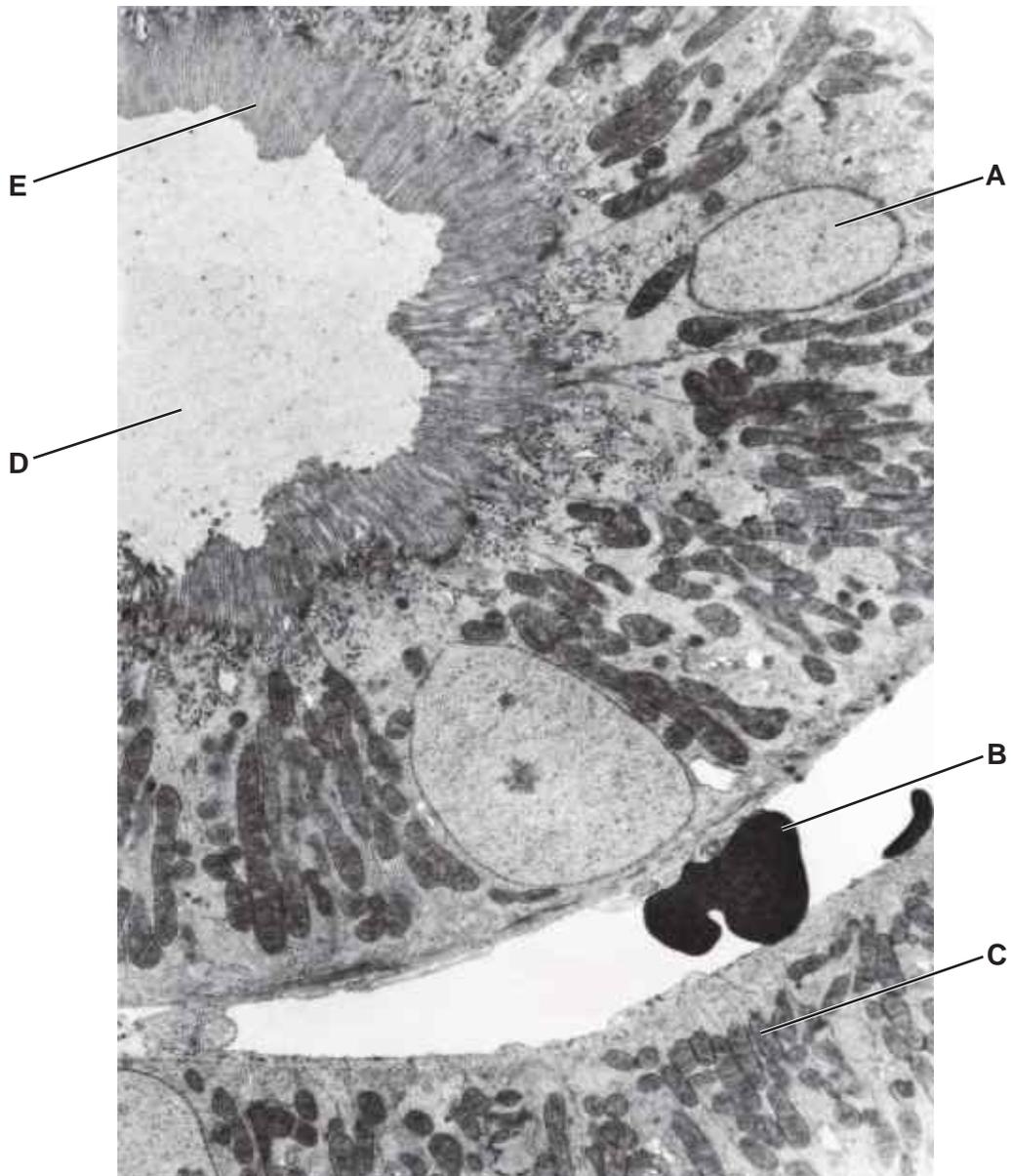


Fig. 1.1

- (i) Complete the table by stating the letter in Fig. 1.1 that identifies each structure.

structure	letter on Fig. 1.1
microvilli	
nucleus	
mitochondrion	

[3]

(ii) State **one** function of the nucleus.

.....
.....[1]

(iii) State the name of **one** part of the mammalian body **other than** the kidney that has cells with microvilli.

.....[1]

(iv) The cells that line the kidney tubules, such as those in Fig. 1.1, absorb many compounds from the filtrate.

Use Fig. 1.1 to explain how the cells are adapted for absorption.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....[4]

[Total: 16]

2 A person who wanted to begin a fitness programme did some vigorous exercise.

A fitness trainer took a drop of blood from the person's finger before, during and after vigorous exercise and tested it for lactic acid.

(a) Explain why it is important that the equipment used for taking blood is clean (sterile).

.....

.....

.....

.....[2]

(b) The results of the tests for lactic acid are shown in Fig. 2.1.

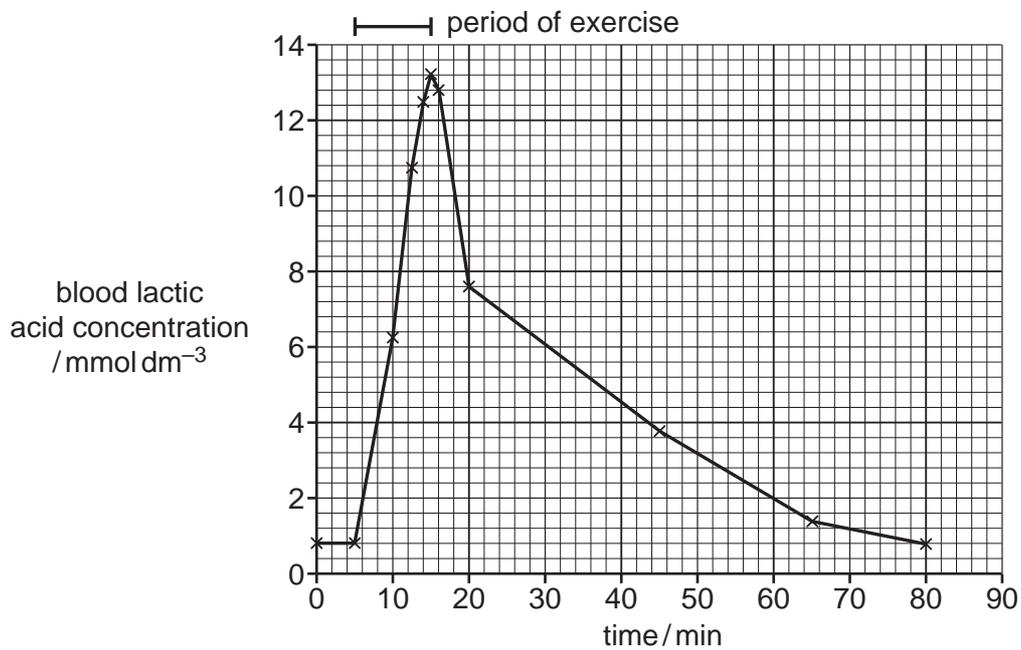


Fig. 2.1

- (c) The concentration of lactic acid in the blood of two athletes was investigated. One athlete, **P**, had been training and the other, **Q**, was returning to training after an injury.

Blood samples were taken from both athletes during a training session. The results are shown in Fig. 2.2.

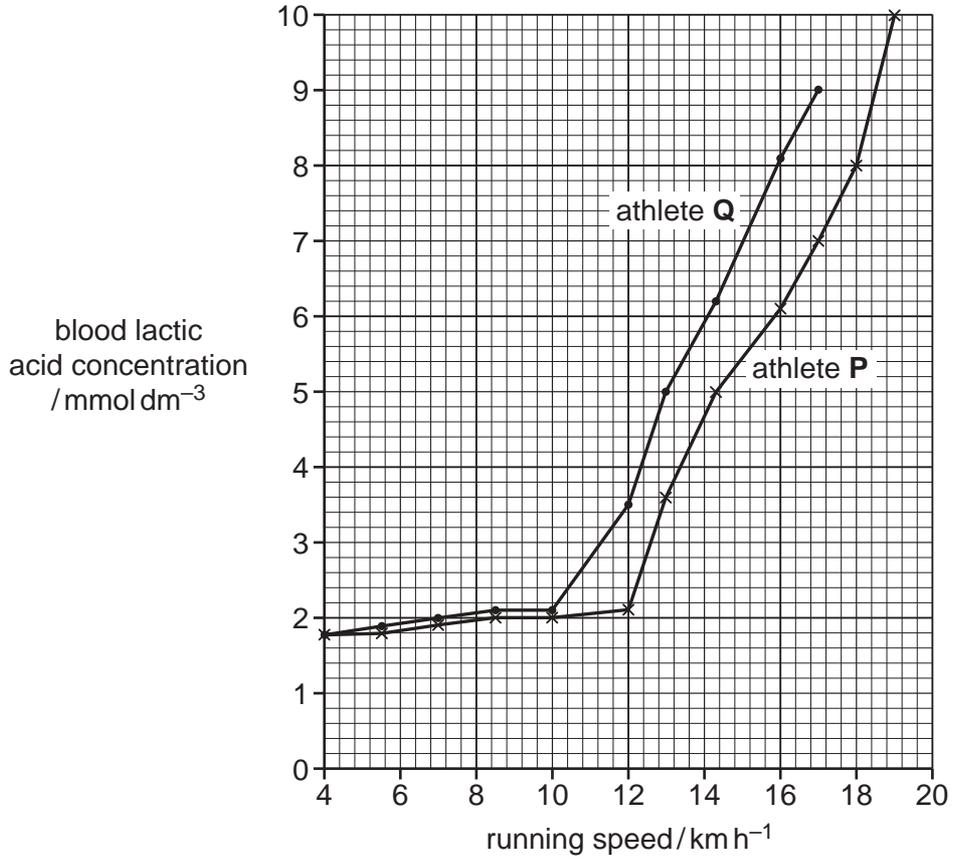


Fig. 2.2

- (i) The lactic acid threshold is the level of exercise where the lactic acid concentration begins to increase exponentially.

State the lactic acid threshold for athletes **P** and **Q**.

P km h⁻¹

Q km h⁻¹

[1]

- (ii) Suggest a reason for the difference in lactic acid threshold of athletes **P** and **Q**.

.....

[1]

(d) Maintaining very large populations of farm animals is unsustainable.

Define the term *sustainable development*.

.....

.....

.....

.....

.....

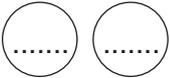
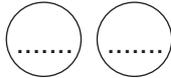
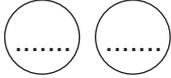
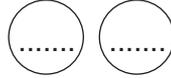
.....[2]

[Total: 12]

(ii) Test crosses can be used to determine the genotype of a plant with purple flowers.

The genetic diagrams show test crosses for purple-flowered plants with two different genotypes.

Complete the genetic diagrams for test cross 1 and test cross 2.

	test cross 1		test cross 2
<i>parental phenotype</i>	purple flowers × white flowers		purple flowers × white flowers
<i>parental genotype</i>	Bb ×		BB ×
<i>genotypes of gametes</i>	 + 		 + 
<i>offspring genotypes</i>
<i>offspring phenotypes</i>

[5]

(c) Pickerel weed, *Pontederia cordata*, is a plant that grows in shallow water on the edges of ponds and lakes in North America.

A few seedlings of these plants are white. The white seedlings cannot make chlorophyll.

Researchers carried out several crosses using pickerel weed plants.

Their results are shown in Table 4.2.

Table 4.2

cross	number of offspring	
	green	white
1	149	0
2	70	22

- (i) Select suitable symbols for the alleles and state the possible genotypes of the parents for each cross.

cross 1

cross 2

[2]

- (ii) It is **not** possible to carry out a test cross with pickerel weed plants.

Suggest why.

.....

.....

.....

.....

.....[2]

[Total: 17]

5 Fig. 5.1 shows the bacterium *Helicobacter pylori*, which is a human pathogen.

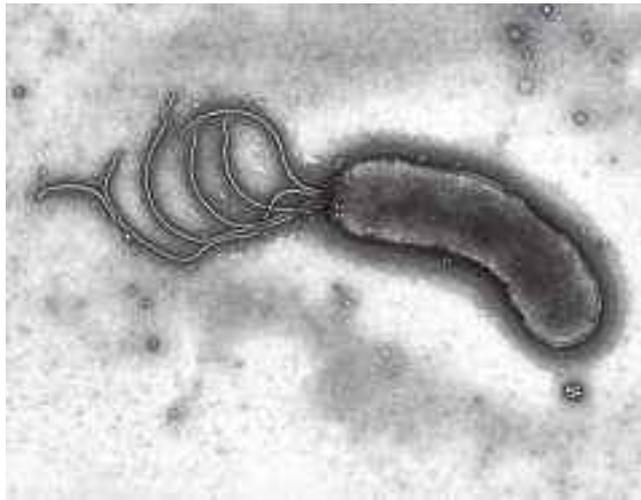


Fig. 5.1

(a) State the genus of *Helicobacter pylori*.

.....[1]

(b) *H. pylori* is placed in the prokaryote kingdom.

State **two** structural features that *H. pylori* shares with other prokaryotes.

1

2

[2]

(c) (i) *H. pylori* can cause infections in the stomach.

Suggest how this infection could be treated.

.....[1]

(ii) State **one** natural body defence that is found in the stomach.

.....[1]

- 6 Glucose is absorbed into the blood in the small intestine. Fig. 6.1 shows the human circulatory system and the pathway taken by molecules, such as glucose, when they travel in the blood.

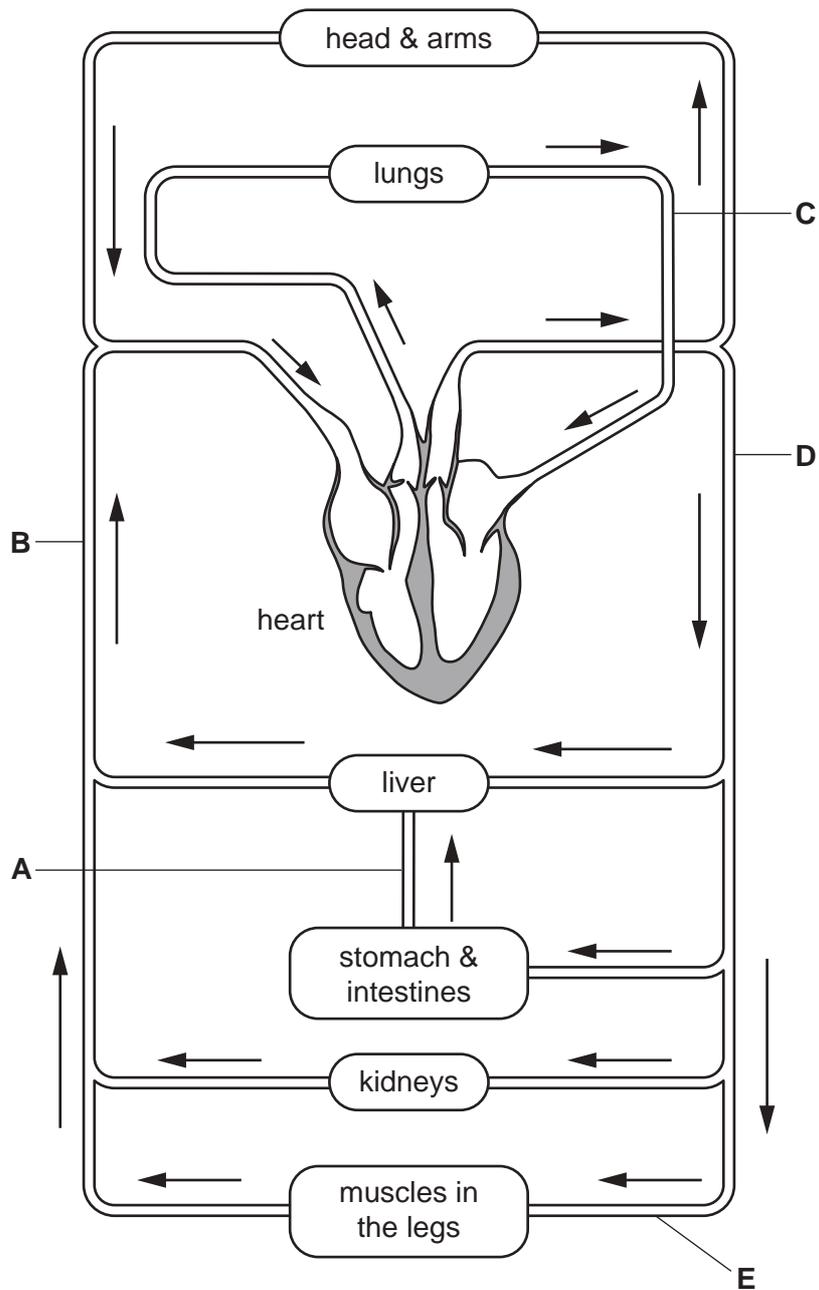


Fig. 6.1

- (a) Complete Table 6.1 by naming the blood vessels labelled on Fig. 6.1 and stating whether they contain oxygenated blood or deoxygenated blood. One row has been completed for you.

Table 6.1

letter on Fig. 6.1	name of the blood vessel	oxygenated or deoxygenated blood
A		
B		
C		
D		
E	femoral artery	oxygenated

[4]

- (b) Insulin is a hormone that is secreted by the pancreas.

- (i) Define the term *hormone*.

.....

 [2]

- (ii) Describe the role of insulin in the body.

.....

 [3]



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BIOLOGY

0610/43

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.

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 **18** printed pages and **2** blank pages.

(c) Fig. 1.2 shows some events during inspiration.

P	pressure in the thorax decreases
Q	air travels down the trachea
R	air enters the bronchi
S	air travels through the larynx
T	air enters the nose
U	the ribcage moves upwards and outwards
V	air enters the alveoli

Fig. 1.2

(i) Put the events shown in Fig. 1.2 into the correct sequence. Two have been done for you.

		T				V
--	--	----------	--	--	--	----------

[2]

(ii) Suggest why alveoli have thin walls.

.....

.....

.....

.....[2]

(d) Sickle-cell anaemia is a disease that reduces the delivery of oxygen to tissues.

Explain why.

.....

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 12]

2 A group of students investigated the effect of exercise on their heart rates.

They measured their heart rates:

- before exercise
- immediately after running 1 km
- one minute after running 1 km

Before doing the investigation they wrote a hypothesis.

(a) (i) Write a hypothesis for this investigation.

.....
.....
.....
.....[2]

(ii) The students measured their pulse as an indicator of heart rate.

Describe how the students could measure their pulse.

.....
.....
.....
.....[2]

(b) In another investigation, a doctor tested some of her patients to determine the effect of exercise on coronary heart disease.

Coronary heart disease is caused by a blockage in the coronary artery.

Describe the effect on the heart of a blockage in the coronary artery.

.....
.....
.....
.....
.....[2]

(c) The doctor divided her coronary heart disease patients randomly into two equal groups.

Each group was given different instructions:

- group **A** – patients were given a daily exercise plan
- group **B** – patients were told to make their own exercise plan.

The doctor measured the heart rate (HR) of each patient immediately after doing exercise and again one minute later.

She calculated their heart rate recovery using this formula:

heart rate recovery = HR immediately after exercise – HR one minute after exercise.

She then calculated the average heart rate recovery for each of the two groups of patients.

The doctor repeated these measurements after three months and after six months.

The results are shown in Fig. 2.1.

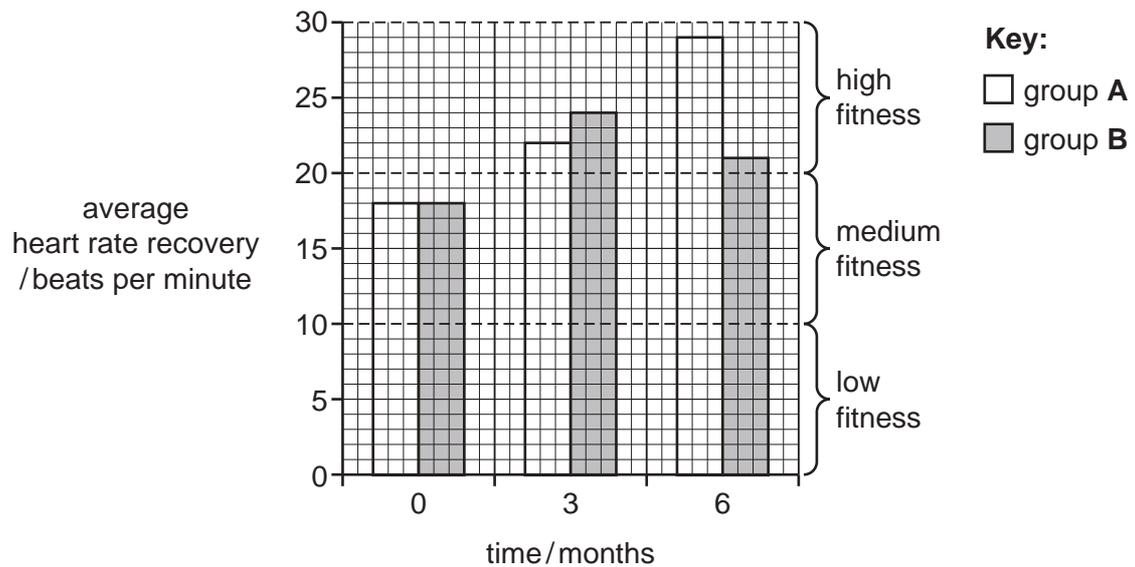


Fig. 2.1

3 Apple scab is a disease that infects apple trees.

Fig. 3.1 shows apples from uninfected and infected apple trees.



uninfected apple tree



infected apple tree

Fig. 3.1

There is a gene that determines whether or not apple trees are resistant to apple scab disease.

There are two alleles for this gene:

- disease-resistant, **R**
- not disease-resistant, **r**

(a) (i) Complete the sentence.

Genes and alleles are made of

[1]

- (ii) The farmer wanted to be sure that only the selected disease-resistant apple trees would reproduce.

Suggest what the farmer could do to ensure that only the selected apple trees were pollinated.

.....
.....
.....[1]

- (iii) Describe how artificial selection differs from natural selection.

.....
.....
.....
.....
.....[2]

[Total: 11]

4 The Canadian Government were concerned about overfishing at the Grand Banks in the Atlantic Ocean.

As a result, commercial fish stocks were monitored from 2002 until 2013.

The population data for four species of fish are shown in Fig. 4.1.

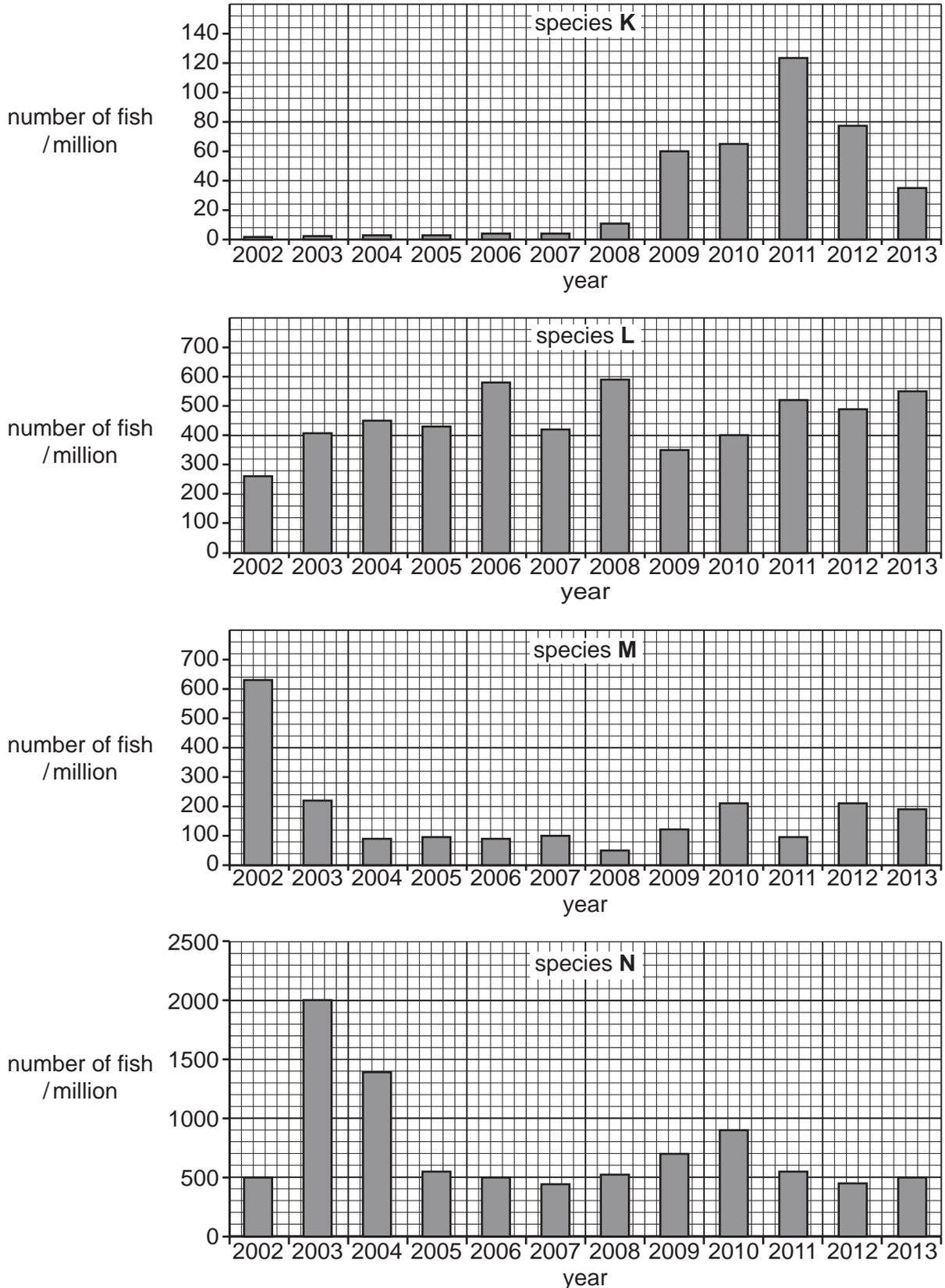


Fig. 4.1 Need a home tutor? Visit smiletutor.sg

(a) Use the information in Fig. 4.1 to:

(i) state the most abundant fish species in **2002**

.....[1]

(ii) suggest the fish species that had the most carefully controlled fishing quotas between **2002** and **2013**.

Give a reason for your choice.

.....
.....
.....[1]

(iii) calculate the percentage increase in species **N** between **2002** and **2003**.

Show your working.

.....
[2]

(b) Overfishing is a possible reason for the decrease of the population of species **M** between 2002 and 2003.

State **two other** reasons that could have caused this decrease.

1
2
[2]

(c) Overfishing can be reduced by having large holes in fishing nets.

Fig. 4.2 shows sections of two fishing nets, the drawings are both at the same scale.

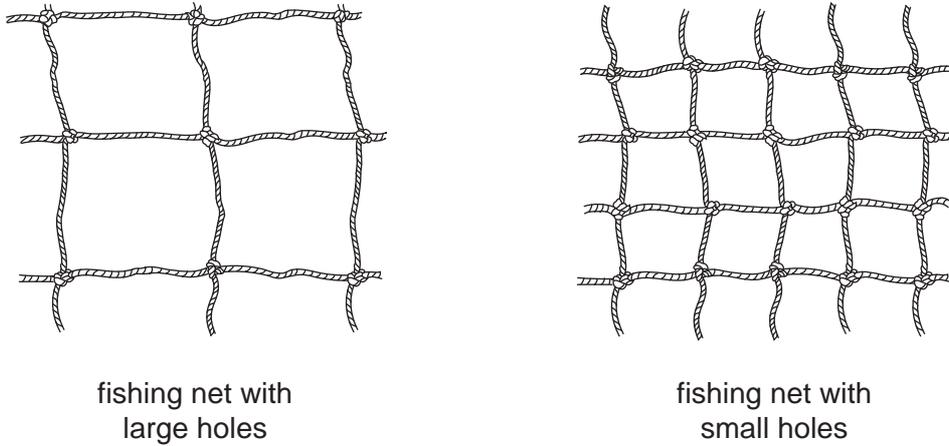


Fig. 4.2

(i) Suggest how controlling the size of the holes in fishing nets helps to reduce overfishing.

.....
.....
.....[1]

(ii) Describe and explain how methods **other** than fishing net hole size, could help to prevent overfishing.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....[4]

(e) Sustainable development is required to manage fish stocks.

Define the term *sustainable development*.

.....
.....
.....[2]

[Total: 17]

5 The kingdom Fungi contains a great diversity of organisms including yeasts, moulds and mushrooms.

Like plants, fungi contain nuclei and mitochondria.

(a) (i) State the function of mitochondria.

.....
.....[2]

(ii) State **two** characteristics of fungi that are used to distinguish them from plants.

1
2
[2]

(b) Yeast is a single-celled fungus that is used in bread-making.

Explain why yeast is used in bread-making.

.....
.....
.....
.....
.....
.....
.....
.....
.....[3]

(c) *Penicillium* is a mould fungus that is used to make antibiotics.

(i) Describe how *Penicillium* is used to make the antibiotic penicillin.

.....
.....
.....
.....
.....
.....
.....
.....[3]

(ii) Explain why antibiotics can be used to treat bacterial infections but not viral infections.

.....
.....
.....[1]

(d) Some fungi are human pathogens.

Describe how the human body prevents pathogens from entering.

.....
.....
.....
.....
.....
.....
.....
.....[3]

[Total: 14]

6 Fig. 6.1 is a flow chart of some of the events that occur to maintain a constant body temperature.

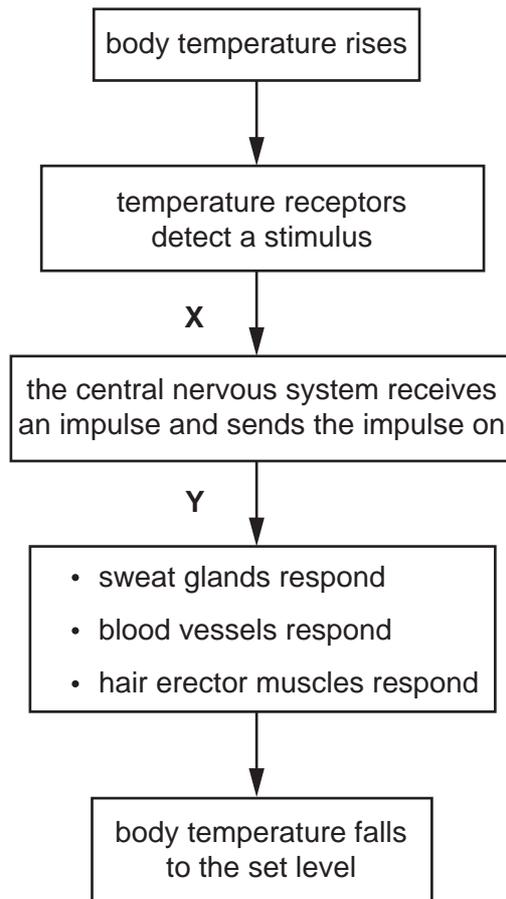


Fig. 6.1

(a) (i) State the names of the types of neurones at **X** and **Y** in Fig. 6.1.

X

Y

[2]

(ii) State the name of **one** effector shown in Fig. 6.1.

.....[1]

(iii) State the name of the mechanism that controls homeostasis which is represented by the flowchart in Fig. 6.1.

.....[1]

(b) (i) Describe how shunt vessels in the skin function to help cool the body when the body temperature is high.

.....
.....
.....
.....
.....
.....
.....
.....
.....[3]

(ii) Describe how the sweat glands and the hair erector muscles function in mammals when the external environment is hot.

.....
.....
.....
.....
.....
.....
.....
.....
.....[3]

(c) (i) Suggest an advantage of using neurones rather than hormones to regulate body temperature.

.....
.....
.....[1]

(ii) List **two** hormones that are involved in homeostasis.

1
2 [2]

[Total: 13]

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BIOLOGY

0610/51

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 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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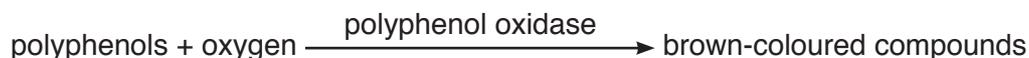
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2	
Total	

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- 1 Fruits such as apples and bananas contain chemicals called polyphenols. An enzyme, polyphenol oxidase, is also present. It catalyses a reaction which converts the polyphenols into brown-coloured compounds.

This reaction happens when the cells are damaged and exposed to oxygen in the air.



You are going to investigate the effect of pH on the enzyme polyphenol oxidase in apples.

Read all the instructions but DO NOT CARRY THEM OUT until you have drawn a table for your results in the space provided in 1(a)(i).

You should use the gloves and eye protection provided when you are carrying out the practical work.

- Step 1 Label five Petri dishes **A, B, C, D** and **E**.
- Step 2 Pour the water from the container labelled **water** into Petri dish **A**.
- Step 3 Pour the solution labelled **B** into the Petri dish labelled **B**.
- Step 4 Repeat step 3 for each of the solutions labelled **C, D** and **E** and the Petri dishes labelled **C, D** and **E**.
- Step 5 Dip the end of one piece of Universal Indicator paper into the solution in Petri dish **A**. Compare the colour of the indicator paper to the colour chart provided to identify the pH of the solution. Record the pH in your table in **1(a)(i)**.
- Step 6 Repeat step 5 for Petri dishes **B, C, D** and **E**.
- Step 7 Cut the apple provided in half vertically and remove the peel. Put the peel into the container labelled **waste**. When cutting, take care to cut downwards on to the white tile and away from your hands.
- Step 8 Cut five slices from the apple, avoiding the core. Each apple slice should be approximately 30 mm × 10 mm × 5 mm in size. Keep the rest of the apple for step 11.
- Step 9 On the white tile, chop one of the apple slices into small pieces and then use a spatula to crush the pieces to a pulp.

Chop and crush the four remaining apple slices. Keep each of the crushed apple slices separate from each other on the white tile, as shown in Fig. 1.1.

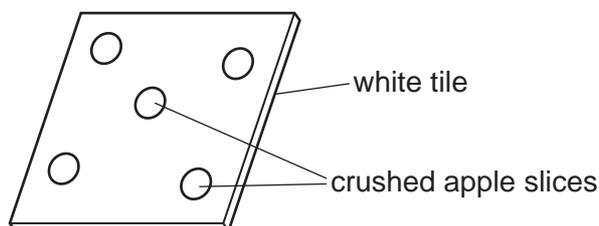


Fig. 1.1

- Step 10 Place one of the crushed apple slices into each of the solutions in Petri dishes **A, B, C, D** and **E**. Put the lids on the Petri dishes and leave them for two minutes.
- Step 11 If the cut surface of the rest of the apple has started to turn brown, cut the brown layer away. Cut another 30 mm × 10 mm × 5 mm slice. Chop and crush this apple slice in the same way as in step 9. Leave this crushed apple slice on the white tile and label it **control**.

Put any leftover apple into the container labelled **waste**.

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Step 12 Remove the lid of Petri dish **A** and carefully tilt the base so the liquid runs away from the crushed apple. Pour the liquid into the beaker labelled **waste liquid**. Make sure that the crushed apple does not fall into the waste liquid.

Do not replace the lid of the Petri dish.

Step 13 Repeat step 12 for each of the Petri dishes labelled **B, C, D** and **E**.

Step 14 Determine the colour intensity of the crushed apple in each Petri dish using the key shown in Table 1.1. Record the results in your table in **1(a)(i)**.

Step 15 Determine the colour intensity of the crushed apple in each Petri dish after 10 minutes and after 20 minutes. Record the results in your table in **1(a)(i)**. While you are waiting continue with the other questions.

Table 1.1

colour of crushed apple slice	no brown colour	light brown	dark brown
colour intensity value	1	2	3

(a) (i) Prepare a table to record your results.

Your table should include:

- the colour intensity value for the crushed apple slices
- the pH of each solution.

[6]

(ii) List the pH values from the most effective to the least effective in preventing the browning of the apple slices.

.....Need a home tutor? Visit smiletutor.sg [1]

(iii) State the purpose of the control set up in step 11.

.....

[1]

Table 1.2 shows the pH of some household products.

Table 1.2

household product	olive oil	lemon juice	milk	water	salt water	baking soda
pH	no value	2.0	6.6	7.0	7.6	9.0

(iv) Using the results of your investigation, suggest which of the household products in Table 1.2 could be used to treat cut apples to prevent them from going brown. Explain your choice.

household product

explanation

.....[2]

(b) (i) State **one** variable that has been kept constant in the investigation you have carried out. Describe how this variable has been kept constant.

variable

how it has been kept constant

.....[2]

(ii) Explain why the lids were not put back on to the Petri dishes after the solutions were poured away in steps 12 and 13.

.....

[1]

(c) Explain why the method used to find the colour intensity value for the crushed apple slices in step 14 is a source of error.

.....

[1]

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(d) Identify **one** source of error in steps 8, 9 or 10 and suggest an improvement for this error.

source of error

.....

improvement

.....

.....

[2]

(e) The enzyme polyphenol oxidase and the substrate polyphenol can be extracted from crushed apples. The substrate turns brown when the enzyme is present.

Some students were provided with extracts of the enzyme and the substrate.

Describe a method the students could use to find the optimum temperature of the enzyme.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[6]

(f) In another experiment, enzymes were extracted from two different fruits.

These enzyme extracts were heated at 65 °C for a total of 60 minutes.

During this time samples were removed every 15 minutes.

The samples were tested to find out how much enzyme activity remained.

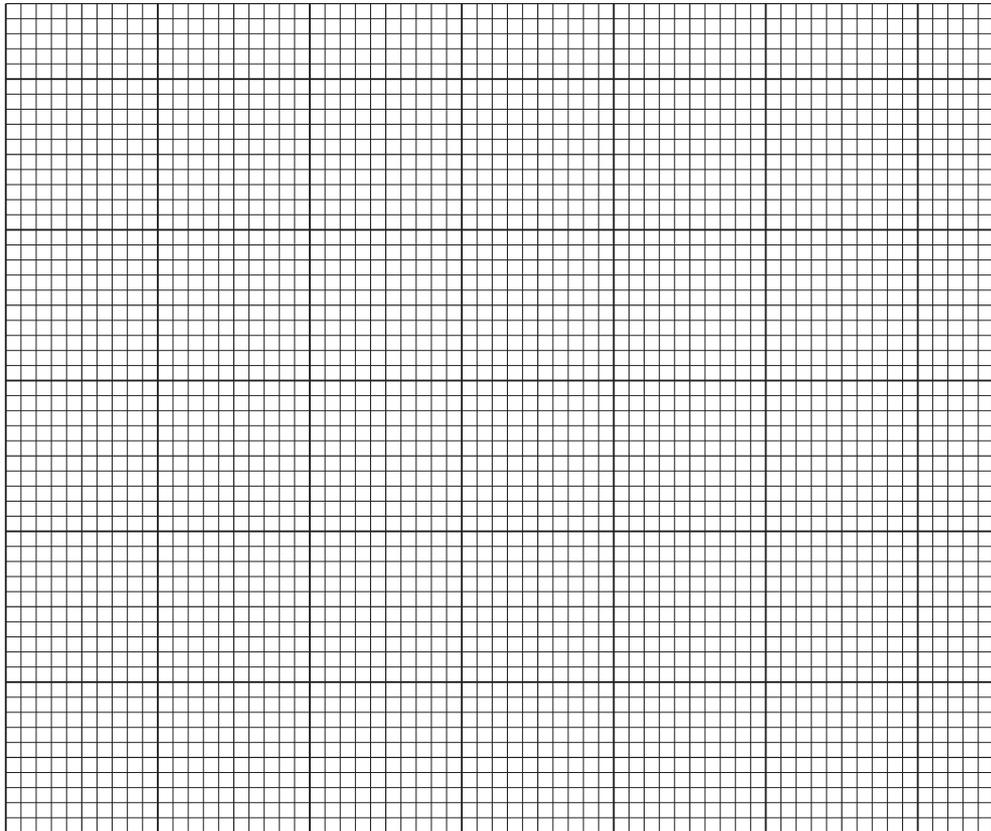
Table 1.3 shows the results of the experiment.

Table 1.3

sample time /min	percentage of enzyme activity remaining	
	apricot	avocado
0	100	100
15	5	40
30	0	25
45	0	20
60	0	10

(i) Plot a line graph on the grid of enzyme activity against sample time.

You should plot the data for the apricot and for the avocado.



[5]

(ii) State a conclusion for these results.

.....
.....
.....[1]

[Total: 28]

2 Fig. 2.1 is a photomicrograph of some blood cells.

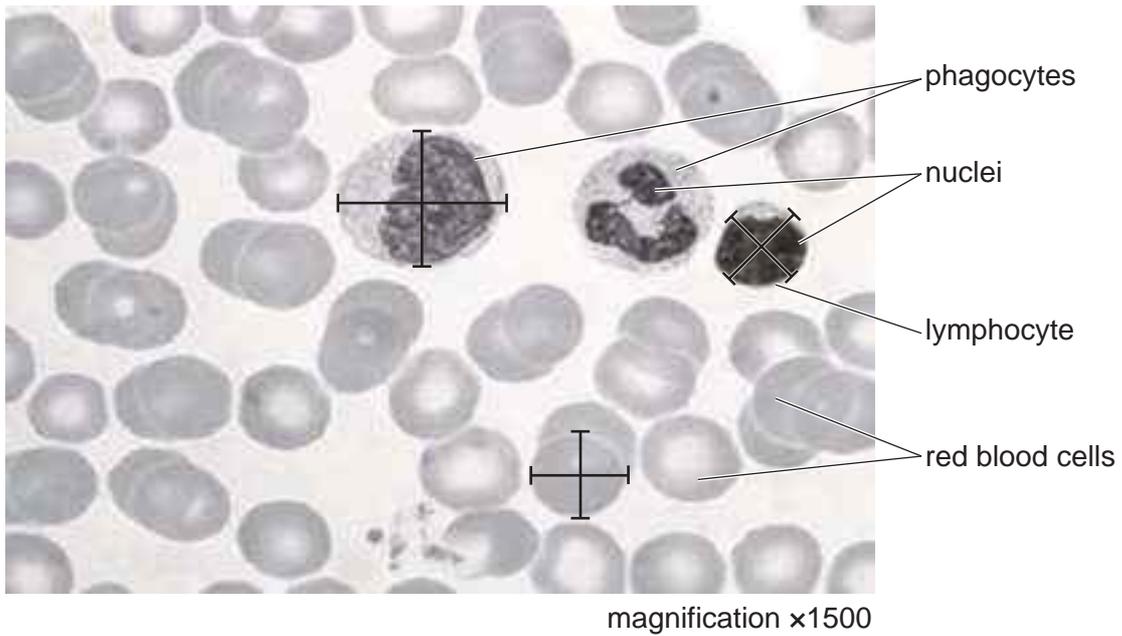


Fig. 2.1

(a) (i) State **two** visible differences between the red blood cells and the white blood cells (phagocytes and lymphocytes) in Fig. 2.1.

1

.....

2

.....

[2]

(ii) Make a large drawing of the two cells labelled **phagocytes** in Fig. 2.1.

- (b) (i) Measure the diameters of the three marked blood cells, along both the lines drawn on each of the cells, in Fig. 2.1. Record these measurements in Table 2.1.

Add the missing units to Table 2.1.

Calculate the average diameter for each type of blood cell and write your results in Table 2.1.

Table 2.1

type of blood cell	diameter 1 /.....	diameter 2 /.....	average diameter /.....
red blood cell			
lymphocyte			
phagocyte			

[3]

- (ii) Calculate the actual average diameter of the red blood cell using your answer in **2(b)(i)** and the following equation.

$$\text{magnification} = \frac{\text{average diameter of the red blood cell in Fig. 2.1}}{\text{actual average diameter of the red blood cell}}$$

Give your answer in micrometres (μm) to the nearest whole number. 1 mm = 1000 μm

Show your working.

..... μm
[3]

[Total: 12]

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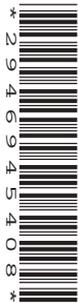
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BIOLOGY

0610/52

Paper 5 Practical Test

October/November 2017

1 hour 15 minutes

Candidates answer on the Question Paper.

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DO NOT WRITE IN ANY BARCODES.

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Electronic calculators may be used.
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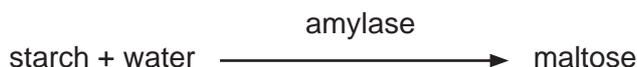
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [] at the end of each question or part question.

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This document consists of **11** printed pages and **1** blank page.

- 1 Starch is an important food source that is digested by the enzyme amylase to form the reducing sugar maltose.



You are going to investigate the effect of enzyme concentration on the rate of digestion of starch by amylase.

Read all the instructions but DO NOT CARRY THEM OUT until you have drawn a table for your results in the space provided in 1 (a)(i). Put on the gloves and eye protection provided before starting the practical work.

- Step 1 Label three test-tubes **A**, **B** and **C**.
- Step 2 Put 5 cm³ of starch solution into each of test-tubes **A**, **B** and **C**.
- Step 3 Label another three test-tubes **A1**, **B1** and **C1**.
- Step 4 Put 1 cm³ of 3% amylase solution into test-tube **A1**.
Put 1 cm³ of 2% amylase solution into test-tube **B1**.
Put 1 cm³ of 1% amylase solution into test-tube **C1**.
- Step 5 Place all six test-tubes into a water-bath at 60 °C and leave for three minutes.
- Raise your hand when you are ready for hot water.

You will need to maintain the temperature of the water-bath between 55–60 °C during the whole experiment. Raise your hand for more hot water if needed.

- Step 6 Use a marker pen to divide a dry white tile into three sections and label them **A**, **B** and **C** as shown in Fig. 1.1.
- Step 7 Drop iodine solution onto the tile to form two rows of 8 drops approximately the same distance apart, in each of the sections **A**, **B** and **C** as shown in Fig. 1.1.

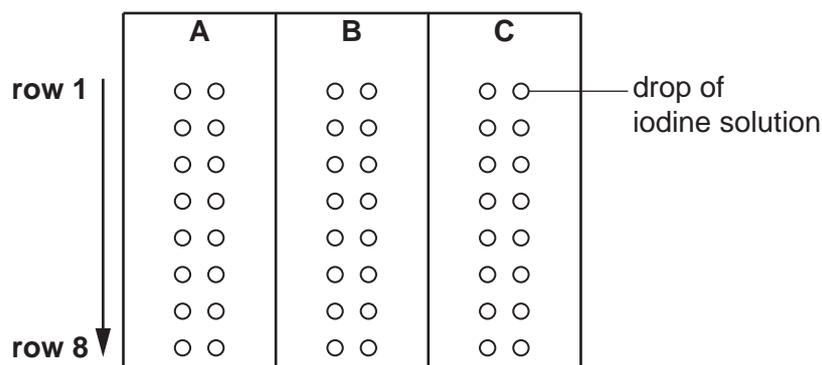


Fig. 1.1

- Step 8 Dip a glass rod into the starch solution in test-tube **A** to remove some of the solution. Then touch the glass rod onto the surface of the first drop and then the second drop of iodine solution in row 1 on the section of the tile labelled **A**. Rinse and dry the glass rod.
- Step 9 Repeat Step 8 using the amylase solution in test-tube **A1** and the drops of iodine solution in row 2 on the section of the tile labelled **A**.

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- Step 10 Start a timer. Add the amylase solution in test-tube **A1** to the contents of test-tube **A**. Stir the mixture with a glass rod and **immediately** remove some of the mixture using the glass rod and touch it onto the surface of the first drop and then the second drop of iodine solution in row **3** on the section of the tile labelled **A**. Rinse and dry the glass rod.
- Step 11 After **one** minute use the glass rod to remove some of the mixture from test-tube **A** and touch it onto the first drop and then the second drop of iodine solution in row **4** on the section of the tile labelled **A**. Rinse and dry the glass rod.
- Step 12 Repeat step 11 for another **four** minutes or until all the starch has been digested. If starch was still present in row 8, record this in your table as > 5 minutes.
- Step 13 Repeat steps 8 to 12 for test-tubes **B** and **B1**.
- Step 14 Repeat steps 8 to 12 for test-tubes **C** and **C1**.

(a) (i) Prepare a table to record your results.

The table should include:

- the concentration of the amylase solution
- the **time** taken for all the starch to be digested for each enzyme concentration.

Record your results in your table as you carry out the practical work.

[5]

(ii) Describe how you decided the time at which all the starch had been digested by the amylase.

.....
.....[1]

(iii) The starch has been digested into simple (reducing) sugars. Describe how you could test the liquid in the test-tubes to show they contain reducing sugars.

.....
.....
.....
.....[2]

(b) (i) State **one** variable that has been kept constant in the investigation you have carried out. Describe how this variable has been kept constant.

variable

how it has been kept constant

.....[2]

(ii) Explain why all the test-tubes were left in the water-bath for three minutes before the enzyme was added to the starch.

.....
.....
.....[1]

(iii) Explain why step 9 was carried out before mixing the enzyme and starch together.

.....
.....
.....[1]

(c) (i) Identify **two** sources of error in the method used in steps 10, 11 and 12.

1

.....

2

.....[2]

(ii) For **one** of the errors you identified in (c)(i), describe how the method could be improved to reduce the error.

.....

.....

.....[1]

- (d) In another experiment some students made starch agar that contained 100 mg per cm^3 of starch.

The starch agar was stained using iodine and was then cut into blocks that measured $2 \text{ cm} \times 3 \text{ cm} \times 0.5 \text{ cm}$.

- (i) Calculate the total mass of starch in each of the blocks of starch agar.

Show your working.

..... mg
[3]

Six small beakers containing 20 cm^3 of 5% amylase solution were placed in water-baths at different temperatures. One of the blocks containing starch from (d)(i) was placed into each of the beakers.

The time taken for all the starch to disappear was measured.

The results of the experiment are shown in Table 1.1.

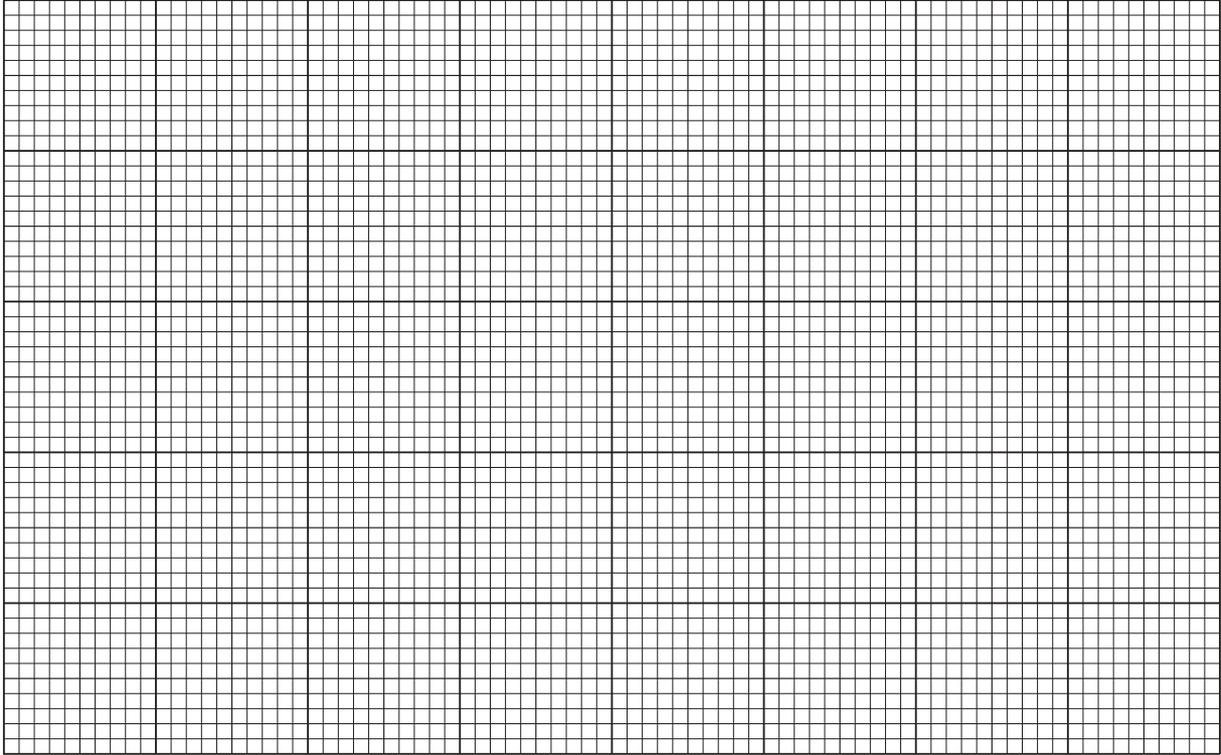
Table 1.1

temperature/ $^{\circ}\text{C}$	time taken for starch to disappear/s	rate of reaction /mg per s
20	1500	0.2
30	375	0.8
40	200	1.5
50	125	2.4
60	65	4.6
70	88	

- (ii) Complete Table 1.1 by writing in the rate of reaction at 70°C .

[1]

(iii) Plot a graph on the grid to show the effect of temperature on the rate of reaction.



[4]

[Total: 23]

- 2 Fig. 2.1 is a photomicrograph of the epidermis of a leaf. It shows epidermal cells, guard cells and stomata.

Each stoma is surrounded by two guard cells containing chloroplasts.

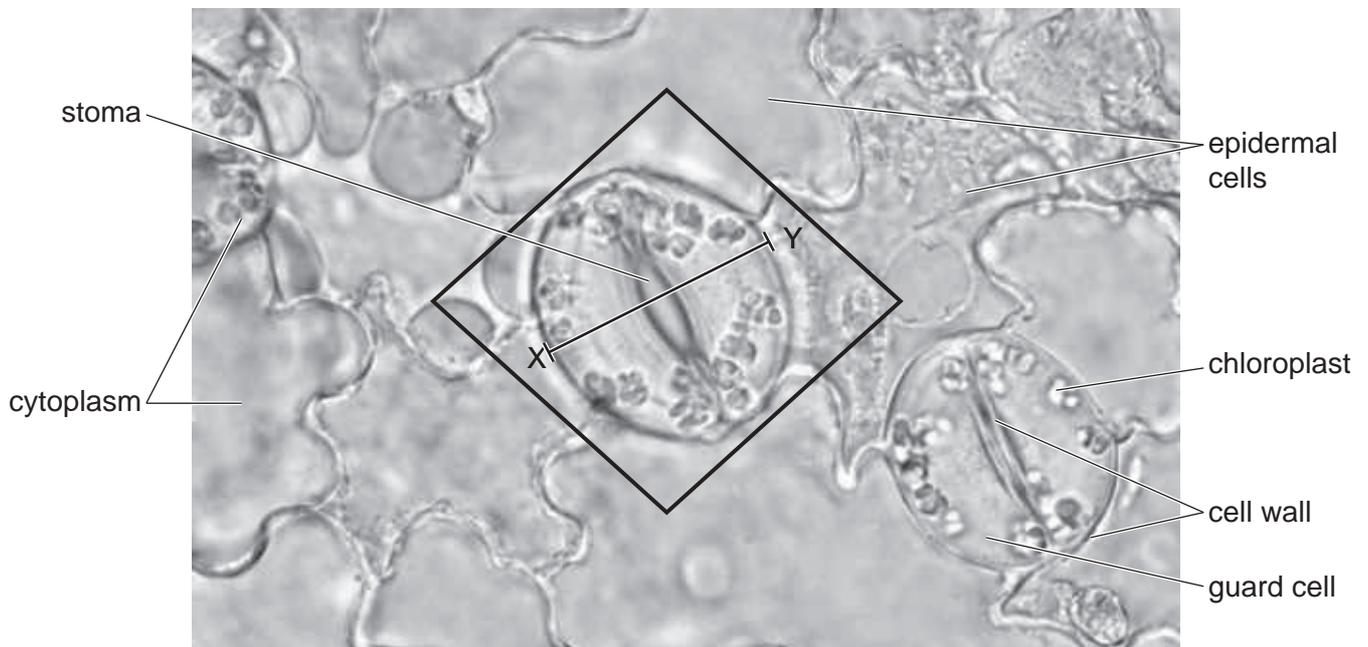


Fig. 2.1

- (a) (i) Complete Table 2.1 to show **two** visible differences between epidermal cells and guard cells.

Table 2.1

feature	epidermal cell	guard cell

[2]

- (ii) Make a large drawing of the two guard cells and the stoma shown inside the box on Fig. 2.1.

[4]

- (b) Measure the total width of the guard cells and stoma along the line **XY** on Fig. 2.1. Include the units.

Total width of the guard cells and stoma on Fig. 2.1

Draw a line **on your drawing** in the same position as the line **XY**.

Measure width of the guard cells and stoma on your drawing. Include the units.

Total width of the guard cells and stoma on your drawing

Calculate the magnification of your drawing using the formula:

$$\text{magnification} = \frac{\text{width on your drawing}}{\text{width on Fig. 2.1}}$$

Show your working and give your answer to the nearest whole number.

.....
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(c) Fig. 2.2 shows the rate of water gain by absorption and the rate of water loss by transpiration in a plant during a 24-hour period on a hot sunny day.

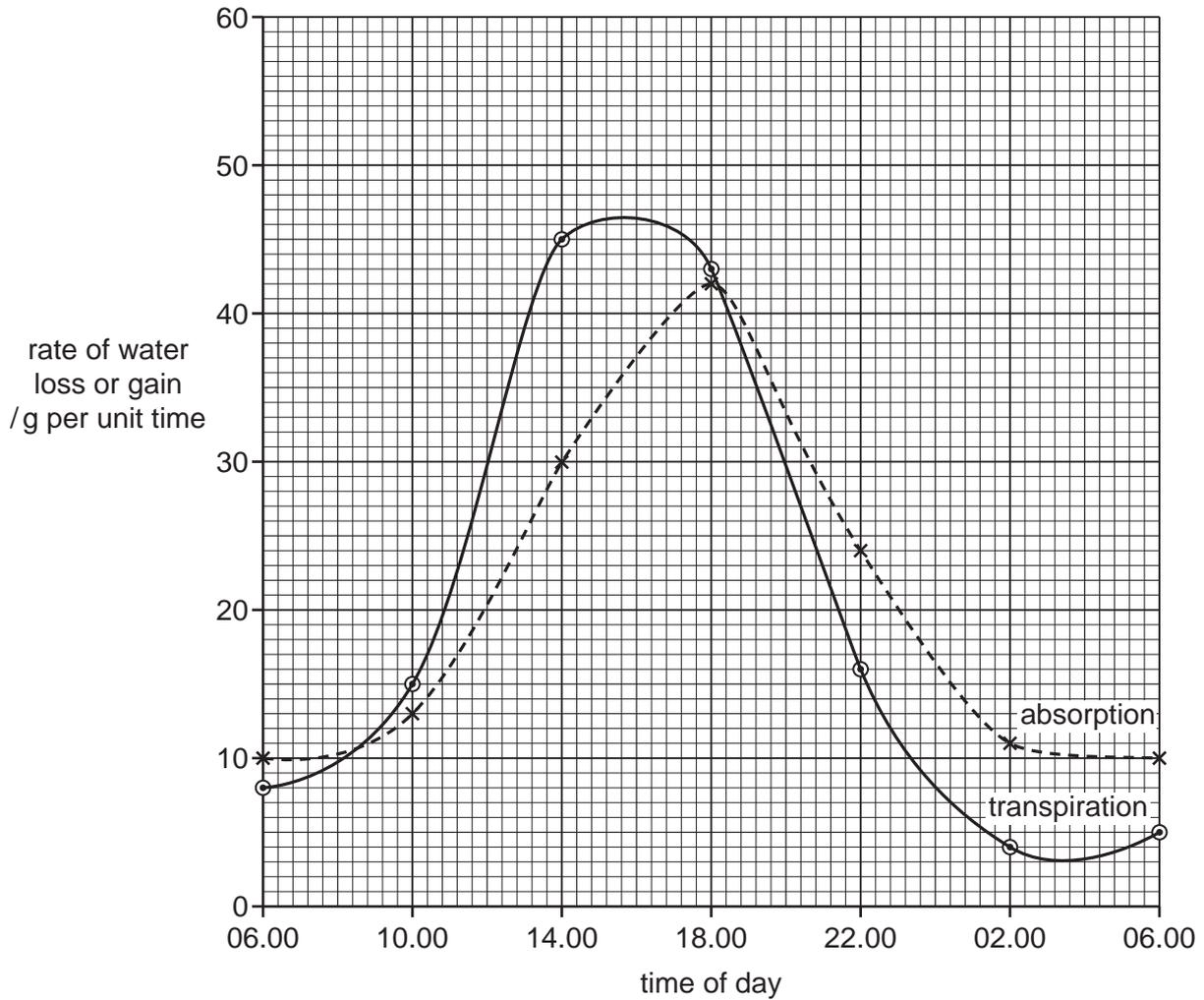


Fig. 2.2

Compare the trends shown in Fig. 2.2 for absorption and transpiration of water during the 24-hour period.

.....

.....

.....

.....[2]

(d) Fig. 2.3 shows the apparatus used to measure water uptake by a leafy shoot. The leafy shoot is sealed tightly into a glass tube which is connected to a capillary tube containing water.

As the leafy shoot loses water through its leaves it absorbs water from the apparatus. Air is pulled into the open end of the capillary tube as the water moves towards the leafy shoot.

The distance moved by the air in the capillary tube can be measured on the scale and used to calculate the volume of water absorbed by the leafy shoot.

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BIOLOGY

0610/53

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 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 **10** printed pages and **2** blank pages.

You should wear the eye protection provided during the practical work in question 1.

- 1 Citrus fruits, such as oranges, contain sugars. You are going to investigate the simple (reducing) sugar content of three different citrus fruits.

Read all the instructions but **DO NOT CARRY THEM OUT** until you have drawn a table for your results in the space provided in **1(a)(ii)**.

Step 1 You are provided with samples of three different types of fruit. Take three separate beakers and label these with the names of the fruits you have been given. Record the names of the fruits in Table 1.1 in **1(a)(i)**.

Step 2 Squeeze the juice from one type of fruit into the labelled beaker.

Step 3 Repeat step 2 with the other two types of fruit.

Step 4 Use the measuring cylinder to measure the volume of juice you have extracted from each type of fruit and record this in Table 1.1 in **1(a)(i)**. Pour the fruit juice back into the labelled beaker when you have finished measuring it.

Rinse the measuring cylinder with the **washing water** after each measurement.

If you have less than 5 cm³ of each juice raise your hand to obtain more fruit and repeat step 2.

(a) (i)

Table 1.1

	type of fruit	volume of juice / cm ³
1		
2		
3		

[1]

Step 5 Label three large test-tubes **1, 2, and 3**.

Step 6 Add 2 cm³ of the juice from fruit **1** to large test-tube **1**.

Step 7 Add 2 cm³ of **reducing sugar test solution** to large test-tube **1** and place it in the empty beaker labelled **water-bath**. Record the colour of the solution in large test-tube **1** in your table in **1(a)(ii)**.

Step 8 Repeat step **6** and step **7** with the juice from fruit **2** and the juice from fruit **3**.

Step 9 You are now going to add hot water to the beaker labelled **water-bath**. Raise your hand when you are ready for hot water. Leave the large test-tubes in the water-bath for 10 minutes.

During this time continue with the rest of the questions.

Step 10 After 10 minutes record the colour observed in large test-tubes **1, 2 and 3** in your table in **1(a)(ii)**. Need a home tutor? Visit smiletutor.sg

(ii) Prepare a table to record your results.

[4]

(iii) State the name of the solution used to test for reducing sugars.

.....[1]

(iv) State which fruits contain reducing sugars.

.....[1]

(v) Explain why it was necessary to record the colour of the reducing sugar test solution and fruit juice mixture **before** heating.

.....
.....
.....[1]

(b) State **one** variable that has been kept constant in the investigation you have carried out.

Describe how this variable has been kept constant.

variable

how it has been kept constant

.....
.....

[2]

(c) Identify **two** sources of error in the method.

For each of these errors, describe how the method could be improved to reduce the error.

error

improvement

.....
.....

error

improvement

.....
.....

[4]

(d) Describe a test that could be used to determine if the fruits you have tested contain protein.

.....
.....

.....
.....

[2]

(f) You are provided with a slice of orange.

Draw a large diagram of the slice of orange.

[4]

[Total: 26]

- 2 Hormones are involved in tropic responses in plants, such as gravitropism and phototropism. Auxin is a plant growth hormone.

A student investigated the length of roots from seedlings grown in different concentrations of auxin.

The student measured the root length of five of the seedlings grown in each concentration of auxin.

Table 2.1 shows the results.

Table 2.1

percentage concentration of auxin	root length / mm					average root length / mm
	1	2	3	4	5	
0.0	15	16	18	14	15	15.6
0.2	18	17	19	20	18	
0.4	24	21	22	22	23	22.4
0.6	17	16	18	17	19	17.4
0.8	13	12	14	5	12	11.2
1.0	12	10	10	12	11	11.0

- (a) (i) Calculate the missing average value from the Table 2.1.

Show your working and give your answer to one decimal place in Table 2.1.

[2]

- (ii) Scientists do not include anomalous data in their average calculations.

One of the pieces of data in Table 2.1 is not consistent with the other results for that concentration. This means it is anomalous.

Circle the anomalous data in Table 2.1.

Calculate the correct average for this concentration of auxin, excluding the anomalous data. Give your answer to one decimal place.

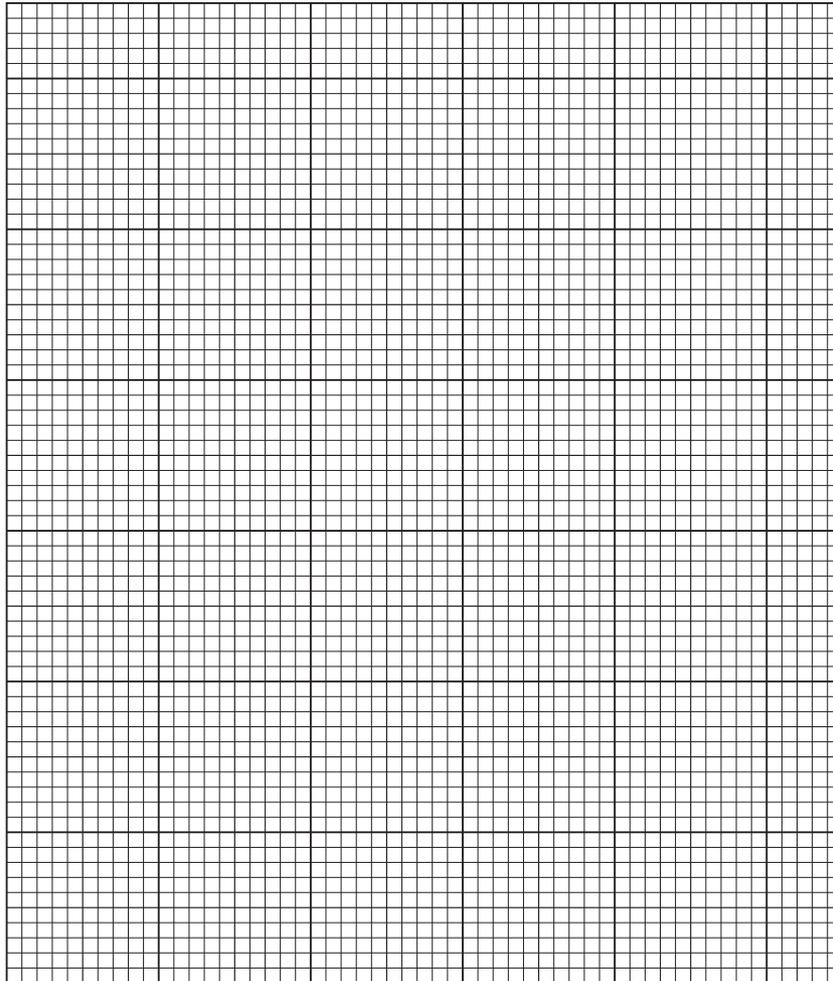
Space for working.

.....mm

[2]

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(iii) Plot a graph on the grid to show the effect of auxin concentration on the average root length.



[4]

(iv) Describe the pattern shown by the data in your graph.

.....

.....

.....

.....

.....

.....

.....[3]

(b) Fig. 2.1 shows the root tip of a poppy seedling.



magnification $\times 120$

Fig. 2.1

Measure the length of the line **MN** on Fig. 2.1. Include the unit.

length of **MN**

Calculate the actual size of the root tip at **MN** using the formula. Include the unit in your answer.

$$\text{magnification} = \frac{\text{length of } \mathbf{MN} \text{ on Fig. 2.1}}{\text{actual size of } \mathbf{MN}}$$

Space for working.

.....
[3]

[Total: 14]

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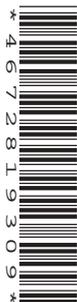
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BIOLOGY

0610/61

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.

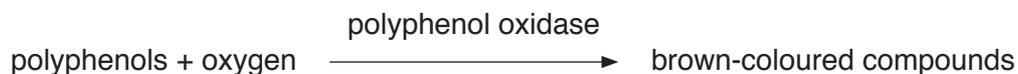
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- 1 Fruits such as apples and bananas contain chemicals called polyphenols. An enzyme, polyphenol oxidase, is also present. It catalyses a reaction which converts the polyphenols into brown-coloured compounds.

This reaction happens when the cells are damaged and exposed to oxygen in the air.



Some students investigated the effect of pH on the enzyme polyphenol oxidase in apples.

The students were provided with one apple, distilled water and four solutions labelled **B**, **C**, **D** and **E**. Each solution had a different pH.

- Step 1 Five Petri dishes were labelled **A**, **B**, **C**, **D** and **E**.
- Step 2 20 cm³ of distilled water was added to Petri dish **A**.
- Step 3 20 cm³ of solution **B** was poured into the Petri dish labelled **B**.
- Step 4 Step 3 was repeated using solutions **C**, **D** and **E** and the Petri dishes labelled **C**, **D** and **E**.
- Step 5 Universal Indicator paper and a pH colour chart were used to find the pH of each of the solutions in the five Petri dishes.
- Step 6 Six slices were cut from an apple and put on to separate white tiles. The apple slices were cut to approximately the same size.
- Step 7 Each apple slice was chopped into small pieces and then crushed with a spatula.
- Step 8 One of the crushed apple slices was put into each of the solutions in Petri dishes **A**, **B**, **C**, **D** and **E**. A lid was put on to each of the Petri dishes and they were left for two minutes.
- Step 9 The crushed apple from the remaining slice was left uncovered, on the white tile and was labelled **control**.
- Step 10 The lid of Petri dish **A** was removed and the liquid was poured away, leaving only the crushed apple in the Petri dish. **The Petri dish lid was not replaced.**
- Step 11 Step 10 was repeated for Petri dishes **B**, **C**, **D** and **E**.
- Step 12 The students looked at the colour of the crushed apple slice in each Petri dish at 0 minutes, 10 minutes and 20 minutes.

The students used the key shown in Table 1.1 to identify the colour intensity value for each crushed apple slice.

Table 1.1

colour of the crushed apple slice	no brown colour	light brown	dark brown
colour intensity value	1	2	3

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Fig. 1.1 shows the students' results.

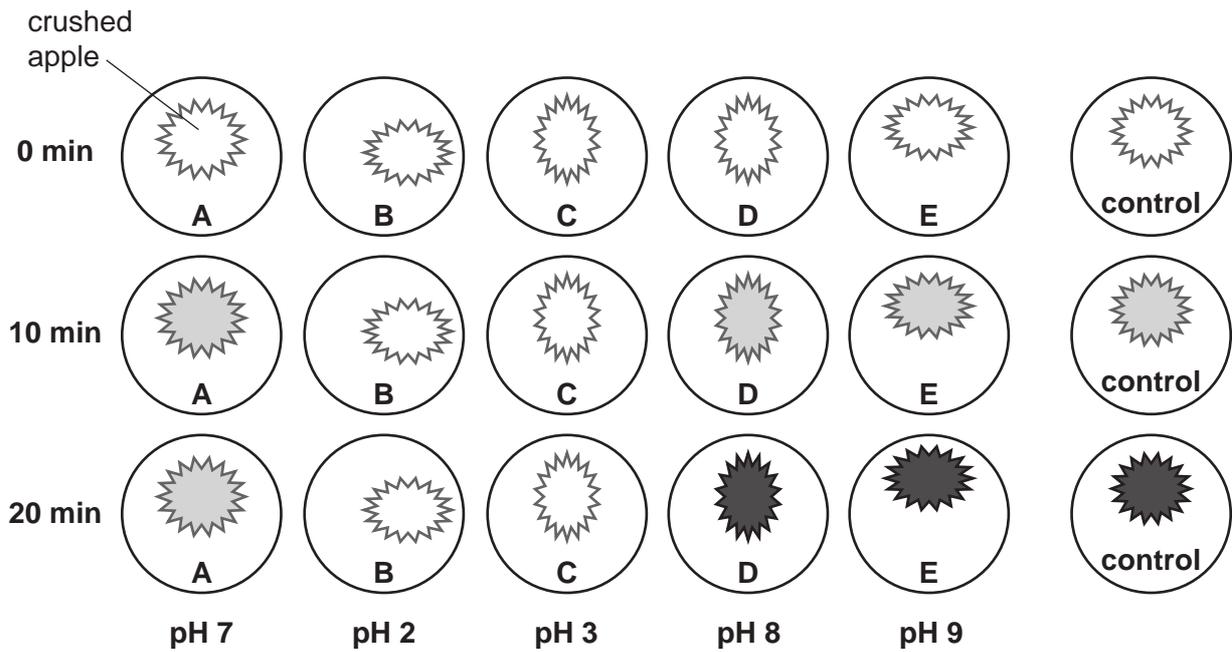


Fig. 1.1

(a) (i) Prepare a table to record the results.

Your table should include:

- the colour intensity value for the crushed apple slices
- the pH of each solution.

[5]

(ii) List the pH values from the most effective to the least effective in preventing the browning of the apple.

.....Need a home tutor? Visit smiletutor.sg [1]

(iii) State the purpose of the control set up in step 9.

.....

 [1]

Table 1.2 shows the pH of some household products.

Table 1.2

household product	olive oil	lemon juice	milk	water	salt water	baking soda
pH	no value	2.0	6.6	7.0	7.6	9.0

(iv) Suggest which of the household products in Table 1.2 should be used to prevent cut apples from going brown. Explain your choice.

household product

explanation

..... [2]

(b) (i) State **one** variable that was kept constant in the investigation described.

Describe how this variable was kept constant.

variable

how it was kept constant

..... [2]

(ii) Explain why the lids were not put back on to the Petri dishes after the solutions were poured away in steps 10 and 11.

.....

 [1]

(iii) State the main hazard in steps 6 and 7 and describe how to reduce the risk of this hazard.

.....

 [1]

Need a home tutor? Visit smiletutor.sg [1]

(c) Explain why the method used to find the colour intensity value for the crushed apple slices in step 12 is a source of error.

.....
.....
..... [1]

(d) Identify **one** source of error in steps 6, 7 or 8 and suggest an improvement for this error.

source of error

.....

improvement

.....

..... [2]

(e) The enzyme polyphenol oxidase and the substrate polyphenol can be extracted from crushed apples. The substrate turns brown when the enzyme is present.

Some students were provided with extracts of the enzyme and the substrate.

Describe a method the students could use to find the optimum temperature of the enzyme.

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..... [6]

(f) In another experiment, enzymes were extracted from two different fruits.

These enzyme extracts were heated at 65 °C for a total of 60 minutes.

During this time samples were removed every 15 minutes.

The samples were tested to find out how much enzyme activity remained.

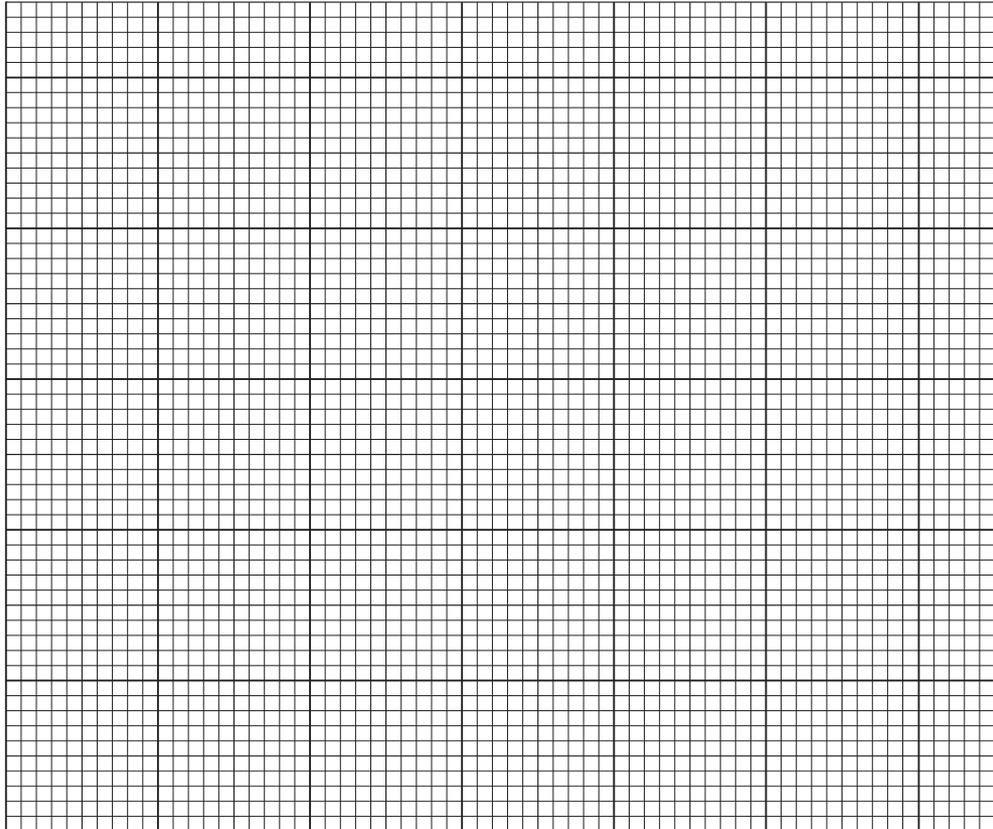
Table 1.3 shows the results of the experiment.

Table 1.3

sample time /min	percentage of enzyme activity remaining	
	apricot	avocado
0	100	100
15	5	40
30	0	25
45	0	20
60	0	10

(i) Plot a line graph on the grid of enzyme activity against sample time.

You should plot the data for the apricot and for the avocado.



[5]

(ii) State a conclusion for these results.

.....
.....
..... [1]

[Total: 28]

2 Fig. 2.1 is a photomicrograph of some blood cells.

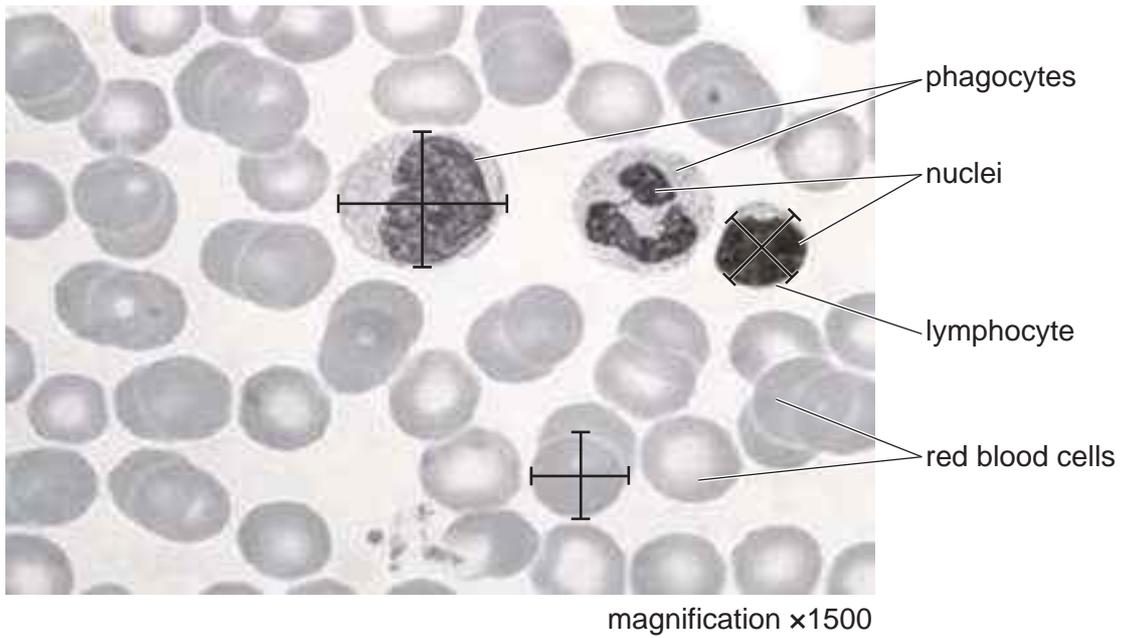


Fig. 2.1

(a) (i) State **two** visible differences between the red blood cells and the white blood cells (phagocytes and lymphocytes) in Fig. 2.1.

- 1
-
- 2
-

[2]

(ii) Make a large drawing of the two cells labelled **phagocytes** in Fig. 2.1.

- (b) (i) Measure the diameters of the three marked blood cells, along both the lines drawn on each of the cells, in Fig. 2.1. Record these measurements in Table 2.1.

Add the missing units to Table 2.1.

Calculate the average diameter for each type of blood cell and write your results in Table 2.1.

Table 2.1

type of blood cell	diameter 1 /	diameter 2 /	average diameter /
red blood cell			
lymphocyte			
phagocyte			

[3]

- (ii) Calculate the actual average diameter of the red blood cell using your answer in 2(b)(i) and the following equation.

$$\text{magnification} = \frac{\text{average diameter of the red blood cell in Fig. 2.1}}{\text{actual average diameter of the red blood cell}}$$

Give your answer in micrometres (μm) to the nearest whole number. 1 mm = 1000 μm

Show your working.

..... μm
[3]

[Total: 12]

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BIOLOGY

0610/62

Paper 6 Alternative to Practical

October/November 2017

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

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Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

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Electronic calculators may be used.

You may lose marks if you do not show your working or if you do not use appropriate units.

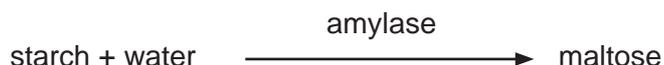
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This document consists of **11** printed pages and **1** blank page.

- 1 Starch is an important food source that is digested by the enzyme amylase to form the reducing sugar maltose.



Some students investigated the effect of enzyme concentration on the rate of digestion of starch.

- Step 1 Three test-tubes were labelled **A**, **B** and **C**.
- Step 2 5 cm³ of starch solution was put into each of test-tubes **A**, **B** and **C**.
- Step 3 Another three test-tubes were labelled **A1**, **B1** and **C1**.
- Step 4 1 cm³ of 3% amylase solution was put into test-tube **A1**.
1 cm³ of 2% amylase solution was put into test-tube **B1**.
1 cm³ of 1% amylase solution was put into test-tube **C1**.
- Step 5 All six test-tubes were placed into a water-bath at 60 °C for three minutes.
- Step 6 A white tile was divided into three sections and labelled **A**, **B** and **C** as shown in Fig. 1.1.
- Step 7 Iodine solution was dropped onto the tile to form two rows of 10 drops approximately the same distance apart, in each of the sections **A**, **B** and **C** as shown in Fig. 1.1.

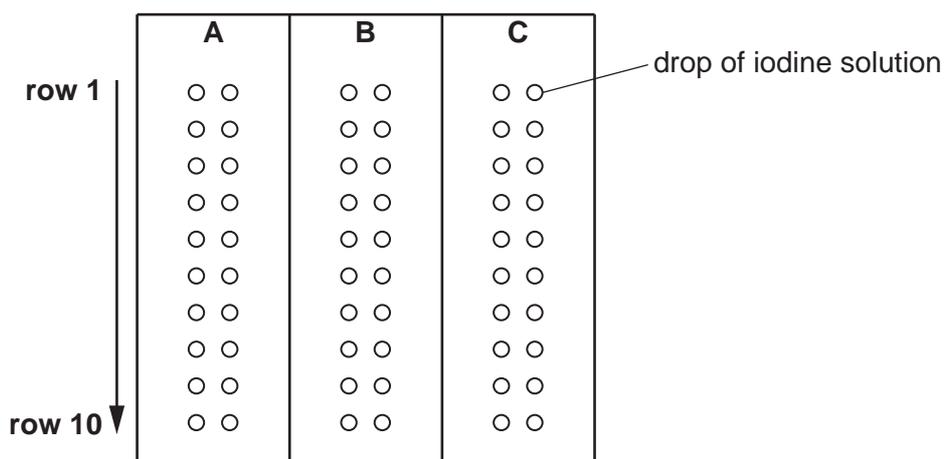


Fig. 1.1

- Step 8 A glass rod was dipped into the starch solution in test-tube **A** to remove some of the solution. The glass rod was then touched onto the surface of the first drop and then the second drop of iodine solution in row **1** on the section of the tile labelled **A**. The glass rod was rinsed and dried.
- Step 9 Step **8** was repeated using the amylase solution in test-tube **A1** and the drops of iodine solution in row **2** on the section of the tile labelled **A**.
- Step 10 A timer was started and the amylase solution in test-tube **A1** was poured into test-tube **A**.

The mixture of starch and amylase in test-tube **A** was stirred with a glass rod and then some of the mixture was **immediately** removed using the glass rod.

The glass rod was then touched onto the surface of the first drop and then the second drop of iodine solution in row **3** on the section of the tile labelled **A**. The glass rod was rinsed and dried.

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Step 11 After **one** minute the glass rod was used to remove some of the mixture from test-tube **A** and touched onto the first drop and then the second drop of the iodine solution in row **4** on the section of the tile labelled **A**. The glass rod was rinsed and dried.

Step 12 Step 11 was repeated for **six more** minutes.

Step 13 Steps 8 to 12 were repeated for test-tubes **B** and **B1**.

Step 14 Steps 8 to 12 were repeated for test-tubes **C** and **C1**.

Fig. 1.2 shows the students' results.

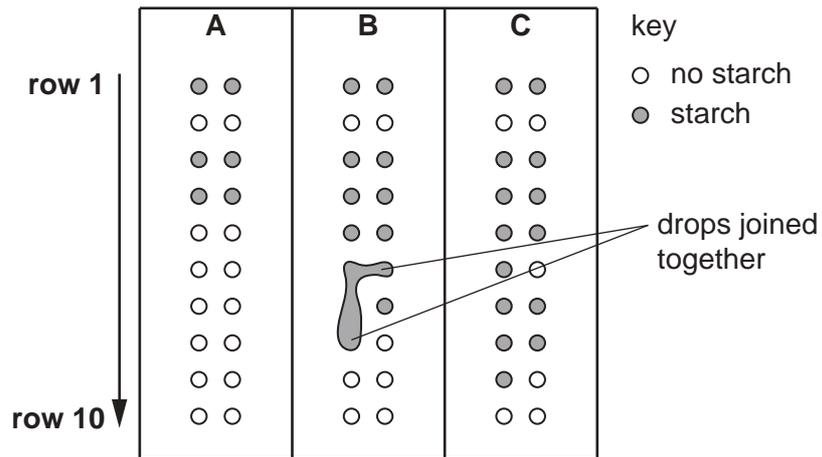


Fig. 1.2

(a) (i) Prepare a table to record the students' results.

The table should include:

- the concentration of the amylase solution
- the time taken for all the starch to be digested for each amylase concentration.

(ii) Explain why the students' results are not reliable.

.....
.....
.....[1]

(iii) The starch was digested into simple (reducing) sugars. Describe how you could test the liquid in the test-tubes to show they contain reducing sugars.

.....
.....
.....[2]

(b) (i) State **one** variable that was kept constant in this investigation.

Describe how this variable was kept constant.

variable

how it was kept constant

.....[2]

(ii) Explain why all the test-tubes were left in the water-bath for three minutes before the amylase was added to the starch.

.....
.....
.....[1]

(iii) Explain why step 9 was carried out before mixing the amylase and starch together.

.....
.....
.....[1]

(c) (i) Identify **two** sources of error in steps 10, 11 and 12.

1

.....

2

.....

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(ii) For **one** of the errors you identified in (c)(i), describe how the method could be improved to reduce the error.

.....
.....
.....[1]

- (d) In another experiment some students made starch agar that contained 100 mg per cm^3 of starch.

The starch agar was stained using iodine and was then cut into blocks that measured $2\text{ cm} \times 3\text{ cm} \times 0.5\text{ cm}$.

- (i) Calculate the total mass of starch in each of the blocks of starch agar.

Show your working.

.....mg
[3]

Six small beakers containing 20 cm^3 of 5% amylase solution were placed in water-baths at different temperatures. One of the blocks containing starch from (d)(i) was placed into each of the beakers.

The time taken for all the starch to disappear was measured.

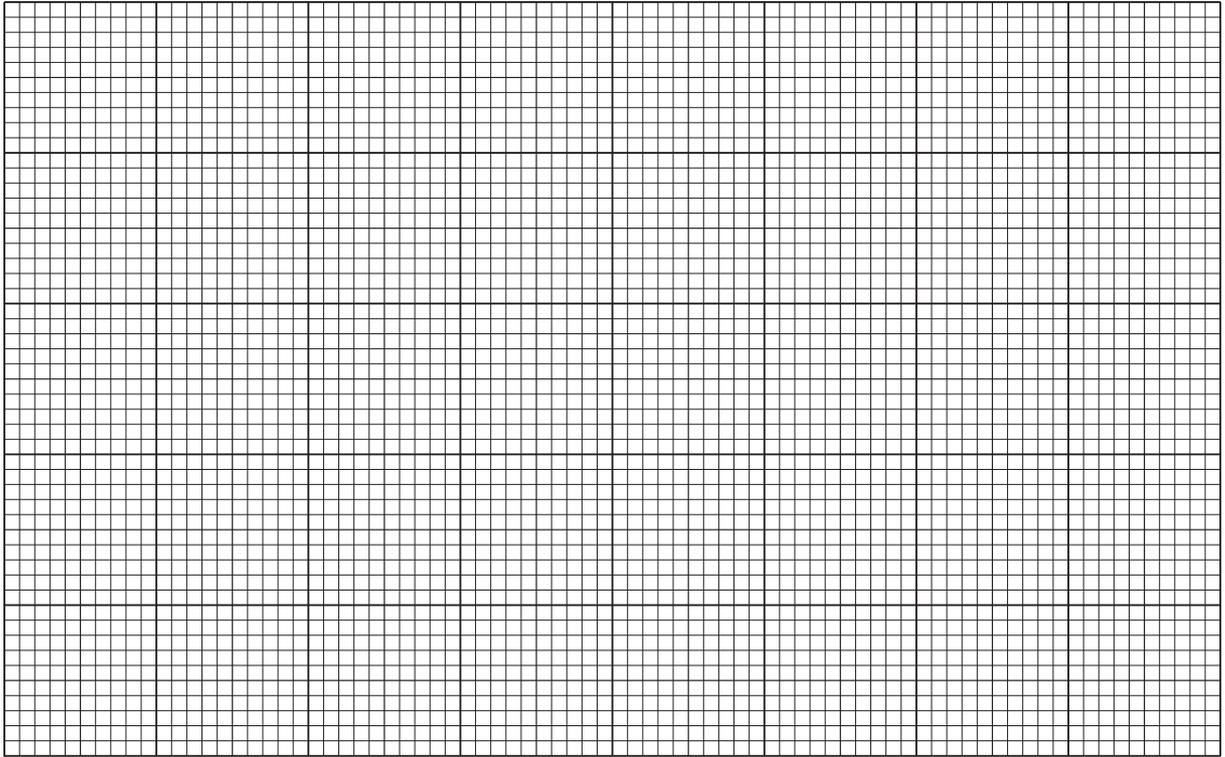
The results of the experiment are shown in Table 1.1.

Table 1.1

temperature/ $^{\circ}\text{C}$	time taken for starch to disappear/s	rate of reaction /mg per s
20	1500	0.2
30	375	0.8
40	200	1.5
50	125	2.4
60	65	4.6
70	88	

- (ii) Complete Table 1.1 by writing in the rate of reaction at 70°C . [1]

(iii) Plot a graph on the grid to show the effect of temperature on the rate of reaction.



[4]

[Total: 23]

- 2 Fig. 2.1 is a photomicrograph of the epidermis of a leaf. It shows epidermal cells, guard cells and stomata.

Each stoma is surrounded by two guard cells containing chloroplasts.

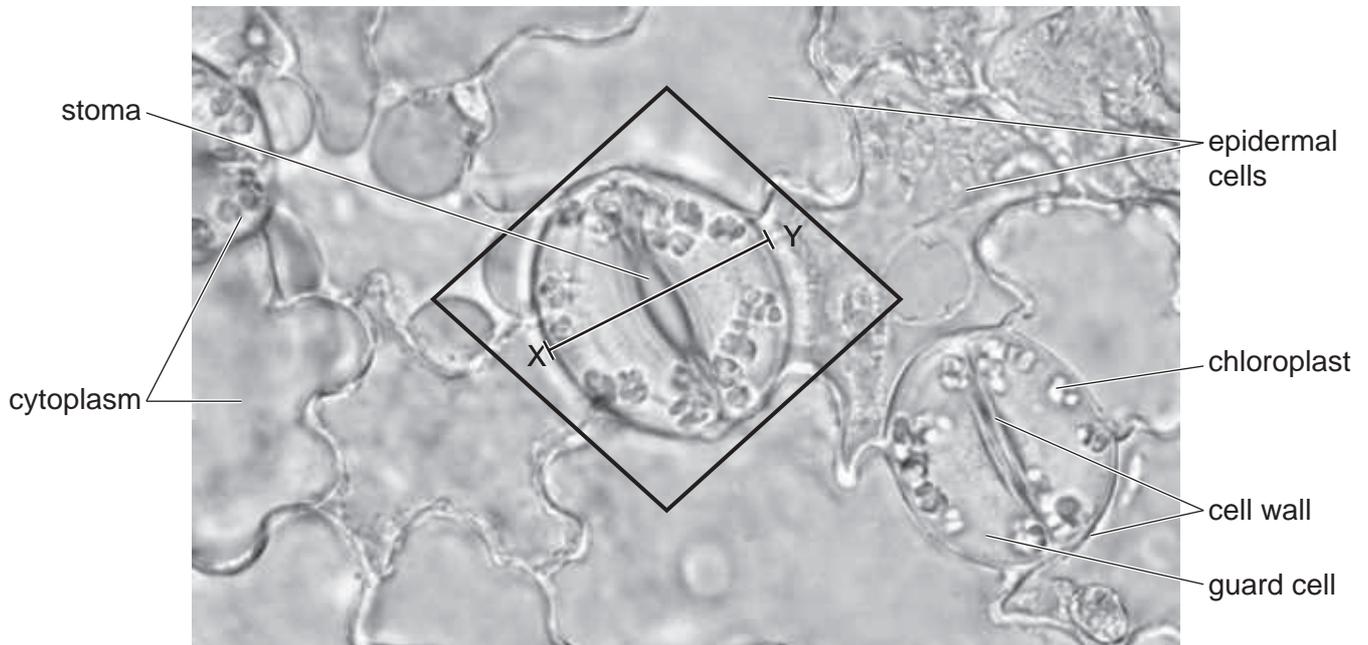


Fig. 2.1

- (a) (i) Complete table 2.1 to show **two** visible differences between epidermal cells and guard cells.

feature	epidermal cell	guard cell

[2]

- (ii) Make a large drawing of the two guard cells and the stoma shown inside the box on Fig. 2.1.

[4]

- (b) Measure the total width of the guard cells and stoma along the line **XY** on Fig. 2.1. Include the units.

Total width of the guard cells and stoma on Fig. 2.1

Draw a line **on your drawing** in the same position as the line XY.

Measure the width of the guard cells and stoma on your drawing. Include the units.

Total width of the guard cells and stoma on your drawing

Calculate the magnification of your drawing using the formula:

$$\text{magnification} = \frac{\text{width on your drawing}}{\text{width on Fig. 2.1}}$$

Show your working and give your answer to the nearest whole number.

.....
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(c) Fig. 2.2 shows the rate of water gain by absorption and the rate of water loss by transpiration in a plant during a 24-hour period on a hot sunny day.

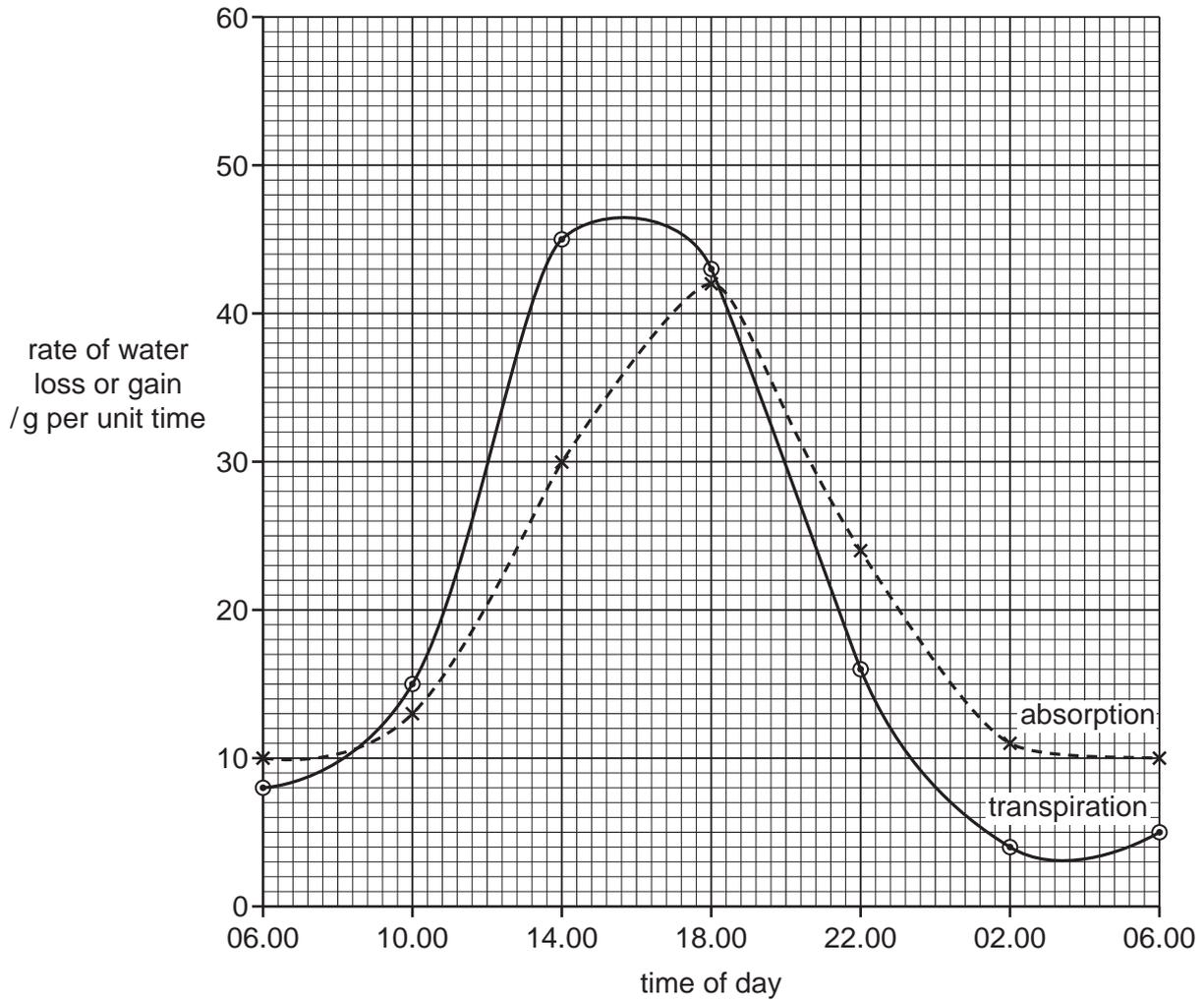


Fig. 2.2

Compare the trends shown in Fig. 2.2 for the absorption and transpiration of water during the 24-hour period.

.....

.....

.....

.....[2]

(d) Fig. 2.3 shows the apparatus used to measure water uptake by a leafy shoot. The leafy shoot is sealed tightly into a glass tube which is connected to a capillary tube containing water.

As the leafy shoot loses water through its leaves it absorbs water from the apparatus. Air is pulled into the open end of the capillary tube as the water moves towards the leafy shoot.

The distance moved by the air in the capillary tube can be measured on the scale and used to calculate the volume of water absorbed by the leafy shoot.

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Cambridge International General Certificate of Secondary Education

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NUMBER

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BIOLOGY

0610/63

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.

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This document consists of **10** printed pages and **2** blank pages.

1 Citrus fruits, such as oranges, contain sugars.

A student investigated the simple (reducing) sugar content of three different citrus fruits.

Step 1 The student was provided with three fruits; orange, grapefruit and lemon.

Step 2 The juice from the orange was squeezed into a labelled beaker.

Step 3 Step 2 was repeated for the grapefruit and the lemon.

Step 4 The student put the juice they extracted into three measuring cylinders.

These are shown in Fig. 1.1.

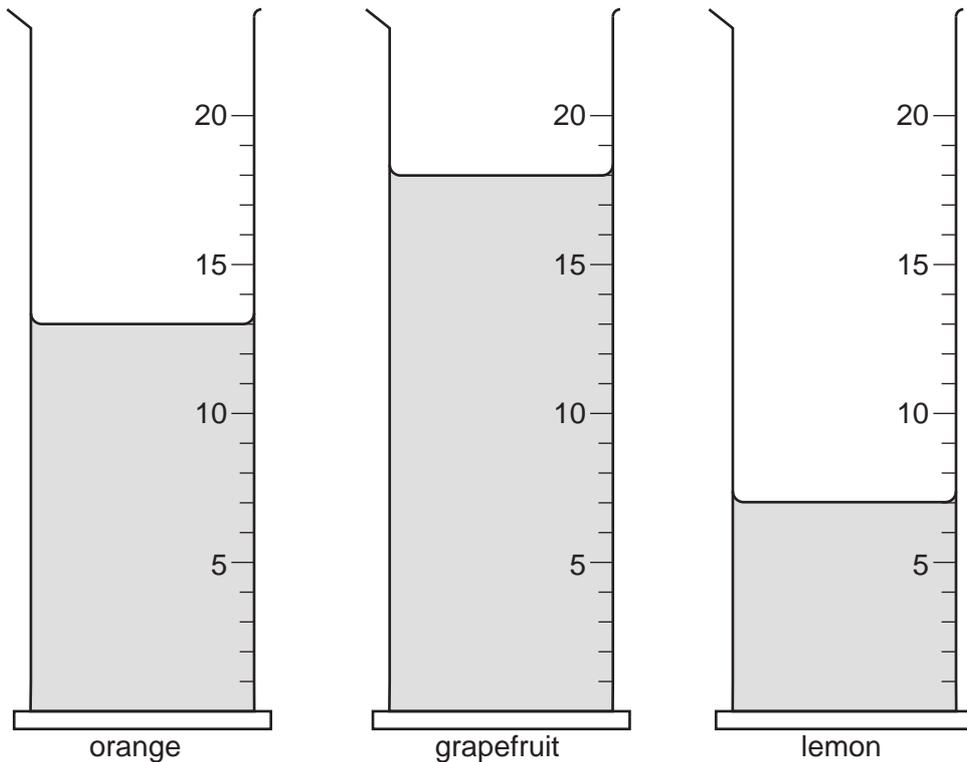


Fig. 1.1

(a) (i) In Table 1.1 record the volume of juice shown in each measuring cylinder in Fig. 1.1.

Table 1.1

type of fruit	volume of juice / cm ³
orange	
grapefruit	
lemon	

[1]

Step 5 The student added 2 cm^3 of the orange juice and 2 cm^3 of the solution used to test for reducing sugars to a test-tube labelled orange and recorded the colour of the liquid.

Step 6 The student repeated step 5 for the grapefruit juice and the lemon juice.

Step 7 The test-tubes were then put into a water-bath and left for five minutes.

Step 8 The colour of the liquid in the test-tubes was recorded after five minutes.

The student's observations are shown in Fig. 1.2.

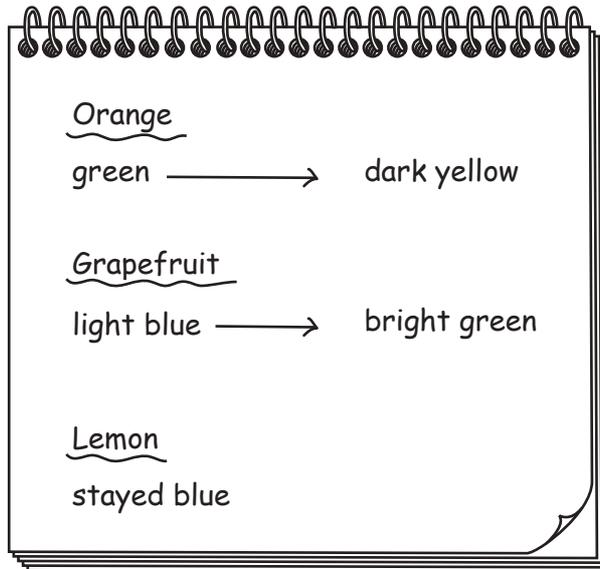


Fig. 1.2

- (ii) Use the information in Fig. 1.2 to prepare a table to record the student's results in the space provided.

(iii) State the name of the solution used to test for reducing sugars.
.....[1]

(iv) Suggest a suitable temperature for the water-bath used in step 7.
.....[1]

(v) State which fruits contain reducing sugars.
.....[1]

(vi) Explain why the student recorded the colour of the reducing sugar test solution and fruit juice mixture **before** heating.
.....
.....
.....[1]

(b) State **one** variable that was kept constant in this investigation.

Describe how this variable was kept constant.

variable
how it has been kept constant
.....
.....[2]

(c) Identify **two** sources of error in the method.

For each of these errors, describe how the method could be improved to reduce the error.

error
improvement
.....
error
improvement
.....
.....[4]

(d) Describe a test that could be used to determine if the fruits contained protein.

.....
.....
.....
..... [2]

(e) Citrus fruits are a good source of vitamin C.

DCPIP can be used to test for vitamin C. When DCPIP reacts with vitamin C the colour of the solution changes from dark blue to colourless.

Vitamin C can be destroyed by heating it at high temperatures or by heating it for a long time.

Fruit juices are often heat treated to kill bacteria which allows the juice to be kept for a long time without being refrigerated.

A student wanted to investigate the effect of heating on the vitamin C content of fruit juice.

Describe a method the student could use for their investigation.

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.....
..... [6]

(f) Fig. 1.3 shows a photograph of a slice of orange.



Fig. 1.3

Draw a large diagram of the slice of orange.

[4]

[Total: 26]
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- 2 Hormones are involved in tropic responses in plants, such as gravitropism and phototropism. Auxin is a plant growth hormone.

A student investigated the length of roots from seedlings grown in different concentrations of auxin.

The student measured the root length of five of the seedlings grown in each concentration of auxin.

Table 2.1 shows the results.

Table 2.1

percentage concentration of auxin	root length / mm					average root length / mm
	1	2	3	4	5	
0.0	15	16	18	14	15	15.6
0.2	18	17	19	20	18	
0.4	24	21	22	22	23	22.4
0.6	17	16	18	17	19	17.4
0.8	13	12	14	5	12	11.2
1.0	12	10	10	12	11	11.0

- (a) (i) Calculate the missing average value from the Table 2.1.

Show your working and give your answer to one decimal place in Table 2.1.

[2]

- (ii) Scientists do not include anomalous data in their average calculations.

One of the pieces of data in Table 2.1 is not consistent with the other results for that concentration. This means it is anomalous.

Circle the anomalous data in Table 2.1.

Calculate the correct average for this concentration of auxin, excluding the anomalous data. Give your answer to one decimal place.

Space for working.

.....mm
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(b) Fig. 2.1 shows the root tip of a poppy seedling.



magnification $\times 120$

Fig. 2.1

Measure the length of the line **MN** on Fig. 2.1. Include the unit.

length of **MN**

Calculate the actual size of the root tip at **MN** using the formula. Include the unit in your answer.

$$\text{magnification} = \frac{\text{length of } \mathbf{MN} \text{ on Fig. 2.1}}{\text{actual size of } \mathbf{MN}}$$

Space for working.

.....
[3]

[Total: 14]

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Grade thresholds – March 2018

Cambridge IGCSE Biology (0610)

Grade thresholds taken for Syllabus 0610 (Biology) in the March 2018 examination.

	maximum raw mark available	minimum raw mark required for grade:						
		A	B	C	D	E	F	G
Component 12	40	–	–	28	25	23	21	19
Component 22	40	33	29	26	23	20	18	16
Component 32	80	–	–	54	47	39	31	23
Component 42	80	51	45	38	32	26	19	12
Component 52	40	27	25	23	20	17	14	11
Component 62	40	27	24	22	19	16	13	10

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	154	139	124	110	95	80	65	50
CY	22, 42, 62	154	139	124	109	94	79	64	49
FY	12, 32, 52	–	–	–	132	116	100	84	68
GY	12, 32, 62	–	–	–	131	115	99	83	67



BIOLOGY

0610/12

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.

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This document consists of **3** printed pages.

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

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



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

BIOLOGY

0610/12

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 is recommended)

* 0 9 3 5 3 6 8 4 0 8 *

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.

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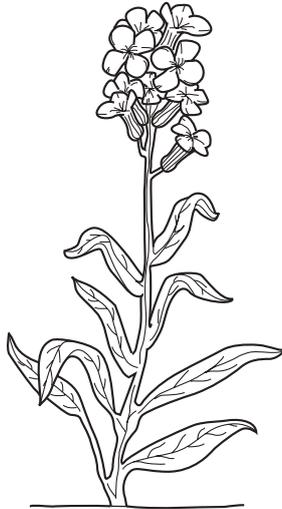
1 What is a characteristic of all living organisms?

- A breathing
- B egestion
- C excretion
- D ingestion

2 What are the characteristics of fish?

	maintain constant body temperature	external ears present	jelly-covered eggs	scales
A	✓	✓	x	x
B	✓	x	✓	✓
C	x	✓	x	x
D	x	x	✓	✓

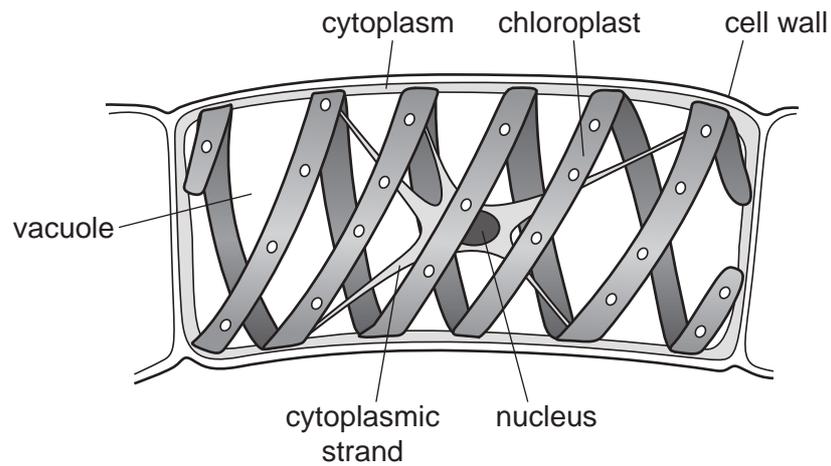
3 The diagram shows part of a flowering plant.



Using the key, identify this plant.

- 1 three petals go to 2
- more than three petals go to 3
- 2 leaves longer than they are wide **A**
- leaves wider than they are long **B**
- 3 leaves parallel-veined **C**
- leaves not parallel-veined **D**

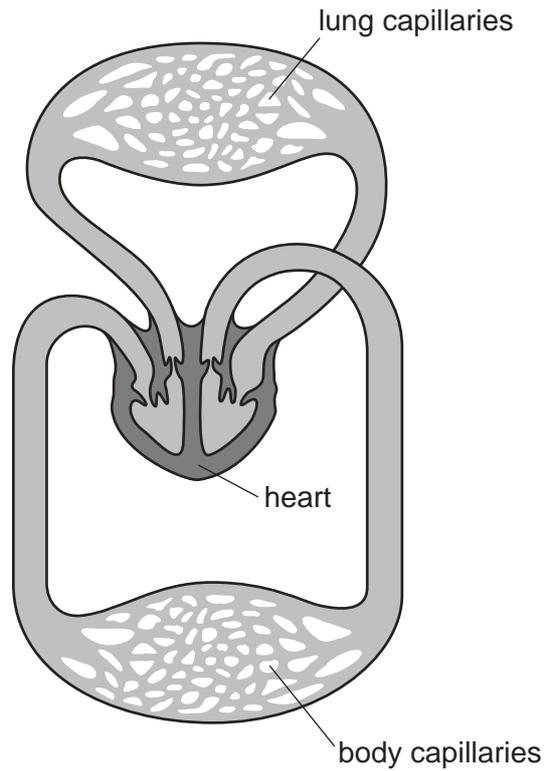
4 The diagram shows a single cell from an organism called *Spirogyra*.



Which features does *Spirogyra* share with plant cells?

	cell wall	chloroplast	cytoplasm	nucleus	vacuole
A	✓	✓	✓	✓	✓
B	✓	✓	✗	✗	✓
C	✓	✗	✓	✓	✗
D	✗	✓	✓	✗	✓

5 Which level of organisation is shown in the diagram?

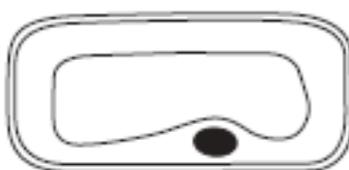


- A organ
B organism
C organ system
D tissue
- 6 An egg measured 6.5 cm in diameter. A student made a drawing of this egg and the diameter was measured as 19.5 cm.

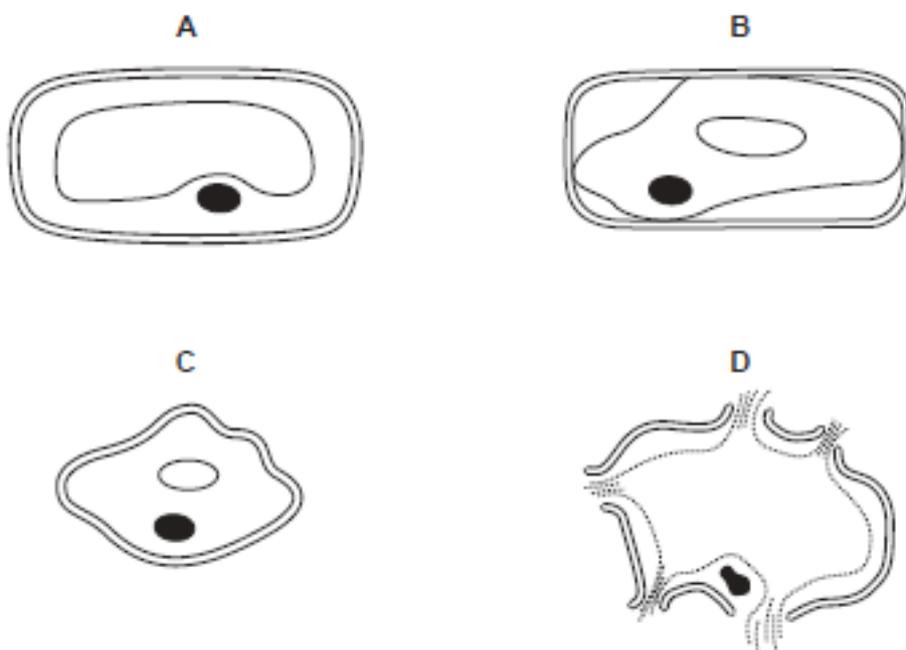
What was the magnification of the drawing?

- A $\times 0.3$ B $\times 3.0$ C $\times 6.5$ D $\times 300$

- 7 The diagram shows a plant cell.

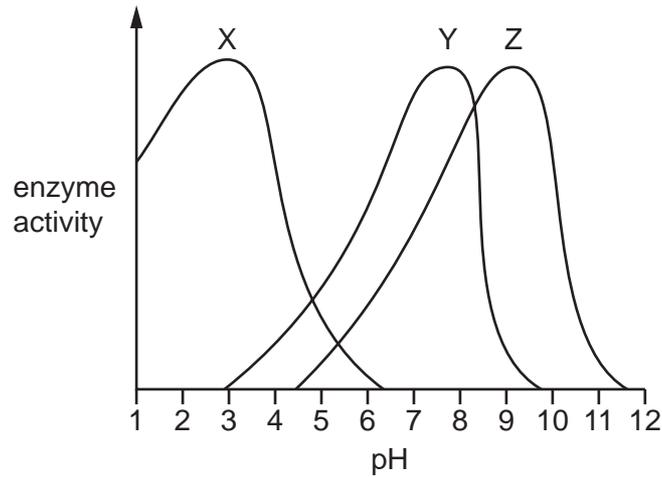


What is the appearance of this cell after it has been placed in pure water for 30 minutes?



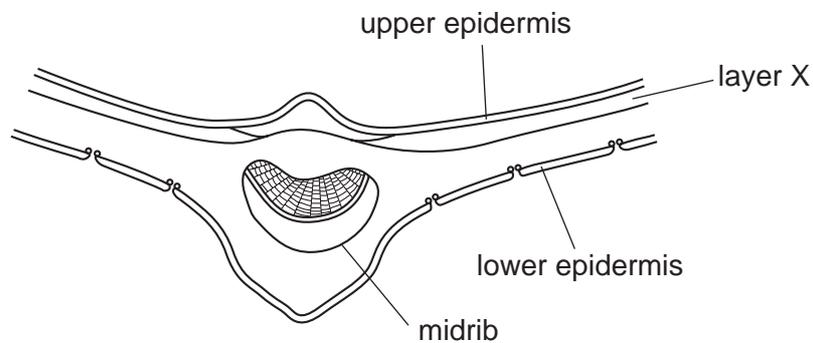
- 8 When a food substance is tested with iodine solution, which colour shows the presence of starch?
- A blue-black
 B brown
 C orange
 D purple

- 9 The graph shows the activity of three digestive enzymes at differing pH levels.

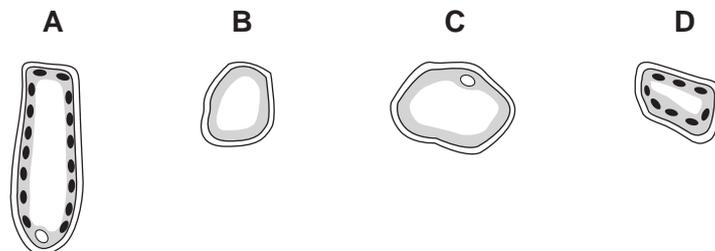


Which statement is correct?

- A Enzymes X and Y are both active at pH7.
 - B Enzymes X and Z are both active at pH4.
 - C Enzymes Y and Z are both active at pH4.
 - D Enzymes Y and Z are both active at pH8.
- 10 The diagram shows a cross-section of part of a leaf.



Which type of cell is found in layer X?

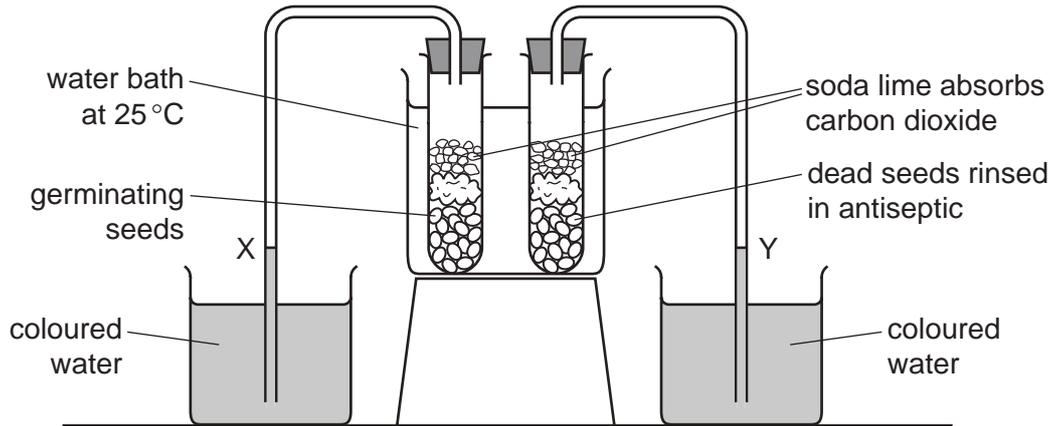


- 11 Which molecule contains magnesium?
- A chlorophyll
 - B fat
 - C glucose
 - D starch
- 12 In which part of the body of a mammal does mechanical digestion occur?
- A gall bladder
 - B liver
 - C mouth
 - D pancreas
- 13 In which order does water pass through these tissues in a plant?
- A mesophyll → xylem → root cortex
 - B root cortex → mesophyll → xylem
 - C root cortex → xylem → mesophyll
 - D xylem → mesophyll → root cortex
- 14 Which part of the blood contains haemoglobin?
- A plasma
 - B platelets
 - C red blood cells
 - D white blood cells
- 15 The body has defences to protect itself from diseases.
- What is a mechanical barrier to diseases?
- A hairs in the nose
 - B plasma
 - C stomach acid
 - D white blood cells

16 Compared with inspired air, which description of expired air is correct?

- A It has less oxygen and less carbon dioxide.
- B It has less oxygen and more carbon dioxide.
- C It has more oxygen and less carbon dioxide.
- D It has more oxygen and more carbon dioxide.

17 An experiment is set up to investigate the uptake of oxygen by germinating seeds.



What happens to the levels of the coloured water at X and Y?

	X	Y
A	falls	rises
B	falls	unchanged
C	rises	falls
D	rises	unchanged

18 Which organ regulates the amount of water in a mammal's body?

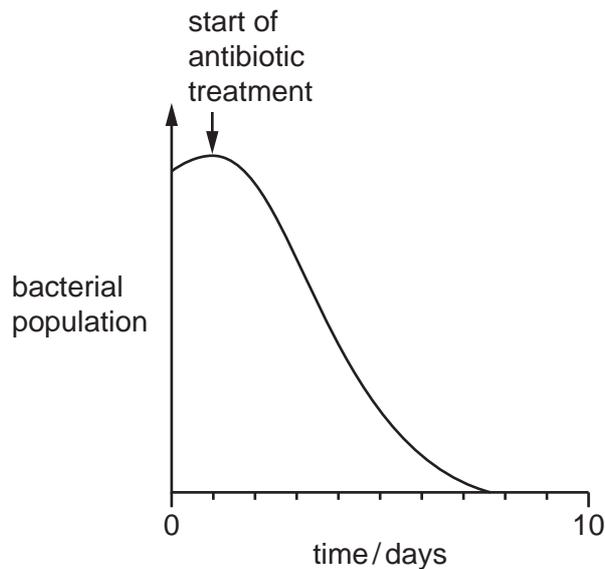
- A kidney
- B liver
- C lungs
- D skin

19 A boy accidentally touches a very hot object and immediately takes his hand away.

In this reflex action, what is the effector?

- A a heat receptor in his hand
- B a motor neurone
- C a muscle in his arm
- D the spinal cord

20 The graph shows the effect of an antibiotic treatment on bacterial populations in the blood.



Which conclusion can be drawn from the graph?

- A Antibiotics are effective against viral and bacterial infections.
- B Antibiotics cause meiosis in bacteria.
- C Antibiotics take ten days to kill all bacteria.
- D Before the start of antibiotic treatment the bacterial population was rising.

21 Drinking alcohol before driving a car is dangerous.

Which statement correctly explains why drinking alcohol and driving is dangerous?

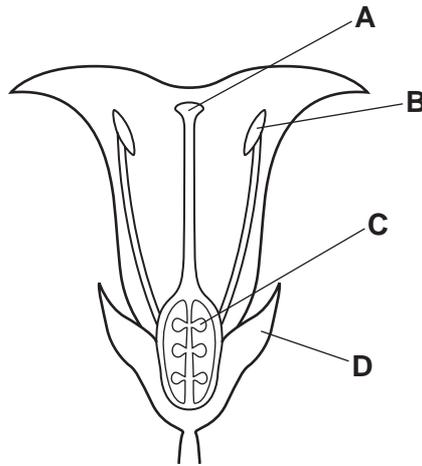
- A Alcohol increases reaction time.
- B Alcohol can cause liver damage.
- C Alcohol is a drug.
- D Alcohol is addictive.

22 Which statement about sexual reproduction is correct?

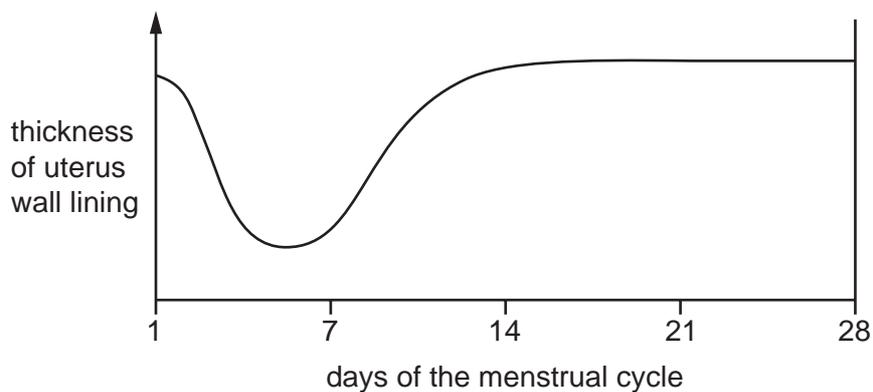
- A It is a process that involves the fusion of two nuclei.
- B It always produces genetically identical offspring.
- C No zygote is formed.
- D There is no fertilisation.

23 The diagram shows a cross-section of a flower.

Where does fertilisation take place?



24 The graph shows changes in the thickness of the lining of the uterus wall during a menstrual cycle.



Which day is the last day of menstruation?

- A 4
- B 8
- C 16
- D 20

- 25 The table shows the percentage of pregnancies in four groups of women. Each group used a different method of contraception.

method of contraception	percentage of pregnancies
the contraceptive pill	1
monitoring body temperature	14
diaphragm	7
male sterilisation (vasectomy)	0

Which contraceptive method was the **least** effective?

- A barrier
 B chemical
 C natural
 D surgical
- 26 Which sex chromosomes in the egg and the sperm will produce a male child?

	sex chromosome in egg	sex chromosome in sperm
A	X	X
B	X	Y
C	Y	X
D	Y	Y

- 27 Cell division has the following functions.

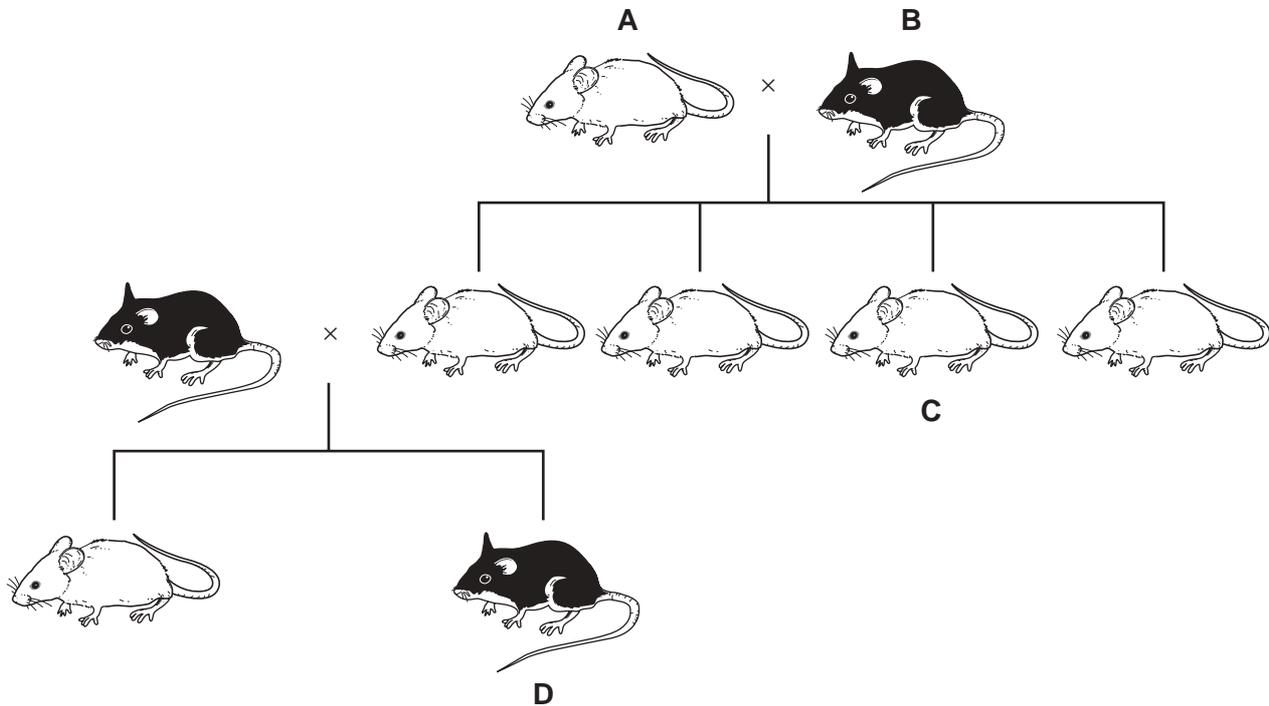
- 1 asexual reproduction
- 2 growth
- 3 production of gametes
- 4 repair of damaged tissue
- 5 replacement of cells

Which functions are specific to mitosis?

- A 1, 2, 3 and 4
 B 1, 2, 4 and 5
 C 2, 3 and 4 only
 D 3, 4 and 5 only

28 The chart shows the inheritance of fur colour in a small mammal.

If the allele for white fur is dominant, which animal **must** be heterozygous for the gene controlling fur colour?



29 Four phenotypes of a group of people were studied.

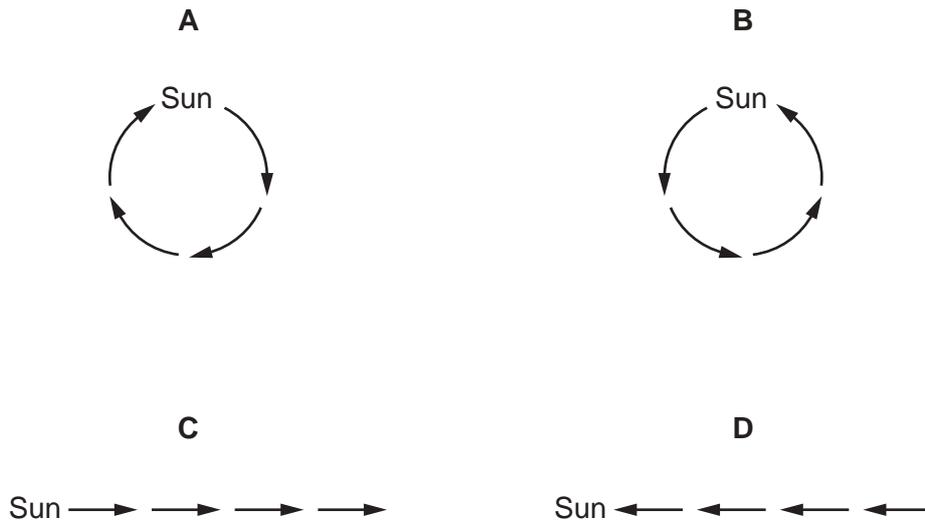
Which phenotype will show discontinuous variation?

- A blood group
- B foot size
- C height
- D weight

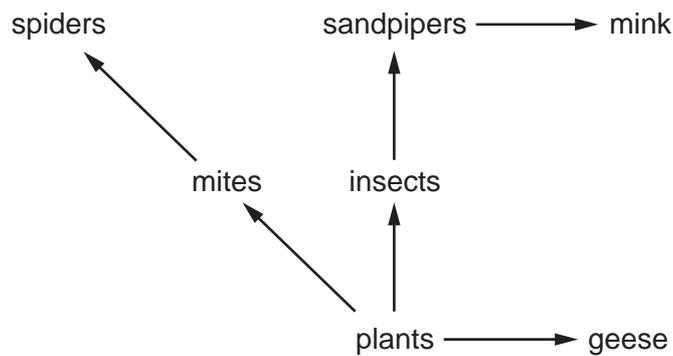
30 Which statement about selective breeding is correct?

- A It does not involve humans.
- B It involves a struggle for survival.
- C It always involves one parent.
- D It involves parents that possess desirable features.

31 Which diagram shows how energy flows through an ecosystem?



32 The diagram shows part of a food web.

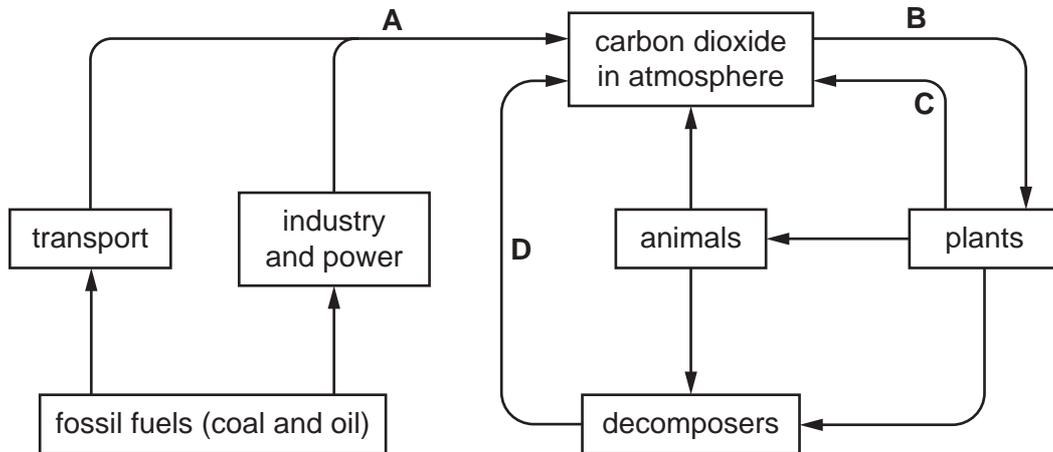


Which members of the food web are examples of producers, herbivores and carnivores?

	producers	herbivores	carnivores
A	insects	sandpipers	mink
B	geese	mites	sandpipers
C	plants	geese	spiders
D	plants	sandpipers	insects

33 The diagram shows part of the carbon cycle.

Which process reduces the carbon dioxide content of the atmosphere?



34 Which factor will cause a decrease in population size?

- A decreased food supply
- B decreased predation
- C decreased disease
- D decreased death rate

35 Some of the characteristics of bacteria are listed.

- 1 can make complex molecules
- 2 can reproduce quickly
- 3 have cytoplasm
- 4 may cause diseases

Which characteristics make bacteria useful in biotechnology and genetic engineering?

- A 1, 2, 3 and 4 B 1 and 2 only C 2 and 3 only D 3 and 4 only

36 What is a product of anaerobic respiration in yeast?

- A biological washing powders
- B ethanol
- C fruit juice
- D human insulin

37 Which statement about genetic engineering is correct?

- A** It involves choosing which individual organisms are used for breeding.
- B** It is always done using genes from the same species.
- C** It produces a new combination of genes.
- D** It produces exact copies of individual organisms.

38 Deforestation has undesirable effects on the environment.

Which effect makes the greatest contribution to global warming?

- A** extinction of species
- B** increased carbon dioxide
- C** increased flooding
- D** loss of soil by erosion

39 Methane is a gas that contributes to the greenhouse effect.

Which human activity is a source of methane?

- A** deforestation
- B** growing rice
- C** using fertilisers
- D** using herbicides

40 Which stage in the treatment of sewage removes large floating objects, such as plastic bags?

- A** aeration
- B** discharge
- C** screening
- D** sedimentation

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BIOLOGY

0610/22

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.

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.

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This document consists of **3** printed pages.

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

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



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

BIOLOGY

0610/22

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 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.

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.

1 Biology is the study of living things.

Which characteristic applies to all forms of life?

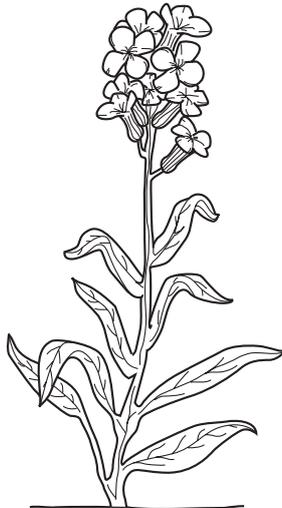
- A able to move from place to place
- B able to reproduce
- C carry out photosynthesis
- D possess a nervous system

2 Two animals have an identical sequence of amino acids in one of the proteins found in their cells.

What does this indicate about these animals?

- A They have been eating the same types of food.
- B They have not been exposed to substances that cause mutation.
- C They must be members of the same genus.
- D They share a recent ancestor.

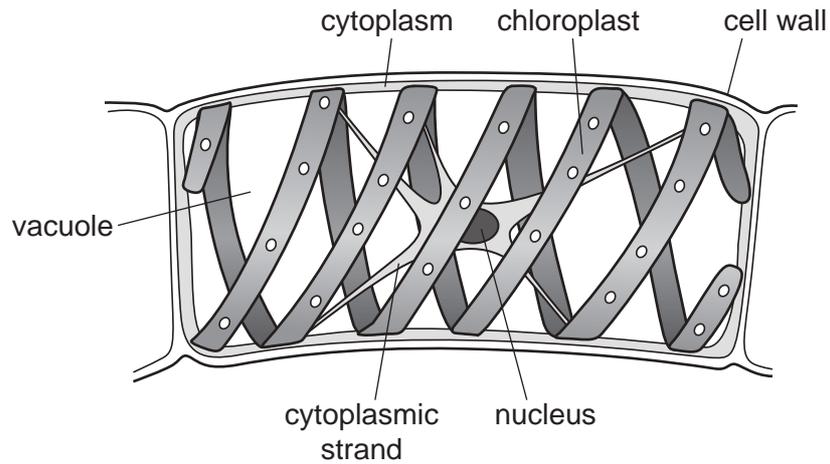
3 The diagram shows part of a flowering plant.



Using the key, identify this plant.

- 1 three petals go to 2
- more than three petals go to 3
- 2 leaves longer than they are wide **A**
- leaves wider than they are long **B**
- 3 leaves parallel-veined **C**
- leaves not parallel-veined **D**

- 4 The diagram shows a single cell from an organism called *Spirogyra*.



Which features does *Spirogyra* share with plant cells?

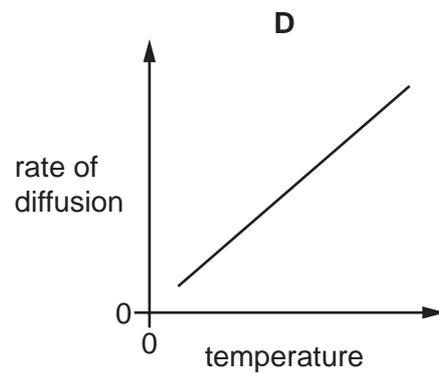
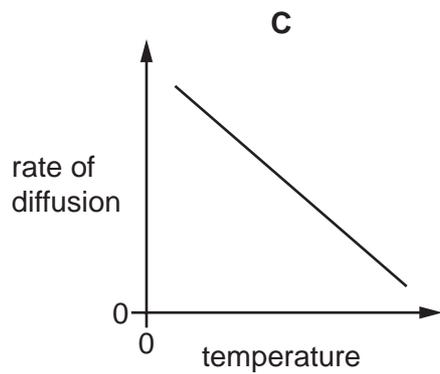
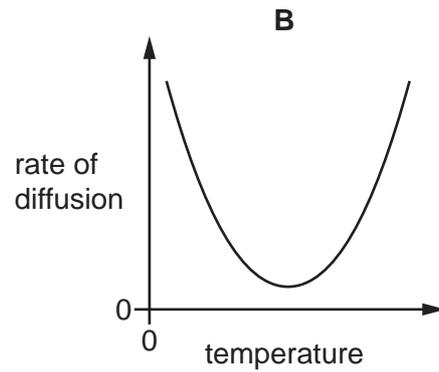
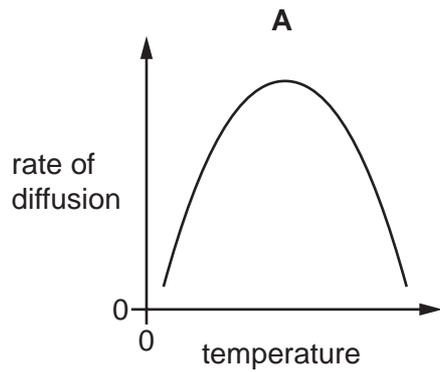
	cell wall	chloroplast	cytoplasm	nucleus	vacuole
A	✓	✓	✓	✓	✓
B	✓	✓	✗	✗	✓
C	✓	✗	✓	✓	✗
D	✗	✓	✓	✗	✓

- 5 A student was told that a drawing of a bacterial cell had been magnified 30 000 times. The length of the drawing was 45 mm.

What was the actual length of the bacterium?

- A** 0.15 mm **B** 1.5 μm **C** 0.66 mm **D** 0.66 μm

6 Which graph represents the effect of increasing temperature on the rate of diffusion?



7 Protoplasts are plant cells that have had their cell walls removed.

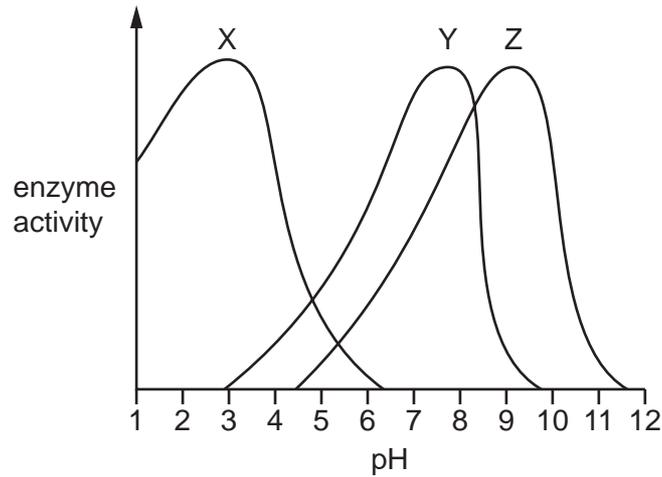
What happens if plant protoplasts are placed in distilled water?

- A** They get larger and become turgid.
- B** They get larger and burst.
- C** They get smaller and become plasmolysed.
- D** They get smaller and shrivel up.

8 When a food substance is tested with iodine solution, which colour shows the presence of starch?

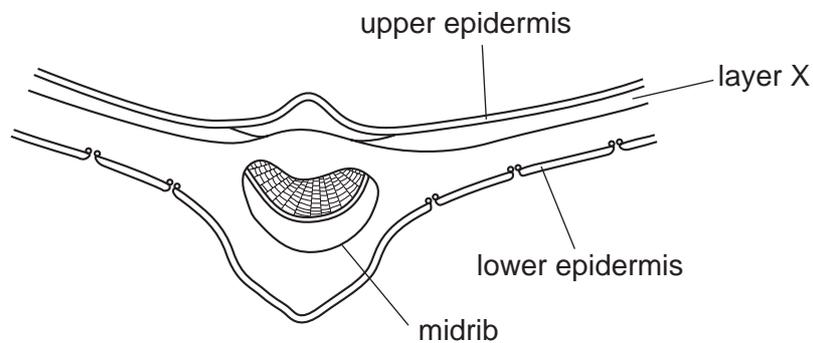
- A** blue-black
- B** brown
- C** orange
- D** purple

- 9 The graph shows the activity of three digestive enzymes at differing pH levels.

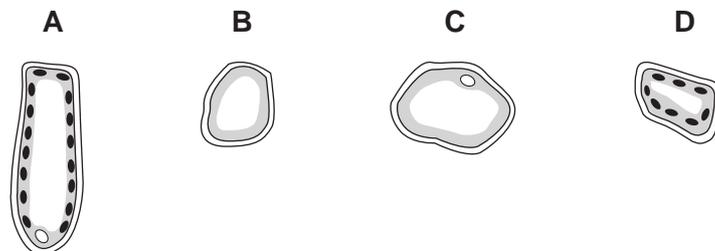


Which statement is correct?

- A Enzymes X and Y are both active at pH7.
 - B Enzymes X and Z are both active at pH4.
 - C Enzymes Y and Z are both active at pH4.
 - D Enzymes Y and Z are both active at pH8.
- 10 The diagram shows a cross-section of part of a leaf.



Which type of cell is found in layer X?



11 Which molecule contains magnesium?

- A chlorophyll
- B fat
- C glucose
- D starch

12 In which part of the body of a mammal does mechanical digestion occur?

- A gall bladder
- B liver
- C mouth
- D pancreas

13 During growth, potato plants produce flowers and underground storage organs called tubers.

During this time, which parts of the plant act as sources and sinks for translocation?

	flowers	leaves	potato tubers
A	sink	sink	source
B	sink	source	sink
C	source	sink	source
D	source	source	sink

14 What is an advantage of a double circulatory system in mammals?

- A Blood can flow down the body on the left and up the body on the right.
- B Blood can flow more slowly along the circulatory system.
- C Blood pressure stays the same throughout the circulatory system.
- D Oxygenated and deoxygenated blood are kept separate.

15 The body has defences to protect itself from diseases.

What is a mechanical barrier to diseases?

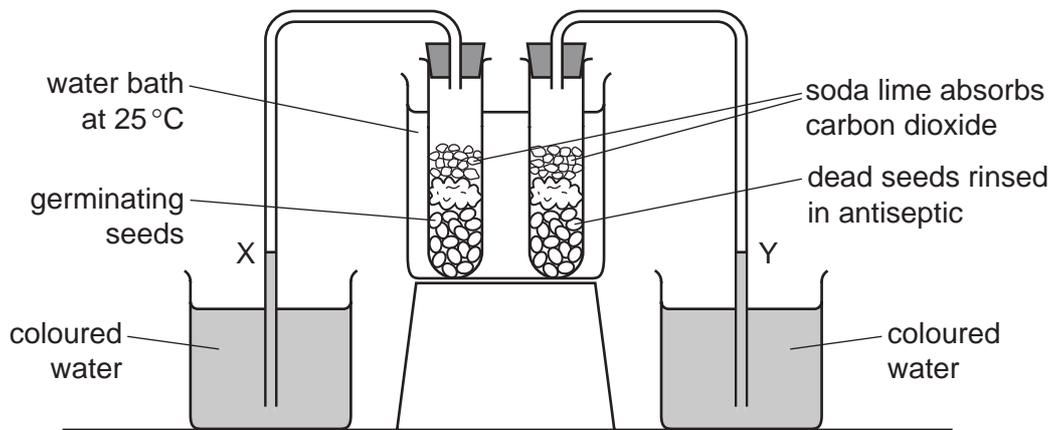
- A hairs in the nose
- B plasma
- C stomach acid
- D white blood cells

16 During exercise, receptors detect a change in the blood and cause the breathing rate to increase.

What change do the receptors detect and where are they found in the body?

	change in blood	site of detection
A	carbon dioxide increases	brain
B	carbon dioxide increases	intercostal muscles
C	oxygen decreases	brain
D	oxygen decreases	intercostal muscles

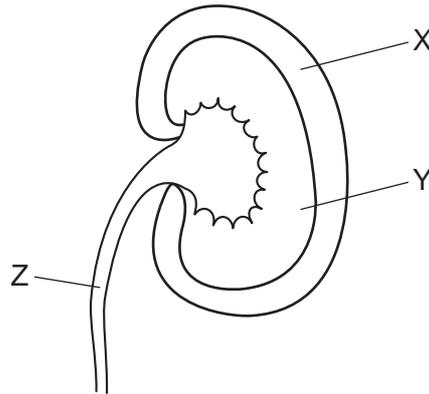
17 An experiment is set up to investigate the uptake of oxygen by germinating seeds.



What happens to the levels of the coloured water at X and Y?

	X	Y
A	falls	rises
B	falls	unchanged
C	rises	falls
D	rises	unchanged

18 The diagram shows a section of a kidney.



What are the correct labels?

	X	Y	Z
A	cortex	medulla	ureter
B	cortex	ureter	medulla
C	medulla	cortex	ureter
D	medulla	ureter	cortex

19 A boy accidentally touches a very hot object and immediately takes his hand away.

In this reflex action, what is the effector?

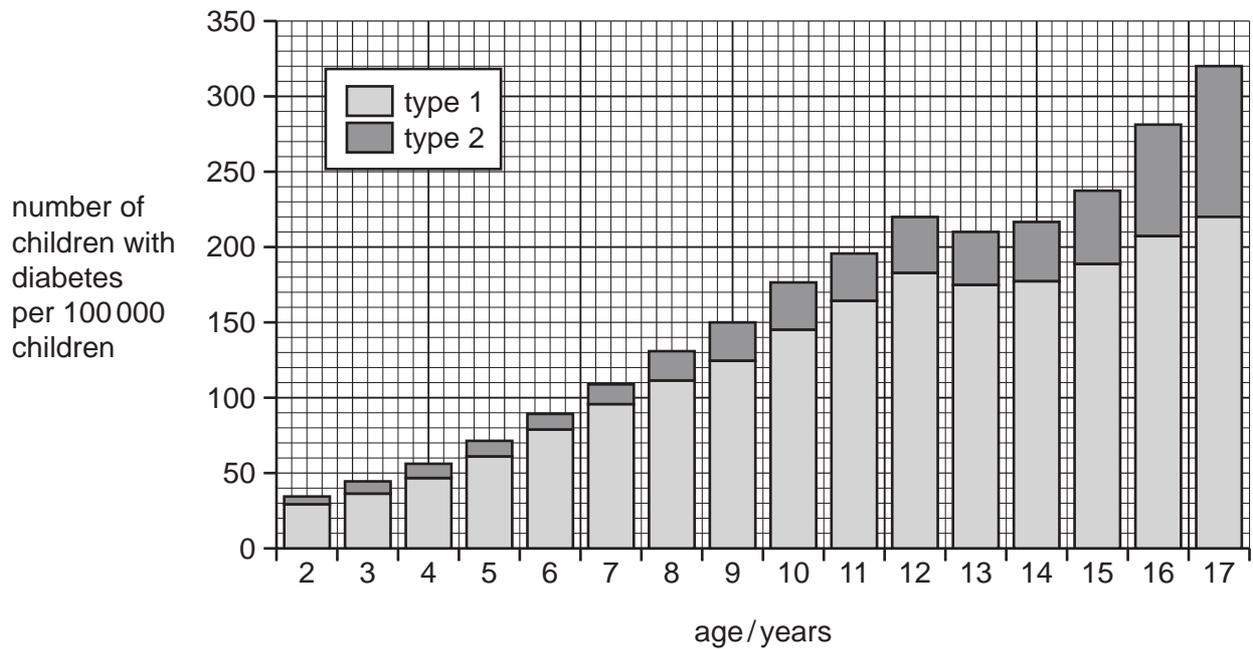
- A** a heat receptor in his hand
- B** a motor neurone
- C** a muscle in his arm
- D** the spinal cord

20 Which description of how the pupil of the eye gets smaller is correct?

	circular muscles	radial muscles
A	contract	contract
B	contract	relax
C	relax	contract
D	relax	relax

21 There are two types of diabetes, type 1 and type 2.

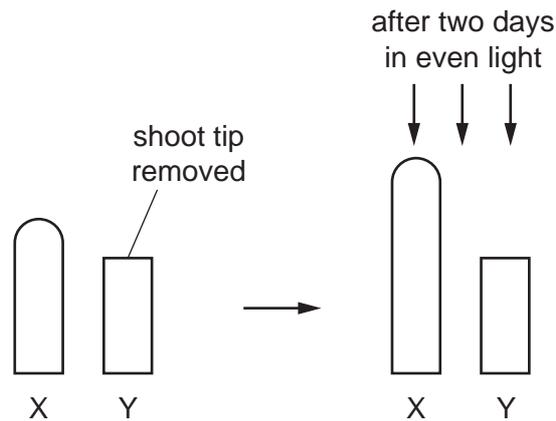
The graph shows the number of children with each type of diabetes per 100 000 children, in one country.



Which conclusion can be made from the graph?

- A 1.5% of 9-year-olds have diabetes.
- B 31.3% of 17-year-olds with diabetes have type 2 diabetes.
- C There are 10 more 12-year-olds in the country with diabetes than 13-year-olds.
- D Type 2 diabetes will cause more health problems than type 1.

22 The diagram shows an experiment using wheat shoot tips to investigate plant growth.



Which statement is supported by the evidence provided by this experiment?

- A Auxin moves through the plant by osmosis.
- B Auxin is made in the shoot tip.
- C Auxin is unequally distributed in response to light.
- D Auxin inhibits cell elongation.

23 A wind-pollinated plant has which features?

- A large anthers, coloured petals and produces nectar
- B large petals, small anthers and a sticky stigma
- C small petals, large anthers and a feathery stigma
- D small petals, produces nectar and has a strong scent

24 Which describes a human male gamete?

	motile	relative size compared to female gamete	flagellum present
A	yes	larger	yes
B	yes	smaller	yes
C	no	smaller	no
D	no	larger	no

25 What is a consequence of HIV infection on the human body?

- A decreased lymphocyte numbers
- B increased protection against bacterial infections
- C increased haemoglobin production
- D sickle-cell anaemia

26 Which sex chromosomes in the egg and the sperm will produce a male child?

	sex chromosome in egg	sex chromosome in sperm
A	X	X
B	X	Y
C	Y	X
D	Y	Y

27 Cell division has the following functions.

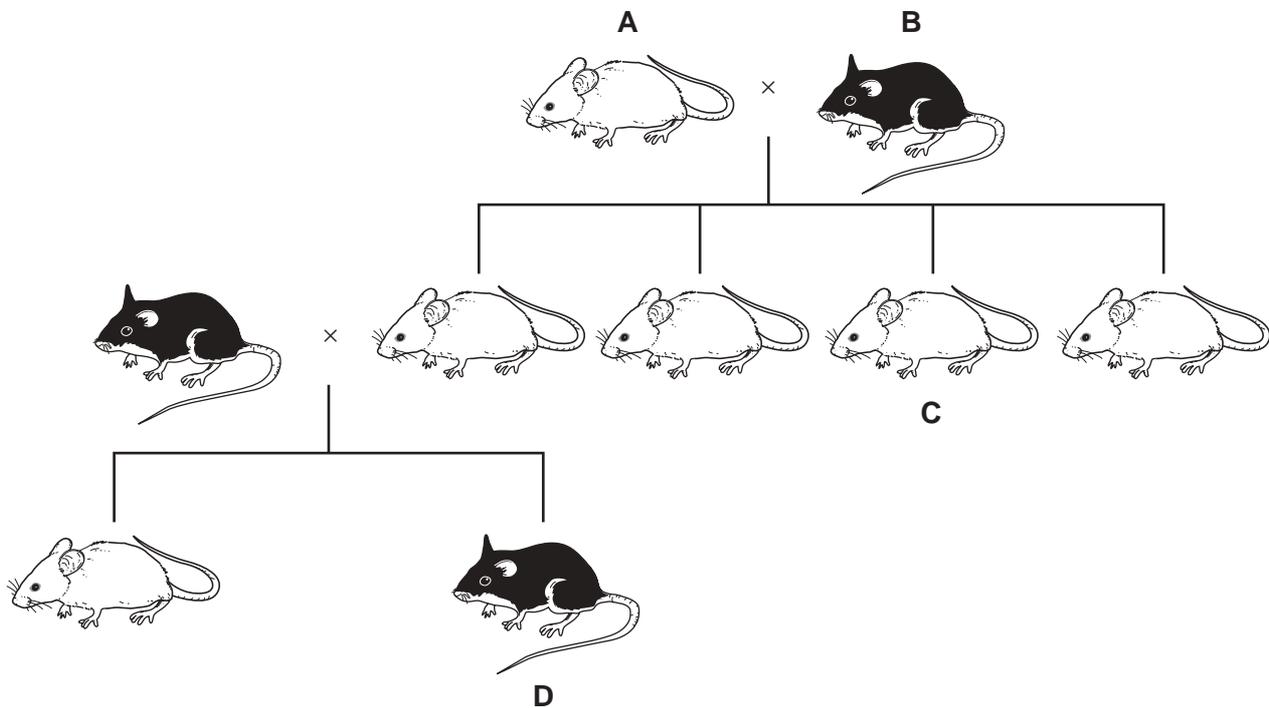
- 1 asexual reproduction
- 2 growth
- 3 production of gametes
- 4 repair of damaged tissue
- 5 replacement of cells

Which functions are specific to mitosis?

- A 1, 2, 3 and 4
- B 1, 2, 4 and 5
- C 2, 3 and 4 only
- D 3, 4 and 5 only

28 The chart shows the inheritance of fur colour in a small mammal.

If the allele for white fur is dominant, which animal **must** be heterozygous for the gene controlling fur colour?



29 In areas of the world where malaria is present, the sickle-cell allele is more common.

What is the reason for this?

- A Both diseases are caused by the same allele.
- B Heterozygous individuals with the sickle-cell allele are less likely to have malaria.
- C Heterozygous individuals with the sickle-cell allele are more likely to have malaria.
- D These are parts of the world with many diseases.

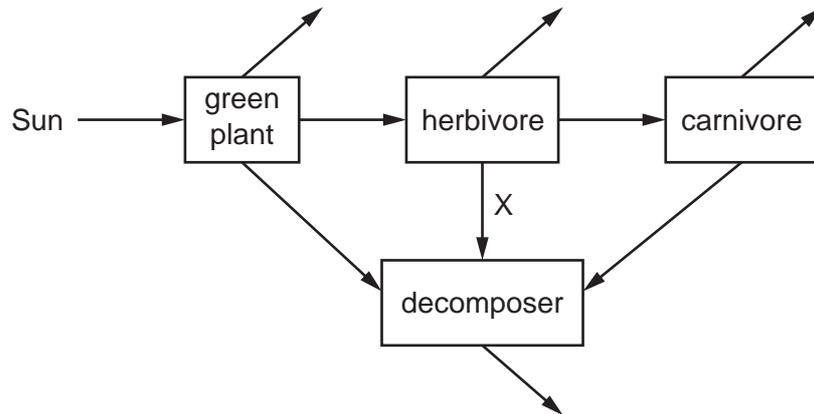
30 Which feature helps a xerophyte survive in its environment?

- A flat leaves with a large surface area
- B no cuticle
- C short roots
- D sunken stomata

31 What is a feature of natural selection?

- A It does not require a struggle for survival.
- B It does not require variation in a population.
- C It involves the selection of advantageous phenotypes.
- D It involves the selection of disadvantageous genotypes.

32 The diagram shows energy flow through an ecosystem.

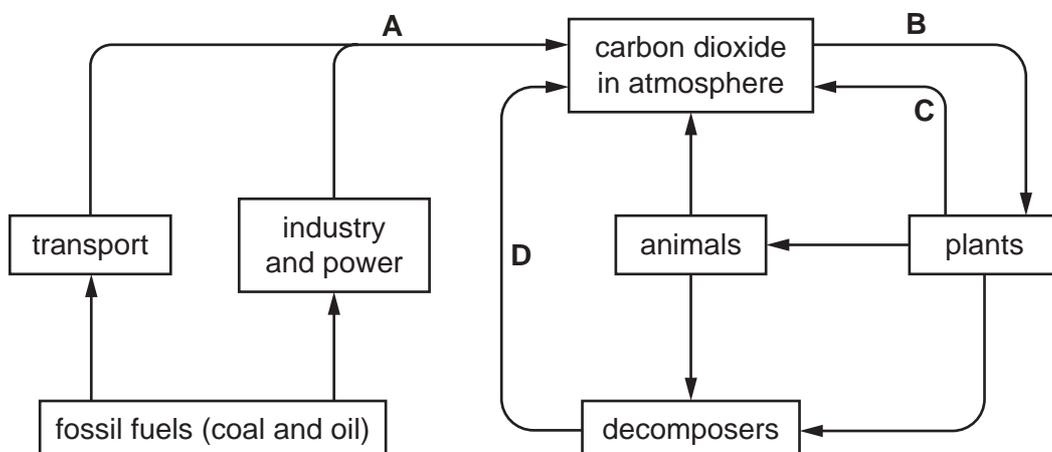


In what form is energy transferred at X?

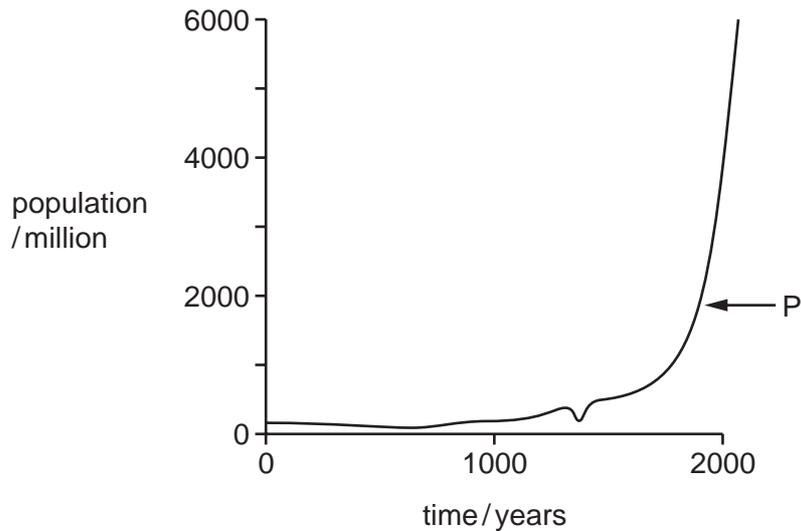
- A chemical
- B heat
- C kinetic
- D light

33 The diagram shows part of the carbon cycle.

Which process reduces the carbon dioxide content of the atmosphere?



34 The graph shows the human population of the world for the last 2000 years.



What is the phase identified by P?

- A death
- B exponential (log)
- C lag
- D stationary

35 Some of the characteristics of bacteria are listed.

- 1 can make complex molecules
- 2 can reproduce quickly
- 3 have cytoplasm
- 4 may cause diseases

Which characteristics make bacteria useful in biotechnology and genetic engineering?

- A** 1, 2, 3 and 4 **B** 1 and 2 only **C** 2 and 3 only **D** 3 and 4 only

36 What is a requirement for the production of penicillin in a fermenter?

- A adding bubbles of nitrogen gas to mix the nutrients and *Penicillium*
- B adding the required amount of sugar as a nutrient
- C ensuring no oxygen enters the fermenter so only anaerobic respiration occurs
- D maintaining a constant temperature of 95 °C to prevent other microorganisms growing

37 Human insulin can be produced in large quantities by modified *E. coli* bacteria.

Four of the steps in this production process are listed.

- 1 Insulin is removed from the bacterial culture.
- 2 An enzyme is used to cut out the insulin gene from a human chromosome.
- 3 The insulin gene is placed into the plasmid of the bacterium.
- 4 Bacteria with the insulin gene reproduce very rapidly.

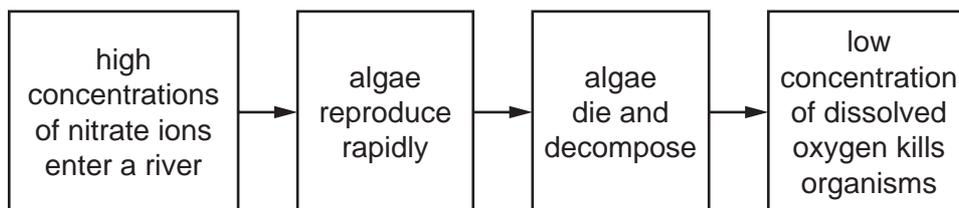
What is the order of these steps?

- A 1 → 2 → 3 → 4
- B 1 → 3 → 4 → 2
- C 2 → 3 → 4 → 1
- D 4 → 1 → 2 → 3

38 What is a major contributor to the problem of worldwide famine?

- A equal distribution of food
- B increasing population and life expectancy
- C large-scale monoculture of crop plants
- D use of herbicides and insecticides in farming

39 The flow diagram shows a process that can occur as a result of pollution in a river.



Which term describes the process shown in the flow diagram?

- A aerobic respiration
- B eutrophication
- C nitrogen cycle
- D photosynthesis

- 40 Which stage in the treatment of sewage removes large floating objects, such as plastic bags?
- A aeration
 - B discharge
 - C screening
 - D sedimentation

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BIOLOGY

0610/32

Paper 3 Theory (Core)

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.

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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:

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.

Abbreviations used in the Mark Scheme:

- ; separates marking points
- / alternatives
- **I** ignore
- **R** reject
- **A** accept (for answers correctly cued by the question, or guidance for examiners)
- **AW** alternative wording
- **AVP** any valid point
- **ecf** credit a correct statement/calculation that follows a previous wrong response
- **ora** or reverse argument
- () the word/phrase in brackets is not required, but sets the context
- underline actual words given must be used by the candidate (or grammatical variants of them)

Question	Answer	Marks	Guidance												
1	<table border="1"> <tr> <td>chemical</td> <td>use of chemical</td> </tr> <tr> <td>antibiotic</td> <td>kill, or stop growth of, bacteria ;</td> </tr> <tr> <td>fertiliser</td> <td>increase (crop) yields / add nutrients to soil / make plants grow ;</td> </tr> <tr> <td>herbicide</td> <td>kill weeds (in crops) / reduce competition with weeds / increase crop yields ;</td> </tr> <tr> <td>insecticide</td> <td>kill insects / increase crop yields / improve quality of yields ;</td> </tr> <tr> <td>pectinase</td> <td>used in fruit juice production ;</td> </tr> </table>	chemical	use of chemical	antibiotic	kill, or stop growth of, bacteria ;	fertiliser	increase (crop) yields / add nutrients to soil / make plants grow ;	herbicide	kill weeds (in crops) / reduce competition with weeds / increase crop yields ;	insecticide	kill insects / increase crop yields / improve quality of yields ;	pectinase	used in fruit juice production ;	5	
chemical	use of chemical														
antibiotic	kill, or stop growth of, bacteria ;														
fertiliser	increase (crop) yields / add nutrients to soil / make plants grow ;														
herbicide	kill weeds (in crops) / reduce competition with weeds / increase crop yields ;														
insecticide	kill insects / increase crop yields / improve quality of yields ;														
pectinase	used in fruit juice production ;														

Question	Answer	Marks	Guidance
2(a)	capillary / capillaries ;	1	
2(b)	no nucleus ; smaller ; contain, haemoglobin / Hb ; (bi)concave disc shape / described ; carries oxygen ; does not produce antibodies / not involved in immunity ; does not carry out phagocytosis ; AVP ; ; e.g. transports carbon dioxide / more RBC's	3	
2(c)(i)	plasma ;	1	1 water

Question	Answer	Marks	Guidance
2(c)(ii)	glucose ; amino acids ; (plasma) proteins ; fats / glycerol / fatty acids ; vitamins / one named vitamin ; mineral (ions) / one named mineral ion ; hormones ; urea ; carbon dioxide ; water ;	3	

Question	Answer	Marks	Guidance
3		6	

Question	Answer	Marks	Guidance				
4(a)	urea ; salt(s) / (named) ions / (named) minerals ; AVP ; e.g. hormones	2					
4(b)(i)	<table border="1"> <tr> <td>volume / dm³</td> </tr> <tr> <td>1.09 ;</td> </tr> <tr> <td>0.05 ;</td> </tr> <tr> <td>1.29 ;</td> </tr> </table>	volume / dm ³	1.09 ;	0.05 ;	1.29 ;	3	A correct figures if given in cm ³ A ± 0.005
volume / dm ³							
1.09 ;							
0.05 ;							
1.29 ;							
4(b)(ii)	(solution) C ; lowest volume of urine was produced ; AVP ;	2	A largest volume of urine as ecf if A given for mp1				
4(c)	water (intake) ; exercise / activity levels / sweat produced ; temperature (body or environmental) ; AVP ; ; correct ref. to diet / disease / medication	2					
4(d)	sweat ; expired air / expired water vapour / exhalation / breathing ; faeces ; vomit / tears / mucus ;	2	A diarrhoea				

Question	Answer	Marks	Guidance														
5(a)(i)	(F) cytoplasm ; (G) chloroplast ; (H) (sap / central) vacuole ;	3	I chlorophyll														
5(a)(ii)	K line ending on the nucleus ; L line ending exactly on inner line of cell wall ;	2															
5(a)(iii)	palisade (mesophyll) cell ;	1															
5(b)(i)	cell / it, has shrunk or is smaller / AW ; cell walls are indented / AW ; vacuole / AW is smaller ; gap developed (between wall and membrane) ;	2	A cell / it, has become flaccid I shape / size, has changed unqualified A plasmolysis / gap between cell wall and protoplast A has one more chloroplast / AW ;														
5(b)(ii)	<table border="1"> <tr> <td>diffusion</td> <td>active transport</td> </tr> <tr> <td>movement from high to low (solute) concentration / down a concentration gradient</td> <td>movement for low to high (solute) concentration / AW</td> </tr> <tr> <td>does not require a membrane</td> <td>does require a membrane</td> </tr> <tr> <td>no energy needed / passive process</td> <td>requires energy / active process / requires ATP</td> </tr> <tr> <td>occurs in (living and) non-living</td> <td>only occurs in living</td> </tr> <tr> <td>rate dependent on concentration gradient</td> <td>rate dependent on requirements</td> </tr> <tr> <td>AVP</td> <td>AVP</td> </tr> </table>	diffusion	active transport	movement from high to low (solute) concentration / down a concentration gradient	movement for low to high (solute) concentration / AW	does not require a membrane	does require a membrane	no energy needed / passive process	requires energy / active process / requires ATP	occurs in (living and) non-living	only occurs in living	rate dependent on concentration gradient	rate dependent on requirements	AVP	AVP	3	
diffusion	active transport																
movement from high to low (solute) concentration / down a concentration gradient	movement for low to high (solute) concentration / AW																
does not require a membrane	does require a membrane																
no energy needed / passive process	requires energy / active process / requires ATP																
occurs in (living and) non-living	only occurs in living																
rate dependent on concentration gradient	rate dependent on requirements																
AVP	AVP																

Question	Answer	Marks	Guidance
6	amino acids ; biological ; temperature ; protease ; bacteria ; amylase ; lipase ;	7	

Question	Answer	Marks	Guidance
7(a)(i)	(human milk) 86.87 ; (water buffalo milk) 80.60 ;	2	
7(a)(ii)	carbohydrate / water ;	1	
7(a)(iii)	fibre / iron / vitamins / named vitamin / AVP ;	1	
7(a)(iv)	mammals ;	1	
7(b)	protein: needed for growth / e.g. of growth / for repair / replacement ; fat: needed for energy / insulation / storage / protection ; carbohydrate: needed for energy ; calcium: needed for making bones / teeth / AVP ; water: solvent / lubricant / used in (metabolic) reactions AW / AVP ;	5	
7(c)	obesity / AW ; coronary heart disease / CHD / blockage of coronary arteries ; AVP ; ;	2	

Question	Answer	Marks	Guidance												
8(a)	transfer of pollen ; from, anther / stamen, to stigma ;	2	A male gamete												
8(b)	stigmas, large / feathery ; stigmas exposed ; filaments long ; anthers / stamens, hang outside flower structure ; anthers loosely attached to filament ; no / less / small, petals ; AVP ;	2													
8(c)	<table border="1"> <tr> <td>insect-pollinated</td> <td>wind-pollinated</td> </tr> <tr> <td>heavy</td> <td>light</td> </tr> <tr> <td>sticky</td> <td>not sticky</td> </tr> <tr> <td>large</td> <td>small</td> </tr> <tr> <td>spiky surface AW</td> <td>smooth surface / less air resistance</td> </tr> <tr> <td>produced in smaller numbers</td> <td>produced in large numbers</td> </tr> </table>	insect-pollinated	wind-pollinated	heavy	light	sticky	not sticky	large	small	spiky surface AW	smooth surface / less air resistance	produced in smaller numbers	produced in large numbers	3	
insect-pollinated	wind-pollinated														
heavy	light														
sticky	not sticky														
large	small														
spiky surface AW	smooth surface / less air resistance														
produced in smaller numbers	produced in large numbers														
8(d)	oxygen ; water ; (suitable) temperature ;	3	<p>1 air</p> <p>A humidity / moisture</p> <p>A warmth</p>												

Question	Answer	Marks	Guidance
9(a)(i)	N and S ;	1	either order
9(a)(ii)	R has different characteristics to the parent / has dark eyes / knobs on the end of antennae / knobs on abdomen ;	1	
9(a)(iii)	phenotype ;	1	
9(b)(i)	height ; weight ; skin colour ; hair colour ; AVP ;;; e.g. leg length / arm length	3	A hair length
9(b)(ii)	tongue rolling / gender / AVP ;	1	A blood group

Question	Answer	Marks	Guidance								
10	<table border="1"> <tr> <td>letter</td> <td>name of the process</td> </tr> <tr> <td>X</td> <td>rain / precipitation / condensation / AW ;</td> </tr> <tr> <td>Y</td> <td>evaporation ;</td> </tr> <tr> <td>Z</td> <td>transpiration ;</td> </tr> </table>	letter	name of the process	X	rain / precipitation / condensation / AW ;	Y	evaporation ;	Z	transpiration ;	3	
letter	name of the process										
X	rain / precipitation / condensation / AW ;										
Y	evaporation ;										
Z	transpiration ;										



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BIOLOGY

0610/32

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 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 **16** printed pages and **4** blank pages.

1 Table 1.1 contains a list of chemicals that are useful to humans.

Complete Table 1.1 by stating **one** way in which each chemical is useful.

Table 1.1

chemical	use of the chemical
antibiotic	
fertiliser	
herbicide	
insecticide	
pectinase	

[5]

[Total: 5]

2 Fig. 2.1 shows a section through a blood vessel.

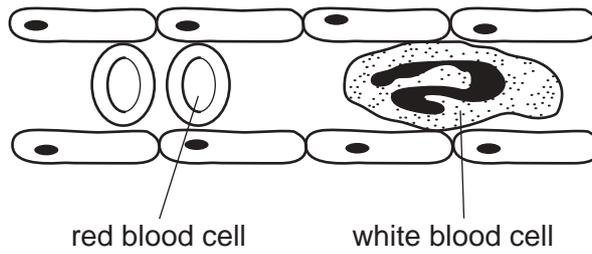


Fig. 2.1

(a) Identify the type of blood vessel shown in Fig. 2.1.

..... [1]

(b) Red blood cells are different to white blood cells.

State **three** ways in which a red blood cell is different to a white blood cell.

1

.....

2

.....

3

.....

[3]

(c) (i) State the name of the liquid component of blood.

..... [1]

(ii) State **three** substances that are transported in the liquid component of blood.

1

2

3

[3]

[Total: 8]

3 The boxes on the left contain the names of structures in the body.

The boxes on the right contain the names of processes carried out by the body.

Draw one straight line from each structure to the process in which it is involved.

Draw **six** lines.

structure	process
aorta	breathing
cervix	circulation
duodenum	digestion
ribs	excretion
sensory neurone	reflex action
ureter	reproduction

[6]

[Total: 6]

4 The kidneys excrete excess water in urine.

(a) The main component of urine is water.

State **two** other substances that are excreted by healthy kidneys.

1

2

[2]

(b) A scientist investigated the effect of drinking sugar solutions, of different concentrations, on the volume of urine produced.

- 1.5 dm³ of sugar solution **A** was consumed by a healthy adult.
- Urine was collected at thirty minute intervals for 150 minutes.
- The volume of urine produced every thirty minutes was added to the previous total volume.
- This procedure was repeated with sugar solutions **B** and **C**.

The results are shown in Fig. 4.1.

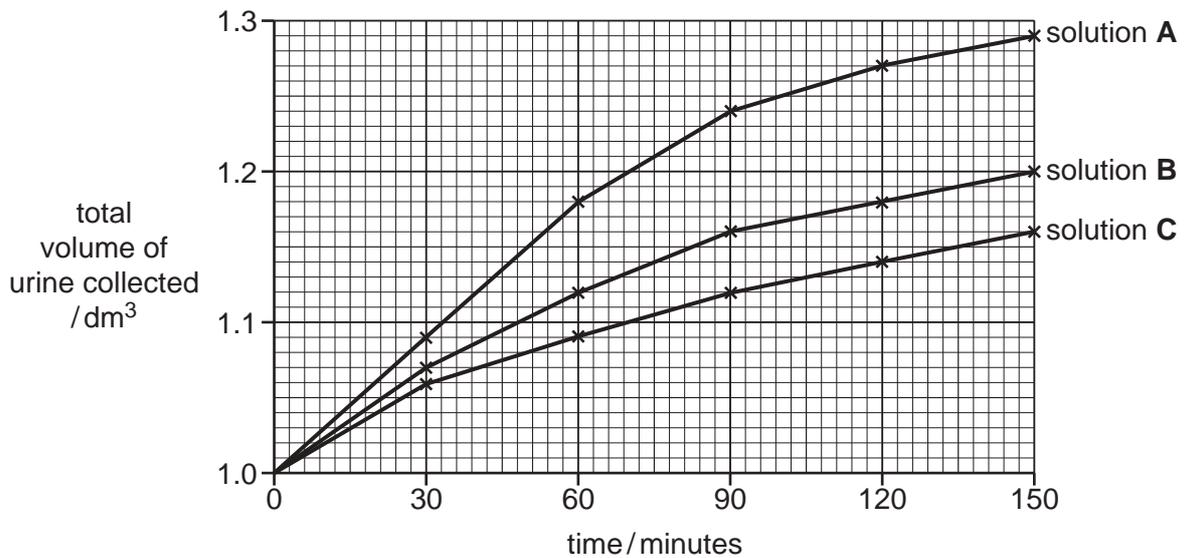


Fig. 4.1

(i) Complete Table 4.1 using the information in Fig. 4.1.

Table 4.1

description of measurement	volume / dm ³
total volume of urine produced 60 minutes after drinking solution C	
volume of urine produced between 30 minutes and 60 minutes after drinking solution B	
total volume of urine produced 150 minutes after drinking solution A	

[3]

(ii) Suggest which of the three solutions, **A**, **B** or **C**, contained the most sugar.

Give a reason for your suggestion.

solution

reason

.....

.....

[2]

(c) List **two** factors that will affect the volume and concentration of urine produced.

1

2

[2]

(d) The body loses water in the urine.

State **two** other ways in which the body loses water.

1

.....

2

.....

[2]

[Total: 11]

5 Fig. 5.1 shows a diagram of a cell found in leaves.

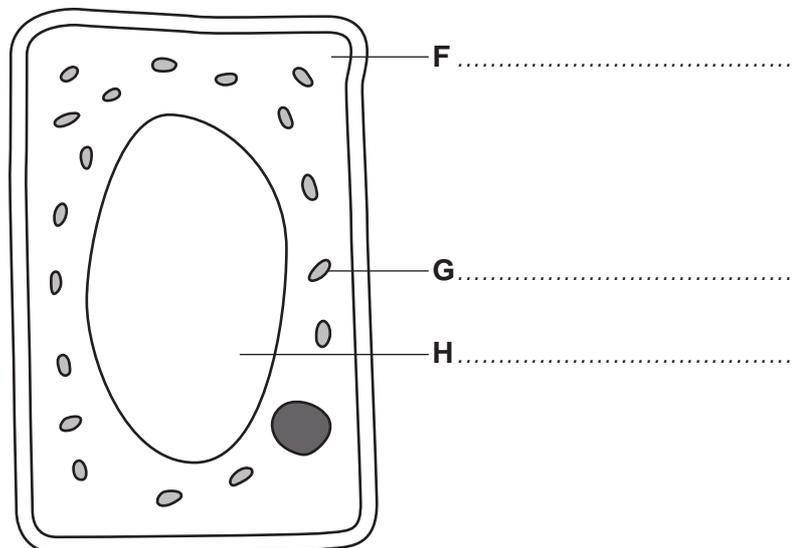


Fig. 5.1

(a) (i) State the names of structures **F**, **G** and **H**.

Write your answers on Fig. 5.1.

[3]

(ii) On Fig. 5.1 draw:

a line labelled **K** to show where the chromosomes are found

a line labelled **L** to show the position of the cell membrane.

[2]

(iii) State the name of this type of plant cell.

..... [1]

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(b) The cell in Fig. 5.1 was placed in a concentrated glucose solution.

Fig. 5.2 shows the appearance of the cell after ten minutes in the glucose solution.

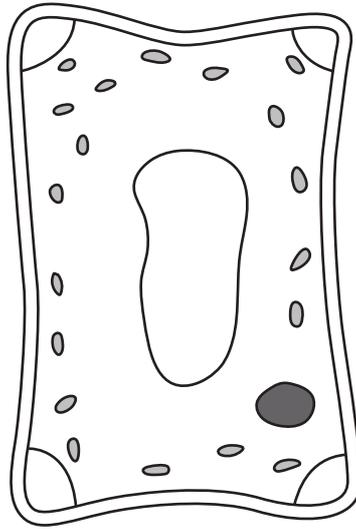


Fig. 5.2

(i) State **two** ways in which the cell has changed.

1

2

[2]

(ii) Water moves into and out of the cell by osmosis.

Osmosis is a form of diffusion.

Describe the ways in which diffusion is different to active transport.

.....
.....
.....
.....
.....
.....

[3]

[Total: 11]

6 This question is about enzymes.

Choose words from the list to complete the sentences.

Each word may be used once, more than once, or not at all.

amino acids	amylase	bacteria	biological
fatty acids	glucose	humidity	lipase
living	protease	salivary	temperature

All enzymes are proteins. Proteins are made of

An enzyme acts as a catalyst.

In order to work rapidly, enzymes need the correct and pH.

An example of an enzyme that works in the acidic conditions in the stomach is

.....

Acidic conditions will kill many of the present in food.

Salivary stops working in acidic conditions.

Fats are broken down by

[7]

[Total: 7]

7 (a) Some animals produce milk to feed their offspring.

Table 7.1 shows the mass of the substances found in 100g of milk from two animals.

Table 7.1

substance	mass in 100g of milk/g	
	human milk	water buffalo milk
protein	1.10	4.50
fat	4.50	8.00
carbohydrate	7.50	4.90
calcium	0.03	2.00
water		

- (i) Calculate the mass of water in both the human milk and the water buffalo milk.

Write your answers in Table 7.1.

Space for working.

[2]

- (ii) State the name of the substance in Table 7.1 that is present in a higher concentration in human milk than in water buffalo milk.

..... [1]

- (iii) State the name of **one** component of a balanced diet that is missing from Table 7.1.

..... [1]

- (iv) Producing milk for offspring is a characteristic of a particular group of animals.

State the name of this group of animals.

..... [1]

- (b) State how young animals use the substances listed in Table 7.1.

protein

.....

fat

.....

carbohydrate

.....

calcium

.....

water

.....

[5]

(c) An adult eats a high-fat diet.

State **two** health problems that could be caused by eating a high-fat diet.

1

.....

2

.....

[2]

[Total: 12]

8 (a) Define the term *pollination*.

.....
.....
.....
.....[2]

(b) Fig 8.1 shows a flower that reproduces using wind-pollination.



Fig. 8.1

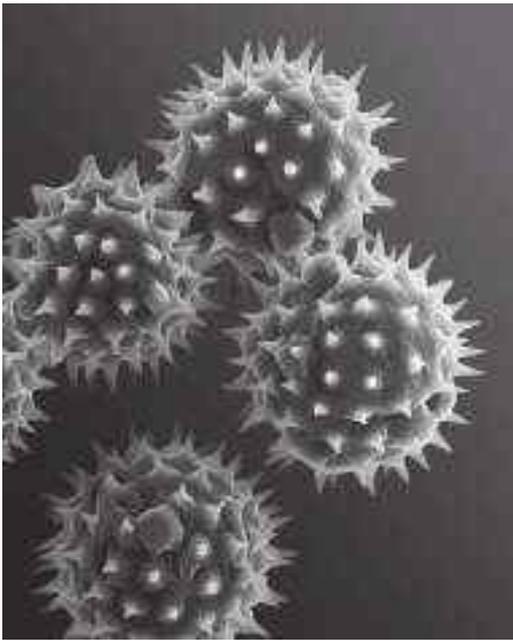
Describe **two** ways in which the flower in Fig. 8.1 is adapted for wind-pollination.

1

2

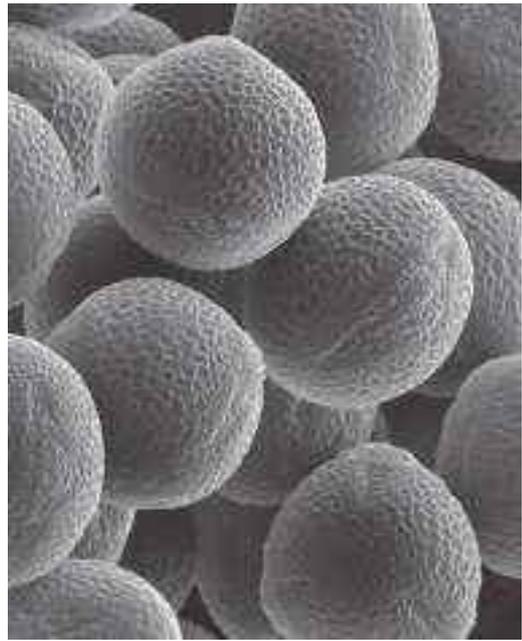
.....[2]

(c) Fig. 8.2 shows two photomicrographs of pollen.



magnification $\times 1250$

pollen from an insect-pollinated flower



magnification $\times 2000$

pollen from a wind-pollinated flower

Fig. 8.2

Describe, using your knowledge and the information in Fig. 8.2, how pollen from an insect-pollinated flower is different to pollen from a wind-pollinated flower.

.....

.....

.....

.....

.....

.....

..... [3]

(d) Sexual reproduction in plants results in seeds being formed.

State **three** conditions needed for the germination of seeds.

1.....

2.....

3.....

[3]

[Total: 10]

- 9 Some insects can reproduce by sexual reproduction **and** asexual reproduction. In both types of reproduction chromosomes are passed from the parent or parents, to the offspring.

Fig. 9.1 shows a drawing of a parent insect and seven of her offspring: **M**, **N**, **P**, **R**, **S**, **T** and **U**.

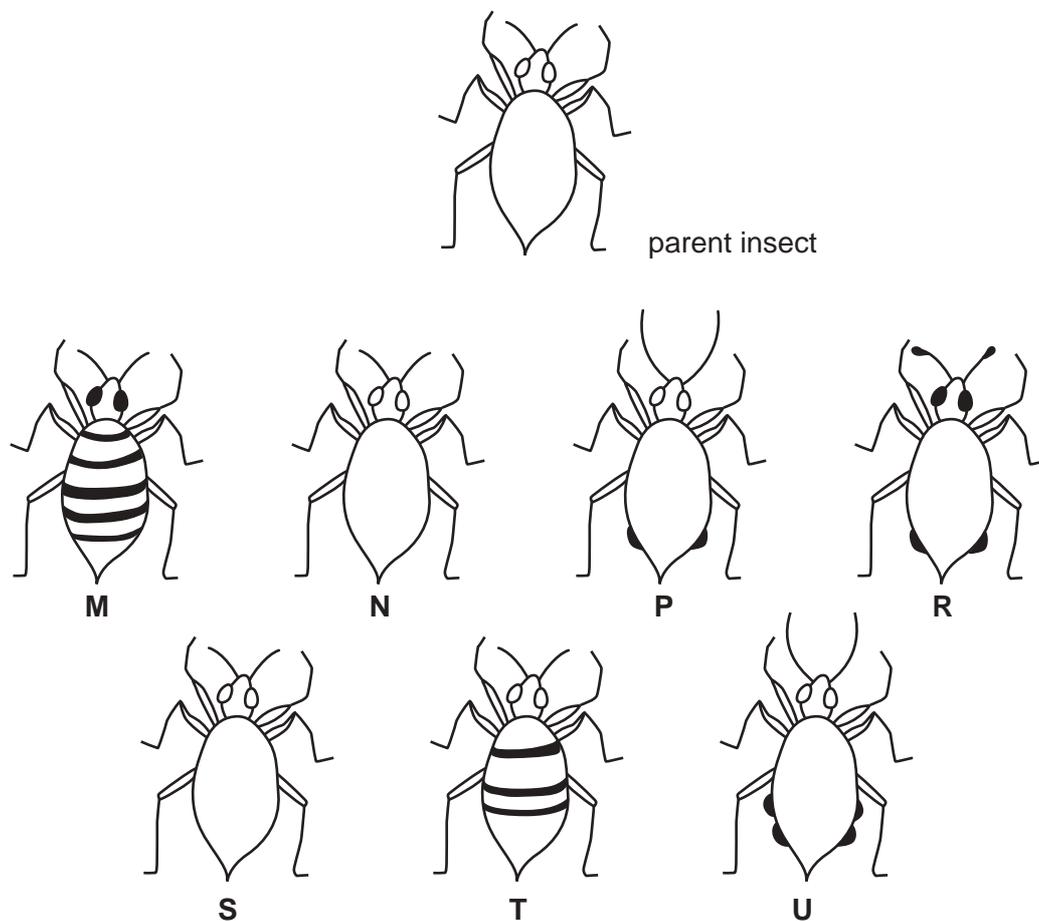


Fig. 9.1

- (a) (i) Two of the offspring were produced by asexual reproduction.

Suggest the letters representing these **two** offspring.

1

2

[1]

- (ii) Insect **R** was produced by sexual reproduction.

Use the information from the diagram to support this statement.

.....

 [1]

- (iii) State the term that is defined as the observable features of an organism.

..... [1]

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(b) Fig. 9.2 shows a group of male students. They are all the same age.



Fig. 9.2

(i) The students in Fig. 9.2 show continuous variation in some of their characteristics.

State **three** characteristics in which these students show continuous variation.

1

2

3

[3]

(ii) State **one** example of discontinuous variation.

.....[1]

[Total: 7]

10 Fig. 10.1 shows part of the water cycle.

The letters represent processes that take place in the water cycle.

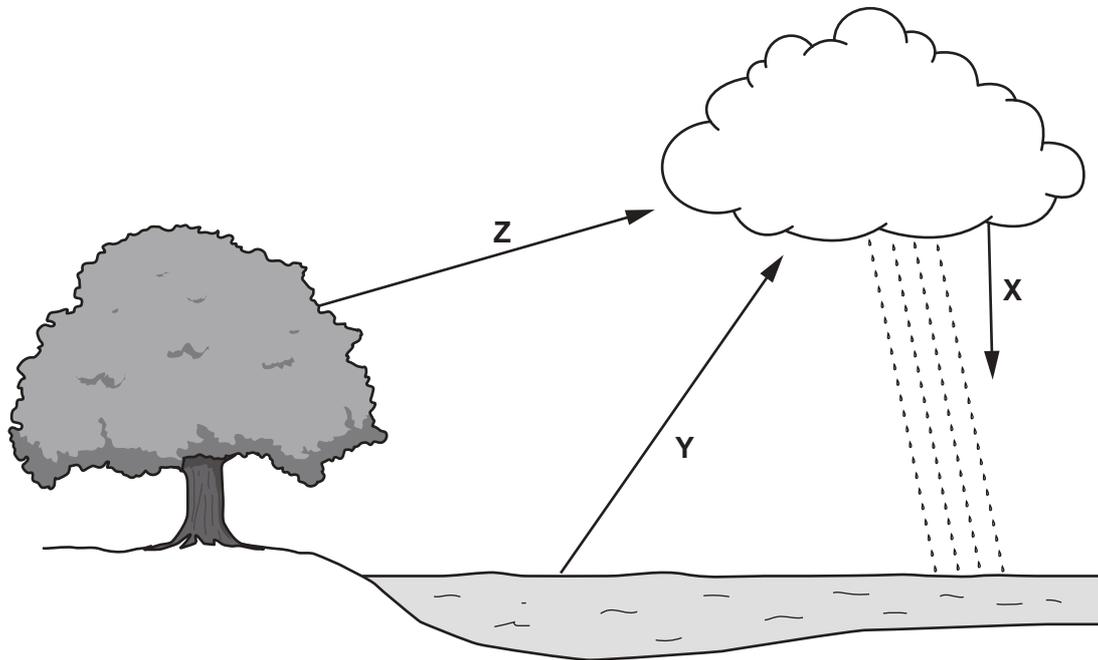


Fig. 10.1

Complete Table 10.1 by stating the names of processes X, Y and Z in Fig. 10.1.

Table 10.1

letter	name of the process
X	
Y	
Z	

[3]

[Total: 3]

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BIOLOGY

0610/42

Paper 4 Theory (Extended)

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.

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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.

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.

Mark schemes will use these abbreviations

- ; separates marking points
- / alternatives
- **I** ignore
- **R** reject
- **A** accept (for answers correctly cued by the question, or guidance for examiners)
- AW alternative wording (where responses vary more than usual)
- AVP any valid point
- ecf credit a correct statement/calculation that follows a previous wrong response or reverse argument
- **ora** the word/phrase in brackets is not required, but sets the context
- () actual word given must be used by candidate (grammatical variants excepted)
- underline indicates the maximum number of marks that can be given
- max

Question	Answer	Marks	Guidance
1(a)(i)	each row in this order: F A E C B D	5	6 correct = 5 marks 4/5 correct = 4 marks 3 correct = 3 marks 2 correct = 2 marks 1 correct = 1 mark
1(a)(ii)	prokaryote ;	1	*****
1(b)	presence of genetic material / DNA / RNA ; presence of protein ;	1	
1(c)(i)	(actual length of bacterium) = size / length, of the image ÷ magnification ;	1	
1(c)(ii)	2.6 (µm) ;	1	
1(d)(i)	1 produces a toxin ; 2 bacteria / toxin, attach to the wall of the, small / large, intestine ; 3 correct ref to chloride ions ; 4 secretion / loss, chloride ions, into the, small intestine ; 5 causing a <u>water potential gradient</u> / water potential of the intestinal lumen is lowered ; 6 causing osmotic movement of water into the gut / water flows from, the cells / blood, into the, lumen / gut ; 7 loss of salts from the blood ; 8 causing, diarrhoea / dehydration ;	4	
1(d)(ii)	<u>oral rehydration</u> (therapy / salts / treatment / solution) ; in-take of water, sugar <u>and</u> , salt / ions ; antibiotics ;	1	

Question	Answer	Marks	Guidance
2(a)	<p><i>describe and compare</i></p> <ol style="list-style-type: none"> 1 COPD higher in villages than cities ; ora 2 COPD increasing in both areas ; 3 increasing more rapidly in villages ; 4 fluctuation / COPD decreases, in cities in 2001 ; 5 data quote comparing villages and cities including year and million ; <p><i>suggest</i></p> <ol style="list-style-type: none"> 6 lack of healthcare in villages ; 7 more people smoke in villages / passive smoking ; 8 lack of awareness / education, in villages ; 9 pollution in villages ; 10 poor quality housing in villages ; 11 differences in diet ; 12 AVP ; e.g. lack of physical activity ; 	6	
2(b)(i)	<ol style="list-style-type: none"> 1 nasal <u>hairs</u>, trap particles / AW ; 2 goblet cells secrete mucus ; 3 particles trapped in the mucus ; 4 cilia moving the mucus ; 5 mucus (containing particles) moved, away from the gas exchange surface / towards the throat / AW ; 6 mucus, swallowed / AW ; 7 AVP ; phagocytes / sneezing 	4	
2(b)(ii)	<p>more oxygen ; less carbon dioxide ; less water vapour ;</p>	2	
2(c)(i)	intercostal ;	1	
2(c)(ii)	(pressure) decreases and (volume) increases ;	1	

Question	Answer	Marks	Guidance
3(a)(i)	0.2 ;	1	
3(a)(ii)	pyramid shape with four trophic levels widest at the bottom ; bars drawn at correct width (\pm half a small square) ; each bar labelled with trophic level ;	3	A ecf from part (i)
3(b)	decomposer ;	1	
3(c)(i)	<u>photosynthesis</u> ; ref. to chlorophyll ; <u>light energy</u> is transferred to <u>chemical energy</u> ; (named) glucose formed (from carbon dioxide and water) ; named example of carbohydrate molecule used to make biomass ;	3	e.g. cellulose, sucrose, starch, protein, DNA, tissues
3(c)(ii)	energy is lost between the trophic levels / energy decreases up the trophic levels ; not all of the organism is, eaten / digested / absorbed ; energy is lost, as heat / in respiration / in metabolic processes / named metabolic process / movement ; energy lost in, excretion / faeces / urine ; (so) less energy to support the next trophic level ;	3	
3(d)	1 prevents extinction / protection of endangered species ; 2 maintains genetic diversity / biodiversity / AW ; 3 maintaining habitat / ecosystem / breeding grounds ; 4 maintain, nutrient recycling ; 5 maintain, resource provision / food / drugs ; 6 maintain, food chains / food webs / trophic levels / description of ; 7 prevent soil erosion / flooding ; 8 AVP ; as a leisure facility / tourism / education	3	

Question	Answer	Marks	Guidance															
4(a)	<table border="1"> <thead> <tr> <th>function</th> <th>letter</th> <th>name</th> </tr> </thead> <tbody> <tr> <td>releases oestrogen</td> <td>F</td> <td>ovary</td> </tr> <tr> <td>site of fertilisation</td> <td>A</td> <td>oviduct</td> </tr> <tr> <td>site of implantation</td> <td>E</td> <td>uterus lining</td> </tr> <tr> <td>dilates during the process of birth</td> <td>C/D</td> <td>vagina (C) / cervix (D)</td> </tr> </tbody> </table> ****	function	letter	name	releases oestrogen	F	ovary	site of fertilisation	A	oviduct	site of implantation	E	uterus lining	dilates during the process of birth	C/D	vagina (C) / cervix (D)	4	1 mark for each correct row
function	letter	name																
releases oestrogen	F	ovary																
site of fertilisation	A	oviduct																
site of implantation	E	uterus lining																
dilates during the process of birth	C/D	vagina (C) / cervix (D)																
4(b)	23 ; 46 / 23 pairs ;	2																
4(c)	1 cases increases then decrease ; 2 large increase between 10–14 and 15–19 ; 3 most cases in the 15–19 age group ; 4 from 15–19 number of cases decrease / from 20–24 number of cases steep decrease ; 5 no cases above 55 years old / in 55–64 age group / 65+ age group ; 6 data quote with number of cases and age group ;	3																
4(d)(i)	antibiotics ;	1																
4(d)(ii)	HIV ;	1																
4(d)(iii)	(named) bodily fluids / sexual fluid ; barrier ; condom / femidom ;	3																

Question	Answer	Marks	Guidance
5(a)(i)	<p><i>advantages</i></p> <ol style="list-style-type: none"> 1 lower (dry) mass ; 2 fewer weeds / lower weed density ; 3 less competition ; 4 therefore higher yield of crop ; <p><i>disadvantages</i></p> <ol style="list-style-type: none"> 5 more treatments ; 6 higher cost / time / effort ; 7 idea of increased environmental impact ; 8 increased health risks ; 	4	
5(a)(ii)	<p>increased strength of wind ; increased precipitation ; resistance ; type of weed ; AVP ;; e.g. ref. to amount / too much time between treatments</p>	2	
5(a)(iii)	<ol style="list-style-type: none"> 1 absorbed by (broad leaved) weeds / selective for weeds ; 2 less absorption by (narrow leaved) crops ; 3 increase the growth (rate) of weeds ; 4 plant cannot produce enough, glucose / photosynthesise fast enough ; 5 weeds cannot maintain rate of growth ; 6 AVP ; e.g. falls over and can't absorb sunlight 	3	
5(b)	<p>gravi / geo ; tropism ;</p>	2	

Question	Answer	Marks	Guidance
6(a)	breakdown of large to small <u>molecules</u> ; from insoluble to soluble ;	2	
6(b)(i)	<i>test-tube 1</i> 1 (less cloudy), slower break down of egg white solution / protein ; 2 (no HCl so) pH of the solution is too high ; ora 3 high pH denatures pepsin / enzyme ; <i>test-tube 2</i> 4 hydrochloric acid causes a low pH ; 5 pepsin works best in / optimal activity, low pH / acidic conditions ; <i>test-tube 3</i> 6 pepsin / enzyme, unable to break down, protein / egg white solution ; 7 boiling denatures, pepsin / enzyme ; 8 ref to enzyme-substrate complex / fewer successful collisions ; 9 high pH / boiling, changes shape of active site ;	5	
6(b)(ii)	as a control ; to show that pepsin is responsible for the protein digestion ; to show that hydrochloric acid does not digest the protein ;	2	
6(b)(iii)	stomach ;	1	
6(c)	maltose broken down ; to <u>glucose</u> ; on the membranes of the epithelial lining ; (acts) in the small intestine / duodenum ;	3	

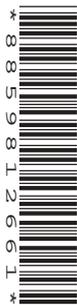
CANDIDATE
NAME

CENTRE
NUMBER

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CANDIDATE
NUMBER

--	--	--	--



BIOLOGY

0610/42

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.

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 **17** printed pages and **3** blank pages.

1 (a) (i) Fig. 1.1 is a branching key used to identify different species of bacteria.

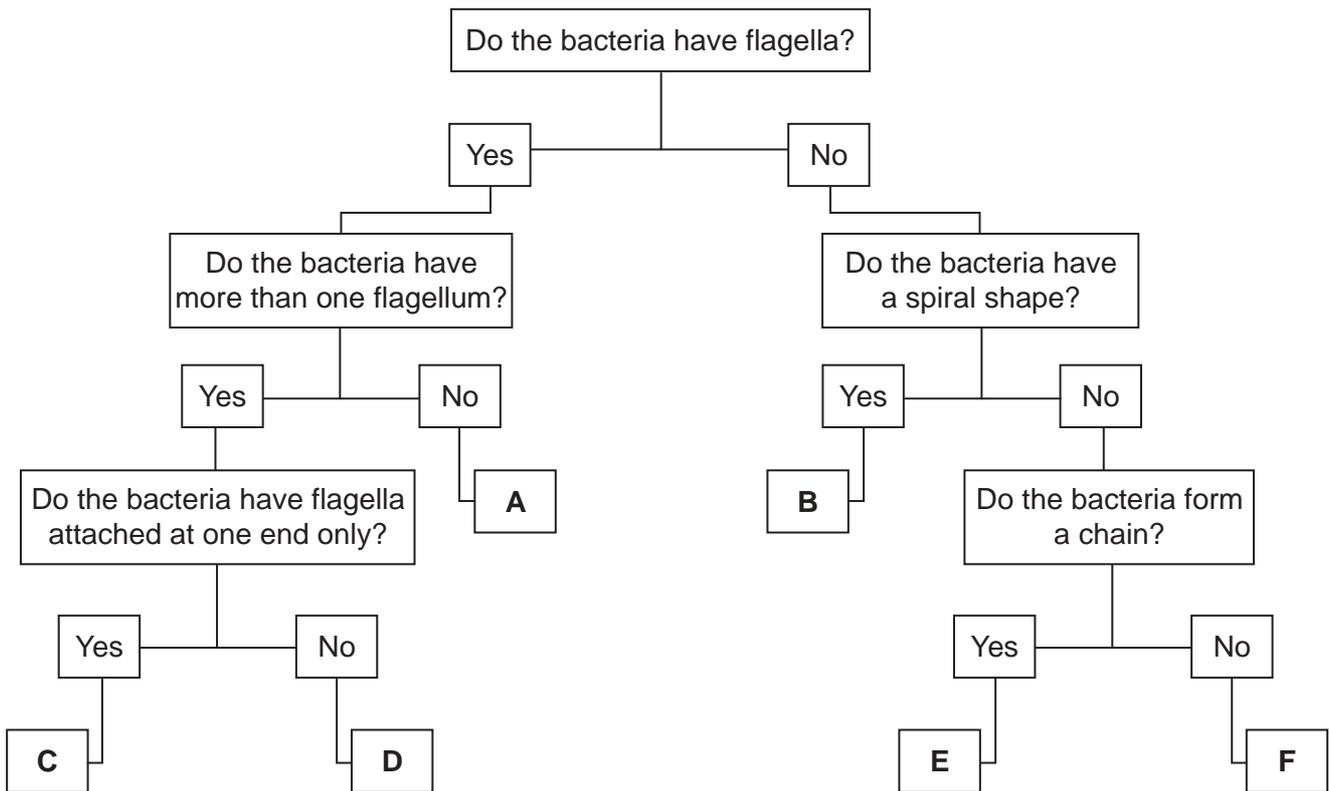


Fig. 1.1

Fig. 1.2 shows six different species of bacteria.

Use the key to identify the six different species of bacteria.

Write the letters on the lines in Fig. 1.2.

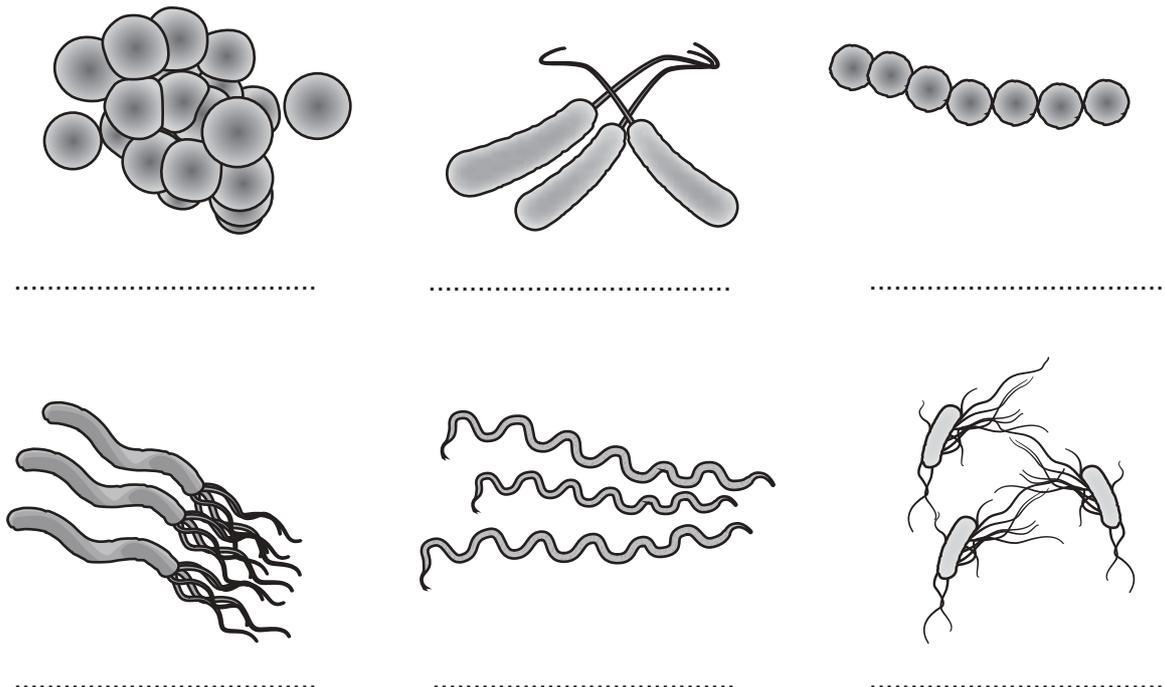


Fig. 1.2

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[5]

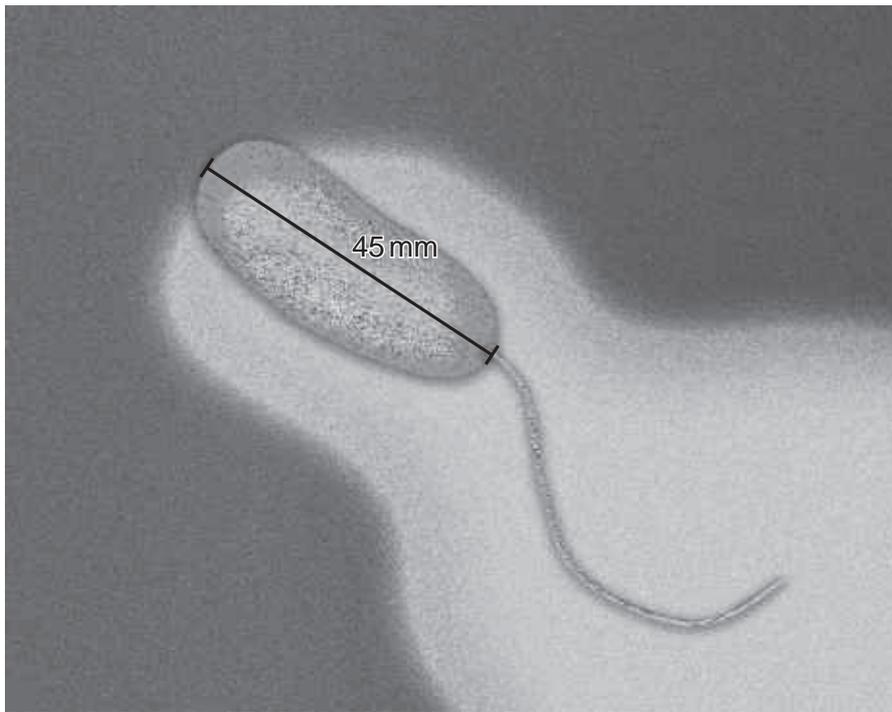
(ii) State the name of the kingdom that bacteria belong to.

..... [1]

(b) State **one** similarity between the structure of bacteria and the structure of viruses.

.....
.....
.....[1]

(c) Fig. 1.3 is a photomicrograph of *Vibrio cholerae*, the bacterium that causes cholera.



magnification $\times 17\,300$

Fig. 1.3

(i) Write the formula that would be used to calculate the actual length of the bacterium (not including the flagellum) in Fig. 1.3.

[1]

- 2 A study estimated the number of people with chronic obstructive pulmonary disease (COPD) in India. Data were collected from two groups of people, those who lived in cities and those who lived in villages.

Fig. 2.1 shows the results.

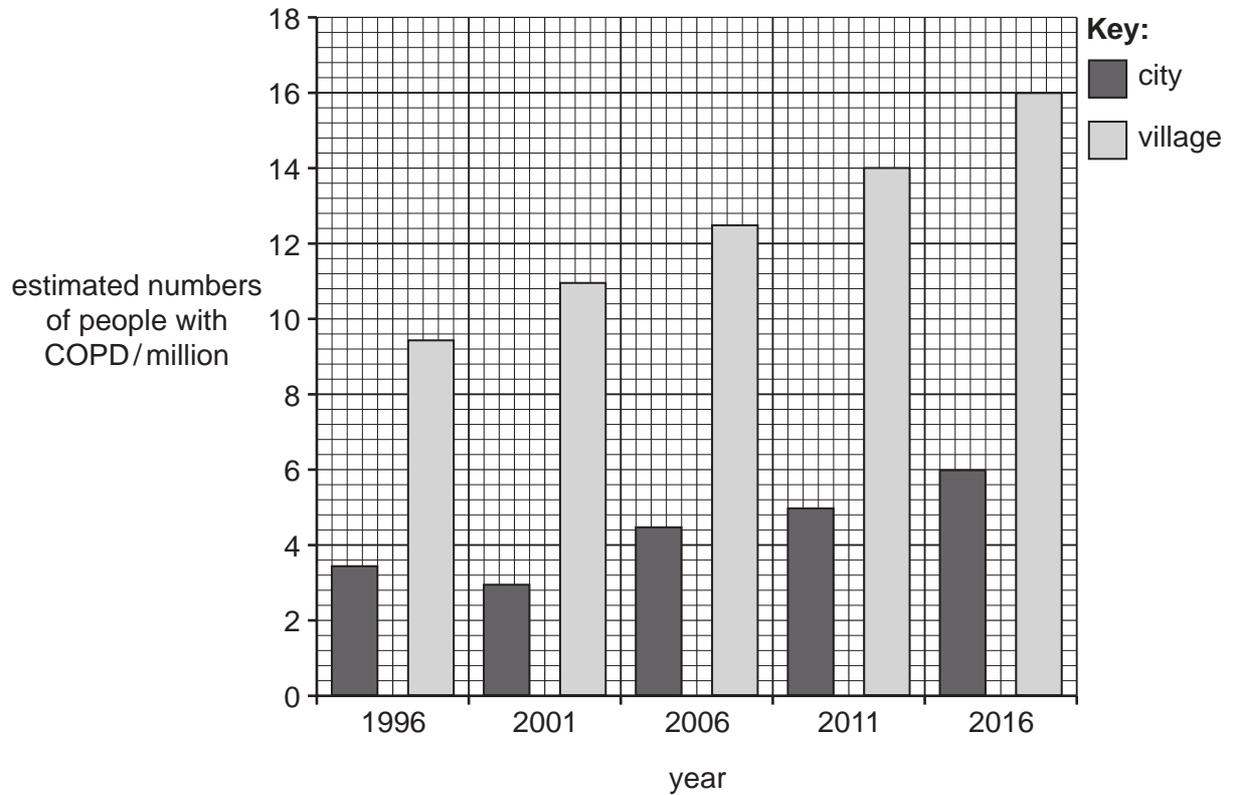


Fig. 2.1

(ii) State **two** ways in which the composition of inspired air differs from the composition of expired air.

1

2

[2]

(c) Alveoli are well-ventilated to provide efficient gas exchange.

(i) State the name of the muscles that cause the ribs to move during ventilation.

.....[1]

(ii) During inspiration the pressure and volume in the thorax changes.

State these changes.

pressure

volume

[1]

[Total: 14]

- 3 (a) Ecologists studied an area of woodland and estimated the biomass of each trophic level for one of the food chains in the woodland.

Some students wanted to use the data to draw a pyramid of biomass for the food chain.

Table 3.1 shows the students' table.

The students added a column to calculate the width of the bars they would need to draw.

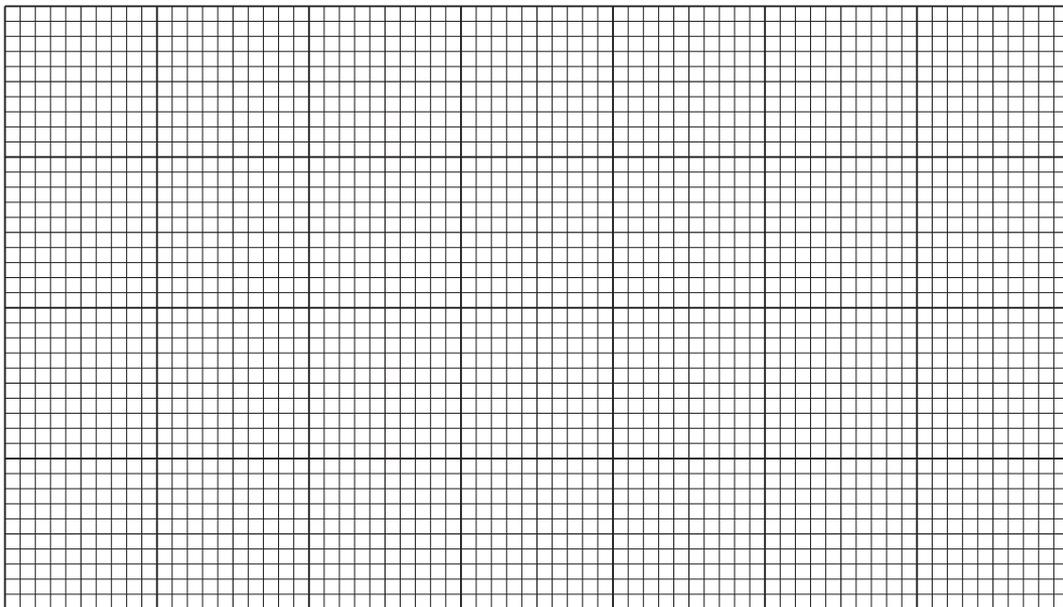
Table 3.1

	trophic level	biomass/g m ⁻²	width of bar/cm
1	producer	120	12.0
2	primary consumer	48	4.8
3	secondary consumer	16	1.6
4	tertiary consumer	2	

- (i) Complete Table 3.1 by calculating the missing value and writing it in the table. [1]

- (ii) Using the information in Table 3.1, draw a pyramid of biomass.

Label each bar with the trophic level.



[3]

- (b) A type of organism gains energy from waste organic material from all trophic levels.

State the name of this type of organism.

.....[1]

(c) (i) Outline how organisms in the first trophic level of the woodland food chain produce biomass using energy from the Sun.

.....
.....
.....
.....
.....
.....
.....
..... [3]

(ii) Explain why the fourth trophic level has the least biomass in this food chain.

.....
.....
.....
.....
.....
.....
..... [3]

(d) The woodland is a conservation area.

Outline the possible benefits of conserving this specific area of woodland.

.....
.....
.....
.....
.....
.....
..... [3]

[Total: 14]

4 Fig. 4.1 is a diagram of the human female reproductive system.

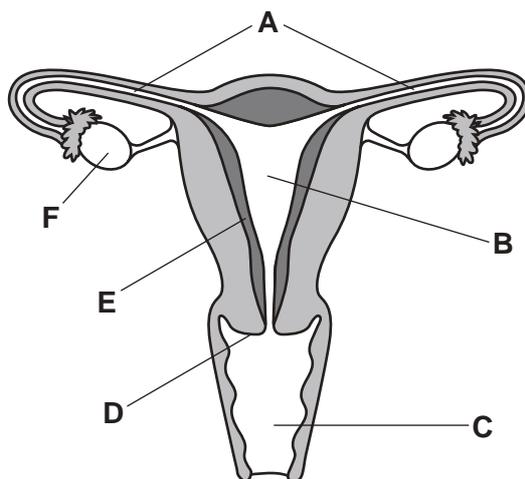


Fig. 4.1

(a) Complete Table 4.1 to show the letter and the name of each of the structures that perform these functions.

Table 4.1

function	letter	name
releases oestrogen		
site of fertilisation		
site of implantation		
dilates during the process of birth		

[4]

(b) Fertilisation is the fusion of the nuclei of a male gamete and a female gamete resulting in a zygote.

State the number of chromosomes present in a human:

female gamete

zygote

[2]

(iii) Complete the sentences about the spread of STIs.

STIs are transmitted through the transfer of during sexual contact. One way individuals can avoid the spread of STIs is to use a type of contraception. One example of this type of contraception is

[3]

[Total: 14]

(iii) Explain how 2,4-D acts as a weedkiller.

.....
.....
.....
.....
.....
.....
.....
.....[3]

(b) Auxin causes the shoots of a plant to grow away from gravity.

State the name of this response.

.....[2]

[Total: 11]

6 (a) Define the term *chemical digestion*.

.....

.....

.....[2]

(b) A student investigated the activity of the digestive enzyme pepsin.

Fig. 6.1 shows the apparatus used in the investigation.

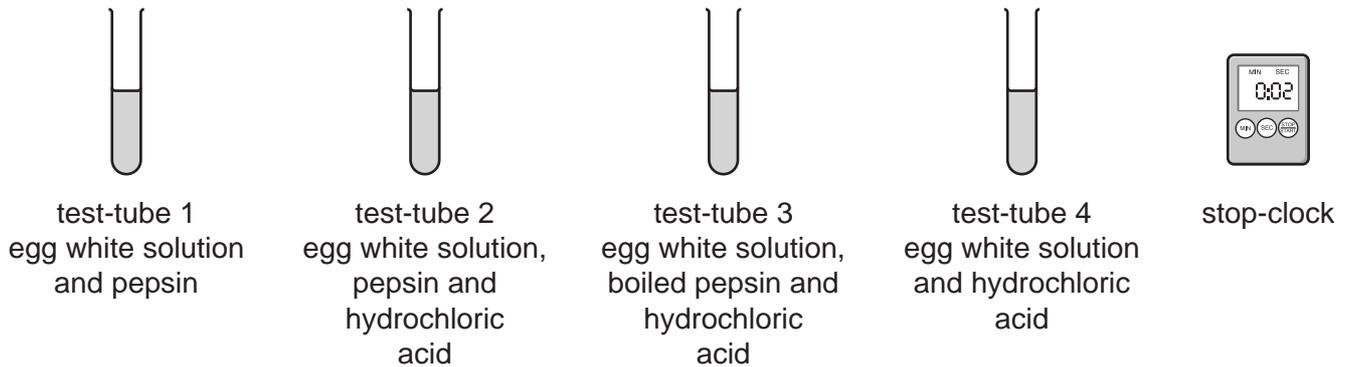


Fig. 6.1

The appearance of the four test-tubes was recorded at 0 and 5 minutes.

The protein in the egg white solution gives the solution a cloudy appearance.

The cloudy appearance clears when the protein in the egg white solution breaks down.

Table 6.1 shows the results.

Table 6.1

test-tube	contents	appearance at 0 mins	appearance after 5 mins
1	egg white solution, pepsin	cloudy	less cloudy
2	egg white solution, pepsin, hydrochloric acid	cloudy	clear
3	egg white solution, boiled pepsin, hydrochloric acid	cloudy	cloudy
4	egg white solution, hydrochloric acid	cloudy	cloudy

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BIOLOGY

0610/52

Paper 5 Practical Test

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.

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- 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:

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- marks are awarded when candidates clearly demonstrate what they know and can do
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- 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:

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GENERIC MARKING PRINCIPLE 5:

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GENERIC MARKING PRINCIPLE 6:

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Abbreviations used in the Mark Scheme

- ; separates marking points
- / alternatives
- **I** ignore
- **R** reject
- **A** accept (for answers correctly cued by the question, or guidance for examiners)
- **AW** alternative wording (where responses vary more than usual)
- **AVP** any valid point
- **ecf** credit a correct statement/calculation that follows a previous wrong response
- **ora** or reverse argument
- () the word/phrase in brackets is not required, but sets the context
- underline actual word given must be used by candidate (grammatical variants excepted)
- **max** indicates the maximum number of marks that can be given

Question	Answer	Marks	Guidance
1(a)(i)	table drawn with (ruled) lines and appropriate number of cells ; column / row, headings with appropriate units for distance ; two distances determined ; correct trend ;	4	
1(a)(ii)	selected correct values ; selected values $\div 10$;	2	ecf from (a)(i)
1(a)(iii)	the higher temperature the faster / further, the stain / water, moves / AW ; ora	1	ecf from (a)(i)
1(b)	<ol style="list-style-type: none"> 1 length / width / surface area / size, of celery (stalk) ; 2 size / width, of cut pieces ; 3 species / type (of plant) ; 4 time in stain ; 5 concentration (of stain) ; 6 volume / depth (of stain) ; 7 type / colour, of stain ; 	2	

Question	Answer	Marks	Guidance
2(a)(i)	O clear outline of lumen with one minor break ; S lumen larger than 55 mm ; D details ;;	4	
2(a)(ii)	measurement of AB 55 ± 1 mm ; (x) 36 / 37 ;	2	A 5.5 cm ecf for incorrect AB measurement for max 1
2(b)(i)	40 ;	1	A response in table if answer in working space does not match
2(b)(ii)	repeat experiment for person 2 ; compare with, the best fit line / other people ;	1	A repeat (measurement) I unexpected result unqualified
2(b)(iii)	A axes labelled with units ; S linear scale for plotted points to half or more in one dimension ; P all plotted points accurate to \pm half small square ; L suitable best fit line ;	4	ecf from 2(b)(i)
2(b)(iv)	indication on plot at 1 minute ; correct reading from their graph at 1 minute ;	2	I units ecf correct reading from indication on graph somewhere other than at 1 minute
2(b)(v)	as running time increase breathing rate increases ; levels off / AW ; from 6 minutes / 48 breaths per minute ;	3	
2(c)(i)	suitable health comment ; suitable environment for exercise ;	1	mp2 e.g. water, level surface, footwear, first aid kit, avoid extreme weather conditions

Question	Answer	Marks	Guidance
2(c)(ii)	gender (of subjects) ; fitness / health (of subjects) ; age (of subjects) ; speed of, exercise / running ; running surface ; (named) environmental condition ; preparation / resting time (before and / or between runs) ; time interval / point after exercise, used to determine breathing rate ;	2	A breathing rate to return to resting rate
2(c)(iii)	running time ;	1	



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER



BIOLOGY

0610/52

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 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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1	
2	
Total	

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- 1 You are going to investigate the effect of temperature on water uptake in celery stalks.

Water is transported in the xylem tissue of plant stems.

Read all the instructions but DO NOT CARRY THEM OUT until you have drawn a table for your results in the space provided in 1(a)(i).

You are provided with two celery stalks of the same length and two small beakers that contain a red stain.

- Step 1 Place one of the small beakers containing red stain into the large beaker labelled **cool**. Place the other small beaker containing red stain into the large beaker labelled **warm**. The large beakers will act as water-baths.
- Step 2 Raise your hand when you are ready for water to be added to the two water-baths. Add ice water to the **cool** water-bath and warm water to the **warm** water-bath. Make sure that the water in the water-baths does not go into the small beakers of red stain.
- Step 3 Leave the small beakers containing the red stain in the water-baths for 3 minutes.
- Step 4 After 3 minutes, put one celery stalk into each beaker of red stain and leave them in the water-baths for 10 minutes.
- Step 5 Label one white tile **cool** and the other white tile **warm**.

You can continue with other questions during this time.

- Step 6 After 10 minutes remove the celery stalk from the **warm** beaker of red stain and place it on the tile labelled **warm**. Remove the celery stalk from the **cool** beaker of red stain and place it on the tile labelled **cool**.
- Step 7 On the tile labelled **warm**, cut a section across the celery stalk, 5 mm from the end that was in the red stain, as shown in Fig. 1.1.

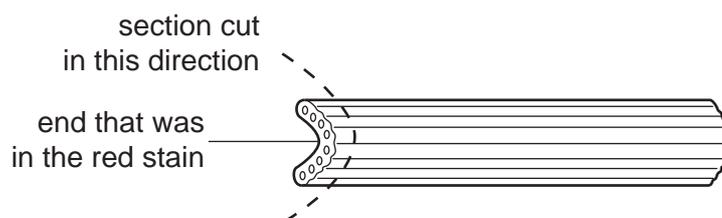


Fig. 1.1

- Step 8 Use a hand lens to see if the red stain is visible in the xylem of the cut section of the celery stalk. Fig. 1.2 shows the location of the xylem tissue in a cut section of a celery stalk.

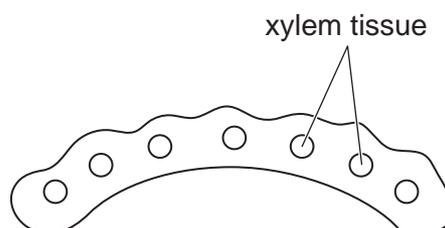


Fig. 1.2

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Step 9 If the red stain is visible, cut another 5 mm section from the celery stalk.

Step 10 Repeat steps 8 and 9 until you cut a section in which the red stain is **not** visible.

Step 11 Count the number of 5 mm sections you have cut and record this number in your table in **1(a)(i)**.

Step 12 Repeat steps 7 to 11 with the other celery stalk on the tile labelled **cool**.

(a) (i) Prepare a table and record your results in your table, in the space provided.

Your table should include:

- the temperature (cool or warm) of the red stain
- the number of sections that were stained in 10 minutes
- the total distance moved by the red stain in 10 minutes.

[4]

(ii) Use your data to calculate the rate of movement of the red stain in the celery stalk at each temperature.

Space for working.

warm mm per minute

cool mm per minute

[2]

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(iii) State a conclusion for your results.

.....
.....
.....[1]

(b) State **two** variables which were kept constant in this experiment.

1
2 [2]

(c) One way of improving the method used in this investigation would be to repeat it a number of times.

Identify **two other** sources of error in this investigation.

For each error, suggest an improvement to minimise the effect of the error.

error 1
.....
improvement 1
.....
.....
error 2
.....
improvement 2
.....
..... [4]

- 2 Fig. 2.1 shows a photomicrograph of a bronchus, surrounded by alveoli and other tissues, in the lung.

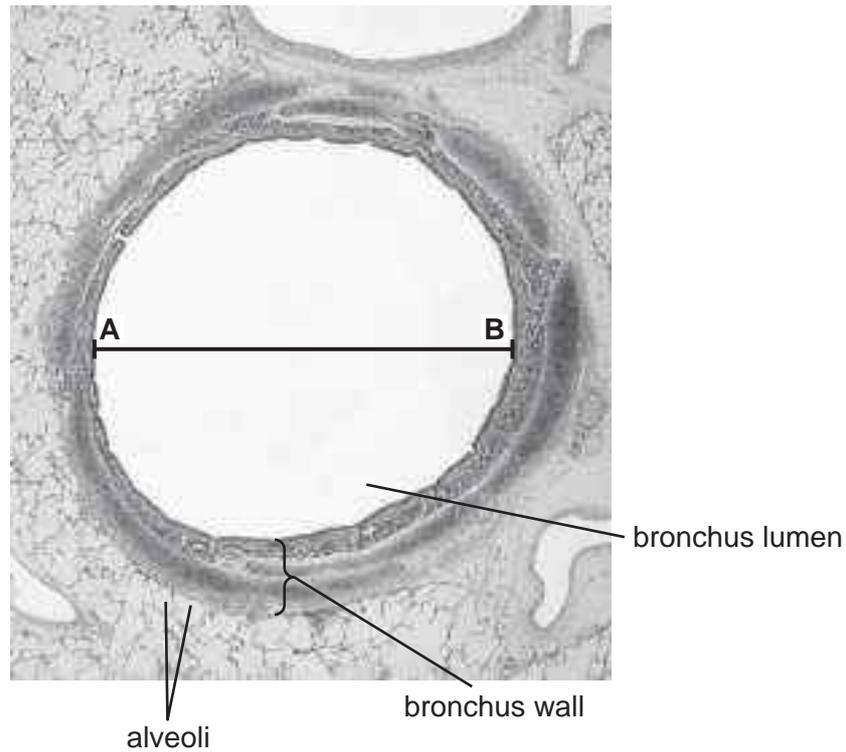


Fig. 2.1

- (a) (i) Make a large drawing of the bronchus shown in Fig. 2.1.

Do **not** include any of the alveoli or other tissues in your drawing. Do **not** label your drawing.

- (ii) The diameter of the bronchus in Fig. 2.1 is shown by the line **AB**.

Measure the length of **AB** on Fig. 2.1. Include the units.

length of **AB** on Fig. 2.1

The actual diameter of the bronchus in Fig. 2.1 is 1.5 mm.

The magnification of the bronchus in Fig. 2.1 can be calculated using the following equation:

$$\text{magnification} = \frac{\text{length of } \mathbf{AB} \text{ on Fig. 2.1}}{\text{actual diameter of the bronchus}}$$

Calculate the magnification of the bronchus in Fig. 2.1.

Give your answer to the nearest whole number.

Space for working.

.....
[2]

- (b) A student investigated the effect of exercise on breathing rate.

The breathing rates of five people were measured at rest and after running for different periods of time. The people rested between each period of running.

The results are shown in Table 2.1.

Table 2.1

running time /minutes	breathing rate/breaths per minute					
	person					average
	one	two	three	four	five	
0	20	24	22	26	28	24
2	32	31	28	32	32	31
4	39	41	38	42	40	
6	46	52	52	46	44	48
8	48	50	52	46	44	48
10	49	51	51	46	43	48

- (i) Complete Table 2.1 by calculating the average breathing rate for four minutes of running.

Space for working.

[1]

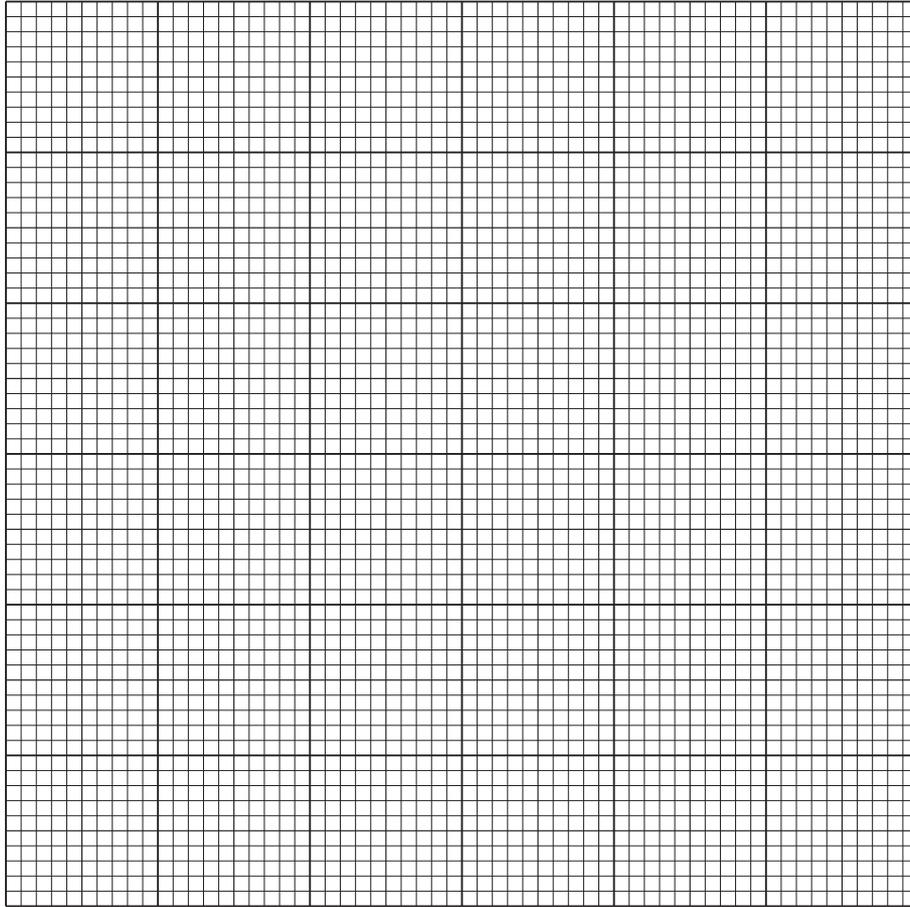
- (ii) The student thought that the result for person two at six minutes was an anomaly.

Suggest what the student should do to determine if the result is anomalous.

.....

[1]

- (iii) Plot a graph on the grid, to show the relationship between running time and the average breathing rate. Draw a line of best fit.



[4]

- (iv) Use your graph to estimate the average breathing rate for one minute of running.
Show on the graph how you obtained your answer.

.....[2]

- (v) Use your graph to describe the relationship between running time and the average breathing rate.

.....
.....
.....
.....
.....
.....[3]

(c) (i) Suggest **one** safety precaution for this investigation.

.....
.....
.....[1]

(ii) State **two** variables that should be kept constant during this investigation.

1
.....
2
.....
[2]

(iii) State the variable that has been changed (the independent variable) in this investigation.

.....[1]

[Total: 21]

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BIOLOGY**0610/62**

Paper 6 Alternative to Practical

March 2018

MARK SCHEME

Maximum Mark: 40

Published

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GENERIC MARKING PRINCIPLE 3:

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- marks are not deducted for errors
- marks are not deducted for omissions
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- **ecf** credit a correct statement/calculation that follows a previous wrong response
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- **underline** actual word given must be used by candidate (grammatical variants excepted)
- **max** indicates the maximum number of marks that can be given

Question	Answer	Marks	Guidance
1(a)(i)	cut on a surface ; method of care in cutting described ; gloves / goggles (to avoid stain on body) ;	1	1 'cut carefully' unqualified 1 lab coats
1(a)(ii)	table drawn with (ruled) lines and appropriate number of cells ; column / row, headings with appropriate units for distance ; two correct distances determined ;	3	
1(a)(iii)	selected correct values ; selected values $\div 10$;	2	ecf from (a)(ii)
1(a)(iv)	the higher temperature the faster / further, the stain / water, moves / AW ; ora	1	
1(b)	1 length / width / surface area / size, of celery (stalk) ; 2 size / width, of cut pieces ; 3 species / type (of plant) ; 4 time in stain ; 5 concentration (of stain) ; 6 volume / depth (of stain) ; 7 type / colour, of stain ;	2	

Question	Answer	Marks	Guidance
2(a)(i)	O clear outline of lumen with one minor break ; S lumen larger than 55 mm ; D details ;;	4	
2(a)(ii)	measurement of AB 55 ± 1 mm ; (x) 36 / 37 ;	2	A 5.5 cm ecf for incorrect AB measurement for max 1
2(b)(i)	40 ;	1	A response in table if answer in working space does not match
2(b)(ii)	repeat experiment for person 2 ; compare with, the best fit line / other people ;	1	A repeat (measurement) I unexpected result unqualified
2(b)(iii)	A axes labelled with units ; S linear scale for plotted points to half or more in one dimension ; P all plotted points accurate to \pm half small square ; L suitable best fit line ;	4	ecf from 2(b)(i)
2(b)(iv)	indication on plot at 1 minute ; correct reading from their graph at 1 minute ;	2	I units ecf correct reading from indication on graph somewhere other than at 1 minute
2(b)(v)	as running time increase breathing rate increases ; levels off / AW ; from 6 minutes / 48 breaths per minute ;	3	
2(c)(i)	suitable health comment ; suitable environment for exercise ;	1	mp2 e.g. water, level surface, footwear, first aid kit, avoid extreme weather conditions

Question	Answer	Marks	Guidance
2(c)(ii)	gender (of subjects) ; fitness / health (of subjects) ; age (of subjects) ; speed of, exercise / running ; running surface ; (named) environmental condition ; preparation / resting time (before and / or between runs) ; time interval / point after exercise, used to determine breathing rate ;	2	A breathing rate to return to resting rate
2(c)(iii)	running time ;	1	



Cambridge International Examinations
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NUMBER

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BIOLOGY

0610/62

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.

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.

- 1 A student investigated the effect of temperature on water uptake in celery stalks.

Water is transported in the xylem tissue in plant stems.

- Step 1 One celery stalk was placed into a beaker containing **warm** red stain. Another celery stalk was placed into a beaker containing **cool** red stain.

This is shown in Fig 1.1.

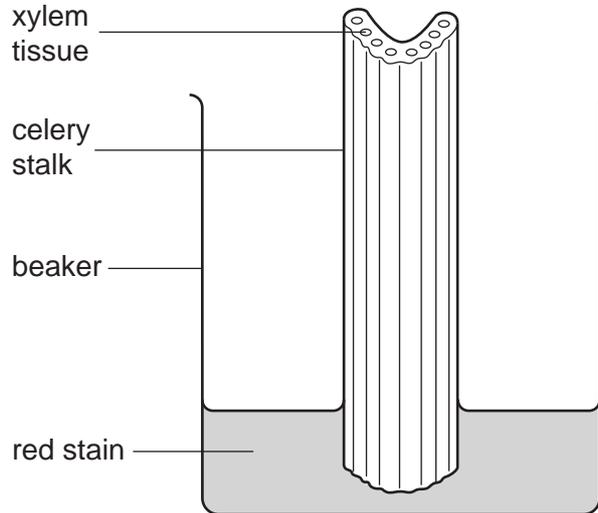


Fig. 1.1

- Step 2 Both celery stalks were left in the red stain for 10 minutes.

- Step 3 After 10 minutes the celery stalks were removed from the red stain.

- Step 4 A 5 mm section was cut from the end of the celery stalk which had been in the **warm** red stain, as shown in Fig. 1.2.

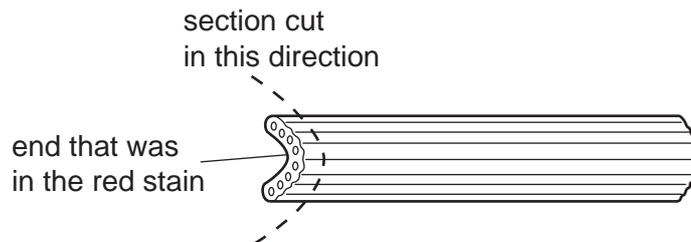


Fig. 1.2

- Step 5 The section was inspected for the presence of the red stain in the xylem tissue in the celery stalk, as shown in Fig. 1.3.

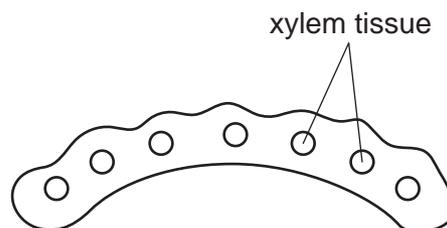


Fig. 1.3

Step 6 If the red stain was visible in the cut section, another 5 mm section was cut and the process repeated until no red stain was visible in the cut section. This allowed the student to estimate how far the red stain had moved up the celery stalk.

Step 7 Steps 4 to 6 were repeated for the celery stalk which had been in the **cool** red stain.

(a) (i) State **one** safety precaution that should be taken while carrying out this method.

.....
.....
.....[1]

(ii) The student's results are shown in Fig. 1.4.

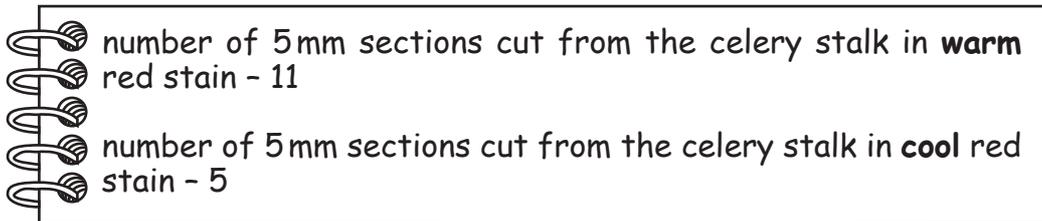


Fig. 1.4

Prepare a table and record your results in your table, in the space provided. Your table should include:

- the temperature (cool or warm) of the red stain
- the number of sections that were stained in 10 minutes
- the total distance moved by the red stain in 10 minutes.

[3]

(iii) Use the data to calculate the rate of movement of the red stain in the celery stalk at each temperature.

Space for working

warm mm per minute

cool mm per minute

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[Turn over

(iv) State a conclusion for these results.

.....
.....
.....[1]

(b) State **two** variables which were kept constant in this experiment.

1
2 [2]

(c) One way of improving the method used in this investigation would be to repeat it a number of times.

Identify **two other** sources of error in this investigation.

For each error, suggest an improvement to minimise the effect of the error.

error 1
.....
improvement 1
.....
.....
error 2
.....
improvement 2
.....
..... [4]

- 2 Fig. 2.1 shows a photomicrograph of a bronchus, surrounded by alveoli and other tissues, in the lung.

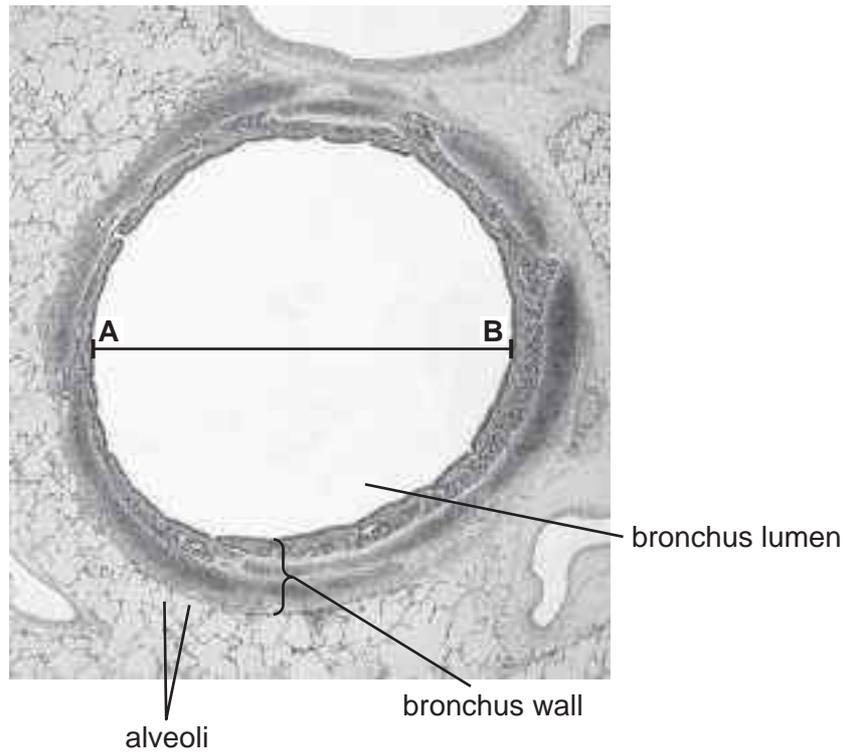


Fig. 2.1

- (a) (i) Make a large drawing of the bronchus shown in Fig. 2.1.

Do **not** include any of the alveoli or other tissues in your drawing. Do **not** label your drawing.

- (ii) The diameter of the bronchus in Fig. 2.1 is shown by the line **AB**.

Measure the length of **AB** on Fig. 2.1. Include the units.

length of **AB** on Fig. 2.1

The actual diameter of the bronchus in Fig. 2.1 is 1.5 mm.

The magnification of the bronchus in Fig. 2.1 can be calculated using the following equation:

$$\text{magnification} = \frac{\text{length of } \mathbf{AB} \text{ on Fig. 2.1}}{\text{actual diameter of the bronchus}}$$

Calculate the magnification of the bronchus in Fig. 2.1.

Give your answer to the nearest whole number.

Space for working.

..... [2]

- (b) A student investigated the effect of exercise on breathing rate.

The breathing rates of five people were measured at rest and after running for different periods of time. The people rested between each period of running.

The results are shown in Table 2.1.

Table 2.1

running time /minutes	breathing rate/breaths per minute					
	person					average
	one	two	three	four	five	
0	20	24	22	26	28	24
2	32	31	28	32	32	31
4	39	41	38	42	40	
6	46	52	52	46	44	48
8	48	50	52	46	44	48
10	49	51	51	46	43	48

- (i) Complete Table 2.1 by calculating the average breathing rate for four minutes of running.

Space for working.

[1]

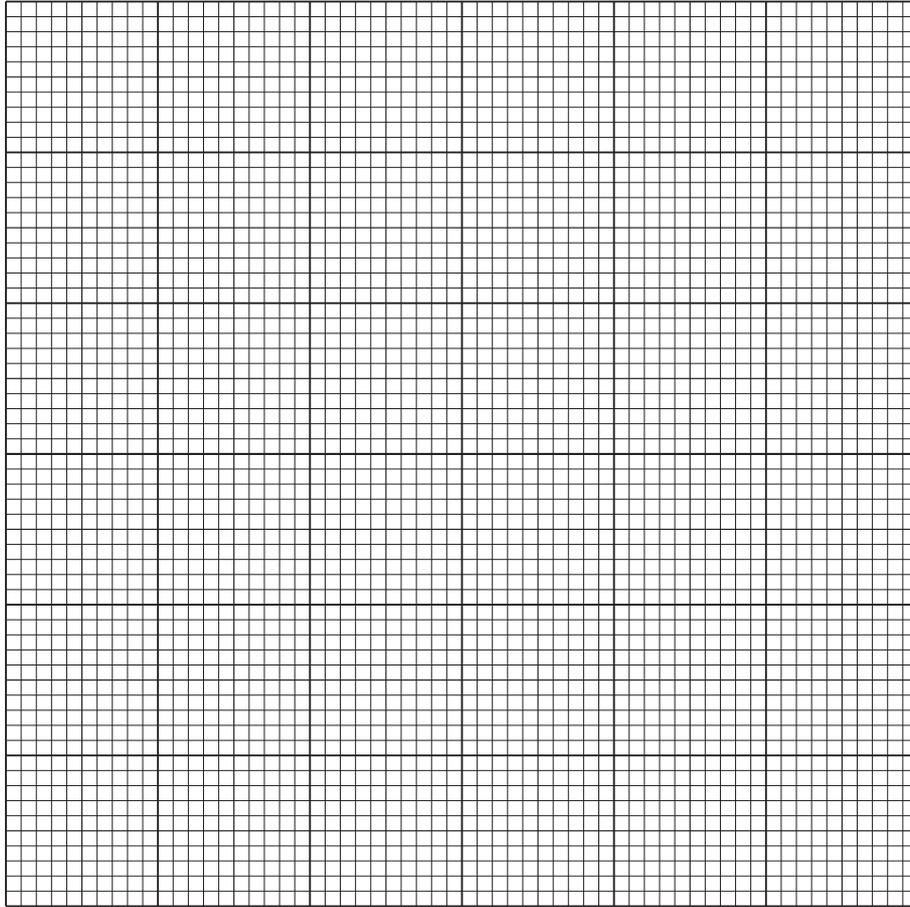
- (ii) The student thought that the result for person two at six minutes was an anomaly.

Suggest what the student should do to determine if the result is anomalous.

.....

[1]

- (iii) Plot a graph, on the grid, to show the relationship between running time and the average breathing rate. Draw a line of best fit.



[4]

- (iv) Use your graph to estimate the average breathing rate for one minute of the running.
Show on the graph how you obtained your answer.

.....[2]

- (v) Use your graph to describe the relationship between running time and the average breathing rate.

.....
.....
.....
.....
.....
.....
.....[3]

(c) (i) Suggest **one** safety precaution for this investigation.

.....
.....
.....[1]

(ii) State **two** variables that should be kept constant during this investigation.

1
.....
2
..... [2]

(iii) State the variable that has been changed (the independent variable) in this investigation.

.....[1]

[Total: 21]

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BIOLOGY

Paper 0610/11
Multiple Choice (Core)

<i>Question Number</i>	<i>Key</i>	<i>Question Number</i>	<i>Key</i>
1	A	21	A
2	B	22	D
3	C	23	B
4	D	24	B
5	B	25	C
6	B	26	C
7	A	27	A
8	B	28	B
9	C	29	B
10	A	30	C
11	B	31	D
12	B	32	B
13	B	33	D
14	A	34	A
15	C	35	B
16	C	36	D
17	B	37	B
18	D	38	B
19	A	39	A
20	D	40	D

General comments

The paper provided a balance of questions and sufficient challenge for candidates working at this level. Common misconceptions were identified and are detailed against individual questions. The sources of vitamin C and birth control were topics that candidates knew well. Interpreting graphs proved to be more challenging.

Comments on specific questions

Question 3

While many understood that amphibians have moist skin without scales, some believed that amphibian skin possesses scales.

Question 5

Most candidates correctly identified the chloroplast as the site where sugar is made, although some believed that sugar is made in the vacuole.

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Questions 6

Most candidates understood that root hairs increase the surface area of root cells. Some wrongly believed that root hairs are used for the maintenance of the temperature of the cell sap.

Question 8

While many candidates correctly identified that it is the cell surface membrane that is partially permeable, some incorrectly opted for the cell wall.

Question 10

Many candidates understood how the axes should be labelled; some were uncertain as to which axis represents the 'pH' and which represents the 'rate of reaction.'

Question 11

This was a well-answered question.

Questions 12 and 31

These were well-answered by the majority.

Question 13

While many candidates correctly identified that a young, active woman requires more iron than a young, active man, some believed that the woman requires more protein.

Question 15

Some candidates were able to correctly identify tissue **C** (the xylem) as transporting water.

Question 18

Although many candidates correctly identified blood component '**D**' (platelets) as being responsible for clotting, many opted for an incorrect blood component.

Question 19

Most candidates correctly identified a transmissible disease as a disease caused when a pathogen passes from one host to another. Some wrongly believed that a transmissible disease is caused when a pathogen passes to the host's body only by direct contact.

Question 20

While many candidates were able to identify the correct response, others were unable to use their knowledge to problem solve and derive the answer.

Question 21

Few were able to select the correct option. Some were not aware that only a little energy is released from anaerobic respiration.

Question 23

Many candidates correctly opted for muscles and glands as effectors. A common incorrect response was the brain and spinal cord.

Question 25

While many candidates appreciated that shivering involves the action of muscles, some wrongly believed that sweating requires the action of muscles.

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Question 26

Most candidates responded correctly to this question, a few believed that antibiotics are effective against scurvy.

Question 27

This proved to be a challenging question with few able to derive the correct answer.

Question 29

Many candidates opted for the correct answer, although some incorrectly believed that menstruation is the release of an egg.

Question 33

While some candidates opted for the correct answer, the majority did not seem to appreciate that meiosis produces gametes (sperm cells).

Question 34

Only some candidates appreciated that ionising radiation increases the rate of mutation.

Question 36

While many candidates identified the correct option, some believed that the hazel trees, and even the soil, are the principal sources of energy for the food chain.

Question 37

The majority of candidates opted for a wrong answer, suggesting that this topic is not well understood.

Question 39

While many candidates opted for the correct answer, some incorrectly opted for selective breeding as an example of genetic engineering.

BIOLOGY

Paper 0610/12
Multiple Choice (Core)

<i>Question Number</i>	<i>Key</i>	<i>Question Number</i>	<i>Key</i>
1	A	21	A
2	B	22	C
3	C	23	D
4	D	24	D
5	B	25	A
6	B	26	C
7	B	27	B
8	B	28	D
9	C	29	D
10	A	30	A
11	B	31	D
12	A	32	D
13	C	33	B
14	D	34	B
15	D	35	A
16	B	36	D
17	B	37	C
18	D	38	B
19	C	39	B
20	D	40	A

General comments

The paper provided a balance of questions and sufficient challenge for candidates working at this level. Common misconceptions were identified and are detailed against individual questions. The questions on mucus as a defence against disease; the effects of adrenaline, and the definition of a drug were well answered.

Comments on specific questions

Question 1

Although many candidates appreciated that all animals and plants carry out the characteristics of living things, many also believed that only animals carry out these characteristics.

Question 3

While many candidates understood that amphibians have moist skin without scales, some believed that amphibian skin possesses scales.

Question 5

While most candidates correctly identified the chloroplast as the site where sugar is made, some believed that sugar is made in the vacuole.

Question 6

Most candidates understood that root hairs increase the surface area of root cells. Some wrongly believed that root hairs are used for the maintenance of the temperature of the cell sap.

Question 7

This proved to be a challenging question with similar numbers of candidates choosing most options suggesting that diffusion gradients are not well understood or that some are unfamiliar with the products of respiration.

Question 8

While many candidates correctly identified that it is the cell surface membrane that is partially permeable, some incorrectly opted for the cell wall.

Question 10

Many candidates understood how the axes should be labelled; some, though, were uncertain which axis represents the 'pH' and which represents the 'rate of reaction.'

Question 11

Although many candidates appreciated that photosynthesis is using up the carbon dioxide and changing the indicator colour, some candidates mistakenly opted for respiration.

Question 12

While some candidates identified that nitrate ions are needed to make amino acids, many wrongly believed that nitrate ions are needed to make fatty acids, glucose or starch.

Question 13

Most appreciated that both chemical and mechanical digestion occurs in the mouth.

Question 14

This proved to be a challenging question, with most candidates incorrectly opting for the colon as the site where most water is absorbed. Responses indicate uncertainty in this topic.

Question 16

This proved to be a challenging question with only some candidates opting for the correct answer. It was not appreciated by many that in this type of investigation, all factors should be kept constant except the one that is being investigated.

Question 18

While many candidates correctly identified blood component 'D' (platelets) as being responsible for clotting, many opted for an incorrect blood component.

Questions 19, 24, 26 and 27

These were well-answered by most candidates.

Question 20

Many candidates were able to identify the correct answer, although some found this challenging.

Question 21

Few were able to select the correct option. Some were not aware that only a little energy is released from anaerobic respiration.

Question 22

Most candidates chose the correct option, although there was some confusion between the terms ureter and urethra.

Question 23

While many candidates identified the correct answer (the 'synapse'), some were less confident with this topic.

Question 25

This proved to be a challenging question with many incorrectly believing that the shoot showed a phototropic response. The seedling was growing inside a dark box, preventing responses to light.

Question 28

The spread of responses suggests some uncertainty about the topic of asexual reproduction and genotypes.

Question 30

Candidates found the interpretation of graphical information about the menstrual cycle challenging.

Question 31

While many candidates correctly identified the birth control device as an IUD, a similar number believed it to be a diaphragm or femidom.

Question 32

There was some uncertainty about which sex chromosomes are found inside sperm cells.

Question 34

While many candidates understood what an adaptive feature of an organism is, some incorrectly believed that it is any feature that is changed by the environment.

Question 37

Only some candidates opted for the correct answer suggesting uncertainty about the processes involved in the carbon cycle.

Question 38

While many candidates realised that in genetic engineering, genes for insulin are inserted into a bacterial cell, a similar number wrongly opted for animal or human cells.

BIOLOGY

Paper 0610/13
Multiple Choice (Core)

<i>Question Number</i>	<i>Key</i>	<i>Question Number</i>	<i>Key</i>
1	A	21	A
2	B	22	A
3	C	23	D
4	D	24	B
5	B	25	A
6	B	26	C
7	A	27	B
8	B	28	A
9	C	29	A
10	A	30	B
11	B	31	C
12	B	32	A
13	A	33	B
14	A	34	B
15	A	35	B
16	C	36	C
17	B	37	D
18	D	38	B
19	C	39	B
20	D	40	B

General comments

The paper provided a balance of questions and sufficient challenge for candidates working at this level. A number of misconceptions and areas of knowledge that are less well understood are detailed against individual questions. The questions on the structure of the leaf; the use of calcium in a pregnant woman; the names of parts of the alimentary canal; identifying the bladder; the role of insulin; the role of the liver; parts of the human reproductive system, and the water cycle were well understood.

Comments on specific questions

Question 1

Although many candidates appreciated that all animals and plants carry out the characteristics of living things, many also incorrectly believed that only animals carry out these characteristics.

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Question 3

While many candidates understood that amphibians have moist skin without scales, some believed that amphibian skin possesses scales.

Question 4

Most candidates were able to use the key to derive the correct answer, although some identified the plant wrongly by not observing carefully the appearance of the leaves.

Question 5

While most candidates correctly identified the chloroplast as the site where sugar is made, some incorrectly believed that sugar is made in the vacuole.

Question 6

Most candidates understood that root hairs increase the surface area of root cells. Some wrongly believed that root hairs are used for the maintenance of the temperature of the cell sap.

Question 8

While some candidates correctly identified that it is the surface membrane that is partially permeable, many incorrectly opted for the cell wall.

Question 9

Although some candidates correctly identified that the fruit contained protein and reducing sugar, many showed a less secure knowledge of food test results.

Question 10

Many candidates understood how the axes should be labelled; some, though, were uncertain which axis represents the 'pH' and which represents the 'rate of reaction.'

Question 13, 14, 24 and 37

These were well-answered by most candidates.

Question 16

Many candidates correctly opted for the rate of respiration not affecting the rate of transpiration, although some incorrectly believed that the number of open stomata does not affect transpiration.

Question 18

While some candidates correctly identified blood component 'D' (platelets) as being responsible for blood clotting, the majority of candidates opted for an incorrect blood component.

Question 21

The question proved to be challenging with few showing a good understanding of anaerobic respiration.

Question 23

This question was well-answered by many candidates, although some wrongly believed that the sequence of the reflex action commenced with a receptor, which generates the stimulus.

Question 25

This proved to be a challenging question with only some candidates opting for the correct answer.

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Question 28 and 29

Only some candidates understood the features of asexual and sexual reproduction.

Question 31

The fact that oestrogen is responsible for the development of secondary sexual characteristics was not well known.

Question 32

There is some confusion about the name of the length of DNA that codes for a protein. The commonest incorrect responses were gene and amino acid.

Question 34

This was a challenging question with many choosing one of the first three options.

Question 39

While many candidates correctly identified methane as a source of air pollution, some opted for herbicides.

BIOLOGY

Paper 0610/21
Multiple Choice (Extended)

<i>Question Number</i>	<i>Key</i>	<i>Question Number</i>	<i>Key</i>
1	A	21	B
2	B	22	D
3	C	23	C
4	D	24	B
5	B	25	C
6	B	26	C
7	A	27	D
8	B	28	A
9	C	29	B
10	A	30	D
11	B	31	B
12	B	32	B
13	B	33	B
14	A	34	D
15	C	35	C
16	C	36	B
17	B	37	C
18	D	38	A
19	A	39	C
20	A	40	D

General comments

The paper provided a balance of questions and sufficient challenge for candidates working at this level. Common misconceptions were identified and are detailed against individual questions. Good knowledge of many areas of the syllabus was demonstrated by the majority of candidates.

Comments on specific questions

Question 1

Many candidates appreciated that all plants and animals carry out the characteristics of living things. Some believed that only animals carry out these characteristics.

Question 3

Although this question was well answered by the majority of candidates, some believed that amphibian skin possesses scales.

Questions 6, 7, 8, 9, 10, 11, 12, 14, 16, 23, 24, 25, 26, 27, 28, 29, 30, 36 and 39

These questions were well-answered by the majority of candidates.

Question 13

While many candidates correctly identified that a young, active woman requires more iron than a young, active man, some believed that the woman requires more protein.

Question 18

This question was well understood by many candidates, although some were uncertain whether fibrin is converted to fibrinogen (incorrect) or fibrinogen to fibrin (correct).

Question 19

Many candidates chose the correct option. Incorrect responses suggested that the term 'passive' was not understood by all.

Question 20

While most candidates understood what muscle action is required for inspiration, some were uncertain as to which way round the external and internal intercostal muscles work.

Question 21

While many candidates gave the correct response, many were uncertain of the differences between aerobic and anaerobic respiration in yeast.

Question 22

This was well-answered. One common misconception was that glucose would not be found in the fluid entering the kidney tubule.

Question 33

Many candidates opted for the correct answer. The commonest wrong response was option A. While it is true that heterozygous individuals do suffer from symptoms, the question asked for benefits of being heterozygous so this ruled out option A as it is not beneficial to be symptomatic.

Question 38

Only some candidates chose the correct option. Many candidates appeared uncertain as to what is required to grow *Penicillium* in a fermenter.

BIOLOGY

Paper 0610/22
Multiple Choice (Extended)

<i>Question Number</i>	<i>Key</i>	<i>Question Number</i>	<i>Key</i>
1	A	21	B
2	B	22	A
3	C	23	D
4	D	24	A
5	B	25	C
6	B	26	B
7	B	27	D
8	B	28	C
9	C	29	D
10	A	30	C
11	B	31	A
12	A	32	C
13	C	33	A
14	D	34	C
15	D	35	A
16	B	36	C
17	B	37	D
18	D	38	A
19	A	39	D
20	A	40	A

General comments

The paper provided a balance of questions and sufficient challenge for candidates working at this level. Common misconceptions were identified and are detailed against individual questions. Good knowledge of many areas of the syllabus was demonstrated by the majority of candidates.

Comments on specific questions

Question 1

Although many candidates appreciated that all animals and plants carry out the characteristics of living things, some also believed that only animals carry out these characteristics.

Questions 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 21, 23, 31, 32, 34, 36, 39 and 40

These questions were well-answered by the majority of candidates.

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Question 14

There was some uncertainty as to whether most water is absorbed in the small intestine (correct option) or in the colon (incorrect option).

Question 18

This question was well-answered by many candidates, although some were uncertain as to whether fibrin is converted to fibrinogen (incorrect) or fibrinogen to fibrin (correct).

Question 19

Many candidates chose the correct option. Incorrect responses suggested that the term 'passive' was not understood by all.

Question 20

While most candidates understood what muscle action is required for inspiration, some were uncertain as to which way round the external and internal intercostal muscles work.

Question 22

This was a challenging question and it was pleasing that many candidates selected the correct option. However, a number showed less secure knowledge of which substances are filtered out of the blood in the kidney and the fact that respiration in the tissues of the kidney would result in lower concentrations of glucose and oxygen and a higher concentration of carbon dioxide in the renal vein than in the renal artery.

Question 26

Although many candidates chose the correct option, some wrongly believed that heroin is a stimulant.

Question 28

While many candidates derived the correct answer, some incorrectly believed that the zygote of the sheep was haploid and would therefore possess 27 chromosomes. A few doubled the diploid number and opted for the zygote possessing 108 chromosomes.

Question 29

Many candidates correctly identified the mitochondrion as providing the energy to enable the sperm to swim. The commonest incorrect response was the flagellum.

Question 33

Although many candidates chose the correct option, some incorrectly believed that genotype $Hb^A Hb^A$ would increase an individual's resistance to malaria.

Question 37

Many candidates were aware that the fact that bacteria mutate frequently is a disadvantage of using bacteria to produce insulin. Some thought that the fact that bacteria share their genetic code with other organisms was a disadvantage.

BIOLOGY

Paper 0610/23
Multiple Choice (Extended)

<i>Question Number</i>	<i>Key</i>	<i>Question Number</i>	<i>Key</i>
1	A	21	A
2	B	22	D
3	C	23	D
4	D	24	B
5	B	25	B
6	B	26	C
7	A	27	C
8	B	28	D
9	C	29	B
10	A	30	B
11	B	31	B
12	B	32	B
13	A	33	C
14	A	34	A
15	A	35	C
16	C	36	C
17	B	37	A
18	D	38	B
19	A	39	C
20	A	40	D

General comments

The paper provided a balance of questions and sufficient challenge for candidates working at this level. Common misconceptions were identified and are detailed against individual questions. Good knowledge of many areas of the syllabus was demonstrated by the majority of candidates.

Comments on specific questions

Question 1

Although many candidates appreciated that all animals and plants carry out the characteristics of living things, some also believed that only animals carry out these characteristics.

Questions 3, 4, 5, 6, 7, 9, 11, 12, 13, 14, 15, 23, 25, 27, 33, 35, 38 and 40

These questions were well-answered by the majority of candidates.

Question 8

While many candidates correctly identified that it is the surface membrane that is partially permeable, some incorrectly opted for the cell wall.

Question 17

While many candidates were able to identify the correct graph which shows the results of the experiment, many opted for an incorrect graph. It is important that candidates work methodically through the information given.

Question 18

The question was well answered by many candidates, although a similar number chose an incorrect option. There was some uncertainty whether fibrin is converted to fibrinogen (incorrect) or fibrinogen to fibrin (correct).

Question 19

Many candidates chose the correct option. Incorrect responses suggested that the term 'passive' was not understood by all.

Question 20

While most candidates understood what muscle action is required for inspiration, some were uncertain as to which way round the external and internal intercostal muscles work.

Question 22

Many candidates correctly identified the renal vein. The renal artery was a common incorrect response.

Question 24

Most candidates were able recall the activities of the structures involved in viewing a near object. However, this proved to be a challenging question for many.

Question 26

Many candidates were uncertain about which region of the shoot would show the greatest rate of growth.

Question 28

While many candidates chose the correct option, some were less secure in their knowledge of these reproductive techniques.

Question 29

Some candidates selected the correct response but many could not identify the curve representing progesterone.

Question 30

Most candidates were able to work through the information given and derive the correct answer. However, many found this challenging.

Question 31

Most candidates were able to work systematically through the information and derive the correct answer.

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Question 34

While many candidates chose the correct option, some believed that xerophytes have a thin cuticle and many stomata.

Question 36

Some candidates were able to recognise the definition of a community. Many were unsure of the definitions of a community, an ecosystem and a population.

Question 37

While many candidates appreciated that the presence of plasmids makes it possible for bacteria to produce human insulin, some wrongly believed that bacteria possess genes for insulin.

Question 39

This proved to be a challenging question for many who did not recall that decomposer bacteria lower the oxygen concentration of water during eutrophication.

BIOLOGY

Paper 0610/31
Theory (Core)

Key messages

Candidates should read questions really carefully and make sure they are following all instructions given. The space provided and the number of marks available indicates the length and type of response required. Where extra space is required candidates should ensure that they have noted in the question where on the script they have written the continuation of their response.

Candidates should know the difference between command words, e.g. state, describe, explain, calculate and suggest so that they can respond to the question appropriately.

General comments

Most candidates were well-prepared for the exam. A good knowledge and understanding of many areas of the syllabus was shown.

Comments on specific questions

Question 1

- (a) Most candidates performed well on the question. The two processes that some found challenging were phagocytosis and blood clotting. Some candidates only drew five lines rather than the required six often the missing line was the second line going to the white blood cell.
- (b)(i) Generally well-answered.
- (ii) The function of stomata was not universally known. Some responses lacked sufficient detail, such as citing a gas but omitting the direction in which it travelled. One misconception was that water would enter the plant through the stomata.

Question 2

- (a) This question proved challenging for some candidates. Many definitions were incomplete as they did not make reference to the production of genetically different offspring. Some incorrectly referred to sexual intercourse.
- (b)(i) A common error was to state 'anus'; the point of exit of faeces rather than where it is transport. Sperm duct was better known. While many responses correctly distinguished between the urethra and the ureter this was a common source of error. Due to the similarity of these words only precise spelling was accepted.
- (ii) The prostate gland was often confused with the seminal vesicle. Significant numbers did not attempt to label the prostate gland at all.
- (c) Some responses confused the scrotum with the testes. The most common incorrect responses were producing sperm or carrying sperm. Some did refer to temperature but did not state that the testes require a lower temperature than the rest of the body.

Question 3

Nearly all candidates knew that neurones are cells that are part of the nervous system. Most named the motor neurone as the third type neurone. Sometimes the option 'stimuli' was chosen in error for 'impulses'. Not all were aware that the junctions between neurones are called synapses. Most were aware that reflex actions are fast.

Question 4

- (a) This proved challenging with few able to recall the correct word equation.
- (b)(i) Most candidates gave the correct value from the graph.
 - (ii) Most candidates were able to give one effect but few gave two correct effects of a reduction in energy.
- (c) Some responses lacked sufficient detail to meet the requirements of the marking points. Others compared males and females in the same age group which unfortunately did not answer the question.
- (d) Surprisingly few scored both marks. The most common correct responses were baking and brewing.

Question 5

- (a)(i) Most candidates did well on the question. A common error was to draw a pyramid instead of a food chain but very few of these had the correct shape. Most candidates remembered to put in arrows and most were the correct way round.
 - (ii) The majority of candidates gave the correct response.
 - (iii) Most candidates gave the correct response.
- (b)(i) The most frequent correct responses were habitat destruction, hunting, lack of food, no mates, more predators and disease.
 - (ii) Most candidates gave a suitable response.

Question 6

- (a) Many found this question challenging.
- (b)(i) A common misconception was that teeth break down molecules rather than food. The question required two functions, where more than two were given only the first two were considered.
 - (ii) Some responses again made reference to the break down of molecules which was incorrect. Many referred to swallowing but few made reference to the increased surface area of the broken down food.

Question 7

- (a)(i) Most candidates could identify a petal but fewer could identify an ovule. A common error was to label the ovary rather than an ovule.
 - (ii) The most frequent error was to put petals instead of sepals.
- (b) Most candidates drew the correct line from the anther of a flower to the stigma of another. A common error was to connect two stigmas. Another common error was to draw a line instead of an arrow.

- (c) Most candidates gave two correct visible features. The commonest error was to refer to structures that were not visible such as scent or nectar.
- (d) Most candidates were able to recall some of the structures involved in the pathway; the most well-known being the root hairs and xylem. Many also made reference to osmosis but not always in the correct context i.e. osmosis occurring the xylem vessels. Few mentioned the cortex or mesophyll. Many went on to discuss water exiting the leaves and transpiration which was not required. Common misconceptions included making reference to the phloem as being part of the pathway or water entering the stomata and travelling to the roots.

Question 8

This question was well-answered by the majority of candidates.

Question 9

- (a) (i) Some candidates found reading values accurately off the graph challenging but most gave two correct times.
 - (ii) Most candidates answered this correctly.
 - (iii) Many candidates successfully linked availability of light to photosynthesis and thus absorption of carbon dioxide. Some only wrote about sunrise and photosynthesis or photosynthesis and carbon dioxide absorption. A few seemed unaware that respiration is still going on alongside photosynthesis, or thought they were alternative processes. A few thought that carbon dioxide was decreasing as the light intensity was decreasing.
- (b) Most candidates were able to state one environmental factor but fewer could give two.

Question 10

- (a) Candidates did well on this question. Many correctly identified the Merino and gave a satisfactory reason for their choice.
- (b) It was pleasing to see that most candidates gave correct responses for this question and showed a good understanding of the process of selective breeding and were able to apply their knowledge in this context. Common errors included stating that the process (of mating and selecting offspring with the desirable features) would be repeated but not that it would need to be repeated for a number of generations or making reference to genetic engineering techniques that did not take into account the context of the question.

BIOLOGY

Paper 0610/32
Theory (Core)

Key messages

Candidates need to read each question carefully, particularly the information given at the beginning of the question.

General comments

There was an improvement in the way data-handling questions were answered.

Comments on specific questions

Question 1

- (a) This question was answered well by most candidates. The prostate gland was sometimes confused with the bladder.
- (b) Candidates showed an excellent understanding of reproduction with many giving a lot of extra information. The question only required the details of the path not the role of sperm.
- (c) (i) Most candidates were aware that the chromosome carries genetic information. A few responses showed uncertainty about the difference between genes and DNA.
 - (ii) Most candidates recognised that the sex chromosomes could be X or Y, the commonest error was to give the sex chromosomes found in the zygote.
 - (iii) This question was well-answered and many candidates. Good responses that stated 'head' went on to describe how it was adapted rather than just giving the structure.

Question 2

- (a) (i) and (ii) Many candidates gave the correct response.
 - (iii) The best responses used the information about chlorophyll provided in the question to arrive at a valid conclusion. Less successful responses did not consider the information given.
- (b) Many candidates were able to link the requirement for light to photosynthesis and a few also recognised that in the absence of light the starch would be used up.
- (c) (i) This question was answered well with many not only recognising the role of root hair cells but also that osmosis and semi-permeable membranes were involved.
 - (ii) Many candidates correctly gave a function of water in a plant. One misconception was to relate it to translocation and nutrition.
 - (iii) An excellent understanding of xylem as a transport tissue was shown.
 - (iv) Most gave the correct response to this question. The commonest error was to name a structure within the leaf.

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Question 3

The data analysis question was correctly and clearly answered by most candidates.

- (a) (i) All candidates gave a correct date.
- (ii) Most candidates read the correct value from the graph.
- (iii) There were some excellent descriptions of the trend.
- (b) Some candidates were able to recognise the genus. Many gave the species name.
- (c) Many responses described the prevention of diarrhoea and a healthy diet rather than treatment of diarrhoea.
- (d) Most candidates gave a correct response to this question.

Question 4

- (a) Many correctly shaded the iris.
- (b) Many candidates completed the diagram correctly.
- (c) (i) Some candidates gave the correct response. A common error was to describe the response rather than the stimulus.
- (ii) A few candidates gave the correct effector.

Question 5

- (a) (i) Many candidates correctly gave **K** and **M** as representing respiration. The commonest error was to include **L**.
- (ii) Many candidates correctly gave the correct response. A common misconception was that fossil fuels respire.
- (iii) Most candidates gave the correct response.
- (b) This question was answered well.
- (c) (i)(ii) Candidates demonstrated an excellent understanding of deforestation.
- (d) (i) Most candidates were able to manipulate the data correctly, with only a few minor errors.
- (ii) Excellent answers were given by most candidates.
- (iii) Although candidates made good attempts to answer this question, many answers focused on the endangered species rather than the forest itself.

Question 6

- (a) A really well-answered question.
- (b) Many excellent responses were seen. The best responses qualified the feature they had identified to show how they were adapted, e.g. having lots of capillaries rather than just stating capillaries.
- (c) (i) The best responses qualified their descriptions by making it clear that there was more of less of the substance described.
- (ii) Most candidates gave the correct response. A common misconception was that there was no difference between breathing and respiration.

- (d) Candidates were able to give an example of a cell and an organ. The commonest error was to give examples from other parts of the body which did not answer the question.

Question 7

- (a) Most candidates answered this well.
- (b) While most candidates understood the relationship between volume and concentration of urine when water intake increases, the relationship between temperature and exercise was less well known.
- (c) (i) Some found it difficult to define growth without using the word *grow* instead of *increase*.
- (ii) An excellent understanding of the characteristics of living things was shown.

Question 8

- (a) This was a challenging question with only a few responses offering a correct explanation.
- (b) Many candidates correctly identified examples of discontinuous variation.
- (c) This question was well-answered.

BIOLOGY

Paper 0610/33
Theory (Core)

Key messages

The space provided and the number of marks available indicates the length and type of response required. Where extra space is required candidates should ensure that they have noted in the question where on the script they have written the continuation of their response. It is important that all of the instructions in a question are followed.

Candidates should know the difference between command words, e.g. state, describe, explain, calculate and suggest so that they can respond to the question appropriately.

General comments

Most candidates were well-prepared for the exam. A good knowledge and understanding of many areas of the syllabus was shown.

Comments on specific questions

Question 1

- (a) Most candidates gave a correct feature.
- (b)(i) Generally well-answered. One misconception was that crocodiles were amphibians.
 - (ii) Again, generally well-answered.
 - (iii) Most candidates gave a correct response.
- (c) While most candidates gave correct responses a common error was name individual organisms rather than the group to which they belong.

Question 2

- (a)(i) This proved to be a challenging question with few able to state the correct word equation for photosynthesis.
 - (ii) A common error was to state chloroplast, which is the structure containing the pigment.
- (b)(i) Most candidates gave the correct response.
 - (ii) Most candidates gave two correct values.
 - (iii) Some candidates calculated the correct value and some gain only the mark for workings.
- (c) Many responses gave the marking point about rising and falling and some went on to state that there were no bubbles at 40°C. Very few gained all three marks.
- (d) Many candidates stated a correct factor. Where the response gave more than one factor, only the first in the list was considered.

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Question 3

- (a) Most candidates gave suitable suggestions and this question was well-answered.
- (a) (ii) Again this question was well-answered by the majority of candidates.
- (b) Many candidates gave five correct responses. Although thought that oranges and lemons are a good source of Vitamin D instead of Vitamin C.
- (c) This was proved challenging for some candidates. It required an explanation and often a list of requirements was given with no reason as to why they were needed which was insufficient.

Question 4

- (a) (i) Some candidates were able to define the term but many could not.
 - (ii) This question was well-answered by the majority of candidates.
- (b) (i) Most correctly identified the skin. The commonest incorrect responses included; cell wall, mesoderm, fat and antibodies.
 - (ii) This proved to be a challenging question. Few responses completed the whole table correctly, suggesting that the roles of the components of blood were not well-understood by all.
- (c) A few candidates could recall the chemical barriers but many could not.

Question 5

- (a) Despite candidates being given the words to choose from, some still included words not on the list. However this was generally well-answered. A common mistake was to give decomposition for process C.
- (b) (i) and (ii) Here, not all candidates followed the instructions given. Common errors included; drawing a line instead of an arrow therefore not indicating the direction, drawing the arrow in the opposite direction, not labelling the arrow with a letter.
- (c) (i) Although this is a topic of worldwide importance, relatively few could give two possible reasons for the increase in carbon dioxide concentration in the atmosphere.
 - (ii) This question was challenging for many. Some referred to the ozone layer, lack of oxygen and general references to pollution. Many referred to the greenhouse effect rather than the enhanced greenhouse effect which was insufficient.
 - (iii) Only a few could name another greenhouse gas.

Question 6

- (a) (i) Some candidates could recall the correct type of cell division.
 - (ii) Some gave the correct response but many were unable to recall it and common wrong answers included; embryo, foetus, baby and gene.
- (b) (i) Some candidates gave the correct definition for the term.
 - (ii) Many responses gave the phenotype rather than the dominant allele.
- (c) This was a challenging question and only a few responses provided a suitable description.
- (d) Some candidates successfully completed this question but a significant number found it challenging.

- (e) While some candidates were able to successfully describe the stages many described techniques involved in genetic engineering. There were many of descriptions of mating and the subsequent births of offspring. Many responses just stopped once the parents had been chosen and bred or suggested that all of the offspring would have the desired characteristics. Some wrote that the process needs to be repeated but not that the repetition was done for many generations.

Question 7

This topic (sewage treatment) was not well-understood by all.

- (a) The answer looked for sources of water pollution not what the pollutant was.
- (b) Most candidates knew that sewage is filtered but fewer could provide further detail of how sewage is treated.
- (c) Few could define this term correctly.

Question 8

- (a) Most candidates could identify the parts of the female reproductive system.
- (b) Most candidates could identify the ovaries. The commonest incorrect structures given were the oviduct or the uterus.
- (c) Many candidates gave the correct response. The commonest incorrect structures given were the ovary, cervix, uterus and uterine wall.

BIOLOGY

Paper 0610/41
Theory (Extended)

Key messages

- Consider all the information provided in a question when formulating a response to the question.
- There is no need to write out the question at the beginning of a response.
- Candidates often use blank pages and spaces to continue their responses. Instead of using asterisks or arrows it is better to state on the question the page number on which the continuation has been written.

General comments

There were some exceptionally good scripts and candidates were well-prepared for the exam. Time spent on thinking and planning would have aided responses to unfamiliar material, especially questions **3(b)** and **4(b)(iv)**. Information given in question **5(c)** was often more appropriate for question **5(d)**.

Candidates showed a good understanding of the requirements for each command word. In particular it was good to see that very few explained concepts when asked to describe them; when asked to suggest many made a logical extrapolation of their knowledge to apply it to an unfamiliar situation. Many also gave concise answers in response to the command word 'state'.

Comments on specific questions

Question 1

- (a) Many candidates identified the molecules shown in Fig. 1.1 correctly. The enzyme-substrate complex (**C**) was the least well-known term. Some candidates identified the active site (**B**) as the enzyme even though that term was given in diagram. 'Substance' was a common incorrect response for 'substrate'.
- (b) Many candidates gave a correct response to this question. A common error was to omit the term molecule; for example, some responses discussed the breakdown of 'particles' and 'substances' and others described the role of mechanical digestion. Some responses did not clearly distinguish between the two types of digestion.
- (c) Many candidates completing Table 1.1 correctly. Common errors were to give the stomach as the site of maltose digestion, the pancreas as the organ that secretes bile and the salivary glands as the site of starch digestion, possibly they were thinking about the source of amylase rather than the site of digestion.

Question 2

- (a) Few responses gave the full definition of the term *fitness*. Many referred simply to survival of an organism in its environment or habitat and did not refer to the increased probability of reproduction as well. Others stated that fitness is to do with having a balanced diet or with physical attributes, such as strength. Some thought fitness referred to an organism's ability to adapt to an environment.
- (b)(i) Many candidates gave two suitable features. Common responses referred to 'thin legs', 'large ears' and some candidates gave 'small size' which on its own was insufficient; some gave large surface area: volume ratio which was more appropriate. A few referred to behavioural adaptations such as seeking shade in the daytime or living in a burrow.

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- (ii) Many suitable features were given. Good responses included the large number of rods in the eyes and the presence of whiskers.
- (c) (i) Candidates often drew two extra blocks representing detritivores and carnivores on the pyramid of biomass in Fig. 2.2, even though the labelling indicates that the biomass of the herbivores and detritivores had been combined to form the second block. Most of the blocks were carefully centred. Many responses did not consider the scale and drew blocks that were too large. Many also did not label the drawn block.
 - (ii) Many responses explained that the detritivores in this desert ecosystem feed on plant matter or are primary consumers like the herbivores. The fact that they are eaten by carnivores was not a reason for placing detritivores in the same block as herbivores.
 - (iii) There were many good responses that referred to energy flow as the reason for the limit to four or five trophic levels in ecosystems. Many stated that only 10 per cent of the energy entering a trophic level is available to the next trophic level and gave suitable reasons to account for this. The idea that not enough energy reaches higher trophic levels was less well appreciated. Many, however, explained that no animals exist that can prey on top consumers.
 - (iv) Candidates found it challenging to explain the advantages of a pyramid of biomass over a pyramid of numbers. Many simply stated what is shown by each type of pyramid. However, others stated that pyramids of numbers do not take into account the size or mass of organisms, often giving an example such as large numbers of caterpillars that can feed on a single tree. Many only gave partial responses to this question by stating that producers may be very large and have greater biomass. Some considered biomass to be the same as energy, but these were often accepted if they stated that a pyramid of biomass gives an indication of the energy available in each trophic level. One misconception was to state that pyramids of biomass show the transfer of energy, which they do not. Simple sketches would have supported less confident responses about the shapes of the pyramids.

Question 3

- (a) (i) Many candidates labelled the central star-like region of the cross-section of the root as the xylem. Common errors were to label the cortex or the phloem. Some label lines to the xylem only just reached the outer line of the 'star' rather than ending clearly within the area of xylem. Some used arrow heads which sometimes made it difficult to interpret which area they were pointing at.
 - (ii) Many candidates were able to give a suitable response but some were not familiar with the definition of the term tissue.
- (b) Some candidates found this question challenging. Some responses described how water is transported in the xylem and how the structure of a leaf is adapted for photosynthesis which did not answer the question. Most stated that the spongy mesophyll has air spaces, but few described the large internal surface area of the mesophyll cells and the evaporation of water from these surfaces. Although most understood that water moves out through stomata, many did not state that it is water vapour that diffuses out. There were also incorrect references to 'water evaporating out of the stomata'. Few linked the guard cells to the stomata and guard cells were often described as opening rather than the stomata opening.

Question 4

- (a) (i) Many candidates gave the correct response.
 - (ii) Few candidates identified all three blood vessels correctly. Most identified the capillary (T), but most identified Q as a vein instead of a venule and S as an artery instead of arteriole.
 - (iii) The majority of candidates gave the correct response. Incorrect responses included myelin and myelin sheath.

- (b)(i)** There were many excellent descriptions of the effect of increasing the temperature of the skin surface on blood flow to the skin without capsaicin. Most of these responses used the units from Fig. 4.2 correctly. However, some responses compared the effects of the two treatments or explained these differences rather than describing the effects on the blood flow in the untreated volunteers. Some responses gave data quotes with no further description. Some responses gave correct readings of values from the graph. A common error was to read 41°C on the graph as 40°C or 42°C. Many responses described an overall increase with no reference to the constant blood flow at the lower temperatures shown on Fig. 4.2.
- (ii)** There were few detailed responses to this question. Most knew that vasodilation is involved in the skin's response to increased temperature and some knew that it is arterioles that dilate to increase blood flow through the capillaries near the surface of the skin. A common error was reference to 'capillaries dilating'. Few responses explained the roles of arterioles and shunt vessels. Many referred to the role of receptors and sensory neurones, the best responses went on to discuss impulses travelling along motor neurones to the rings of muscle on the blood vessels. Only some responses described an increase in blood flow in capillaries near the surface of the skin (as shown in Fig. 4.1). A common error was to describe blood vessels 'moving up towards the surface of the skin'.
- (iii)** The majority of candidates gave the correct response.
- (iv)** This was a challenging question for some candidates. The best responses made correct reference to diffusion of capsaicin down a concentration gradient. Some good responses made full use of all the information provided in the question and referred to the structures through which capsaicin had to pass in order to reach the receptors.
- (c)** Some responses to this question explained how the body temperature is controlled rather than explaining its importance. Most recognised the effect of deviations in optimal body temperature on enzyme activity. Good responses linked the effects of temperature changes on enzymes to the rate of metabolic processes, such as respiration and chemical digestion. The best responses referred to other effects including; dehydration, heat stroke and the effect of high temperature on sperm production.
- (d)** This was answered well by the majority of candidates. Less well-executed responses described the features of the nervous system and made little or no reference to hormones. Others gave a description of the reflex arc, which was not relevant.

Question 5

- (a)** The vast majority of candidates were familiar with the chemical equation for aerobic respiration. A few wrote the equation for photosynthesis and not all were able to correctly balance the equation. Some gave an equation for anaerobic respiration.
- (b)** There were some correct calculations. Many calculated the correct difference between walking and trotting but then chose the wrong value as the denominator. In some cases partial credit could be awarded because the response showed the correct working despite arriving at an incorrect final value. This highlights the importance of showing working when prompted to do so.
- (c)** Many explanations of the oxygen debt stated that 'the horse' or 'the body' respire anaerobically instead of making it clear that the change from aerobic to anaerobic respiration occurs in muscles. Many stated correctly that lactic acid is produced. Common errors included confusing respiration with breathing and stating that the 'body produces oxygen'. Some also wrote in general terms about carbon dioxide and sometimes about its effect on blood pH, which was not relevant to the question.
- (d)** Many responses stated that the horses would continue to breathe faster and/or deeper and would have a fast heart rate in order to recover from the oxygen debt. A common error was to state that lactic acid is broken down within muscle tissue rather than diffusing into the blood to be transported to the liver where it is oxidised. The role of oxygen in this process was not well-understood. Others misinterpreted the question and described how the horses should be provided with rest and water to recover from the exercise.

Question 6

- (a) (i) There were many correct responses. The most common incorrect response was **T** (uterus) as the site of fertilisation.
- (ii) The majority of candidates gave the correct response. Ovary was the most common incorrect response.
- (b) (i) The majority of candidates gave the correct response. Some incorrect responses gave the size of the image as a percentage of the actual image which was not what was required.
- (ii) There were many incorrect responses to this question ranging from $5.5\mu\text{m}$ to $0.5 \times 10^{-8}\mu\text{m}$.
- (c) Most candidates stated that sperm cells are haploid or that they contain 23 chromosomes. However, very few went on to give an *explanation*, either in terms of the production of sperm cells by meiosis, or that this ensures the number of chromosomes remains constant from generation to generation. Some candidates stated incorrectly that sperm cells are haploid because they divide by meiosis.
- (d) There were many excellent explanations of the roles of the three parts of the sperm cell. Most stated that the flagellum propels the sperm towards the oviduct or towards the egg. Fewer stated that mitochondria are the site of aerobic respiration and provide energy for this movement. Several misconceptions were seen. Fewer knew the role of the acrosome as a store of enzymes, although many stated that the role of the acrosome is to ensure that sperm and egg nuclei can fuse together. Common errors seen included; stating that the acrosome is an enzyme rather than it contains enzymes, suggesting that the acrosome is used as a navigation tool to find the egg, stating that the enzymes digest the egg cell membrane so that the whole sperm can enter the egg and describing digestion of the cell wall rather than the jelly coat.
- (e) There were many good accounts of the role of the father in sex determination. Errors included stating that X and Y are genes or alleles rather than chromosomes and not making clear the difference between the sex chromosomes in diploid cells and in gametes. Another misconception was that the Y chromosome is 'dominant' to the X, and/or that the X chromosome is 'recessive'.

BIOLOGY

Paper 0610/42
Theory (Extended)

Key messages

- Some questions require candidates to give descriptions or explanations. The best responses identify the relevant points and link them together logically to give a clear account.
- Candidates often use blank pages and spaces to continue their responses. Instead of using asterisks or arrows it is better to state on the question the page number on which the continuation has been written.

General comments

There was a full range of responses which demonstrated all the points required by the mark scheme. Although many candidates were well-prepared to answer questions on the entire syllabus, some responses indicated less familiarity with methods of contraception and the significance of barrier methods of birth control in the prevention of spread of sexually-transmitted infections in responses to question 4.

Comments on specific questions

Question 1

- (a) (i) Almost all candidates knew the structure of a tooth and the names of the different types of mammalian teeth. Cement (**B**) was the least well-known in Fig. 1.1. Common errors included writing 'dental' for dentine for **A** and transposing the positions of molars and pre-molars or the incisors and canines as shown in Fig. 1.2.
- (ii) Most candidates identified the correct type of digestion. Common incorrect responses included; ingestion, mastication and chewing.
- (b) (i) The fact that acid is released by bacteria to cause tooth decay was also well-known. Common incorrect responses included; plaque and sugar.
- (ii) The two parts of a tooth that are dissolved by acid were slightly less well-known. Dentine was less well known than enamel. Some candidates suggested both enamel and the crown, which are essentially the same part of the tooth.
- (c) Most candidates suggested that sugars are the part of a human diet and are used by bacteria to cause tooth decay.

Question 2

- (a) (i) Many candidates were familiar with the definition of fitness. 'Survive and respire' was sometimes seen instead of 'survive and reproduce'.
- (ii) There were many sensible suggestions for this question. Although some confused seed dispersal with pollination and others suggested that mangrove seeds float in order to photosynthesise.
- (b) (i) Many candidates could calculate the mass of one fiddler crab, but fewer gave their answer to two significant figures.
- (ii) Many correct sketches of a pyramid of numbers were seen. The most common mistakes were to omit the numbers and labels for the trophic levels. In some response the trophic levels were incorrectly reordered to achieve a pyramid shape.

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- (iii) The best responses explained fully the difference in shape between the pyramid of biomass and the pyramid of numbers. However, many described pyramids of energy and the energy loss between trophic levels which was not relevant. Good responses made good use of comparative data. Less well-executed response repeated the information for the pyramid of numbers sketched in the previous question and did not compare this with the biomass data.

Question 3

- (a) (i) Many candidates knew that sucrose and amino acids are transported in phloem. A common error was to give two different sugars, omitting the reference to amino acids. The transport of starch was another less common error.
- (ii) Many candidates knew the terms source and sink and used these words to explain the role of phloem in plant transport. Some seemed to be unfamiliar with these key terms and answered the question in terms of sucrose 'sinking down the phloem'. Many attempted to demonstrate their understanding that sources and sinks could change at different times of the year, but responses often lacked clarity. One error was to suggest that the soil is the source of nutrients or that it is transported in the phloem.
- (b) The long response question on the function of xylem and its adaptations was answered well by most candidates. Some marking points were not seen very often. Candidates rarely stated that thickened cell walls prevent inward collapse of xylem vessels or that the lack of end plates or end walls decreases the resistance to flow of water. A common misconception was that water movement in the xylem due to osmosis.
- (c) The best responses explained the benefits to farmers of killing pests. The most common correct responses explained the reduction in damage leading to an increase in yield.

Question 4

- (a) (i) Many candidates applied their knowledge successfully to answer this question, although quite a few referred to pathogens or to diseases in general without any specific reference to STIs. Common misconceptions were that contraceptives cause infections and that they are able to destroy pathogens. Common omissions were not to give examples of STIs or to state that *some* contraceptives reduce the risk of infection. Instead, many responses implied that all contraceptives reduce the risk of infection. One error was to describe the prevention of pregnancy rather than the prevention of disease.
- (b) (i) Many candidates knew the two hormones found in contraceptive pills. The most common errors were to suggest LH or testosterone.
- (ii) Few responses explained fully why FSH is not found in contraceptive pills. Most candidates, however, linked FSH with follicle development and an increased chance of ovulation. Common errors were to state that FSH causes the production of eggs or follicles rather than stimulating development or growth. Some stated that whole follicles are released at ovulation rather than just the egg.
- (iii) Many were able to give the name of another contraceptive that contains chemicals. A common error was to describe surgical or barrier methods of contraception. The most common correct response was spermicides.
- (iv) Some candidates were able to suggest other contraceptive methods. The most common correct responses were examples of surgical or natural methods.
- (v) Some candidates interpreted the data sufficiently to explain the apparent discrepancy in the data in Fig. 4.1. A common misinterpretation of the data in the survey was to suggest that there were more methods not included in the survey.

Question 5

- (a) The distinguishing features of insects were well-known. A common mistake was to fail to state how many body parts are common to insects, an important distinguishing feature from other arthropods. Hair was also often given incorrectly as a distinguishing feature.
- (b) The vast majority of candidates were familiar with the chemical equation for aerobic respiration. A few wrote the equation for photosynthesis and not all were able to correctly balance the equation.
- (c) (i) Many candidates seemed to be familiar with the experiment shown in Fig. 5.2 and were able to complete the sentences to explain how to use a respirometer. The most common misconception was to suggest that the water-bath is used to increase, rather than to maintain a constant temperature.
- (ii) A similar number of candidates also explained why soda lime is put in the bottom of the respirometer.
- (iii) Many good examples of the uses of energy were given. A common error was to give general responses rather than to think about the context in which this question was set. For example, many suggested that the larvae in the respirometer were reproducing or flying or that energy is used to maintain body temperature. The most common correct answers were growth and movement, some reflected on what they had learnt about energy usage and gave excellent examples including protein synthesis and active transport.
- (d) Candidates familiar with making predictions and explaining them gave detailed responses to this question. Many stated that respiration would increase as temperature increased, but not all went on to state that respiration would decrease at higher temperatures. Many explained their predictions in terms of enzyme activity and denaturation with some correctly referred to kinetic energy.

Question 6

- (a) Most candidates identified the process shown in Fig. 6.1 as reproduction.
- (b) (i) Many candidates knew the formula to calculate the actual size of an organism from a magnified image. Some knew the standard equation but were unable to rearrange the formula successfully.
- (ii) Some knew how to convert millimetres to micrometres with many incorrectly dividing by the conversion number rather than multiplying by it. A number of candidates wrote their answers in standard form as 8×10^{-1} but a common error was to express the answer as 8×10^{-10} instead.
- (c) (i) Many candidates gave a correct response to this question.
- (ii) Although most responses explained part of the process of producing human proteins in bacteria, only a few gave a fully detailed and accurate account. Key words and enzymes were often remembered, but not used in the correct context. Only the best responses used the term gene correctly. Some used the terms protein and DNA interchangeably implying that were the same structure. A common omission was to not refer to using the *same* restriction enzyme for cutting both the human DNA and the plasmids. Another omission was to not make it clear that plasmids were used; simply stating that DNA is inserted into the bacteria.
- (d) (i) Some good suggestions were seen. Often responses explained that the steam denatured the enzymes, but did not go on to state that this killed the bacteria.
- (ii) Most candidates knew at least some of the conditions in a fermenter that are controlled and measured. The most common error was to suggest the control of light intensity. The most common correct responses were temperature and pH.
- (iii) Although penicillin was the most common correct response, a wide variety of other commercial products made in fermenters were given. The most frequent incorrect responses were *Penicillium* and bread.

- (e) An extensive range of advantages were suggested. Some responses lacked precision; stating in general terms that genetic modification adapts crop plants to the environment. These statements were often not specific to genetically modified crops and could be true of crops grown as monocultures or crop species improved by selective breeding.

BIOLOGY

Paper 0610/43
Theory (Extended)

Key messages

- Some questions require candidates to give descriptions or explanations. The best responses identify the relevant points and link them together logically to give a clear account.
- Candidates often use blank pages and spaces to continue their responses. Instead of using asterisks or arrows it is better to state on the question the page number on which the continuation has been written.

General comments

There was a full range of responses which demonstrated all the points required by the mark scheme. Although many candidates were well-prepared to answer questions on the entire syllabus, there was some evidence that not all were familiar with some of the aspects relating to plants, such as the use of 2, 4-D in agriculture (question 4(e)(ii)), the changes taking place in cells when a leaf wilts (question 3(b)(ii)) and the adaptations of a leaf (questions 3(a)(ii) and 3(a)(iii)).

Comments on specific questions

Question 1

- (a) Almost all candidates knew that mechanical digestion starts in the mouth, but only the best responses gave a detailed description. Many descriptions focused on chemical digestion. Very few gave details of the roles of the different types of teeth.
- (b) Many were familiar with at least some of the digestive enzymes and the products of chemical digestion. Amylase was the most well-known enzyme although some responses did not state the products of starch digestion. The location of fat digestion was the least well-known.
- (c) (i) Some candidates knew the storage carbohydrate in the liver. A common error was glucagon. Correct spelling of glycogen was important to differentiate it from glucagon.
- (ii) Many candidates knew the correct response.
- (iii) Almost all candidates suggested a suitable function for the fat layer beneath the skin. The most common misconception was that the fat layer would produce heat rather than provide insulation.

Question 2

- (a) (i) Many candidates knew that fur is one visible feature of mammals, but only a few suggested a correct second feature. Where more than two features were given in a response, only the first two were considered. Features which were not visible or were not distinguishing were often seen. A considerable number suggested that having four legs and a backbone were unique to mammals.
- (ii) Many good explanations of the term adaptive feature were seen. Almost all candidates explained that adaptive features increase chances of survival. Less well-executed responses just described the adaptive features of wolves. Some did not extend their explanations to cover all aspects of an adaptive feature; the genetic link in the context of natural selection and reference to fitness were the most common omissions.
- (b) Almost all candidates knew some conditions that limit plant growth. Responses that used very general terms such as 'weather' or 'environment' were rare.

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- (c) There were many good responses to this question. The most common points made were the lack of food and the low reproductive rates, but a broad range of valid points were made. Less well-executed responses tended to state the same point multiple times or lacked sufficient scientific detail.

Question 3

- (a) (i) Even though the three-dimensional image of the broad bean leaf was likely to be unfamiliar, many candidates identified successfully the two labelled tissues in the photomicrograph. A common error was to state that the epidermis (A) was the cuticle.
- (ii) Good responses were able to explain why the mesophyll tissues have a large surface area or considered the optimisation of either light absorption or gas exchange. Only the best responses considered both aspects.
- (iii) The best responses provided a detailed account of why there are interconnecting air spaces in a leaf. Many realised that it would be related to diffusion and the processes that occur in a leaf, but were not able to construct a response in sufficient detail.
- (b) (i) Many suggested one correct condition that could increase the chances of wilting, but only a few gave two correct conditions. A significant number of candidates stated an abiotic factor without qualifying it; for example, many gave humidity without stating *low* humidity. A common misconception was that the absence of light would cause wilting.
- (ii) Explaining what happens to leaf cells to cause wilting proved to be challenging. There were some very good responses, but many gave lacked sufficient detail stating only that cells loose turgor or become flaccid but offering no further explanation.
- (iii) The most common correct advantage of wilting suggested was to reduce herbivory, but many other plausible suggestions were also given.

Question 4

- (a) Many candidates gave part of the definition of a hormone, but only some gave a detailed, precise response. Many did not state that hormones are transported in the blood.
- (b) (i) The majority of candidates stated that the retina converts light energy into nerve impulses.
- (ii) Fewer candidates knew that the fovea has the highest concentration of light sensitive cells in the eye. The most common wrong answer was the retina.
- (iii) Many candidates knew that sensory neurones conduct impulses from the eye to the brain. The most common wrong response was the optic nerve, suggesting that some were unsure of the difference between nerve tissue and nerve cells or neurones.
- (iv) Almost all candidates knew that the optic nerve contains the neurones that conduct impulses from the eye to the brain.
- (v) The majority of candidates identified the spinal cord from the diagram. References to the spine, rather than spinal cord were rare, suggesting that most candidates knew the difference between these two terms.
- (vi) A few correctly identified the adrenal gland but it was not widely known.
- (c) Most candidates completed at least part of Table 4.1 to describe the effect of adrenaline on different parts of the body. The effects on the liver were the least well-known. Many responses made general statements about the eyes dilating rather than stating that it is the *pupils* that dilate.
- (d) The best responses gave a full explanation. Many referred correctly to the increased speed of the nervous system as well as the long-lasting effects of the endocrine system. Some responses did not make it clear as to whether they were referring to the nervous system or to the endocrine system.

- (e) (i) A reasonable number of responses named a plant hormone, but many gave the names of animal hormones.
- (ii) Very few candidates knew how 2, 4-D is used in agriculture. Most suggested that it is used to promote the growth of crops without specific mention of its role as a weedkiller.

Question 5

- (a) The vast majority of candidates were familiar with the chemical equation for aerobic respiration. A few wrote the equation for photosynthesis and not all were able to correctly balance the equation.
- (b) Many candidates calculated the rate of carbon dioxide production and most also went on to give their answer to the correct number of significant figures, however, some found this challenging. Similarly, correct rounding of the calculated value proved to be a challenge for some.
- (c) Many excellent explanations were seen, both in terms of concern for the welfare of the crickets and good experimental design.
- (d) A similar number of candidates also explained why the temperature in the jar would increase. A broad range of correct points were made with many extending their responses to cover many valid reasons.
- (e) Most candidates stated two conclusions from the data in the figure, but fewer were able to support their conclusions with appropriate data quotations. Often where data was quoted there were no comparative figures or units were missing.

Question 6

- (a) Many candidates were able to identify at least some parts of the flower, but fewer could correctly identify their functions. The least well-known function was the protection given by sepals to the flower bud.
- (b) (i) Many candidates knew the formula to calculate the actual size of a pollen grain from a magnified image.
 - (ii) Many candidates converted millimeters to micrometers successfully with only a few using something other than a factor of a thousand.
 - (iii) Almost all candidates suggested that the spikes on the pollen grains would hook on to the bodies of insects to aid pollination.
- (c) (i) A reasonable number of candidates knew that the ovule contains the female gamete in flowers.
 - (ii) Some candidates gave a correct definition. Good responses approximated the definition given in the syllabus. A common error was to state that the chromosome number was 23 without further explanation.
 - (iii) Some candidates explained in detail why it is important that gametes are haploid with many referring to the restoration of the diploid number at fertilisation. Less well-executed responses seemed to be familiar with the terminology, but were not able to use it in the correct context.

BIOLOGY

Paper 0610/51
Practical Test

Key messages

Candidates should be able to:

- recognise variables in an experiment and describe how to change the independent variable, measure a dependent variable and describe how to keep any other important variables constant
- use correct scientific terminology and units for quantities for volume, mass and concentration
- know the difference between a bar chart and a histogram
- know how to work out ratios.

General comments

Many excellent scripts were seen with clearly written responses that were precise and direct. If candidates need to cross out an answer, it is better to write the revised answer on a blank part of the question paper if there is not enough space left in the answer lines. Writing over the top of the crossed-out section, particularly over changed numbers, is often difficult to read.

It is important that candidates follow the instructions in the question paper carefully. There were examples in both question 1 and question 2 where candidates appeared to have misread the question, for example in question 1(a) candidates recorded results at intervals of five minutes, rather than intervals of one minute for five minutes. In question 2(b)(i) a great many did not follow the instruction 'label the abdomen' on their drawing.

The supervisor's report is very important in ensuring that candidates are credited appropriately when the results of the experiment do not fit the expected pattern. Chemicals should be new as deterioration can give false results. Supervisors should trial practical materials, as required in the confidential instructions, as far in advance of the actual examination as possible. This gives time, if any difficulties arise, to seek advice about alternative materials from Cambridge, using the contact information on the confidential instructions. In cases where a substitution is made the supervisor's report should include as much detail as possible to allow examiners to assess the candidates' responses appropriately.

Comments on specific questions

Question 1

- (a) The majority of candidates were able to draw a suitable table, but in many cases were not able to use suitable headings that included appropriate units. A common error was to put units in the body of the table.

Candidates need to know that it is good practice for the independent variable to be the first column or row of a table and the dependent variables should be the next column(s) or row(s). In this question the independent variable was the pH of the tubes A, B and C and the dependent variable the stage of clotting at minute intervals. Candidates should know how to construct tables when a column heading may be further sub-divided. In this question, if candidates made their first column the type of test-tube, the second column would be time / minutes subdivided into columns numbered 1, 2, 3, 4, and 5.

Good responses showed that candidates followed the instruction to record the stage of clotting in each test-tube at one-minute intervals, using the letters given in the question paper, so their tables had fifteen results recorded. Less clear responses often did not use the letters given in the question paper and used other symbols or words without providing a key.

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The table was also expected to show a correct trend. The supervisor's results were critical if the candidate's results did not follow the expected pattern.

Some misinterpreted this question in one of two ways. In some cases, results were recorded candidates every five minutes. Credit was given if the table matched the expected criteria. In other cases 'stages of clotting' were used as column headings in the table and the number of minutes taken to reach this stage for each of the test-tubes, P, Q and R was recorded. In these cases the supervisor's results were taken into consideration.

- (b) Good responses usually noted that rennin works best in low pH or acid conditions. The best responses also noted that rennin was inhibited at higher pH or basic conditions. Some responses were unclear about the difference between low pH and high pH; a common error was to state that 'the optimum pH for rennin is acid conditions giving a high pH'. Less well-executed responses omitted any mention of rennin and variously answered in terms milk clotting with acid and being unaffected by alkali. A great many simply described their results.
- (c) (i) Many candidates gave a correct response, but a large number assumed that 37°C was the optimum temperature of the enzyme or that the enzymes would be activated by the temperature.
- (ii) The commonest correct responses were the volume of rennin and the volume of milk. Less well-executed responses simply stated time without any further qualification, others listed equipment such as size of test-tubes and beakers. Candidates need to be able to identify which of the variables in an experiment must be kept constant in order to obtain valid results.
- (d) The best responses gave at least three acceptable suggestions. The most common were; the temperature of the water bath not being maintained, contamination from using the same dropping pipette, the difference in volume of drops and not having any repeats. A common mistake was to state an improvement instead of identifying an error or to list human errors such as not carrying out the method correctly.
- (e) Almost all candidates gave a correct response, commonly the use of acid.
- (f) The majority of candidates gave the correct response. The most common error was to confuse biuret reagent with Benedict's solution. A minority did not appear to know how to test for protein and added more rennin so that extra protein would form clots.
- (g) Responses to this question were very variable. Some candidates gave concise answers that described a suitable sequence for testing the effect of temperature on a protease enzyme. They chose a suitable range of temperatures, standardised the pH and volume of enzyme, described how they identify the end point and included a safety precaution. A common error was to state that the experiment should be repeated, but to omit how many times it should be repeated. Some response lacked detail as to how the procedure would be performed. Some responses did not seem to have considered the information in the question and just described how to do the original experiment at different temperatures. The best responses identified the independent variable and how it would be changed, how the dependent variable would be measured and which variables would be kept constant. They also gave a range of values for the independent variable and stated how many times the procedure would be repeated.

Question 2

- (a) Most candidates gave correct responses to parts (i) (ii) and (iii). The most common error in part (i) was to miscount either web B or web E. In these cases, error carried forward was allowed in parts (ii) and (iii). In part (iii) the most common errors were to divide 102 by 6 or to add 6 to 102.
- (a) (iv) This proved to be challenging for some candidates. The best responses showed a clear understanding of what is meant by an estimate or the purpose of an average. Good responses showed an understanding that the sample counted was relatively small for the total number of webs or that the sample did not represent the situation in the whole garden. The majority of responses discussed the different size of webs, the variation in the number of insects caught or the unreliability of the estimate.

- (b)(i)** The quality of drawings varied greatly. There were some excellent examples drawn with a sharp pencil with clear outlines that accurately observed the specimen and made good use of the space provided. Good responses also did not use shading or other artistic edging of lines.

Less well-executed drawings had three body segments instead of two, lacked detail of the segmentation of the legs or extended into the text of the question. Some were also drawn in pen or with a blunt pencil that gave thick sketchy lines.

Good responses showed the relative size of the body in correct proportion to the legs. Measuring the specimen can be helpful when determining the correct proportions of structures. Those who labelled the abdomen usually labelled it correctly, but many omitted this step or drew a label line that did not actually touch the abdomen.

- (ii)** The majority of candidates measured the line on Fig. 2.2 correctly. Better responses also showed a line drawn on their drawing and a correct measurement for this line. Common errors included omitting the line or the units for the line measurement. Most candidates correctly calculated the magnification from their measurements, although some incorrectly stated the unit for magnification in cm or mm.

- (c)(i)** Most candidates correctly labelled the axes of the bar chart and used a suitable scale. Candidates were also able to accurately plot data. The commonest error was to draw a histogram (bars touching) instead of a bar chart.

- (ii)** Most candidates could find the correct total for the number of plants and animals. Many gave a correct ratio, although some did not express it in its simplest form. A common error was to give the ratio of plants to animals instead of animals to plants.

BIOLOGY

<p>Paper 0610/52 Practical Test</p>

Key messages

The Practical Test requires candidates to have experience of using a wide range of practical equipment. They should be able to gather valid data and be able to design an experiment that also produces suitable data.

General comments

Successful candidates are able to:

- use a range of practical equipment to gather data that is valid
- be able to justify their choice of equipment and evaluate its accuracy
- design an experiment that takes into consideration the variables, how the data is going to be collected and how the data will be analysed
- present data in a table, with suitable headings that include the appropriate SI units
- present data graphically with a suitable trend line where appropriate
- label graph axes and include the units
- draw an accurate representation of a biological specimen with clear and continuous lines, using a sharp pencil. Drawings should be freehand as ruled lines are usually not appropriate when drawing biological specimens.

Comments on specific questions

Question 1

- (a) (i) Most candidates were able to record a starting and final temperature for the warm and cool water-baths. The most common error was to transpose the two values.
- (ii) It was pleasing to see that most candidates were able to access all the marking points for drawing a table. The best responses provided suitable heading titles and units for the data collected. It is important that the units are recorded only in the table heading and not in the data cells.
- (b) (i) Most candidates were able to draw a relevant conclusion for the investigation. Many stated that as the temperature increased the height of the yeast suspension increased. Some correctly identified that as the temperature increases, so does the rate of the respiration of the yeast.
- (ii) This question proved challenging for some. The commonest error was to discuss the temperature of the water in the water-bath rather than the contents of the small test-tube.
- (iii) Some found it challenging to identify a suitable error in step 7. Many identified a number of experimental errors that were not related to step 7. The best responses matched the improvement to the error identified in step 7.
- (iv) This question was answered well by most candidates. A common error was to provide a list of the controlled variables.
- (c) (i) It was pleasing to see that most candidates were able to correctly calculate the average volume of carbon dioxide produced in five minutes and in one minute.

- (ii) Most candidates were able to draw a good graph with suitable units for the axes. The best responses produced line graphs that had clearly plotted data points with a line that showed no further increase after 4.4 cm^3 per minute.
 - (iii) It was encouraging to see that the majority of candidates were able to access the higher marks for this question. The most common error was to omit the units when quoting data. The best responses described all the trends in the data.
 - (iv) Most candidates provided a suitable response for this question. Some did not use their calculated value for **1(c)(i)** as instructed and so could not calculate the correct value.
- (d)(i) The majority of candidates were able to recall the test for reducing sugars. A common error was to omit the heating step from the procedure. A few responses described the test for starch.
- (ii) Most candidates were able to identify a suitable hazard and precaution.

Question 2

- (a)(i) The best responses had clear outlines with no shading or jagged lines. It was important that the drawing was an accurate representation of the algae, showing eight individual alga with a circle in the centre where the individuals join. Less successful responses had ruled lines which did not accurately represent the image.
- (ii) Most candidates were able to correctly measure the length of the algae in either cm or mm. The most common error was not dividing the length of the algae by the magnification.
- (b)(i) Some found this question challenging. A common error was to describe the different colours that hydrogencarbonate indicator would be at different light intensities rather than a method and variables to be measured and controlled. Better responses gave a suitable light intensity range with a method that described how this could be achieved.
- (ii) Candidates responded with a wide range of acceptable indicators. Less precise responses referred to 'pH paper', rather than Universal Indicator Paper or Litmus Paper which was not accepted.

BIOLOGY

Paper 0610/53
Practical Test

Key messages

- It is essential that candidates take time to ensure that their written work is legible. This includes the avoidance of 'overwriting' when mistakes are made or even writing in pencil and then overwriting in pen. When mistakes are made, they should be crossed out completely and the alternative answer written in a suitable clear space.
- Candidates must ensure that they read the questions carefully before starting to answer. This is particularly important for any planning exercise that is required. Identification of the dependent and independent variables is vital before a plan is completed.
- Candidates must be familiar with the practical procedures listed in the syllabus. This means that candidates are expected to be able to carry out these procedures safely, but also that they should be able to work safely and with competence on practical procedures that derive from learned methods.
- When asked about safety considerations, candidates should identify a risk, but also identify a method of reducing that risk.
- Mathematical calculations form an important part of the practical assessment. It is essential that candidates check all of their working carefully and take time to consider whether the resulting answer is realistic.

General comments

Candidates performed well on the majority of the paper, showing advanced preparation and familiarisation with the type of questions asked. It was evident that an increasing number of candidates show an understanding of the expectations of the assessment.

Some candidates continue to find the planning exercises challenging, but the majority were able to produce well thought-out, logical investigations. Identification of variables, safety and a workable method are key aspects of this task.

Graph drawing is a skill that most candidates continue to perform well on, with well-produced graphs. Similarly, producing a table for the data also posed few problems for the majority of candidates, with underlined headings and units.

The drawing skill remains challenging for a number of candidates. The instructions should be read carefully and drawings should be neat, in proportion and show sufficient detail.

Comments on specific questions

Question 1

- (a) (i) A surprising number of candidates found this simple calculation very challenging. A simple proportional dilution was expected but many used the wrong numbers when performing the calculation. The table of data provided shows a logical progression in the values this shows that the value of the salt concentration in test-tube 2 is half of that in test-tube 3, so the concentration of salt for the calculated value should have been half as well.

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- (ii) Space was provided for a table of results to be constructed. Most candidates did this reasonably well. Common errors in table construction included:
- the use of incorrect headings. The top of each column of data should have an appropriate heading. Many included units within the body of the table instead of just in the heading. Percentage concentration of salt was an acceptable heading but mol/dm^3 was incorrect in this context.
 - Not all candidates recorded the four repeat measurements, and some did not calculate an average for the repeats.
 - A few candidates presented their results simply as a list of numbers and did not produce a table. A table should be drawn, preferably using ruled lines, with headings and units along the top of the table. Some placed the headings down one side of the table, which if clear, was accepted.
- (b) Most candidates easily identified the use of a sharp knife was a hazard. Fewer were able to give a suitable precaution. The use of gloves alone was insufficient as standard plastic gloves would not protect against cuts. Ideas of cutting on a stable surface or alternative methods of holding the stem were credited.
- (c) This was generally well-answered. Some gave imprecise responses that simply said that repeats would make the procedure more accurate, reliable or precise. A few candidates identified that taking repeats would allow anomalous results to be identified and to compare repeated values with one another.
- (d)(i) Surprisingly few candidates could identify the concentration of salt as the independent variable in this investigation. Many stated that the volume of water or salt was changed but did not see that it was the final concentration of salt that was important (both the water and the salt volume could change with no change in concentration). The use of the terms volume or concentration is preferable to the more general amount, as in some contexts this can be too ambiguous.
- Some were unsure of the difference between the variable that is measured (the dependent variable) and the variable that is changed (the independent variable).
- (ii) Most candidates could easily identify two variables that stayed the same, with the most common answers being the length of the cut stem and the type of tissue being used.
- (e) Most candidates could identify the error in step 8 of the procedure, stating that there was difficulty in measuring the distance of 2mm. Any suitable method for improving this, such as marking the stem before cutting, was accepted. Similarly, candidates could easily identify that it was difficult to measure the distance between the cut ends of the stem, which were sometimes less than a millimetre apart.
- (f) Most candidates were able to calculate the actual length of the line on Fig. 1.4, although a few could not rearrange the equation correctly or gave the wrong units.

Question 2

- (a) Although asked to draw one of the hindwings of the butterfly, some drew the entire specimen, wasting valuable time and making their hindwing drawing too small.
- Most drawings were drawn to a good size with an appropriate level of detail and suitable shape. Unfortunately many had shaded their drawings which not accepted. The use of a sharp pencil would improve the quality of the lines drawn in many cases.
- (b) Generally candidates found this question straightforward, but many used language that lacked precision. Some stated, for example, that the pattern on the wings was similar or that the pattern was different but did not go onto say how it was similar or different. The best responses described exactly how the pattern, size or shape of the wings were similar or different. A common error was to describe features of the head or body of the butterfly rather than the wings.

- (c) (i)** The graph was plotted quite well with most candidates placing the points accurately. The axes were nearly always correctly labelled but the scale sometimes posed a problem. Good examples of scales either started at zero or the first value given. The scale chosen should ensure that more than half of the graph grid is being used to plot the points.
- (ii)** This was very well-answered with only a few imprecise responses seen that did not describe any relationship. Candidates can use the terms directly or indirectly proportional but they should then also go on to describe what this means.
- (iii)** Most candidates were able to estimate the body mass, but those who had chosen an inappropriate scale for their graph axes found it difficult to do this accurately. Some did not mark the graph to show how the estimate was achieved.
- (d)** The planning exercise was a very simple application of food tests to find out which substances were present in nectar. Despite this, a large number seemed to get confused by the reference to molecules and did not describe the standard food tests at all, using microscopes to see the molecules instead. Even with no food tests, candidates were able to access some marks for experimental procedures such as the extraction of the nectar or for carrying out repeats to confirm results. Those who did describe the food tests scored highly for a completed plan.

BIOLOGY

Paper 0610/61
Alternative to Practical

Key messages

There were many excellent scripts where the answers were accurate, informed, clearly reasoned and well presented.

General comments

Candidates must read a question carefully before starting to write their answer. They must also follow the instructions precisely. Credit cannot be given for correct biology that is irrelevant to the answer required. It would be helpful for the candidates to look at both the mark allowance for an answer and at the space provided for it. Often only one piece of information is provided in an answer when there are two marks available. Similarly, if one line is provided and only one mark is available, it is inappropriate to write a paragraph.

When drawing a diagram, a soft pencil should be used and an eraser if necessary. Thus, any errors can be rectified easily. Lines need to be continuous, with no breaks and no overlaps. Shading and artistic additions should not appear.

When drawing a graph, candidates should use a sharp pencil. Axes need to be fully labelled with units stated. The scale must be even but need not necessarily start at zero. The completed graph should occupy more than half of the grid provided. The size of the printed grid is chosen to help candidates to choose an easy scale. Candidates need to recognise when it is appropriate to draw a line graph, a bar chart or a histogram. (Line graphs are for continuous data, bar charts for discontinuous data and histograms are used for displaying data frequency.)

The construction of a table should be done with ruled lines, preferably with an outer border. Units need to appear in the headings and not in the cells of the table. Each item of information needs to be in a discrete cell. Candidates need more practice in constructing a table where there is an over-arching heading with sub-headings beneath, as was required in this paper.

When planning an investigation it is good practice to repeat the measurements of each value in the range chosen for the independent variable at least twice (i.e. three or more measurements in total for each independent variable value). If measurements are only taken twice and the results are different, then it is not possible to know which result is the true value one.

Comments on specific questions

Question 1

- (a) Almost all candidates could draw a table with at least three columns with a line separating the headings from the data. Many candidates also entered the data correctly. Stating the correct headings for the table proved to be more challenging. Some thought that the results referred to the length of the clotting process, rather than the state of clotting that had been reached after a period.
- (b) Most candidates were able to state a reasonable conclusion for the results provided. The best responses made the connection between the pH of the test-tube contents and the amount of clotting produced. A common mistake was to state that clotting occurred more slowly in alkaline conditions, a fact that could not be determined from the results given.
- (c) (i) The reason for keeping the separate test-tubes at 40°C for three minutes before mixing the content was not widely appreciated. Many thought that the reason was to provide optimum conditions for enzyme activity, whereas the over-riding reason was to ensure that all the reactants were at the same temperature prior to being mixed.

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- (ii) This was well-answered, with most candidates being able to state two factors that were kept constant during the investigation. Some gave answers that were imprecise: for example, 'time' needs to be qualified by stating the time for which part of the investigation and 'volume' needs to be qualified by the name of the chemical.
- (d) This proved to be a challenging question for some candidates. They were asked to identify four sources of error in the investigation and some responses instead stated improvements to the method or listed human errors such as not carrying out the stated method correctly.
- (e) A significant proportion of candidates identified the use of an acid or an alkali as a hazard.
- (f) The majority of candidates could name the biuret test as a test for the presence of proteins and knew the required colour change. Common errors included heating the reagents or performing the Benedict's test for reducing sugars.
- (g) Many candidates correctly identified the test for fats as the ethanol emulsion test.
- (h) There were some excellent descriptions given for testing the hypothesis stated in the question. Less detailed responses wrote about enzymes in general which did not meet all the criteria required. Others gained marks for general points such as repeating (the investigation) at least twice and wearing safety equipment such as goggles. Apart from these, the most frequently awarded marks were for using a thermostatically controlled water-bath, using the same volumes of reactants and keeping the pH the same.

Question 2

- (a) (i) Almost all candidates performed this task accurately.
- (ii) The average number of spiders per web was calculated correctly by nearly all candidates.
- (iii) The calculation of the average number of insects in the whole garden was carried out correctly by the many candidates. A common error was to carry out a division instead of a multiplication.
- (iv) Some candidates this question challenging. The majority referred (incorrectly) to differences in web size, or the fact that the figures used were averages. Many candidates did not appear to appreciate the nature of an average. Relatively few identified the fact that the sample size was too small or that environments could vary within the garden.
- (b) (i) Some candidates produced an excellent drawing of the spider. Most drawings had clear unbroken outline which were of an appropriate size. Less well executed drawings divided the body into three sections with legs that did not give any indication of having joints. Those who labelled the abdomen usually labelled it correctly, but many omitted this step.
- (ii) The measurement and calculation of magnification were usually carried out accurately. The most common errors were not inserting the measurement line on their drawing and stating the magnification with a unit.
- (c) (i) Candidates were given information which they had to represent in a bar chart. Many were awarded full marks for this. The most common errors were not labelling the axes and drawing a histogram (with no space between the bars) instead of a bar chart.
- (ii) A minority of candidates did not seem to recognise the term 'ratio'. Most performed the calculation correctly but a significant number wrote down the ratio of plants to animals instead of what had been requested: animals to plants.

BIOLOGY

Paper 0610/62
Alternative to Practical

Key messages

Many candidates were well-prepared for this exam and there were a lot of very good scripts which demonstrated good experience of the practical procedures outlined in the syllabus. Some need more practise in planning an investigation, drawing trend lines on graphs and identifying experimental errors.

Candidates should use a sharp pencil for drawings and graphs.

General comments

Most candidates were well prepared for the exam and answered the questions confidently.

Comments on specific questions

Question 1

- (a) (i) The majority of candidates drew a table with ruled lines and the appropriate number of columns. Most responses also included headings with units and data within the data cells.

A common error was to include units in the data cells. Less frequently seen errors included omitting the header for the independent variable or writing the header in the data cells.

Most correctly put the data into the table to show the number of bubbles at each temperature. A few reversed their answers. Some included a column for the tally score and a few did not convert the tally to actual numbers.

- (ii) Nearly all candidates gave a correct response to this question.

- (b) (i) Many candidates gave a suitable conclusion. The most common error was to give a response that was not comparative. For example; referring to the yeast in the warm water-bath producing lots of bubbles but not going on to compare it to the yeast in the cool water-bath.

A less frequent error was to refer to the temperature drop between the starting and final temperatures.

- (ii) Most candidates gave a correct explanation for why counting bubbles is not an accurate method of measurement. Describing an improvement proved more challenging. Some discussed using correct apparatus, such as a gas syringe, but did not explain that this would be used to measure the volume of gas produced. Others realised that the volume of gas should be measured, but did not say how it would be measured. Some incorrectly said that repeating the investigation would be an improvement.

- (iii) Candidates found it challenging to identify the variable that should have been kept constant but was not kept constant. Good responses had considered all the information that was provided.

Many did identify that the temperature of each water-bath should have been kept constant. Many other variables were given, the most common being volumes or concentrations of yeast and glucose.

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Few were able to correctly describe a way of keeping the temperature in each water-bath constant, such as the use of a thermostatically controlled water-bath. Many thought that use of a thermometer was sufficient.

- (iv) Most candidates were able to identify the independent variable; fewer were able to identify the dependent variable. A common error was to state volume instead of the number of bubbles.
- (c)(i) The majority of candidates were able to calculate the average volumes of carbon dioxide produced in five minutes and one minute.
- (ii) Most candidates were able to plot the graph accurately. Fewer were able to add a suitable trend line. Many did not realise that a line of best fit can be a curve. It was pleasing to see very few sketchy or thick lines.

The best responses selected a sensible scale for the axes which helped them to plot the points accurately. A few chose scales that went up in threes which made plotting the points more difficult. Omitting the units was the commonest error for the axes marking point. Overall plotting was done very accurately with the use of either small crosses or dots.

- (iii) Most candidates recognised that as the concentration of glucose increased the rate of carbon dioxide production increased. A common error was to omit the units when quoting data. Descriptions of the plateau in the results were not always worded clearly enough to gain credit. Responses sometimes termed the plateau as the rate itself, rather than the increase in rate, stopping.
- (iv) Many found this question challenging. Good responses made use of the graph when calculating the correct value. A common error was to try to calculate a value without using the graph.
- (d)(i) The majority of candidates knew the test for reducing sugars. The main errors were to either omit the heating step entirely or to simply state that a water-bath was used without further detail of what it would be used for, which was insufficient.
- (ii) The hazard and precaution were often identified correctly. One error seen was to state that Benedict's reagent is flammable. Most identified the hazard caused by heating. But some did not describe the hazard adequately and described problems with Bunsen burners with no mention of the risk of hot water or of heating.

Question 2

- (a) (i)** Drawings of the algae were generally good. The most common errors were drawing the algae too large, so that part of it covered the text either above or below the space. Few drew it too small. Some did not draw the correct number of alga and some omitted the central circle. A common error was to use ruled lines to draw the algae. Ruled lines are rarely appropriate in biological drawings. It was pleasing to see that very few responses had sketchy or jagged lines or shading.
- (ii)** Measurements were usually correct as were calculations.
- (b) (i)** Candidates who were familiar with this investigation did well on this question and some excellent answers were seen. Good responses described moving the light source further away from the algae in increments. Less precise but still acceptable responses simply described the use of varying light intensity with one set-up in the light and the other in the dark. Some responses incorrectly described the testing of leaves for starch and de-starched the algae at the start of the experiment. Some used leaves and tested them with iodine. Another common error was to describe the expected results more fully than the process of doing the experiment and obtaining the results. Some did not describe the use of the hydrogencarbonate indicator and counted bubbles instead. Descriptions of timescales were often imprecise. The use of a control with no algae was rarely given but should be considered when designing an investigation. Good responses also considered the controlled variables.
- (ii)** Most candidates provided a correct response to this question. A wide range of alternative pH indicators were given. The most common error was to suggest the use of a pH meter, or pH paper. Other incorrect answers seen were lemon juice and hydrogen peroxide.

BIOLOGY

Paper 0610/63
Alternative to Practical

Key messages

- It is essential that candidates take time to ensure that their written work is legible. This includes the avoidance of 'overwriting' when mistakes are made or even writing in pencil and then overwriting in pen. When mistakes are made, they should be crossed out completely and the alternative answer written in a suitable clear space.
- Candidates must ensure that they read the questions carefully before starting to answer. This is particularly important for any planning exercise that is required. Identification of the dependent and independent variables is vital before a plan is completed.
- Candidates must be familiar with the practical procedures indicated by the syllabus. This means that candidates are expected to be able to carry out these procedures safely, but also that they should be able to work safely and with competence on practical procedures that derive from learned methods.
- When asked about safety considerations, candidates should identify a risk, but also identify a method of reducing that risk.
- Mathematical calculations form an important part of the practical assessment. It is essential that candidates check all of their working carefully and take time to consider whether the resulting answer is realistic.

General comments

Candidates performed well on the majority of the paper, showing advanced preparation and familiarisation with the type of questions asked. It was evident that an increasing number of candidates show an understanding of the expectations of the mark scheme.

Some candidates continue to find the planning exercises challenging, but the majority were able to produce well thought-out logical investigations. Identification of variables, safety and a workable method are key aspects of this task.

Graph drawing is a skill that most candidates continue to perform well on, with well-produced graphs. Similarly, producing a table for the data also posed few problems for the majority of candidates, with underlined headings and units.

The drawing skill remains challenging for a number of candidates. The instructions should be read carefully and drawings should be neat, in proportion and show sufficient detail.

Comments on specific questions

Question 1

- (a) (i)** A surprising number of candidates found this simple calculation very challenging. A simple proportional dilution was expected but many used the wrong numbers when performing the calculation. The table of data provided shows a logical progression in the values this shows that the value of the salt concentration in test-tube 2 is half of that in test-tube 3, so the concentration of salt for the calculated value should have been half as well.

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(ii) Space was provided for a table of results to be constructed. Most candidates did this reasonably well. Common errors in table construction included:

- the use of incorrect headings. The top of each column of data should have an appropriate heading. Many included units within the body of the table instead of just in the heading. Percentage concentration of salt was an acceptable heading but mol/dm³ was incorrect in this context.
- Not all candidates recorded the four repeat measurements, and some did not calculate an average for the repeats.
- A few candidates presented their results simply as a list of numbers and did not produce a table. A table should be drawn, preferably using ruled lines, with headings and units along the top of the table. Some placed the headings down one side of the table, which if clear, was accepted.

(iii) Some candidates found this quite challenging. Many described just one or two of the results rather than making a comment that summarised all of the results. Candidates can use terms such as inversely proportional but they must go on to describe what this means in terms of the results.

(b) Most candidates easily identified the use of a sharp knife was a hazard. Fewer were able to give a suitable precaution. The use of gloves alone was insufficient as standard plastic gloves would not protect against cuts. Ideas of cutting on a stable surface or alternative methods of holding the stem were credited.

(c) This was generally well-answered. Some gave imprecise responses that simply said that repeats would make the procedure more accurate, reliable or precise. A few candidates identified that taking repeats would allow anomalous results to be identified and to compare repeated values with one another.

(d)(i) Surprisingly few candidates could identify the concentration of salt as the independent variable in this investigation. Many stated that the volume of water or salt was changed but did not see that it was the final concentration of salt that was important (both the water and the salt volume could change with no change in concentration). The use of the terms volume or concentration is preferable to the more general amount, as in some contexts this can be too ambiguous.

Some were unsure of the difference between the variable that is measured (the dependent variable) and the variable that is changed (the independent variable).

(ii) Most candidates could easily identify two variables that stayed the same, with the most common answers being the length of the cut stem and the type of tissue being used.

(e) Most candidates could identify the error in step 8 of the procedure, stating that there was difficulty in measuring the distance of 2mm. Any suitable method for improving this, such as marking the stem before cutting, was accepted. Similarly, candidates could easily identify that it was difficult to measure the distance between the cut ends of the stem, which were sometimes less than a millimetre apart.

(f) Most candidates were able to calculate the actual length of the line on Fig. 1.5, although a few could not rearrange the equation correctly or gave the wrong units.

Question 2

(a) Although asked to draw one of the hindwings of the butterfly, some drew the entire specimen, wasting valuable time and making their hindwing drawing too small.

Most drawings were drawn to a good size with an appropriate level of detail and suitable shape. Unfortunately many had shaded their drawings which not accepted. The use of a sharp pencil would improve the quality of the lines drawn in many cases.

- (b)** Generally candidates found this question straightforward, but many used language that lacked precision. Some stated, for example, that the pattern on the wings was similar or that the pattern was different but did not go on to say how it was similar or different. The best responses described exactly how the pattern, size or shape of the wings were similar or different. A common error was to describe features of the head or body of the butterfly rather than the wings.
- (c) (i)** The graph was plotted quite well with most candidates placing the points accurately. The axes were nearly always correctly labelled but the scale sometimes posed a problem. Good examples of scales either started at zero or the first value given. The scale chosen should ensure that more than half of the graph grid is being used to plot the points.
- (ii)** This was very well-answered with only a few imprecise responses seen that did not describe any relationship. Candidates can use the terms directly or indirectly proportional but they should then also go on to describe what this means.
- (iii)** Most candidates were able to estimate the body mass, but those who had chosen an inappropriate scale found it difficult to do this accurately. Some candidates did not mark on the graph show how the estimate was achieved.
- (d)** The planning exercise was a very simple application of food tests to find out which substances were present in nectar. Despite this, a large number seemed to get confused by the reference to molecules and did not describe the standard food tests at all, using microscopes to see the molecules instead. Even with no food tests, candidates were able to access some marks for experimental procedures such as the extraction of the nectar or for carrying out repeats to confirm results. Those who did describe the food tests scored highly for a completed plan.



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

BIOLOGY

0610/51

Paper 5 Practical Test

May/June 2018

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No access to the question paper is permitted in advance of the examination.

Centres are reminded that candidates are expected to follow the instructions on the question paper and record all their results. They will not be penalised if these results are not what they expect.

The Supervisor should make sure the Supervisor's Report is fully completed and a copy is enclosed with each packet of scripts.

It is assumed that the ordinary apparatus of a science laboratory will be available, including a supply of purified water (distilled or deionised).

If arrangements are made for different sessions for different groups of candidates, care must be taken to ensure that the different groups of candidates are effectively isolated so that **no information passes between them.**

All specimens should carry only the code letters and numbers as indicated and their identity should not be revealed to the candidates.

Supervisors should ensure that all specimens have the correct identity attached to the specimen and that these are **not** removed during the examination.

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.

Supervisors are advised to remind candidates that **all** substances in the examination should be treated with caution. Pipette fillers and eye protection should be used where necessary.

In accordance with COSHH (Control of Substances Hazardous to Health) Regulations, operative in the UK, a hazard appraisal of the examination has been carried out.

The following codes are used where relevant:

C corrosive	MH moderate hazard
HH health hazard	T acutely toxic
F flammable	O oxidising
N hazardous to the aquatic environment	

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Question 1

Each candidate should be provided with:

- (i) six test-tubes
- (ii) one test-tube rack
- (iii) one 250 cm³ beaker labelled **water-bath**
- (iv) a supply of warm water at 40 °C. Candidates will raise their hands when they are ready for warm water to fill their water-bath.
- (v) one glassware marker pen
- (vi) one 5 cm³ syringe without needle
- (vii) one 1 cm³ syringe without needle
- (viii) stop-clock
- (ix) 25 cm³ of fresh whole milk in a container labelled **milk**
- (x) 10 cm³ of 0.4 mol dm⁻³ hydrochloric acid in a container labelled **acid**
- (xi) 40 cm³ of distilled water in a container labelled **distilled water**
- HH, MH, C (xii)** 10 cm³ of 0.1% rennin solution in a container labelled **0.1% rennin**
- MH (xiii)** 10 cm³ of 0.4 mol dm⁻³ sodium hydroxide in a container labelled **alkali**
- (xiv) three dropping pipettes, graduations are not required
- (xv) paper towels
- (xvi) disposable gloves
- (xvii) eye protection

Preparation of solutions**HH, MH, C** *0.1% rennin solution*

This can be made up using dried rennin, rennet essence or vegerennin. It can be purchased from science providers, dairy industry providers and some food stores. The enzyme should be refrigerated but should not be frozen prior to use.

Dissolve 1 g of dried rennin in (or add 1 cm³, if in liquid form, to) 500 cm³ of distilled water. Add more distilled water to make up to a total volume of 1 dm³.

Milk

The milk should be fresh whole cow's milk. Skimmed or semi-skimmed milk is unsuitable. Before the examination the Supervisor should trial the enzyme reaction of the milk and rennin solution. Warm separate samples of the milk and the 0.1% rennin solution to 40 °C. Add two drops of 0.4 mol dm⁻³ hydrochloric acid to 5 cm³ of warmed fresh whole milk. Add 1 cm³ of warmed 0.1% rennin to the milk and acid mixture.

The milk should form visible clots (small lumps) within one minute and should be partially solid within three minutes. If these times are longer or shorter adjust the concentration of the rennin enzyme accordingly.

MH Add two drops of 0.4 mol dm⁻³ sodium hydroxide to 5 cm³ of fresh whole milk, which has been warmed to 40 °C. Add 1 cm³ of warmed rennin solution to the milk and alkali mixture. There should be little or no clotting with this mixture within 5 minutes. Increase the strength of the alkali if the milk is clotting but note that sodium hydroxide is classified as **C** at concentrations equal to or greater than 0.5 mol dm⁻³.

Question 2

- (i) ruler with a mm scale

The Supervisor (**not** the Invigilator) should carry out the practical aspects of **Question 1** and record their results in the space provided in the Supervisor's Report. This must be done during the examination, using the same apparatus and reagents as the candidates but **out of sight** of the candidates.

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- 1 Was any difficulty experienced in providing the necessary materials? If so, give brief details.

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- 2 Give details of any difficulties experienced by particular candidates, giving names and candidate numbers. Reference should be made to:

(a) difficulties with specimens or materials;

.....

(b) accidents to apparatus or materials;

.....

(c) assistance provided in the case of colour blindness;

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The Invigilator should not carry out Question 1.

Question 1 results:

- 4 A plan of work benches, giving details of the candidate numbers of the places occupied by the candidates for each session, must be enclosed with the scripts.

Declaration (to be signed by the Supervisor)

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

Signed

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BIOLOGY

0610/52

Paper 5 Practical Test

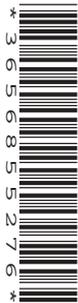
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Question 1

Each candidate should be provided with:

- (i) two standard test-tubes (125 × 15 mm) (The standard test-tubes must be able to fit inside the large test-tubes when inverted.)
- (ii) two large test-tubes (150 × 25 mm)
- (iii) one empty 250 cm³ beaker labelled **warm**
- (iv) one 250 cm³ beaker labelled **cool** containing approximately 200 cm³ of water at 20 °C
- (v) waterproof pen (fine tip) for writing on glass
- (vi) 80 cm³ of active yeast suspension (not including foam) in a beaker with a pouring lip, labelled **yeast suspension**
- (vii) a supply of water at 45 °C (approximately 200 cm³), to be distributed to candidates when they put their hand up
- (viii) thermometer
- (ix) 30 cm ruler with a mm scale
- (x) timer
- (xi) paper towels
- (xii) gloves

Preparation of solutions

Yeast suspension

Add 50 g of fast-acting yeast and 10 g of sucrose (table sugar) to 500 cm³ of warm water (35–40 °C) and stir to mix. Add more warm water to make up to 1 dm³. Ensure that the yeast suspension is active and producing foam before giving it to candidates. Skim the foam from the top of the suspension before giving it to candidates.

The yeast suspension should be made on the day of the examination. Before the examination it is recommended that centres trial how long it takes for the yeast to become active (producing foam) as some yeasts require more time.

Question 2

- (i) 30 cm ruler with mm scale

The Supervisor (**not** the invigilator) should carry out the practical aspects of Question 1 and record their results in the space in the Supervisor's Report. This must be done during the examination, using the same apparatus as the candidates but **out of sight** of the candidates.

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Paper 5 Practical Test

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READ THESE INSTRUCTIONS FIRST

These Confidential Instructions give details of the apparatus required by each candidate for each experiment in this paper. A summary of the questions that will be presented to the candidates is included, where appropriate, to allow the biology teacher to test the apparatus appropriately. **Testing must be done out of sight of all candidates.**

No access to the question paper is permitted in advance of the examination.

Centres are reminded that candidates are expected to follow the instructions on the question paper and record all their results. They will not be penalised if these results are not what they expect.

The Supervisor should make sure the Supervisor's Report is fully completed and a copy is enclosed with each packet of scripts.

It is assumed that the ordinary apparatus of a science laboratory will be available, including a supply of purified water (distilled or deionised).

If arrangements are made for different sessions for different groups of candidates, care must be taken to ensure that the different groups of candidates are effectively isolated so that **no information passes between them.**

All specimens should carry only the code letters and numbers as indicated and their identity should not be revealed to the candidates.

Supervisors should ensure that all specimens have the correct identity attached to the specimen and that these are **not** removed during the examination.

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.

Supervisors are advised to remind candidates that **all** substances in the examination should be treated with caution. Pipette fillers and eye protection should be used where necessary.

In accordance with COSHH (Control of Substances Hazardous to Health) Regulations, operative in the UK, a hazard appraisal of the examination has been carried out.

The following codes are used where relevant:

C corrosive	MH moderate hazard
HH health hazard	T acutely toxic
F flammable	O oxidising
N hazardous to the aquatic environment	

Centres are reminded that they are **not** permitted to open the question paper envelopes before the examination.

If there are any difficulties with any aspect of setting up this practical examination that the Centre is not able to resolve, it is essential for Centres to contact Cambridge as soon as possible by **email** to info@cie.org.uk, by **fax** to +44 1223 553558 or by **phone** to +44 1223 553554.

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Question 1

Each candidate should be provided with:

- (i) 100 cm³ 2% salt solution in a beaker labelled **2% salt solution**
- (ii) 100 cm³ distilled water in a beaker labelled **distilled water**
- (iii) one 5 cm long hollow stem from the genus *Allium* (spring onion or scallion for example) this needs to be a young stem (green in colour) presented on a white tile labelled **S**. The stems should **not** be kept in water prior to the experiment.
- (iv) sharp knife such as a scalpel or razor blade
- (v) photocopy of mm scale (Fig. 1.1 on page 5) on white paper and made waterproof by either laminating, or enclosing in a clear plastic bag
- (vi) paper towels
- (vii) four large test-tubes and a test-tube rack
- (viii) four Petri dish bases
- (ix) two 10 cm³ syringes
- (x) white tile
- (xi) waterproof marker pen
- (xii) stop-clock

Preparation of solutions*2% salt solution*

Add 20 g of sodium chloride to 500 cm³ of distilled water. Stir until the sodium chloride dissolves. Add more distilled water to make up to 1 dm³.

The solution can be made up to one week before the examination and stored in a cool place.

Question 2

- (i) ruler with a mm scale

The Supervisor (**not** the Invigilator) is expected to carry out the practical aspects of Question 1 and record their results in the space provided in the Supervisor's Report. This must be done during the examination, using the same apparatus and reagents as the candidates but out of sight of candidates.

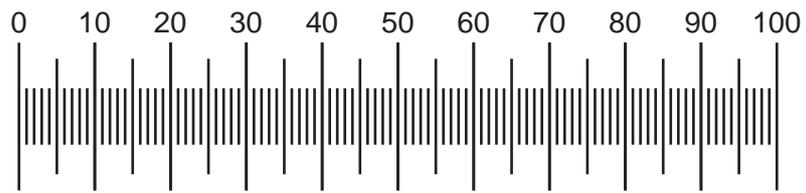


Fig. 1.1

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This form should be completed and sent to Cambridge with the scripts.

SUPERVISOR'S REPORT

The Supervisor or Teacher responsible for the subject should provide the following information.

- 1** Was any difficulty experienced in providing the necessary materials? If so, give brief details.

.....

.....

.....

- 2** Give details of any difficulties experienced by particular candidates, giving names and candidate numbers. Reference should be made to:

(a) difficulties with specimens or materials;

.....

(b) accidents to apparatus or materials;

.....

(c) assistance provided in the case of colour blindness;

.....

(d) any other information that is likely to assist the Examiner, especially if this cannot be discovered from the scripts.

.....

Other cases of individual hardship, e.g. illness or disability, should be reported direct to Cambridge on the normal Special Consideration Form as detailed in the Handbook for Centres.

- 3** During the examination, the Supervisor should, **out of sight of the candidates**, carry out the practical aspects of **Question 1** using the same apparatus and reagents as the candidates. Results should be recorded in the space on page 8 (**not** on a spare question paper). Attach extra sheets if necessary.

The Invigilator should **not** carry out **Question 1**.

Question 1 results:

- 4 A plan of work benches, giving details of the candidate numbers of the places occupied by the candidates for each session, must be enclosed with the scripts.

Declaration (to be signed by the Supervisor)

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

Signed

Name (IN BLOCK CAPITALS)

Centre number

Centre name

If scripts are required to be dispatched in more than one packet, it is essential that a copy of the Supervisor's Report and the appropriate seating plan(s) are inside **each packet**.

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Grade thresholds – June 2018

Cambridge IGCSE™ Biology (0610)

Grade thresholds taken for Syllabus 0610 (Biology) 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	–	–	25	23	21	19	17
Component 12	40	–	–	22	20	18	16	15
Component 13	40	–	–	24	23	21	19	18
Component 21	40	32	27	22	20	18	16	14
Component 22	40	33	28	22	20	17	15	13
Component 23	40	33	28	23	22	20	18	16
Component 31	80	–	–	47	39	31	23	15
Component 32	80	–	–	48	42	36	30	24
Component 33	80	–	–	47	41	35	29	23
Component 41	80	44	35	27	22	17	12	7
Component 42	80	51	42	34	27	20	14	8
Component 43	80	42	35	29	23	18	13	8
Component 51	40	28	25	21	19	17	15	13
Component 52	40	32	28	24	21	18	14	10
Component 53	40	30	27	24	21	18	16	14
Component 61	40	29	25	21	19	17	15	13
Component 62	40	33	28	24	21	19	16	13
Component 63	40	29	26	23	20	18	16	14

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	151	130	109	88	76	65	54	43
BY	22, 42, 52	166	144	122	100	84	69	54	39
BZ	23, 43, 53	149	131	113	95	83	71	59	47
CX	21, 41, 61	153	131	109	88	76	65	54	43

Grade thresholds continued
Cambridge IGCSE Biology (0610)

Option	Combination of Components	A*	A	B	C	D	E	F	G
CY	22, 42, 62	168	145	122	100	85	70	56	42
CZ	23, 43, 63	148	130	112	94	82	71	59	47
FX	11, 31, 51	–	–	–	117	102	87	72	57
FY	12, 32, 52	–	–	–	117	103	90	76	62
FZ	13, 33, 53	–	–	–	119	106	93	81	69
GX	11, 31, 61	–	–	–	117	102	87	72	57
GY	12, 32, 62	–	–	–	117	104	91	78	65
GZ	13, 33, 63	–	–	–	118	105	93	81	69



BIOLOGY

0610/11

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.

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

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



BIOLOGY

0610/12

Paper 1 Multiple Choice (Core)

May/June 2018

MARK SCHEME

Maximum Mark: 40

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

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



BIOLOGY

0610/13

Paper 1 Multiple Choice (Core)

May/June 2018

MARK SCHEME

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

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



BIOLOGY

0610/21

Paper 2 Multiple Choice (Extended)

May/June 2018

MARK SCHEME

Maximum Mark: 40

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

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



CHEMISTRY

0610/22

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

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



BIOLOGY

0610/23

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

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



BIOLOGY

0610/31

Paper 3 Theory (Core)

May/June 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.

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This document consists of **13** 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.

Abbreviations used in the Mark Scheme

- ; separates marking points
- / separates alternatives within a marking point
- **R** reject
- **ignore** mark as if this material was not present
- **A** accept (a less than ideal answer which should be marked correct)
- **AW** alternative wording (accept other ways of expressing the same idea)
- underline words underlined (or grammatical variants of them) must be present
- **max** indicates the maximum number of marks that can be awarded
- mark independently the second mark may be given even if the first mark is wrong
- **ecf** credit a correct statement that follows a previous wrong response
- () the word / phrase in brackets is not required, but sets the context
- **ora** or reverse argument
- **AVP** any valid point

Question	Answer	Marks	Guidance
1(a)		6	<p>one mark for each correct line</p> <p>deduct one mark for each extra line drawn</p>
1(b)(i)	<p>line ending on a guard cell labelled G ;</p> <p>line ending in a stoma labelled S ;</p>	2	
1(b)(ii)	<p>gas exchange / diffusion of gases / for transpiration / movement of correct substance in correct direction described ;</p>	1	
Question	Answer	Marks	Guidance
2(a)	<p>fusion of the nuclei of two gametes / AW ;</p> <p>to form a zygote ;</p> <p>production of genetically different offspring ;</p>	3	

Question	Answer	Marks	Guidance															
2(b)(i)	<table border="1"> <thead> <tr> <th>letter</th> <th>name of tube</th> <th>name of substance or substances transported</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>rectum / colon / large intestine ;</td> <td>faeces</td> </tr> <tr> <td>B</td> <td>sperm duct ;</td> <td>sperm</td> </tr> <tr> <td>C</td> <td><u>urethra</u> ;</td> <td>sperm and urine</td> </tr> <tr> <td>D</td> <td><u>ureter</u> ;</td> <td>urine</td> </tr> </tbody> </table>	letter	name of tube	name of substance or substances transported	A	rectum / colon / large intestine ;	faeces	B	sperm duct ;	sperm	C	<u>urethra</u> ;	sperm and urine	D	<u>ureter</u> ;	urine	4	
letter	name of tube	name of substance or substances transported																
A	rectum / colon / large intestine ;	faeces																
B	sperm duct ;	sperm																
C	<u>urethra</u> ;	sperm and urine																
D	<u>ureter</u> ;	urine																
2(b)(ii)	line labelled P ending on prostate gland ;	1																
2(c)	protects / holds / contains, testis or idea of maintains testes at <u>lower</u> temperature (than that of body) ;	1																

Question	Answer	Marks	Guidance
3	nervous ; motor ; impulses ; synapses ; fast ;	5	
4(a)	(reactants) glucose + oxygen ; (products) carbon dioxide + water ;	2	

Question	Answer	Marks	Guidance
4(b)(i)	6200 (kJ per day) ;	1	
4(b)(ii)	(for male) energy input is, (too) low / below needs ; loss of weight / thin ; normal growth, would cease / be reduced ; fatigue / tired / weak / less active / AW ; idea of more susceptible to infection / disease ;	2	A (8000 kJ) is correct for 11 year-old female I becomes ill unqualified
4(c)	1 17 year olds require more energy than inactive adults / inactive adults require less energy than 17 year olds ; 2 17 year olds require less energy than active adults / active adults require more energy than 17 year olds ; 3 comparative data quote with correct units in support of correct statements for mp1 or mp2 ;	3	Comparison must be between 17 year-old and one of the adult groups.
4(d)	bread / baking / making dough rise ; brewing / producing alcohol ; biofuels production / use of alcohol as a fuel ; AVP ;	2	

Question	Answer	Marks	Guidance
5(a)	food chain starting with fig tree and ending with hawk ; caterpillar before blackbird ; three correct arrows ;	3	fig tree → caterpillar → blackbird → hawk = 3
5(a)(ii)	(the) Sun ;	1	
5(a)(iii)	decomposer(s) ;	1	
5(b)(i)	1 habitat destruction ; 2 hunting / poaching (of animals) ; 3 introduction of new, species / predator ; 4 lack of food ; 5 (named) pollution ; 6 climate change / global warming ; 7 disease ; 8 hard to find a mate / AW ; 9 more predators ;	4	A deforestation A collecting, plants / animals

Question	Answer	Marks	Guidance
5(b)(ii)	monitoring / protecting, species ; remove predators ; remove vectors of disease ; protecting / preserving / making new, habitats ; education ; captive breeding ; seed banks ; DNA banks ; zoos / wild life parks / conservation areas ; preserved embryos ; banning hunting ;	1	A AW throughout

Question	Answer	Marks	Guidance
6(a)	F: enamel ; G: dentine ; H: (named) blood vessel / nerve / pulp (cavity) ;	3	
6(b)(i)	bite / tear / cut / hold / rip ; chewing / grinding / crushing / producing small(er) pieces / mechanical digestion ; increases surface area (of food) ; killing prey / defence / cleaning fur ;	2	
6(b)(ii)	produces small pieces of food ; increases surface area ; easier to swallow food ;	2	

Question	Answer	Marks	Guidance
7(a)(i)	labelled line to one ovule ; labelled line to petal ;	2	
7(a)(ii)	carpel / ovary ; sepal ;	2	
7(b)	line from the anther of one flower ; line to stigma of another flower ;	2	

Question	Answer	Marks	Guidance
7(c)	(large) petals ; stamens / anthers / filaments, inside flower or short, stamens / filaments or small anthers ; stigma inside flower / short style ; stigma, broad / wide / not feathery / AW ;	2	1 features that are not visible on Fig. 7.1
7(d)	1 ref. to root hair (cell) ; 2 across cortex ; 3 ref. to xylem ; 4 moves up the stem ; 5 (into) mesophyll (cells) ; 6 AVP ; e.g. osmosis / diffusion , ref. to transpiration	4	4 must be in correct order

Question	Answer	Marks	Guidance												
8	<table border="1"> <thead> <tr> <th>food type</th> <th>enzyme acting on the food type</th> <th>simpler chemicals produced</th> </tr> </thead> <tbody> <tr> <td>protein</td> <td>protease</td> <td>amino acids ;</td> </tr> <tr> <td>starch ;</td> <td>amylase</td> <td>glucose / sugar ;</td> </tr> <tr> <td>fats ;</td> <td>lipase ;</td> <td>fatty acids and glycerol</td> </tr> </tbody> </table>	food type	enzyme acting on the food type	simpler chemicals produced	protein	protease	amino acids ;	starch ;	amylase	glucose / sugar ;	fats ;	lipase ;	fatty acids and glycerol	5	<p>A (poly)peptides</p> <p>A maltose</p> <p>A lipids / oils</p>
food type	enzyme acting on the food type	simpler chemicals produced													
protein	protease	amino acids ;													
starch ;	amylase	glucose / sugar ;													
fats ;	lipase ;	fatty acids and glycerol													

Question	Answer	Marks	Guidance
9(a)(i)	02:00 and 05:00 ;	1	
9(a)(ii)	11 (arbitrary units) ;	1	A 10.8 to 11.1
9(a)(iii)	sunrise / light is present ; carbon dioxide, absorbed / used ; (for) photosynthesis ; photosynthesis is using carbon dioxide faster than respiration can provide it ;	3	A photosynthesis is faster than respiration
9(b)	rain ; wind ; humidity ; temperature ; shade / clouds / time of year ;	2	

Question	Answer	Marks	Guidance
10(a)	Merino ; it has, good wool yield / good meat yield / very good wool quality ;	2	
10(b)	use Awassi and Merino sheep ; breed / cross / mate (together) ; pick / select / choose, the offspring with required characteristics ; allow these (chosen) offspring to breed ; breed the (chosen) offspring with Awassi / Merino sheep ; repeat for (many / several) generations ;	4	



BIOLOGY

0610/32

Paper 3 Theory (Core)

May/June 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.

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This document consists of **12** printed pages.

Generic Marking Principles

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- the specific skills defined in the mark scheme or in the generic level descriptors for the question
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Abbreviations used in the Mark Scheme

- ; separates marking points
- / separates alternatives within a marking point
- **R** reject
- **ignore** mark as if this material was not present
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- **max** indicates the maximum number of marks that can be awarded
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- **()** the word / phrase in brackets is not required, but sets the context
- **ora** or reverse argument
- **AVP** any valid point

Question	Answer	Marks	Guidance
1(a)	C ; E ; B ;	3	
1(b)	sperm is, deposited / AW, in the vagina ; (travels) through, cervix / uterus ; to oviduct ;	3	
1(c)(i)	DNA ; information ; genes ;	3	
1(c)(ii)	X and Y ;	1	
1(c)(iii)	ref. to tail / flagellum ; ref. to enzymes ; AVP ; e.g. mitochondria / streamlined shape / haploid nucleus	2	A acrosome

Question	Answer	Marks	Guidance
2(a)(i)	yellow / brown ;	1	
2(a)(ii)	blue-black ;	1	
2(a)(iii)	chlorophyll is required for, photosynthesis / production of starch or glucose ;	1	
2(b)	light required, for photosynthesis / to make starch or glucose ; no photosynthesis took place ;	1	
2(c)(i)	into the root ; (via) <u>root hair cell</u> ; by osmosis / diffusion ; across a partially permeable membrane ;	3	
2(c)(ii)	support / transport of mineral ions ;	1	A cooling / solvent / germination
2(c)(iii)	xylem ;	1	
2(c)(iv)	stoma(ta) ;	1	A guard cells

Question	Answer	Marks	Guidance									
3(a)(i)	1995 ;	1										
3(a)(ii)	195 (cases per 100 000 people) ;	1										
3(a)(iii)	(steady) increase (from 2003) ; fluctuation between 2007 and 2009 / described ; level off / plateau / AW, from 2009 ; data quote with year and number including units ;	3										
3(b)	<i>Campylobacter</i> ;	1										
3(c)	rehydration / oral rehydration therapy ;	1	A water with, sugar and salt / electrolytes									
3(d)	<table border="1"> <tr> <td><i>cellular</i></td> <td><i>chemical</i></td> <td><i>mechanical</i></td> </tr> <tr> <td>phagocytosis</td> <td>stomach acid</td> <td>nasal hairs</td> </tr> <tr> <td>antibodies</td> <td>mucus</td> <td>skin</td> </tr> </table> ***	<i>cellular</i>	<i>chemical</i>	<i>mechanical</i>	phagocytosis	stomach acid	nasal hairs	antibodies	mucus	skin	3	1 mark for each correct column
<i>cellular</i>	<i>chemical</i>	<i>mechanical</i>										
phagocytosis	stomach acid	nasal hairs										
antibodies	mucus	skin										

Question	Answer	Marks	Guidance
4(a)	iris shaded on diagram ;	1	
4(b)	<p>controls how much light enters eye</p> <p>refracts light</p> <p>focuses light</p> <p>carries impulses to brain</p> <p>contain light receptors</p> <p>***</p>	3	<p>1 mark for 1 correct</p> <p>2 marks for 2 / 3 correct</p> <p>3 marks for 4 correct</p>
4(c)(i)	(change in) temperature / cold / fear ;	1	
4(c)(ii)	(hair) erector muscles ;	1	

Question	Answer	Marks	Guidance
5(a)(i)	K ; M ;	2	
5(a)(ii)	combustion ;	1	
5(a)(iii)	arrow drawn from carbon compounds in plants to carbon compounds in animals ;	1	
5(b)	methane ;	1	A water vapour / nitrous oxides/ CFCs / ozone
5(c)(i)	habitat destruction ; extinction ; soil erosion ; flooding ; AVP ; e.g. landslides / leaching / disruption to food chains or webs or loss of food source / desertification	2	
5(c)(ii)	agriculture ; mining / extraction, of resources ; building, houses / factories / industries ; building, transport links / roads ; AVP ; e.g. paper production	2	
5(d)(i)	10662.4 ; ;	2	A 10662 ecf incorrect total ÷ 5 max one mark
5(d)(ii)	deforestation is decreasing / less areas of forest are being removed ;	1	
5(d)(iii)	ref. to, education / awareness ; protecting areas / national parks ; legislation ; AVP ; e.g. idea of alternative, sources of energy used / resources	2	ecf if wrong trend in 5d(ii)

Question	Answer	Marks	Guidance
6(a)	bronchiole, diaphragm, intercostal (muscle), trachea labelled ;;;;	4	1 mark for each correct label
6(b)	good blood supply ; thin ; ventilated ; large surface (area) ; AVP ; e.g. moist / permeable	2	
6(c)(i)	more water vapour ; more carbon dioxide ; higher temperature ;	2	A saturated A warmer
6(c)(ii)	(aerobic) respiration ;	1	A removal of lactic acid / oxidation R anaerobic respiration
6(d)	<i>cell</i> red blood cell / ciliated cell / muscle cell / white blood cell ; A guard cell <i>organ</i> lung / trachea / bronchus / bronchiole / larynx ; A leaf	2	1 mark for example of a cell / goblet cell 1 mark for example of an organ

Question	Answer	Marks	Guidance												
7(a)	carbon dioxide ; urea ;	2	A (excess) salts												
7(b)	<table border="1"> <thead> <tr> <th>changing condition</th> <th>volume of urine</th> <th>concentration of urine</th> </tr> </thead> <tbody> <tr> <td>increase in water uptake</td> <td>increase</td> <td>decrease</td> </tr> <tr> <td>increase in temperature</td> <td>decrease</td> <td>increase</td> </tr> <tr> <td>increase in exercise</td> <td>decrease</td> <td>increase</td> </tr> </tbody> </table> ; ; ;	changing condition	volume of urine	concentration of urine	increase in water uptake	increase	decrease	increase in temperature	decrease	increase	increase in exercise	decrease	increase	3	one mark for each correct row
changing condition	volume of urine	concentration of urine													
increase in water uptake	increase	decrease													
increase in temperature	decrease	increase													
increase in exercise	decrease	increase													
7(c)(i)	permanent ; increase in size ;	2													
7(c)(ii)	movement ; respiration ; sensitivity ; reproduction ; nutrition ;	3													

Question	Answer	Marks	Guidance												
8(a)	limited number of, phenotypes / categories / groups ; no intermediates / AW ;	1													
8(b)	<table border="1"> <tr> <td>attached or unattached earlobes</td> <td>✓</td> </tr> <tr> <td>foot length</td> <td></td> </tr> <tr> <td>gender (male or female)</td> <td>✓</td> </tr> <tr> <td>height</td> <td></td> </tr> <tr> <td>tongue rolling</td> <td>✓</td> </tr> <tr> <td>weight</td> <td></td> </tr> </table> ; ; ;	attached or unattached earlobes	✓	foot length		gender (male or female)	✓	height		tongue rolling	✓	weight		3	deduct one for each additional box ticked
attached or unattached earlobes	✓														
foot length															
gender (male or female)	✓														
height															
tongue rolling	✓														
weight															
8(c)	is a genetic change ; forms new alleles ; can be caused by ionising radiation ;	3	deduct one for each additional line												



BIOLOGY

0610/33

Paper 3 Theory (Core)

May/June 2018

MARK SCHEME

Maximum Mark: 80

Published

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- / alternatives
- **I** reject
- **R** reject
- **A** (for answers correctly cued by the question, or guidance for examiners)
- **AW** alternative wording (where responses vary more than usual)
- **AVP** any valid point
- **ecf** credit a correct statement/calculation that follows a previous wrong response or reverse argument
- **ora** the word/phrase in brackets is not required, but sets the context
- () the word/phrase in brackets is not required, but sets the context
- underline actual word given must be used by candidate (grammatical variants excepted)
- max indicates the maximum number of marks that can be given

Question	Answer	Marks	Guidance
1(a)	bony skeleton / internal skeleton / endoskeleton / bones / vertebral column / backbone / spine / vertebrae / skull ;	1	
1(b)(i)	birds ; feathers / beaks / bill / hard-shelled eggs ;	2	
1(b)(ii)	reptiles ; scales (skin) / leathery eggs ;	2	A soft-shelled eggs
1(b)(iii)	<i>evidence for (being a mammal)</i> it has fur / hair ; <i>evidence against</i> lays / external, eggs ; young develop outside the body ; has a beak / bill ;	3	
1(c)	fish ; amphibians ;	2	

Question	Answer	Marks	Guidance
2(a)(i)	(reactants) carbon dioxide + water ; (products) glucose + oxygen ;	2	
2(a)(ii)	chlorophyll ;	1	
2(b)(i)	30(°C) ;	1	
2(b)(ii)	85 and 170 ;	1	
2(b)(iii)	100% ; ;	2	(170 – 85) ÷ 85 × 100 = 1 mark ecf (b)(ii) for 2 marks
2(c)	rises and falls / rises and peaks / peaks and falls ; slow increase and fast decrease / slower increase (to peak) or steeper / faster, decrease ; slowest rise between 0 °C and 10 °C / increase more rapid between 10 °C and 25 °C ; decrease is most rapid after 35 °C / AW ; (no, bubbles / gas) stops at 40 °C ;	3	
2(d)	light intensity / brightness of light ; size of plant / number of leaves / size of leaves / surface area of leaves ; availability / concentration / amount, of CO ₂ ; amount of chlorophyll / number of chloroplasts ; species / type, of plant ; water ;	1	A amount of light / time of day / different wavelengths of light

Question	Answer	Marks	Guidance
3(a)(i)	high in (named) carbohydrates ; high in (named) fats ; too high in energy / calories / kJ ; lacks protein ; lacks (named) vitamins ; lacks (named) minerals ; lacks fibre ; lacking, fruits / vegetables / water ;	2	
3(a)(ii)	eat less (named) carbohydrates / eat less (named) fat / reduce calorie intake / reduce kJ intake / reduce energy consumption ; consume, fibre / vegetables / fruit / water / protein ; exercise / physical activity ; <i>idea of using up fat reserves ;</i> <i>idea of input less than output ;</i>	2	AW throughout

Question	Answer	Marks	Guidance
3(b)	<p>vitamin C ;</p> <p>scurvy ;</p> <p>teeth ;</p> <p>vitamin D / calcium ;</p> <p>constipation ;</p>	5	
3(c)	<p>women will require more, energy / food ;</p> <p>for growth / development, of fetus ;</p> <p>more, carbohydrates / proteins / fats / named vitamin / named mineral ;;</p> <p>role of named nutrient (must be linked to named nutrient) ;;</p> <p>AVP ; e.g. ref. to alcohol consumption</p>	4	<p>AW throughout</p> <p>A growth / development, only once A more vitamin = 1 A more minerals = 1</p>

Question	Answer	Marks	Guidance
4(a)(i)	a pathogen / disease causing organism ; is passed from one host to another ;	2	
4(a)(ii)	<i>idea of piercing the skin ;</i> <i>idea of long mouthparts (to reach blood vessel below the skin) ;</i> hollow mouthparts can suck up blood ;	1	
4(b)(i)	skin / epidermis ;	1	
4(b)(ii)	(antibody) white blood cell ticked ; (blood clotting) platelets ticked ; (phagocytosis) white blood cell ticked ;	3	
4(c)	stomach acid / hydrochloric acid ; mucus ; tears ;	2	

Question	Answer	Marks	Guidance
5(a)	A combustion ; B feeding ; C fossilisation ;	3	
5(b)(i)	arrow from 'carbon dioxide in the atmosphere' to 'carbon compounds in plants' box and labelled D ;	1	
5(b)(ii)	arrow from, plants or animals, box to 'carbon dioxide in the atmosphere' and labelled E ;	1	
5(c)(i)	(named) fossil fuels being burned ; deforestation; industry / factories / power stations / urbanisation / AW ; (named) transport ; cattle / farm animals, being raised for food ;	2	
5(c)(ii)	global warming / increased temperatures / climate change / enhanced greenhouse effect ; flooding ; increase in sea level / ice caps or glaciers melting ; desertification ;	2	AW throughout
5(c)(iii)	methane ; water vapour ;	1	A nitrous oxides / ozone / CFC's

Question	Answer	Marks	Guidance
6(a)(i)	meiosis ;	1	
6(a)(ii)	zygote ;	1	
6(b)(i)	having two identical alleles of a (particular) gene ;	1	
6(b)(ii)	B ; all of the offspring have black fur / brown fur not seen in offspring ;	2	A black
6(c)	phenotype is, the observable features / appearance, whereas genotype is alleles present / AW ;	1	
6(d)	<i>gametes</i> b , b B , b ; <i>offspring genotypes</i> bb Bb Bb bb ; <i>offspring phenotypes</i> brown black black brown ; <i>ratio</i> 1:1 ;	4	phenotype must match genotype
6(e)	choose (parents) desired, feature / trait ; breed / cross / mate ; choose offspring with the feature ; breed offspring with feature ; for, several / many generations ;	3	AW throughout

Question	Answer	Marks	Guidance
7(a)	<p>insecticides / pesticides ;</p> <p>herbicides ;</p> <p>nuclear waste / radioactive waste ;</p> <p>chemicals / toxic waste / (named) heavy metals ;</p> <p>discarded household rubbish / litter / garbage / trash ;</p> <p>plastics ;</p> <p>fertiliser (from farmland) ;</p> <p>oil / fuel / fossil fuel ;</p>	4	A acid rain
7(b)	<ol style="list-style-type: none"> 1 screening / removal of large solids / twigs / plastic ; 2 settling out / grit settles to bottom of tank ; 3 microbes / bacteria decompose (digest) organic material ; 4 digestion of materials in liquid by (aerobic) microorganisms ; 5 aeration ; 6 materials in sludge digested by (anaerobic) bacteria ; 7 filtration ; 8 chlorination or sterilisation / use of disinfectants / chemical treatment / bactericides / bacteria or pathogens killed ; 	3	A filtration once only unless qualified
7(c)	a disease causing organism ;	1	

Question	Answer	Marks	Guidance
8(a)	(cervix) G ; (oviduct) D ; (uterus) F ; (vagina) H ;	4	
8(b)	X drawn on an ovary ;	1	
8(c)	oviduct ;	1	



BIOLOGY

0610/41

Paper 4 Theory (Extended)

May/June 2018

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks	Guidance																								
1(a)	A substrate ; B active site ; C enzyme-substrate complex ; D product(s) ;	4																									
1(b)	production of, small(er) / soluble / simple(r), <u>molecules</u> ; (small molecules can be) absorbed / ref. to absorption ; ora (moves through) cell membranes / wall of intestine / into blood / into cells ;	2																									
1(c)	<table border="1"> <thead> <tr> <th>function</th> <th>letter from Fig. 2.1</th> <th>name of structure</th> </tr> </thead> <tbody> <tr> <td>site of starch digestion</td> <td>A J/E</td> <td>mouth / buccal cavity small intestine</td> </tr> <tr> <td>reabsorption of water</td> <td>J/E H F</td> <td>small intestine colon / large intestine rectum</td> </tr> <tr> <td>secretion of pepsin</td> <td>C</td> <td>stomach</td> </tr> <tr> <td>site of maltose digestion</td> <td>J/E</td> <td>small intestine</td> </tr> <tr> <td>secretion of bile</td> <td>K L</td> <td>liver gall bladder</td> </tr> <tr> <td>storage of faeces</td> <td>F</td> <td>rectum</td> </tr> <tr> <td>secretion of lipase and trypsin</td> <td>D</td> <td>pancreas</td> </tr> </tbody> </table>	function	letter from Fig. 2.1	name of structure	site of starch digestion	A J/E	mouth / buccal cavity small intestine	reabsorption of water	J/E H F	small intestine colon / large intestine rectum	secretion of pepsin	C	stomach	site of maltose digestion	J/E	small intestine	secretion of bile	K L	liver gall bladder	storage of faeces	F	rectum	secretion of lipase and trypsin	D	pancreas	6	<p><i>one mark per row the letter must agree with the name if more than one letter or name mark first one only</i></p> <p>A J/E small intestine</p>
function	letter from Fig. 2.1	name of structure																									
site of starch digestion	A J/E	mouth / buccal cavity small intestine																									
reabsorption of water	J/E H F	small intestine colon / large intestine rectum																									
secretion of pepsin	C	stomach																									
site of maltose digestion	J/E	small intestine																									
secretion of bile	K L	liver gall bladder																									
storage of faeces	F	rectum																									
secretion of lipase and trypsin	D	pancreas																									

Question	Answer	Marks	Guidance
2(a)	(the probability that an organism will) survive <u>and</u> , reproduce / AW ;	1	
2(b)(i)	(during the day they) remain in a burrow / stay in the shade / stay inactive / sleep / AW ; light colour / pale / yellow / white (fur / hair) / AW ; thin / long, tail / legs ; thin / short / little, fur ; no fur on legs ; fur on feet ; large, ears / pinna(e) ; little / no, fat ; large surface area: volume ratio ; produces, little / concentrated, urine ; AVP ;	2	A nocturnal (habit) A ref. to long kidney tubules / AW
2(b)(ii)	big eyes / large pupils / good eyesight ; whiskers ; lots of rods (in the retina / fovea) ; large ears / good sense of hearing / sensitive ears ; good sense of smell ;	2	A eye has no cones
2(c)(i)	block added to the top of the pyramid that is 4 small squares wide ; labelled carnivores ;	2	
2(c)(ii)	(detritivores) eat (mainly), plants / producers ; (detritivores) feed, at second trophic level / as primary consumers ; detritivores are eaten by, third trophic level / secondary consumers ;	1	
2(c)(iii)	little energy is transferred from one trophic level to the next ; ora not all of the organisms are, eaten / digested / absorbed ; named example of energy loss ; <i>idea that not enough energy to support higher trophic levels ;</i>	2	

Question	Answer	Marks	Guidance
2(c)(iv)	<i>idea that</i> in a pyramid of numbers one large individual is shown in the same way as one very tiny individual ; ora biomass indicates how much food there is, available / left ; biomass is an indicator of the energy available ; pyramid of biomass is pyramid shaped whereas a pyramid of numbers is not always ; ora AVP ;	3	

Question	Answer	Marks	Guidance
3(a)(i)	label line and X pointing to any part of the 'star' in the centre of the root section ;	1	
3(a)(ii)	composed of (group of) cells with similar structures ; working together to perform shared functions ;	2	
3(b)	xylem supplies water ; air spaces ; large (internal) surface area ; water evaporates from surface of mesophyll cells ; guard cells, open / close, stomata ; water vapour, diffuses / moves, out through stomata ;	3	

Question	Answer	Marks	Guidance
4(a)(i)	sensory neurone / (temperature / thermo-) receptor (neurone) ;	1	
4(a)(ii)	Q venule ; S arteriole ; T capillary ;	3	
4(a)(iii)	fat / fatty tissue ;	1	

Question	Answer	Marks	Guidance
4(b)(i)	blood flow remains constant and then increases / AW ; blood flow remains at, 4 / 5% ; increase in blood flow from 25 (± 2) °C ; to, maximum / 100%, at 41 °C ;	3	
4(b)(ii)	detection by, sensory neurone / receptor (in skin) ; brain / hypothalamus, as control centre / AW ; <u>impulses</u> in, motor / effector, neurones ; <u>muscles</u> in, shunt vessels contract / arterioles relax ; so shunt vessels, constrict / close ; arterioles dilate / <u>vasodilation</u> ; increased / more, blood flow, into capillaries / near surface (of skin) ;	3	A brain / hypothalamus, detecting temperature
4(b)(iii)	46 (%) ;	1	
4(b)(iv)	<u>diffusion</u> ; down concentration gradient / high to low concentration ; active transport ; through epidermis ; between / into / through, cells ; across cell membranes ; AVP ;	3	
4(c)	(so that) enzymes do not denature / enzymes remain active / maintains optimum temperature for enzymes ; <i>idea of</i> maintaining a constant rate of, reactions / metabolism / respiration ; avoids damage to other named (type of) protein ; avoids damage to cell membranes ; avoids, heatstroke / hyperthermia / overheating / dehydration / freezing / chills / becoming too cold / hypothermia ; at high temperature sperm production, reduced / harmed ; AVP ;	4	e.g. (permits) colonisation of different parts of the world / different climates active in, both day and night / different seasons

Question	Answer	Marks	Guidance								
4(d)	hormones are chemicals / hormonal coordination is only chemical ; transported in the, blood / circulatory system ; (effects are) <u>slower</u> (than nerves) ; ora (effects are) longer lasting ; ora each hormone may have more than one target, organ / tissue / cells ; ora	3									
Question	Answer	Marks	Guidance								
5(a)	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ (+ energy released) ; ;	2	one mark for correct symbols one mark for correct balancing								
5(b)	150(%); ;	2	one mark for correct working if answer wrong								
5(c)	demand for, energy / oxygen, increases ; (rate of) respiration increases ; limited supply of oxygen to <u>muscle</u> (tissue) ; <i>idea that heart / pulse / breathing, rate not increased enough ; muscles respire <u>anaerobically</u> ; lactic acid is produced ;</i>	3									
5(d)	horses continue to breathe, at high rate / deeper ; continue with a high, heart/pulse, rate ; to provide, enough / AV, oxygen (to 'pay-off' the debt) ; lactic acid, moves / diffuses / AW, (from muscle) into blood ; lactic acid transported to the liver ; (in the liver) lactic acid is, broken down / oxidised / respired (aerobically) ;	4									
6(a)(i)	<table border="1"> <tr> <td>process / event</td> <td>letter from Fig. 6.1</td> </tr> <tr> <td>meiosis</td> <td>R ;</td> </tr> <tr> <td>fertilisation</td> <td>S ;</td> </tr> <tr> <td>implantation</td> <td>V ;</td> </tr> </table>	process / event	letter from Fig. 6.1	meiosis	R ;	fertilisation	S ;	implantation	V ;	3	
process / event	letter from Fig. 6.1										
meiosis	R ;										
fertilisation	S ;										
implantation	V ;										

Question	Answer	Marks	Guidance
6(a)(ii)	oviduct ;	1	
6(b)(i)	image size ÷ actual size ;	1	
6(b)(ii)	55 (µm) ;	1	
6(c)	haploid / <i>n</i> / one set of chromosomes / half the diploid number / 23 chromosomes ; (produced by) meiosis ; so number of chromosomes, remains the same / does not double at fertilisation ;	2	A so diploid number restored at fertilisation / so zygote is diploid
6(d)	<i>flagellum</i> (flagellum) propels the sperm ; to, oviduct / site of fertilisation / egg (cell) / ovum ; <i>mitochondria</i> <u>aerobic respiration</u> ; provides / releases / supplies, energy / ATP ; <i>acrosome</i> (contains / has / releases) enzyme(s) ; (enzymes) digest / break down / dissolve, jelly coat / protein layer ; so sperm nucleus can enter the egg cell / so sperm and egg membranes can fuse together ;	6	A flagellum allows sperm to swim R 'produces energy'
6(e)	<i>idea that sex is determined by X and Y chromosomes / males are XY and females are XX ;</i> egg cells have X chromosome / females can only provide X chromosome ; sperm cells have X <u>or</u> Y chromosome / only the males can provide X <u>or</u> Y chromosome / only males can provide the Y chromosome ;	2	



BIOLOGY

0610/42

Paper 4 Theory (Extended)

May/June 2018

MARK SCHEME

Maximum Mark: 80

Published

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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.

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**:

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- 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:

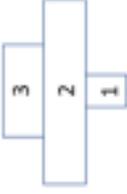
Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Abbreviations used in the Mark Scheme

- ; separates marking points
- / separates alternatives within a marking point
- **R** reject
- **ignore** mark as if this material was not present
- **A** accept (a less than ideal answer which should be marked correct)
- **AW** alternative wording (accept other ways of expressing the same idea)
- underline words underlined (or grammatical variants of them) must be present
- **ecf** credit a correct statement that follows a previous wrong response
- () the word / phrase in brackets is not required, but sets the context
- **ora** or reverse argument
- **AVP** any valid point

Question	Answer	Marks	Guidance
1(a)(i)	A dentine B cement C incisors D canine(s) E premolars F molars	3	6 / 5 correct = 3 marks 3 / 4 = 2 marks 1 / 2 = 1 mark
1(a)(ii)	<u>mechanical</u> ; ::;	1	
1(b)(i)	acid ;	1	A carbon dioxide
1(b)(ii)	enamel ; dentine ;	2	
1(c)	(named) sugar ;	1	

Question	Answer	Marks	Guidance
2(a)(i)	the probability of an organism will survive <u>and</u> reproducing (in the environment in which it is found) / AW ;	1	
2(a)(ii)	<i>aerial roots</i> for anchorage / stability (in flowing water) / (aerobic) respiration / gas exchange / oxygen absorption ; <i>floating seeds</i> for (seed) dispersal (carried on water) / reduce competition (from parent) / access to oxygen (to germinate / respire) ;	2	
2(b)(i)	1.1 (g) ; ;	2	one mark for correct working if answer wrong (8000 / 7 500000) × 1000

Question	Answer	Marks	Guidance
2(b)(ii)	bottom bar is narrowest ; middle bar is widest ; correct numbering of trophic levels ;	3	
2(b)(iii)	pyramid of biomass is pyramid-shaped (and pyramid of numbers is not) ; ora mangrove trees have a <u>larger</u> biomass (than crabs) ; ora so one tree provides food for many crabs / AW ; (one) crab has a smaller biomass than (one) seagull ; ora each seagull needs to eat many crabs / AW ; (total) crab biomass is greater than (total) seagull biomass ; ora comparative data to support an argument with units ;	4	

Question	Answer	Marks	Guidance
3(a)(i)	sucrose / sugar ; amino acids ;	2	
3(a)(ii)	<u>translocation</u> ; (phloem) allows bidirectional movement / AW ; movement (of food / sap) from <u>source</u> to <u>sink</u> ; sucrose / amino acids / food, are produced / taken from storage, at a <u>source</u> ; region of respiration / storage / growth, is a <u>sink</u> ; named example of a, source / sink (in the correct context) ; some organs can be both a source or a sink at different times ;	4	

Question	Answer	Marks	Guidance
3(b)	<p><i>functions</i> conduct / transport, water (and mineral ions) ; <i>ref to transpiration</i> ; reduced resistance to water flow / AW ; structural support (for plant) ; prevents (inward) collapse (of xylem vessels) ; (spirals) allows (some) flexibility / bending, of stems (to prevent breaking) ;</p> <p><i>adaptations</i> long / elongated (cells / vessels / tubes) ; <i>ref to lignin</i> (in walls) ; (cell walls) are water impermeable / waterproof / AW ; (secondary) thickening of cell walls ; hollow / no cytoplasm / no (named) organelles ; no, end / cross, walls (between cells) ; end plates to connect vessels (end to end) ; pits in walls (for water movement between vessels) ;</p>	6	<p>max 5 from one section</p> <p>A rings / spirals / AW</p>
3(c)	<p>reduced / no, damage to crops ; ora increased, yield / quality (of the crop) ; ora more, income / profit ; ora because more, sugar / amino acids, available for growth ; ora reduced disease transmission / AW ; ora</p>	2	A not / less, eaten by pests

Question	Answer	Marks	Guidance
4(a)	there are many, diseases / infections / pathogens / transmitted through sexual contact ; named example of STI ; STIs / AW, can be prevented by the use of some (contraceptive) methods ; such as, condoms / femidoms ; for education about STI prevention / inform preventative strategies / AW ; assess effectiveness of different (contraceptive) methods (to prevent disease) ;	3	
4(b)(i)	(named) oestrogen ; (named) progesterone ;	2	
4(b)(ii)	(FSH would) stimulate an egg / follicle, to mature / develop / grow / ripen ; ora (FSH would) stimulate (release of) oestrogen / LH ; ora (FSH would) lead to ovulation ; ora (FSH would) increase the chance of fertilisation / pregnancy / AW ; ora	3	I production (of eggs) A FSH is a fertility drug
4(b)(iii)	implant / patch / injection / IUD / IUS (containing contraceptive hormones) ; spermicide ;	1	I birth control pills
4(b)(iv)	abstinence / body temperature / cervical mucus / natural contraception ; ; diaphragm ; (named) surgical (sterilisation) method ; ;	2	I birth control pills A cap A (named) tubes tied
4(b)(v)	some females could use more than one method of contraception ; some people may not have completed the survey, correctly / honestly / AW ;	1	A not used a method regularly (so not answered all questions accurately)

Question	Answer	Marks	Guidance
5(a)	three pairs of legs ; three (named) body segments ; wings ; (pair of) antennae ; <u>compound</u> eyes ;	3	
5(b)	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ (+ energy released) ; ;	2	one mark for correct symbols one mark for correct balancing
5(c)(i)	volume ; distance / length ; control / maintain / regulate / stabilise / keep / constant / sustain ;	3	
5(c)(ii)	carbon dioxide will affect, results / volume of gas (in respirometer) / carbon dioxide could kill the larvae ;	1	A to measure (changes in) oxygen only
5(c)(iii)	growth / development ; active transport ; protein synthesis ; cell division / mitosis ; passage of nerve impulses ; muscle contraction ; AVP ; e.g. metabolism / (description of) metamorphosis	2	A movement / breathe / egestion / digestion / excretion

Question	Answer	Marks	Guidance
5(d)	<p><i>prediction</i> as temperature increases the respiration rate will increase ; ora and then decrease ;</p> <p><i>explanation:</i> there will be an <u>optimum</u> temperature (at a particular temperature) for seed germination ; <i>ref to</i> (respiratory / germination) <u>enzymes</u> ; at high temperatures enzymes denature / described ; at low temperatures not enough (kinetic) energy for, effective collisions / biochemical reactions / respiration / digestion ; ora AVP ;</p>	4	<p>max 3 for explanation</p> <p>e.g. temperature will also affect the gas pressure in the respirometer</p>

Question	Answer	Marks	Guidance
6(a)	(asexual) reproduction ;	1	R sexual reproduction
6(b)(i)	image size ÷ magnification ;	1	
6(b)(ii)	0.8 (µm) ;	1	
6(c)(i)	(Type 1) diabetes ;	1	A Type 2 diabetes
6(c)(ii)	<p><i>ref. to</i> (human) <u>gene</u> / DNA that codes for (human) protein ; (human) DNA / gene, is, identified / isolated ; DNA / gene / plasmid, cut (out) using <u>restriction</u> enzymes ; forming, <u>complementary</u> / <u>sticky</u>, ends ; DNA / gene / plasmid, cut with the same restriction enzymes ; formation of recombinant, DNA / plasmid ; into plasmid (DNA) <u>ligase</u> used to join plasmid and, gene / DNA ; plasmids (with gene) inserted into bacteria ; bacteria (with the plasmid), replicate / reproduce / multiply ; AVP ; e.g. purification / identification of transformed bacteria /</p>	5	<i>procedures must be in the correct sequence</i>

Question	Answer	Marks	Guidance
6(d)(i)	kills (named) microorganisms / pathogens ; prevents contamination (by bacteria / microorganisms) ; steam does not contaminant, product / medicines (with chemicals) ; steam reaches all the crevices of fermenter ;	2	
6(d)(ii)	pH ; temperature ; oxygen ; carbon dioxide ; (named) nutrients ; waste ; turbidity ; AVP ; (gas) pressure / rate of stirring / amount of (named) product	3	
6(d)(iii)	penicillin ; AVP ;	1	
6(e)	disease resistance ; large(r) / fast(er), yield ; drought resistance ; salt resistance ; frost resistance ; (named) nutritional enrichment ; pest / insect, resistance ; herbicide resistance ; vaccine production ; ref to benefits to, environment ; ref to more desirable, product / increased income / AW ; ref to a qualified benefit to humans ; e.g. food shortage / described health benefit AVP ; growth modification e.g. short stems / adaptations to extreme environments / rapid improvement to crop / improvements using characteristic that are not present in natural population	4	



BIOLOGY

0610/43

Paper 4 Theory (Extended)

May/June 2018

MARK SCHEME

Maximum Mark: 80

Published

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- I ignore
- R reject
- A accept (for answers correctly cued by the question, or guidance for examiners)
- AW alternative wording (where responses vary more than usual)
- AVP any valid point
- ecf credit a correct statement / calculation that follows a previous wrong response or reverse argument
- ora the word / phrase in brackets is not required, but sets the context
- () actual word given must be used by candidate (grammatical variants excepted)
- underline indicates the maximum number of marks that can be given
- max

Question	Answer	Marks	Guidance																
1(a)	(food) is broken down into smaller pieces (without chemical change) ; <i>sites of mechanical digestion:</i> mouth / buccal cavity (in context mechanical) ; stomach (in context of mechanical) ; chewing / mastication ; role of a named teeth ; ; <i>ref to involvement of tongue ;</i> <i>ref to movement of the jaw ;</i> churning / muscular, action of the stomach ;	4																	
1(b)	<table border="1"> <thead> <tr> <th>part of the alimentary canal</th> <th>enzyme</th> <th>substrate</th> <th>product(s)</th> </tr> </thead> <tbody> <tr> <td>mouth</td> <td>amylase</td> <td>starch</td> <td>maltose</td> </tr> <tr> <td>stomach</td> <td>pepsin</td> <td>protein</td> <td>peptides</td> </tr> <tr> <td>small intestine / duodenum / ileum</td> <td>lipase</td> <td>fat</td> <td>fatty acids and glycerol</td> </tr> </tbody> </table> ; ; ;	part of the alimentary canal	enzyme	substrate	product(s)	mouth	amylase	starch	maltose	stomach	pepsin	protein	peptides	small intestine / duodenum / ileum	lipase	fat	fatty acids and glycerol	3	one mark per row A protease (for enzyme) R pancreas (for part of the alimentary canal)
part of the alimentary canal	enzyme	substrate	product(s)																
mouth	amylase	starch	maltose																
stomach	pepsin	protein	peptides																
small intestine / duodenum / ileum	lipase	fat	fatty acids and glycerol																
1(c)(i)	<u>glycogen</u> ;	1																	
1(c)(ii)	<u>antibody</u> ;	1																	
1(c)(iii)	(thermal) insulation ;	1	A storage / protection																

Question	Answer	Marks	Guidance
2(a)(i)	(external) ears / pinna(e) ; fur / hair ; whiskers ;	2	
2(a)(ii)	inherited / genetic, feature ; result of natural selection ; increases <u>fitness</u> ; increases chances of survival / AW ; increases chances of, reproducing / AW ;	3	
2(b)	temperature ; light (intensity) ; water (supply) / <i>idea that water is not available (as frozen)</i> ; (named) soil feature ; (named) mineral ion ; carbon dioxide ; grazing / predation ; (competition for) space ; disease ; (named) pollutant ;	3	A humidity

Question	Answer	Marks	Guidance
2(c)	<p>little energy available from, herbivores / primary consumers / lower trophic level(s) ; few producers / low population of producers / AW ; energy is lost, between / within, trophic levels / along food chain ; ora ref to 10 % energy transfer / 90% energy loss (between trophic levels) ; ora energy lost, in named process ;;; low numbers of, prey / (primary) consumers / food ;</p> <p>wolves not very successful at catching prey ; reason why ; e.g. prey are widely dispersed / larger animals</p> <p>lower reproductive rate / higher mortality of wolves ;</p> <p>hunting / killed by people ; reason why ; e.g. for fur / compete with humans for food</p> <p>habitat destruction (by humans) ; reason why ; e.g. road building / oil exploration / melting of snow</p> <p>disruption of food web (described) ; disease ; inbreeding / reduced genetic diversity ; <u>climate change</u> / <u>global warming</u> ;</p>	6	

Question	Answer	Marks	Guidance
3(a)(i)	A (upper) <u>epidermis</u> ; B palisade (mesophyll) ;	2	
3(a)(ii)	(cell surfaces are sites of) gas exchange ; movement of gases by <u>diffusion</u> ; <i>ref. to efficient / faster / AW, gas exchange / diffusion / photosynthesis ;</i> carbon dioxide is, raw material / needed, for photosynthesis ; absorption of carbon dioxide (when light available) ; loss of oxygen (when light available) / absorption of oxygen ; oxygen is required for (aerobic) respiration ; more evaporation ; <i>idea of maximising light absorption ;</i>	3	
3(a)(iii)	allows for, movement of (named) gases / diffusion / gas exchange, throughout the whole of the leaf ; <i>ref. to faster / efficient / AW, diffusion / gas exchange ;</i> allows / AW, photosynthesis / respiration / transpiration / evaporation ; <i>ref. to storage of carbon dioxide ;</i> (air spaces) connect (to outside air) via stomata ;	2	
3(b)(i)	no / little, water ; high temperature ; low humidity / dry air ; high wind speed ; long day length / high light intensity ; high salinity / salt ; freezing ; disease ; (soil) waterlogging / low oxygen concentration / pH ; mineral / magnesium, deficiency ;	2	A drought / no, rainfall / precipitation / irrigation

Question	Answer	Marks	Guidance
3(b)(ii)	<p>ref to osmosis ; water, lost from / moves out of, cells / vacuoles ; down water <u>potential</u> gradient ; pressure of, water / cell contents, on (inelastic) cell wall decreases ; <i>correct ref. to turgor / turgidity / flaccid / plasmolysed ;</i> ref. to plants / cells, rely on water, for (structural) support / to prevent wilting ; ora water in cells not being replaced as quickly (as it is being lost) ; AVP ; ;</p>	4	
3(b)(iii)	<p>stomata close ; to prevent more water loss ; water conserved for, other processes / other parts of plant ; decrease surface area, exposed to the Sun / for absorption of heat ;</p>	2	A reduces transpiration

Question	Answer	Marks	Guidance
4(a)(i)	<p>chemical / substance, produced by a gland ; transported in the blood (plasma) ; alters the activity of one of more specific target, organs / tissues / cells ;</p>	2	
4(b)(i)	retina ;	1	
4(b)(ii)	fovea ;	1	
4(b)(iii)	sensory (neurone / nerve cell) ;	1	
4(b)(iv)	optic ;	1	

Question	Answer	Marks	Guidance										
4(b)(v)	spinal cord ;	1											
4(b)(vi)	adrenal (gland) ;	1											
4(c)	<table border="1"> <tr> <td>organ</td> <td>effect of the hormone</td> </tr> <tr> <td>heart</td> <td>increased, pulse / heart, rate / beat ;</td> </tr> <tr> <td>liver</td> <td>conversion of glycogen to glucose / increased blood glucose (concentration) ;</td> </tr> <tr> <td>lungs</td> <td>increase, (rate) / depth, of breathing ;</td> </tr> <tr> <td>eyes</td> <td>dilated pupils / radial muscles (in iris) contract ;</td> </tr> </table>	organ	effect of the hormone	heart	increased, pulse / heart, rate / beat ;	liver	conversion of glycogen to glucose / increased blood glucose (concentration) ;	lungs	increase, (rate) / depth, of breathing ;	eyes	dilated pupils / radial muscles (in iris) contract ;	4	
organ	effect of the hormone												
heart	increased, pulse / heart, rate / beat ;												
liver	conversion of glycogen to glucose / increased blood glucose (concentration) ;												
lungs	increase, (rate) / depth, of breathing ;												
eyes	dilated pupils / radial muscles (in iris) contract ;												
4(d)	nervous system, responds quickly / immediately ; ora <i>idea that</i> (nerve) impulses travel to, (specific) muscles / (adrenal) glands / effector(s) ; effects of endocrine system are long lasting ; ora hormones / adrenaline, travels throughout the body / allows multiple (target) organs to respond (to same signal) ; <i>idea that</i> less energy required than to have nerves going to every, cell / tissue ; stimulate both voluntary and involuntary responses (simultaneously) ; more effective / enhanced, response (than using one system alone) ;	4											
4(e)(i)	auxin ;	1											
4(e)(ii)	2,4-D is a weedkiller / AW ; sprayed on crops / applied to leaves ; specific to broadleaved weeds ; does not affect, cereals / narrow-leaved crop plants ; causes uncontrolled growth ;	2											

Question	Answer	Marks	Guidance
5(a)	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ (+ energy released) ; ;	2	one mark for correct symbols one mark for correct balancing
5(b)	0.42 (ppm s ⁻¹) ;	1	
5(c)	to allow oxygen to enter the chamber ; keep the crickets <u>respiring aerobically</u> ; to remove carbon dioxide ; to prevent death of crickets ; <i>ref. to ethical treatment of animals ;</i> maintaining similar conditions / resetting, for repeat readings / AW ;	2	
5(d)	heat (energy) is released by crickets ; movement / <i>ref. to kinetic energy</i> ; pressure increase ; increased carbon dioxide leading to greenhouse effect ; small closed space ;	2	
5(e)	rate of oxygen consumption increases with body mass of crickets (for each temperature) ; any suitable data quote comparing rate at different masses (at same temperature) ; rate of oxygen consumption increases with temperature ; any suitable data quote comparing rate at two temperatures (for the same body mass) ;	4	A respiration for oxygen consumption

Question	Answer	Marks	Guidance															
6(a)	<table border="1"> <thead> <tr> <th>process / event</th> <th>letter from Fig. 6.1</th> <th>name of the organ</th> </tr> </thead> <tbody> <tr> <td>meiosis to produce pollen grains</td> <td>C</td> <td>anther</td> </tr> <tr> <td>pollination</td> <td>D</td> <td>stigma</td> </tr> <tr> <td>development of seeds</td> <td>E</td> <td>ovary</td> </tr> <tr> <td>protection of flower in the bud</td> <td>A</td> <td>sepal</td> </tr> </tbody> </table>	process / event	letter from Fig. 6.1	name of the organ	meiosis to produce pollen grains	C	anther	pollination	D	stigma	development of seeds	E	ovary	protection of flower in the bud	A	sepal	4	one mark per row
process / event	letter from Fig. 6.1	name of the organ																
meiosis to produce pollen grains	C	anther																
pollination	D	stigma																
development of seeds	E	ovary																
protection of flower in the bud	A	sepal																
6(b)(i)	image size ÷ magnification ;	1																
6(b)(ii)	82 (µm) ;	1																
6(b)(iii)	(covered in) spikes / sticky ; (pollen) sticks to, insect / animal (bodies / legs / AW) ; large(r) size (in comparison with wind) ; AVP ;	2																
6(c)(i)	ovule ;	1																
6(c)(ii)	(nucleus) containing one set of (unpaired) chromosomes ;	1																
6(c)(iii)	so that chromosome number does not double (at fertilisation) ; so that chromosome number remains constant from generation to generation ;	1																



BIOLOGY

0610/51

Paper 5 Practical Test

May/June 2018

MARK SCHEME

Maximum Mark: 40

Published

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Generic Marking Principles

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- 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:

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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
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- 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.

Abbreviations used in the Mark Scheme

- ; separates marking points
- / separates alternatives within a marking point
- **R** reject
- **ignore** mark as if this material was not present
- **A** accept (a less than ideal answer which should be marked correct)
- **AW** alternative wording (accept other ways of expressing the same idea)
- underline words underlined (or grammatical variants of them) must be present
- **max** indicates the maximum number of marks that can be awarded
- **mark independently** the second mark may be given even if the first mark is wrong
- **ecf** credit a correct statement that follows a previous wrong response
- **()** the word / phrase in brackets is not required, but sets the context
- **ora** or reverse argument
- **AVP** any valid point

Question	Answer	Marks	Guidance
1(a)	one table drawn with at least three columns and a line separating headings from data ; column / row headings with appropriate units for each heading ; five clots records for each of three test-tubes (15 in all) ; correct trend in results ;	4	R if units given in data cells
1(b)	idea that rennin or enzyme acts / forms clots quickest AW / is optimum / is best, in acid conditions ; idea that rennin or enzyme acts / forms clots more slowly AW, in water / neutral conditions ; idea that rennin or enzyme does not act / does not form clots in alkaline / basic conditions ;	2	
1(c)(i)	idea of equilibration / allowing time for test-tube contents to reach the same temperature / all test-tubes at the same temperature ;	1	
1(c)(ii)	volume / 5 cm ³ / mass of milk ; volume / 1 cm ³ , of enzyme / rennin ; concentration / 0.1%, of enzyme / rennin ; temperature / 40 °C ; volume / 2 drops, of acid / alkali / distilled water ; equilibration time / 3 minutes or total time / 5 minutes (for investigation) ;	2	I time unqualified

Question	Answer	Marks	Guidance
1(d)	<p>subjective nature of deciding on clotting point ;</p> <p>test-tubes are observed at different times (step 12) / different mixing times (step 10) ;</p> <p>no repeats ;</p> <p>insufficient time intervals / AW;</p> <p>drops (of acid / water / alkali) could be of different volumes ;</p> <p>some contents remain in the test-tube when adding to other tube, so volumes vary ;</p> <p>tip and rotate not standardised ;</p> <p>same dropping pipette (for acid / water / alkali) could have been used, leading to contamination ;</p> <p>temperature of water-bath not maintained ;</p> <p>no control (to show that milk does not clot without rennin) ;</p>	4	
1(e)	use of acid / alkali / enzyme ;	1	
1(f)	<p>add biuret (reagent) (to liquid part) ;</p> <p>purple / mauve / lilac, colour indicates, presence of protein / is a positive result ;</p>	2	

Question	Answer	Marks	Guidance
1(g)	<p>at least 3 stated temperature values: <u>37 °C</u> and at least one above and one below ;</p> <p>method of maintaining temperature given ;</p> <p>clot / white solid / changed milk, from same sample of milk ;</p> <p>same pH (pH 7) of solutions ;</p> <p>same concentration / volume, of enzyme / (named) protease ;</p> <p>equilibrate temperature of enzyme and milk solutions before mixing ;</p> <p>time how long for samples to become colourless or shortest time has, greatest activity / is the optimum or if optimum is 37 °C the hypothesis is correct ;</p> <p>repeat at least twice (and calculate the mean) ;</p> <p>valid safety precaution e.g. eye protection / gloves ;</p> <p>AVP ; e.g. crush / blend, clotted milk sample or valid control experiment described</p>	6	max 2 from mp 4, 5 and 6

Question	Answer	Marks	Guidance
2(a)(i)	A 6, B 3, C 4, D 6, E 8, F 9; (total) 36 ;	2	
2(a)(ii)	6 ;	1	
2(a)(iii)	612 ;	1	
2(a)(iv)	variation in insect populations in different parts of garden / unrepresentative sample / some webs difficult to see / AW; some insects eaten by spiders / or fallen off web ; some insects, too small to be visible / difficult to count ; some caught organisms may not be insects ; AVP ;	1	
2(b)(i)	O (outer line) single, clear, continuous lines with no shading ; S (size) occupies at least half the space provided (must be at least 75 mm in length) ; D (detail) two body parts <u>and</u> 2 chelicerae (on the cephalothorax) or 2 spinnerets (on abdomen) ; 8 jointed legs, attached to the body in the correct position and in the correct orientation ; L (label) <u>line</u> labelled <i>abdomen</i> ending on the abdomen ;	5	

Question	Answer	Marks	Guidance
2(b)(ii)	length of XY on Fig. 2.2 given as 38.5 mm – 41 mm ; line XY shown on the candidate's drawing in correct position ; correct calculation ;	3	max 2 if no units given
2(c)(i)	A (axes) labelled with units S (scale and size) even scale bars to occupy at least half the grid in both directions ; P (plotting) all five bars plotted accurately \pm half a small square bars same width (at least 1 small squares wide) gaps between bars	3	
2(c)(ii)	3 : 1 ; ;	2	



BIOLOGY

0610/52

Paper 5 Practical Test

May/June 2018

MARK SCHEME

Maximum Mark: 40

Published

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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.

Mark schemes will use these abbreviations

- ; separates marking points
- / alternatives
- **I** ignore
- **R** reject
- **A** accept (for answers correctly cued by the question, or guidance for examiners)
- **AW** alternative wording (where responses vary more than usual)
- **AVP** any valid point
- **ecf** credit a correct statement / calculation that follows a previous wrong response or reverse argument
- **ora** the word / phrase in brackets is not required, but sets the context
- () actual word given must be used by candidate (grammatical variants excepted)
- max indicates the maximum number of marks that can be given

Question	Answer	Marks	Guidance
1(a)(i)	start temperature and final temperature recorded for each water-bath ;	1	
1(a)(ii)	one table drawn with (ruled) header line and minimum two columns ; appropriate headings ; height recorded for warm and cool over 5 minutes (for each minute) ; correct trend ; (check Supervisor's report)	4	R units in any data cell
1(b)(i)	the level of yeast suspension rises (in large test-tube) ; the level of yeast suspension decreases (in smaller test-tube) ; the displacement of gas increases as temperature increases ; the level of gas at the top of the test-tube is greater at higher temperatures ; it rises faster / more, in the warm than the cool ; respiration / rate of reaction, is greater at higher temperatures ; ora	1	conclusions need to match the candidate's data
1(b)(ii)	idea that there is a layer of air acting as an insulator / the water in the water-bath is not in contact with glass of the small test-tube ; no time was given to equilibrate ;	1	
1(b)(iii)	<i>error</i> inaccuracy of the hand-drawn scale ; marks rubbed off the test-tube ; <i>improvement</i> use a measuring cylinder / gas syringe / burette ;	2	the improvement must match the error
1(b)(iv)	(independent variable) temperature ; (dependent variable) height of yeast (foam) / volume of gas produced ;	2	
1(c)(i)	(average volume) 13.6 ; (average rate) 2.72 or 2.7 ;	2	

Question	Answer	Marks	Guidance
1 (c)(ii)	<p>A(xes) – labelled with units percentage concentration of glucose and <u>average</u> rate of carbon dioxide production / cm³ per minute ;</p> <p>S(cale) – suitable scale and data occupies at least half the grid in both direction ;</p> <p>P(lot) – all points plotted accurately \pm half a small square ;</p> <p>L(ines) – suitable line drawn (point to point or a smoothed curve) ;</p>	4	
1 (c)(iii)	<p>as concentration (of glucose) increases the rate (of CO₂) production increases ;</p> <p>levels off (at 2.0 or 2.5%) / AW / rate of carbon dioxide production decreases (at 1.5–2.0%) ;</p> <p>data quote with units; e.g. rises from 1.3 cm³ per min to 4.3 / 4.4 cm³ per min or levels off at 2.0 / 2.5% glucose or levels off at 4.3 / 4.4 cm³ per minute (of carbon dioxide)</p>	3	
1 (c)(iv)	1.05(%) ;	1	A \pm 0.05%
1 (d)(i)	<p>add Benedict's reagent ;</p> <p>heat ;</p> <p>green / orange / yellow / red colour, shows presence of reducing sugars ;</p>	3	

Question	Answer	Marks	Guidance						
1 (d)(ii)	<table border="1"> <tr> <td><i>hazard</i></td> <td><i>precaution</i></td> </tr> <tr> <td>Benedict's reagent</td> <td>goggles / gloves</td> </tr> <tr> <td>heating / ref. to dangers of using hot water</td> <td>use a thermostatically controlled water-bath / AVP (goggles / gloves / use of tongs / stand while doing the experiment / ;;</td> </tr> </table>	<i>hazard</i>	<i>precaution</i>	Benedict's reagent	goggles / gloves	heating / ref. to dangers of using hot water	use a thermostatically controlled water-bath / AVP (goggles / gloves / use of tongs / stand while doing the experiment / ;;	2	I being careful / supervision
<i>hazard</i>	<i>precaution</i>								
Benedict's reagent	goggles / gloves								
heating / ref. to dangers of using hot water	use a thermostatically controlled water-bath / AVP (goggles / gloves / use of tongs / stand while doing the experiment / ;;								
2(a)(i)	<p>O (utline) single clear line no shading ;</p> <p>S (ize) use at least half available space (AB greater than 85 mm) ;</p> <p>D (etail) eight algae ;</p> <p>D (etail) circle drawn in the centre ;</p>	4							
2(a)(ii)	<p>AB = 85 (mm) or 8.5 (cm) ;</p> <p>0.2 (mm) or 0.02 (cm) ;;</p>	3	<p>A 84–86 mm</p> <p>ecf wrong AB but correct actual diameter from their measurements for max 2</p> <p>max 2 if no units given or wrong units given</p> <p>A correct answer in micrometres</p>						

Question	Answer	Marks	Guidance
2(b)(i)	<p><i>independent variable:</i></p> <ol style="list-style-type: none"> 1 at different light (intensities) ; <p><i>dependent variable:</i></p> <ol style="list-style-type: none"> 2 record colour of hydrogen carbonate indicator after a time or record the time taken to reach a set colour ; <p><i>controlled variables:</i></p> <ol style="list-style-type: none"> 3 same amount / number / mass / species / type, of algae ; 4 same volume / concentration, of hydrogen carbonate indicator ; 5 same temperature ; 6 same time / same end colour ; 7 same initial colour of indicator at the start ; <p><i>methodology: Max 3 from mp8–11</i></p> <ol style="list-style-type: none"> 8 detail of a quantitative method used to achieve different light intensities e.g. moving light source / use of bulbs with different light intensities / determining light intensity with a light meter ; 9 method of achieving constant temperature e.g. heat shield / screen / low energy bulb / LED bulb ; 10 use of a control tube with no algae ; 11 time to equilibrate (to different light intensities) ; 12 two or more repeats / replicates ; 	6	max 3 from mp3–7
2(b)(ii)	Universal Indicator / litmus ' AVP	1	



BIOLOGY

0610/53

Paper 5 Practical Test

May/June 2018

MARK SCHEME

Maximum Mark: 40

Published

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Question	Answer	Marks	Guidance
1(a)(i)	0.5 ;	1	
1(a)(ii)	one table drawn with three columns and header line ; headings and units ; three repeats within range ; correct averages calculated ; correct trend showing a difference between 0% and 2% ;	5	R if units in data cells
1(b)	use of knife / cutting ; cut on solid surface / cut away from body / avoid fingers ;	2	I carefully / gloves
1(c)	to find an average ; to see if measurements are comparable / AW ; to find outlier / anomalous results / measurements show variation ;	2	
1(d)(i)	salt <u>concentration</u> ;	1	
1(d)(ii)	number of rings ; volume of solution ; species of plant ; length of stem ; soaking time ; temperature ;	2	R salt concentration I cutting / Petri dishes

Question	Answer	Marks	Guidance																
1(e)	<table border="1"> <tr> <td><i>error</i></td> <td><i>improvement</i></td> </tr> <tr> <td>cutting to same length</td> <td>ref. to ruler / cut larger sections</td> </tr> <tr> <td>stems measured at different times</td> <td>stagger start of investigation</td> </tr> <tr> <td>difficult to measure distance between ends</td> <td>use magnifier</td> </tr> <tr> <td>starting distance not known / stem diameter varies</td> <td>measure, gap / diameter, before timing</td> </tr> <tr> <td>evaporation of salt solutions</td> <td>cover Petri dishes</td> </tr> <tr> <td>rings difficult to measure</td> <td>keep rings in solution / use hand lens</td> </tr> <tr> <td>stems mixed up</td> <td>stems labelled</td> </tr> </table>	<i>error</i>	<i>improvement</i>	cutting to same length	ref. to ruler / cut larger sections	stems measured at different times	stagger start of investigation	difficult to measure distance between ends	use magnifier	starting distance not known / stem diameter varies	measure, gap / diameter, before timing	evaporation of salt solutions	cover Petri dishes	rings difficult to measure	keep rings in solution / use hand lens	stems mixed up	stems labelled	4	2 + 2 improvement must match stated error
<i>error</i>	<i>improvement</i>																		
cutting to same length	ref. to ruler / cut larger sections																		
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difficult to measure distance between ends	use magnifier																		
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evaporation of salt solutions	cover Petri dishes																		
rings difficult to measure	keep rings in solution / use hand lens																		
stems mixed up	stems labelled																		
1(f)	(length of AB) 28 mm ; 0.56 ; ;	3	A 27-29 mm A correct values in cm or μm																

Question	Answer	Marks	Guidance
2(a)	<p>O (outline) single clear line no shading ;</p> <p>S (ize) use at least half available space ;</p> <p>D (etail) dots visible ;</p> <p>D (etail) 7 / 8 / 9 sections visible ;</p>	4	

Question	Answer	Marks	Guidance
2(b)	<p><i>one similarity</i> both have dots ; both have bars ; number of wings ; colours ; antennae / head ;</p> <p><i>two differences</i> wing, shape / position ; pattern / viceroy, has a dark horizontal band in lower half of hindwing ; shape of dots ; number of dots ; monarch / monarch's wings, larger ; ora</p>	3	1 + 2
2(c)(i)	<p>A(xes) – labels with units mass / g and length / mm ; S(cale) – suitable even scale and data occupies more than half the grid in at least one direction ; P(lot) – all points plotted accurately \pm half a small square ; L(ine) – suitable line drawn through points ;</p>	4	R line through zero
2(c)(ii)	as body mass increases wing length increases / AW ;	1	
2(c)(iii)	correct use of graph ; correct value ;	2	ecf

Question	Answer	Marks	Guidance
2(d)	collect samples of nectar (from plants) ; (repeat test on) more than one sample ; named nutrient molecule ; perform (named) food tests ; ; details of food testing method ; ; detail of positive and negative food test results ; valid safety precaution ; AVP ; e.g. sample from plants at different times of year to see if content changes / AW	6	max 4 for food test details



BIOLOGY

0610/61

Paper 6 Alternative to Practical

May/June 2018

MARK SCHEME

Maximum Mark: 40

Published

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- **AVP** any valid point

Question	Answer	Marks	Guidance
1(a)	one table drawn with at least three columns and a line separating headings from data ; column / row headings with appropriate units for each heading ; five correct clot records for each of three test-tubes ;	3	R if units given in data cells
1(b)	idea that rennin or enzyme acts / forms clots quickest AW / is optimum / is best, in acid conditions ; idea that rennin or enzyme acts / forms clots more slowly AW, in water / neutral conditions ; idea that rennin or enzyme does not act / does not form clots in alkaline / basic conditions ;	2	
1(c)(i)	idea of equilibration / allowing time for test-tube contents to reach the same temperature / all test-tubes at the same temperature ;	1	
1(c)(ii)	volume / 5 cm ³ / mass, of milk ; volume / 2 drops, of acid / alkali / distilled water ; volume / 1 cm ³ , of enzyme / rennin ; concentration / 0.1%, of enzyme / rennin ; temperature / 40 °C ; equilibration time / 3 minutes or total time / 5 minutes (for investigation) ;	2	I time unqualified

Question	Answer	Marks	Guidance
1(d)	<p>subjective nature of deciding on clotting point ;</p> <p>three test-tubes observed at different times (step 11) / Q and R longer in water-bath before being tested / different mixing times (step 9) ;</p> <p>no repeats ;</p> <p>insufficient time intervals / AW ;</p> <p>drops (of acid / water / alkali) could be of different volumes / sizes / amounts ;</p> <p>some contents remain in the test-tube when adding to other tube, so volumes vary ;</p> <p>tip and rotate not standardised ;</p> <p>same dropping pipette (for acid / water / alkali) could have been used, leading to contamination ;</p> <p>temperature of water-bath not maintained ;</p> <p>no control (to show that milk does not clot without rennin) ;</p>	4	
1(e)	use of acid / alkali / enzyme ;	1	
1(f)	<p>add biuret (reagent) (to liquid part) ;</p> <p>purple / mauve / lilac, colour indicates, presence of protein / is a positive result ;</p>	2	
1(g)	ethanol emulsion test / add ethanol and white emulsion forms ;	1	

Question	Answer	Marks	Guidance
1(h)	<p>at least 3 stated temperature values: <u>37 °C</u> and at least one above and one below ;</p> <p>method of maintaining temperature given ;</p> <p>clot / white solid / changed milk, from same sample of milk ;</p> <p>same pH (pH 7) of solutions ;</p> <p>same concentration / volume, of enzyme / (named) protease ;</p> <p>equilibrate temperature of enzyme and milk solutions before mixing ;</p> <p>time how long for samples to become colourless or shortest time has, greatest activity / is the optimum or if optimum is 37 °C the hypothesis is correct ;</p> <p>repeat at least twice (and calculate the mean) ;</p> <p>valid safety precaution, e.g. eye protection / gloves ;</p> <p>AVP ; e.g. crush / blend, clotted milk sample or valid control experiment described</p>	6	max 2 from mp 4, 5 and 6

Question	Answer	Marks	Guidance
2(a)(i)	A 6, B 3, C 4, D 6, E 8, F 9 ; (total) 36 ;	2	
2(a)(ii)	6 ;	1	
2(a)(iii)	612 ;	1	
2(a)(iv)	variation in insect populations in different parts of garden / unrepresentative sample / some webs difficult to see / AW; some insects eaten by spiders / or fallen off web ; some insects, too small to be visible / difficult to count ; some caught organisms may not be insects ; AVP ;	1	
2(b)(i)	O (outer line) single, clear, continuous lines with no shading ; S (size) occupies at least half the space provided (must be at least 75 mm in length) ; D (detail) two body parts <u>and</u> 2 chelicerae (on the cephalothorax) or 2 spinnerets (on abdomen) ; 8 jointed legs, attached to the body in the correct position and in the correct orientation ; L (label) <u>line</u> labelled <i>abdomen</i> ending on the abdomen ;	5	

Question	Answer	Marks	Guidance
2(b)(ii)	length of XY on Fig. 2.2 given as 38.5 mm – 41 mm ; line XY shown on the candidate's drawing in correct position ; correct calculation ;	3	max 2 if no units given
2(c)(i)	A (axes) labelled with units S (scale and size) even scale bars to occupy at least half the grid in both directions ; P (plotting) all five bars plotted accurately \pm half a small square bars same width (at least 1 small squares wide) gaps between bars	3	
2(c)(ii)	3 : 1 ; ;	2	



BIOLOGY

0610/62

Paper 6 Alternative to Practical

May/June 2018

MARK SCHEME

Maximum Mark: 40

Published

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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 **9** printed pages.

Generic Marking Principles

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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:

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- 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:

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GENERIC MARKING PRINCIPLE 6:

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Abbreviations used in the Mark Scheme

- ; separates marking points
- / separates alternatives within a marking point
- **R** reject
- **ignore** mark as if this material was not present
- **A** accept (a less than ideal answer which should be marked correct)
- **AW** alternative wording (accept other ways of expressing the same idea)
- underline words underlined (or grammatical variants of them) must be present
- **max** indicates the maximum number of marks that can be awarded
- **mark independently** the second mark may be given even if the first mark is wrong
- **ecf** credit a correct statement that follows a previous wrong response
- **()** the word / phrase in brackets is not required, but sets the context or reverse argument
- **ora** or reverse argument
- **AVP** any valid point

Question	Answer	Marks	Guidance									
1(a)(i)	one table drawn with (ruled) header line and minimum two columns ; appropriate headings ; number of bubbles recorded for warm 19 and cool 7 ;	3	R units in any data cell									
1(a)(ii)	<table border="1"> <thead> <tr> <th>water-bath</th> <th>starting temperature / °C</th> <th>final temperature / °C</th> </tr> </thead> <tbody> <tr> <td>warm</td> <td>50</td> <td>43</td> </tr> <tr> <td>cool</td> <td>25</td> <td>21</td> </tr> </tbody> </table> ; ;	water-bath	starting temperature / °C	final temperature / °C	warm	50	43	cool	25	21	1	
water-bath	starting temperature / °C	final temperature / °C										
warm	50	43										
cool	25	21										
1(b)(i)	the warmer the temperature the more bubbles are produced / (rate of) respiration is greater at higher temperatures ; ora	1										
1(b)(ii)	<i>explanation</i> miscount bubbles / bubbles may be different sizes / volume of gas produced is unknown ; <i>improvement</i> method to collect gas and measure volume described / measure height of foam / AVP ;	2										
1(b)(iii)	temperature (of each water-bath / test-tube) ; idea of using a thermostatically controlled water-bath / description of method that could be used to keep the temperature constant ;	2										
1(b)(iv)	(independent variable is) temperature ; (dependent variable is) number / amount of bubbles (produced) ;	2										
1(c)(i)	(average volume) 13.6 ; (average rate) 2.72 or 2.7 ;	2										

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Question	Answer	Marks	Guidance
1(c)(ii)	<p>A(xes) – labelled with units i.e. percentage concentration of glucose and <u>average</u> rate of carbon dioxide production / cm³ per minute ;</p> <p>S(cale) – suitable even scale and data occupies more than half the grid in both directions ;</p> <p>P(lot) – all points plotted accurately \pm half a small square ;</p> <p>L(ines) – suitable line drawn (point to point or a smoothed curve) ;</p>	4	
1(c)(iii)	<p>as concentration (of glucose) increases the rate (of CO₂ production) increases ; ora</p> <p>levels off (at 2.0 or 2.5%) / AW / rate of carbon dioxide production decreases (at 1.5–2.0%) ;</p> <p>data quote with units ; e.g. rises from 1.3 cm³ per min to 4.3 / 4.4 cm³ per min OR levels off at 2.0 / 2.5% (glucose) or levels off at 4.3 / 4.4 cm³ per min (of carbon dioxide)</p>	3	
1(c)(iv)	1.05(%) ;	1	A \pm 0.05%
1(d)(i)	<p>add Benedict's reagent ;</p> <p>heat ;</p> <p>green / orange / yellow / red colour shows presence of reducing sugars ;</p>	3	

Question	Answer	Marks	Guidance						
1(d)(ii)	<table border="1"> <tr> <td><i>hazard</i></td> <td><i>precaution</i></td> </tr> <tr> <td>Benedict's reagent</td> <td>goggles / gloves</td> </tr> <tr> <td>heating / ref. to dangers of using hot water</td> <td>use a thermostatically controlled water-bath / AVP</td> </tr> </table> :: ;	<i>hazard</i>	<i>precaution</i>	Benedict's reagent	goggles / gloves	heating / ref. to dangers of using hot water	use a thermostatically controlled water-bath / AVP	2	1 being careful / supervision
<i>hazard</i>	<i>precaution</i>								
Benedict's reagent	goggles / gloves								
heating / ref. to dangers of using hot water	use a thermostatically controlled water-bath / AVP								

Question	Answer	Marks	Guidance
2(a)(i)	<p>O (outline) single clear line no shading ;</p> <p>S (ize) use at least half available space (AB greater than 85 mm) ;</p> <p>D (etail) eight algae ;</p> <p>D (etail) circle drawn in the centre ;</p>	4	
2(a)(ii)	<p>AB = 85 mm or 8.5 cm ;</p> <p>0.2 (mm) or 0.02 (cm) ; ;</p>	3	<p>A 84–86 mm</p> <p>ecf wrong AB but correct actual diameter from their measurements for max 2</p> <p>max 2 if no units given or wrong units given</p> <p>A correct answer in micrometres</p>

Question	Answer	Marks	Guidance
2(b)(i)	<p><i>independent variable:</i></p> <p>1 at different light (intensities) ;</p> <p><i>dependent variable:</i></p> <p>2 record colour of hydrogencarbonate indicator after a time or record the time taken to reach a set colour ;</p> <p><i>controlled variables:</i></p> <p>3 same amount / number / mass / species / type, of algae ;</p> <p>4 same volume / concentration, of hydrogencarbonate indicator ;</p> <p>5 same temperature ;</p> <p>6 same time / same end colour ;</p> <p>7 same initial colour of indicator at the start ;</p> <p><i>methodology: Max 3 from mp8–11</i></p> <p>8 detail of a quantitative method used to achieve different light intensities e.g. moving light source / use of bulbs with different light intensities / determining light intensity with a light meter ;</p> <p>9 method of achieving constant temperature e.g. heat shield / screen / low energy bulb / LED bulb ;</p> <p>10 use of a control tube with no algae ;</p> <p>11 time to equilibrate (to different light intensities) ;</p> <p>12 two or more repeats / replicates ;</p>	6	max 3 from mp3–7
2(b)(ii)	Universal Indicator / litmus / AVP	1	



BIOLOGY

0610/63

Paper 6 Alternative to Practical

May/June 2018

MARK SCHEME

Maximum Mark: 40

Published

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Question	Answer	Marks	Guidance
1(a)(i)	0.5 ;	1	
1(a)(ii)	table drawn with 3 columns and header line ; headings and units ; twelve measurements within the acceptable range ; correct averages calculated ;	4	
1(a)(iii)	the higher the salt concentration the smaller the gap / AW ; ora	1	
1(b)	use of knife / cutting ; cut on solid surface / cut away from body / avoid fingers ;	2	I carefully / gloves
1(c)	to find an average ; to see if measurements are comparable / AW ; to find outlier / anomalous results / measurements show variation ;	2	
1(d)(i)	salt <u>concentration</u> ;	1	
1(d)(ii)	number of rings ; volume of solution ; species of plant ; length of stem ; soaking time ;	2	R salt concentration I cutting / Petri dishes

Question	Answer	Marks	Guidance																
1(e)	<table border="1"> <tr> <td><i>error</i></td> <td><i>improvement</i></td> </tr> <tr> <td>cutting to same length</td> <td>use of a ruler</td> </tr> <tr> <td>stems measured at different times</td> <td>stagger start of investigation</td> </tr> <tr> <td>difficult to measure distance between ends</td> <td>use magnifier</td> </tr> <tr> <td>starting distance not known / stem diameter varies</td> <td>measure, gap / diameter, before timing</td> </tr> <tr> <td>evaporation of salt solutions</td> <td>cover Petri dishes</td> </tr> <tr> <td>rings change during measurement</td> <td>keep rings in solution</td> </tr> <tr> <td>stems mixed up</td> <td>stems labelled</td> </tr> </table>	<i>error</i>	<i>improvement</i>	cutting to same length	use of a ruler	stems measured at different times	stagger start of investigation	difficult to measure distance between ends	use magnifier	starting distance not known / stem diameter varies	measure, gap / diameter, before timing	evaporation of salt solutions	cover Petri dishes	rings change during measurement	keep rings in solution	stems mixed up	stems labelled	4	2 + 2 improvement must match stated error
<i>error</i>	<i>improvement</i>																		
cutting to same length	use of a ruler																		
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evaporation of salt solutions	cover Petri dishes																		
rings change during measurement	keep rings in solution																		
stems mixed up	stems labelled																		
1(f)	(length of AB) 28 mm ; 0.56 ;;	3	A 27-29 mm A correct values in cm or µm																

Question	Answer	Marks	Guidance
2(a)	<p>O (outline) single clear line no shading ;</p> <p>S (ize) use at least half available space ;</p> <p>D (etail) dots visible ;</p> <p>D (etail) 7 / 8 / 9 sections visible ;</p>	4	

Question	Answer	Marks	Guidance
2(b)	<p><i>one similarity</i> both have dots ; both have bars ; number of wings ; colours ; antennae / head ;</p> <p><i>two differences</i> wing, shape / position ; pattern / viceroy, has a dark horizontal band in lower half of hindwing ; shape of dots ; number of dots ; monarch / monarch's wings, larger ; ora</p>	3	1 + 2
2(c)(i)	<p>A(xes) – labels with units mass / g and length / mm ; S(cale) – suitable even scale and data occupies more than half the grid in at least one direction ; P(lot) – all points plotted accurately \pm half a small square ; L(ine) – suitable line drawn through points ;</p>	4	R line through zero
2(c)(ii)	as body mass increases wing length increases / AW ;	1	
2(c)(iii)	correct use of graph ; correct value ;	2	ecf

Question	Answer	Marks	Guidance
2(d)	<p>collect samples of nectar (from plants) ; (repeat test on) more than one sample ;</p> <p>named nutrient molecule ;</p> <p>perform (named) food tests ; ;</p> <p>details of food testing method ; ;</p> <p>detail of positive and negative food test results ;</p> <p>valid safety precaution ;</p> <p>AVP ; e.g. sample from plants at different times of year to see if content changes / AW</p>	6	max 4 for food test details



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

BIOLOGY

0610/11

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 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.

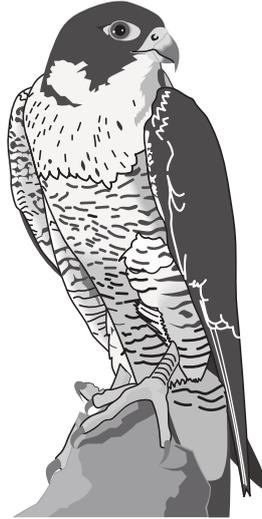
Any rough working should be done in this booklet.

Electronic calculators may be used.

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 **14** printed pages and **2** blank pages.

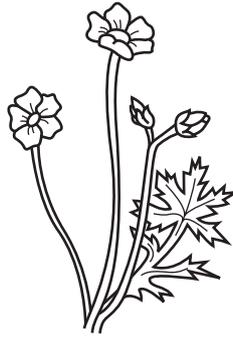
- 1 Which organisms carry out respiration, growth, movement and excretion?
- A all animals and all plants
 - B animals only
 - C arthropods and flowering plants only
 - D plants only
- 2 The diagram shows an animal whose scientific name is *Falco peregrinus*.



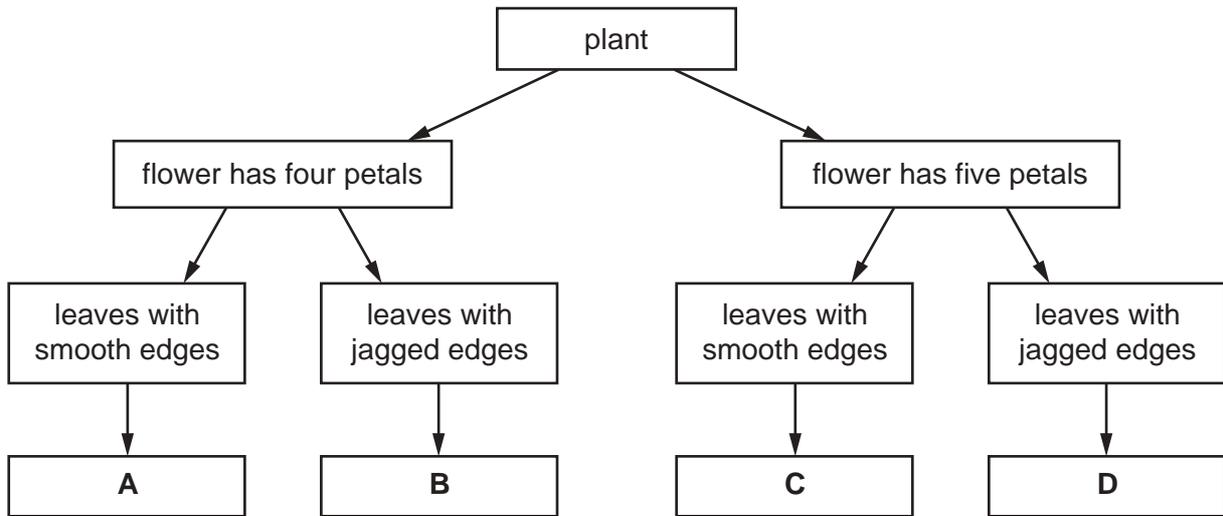
To which species does it belong?

- A bird
 - B *F. peregrinus*
 - C *Falco*
 - D vertebrate
- 3 What kind of skin do amphibians have?
- A dry without scales
 - B dry with scales
 - C moist without scales
 - D moist with scales

4 The diagram shows a flowering plant.

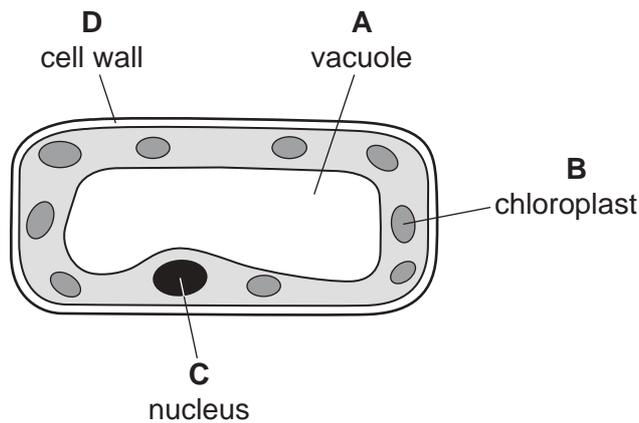


Use the key to identify the plant.



5 The diagram shows a plant cell.

In which labelled part of the cell is sugar made?



6 Why do some root cells have root hairs?

- A for the maintenance of the temperature of the cell sap
- B to increase the surface area of the cells
- C to increase the volume of the cell sap
- D to provide a place for cell nuclei

7 Which words correctly complete the paragraph?

Diffusion may be defined as the net movement of particles from a region of their1..... concentration, to a region of their2..... concentration, where movement is3..... a concentration gradient.

	1	2	3
A	higher	lower	down
B	higher	lower	up
C	lower	higher	down
D	lower	higher	up

8 Which part of a plant root hair is partially permeable?

- A the cell sap
- B the cell surface membrane
- C the cell vacuole
- D the cell wall

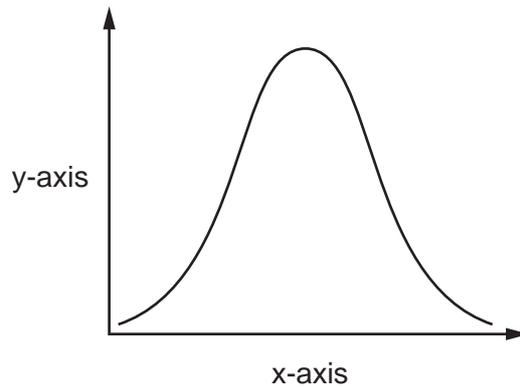
9 The table shows the results of food tests carried out on a fruit.

test	Benedict's	biuret	ethanol	iodine
result	positive	positive	negative	negative

What did the fruit contain?

- A fat and reducing sugar
- B fat and starch
- C protein and reducing sugar
- D protein and starch

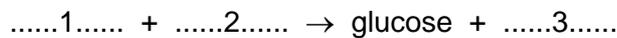
- 10 An experiment was carried out to investigate the effect of pH on enzyme action. The graph shows the results.



What are the labels for the x-axis and the y-axis?

	x-axis	y-axis
A	pH	rate of reaction
B	pH	time
C	rate of reaction	pH
D	time	pH

- 11 The equation for photosynthesis is shown.



Which words correctly complete gaps 1, 2 and 3?

	1	2	3
A	carbon dioxide	light	oxygen
B	carbon dioxide	water	oxygen
C	oxygen	light	carbon dioxide
D	oxygen	water	carbon dioxide

- 12 What is the best source of vitamin C in a balanced diet?

- A** fish
- B** fruit
- C** meat
- D** rice

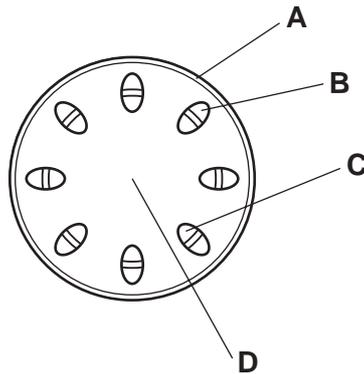
- 13 A young, active woman requires more of which constituent in her diet than a young, active man?
- A fat
 - B iron
 - C protein
 - D vitamin C

- 14 Which condition could be caused by a lack of iron?

- A anaemia
- B cholera
- C scurvy
- D diabetes

- 15 The diagram shows part of a section through a plant stem.

Which tissue transports water from the roots to the leaves?



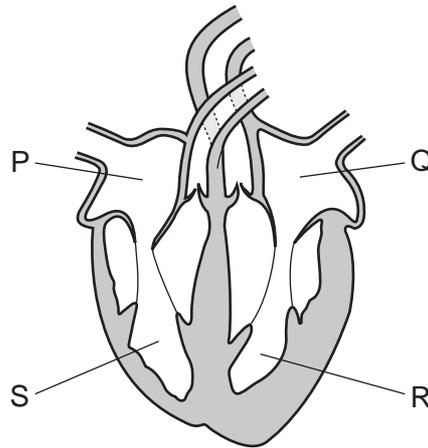
- 16 Petroleum jelly is waterproof and transparent.

Covering the underside of the leaves of a plant with a thin layer of petroleum jelly will slow down the rate of water loss from the plant.

Which statement explains this?

- A Plants absorb nutrients from the petroleum jelly.
- B Plants absorb water from the petroleum jelly.
- C Stomata are blocked by the petroleum jelly.
- D The petroleum jelly stops photosynthesis.

17 The diagram shows the human heart.

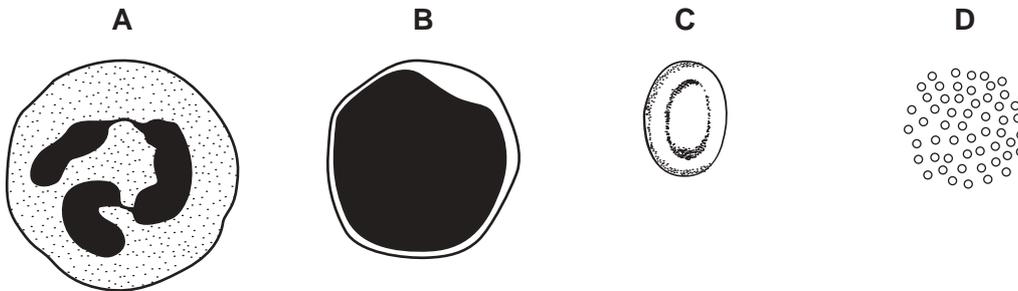


In which order does blood pass through the chambers during a complete circuit of the body after it returns from the lungs?

- A Q → R → S → P
- B Q → R → P → S
- C P → S → Q → R
- D P → S → R → Q

18 The diagrams show some components of the blood of a mammal.

Which component causes the blood to start clotting?

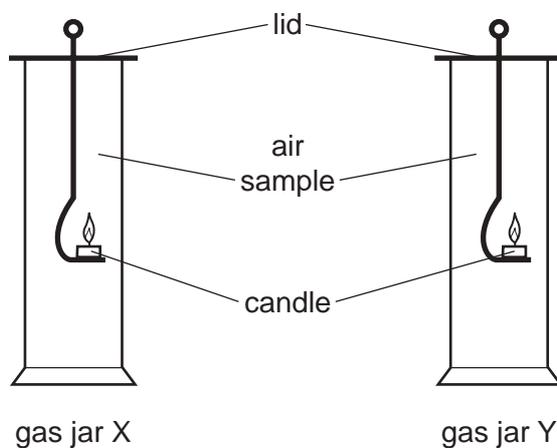


19 Which statement describes a transmissible disease?

- A a disease caused when a pathogen passes from one host to another
- B a disease caused when a pathogen passes through a host's body
- C a disease caused when a pathogen passes to the host's body only by direct contact
- D a disease caused when a pathogen passes to the host's body only by indirect contact

20 A sample of expired air is collected in a gas jar. Another gas jar contains normal atmospheric air.

A lighted candle is placed inside each gas jar as shown. The time taken for each flame to go out is measured. As the candles burn they use up the oxygen available in the jar.



The table shows the results of this experiment.

gas jar	time for candle flame to go out/s
X	15
Y	9

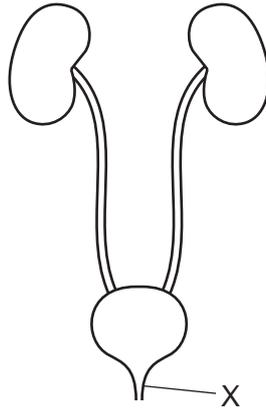
What is an explanation of the difference between the results in jars X and Y?

- A Jar X contains atmospheric air which has more carbon dioxide.
- B Jar X contains expired air which has more carbon dioxide.
- C Jar Y contains atmospheric air which has less oxygen.
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21 Which row describes anaerobic respiration?

	energy released	oxygen required	waste products
A	a little	no	lactic acid
B	a little	yes	carbon dioxide and water
C	a lot	no	lactic acid
D	a lot	yes	carbon dioxide and water

22 The diagram shows the excretory system.



What is structure X?

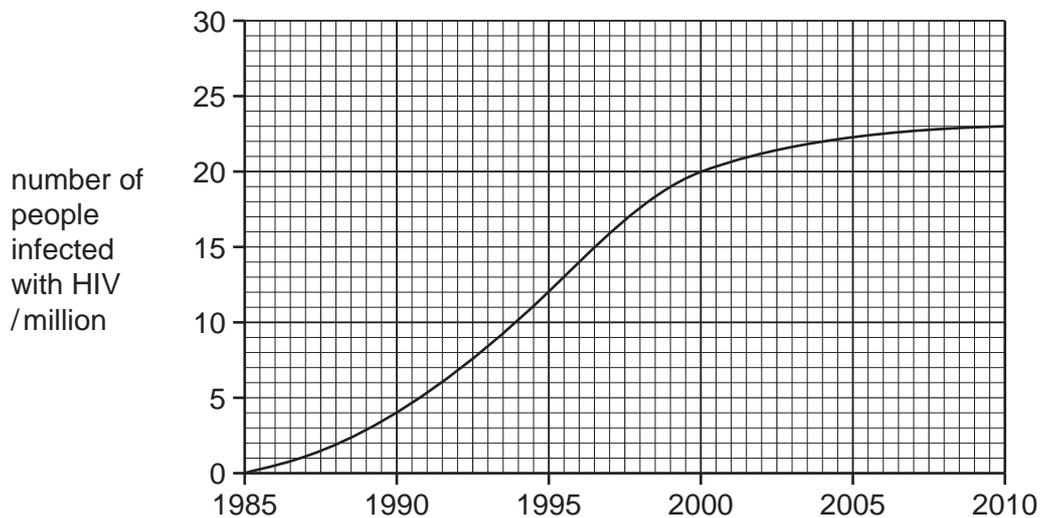
- A bladder
 - B kidney
 - C ureter
 - D urethra
- 23 Which are effectors?
- A brain and spinal cord
 - B muscles and glands
 - C receptors
 - D sensory neurones and motor neurones
- 24 Which hormone is involved in the conversion of glucose to glycogen?
- A adrenaline
 - B insulin
 - C oestrogen
 - D testosterone
- 25 Which mechanism for maintaining body temperature involves the action of muscles?
- A detection of temperature
 - B insulation with fatty tissue
 - C shivering
 - D sweating

26 Antibiotics are used to treat some diseases.

Which diseases could they be effective against?

	bacterial infection	HIV	scurvy
A	✓	✓	✓
B	✓	✗	✓
C	✓	✗	✗
D	✗	✓	✗

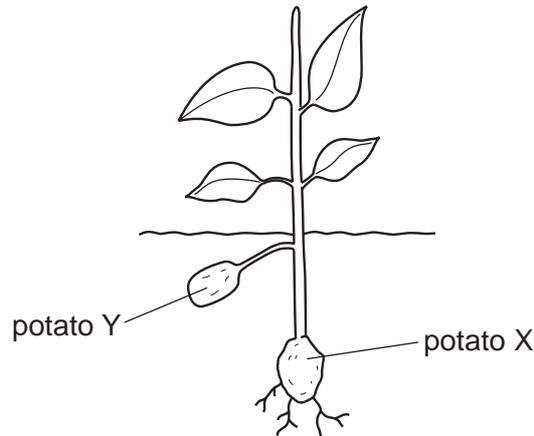
27 The graph shows the number of people infected with HIV, in one part of the world, between 1985 and 2010.



Using data from the graph, which statement is correct?

- A** Between 1995 and 2000 the number of people infected with HIV increased by 67%.
- B** Between 1995 and 2000 the number of people infected with HIV increased by 20%.
- C** Between 1990 and 1995 the number of people infected with HIV doubled.
- D** Between 1995 and 2000 the number of people infected with HIV doubled.

- 28 The diagram shows reproduction in a potato plant. Potato X was planted into the ground and a plant grew from it. The plant then produced potato Y.



Which statement is correct?

- A X and Y are genetically different.
 - B Y was produced by asexual reproduction.
 - C Y was produced by sexual reproduction.
 - D Y was produced by the fusion of gametes.
- 29 Which row correctly links the named process with its description?

	process	description
A	menstruation	release of an egg
B	menstruation	shedding of the lining of the uterus
C	ovulation	fusion of nuclei
D	ovulation	start of puberty

30 The human immunodeficiency virus (HIV) can be transmitted in body fluid.

Some examples of body fluids are listed.

- 1 blood
- 2 saliva
- 3 semen
- 4 tear fluid

Which body fluids could transmit HIV?

- A 1, 2, 3 and 4
 - B 1, 2 and 3 only
 - C 1 and 3 only
 - D 3 only
- 31 Which method of birth control involves a surgical procedure?
- A condom
 - B contraceptive pill
 - C monitoring body temperature and cervical mucus
 - D vasectomy
- 32 The diagram shows the inheritance of sex in humans.

		male gametes	
		X	Y
female gametes	X	XX	XY
	X	XX	XY

What is the chance of the couple's next child being male?

- A 25%
 - B 50%
 - C 75%
 - D 100%
- 33 Which type of cell is produced by meiosis?
- A fertilised egg cell
 - B leaf cell
 - C red blood cell
 - D sperm cell

34 What will cause the rate of mutation to increase?

- A increase in exposure to ionising radiation
- B increase in genetic variation in a population
- C increase in phenotypic variation in a population
- D increase in the rate of reproduction

35 A feature of some plants that live in dry places is that the leaves are reduced to spines.

What is an advantage of the leaves being reduced to spines?

- A decrease in photosynthesis
- B decrease in transpiration
- C increase in photosynthesis
- D increase in transpiration

36 Black truffle is a fungus that obtains nutrients from the roots of hazel trees. Female pigs find and eat the fungi.

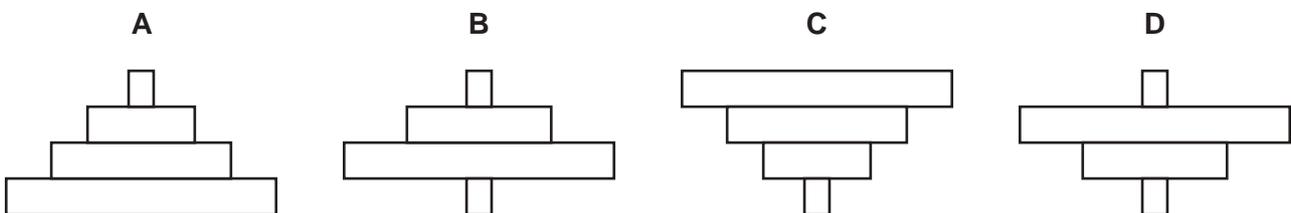
What is the principal source of the energy for this food chain?

- A female pigs
- B hazel trees
- C soil
- D the Sun

37 The diagram shows a food chain.

apple tree → herbivorous insects → carnivorous insects → bird

Which pyramid of numbers represents the food chain?



38 Some washing powders are called biological washing powders.

What is the reason for this?

- A** They contain bacteria.
- B** They contain enzymes.
- C** They contain myriapods.
- D** They contain viruses.

39 What is an example of genetic engineering?

- A** inserting a gene for human insulin production into bacteria
- B** selective breeding to produce cattle with high milk yields
- C** using herbicides to kill unwanted plants
- D** using insecticides to kill insect pests

40 What is a negative impact to an ecosystem of large-scale monoculture?

- A** Crops need harvesting at the same time.
- B** Monocultures produce less food.
- C** Monocultures produce more food.
- D** The genetic variation of organisms is reduced.

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Cambridge International Examinations
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BIOLOGY

0610/12

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 is recommended)

* 1 2 7 6 4 2 5 6 0 6 *

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.

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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.

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This document consists of **16** printed pages.

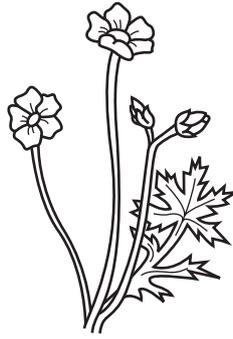
- 1 Which organisms carry out respiration, growth, movement and excretion?
- A all animals and all plants
 - B animals only
 - C arthropods and flowering plants only
 - D plants only
- 2 The diagram shows an animal whose scientific name is *Falco peregrinus*.



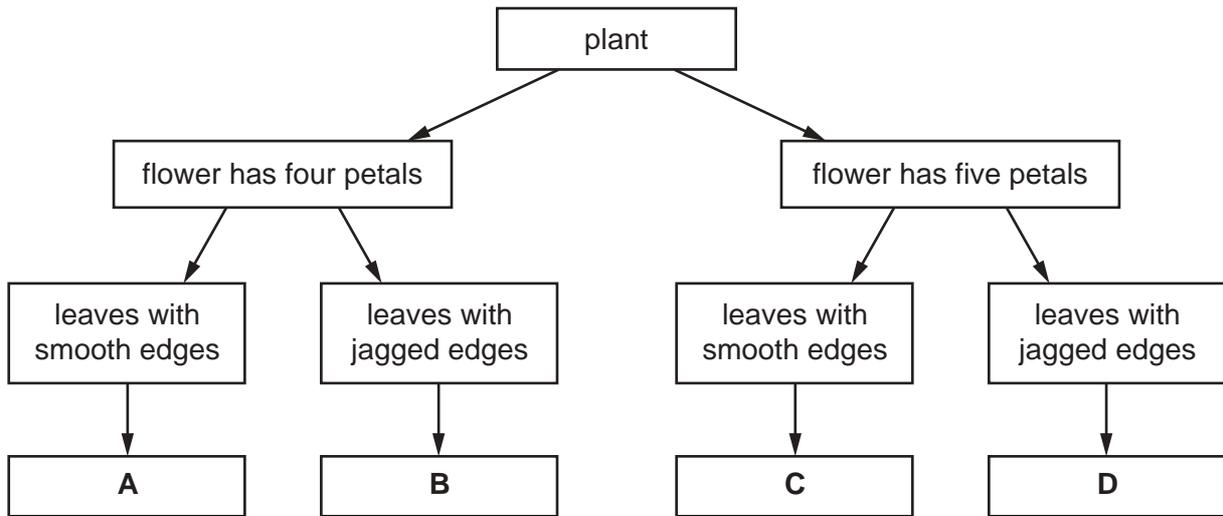
To which species does it belong?

- A bird
 - B *F. peregrinus*
 - C *Falco*
 - D vertebrate
- 3 What kind of skin do amphibians have?
- A dry without scales
 - B dry with scales
 - C moist without scales
 - D moist with scales

4 The diagram shows a flowering plant.

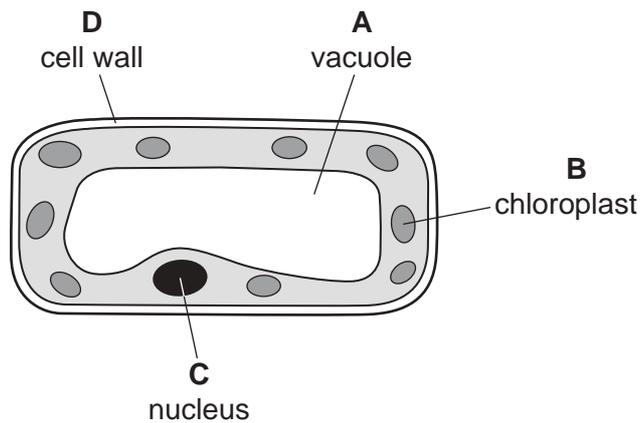


Use the key to identify the plant.



5 The diagram shows a plant cell.

In which labelled part of the cell is sugar made?



6 Why do some root cells have root hairs?

- A for the maintenance of the temperature of the cell sap
- B to increase the surface area of the cells
- C to increase the volume of the cell sap
- D to provide a place for cell nuclei

7 The table shows the concentration of gases in a blood vessel and in an alveolus.

Which row shows the conditions that cause a gas produced in respiration to diffuse from the blood vessel into the alveolus?

	gas produced	concentration in the blood vessel	concentration in the alveolus
A	carbon dioxide	low	high
B	carbon dioxide	high	low
C	oxygen	low	high
D	oxygen	high	low

8 Which part of a plant root hair is partially permeable?

- A the cell sap
- B the cell surface membrane
- C the cell vacuole
- D the cell wall

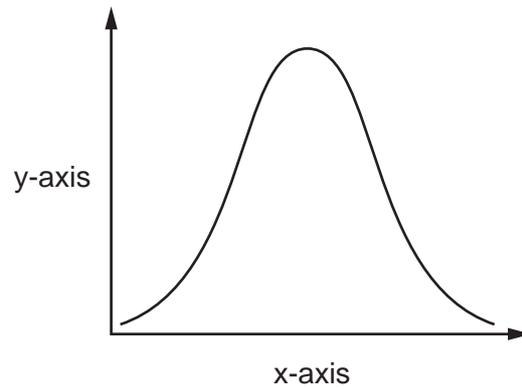
9 The table shows the results of food tests carried out on a fruit.

test	Benedict's	biuret	ethanol	iodine
result	positive	positive	negative	negative

What did the fruit contain?

- A fat and reducing sugar
- B fat and starch
- C protein and reducing sugar
- D protein and starch

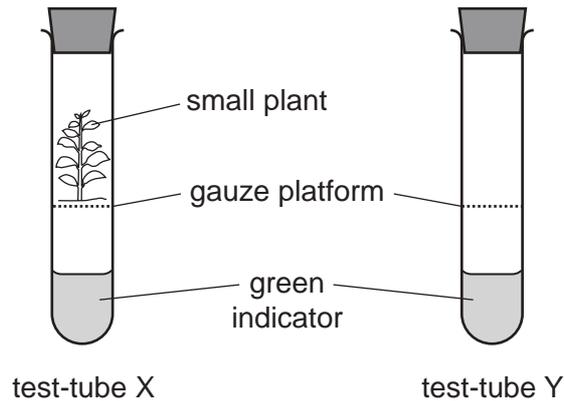
- 10 An experiment was carried out to investigate the effect of pH on enzyme action. The graph shows the results.



What are the labels for the x-axis and the y-axis?

	x-axis	y-axis
A	pH	rate of reaction
B	pH	time
C	rate of reaction	pH
D	time	pH

11 An experiment is set up as shown.



The green indicator turns yellow when the concentration of carbon dioxide increases. The green indicator turns blue when the concentration of carbon dioxide decreases.

After several hours, the indicator in test-tube X turned blue. The indicator in test-tube Y remained green.

Which process caused the colour change?

- A germination
- B photosynthesis
- C respiration
- D transpiration

12 Why do plants need nitrate ions?

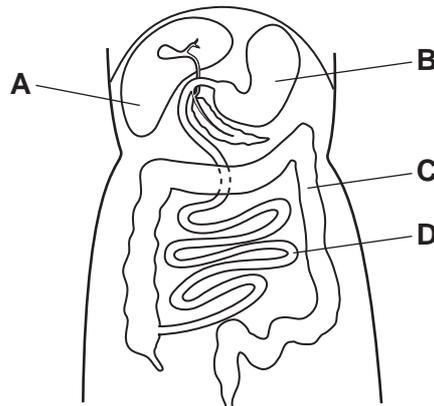
- A for making amino acids
- B for making fatty acids
- C for making glucose
- D for making starch

13 In which part of the alimentary canal do chemical digestion and mechanical digestion take place?

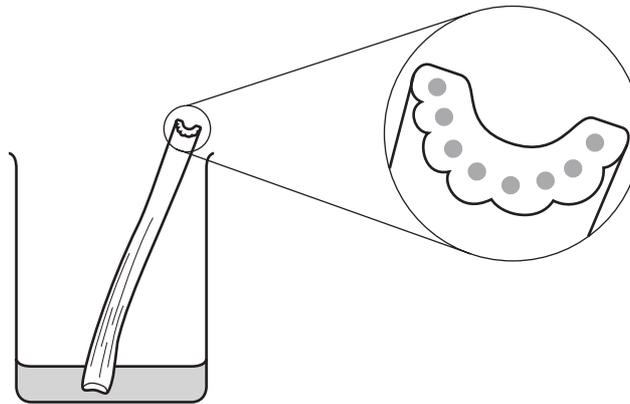
- A colon
- B duodenum
- C mouth
- D oesophagus

14 The diagram shows part of the alimentary canal.

Where is most water absorbed?



15 A celery stalk was placed in a beaker which contained a red stain. After 24 hours, the red stain appeared at the top of the celery stalk.



Which structures stained red?

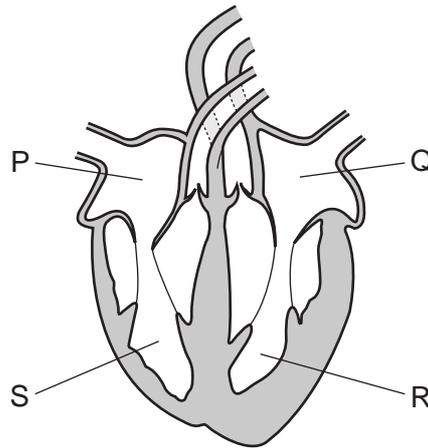
- A cortex cells
- B mesophyll cells
- C phloem
- D xylem

16 A student is investigating the effect of temperature on the rate of transpiration.

Which environmental conditions should be kept constant during this investigation?

	humidity	light intensity	temperature	wind speed
A	✓	✓	✓	✓
B	✓	✓	x	✓
C	x	✓	x	✓
D	x	x	✓	x

17 The diagram shows the human heart.

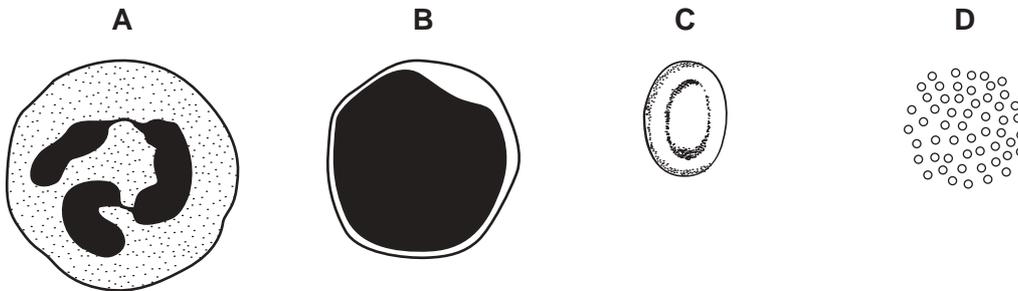


In which order does blood pass through the chambers during a complete circuit of the body after it returns from the lungs?

- A Q → R → S → P
- B Q → R → P → S
- C P → S → Q → R
- D P → S → R → Q

18 The diagrams show some components of the blood of a mammal.

Which component causes the blood to start clotting?



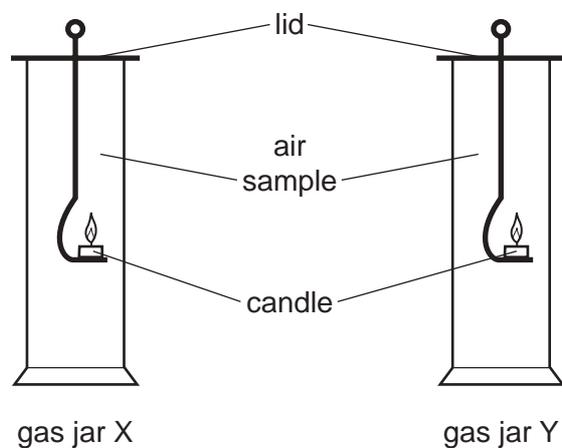
19 The body produces mucus as a defence against diseases.

What type of defence is stomach acid?

	cells	chemical barrier	mechanical barrier
A	✓	✓	✓
B	✓	x	x
C	x	✓	x
D	x	x	✓

20 A sample of expired air is collected in a gas jar. Another gas jar contains normal atmospheric air.

A lighted candle is placed inside each gas jar as shown. The time taken for each flame to go out is measured. As the candles burn they use up the oxygen available in the jar.



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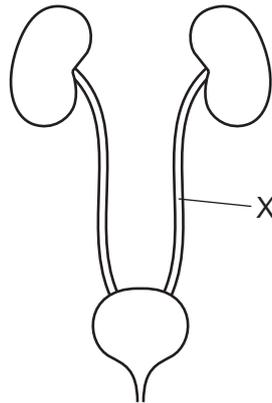
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21 Which row describes anaerobic respiration?

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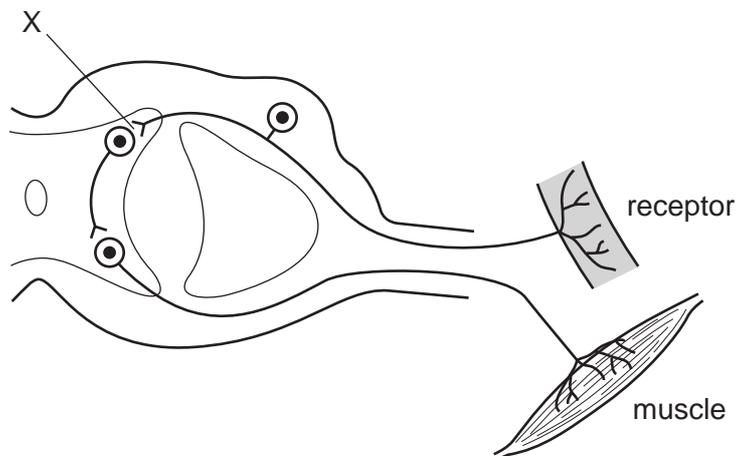
22 The diagram shows the excretory system.



What is structure X?

- A bladder
- B kidney
- C ureter
- D urethra

23 The diagram shows structures in a reflex arc.



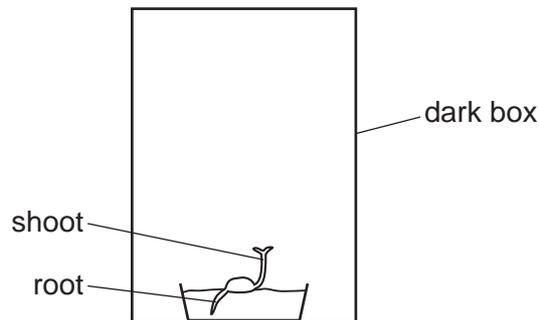
What is X?

- A effector
- B relay neurone
- C sensory neurone
- D synapse

- 24 Which row describes the effect of the hormone adrenaline on breathing rate, pulse rate and pupil size?

	breathing rate	pulse rate	pupil size
A	decrease	decrease	larger
B	decrease	increase	smaller
C	increase	decrease	smaller
D	increase	increase	larger

- 25 The diagram shows a seedling growing inside a dark box.



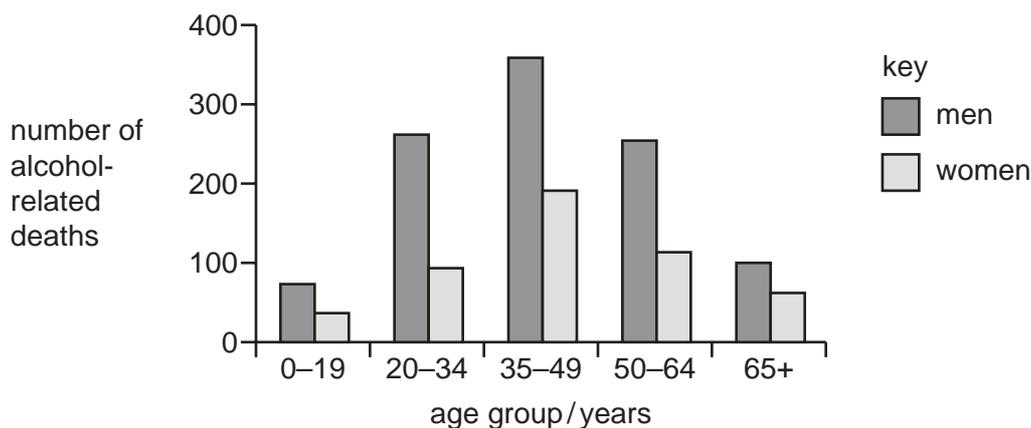
What type of responses affect the direction of growth of the root and the shoot in this experiment?

	response by the root	response by the shoot
A	gravitropism	gravitropism
B	gravitropism	phototropism
C	phototropism	gravitropism
D	phototropism	phototropism

- 26 What is the definition of a drug?

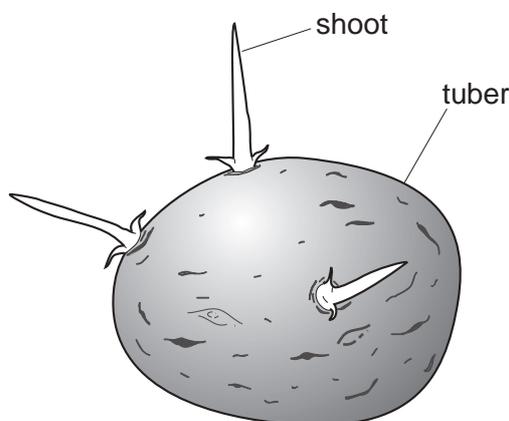
- A** any illegal substance taken into the body
- B** any substance taken into the body
- C** any substance taken into the body that modifies or affects chemical reactions in the body
- D** any substance taken into the body which is not a medicine

- 27 The graph shows the number of alcohol-related deaths in men and women between the years 2001 and 2005 in one country.



Which conclusion is supported by the data in the graph?

- A** All alcohol-related deaths increase with age.
- B** Men in the 35–49 year old age group are most likely to die due to alcohol-related reasons.
- C** Men in the 65+ age group are least likely to die due to alcohol-related reasons.
- D** Women are more likely to die due to alcohol-related reasons than men.
- 28 The diagram shows a potato tuber that developed from the stem of a parent potato plant. Three shoots are starting to grow from the tuber.



How do the genotypes of the shoots compare with the genotypes of the tuber and of the parent?

	genotype of tuber	genotype of parent
A	is different to the shoots	is different to the shoots
B	is different to the shoots	is identical to the shoots
C	is identical to the shoots	is different to the shoots
D	is identical to the shoots	is identical to the shoots

29 The list shows various terms used in sexual reproduction in organisms.

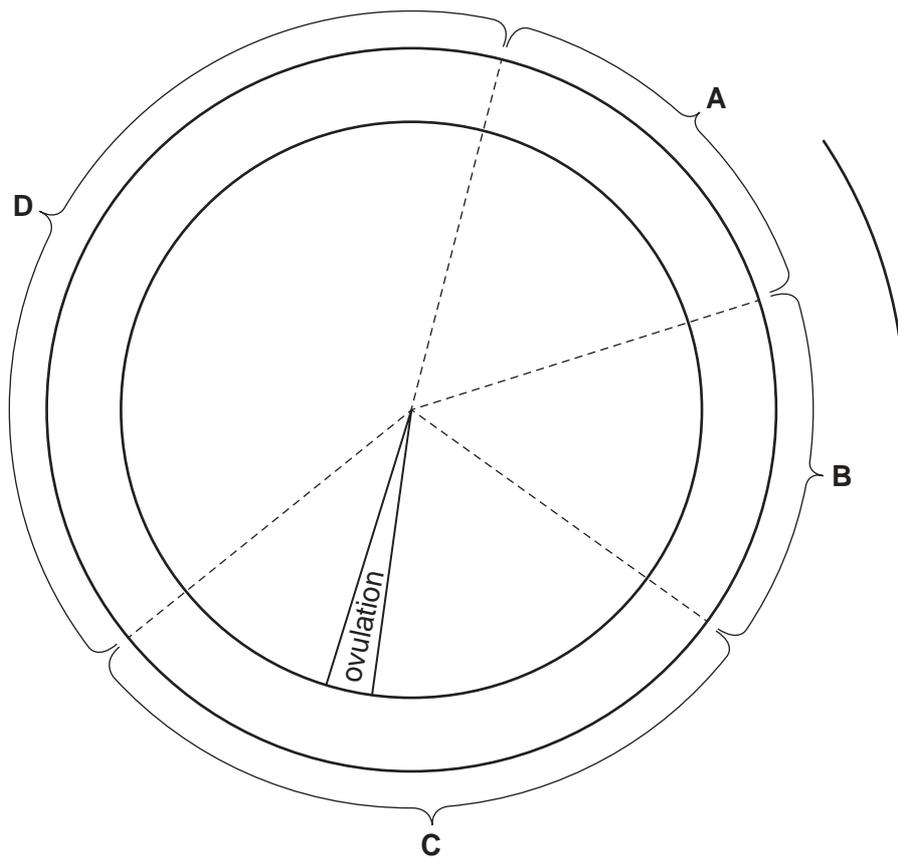
- 1 male gamete
- 2 female gamete
- 3 ovule
- 4 ovary
- 5 filament
- 6 fertilisation
- 7 haploid

Which terms are only used in sexual reproduction in plants?

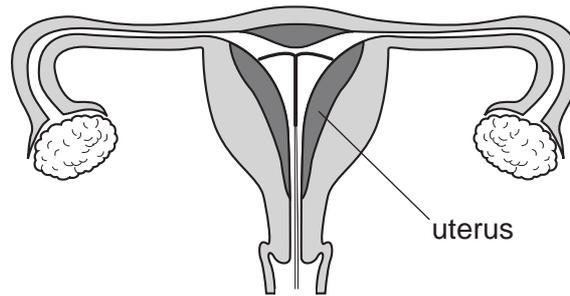
- A** 1 and 7 **B** 2 and 4 **C** 2 and 6 **D** 3 and 5

30 The diagram shows stages of a menstrual cycle.

During which stage does menstruation occur?



31 The diagram shows part of the female reproductive system with a birth control device in place.



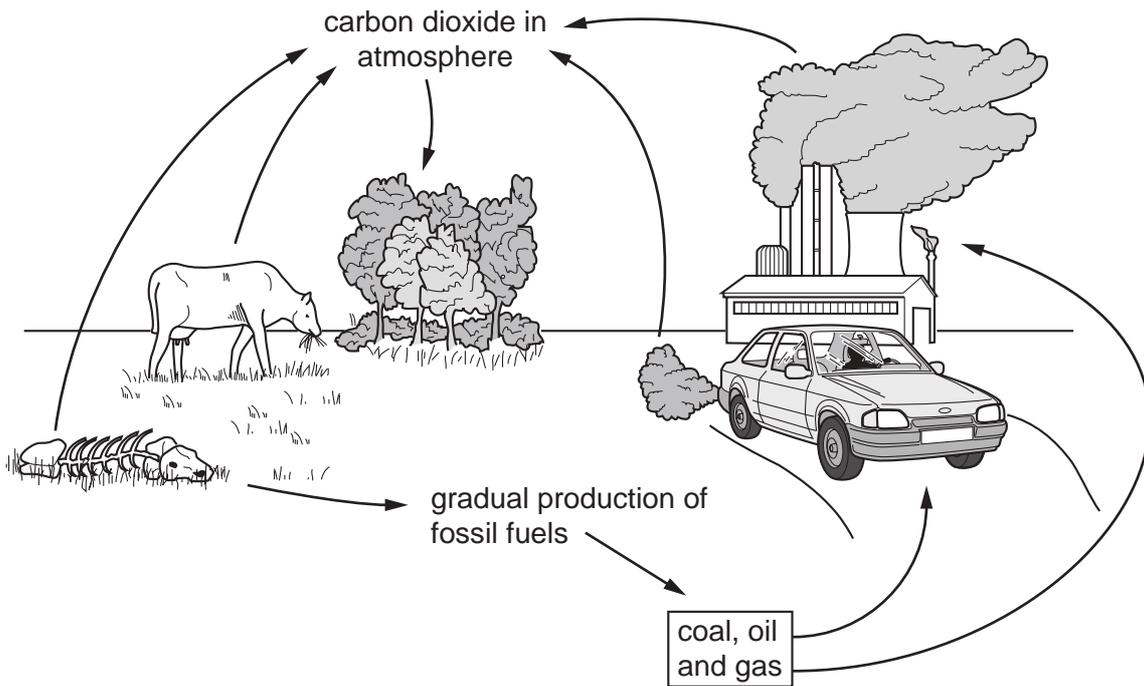
Which birth control device is being used?

- A chemical implant
 - B diaphragm
 - C femidom
 - D IUD
- 32 Which chromosomes can be found in a single sperm?
- A X and X
 - B X and Y
 - C X or X
 - D X or Y
- 33 Which term is used for an organism that has two different alleles of a particular gene?
- A dominant
 - B heterozygous
 - C homozygous
 - D recessive
- 34 What is an adaptive feature of an organism?
- A any feature that is changed by the environment
 - B any feature that helps an organism to survive and reproduce
 - C any feature that shows continuous variation
 - D any inherited feature than an organism has
- 35 What is required for natural selection to occur?
- A genetic variation between individuals
 - B humans selecting desirable characteristics
 - C no competition between individuals or resources
 - D offspring produced by asexual reproduction

36 What is the principal source of energy for most food chains?

- A carbon dioxide gas
- B glucose
- C oxygen
- D sunlight

37 The diagram shows part of the carbon cycle.



Which process is missing from the diagram?

- A combustion
- B photosynthesis
- C plant respiration
- D decomposition

38 Genetic engineering has been used to produce human insulin.

Into which type of cell were the human genes for insulin inserted?

- A animal
- B bacterial
- C fungal
- D human

39 What are reasons for using chemical fertilisers in food production?

	increase pollution in rivers and lakes	increase crop yields	reduce competition between crops and weeds
A	✓	✓	✓
B	x	✓	x
C	✓	x	x
D	x	x	✓

40 As well as carbon dioxide, which other gas is mainly responsible for the enhanced greenhouse effect?

- A** methane
- B** oxygen
- C** ozone
- D** sulfur dioxide

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BIOLOGY

0610/13

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 is recommended)



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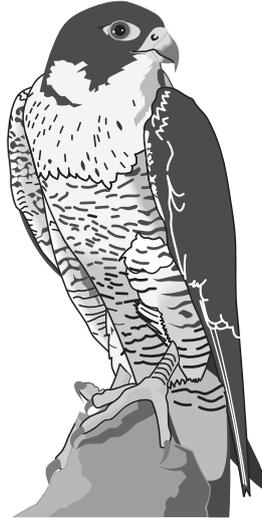
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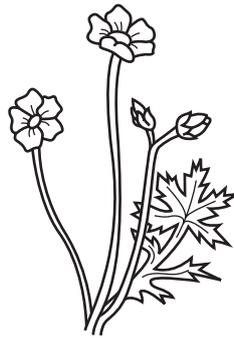
- 1 Which organisms carry out respiration, growth, movement and excretion?
- A all animals and all plants
 - B animals only
 - C arthropods and flowering plants only
 - D plants only
- 2 The diagram shows an animal whose scientific name is *Falco peregrinus*.



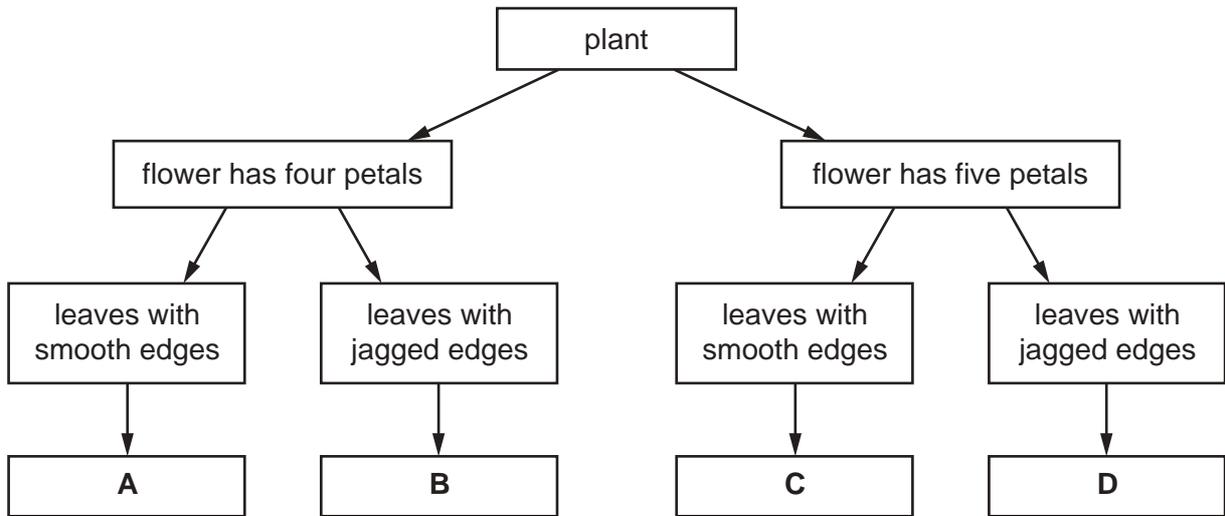
To which species does it belong?

- A bird
 - B *F. peregrinus*
 - C *Falco*
 - D vertebrate
- 3 What kind of skin do amphibians have?
- A dry without scales
 - B dry with scales
 - C moist without scales
 - D moist with scales

4 The diagram shows a flowering plant.

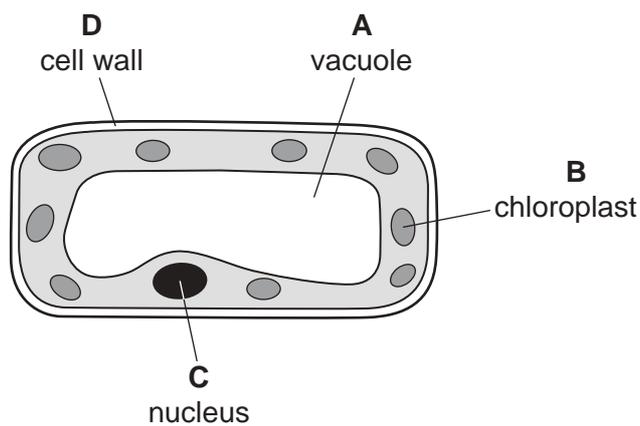


Use the key to identify the plant.



5 The diagram shows a plant cell.

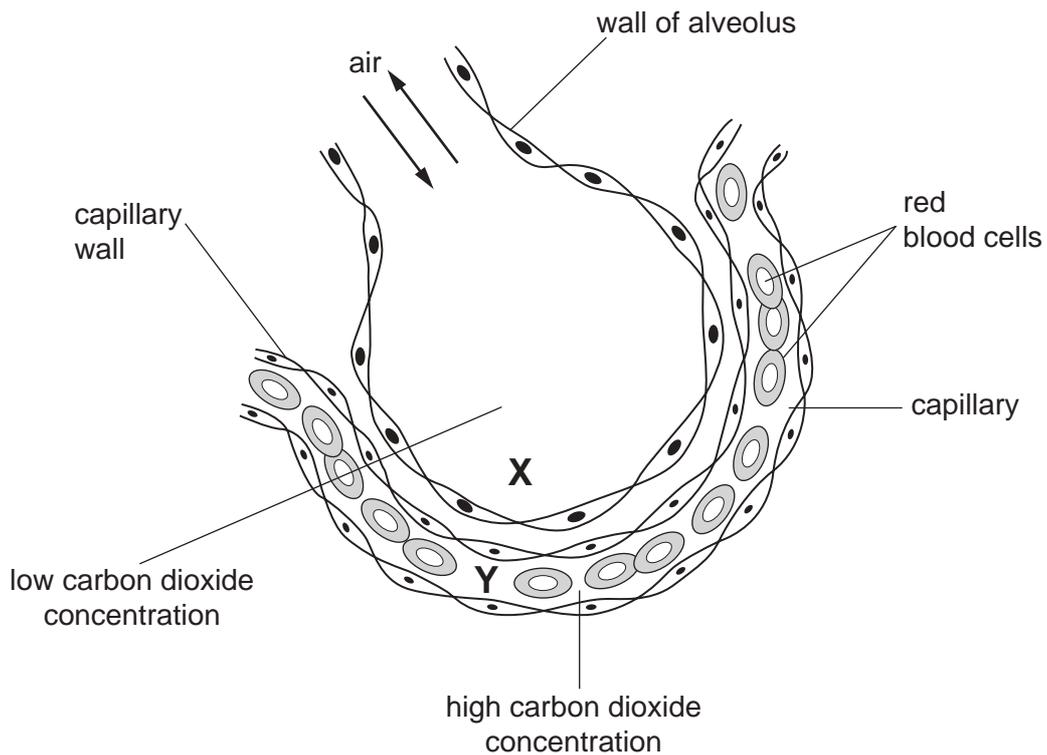
In which labelled part of the cell is sugar made?



6 Why do some root cells have root hairs?

- A for the maintenance of the temperature of the cell sap
- B to increase the surface area of the cells
- C to increase the volume of the cell sap
- D to provide a place for cell nuclei

7 The diagram shows a section through an alveolus and through a capillary.



How does carbon dioxide move from **Y** to **X**?

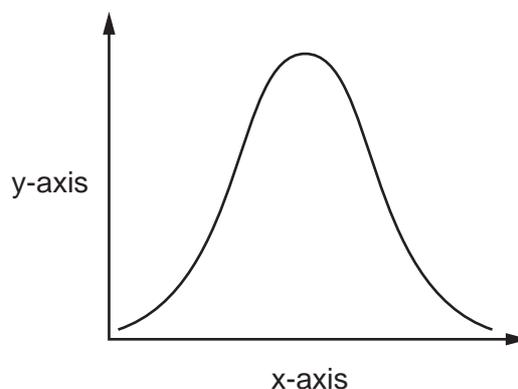
- A by diffusion
 - B by osmosis
 - C by translocation
 - D by transpiration
- 8 Which part of a plant root hair is partially permeable?
- A the cell sap
 - B the cell surface membrane
 - C the cell vacuole
 - D the cell wall

- 9 The table shows the results of food tests carried out on a fruit.

test	Benedict's	biuret	ethanol	iodine
result	positive	positive	negative	negative

What did the fruit contain?

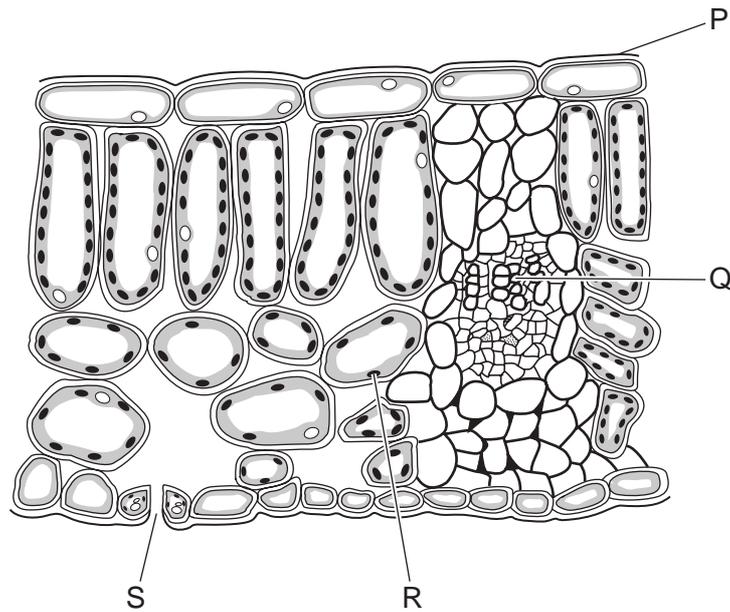
- A fat and reducing sugar
 B fat and starch
 C protein and reducing sugar
 D protein and starch
- 10 An experiment was carried out to investigate the effect of pH on enzyme action. The graph shows the results.



What are the labels for the x-axis and the y-axis?

	x-axis	y-axis
A	pH	rate of reaction
B	pH	time
C	rate of reaction	pH
D	time	pH

11 The diagram shows a section through a leaf.



What are structures P, Q, R and S?

	P	Q	R	S
A	chloroplast	phloem	palisade tissue	xylem
B	cuticle	xylem	chloroplast	stoma
C	phloem	palisade tissue	cuticle	stoma
D	xylem	chloroplast	phloem	cuticle

12 A lack of which dietary component can result in constipation?

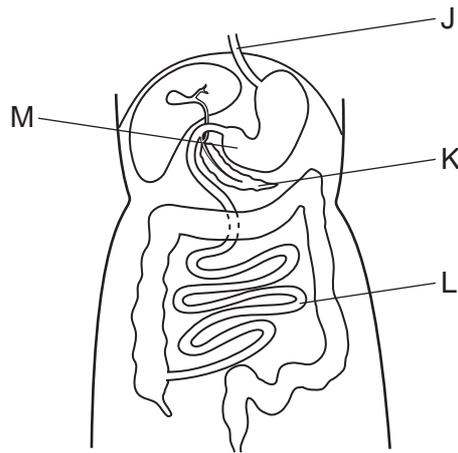
- A** fat
- B** fibre (roughage)
- C** carbohydrate
- D** protein

13 A woman requires more calcium in her diet when she is pregnant.

Which statement explains why?

- A** bone growth in the fetus
- B** muscle growth in the fetus
- C** production of haemoglobin in the fetus
- D** to provide energy for the fetus

14 The diagram shows part of the alimentary canal.



Which row correctly identifies the structures labelled J to M?

	J	K	L	M
A	oesophagus	pancreas	small intestine	stomach
B	pancreas	small intestine	stomach	oesophagus
C	small intestine	stomach	oesophagus	pancreas
D	stomach	oesophagus	pancreas	small intestine

15 The diagram shows the pathway of water from the soil through a plant.

soil → X → Y → Z → mesophyll cells

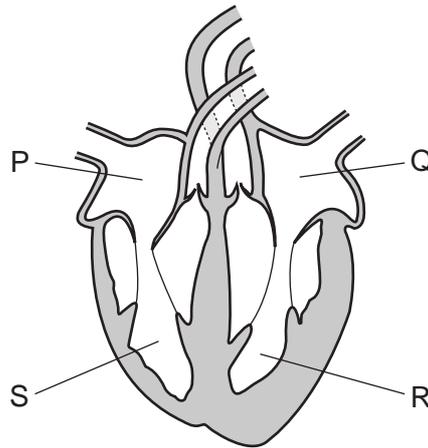
Which cells are represented by X, Y and Z?

	X	Y	Z
A	root hair cells	root cortex cells	xylem
B	root hair cells	xylem	root cortex cells
C	xylem	root cortex cells	root hair cells
D	xylem	root hair cells	root cortex cells

16 What will **not** affect the rate of transpiration?

- A** humidity of the atmosphere
- B** number of open stomata
- C** rate of respiration
- D** temperature

17 The diagram shows the human heart.

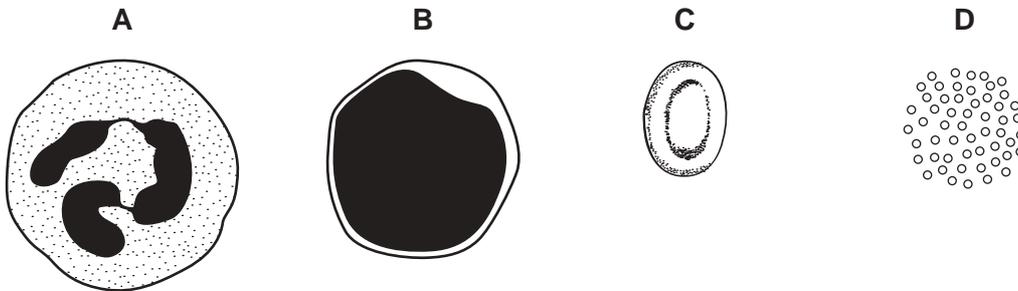


In which order does blood pass through the chambers during a complete circuit of the body after it returns from the lungs?

- A Q → R → S → P
- B Q → R → P → S
- C P → S → Q → R
- D P → S → R → Q

18 The diagrams show some components of the blood of a mammal.

Which component causes the blood to start clotting?

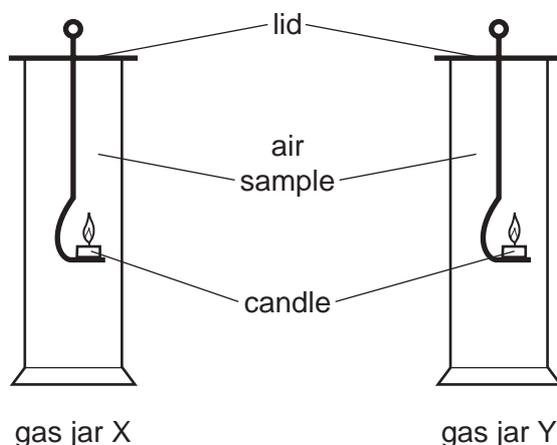


19 What is an indirect method of transmitting disease?

- A body fluid
- B blood
- C food
- D skin contact between people

20 A sample of expired air is collected in a gas jar. Another gas jar contains normal atmospheric air.

A lighted candle is placed inside each gas jar as shown. The time taken for each flame to go out is measured. As the candles burn they use up the oxygen available in the jar.



The table shows the results of this experiment.

gas jar	time for candle flame to go out/s
X	15
Y	9

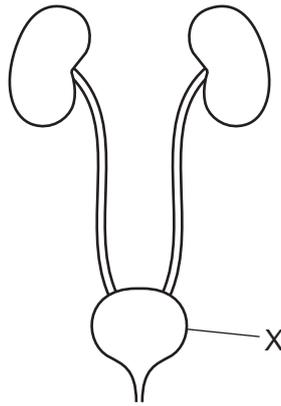
What is an explanation of the difference between the results in jars X and Y?

- A Jar X contains atmospheric air which has more carbon dioxide.
- B Jar X contains expired air which has more carbon dioxide.
- C Jar Y contains atmospheric air which has less oxygen.
- D Jar Y contains expired air which has less oxygen.

21 Which row describes anaerobic respiration?

	energy released	oxygen required	waste products
A	a little	no	lactic acid
B	a little	yes	carbon dioxide and water
C	a lot	no	lactic acid
D	a lot	yes	carbon dioxide and water

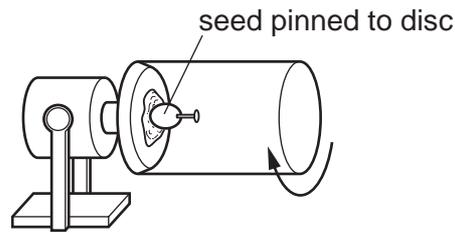
22 The diagram shows the excretory system.



What is structure X?

- A bladder
 - B kidney
 - C ureter
 - D urethra
- 23 What is the correct sequence in a reflex action?
- A receptor → stimulus → motor neurone → relay neurone → sensory neurone → effector
 - B receptor → stimulus → sensory neurone → relay neurone → motor neurone → effector
 - C stimulus → receptor → motor neurone → relay neurone → sensory neurone → effector
 - D stimulus → receptor → sensory neurone → relay neurone → motor neurone → effector
- 24 In 1921, Banting and Best extracted a substance from the pancreas of an animal. The substance was injected into children whose blood sugar concentrations were too high. The children's blood sugar concentrations were returned to normal.
- Which substance in the pancreatic extract would return the children's blood sugar concentrations to normal?
- A adrenaline
 - B insulin
 - C glucose
 - D oestrogen

25 A seed is placed and grown on a rotating disc, as shown.



Which diagram shows the appearance of the seedling shoot after seven days?



26 Which organ is the site of break down of alcohol in the human body?

- A bladder
- B kidney
- C liver
- D stomach

27 Alcohol is a drug.

Which statement is correct?

- A It can cause COPD.
- B It is a depressant.
- C It is not addictive.
- D It speeds up reaction times.

28 The following statements give information about the reproduction of different organisms.

- 1 Daffodil plants produce genetically identical bulbs that grow into a new plant the following year.
- 2 In summer, female aphids produce genetically identical offspring without fertilisation by a male.
- 3 Most banana plants are genetically identical because they were produced from one parent plant.

Which statements are examples of asexual reproduction?

- A 1, 2 and 3
- B 1 and 2 only
- C 1 and 3 only
- D 2 and 3 only

29 Which stages in sexual reproduction occur in both flowering plants and human reproduction?

- 1 Gametes are made by meiosis.
- 2 Gametes fuse to form a zygote.
- 3 The male gamete moves to the female gamete.

A 1, 2 and 3 **B** 1 and 2 only **C** 1 only **D** 2 and 3 only

30 Which part of the female reproductive system produces oestrogen?

- A** cervix
- B** ovary
- C** oviduct
- D** uterus

31 Which hormone is responsible for the development of secondary sexual characteristics?

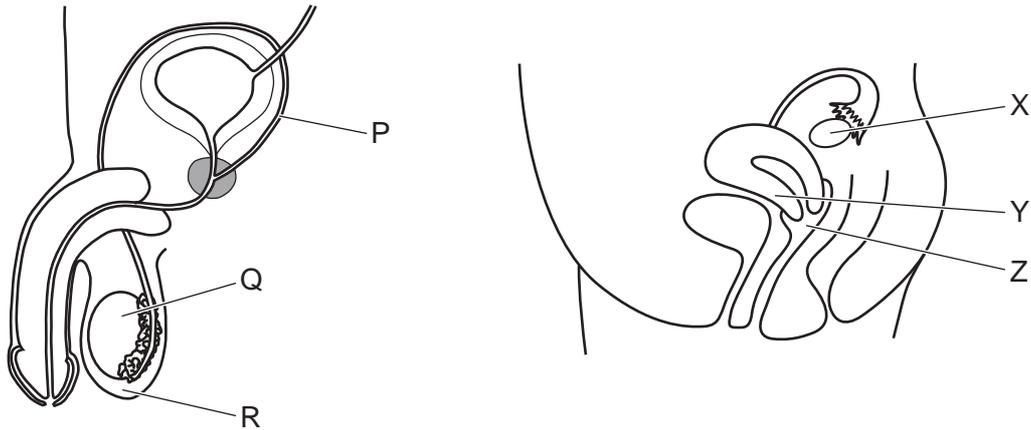
- A** FSH
- B** LH
- C** oestrogen
- D** progesterone

32 A length of DNA codes for a protein.

What is this a definition of?

- A** a gene
- B** an amino acid
- C** an X chromosome
- D** a Y chromosome

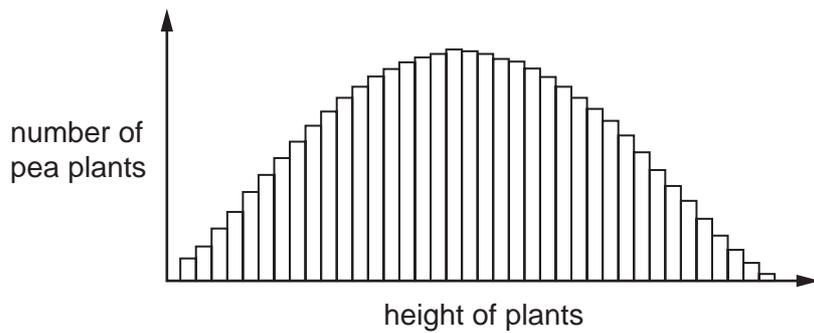
33 The diagrams show human male and female reproductive organs.



Where does meiosis take place?

- A** P and X **B** Q and X **C** Q and Y **D** R and Z

34 The bar chart shows the heights of pea plants grown from 500 pea seeds.



What variation do the plants show?

	continuous	discontinuous
A	✓	✓
B	✓	x
C	x	✓
D	x	x

35 The picture shows a fox that lives in the desert.



Which adaptation does the fox have for living in the desert?

- A eyes at front of head to help judge distance
- B large ears to increase heat loss
- C long bushy tail for balance
- D sharp teeth to catch prey

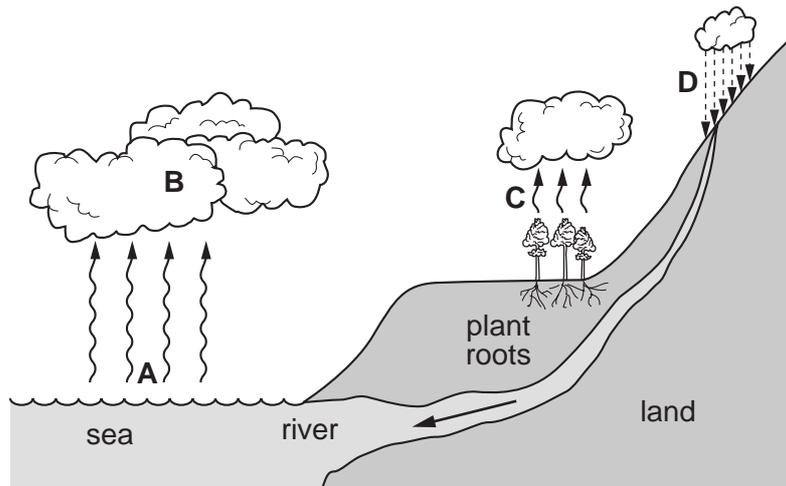
36 The diagram shows a simple food chain.



Which process releases the energy that is lost at 1, 2 and 3?

- A ingestion
- B photosynthesis
- C respiration
- D transpiration

37 Which labelled stage in the water cycle shows precipitation?



38 What is the name of the structure that separates the left and right ventricles of the heart?

- A atrium
- B septum
- C vena cava
- D valve

39 What is a source of air pollution?

- A herbicides
- B methane
- C untreated sewage
- D water vapour

40 Which process does **not** change the carbon dioxide level in the air?

- A decomposition
- B feeding
- C photosynthesis
- D respiration

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BIOLOGY

0610/21

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 is recommended)

* 0 6 5 4 7 3 7 3 6 4 *

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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.

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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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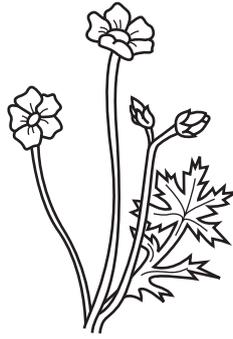
- 1 Which organisms carry out respiration, growth, movement and excretion?
- A all animals and all plants
 - B animals only
 - C arthropods and flowering plants only
 - D plants only
- 2 The diagram shows an animal whose scientific name is *Falco peregrinus*.



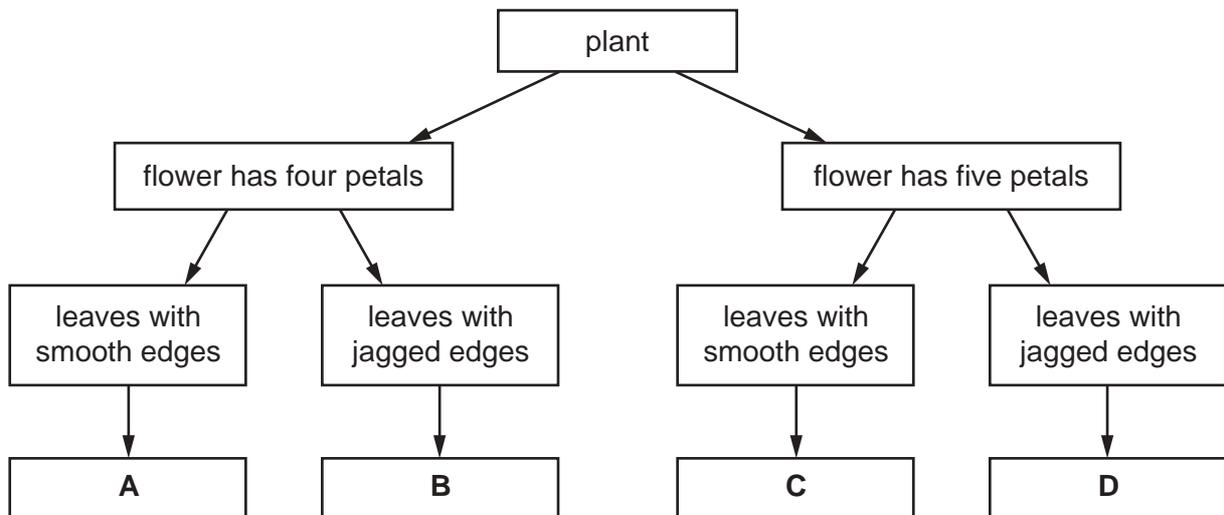
To which species does it belong?

- A bird
 - B *F. peregrinus*
 - C *Falco*
 - D vertebrate
- 3 What kind of skin do amphibians have?
- A dry without scales
 - B dry with scales
 - C moist without scales
 - D moist with scales

4 The diagram shows a flowering plant.



Use the key to identify the plant.



5 In which part of the cell does aerobic respiration occur?

- A cytoplasm
- B mitochondrion
- C ribosome
- D vesicle

6 Why do some root cells have root hairs?

- A for the maintenance of the temperature of the cell sap
- B to increase the surface area of the cells
- C to increase the volume of the cell sap
- D to provide a place for cell nuclei

7 Which words correctly complete the paragraph?

Diffusion may be defined as the net movement of particles from a region of their1..... concentration, to a region of their2..... concentration, where movement is3..... a concentration gradient.

	1	2	3
A	higher	lower	down
B	higher	lower	up
C	lower	higher	down
D	lower	higher	up

8 Which part of a plant root hair is partially permeable?

- A** the cell sap
- B** the cell surface membrane
- C** the cell vacuole
- D** the cell wall

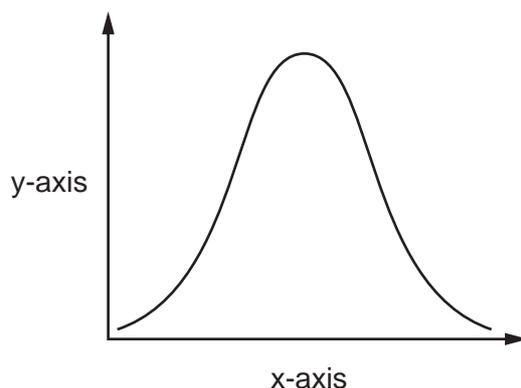
9 The table shows the results of food tests carried out on a fruit.

test	Benedict's	biuret	ethanol	iodine
result	positive	positive	negative	negative

What did the fruit contain?

- A** fat and reducing sugar
- B** fat and starch
- C** protein and reducing sugar
- D** protein and starch

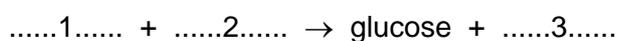
- 10 An experiment was carried out to investigate the effect of pH on enzyme action. The graph shows the results.



What are the labels for the x-axis and the y-axis?

	x-axis	y-axis
A	pH	rate of reaction
B	pH	time
C	rate of reaction	pH
D	time	pH

- 11 The equation for photosynthesis is shown.



Which words correctly complete gaps 1, 2 and 3?

	1	2	3
A	carbon dioxide	light	oxygen
B	carbon dioxide	water	oxygen
C	oxygen	light	carbon dioxide
D	oxygen	water	carbon dioxide

- 12 What is the best source of vitamin C in a balanced diet?

- A** fish
- B** fruit
- C** meat
- D** rice

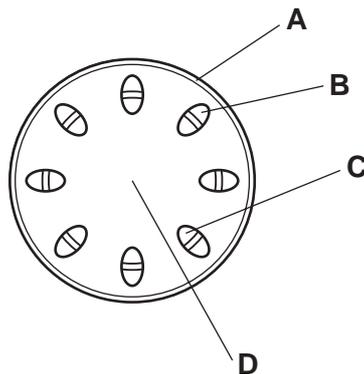
- 13 A young, active woman requires more of which constituent in her diet than a young, active man?
- A fat
 - B iron
 - C protein
 - D vitamin C

- 14 Which condition could be caused by a lack of iron?

- A anaemia
- B cholera
- C scurvy
- D diabetes

- 15 The diagram shows part of a section through a plant stem.

Which tissue transports water from the roots to the leaves?



- 16 Petroleum jelly is waterproof and transparent.

Covering the underside of the leaves of a plant with a thin layer of petroleum jelly will slow down the rate of water loss from the plant.

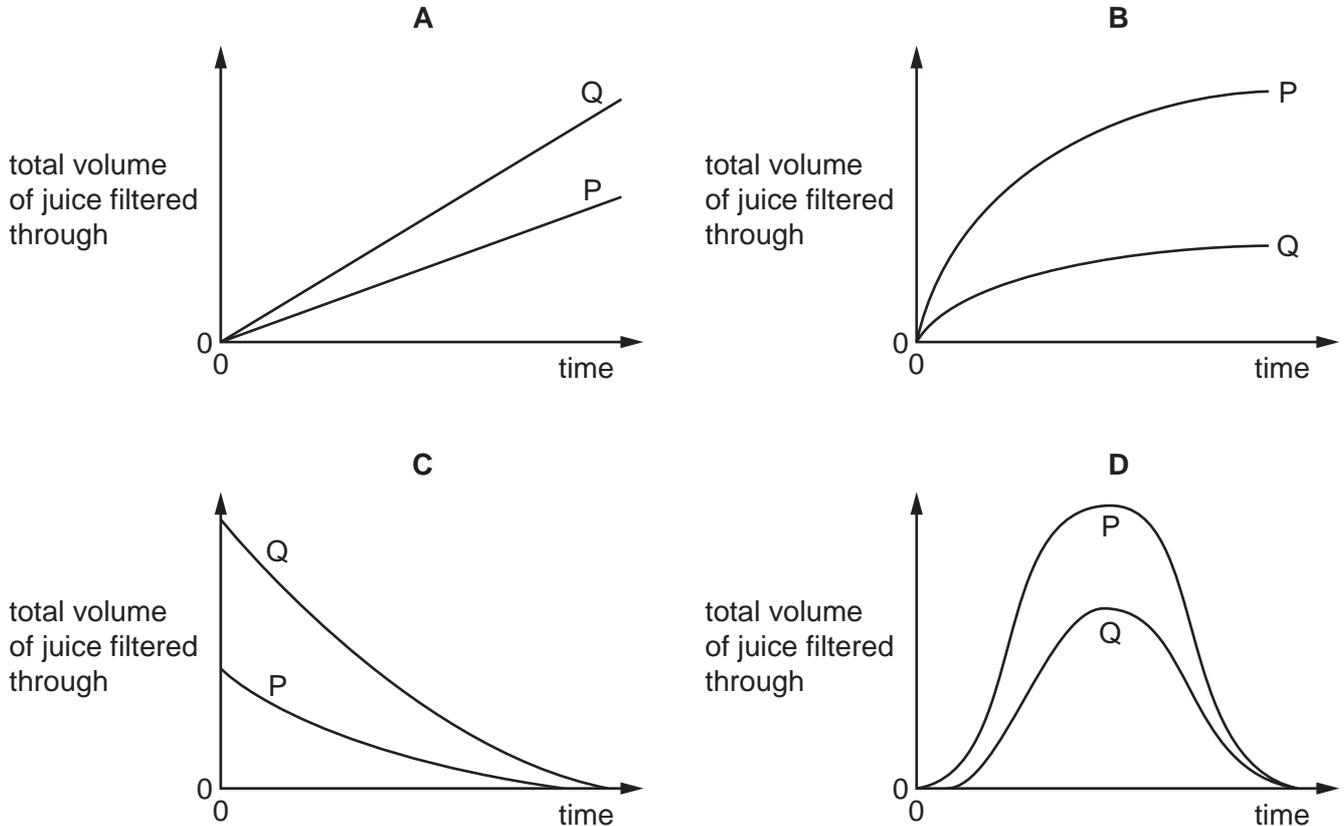
Which statement explains this?

- A Plants absorb nutrients from the petroleum jelly.
- B Plants absorb water from the petroleum jelly.
- C Stomata are blocked by the petroleum jelly.
- D The petroleum jelly stops photosynthesis.

- 17 A student places two samples of crushed apple into two beakers, P and Q. The samples are of equal size. She adds 5 cm^3 of pectinase solution to beaker P and 5 cm^3 of water to beaker Q.

After five minutes, she places the samples of crushed apple into two different filter funnels, and measures the volume of juice filtering through from each sample over a period of 10 minutes.

Which graph shows her results?



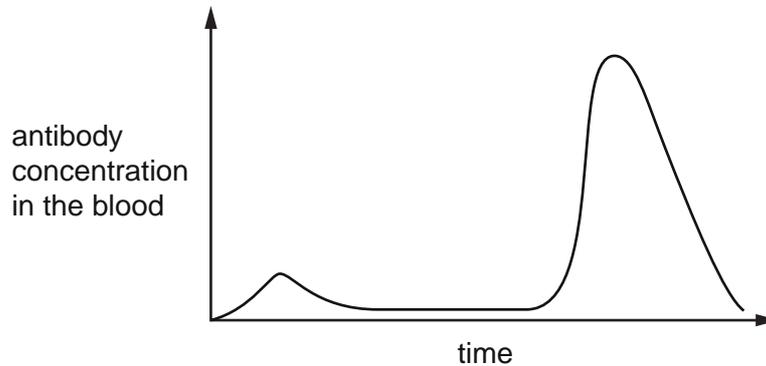
- 18 During the process of blood clotting, damage to blood vessels stimulates L, and M is converted to N.

What are L, M and N?

	L	M	N
A	fibrin	platelets	fibrinogen
B	fibrinogen	platelets	fibrin
C	platelets	fibrin	fibrinogen
D	platelets	fibrinogen	fibrin

- 19 A child is vaccinated against measles. After a period of time the child is infected with the measles virus.

The graph shows the concentration of measles antibodies in the child's bloodstream during this time.



Which statement is consistent with the information in the graph?

- A After the vaccination, the child produced memory cells.
 B The child had passive immunity against measles.
 C The measles virus contains antibodies.
 D The vaccination failed to protect the child against measles.
- 20 Muscles are responsible for the ventilation of the lungs during breathing.

Which row describes their action during the inspiration of air?

	diaphragm muscles	external intercostal muscles	internal intercostal muscles
A	contract	contract	relax
B	contract	relax	contract
C	relax	contract	relax
D	relax	relax	contract

- 21 Yeast is able to respire both aerobically and anaerobically.

Which statement describes the waste products of yeast respiration?

- A Aerobic respiration produces alcohol as one of its waste products.
 B Aerobic respiration produces three times as much carbon dioxide as anaerobic respiration from one molecule of glucose.
 C Anaerobic respiration and aerobic respiration both produce the same amount of carbon dioxide from one molecule of glucose.
 D Anaerobic respiration produces three times as much carbon dioxide as aerobic respiration from one molecule of glucose.

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22 The table shows the presence or absence of chemicals in solution in different parts of a healthy kidney.

Which row is correct?

	chemical	blood plasma in glomerulus	fluid entering kidney tubule	fluid in ureter
A	glucose	✓	x	x
B	protein	✓	✓	✓
C	salts	✓	x	x
D	urea	✓	✓	✓

key

✓ = present

x = absent

23 Four processes occur when impulses cross a synapse.

P neurotransmitter diffuses across the gap

Q neurotransmitter binds with receptors

R impulse stimulates vesicles

S release of neurotransmitter

What is the correct sequence for these processes?

A P → R → Q → S

B R → P → Q → S

C R → S → P → Q

D S → Q → R → P

24 Which hormone is involved in the conversion of glucose to glycogen?

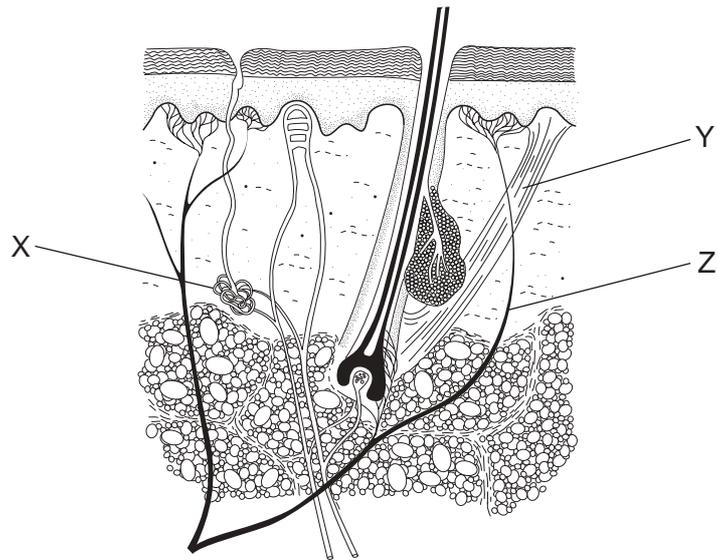
A adrenaline

B insulin

C oestrogen

D testosterone

25 The diagram shows the structure of human skin.

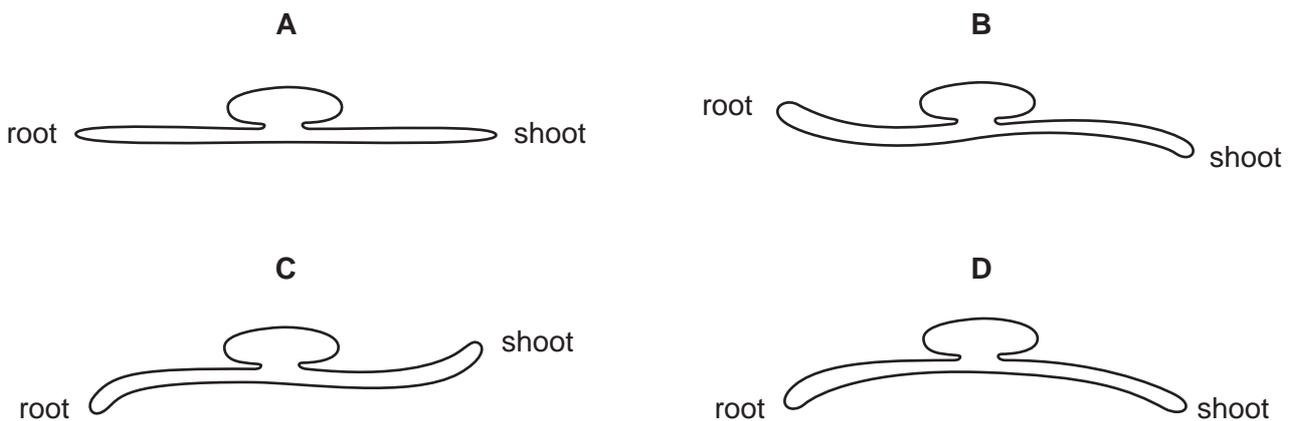


What are X, Y and Z?

	X	Y	Z
A	receptor	sensory neurone	sweat gland
B	sensory neurone	hair erector muscle	receptor
C	sweat gland	hair erector muscle	sensory neurone
D	sweat gland	receptor	blood vessel

26 A seedling was placed in a horizontal position.

Which diagram shows the result of the gravitropic responses in the seedling?



27 Which hormone may be used to improve sporting performance?

- A FSH
- B LH
- C oestrogen
- D testosterone

28 Specific grape varieties are maintained using stem cuttings from mature plants that are then planted and cultivated to produce grapes. This is an example of artificial asexual reproduction.

What is a disadvantage of using asexual reproduction to produce fruit?

- A An outbreak of disease will affect the whole crop in the same way.
- B Genetically identical fruit is produced relatively quickly.
- C No pollination or pollinators are required.
- D The characteristics of the grapes will vary between plants.

29 Which two statements are correct for the process of cross-pollination in plants?

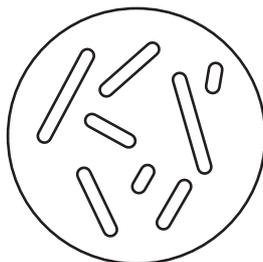
- 1 increases potential for variation in offspring
- 2 pollen is transferred to a different flower on the same plant
- 3 reduces potential to respond to environmental change
- 4 pollen is transferred to a flower on a different plant of the same species

- A 1 and 2 B 1 and 4 C 2 and 3 D 3 and 4

30 What is a function of the mitochondria in a sperm cell?

- A penetrating the surface of the egg cell
- B propelling the sperm towards the egg
- C storing food energy
- D supplying the energy for movement

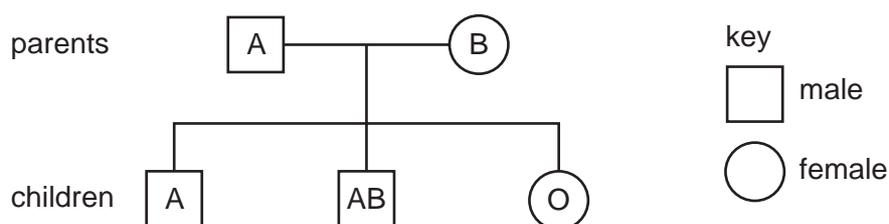
- 31 The diagram shows the chromosomes in the nucleus of a body cell in an adult fruit fly.



What are the diploid and haploid number of chromosomes in the fruit fly?

	diploid	haploid
A	4	8
B	8	4
C	8	16
D	16	8

- 32 The diagram shows the phenotypes for blood groups in a family.



Which statement about the genotypes of the parents is correct?

- A** Both parents have alleles for blood group A and B.
B Both parents have the allele for blood group O.
C Only the father has the allele for blood group O.
D Only the mother has the allele for blood group O.
- 33 Sickle-cell anaemia is a genetic disorder which results in severe illness in homozygous individuals. In some human populations being heterozygous can be beneficial.

What could be the reason for this?

- A** Heterozygous individuals are not affected by the disorder.
B Heterozygous individuals are more resistant to malaria.
C It is caused by a dominant allele.
D The disorder is sex-linked.

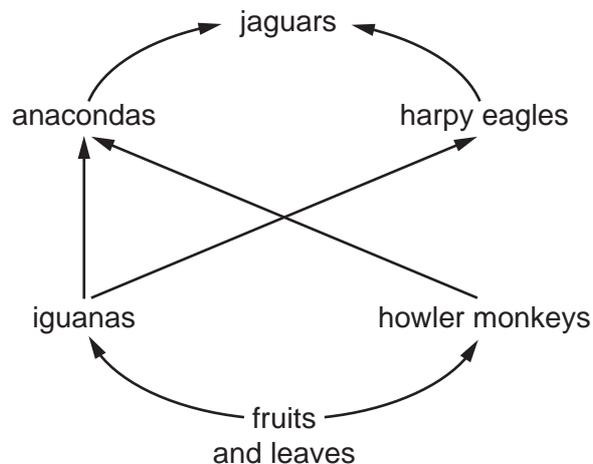
- 34 Which statement describes the relationship between evolution and natural selection?
- A A change in the adaptive features of a population over time causes evolution, resulting in natural selection.
 - B Evolution causes a change in the adaptive features of a population over time, resulting in natural selection.
 - C Evolution causes natural selection, resulting in a change in the adaptive features of a population over time.
 - D Evolution is the change in the adaptive features of a population over time as a result of natural selection.

- 35 The diagram shows a food chain.

maize → locusts → lizards → snakes
 10 000 kJ 1 000 kJ 100 kJ 10 kJ

What is the efficiency of energy transfer between the maize and the lizards in this food chain?

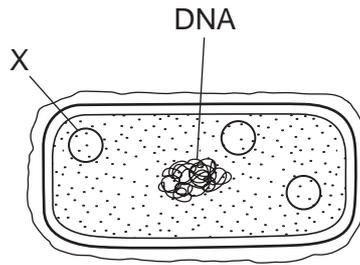
- A 0.01%
 - B 0.1%
 - C 1%
 - D 10%
- 36 The diagram shows part of a food web from a rainforest.



In this food web, at which trophic level are the anacondas?

- A primary consumers
- B secondary consumers
- C tertiary consumers
- D quaternary consumers

37 The diagram shows the structure of a bacterial cell.



The presence of structure X in the bacterial cell is one reason why bacteria are used in genetic engineering.

What is structure X?

- A endoplasmic reticulum
- B mitochondria
- C plasmid
- D ribosome

38 What does *Penicillium* need to grow in a fermenter?

	amino acids	carbohydrates	oxygen
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

39 Deforestation can have a negative impact on the environment.

Which statement about the negative impact of deforestation is correct?

- A decreases the levels of carbon dioxide which can lead to reduced rates of photosynthesis
- B decreases the amount of water flowing in local rivers so there is less flooding
- C leads to soil loss so there is less fertile soil for the growth of crops in the area
- D provides less land for the extraction of natural resources

40 When nitrates enter a lake they cause rapid growth of algae on the surface of the water. This causes the following changes in the lake:

- 1 a decrease in the concentration of dissolved oxygen in the water
- 2 fish and other aquatic animals die
- 3 an increase in aerobic respiration by decomposers
- 4 producers die and decomposition increases

In which order do these changes occur?

- A** 1 → 2 → 4 → 3
- B** 3 → 1 → 2 → 4
- C** 4 → 2 → 3 → 1
- D** 4 → 3 → 1 → 2

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BIOLOGY

0610/22

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 is recommended)

* 1 7 5 1 7 1 8 7 5 6 *

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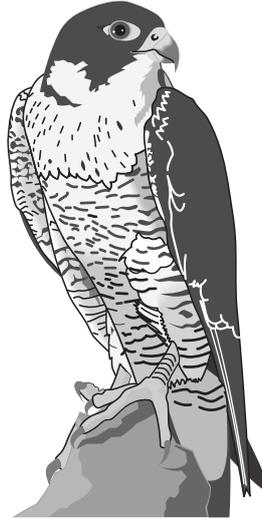
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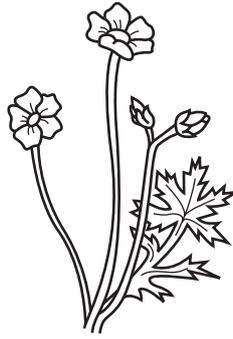
- 1 Which organisms carry out respiration, growth, movement and excretion?
- A all animals and all plants
 - B animals only
 - C arthropods and flowering plants only
 - D plants only
- 2 The diagram shows an animal whose scientific name is *Falco peregrinus*.



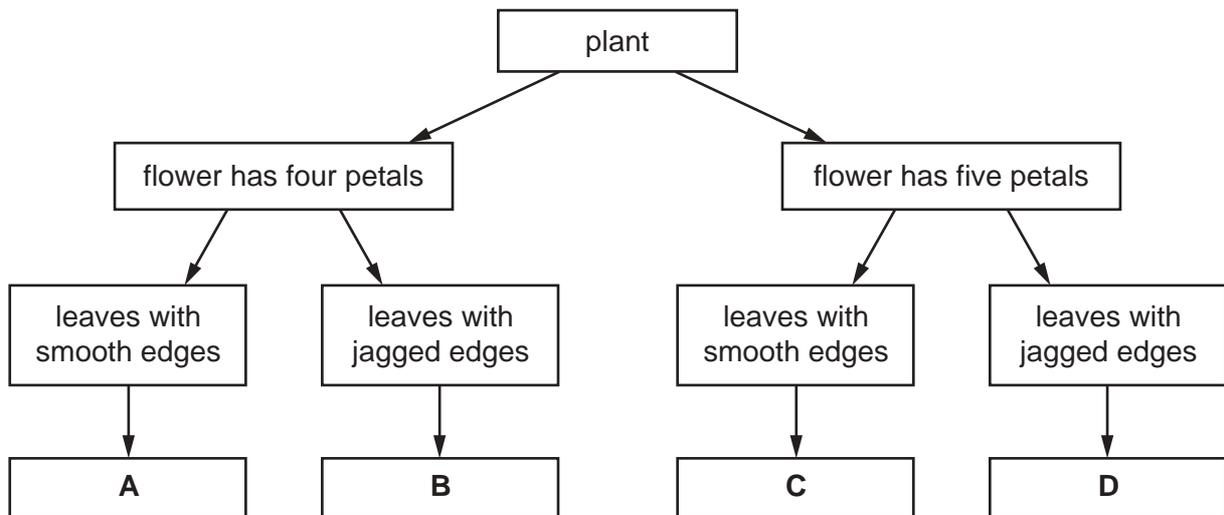
To which species does it belong?

- A bird
 - B *F. peregrinus*
 - C *Falco*
 - D vertebrate
- 3 What kind of skin do amphibians have?
- A dry without scales
 - B dry with scales
 - C moist without scales
 - D moist with scales

4 The diagram shows a flowering plant.



Use the key to identify the plant.



5 In which part of the cell does aerobic respiration occur?

- A cytoplasm
- B mitochondrion
- C ribosome
- D vesicle

6 Why do some root cells have root hairs?

- A for the maintenance of the temperature of the cell sap
- B to increase the surface area of the cells
- C to increase the volume of the cell sap
- D to provide a place for cell nuclei

7 The table shows the concentration of gases in a blood vessel and in an alveolus.

Which row shows the conditions that cause a gas produced in respiration to diffuse from the blood vessel into the alveolus?

	gas produced	concentration in the blood vessel	concentration in the alveolus
A	carbon dioxide	low	high
B	carbon dioxide	high	low
C	oxygen	low	high
D	oxygen	high	low

8 Which part of a plant root hair is partially permeable?

- A** the cell sap
- B** the cell surface membrane
- C** the cell vacuole
- D** the cell wall

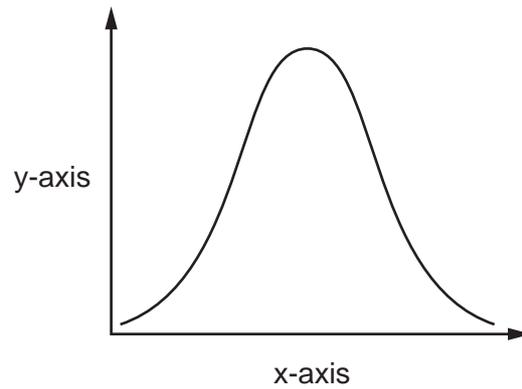
9 The table shows the results of food tests carried out on a fruit.

test	Benedict's	biuret	ethanol	iodine
result	positive	positive	negative	negative

What did the fruit contain?

- A** fat and reducing sugar
- B** fat and starch
- C** protein and reducing sugar
- D** protein and starch

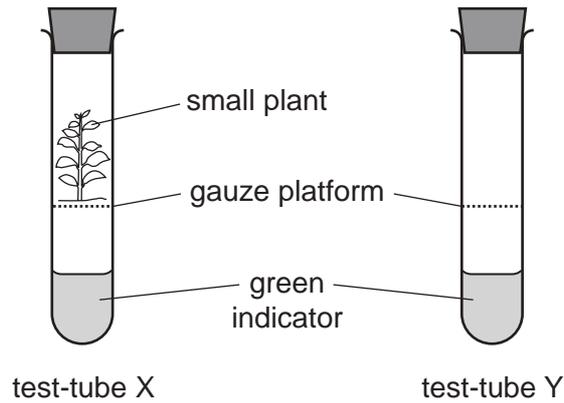
- 10 An experiment was carried out to investigate the effect of pH on enzyme action. The graph shows the results.



What are the labels for the x-axis and the y-axis?

	x-axis	y-axis
A	pH	rate of reaction
B	pH	time
C	rate of reaction	pH
D	time	pH

11 An experiment is set up as shown.



The green indicator turns yellow when the concentration of carbon dioxide increases. The green indicator turns blue when the concentration of carbon dioxide decreases.

After several hours, the indicator in test-tube X turned blue. The indicator in test-tube Y remained green.

Which process caused the colour change?

- A germination
- B photosynthesis
- C respiration
- D transpiration

12 Why do plants need nitrate ions?

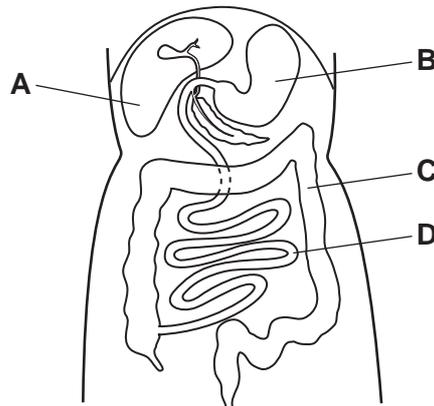
- A for making amino acids
- B for making fatty acids
- C for making glucose
- D for making starch

13 In which part of the alimentary canal do chemical digestion and mechanical digestion take place?

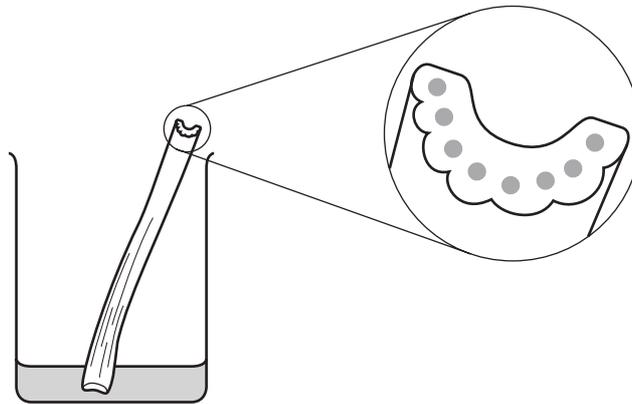
- A colon
- B duodenum
- C mouth
- D oesophagus

14 The diagram shows part of the alimentary canal.

Where is most water absorbed?



15 A celery stalk was placed in a beaker which contained a red stain. After 24 hours, the red stain appeared at the top of the celery stalk.



Which structures stained red?

- A cortex cells
- B mesophyll cells
- C phloem
- D xylem

16 A student is investigating the effect of temperature on the rate of transpiration.

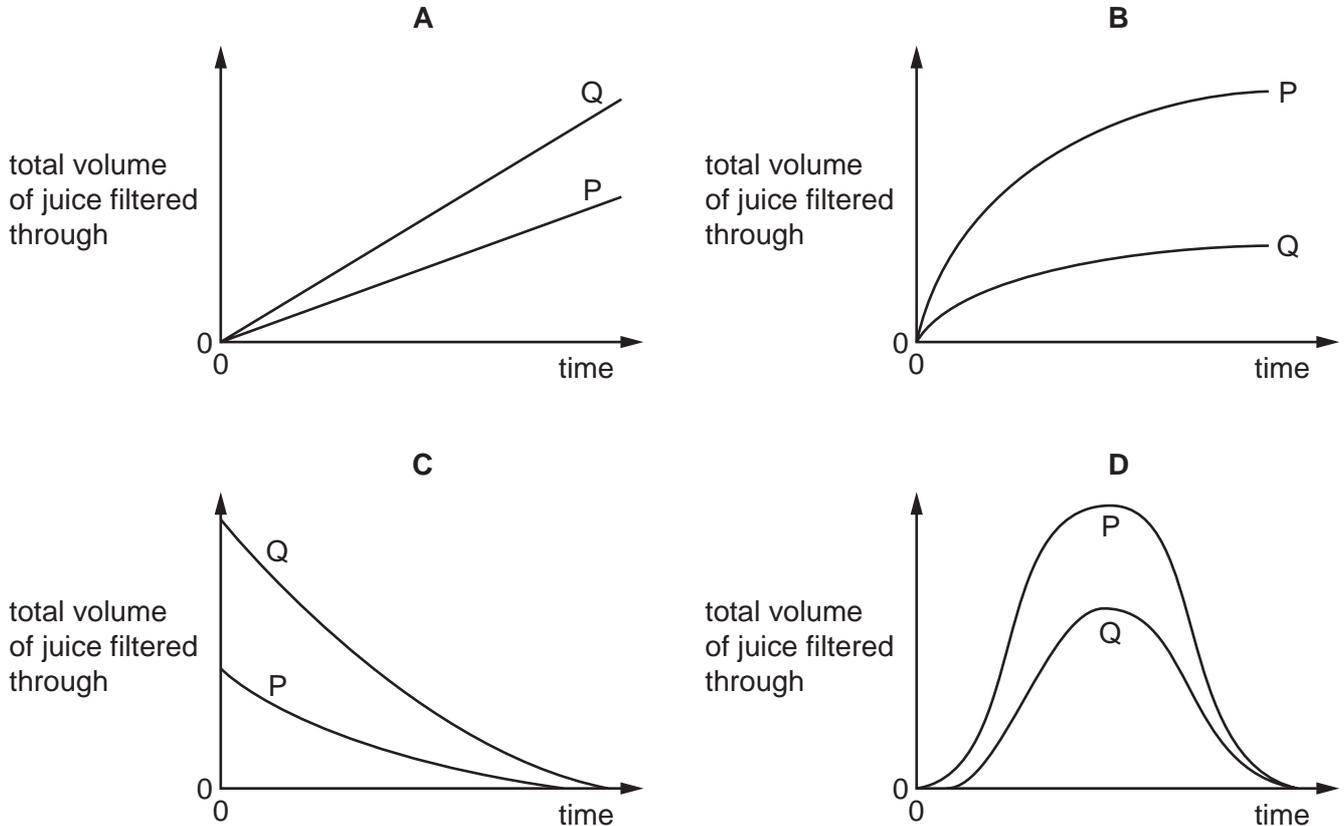
Which environmental conditions should be kept constant during this investigation?

	humidity	light intensity	temperature	wind speed
A	✓	✓	✓	✓
B	✓	✓	x	✓
C	x	✓	x	✓
D	x	x	✓	x

- 17 A student places two samples of crushed apple into two beakers, P and Q. The samples are of equal size. She adds 5 cm^3 of pectinase solution to beaker P and 5 cm^3 of water to beaker Q.

After five minutes, she places the samples of crushed apple into two different filter funnels, and measures the volume of juice filtering through from each sample over a period of 10 minutes.

Which graph shows her results?



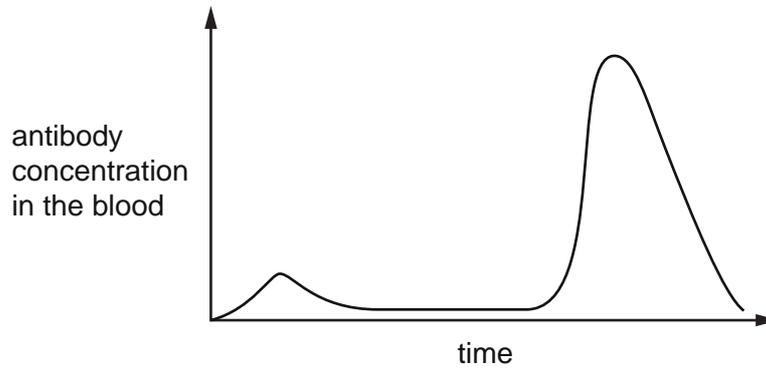
- 18 During the process of blood clotting, damage to blood vessels stimulates L, and M is converted to N.

What are L, M and N?

	L	M	N
A	fibrin	platelets	fibrinogen
B	fibrinogen	platelets	fibrin
C	platelets	fibrin	fibrinogen
D	platelets	fibrinogen	fibrin

- 19 A child is vaccinated against measles. After a period of time the child is infected with the measles virus.

The graph shows the concentration of measles antibodies in the child's bloodstream during this time.



Which statement is consistent with the information in the graph?

- A After the vaccination, the child produced memory cells.
 - B The child had passive immunity against measles.
 - C The measles virus contains antibodies.
 - D The vaccination failed to protect the child against measles.
- 20 Muscles are responsible for the ventilation of the lungs during breathing.

Which row describes their action during the inspiration of air?

	diaphragm muscles	external intercostal muscles	internal intercostal muscles
A	contract	contract	relax
B	contract	relax	contract
C	relax	contract	relax
D	relax	relax	contract

21 Aerobic respiration involves the break down of glucose.



Which values for x, y and z balance the equation?

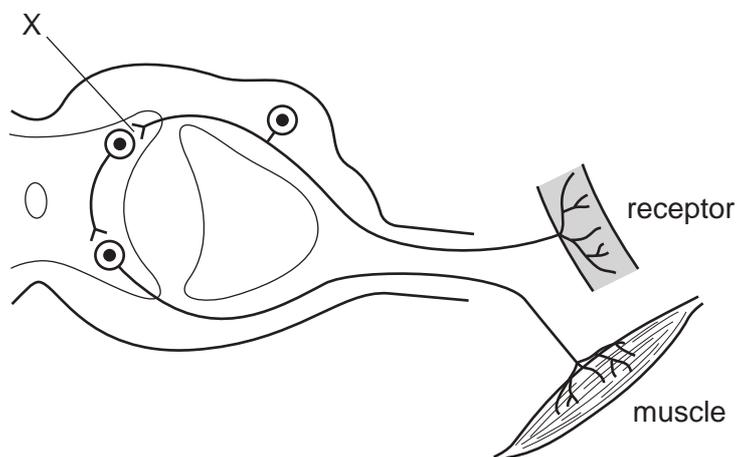
	x	y	z
A	6	4	6
B	6	6	6
C	6	12	6
D	12	12	12

22 The composition of the blood in the renal vein is different to the composition of the blood in the renal artery.

What substance has a higher concentration in the renal vein than in the renal artery?

- A** carbon dioxide
- B** glucose
- C** oxygen
- D** urea

23 The diagram shows the structures in a reflex arc.



What is X?

- A** effector
- B** relay neurone
- C** sensory neurone
- D** synapse

24 Which row describes accommodation when viewing a near object?

	ciliary muscles	suspensory ligaments	lens shape
A	contracted	slackened	more spherical
B	contracted	tight	more spherical
C	relaxed	slackened	less spherical
D	relaxed	tight	more spherical

25 Hormones and the nervous system both control our bodies.

Which statement about the control provided by our hormones is correct?

- A** fast response and long lasting
- B** fast response and short lived
- C** slow response and long lasting
- D** slow response and short lived

26 Which row describes heroin?

	type of drug	location of effect
A	depressant	blood
B	depressant	synapses
C	stimulant	blood
D	stimulant	synapses

27 What is an advantage, for an organism, of using asexual reproduction?

- A** Disease spreads rapidly.
- B** It does not cause variation.
- C** It easily adapts to environmental change.
- D** Population increases rapidly.

28 The diploid number in *Ovis aries* (sheep) is 54.

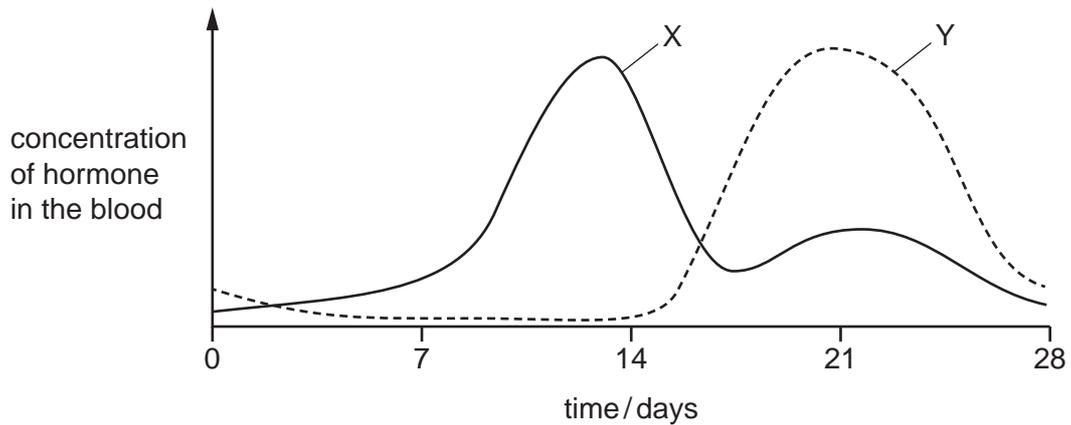
How many chromosomes will there be in a zygote of this species?

- A** 0
- B** 27
- C** 54
- D** 108

29 Which adaptive feature of sperm provides the energy that enables it to swim?

- A the acrosome
- B the cell membrane
- C the flagellum
- D the mitochondria

30 Two hormones, X and Y, are secreted by the ovaries. The graph shows the concentrations of these hormones in the blood during one complete menstrual cycle.



What are hormones X and Y?

	hormone X	hormone Y
A	FSH	LH
B	LH	FSH
C	oestrogen	progesterone
D	progesterone	oestrogen

31 The mitotic index of a tissue is the percentage of cells in a tissue that are undergoing division.

The table shows the number of cells in two tissue samples, X and Y.

tissue sample	number of cells undergoing mitosis	number of cells not undergoing mitosis	total number of cells in the tissue sample
X	25	55	80
Y	15	95	110

Which statement is correct?

- A Tissue X is growing faster with a mitotic index of 31.3%.
- B Tissue X is growing faster with a mitotic index of 45.4%.
- C Tissue Y is growing faster with a mitotic index of 13.6%.
- D Tissue Y is growing faster with a mitotic index of 15.8%.

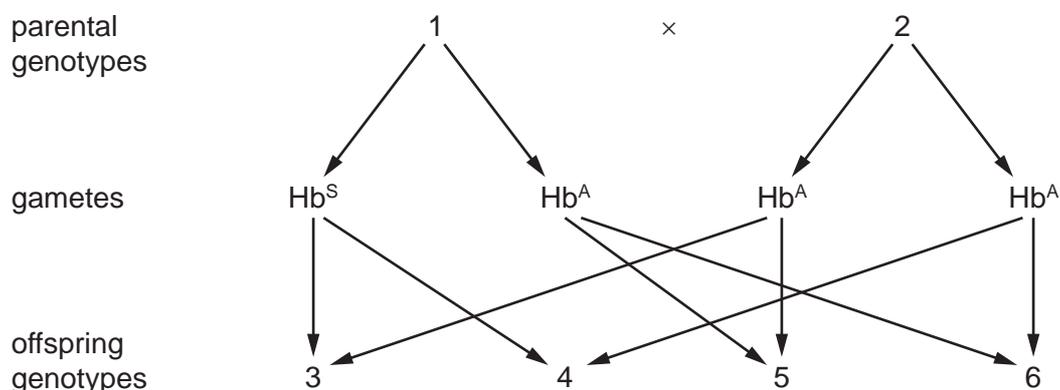
32 Some features of cell division are listed.

- 1 haploid cells are produced
- 2 new cells are genetically identical
- 3 reduction division
- 4 results in variation

Which features would be associated with meiosis?

- A 1, 2 and 3 B 1, 2 and 4 C 1, 3 and 4 D 2, 3 and 4

33 Sickle-cell anaemia is an inherited disease.



Which genotypes represented in the diagram would increase an individual's resistance to malaria?

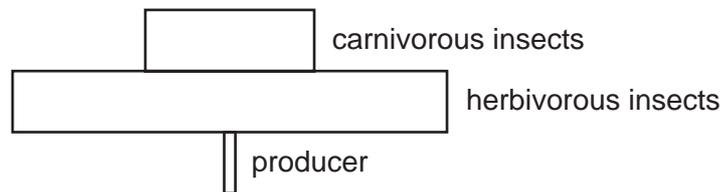
- A 1, 3 and 4 B 1, 4 and 5 C 2, 3 and 4 D 2, 5 and 6

34 Fitness is defined as the probability of an organism1..... and2..... in the environment in which it is found.

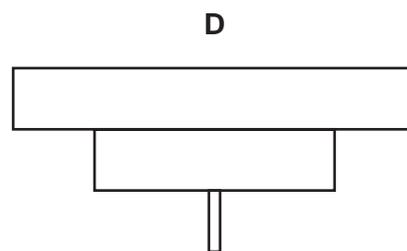
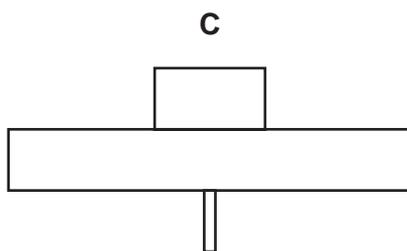
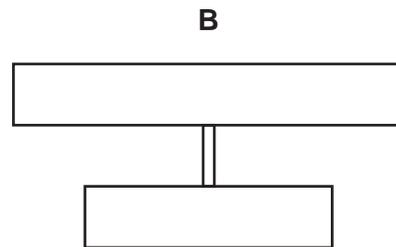
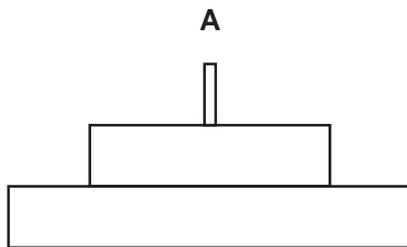
Which words correctly complete gaps 1 and 2?

	1	2
A	photosynthesising	respiring
B	reproducing	respiring
C	surviving	reproducing
D	surviving	photosynthesising

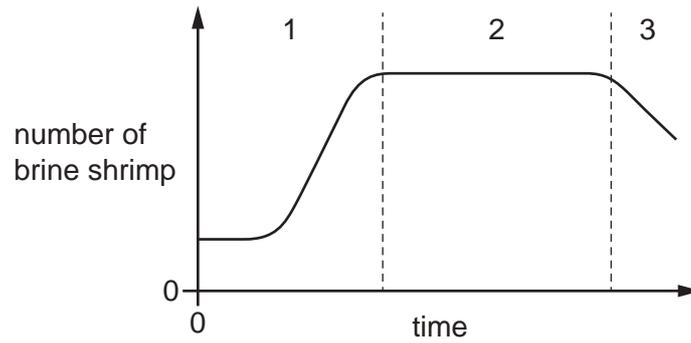
35 A food chain has the pyramid of numbers shown.



What is the pyramid of biomass for the same food chain?



36 The graph shows the changes in a population of brine shrimp over a period of time.



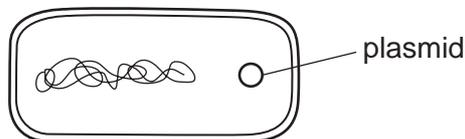
Over which section or sections is the birth rate greater than the death rate?

- A** 1, 2 and 3 **B** 1 and 2 only **C** 1 only **D** 2 only

37 What is a disadvantage of using bacteria to produce human insulin?

- A** few ethical concerns
B genetic code shared with other organisms
C they contain plasmids
D they mutate frequently

38 The diagram shows a bacterial cell containing a plasmid.



What is inserted into the plasmid if this cell is to be used for the production of insulin?

- A** a length of DNA from a human
B a length of DNA from another bacterium
C a molecule of insulin
D an enzyme
- 39 What would be unlikely to increase the risk of human famine?
- A** a rapidly increasing human population
B flooding of land
C lack of rain causing a drought
D the use of pesticides on crops

40 Since 1970 sulfur dioxide emissions have dropped by 95% in some parts of the world.

What is the main reason for the reduction in emissions?

- A fewer coal-powered power stations
- B increase in wind turbines
- C less cars on the road
- D less industry

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BIOLOGY

0610/23

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 is recommended)

* 7 5 3 9 9 7 8 9 5 6 *

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.

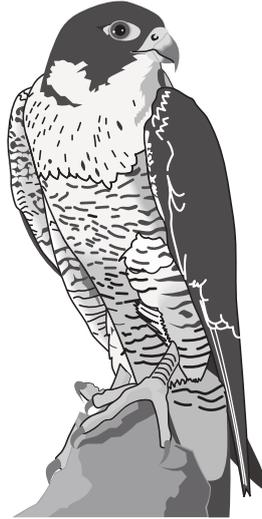
Any rough working should be done in this booklet.

Electronic calculators may be used.

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.

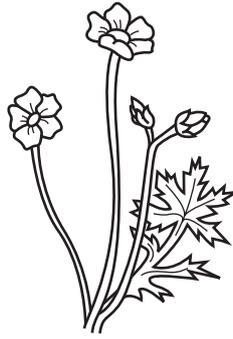
- 1 Which organisms carry out respiration, growth, movement and excretion?
- A all animals and all plants
 - B animals only
 - C arthropods and flowering plants only
 - D plants only
- 2 The diagram shows an animal whose scientific name is *Falco peregrinus*.



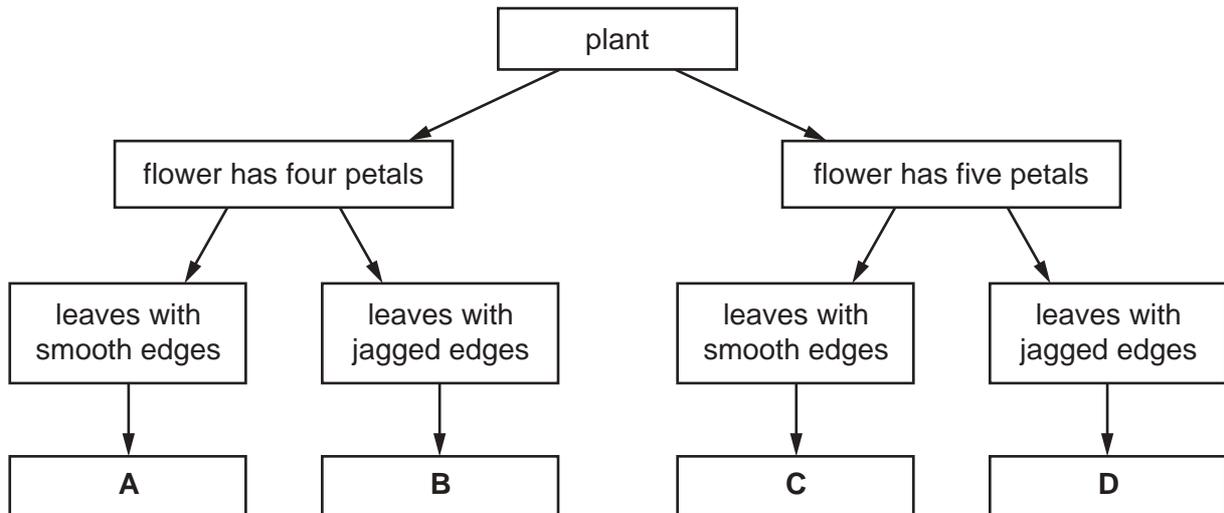
To which species does it belong?

- A bird
 - B *F. peregrinus*
 - C *Falco*
 - D vertebrate
- 3 What kind of skin do amphibians have?
- A dry without scales
 - B dry with scales
 - C moist without scales
 - D moist with scales

4 The diagram shows a flowering plant.



Use the key to identify the plant.



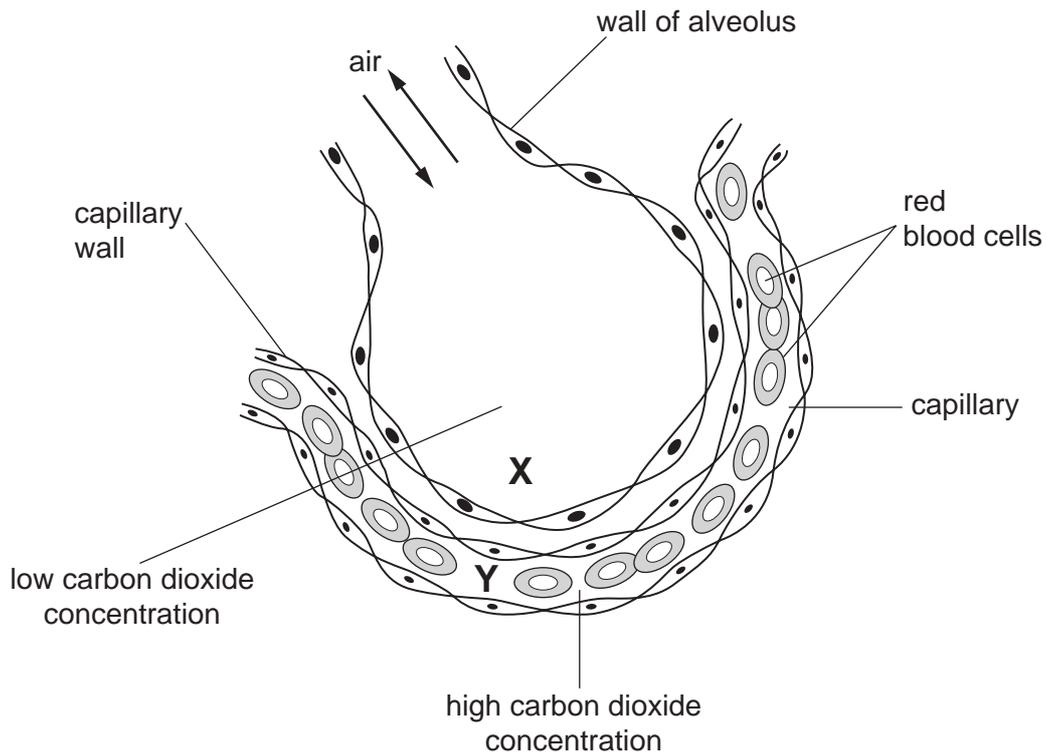
5 In which part of the cell does aerobic respiration occur?

- A cytoplasm
- B mitochondrion
- C ribosome
- D vesicle

6 Why do some root cells have root hairs?

- A for the maintenance of the temperature of the cell sap
- B to increase the surface area of the cells
- C to increase the volume of the cell sap
- D to provide a place for cell nuclei

7 The diagram shows a section through an alveolus and through a capillary.



How does carbon dioxide move from **Y** to **X**?

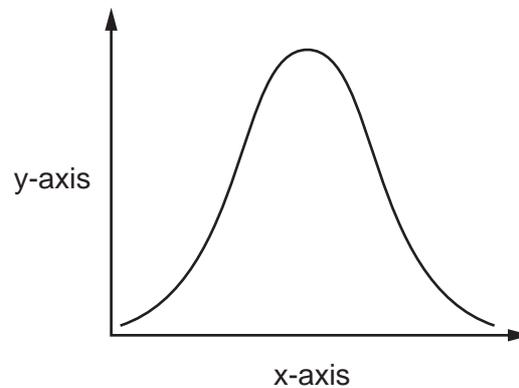
- A by diffusion
 - B by osmosis
 - C by translocation
 - D by transpiration
- 8 Which part of a plant root hair is partially permeable?
- A the cell sap
 - B the cell surface membrane
 - C the cell vacuole
 - D the cell wall

- 9 The table shows the results of food tests carried out on a fruit.

test	Benedict's	biuret	ethanol	iodine
result	positive	positive	negative	negative

What did the fruit contain?

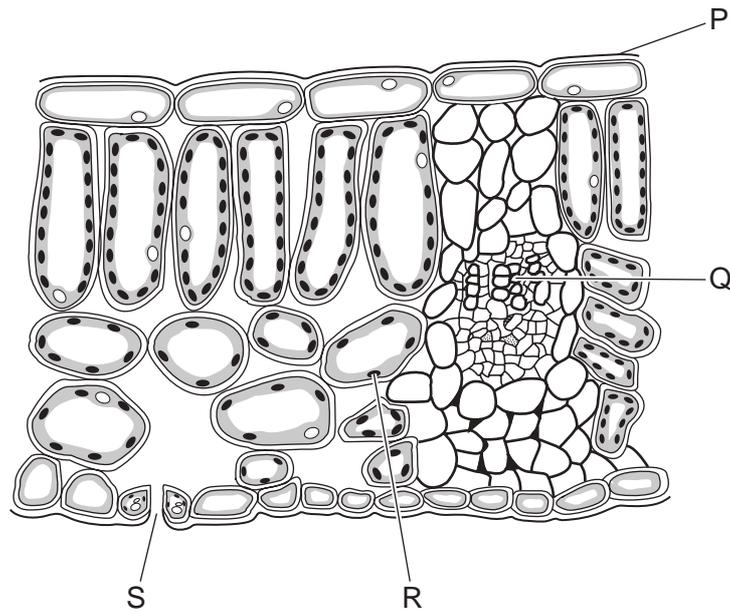
- A** fat and reducing sugar
B fat and starch
C protein and reducing sugar
D protein and starch
- 10 An experiment was carried out to investigate the effect of pH on enzyme action. The graph shows the results.



What are the labels for the x-axis and the y-axis?

	x-axis	y-axis
A	pH	rate of reaction
B	pH	time
C	rate of reaction	pH
D	time	pH

11 The diagram shows a section through a leaf.



What are structures P, Q, R and S?

	P	Q	R	S
A	chloroplast	phloem	palisade tissue	xylem
B	cuticle	xylem	chloroplast	stoma
C	phloem	palisade tissue	cuticle	stoma
D	xylem	chloroplast	phloem	cuticle

12 A lack of which dietary component can result in constipation?

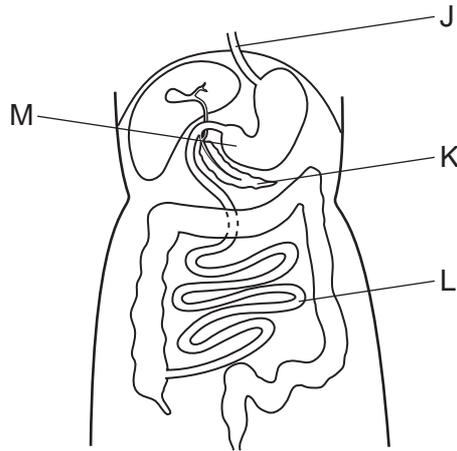
- A** fat
- B** fibre (roughage)
- C** carbohydrate
- D** protein

13 A woman requires more calcium in her diet when she is pregnant.

Which statement explains why?

- A** bone growth in the fetus
- B** muscle growth in the fetus
- C** production of haemoglobin in the fetus
- D** to provide energy for the fetus

14 The diagram shows part of the alimentary canal.



Which row correctly identifies the structures labelled J to M?

	J	K	L	M
A	oesophagus	pancreas	small intestine	stomach
B	pancreas	small intestine	stomach	oesophagus
C	small intestine	stomach	oesophagus	pancreas
D	stomach	oesophagus	pancreas	small intestine

15 The diagram shows the pathway of water from the soil through a plant.

soil → X → Y → Z → mesophyll cells

Which cells are represented by X, Y and Z?

	X	Y	Z
A	root hair cells	root cortex cells	xylem
B	root hair cells	xylem	root cortex cells
C	xylem	root cortex cells	root hair cells
D	xylem	root hair cells	root cortex cells

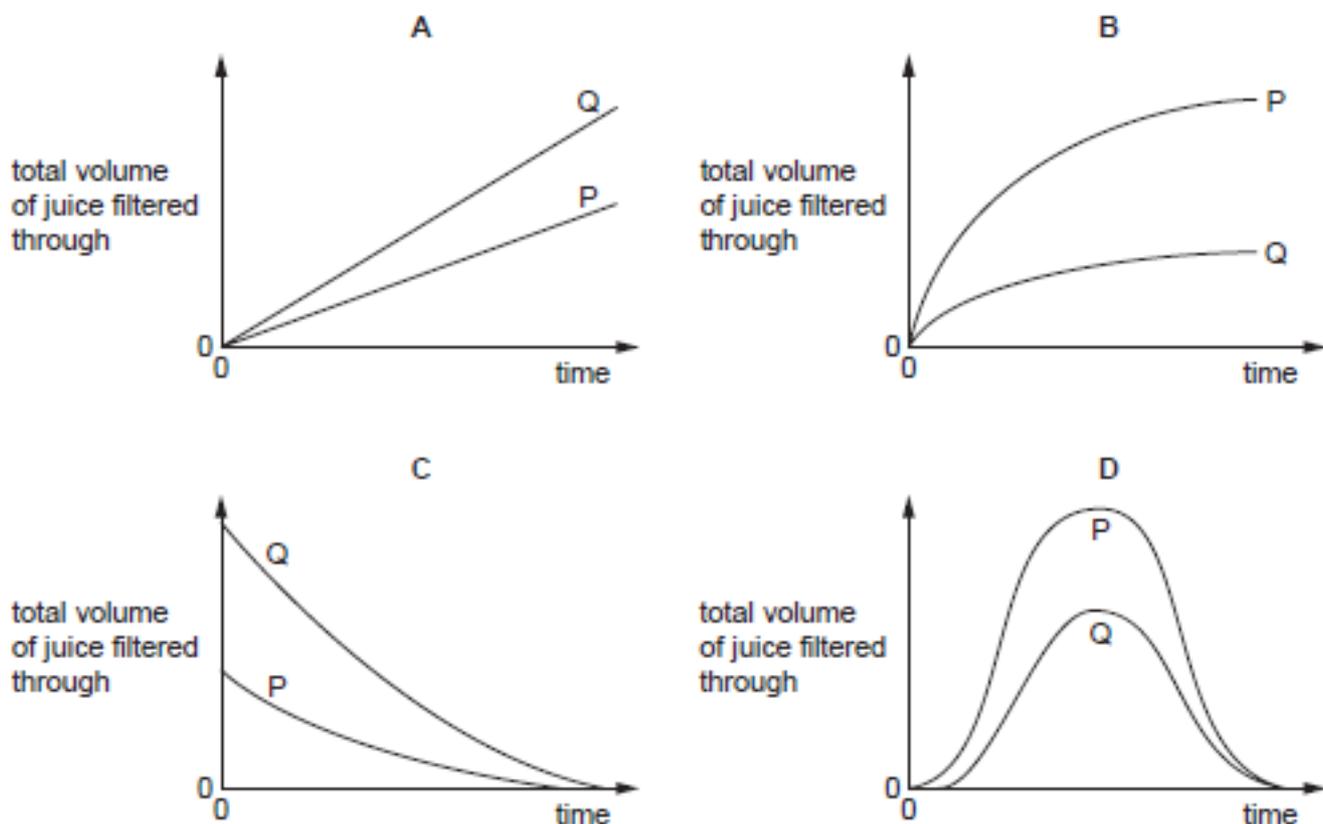
16 What will **not** affect the rate of transpiration?

- A** humidity of the atmosphere
- B** number of open stomata
- C** rate of respiration
- D** temperature

- 17 A student places two samples of crushed apple into two beakers, P and Q. The samples are of equal size. She adds 5 cm^3 of pectinase solution to beaker P and 5 cm^3 of water to beaker Q.

After five minutes, she places the samples of crushed apple into two different filter funnels, and measures the volume of juice filtering through from each sample over a period of 10 minutes.

Which graph shows her results?



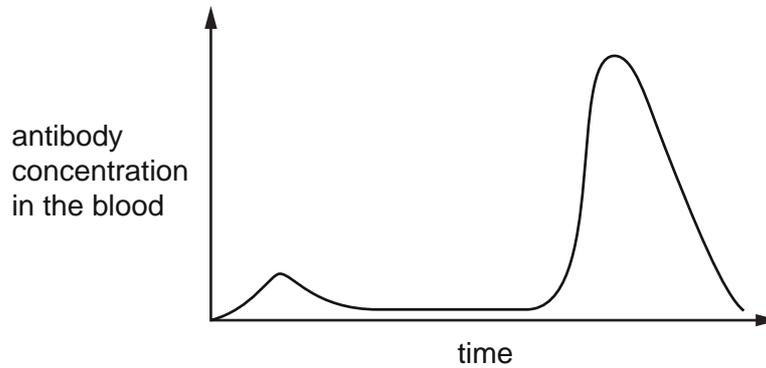
- 18 During the process of blood clotting, damage to blood vessels stimulates L, and M is converted to N.

What are L, M and N?

	L	M	N
A	fibrin	platelets	fibrinogen
B	fibrinogen	platelets	fibrin
C	platelets	fibrin	fibrinogen
D	platelets	fibrinogen	fibrin

- 19 A child is vaccinated against measles. After a period of time the child is infected with the measles virus.

The graph shows the concentration of measles antibodies in the child's bloodstream during this time.



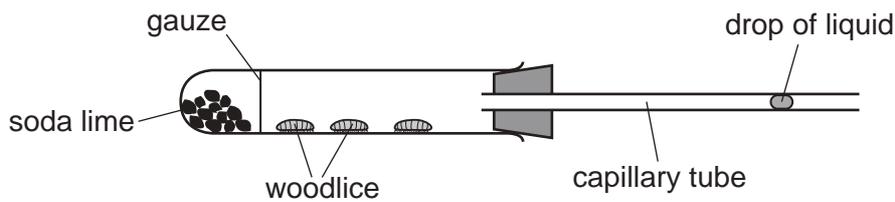
Which statement is consistent with the information in the graph?

- A After the vaccination, the child produced memory cells.
 - B The child had passive immunity against measles.
 - C The measles virus contains antibodies.
 - D The vaccination failed to protect the child against measles.
- 20 Muscles are responsible for the ventilation of the lungs during breathing.

Which row describes their action during the inspiration of air?

	diaphragm muscles	external intercostal muscles	internal intercostal muscles
A	contract	contract	relax
B	contract	relax	contract
C	relax	contract	relax
D	relax	relax	contract

21 A student investigated aerobic respiration.

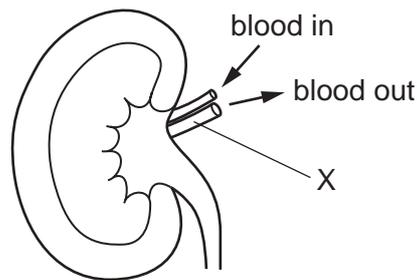


Soda lime absorbs carbon dioxide.

If the woodlice are respiring aerobically, what will happen to the drop of liquid?

- A It will move towards the woodlice as oxygen is used up and carbon dioxide is released.
- B It will move away from the woodlice as oxygen is used up and carbon dioxide is released.
- C It will not move as carbon dioxide is used up and oxygen is released.
- D It will not move as oxygen is used up and carbon dioxide is released.

22 The diagram shows a kidney and associated structures.



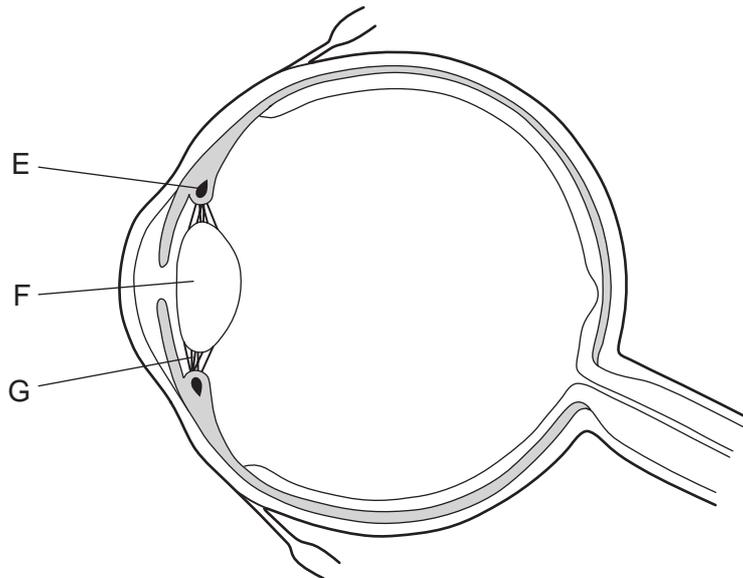
What is the name of structure X?

- A pulmonary artery
- B pulmonary vein
- C renal artery
- D renal vein

23 What is the correct sequence in a reflex action?

- A receptor → stimulus → motor neurone → relay neurone → sensory neurone → effector
- B receptor → stimulus → sensory neurone → relay neurone → motor neurone → effector
- C stimulus → receptor → motor neurone → relay neurone → sensory neurone → effector
- D stimulus → receptor → sensory neurone → relay neurone → motor neurone → effector

24 The diagram shows the cross-section of an eye.



Which statement is true when a person views a near object?

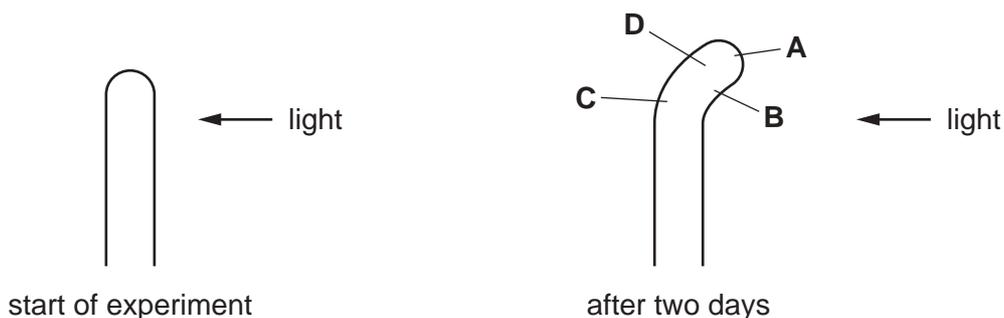
- A E contracts; G is pulled less; F bulges less; more refraction of light takes place
- B E contracts; G is pulled less; F bulges more; more refraction of light takes place
- C E relaxes; G is pulled less; F bulges less; less refraction of light takes place
- D E relaxes; G is pulled more; F bulges more; less refraction of light takes place

25 Compared to the hormonal system, the responses of the nervous system are

- A faster and of longer-duration.
- B faster and of shorter-duration.
- C slower and of longer-duration.
- D slower and of shorter-duration.

26 In an experiment to investigate phototropism, a plant shoot is grown with light coming from one side only.

After two days, in which region has the greatest rate of growth occurred?



27 Crop plants produced by asexual reproduction are identical. This can be a disadvantage.

Which statements describe disadvantages?

- 1 Crop plants are produced rapidly.
- 2 A disease could kill all of the plants.
- 3 Only one parent is needed.
- 4 The plants cannot adapt to environmental changes.

A 1 and 2 B 1 and 3 C 2 and 4 D 3 and 4

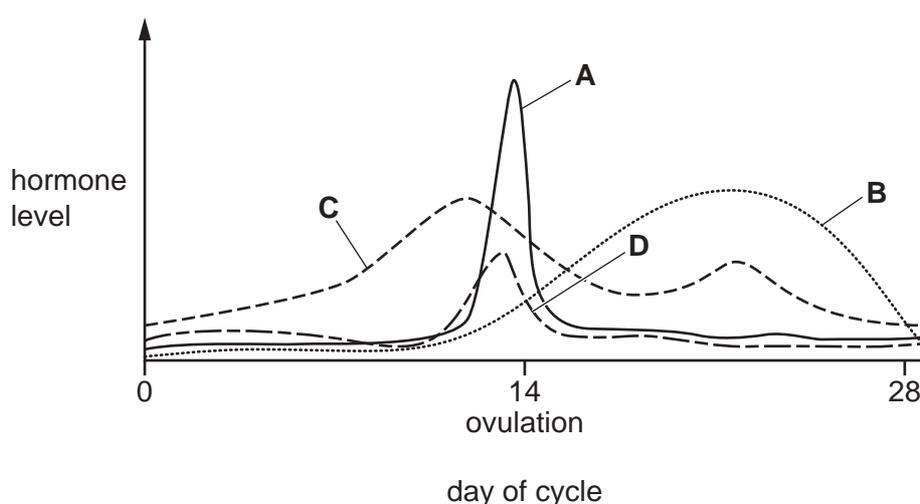
28 The table shows some features of artificial insemination and in-vitro fertilisation.

Which row shows the features that are correct for **both** artificial insemination and in-vitro fertilisation?

	fertilisation happens outside the female reproductive system	implantation happens outside the female reproductive system	involves sexual intercourse	pregnancy develops naturally after implantation
A	✓	✓	x	x
B	✓	x	x	✓
C	x	x	✓	x
D	x	x	x	✓

29 The graph shows the concentration of four hormones during the menstrual cycle.

Which line represents progesterone?



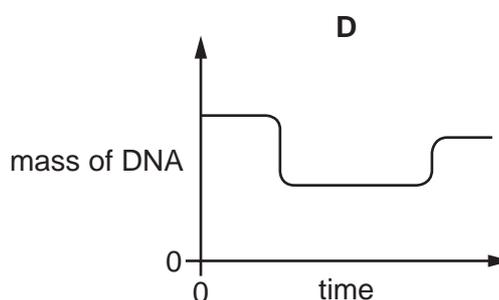
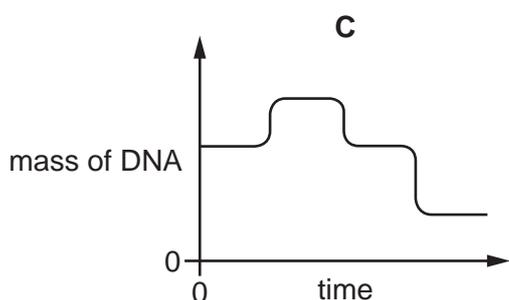
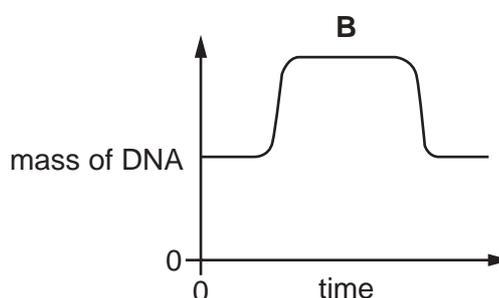
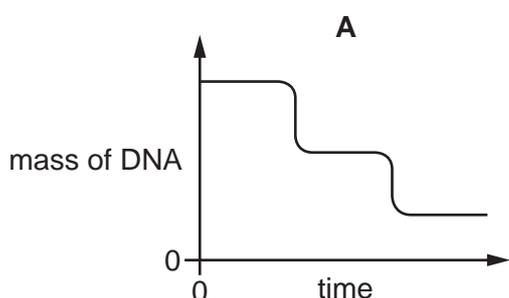
30 Cystic fibrosis is an inherited disease. The allele for cystic fibrosis is recessive.

A woman is heterozygous and her partner is homozygous dominant.

What is true of any children they produce?

- A All of their children will have cystic fibrosis.
- B There is a one in two chance of being heterozygous.
- C There is a one in four chance of being heterozygous.
- D There is no chance of having the cystic fibrosis allele.

31 Which graph shows the correct change in mass of DNA in one cell during cell division by mitosis?



32 Cell X contains 16 chromosomes. It divides by meiosis.

How many chromosomes do each of the new cells contain?

- A 4 B 8 C 16 D 32

33 Which statement about blood groups in humans is correct?

- A They are determined by genes and the environment.
- B They are determined only by the environment.
- C They are determined only by genes.
- D They show continuous variation.

34 Plants are adapted to survive in different environments.

Which are features of xerophytes?

	cuticle	number of stomata
A	thick	few
B	thick	many
C	thin	few
D	thin	many

35 In which form is nitrogen taken up by the roots of plants?

- A** as amino acids
- B** as nitrate ions
- C** as protein
- D** as urea

36 What is a community?

- A** a unit containing all the organisms in a given area, and their environment, interacting together
- B** a unit in which energy is transferred from one organism to the next
- C** all of the populations of different species in an ecosystem
- D** all the organisms of one species in a given area

37 Which feature of bacteria makes it possible for them to be used to produce human insulin?

- A** Bacteria possess plasmids.
- B** Bacteria possess exactly the same DNA base sequences as humans.
- C** Bacteria possess the same genes for insulin.
- D** Bacteria possess the same number of chromosomes as humans.

38 In some areas, farmers who grow genetically modified (GM) corn have to make sure there is a gap between GM and non-GM crops.

What is the reason for leaving a gap between the crops?

- A** so they can get large machinery into the fields
- B** to prevent cross-pollination between GM and non-GM crops
- C** to prevent disease spreading between crops
- D** to prevent pests attacking crops

39 How does eutrophication lead to the death of aquatic organisms?

- A** algae not releasing enough oxygen
- B** algae respiring instead of photosynthesising
- C** decomposer bacteria lowering oxygen concentration in the water
- D** poisoning due to carbon dioxide accumulation in the water

40 What is an example of sustainable development?

- A** burning more fossil fuels to provide more energy
- B** catching more fish to feed a growing population
- C** clearing tropical forest to plant large areas of oil palm plants
- D** selective felling of forest trees for timber and replanting cleared areas

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BIOLOGY

0610/31

Paper 3 Theory (Core)

May/June 2018

1 hour 15 minutes

Candidates answer on the Question Paper.

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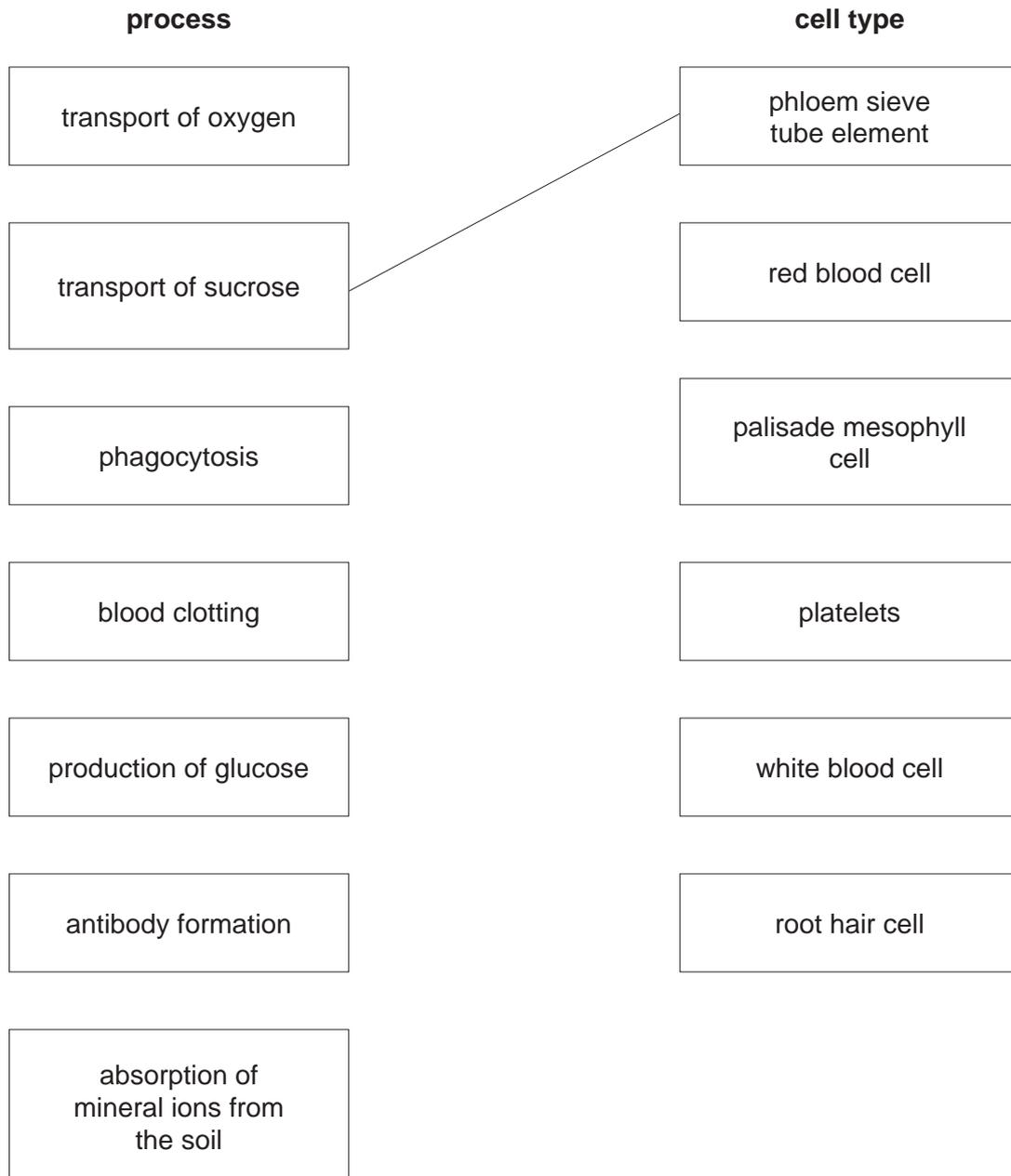
- 1 (a) The boxes on the left describe processes carried out by cells.

The boxes on the right contain the names of the cells that carry out these processes.

Draw **one** straight line from each box on the left to a box on the right to link the process to the cell type.

Draw **six** lines.

An example has been done for you.



[6]

(b) Fig. 1.1 shows a section through part of a leaf.

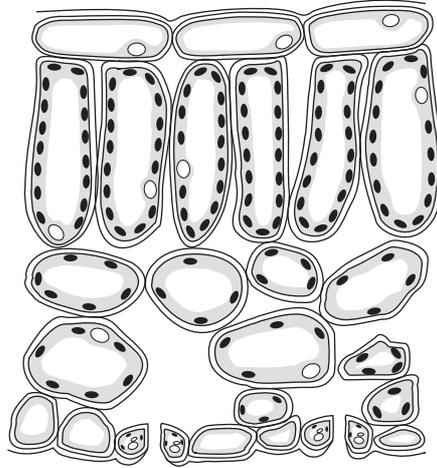


Fig. 1.1

(i) On Fig. 1.1 draw:

- a label line to identify one guard cell and label it **G**
- a label line to identify one of the stomata and label it **S**.

[2]

(ii) State **one** function of stomata.

.....

..... [1]

[Total: 9]

2 (a) Define the term *sexual reproduction*.

.....

.....

.....[3]

(b) Fig. 2.1 shows some organs in the body of a man.

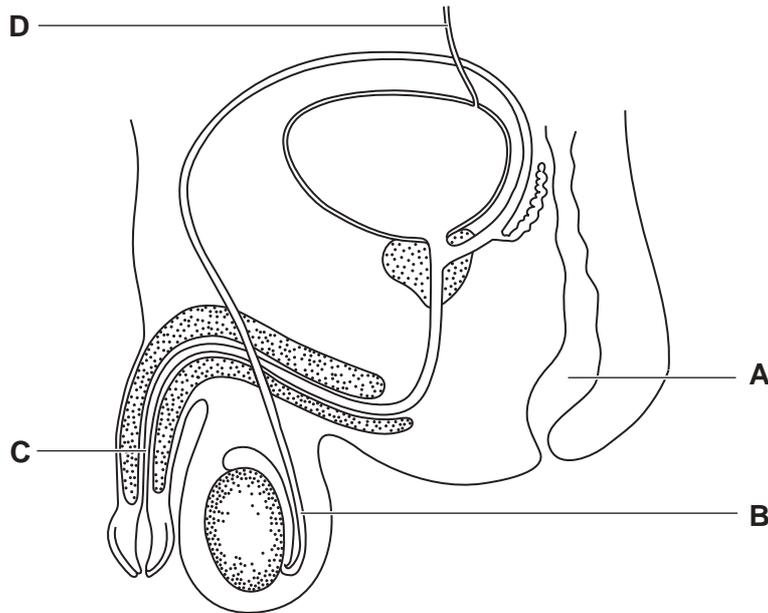


Fig. 2.1

(i) Complete Table 2.1 by writing in the names of the parts labelled **A** to **D** in Fig. 2.1.

Table 2.1

letter on Fig. 2.1	name of part	name of the substance or substances transported
A		faeces
B		sperm
C		sperm and urine
D		urine

[4]

(ii) On Fig. 2.1 draw a label line to the prostate gland and label it **P**. [1]

(c) State the function of the scrotum.

.....
.....
.....[1]

[Total: 9]

3 This question is about neurones and reflex actions.

Choose words from the list to complete the sentences.

Each word may be used once, more than once, or not at all.

endocrine **fast** **impulses**
motor **nervous** **receptor** **sensory**
slow **stimuli** **synapses**

Neurones are cells that are part of the system.

There are three types of neurone involved in a simple reflex action: a sensory neurone, a relay neurone and a neurone.

The nerves conduct electrical These are transmitted from one neurone to the next at junctions called

A reflex action is automatic, co-ordinated and

[5]

[Total: 5]

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4 (a) Respiration releases energy.

Write the word equation for aerobic respiration.

..... [2]

(b) Fig. 4.1 shows the average daily energy requirement of different groups of males and females.

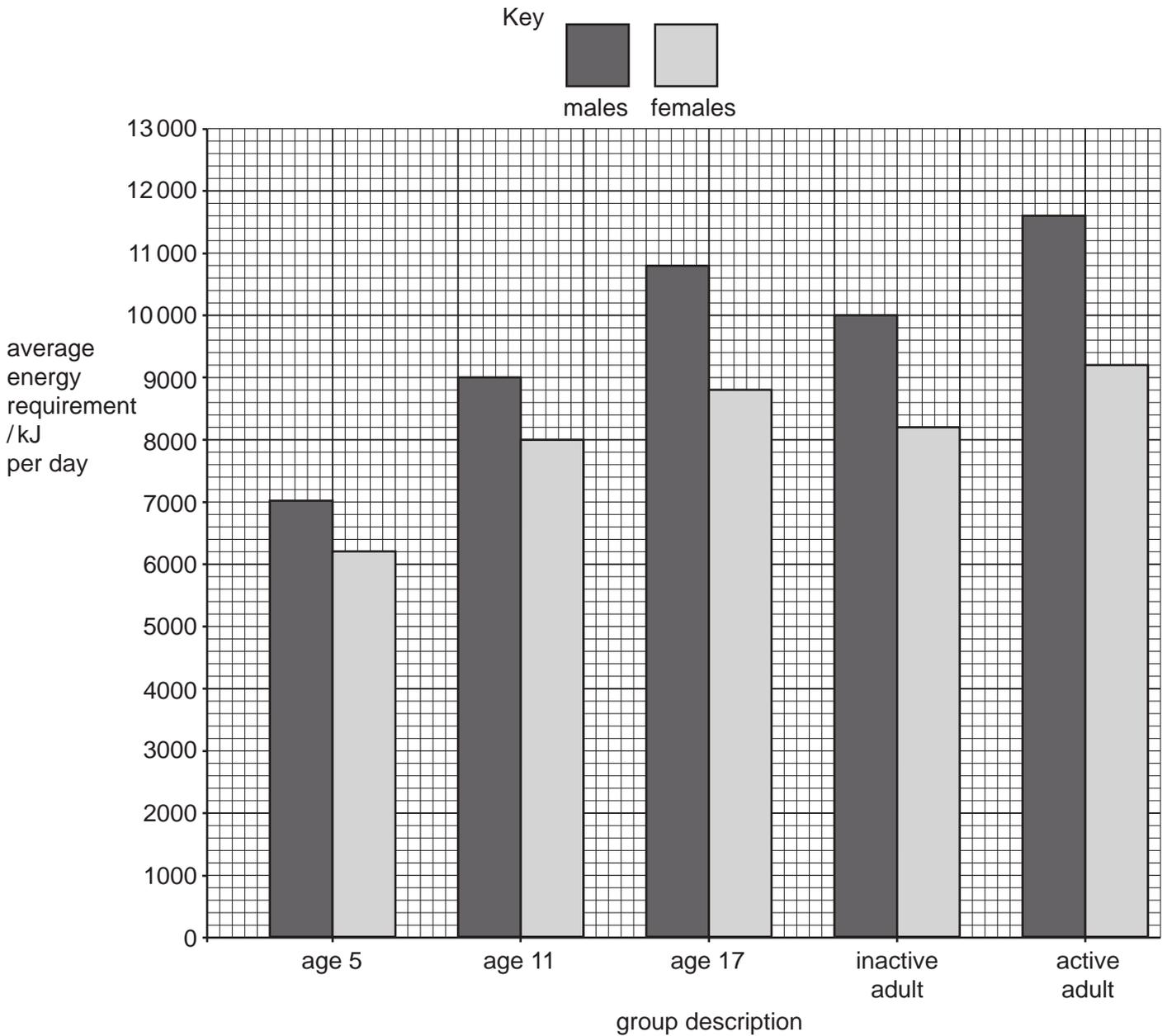


Fig. 4.1

(i) State the average energy requirement of a five-year-old female.

..... kJ per day
[1]

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(ii) An eleven-year-old male received only 8000 kJ per day for four months.

Use the data in Fig. 4.1 to suggest **two** ways this could affect him.

1

2

[2]

(c) Use the data in Fig. 4.1 to make **three** comparisons between the energy requirements of individuals aged 17 years and adults.

1

.....

2

.....

3

.....

[3]

(d) Yeast cells can respire anaerobically.

Biotechnology makes use of this.

State **two** ways that the products of anaerobic respiration in yeast are used by humans.

1

.....

2

.....

[2]

[Total: 10]

(ii) State **one** way in which endangered species can be conserved.

.....
.....
.....[1]

[Total: 10]

7 Fig. 7.1 shows sections of two flowers, **K** and **L**, from the same species.

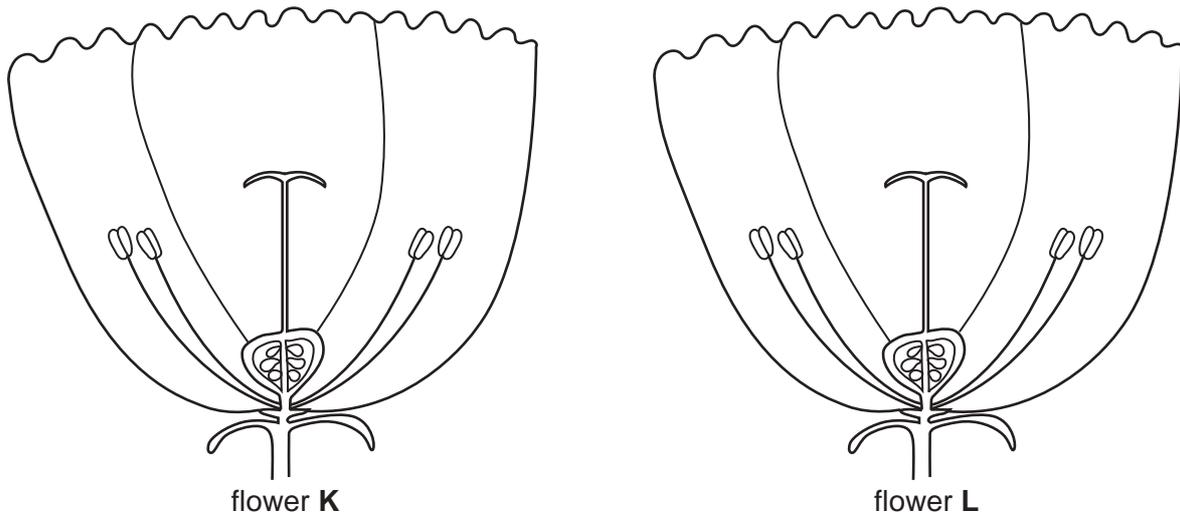


Fig. 7.1

(a) (i) On flower **L** in Fig. 7.1, identify and label an ovule and a petal. [2]

(ii) State the names of the parts in Fig. 7.1 that:
 produce ovules
 protect the bud of the flower [2]

(b) On Fig. 7.1, draw an arrow to represent the transfer of pollen from flower **K** to flower **L** during pollination. [2]

(c) A student said, "*Flowers **K** and **L** are pollinated by insects.*"
 Describe **two** structures in flowers **K** and **L** that support this statement.
 Use features that are visible in Fig. 7.1.
 1

 2
 [2]

- 8 During digestion enzymes act on different types of food to produce simpler substances that can be absorbed.

Complete Table 8.1 by inserting the missing information.

Table 8.1

food type	enzyme acting on the food type	simpler substances produced
protein	protease	
	amylase	
		fatty acids and glycerol

[5]

[Total: 5]

- 9 In an investigation, the carbon dioxide concentration in the air above a crop of maize plants was measured for 24 hours.

There was no wind blowing during the 24 hours of the investigation.

The results of this investigation are shown in Fig. 9.1.

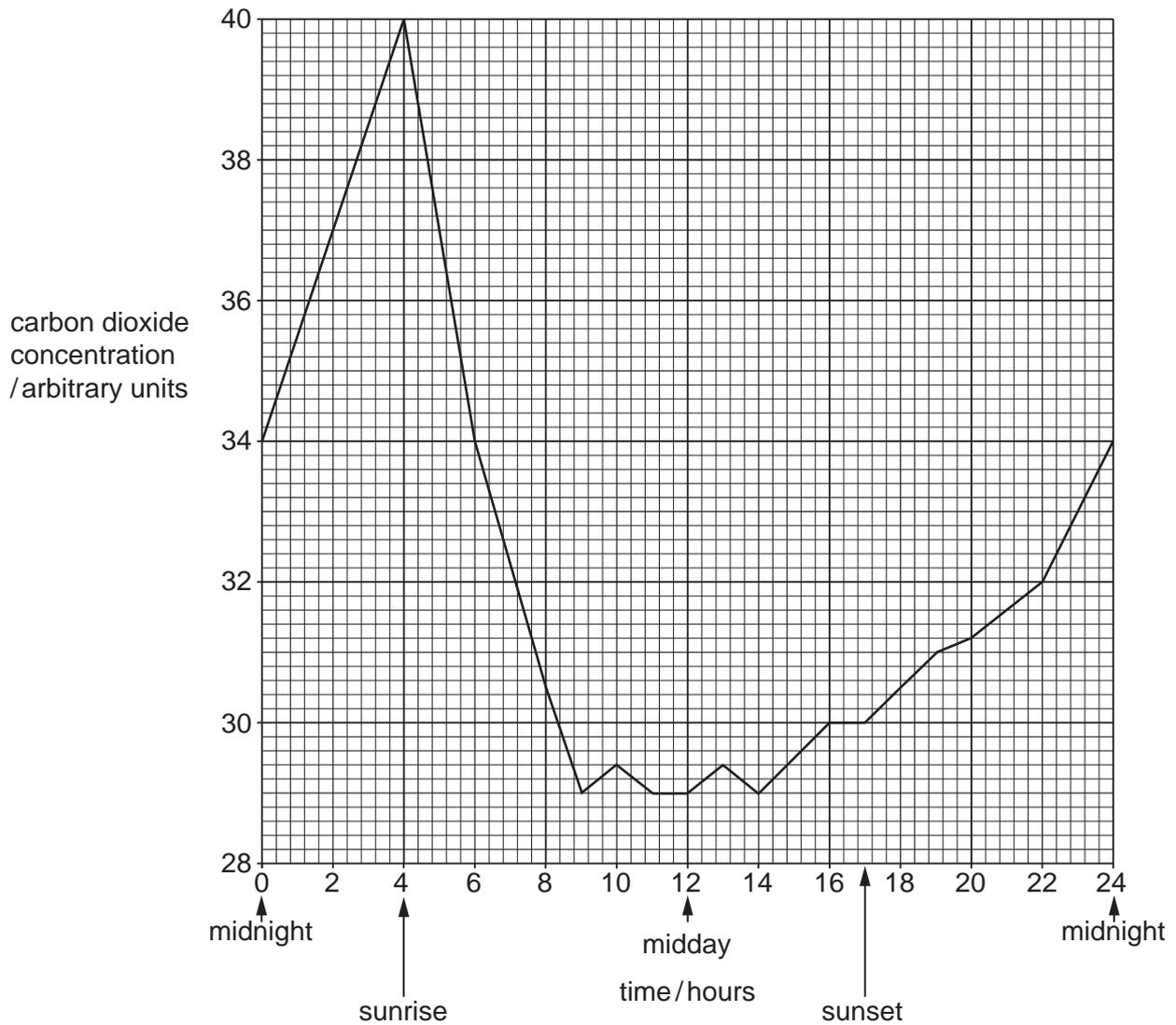


Fig. 9.1

(a) (i) State the **two** times, on Fig. 9.1, at which the carbon dioxide concentration in the air was 37 arbitrary units.

..... [1]

(ii) Calculate the difference in the carbon dioxide concentration in the air between 04:00 (sunrise) and 12:00 (midday) on Fig. 9.1.

Space for working.

.....arbitrary units [1]

(iii) Explain why the concentration of carbon dioxide decreases between 04:00 and 09:00.

.....
.....
.....
.....
.....
.....
.....
.....
..... [3]

(b) State **two** environmental factors that would affect the results of this investigation.

1
2 [2]

[Total: 7]

10 Selective breeding of animals is very important to farmers.

Many different breeds of sheep have been produced by selective breeding.

Fig. 10.1 shows a flock of Merino sheep. This breed of sheep was produced by selective breeding.



Fig. 10.1

(a) Sheep are important animals in many parts of the world as they produce meat, wool and milk.

Table 10.1 describes some characteristics of five different breeds of sheep.

Table 10.1

breed of sheep	wool yield	wool quality	meat yield	milk yield
Arapawa	average	good	poor	average
Awassi	average	poor	average	very good
Blackbelly	poor	poor	very good	average
Merino	good	very good	good	poor
Tsurcana	average	good	average	average

A farmer wants to sell both meat and wool.

Suggest which breed of sheep in Table 10.1 is the most suitable for this farmer.

Give a reason for your choice.

breed of sheep

reason

.....

.....

[2]

- (b) Another farmer wants to produce a new breed of sheep with both a very good milk yield and a very good quality of wool.

The farmer is able to buy any of the breeds of sheep shown in Table 10.1.

Describe the process this farmer would use to produce the new breed of sheep on her farm.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 6]

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0610/32

Paper 3 Theory (Core)

May/June 2018

1 hour 15 minutes

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(c) Sperm contain chromosomes that can become part of a zygote.

(i) Complete the definition of the term *chromosome*.

Use words from the list.

Each word can only be used once or not at all.

- | | | | |
|--------------------|--------------|---------------|-----------------|
| amino acids | cells | DNA | hormones |
| information | genes | nerves | protein |

A chromosome is a thread-like structure of , carrying genetic
..... in the form of [3]

(ii) State **all** the possible sex chromosomes that a normal sperm can contain.

.....[1]

(iii) State **two** ways that sperm are adapted to their function.

- 1
- 2 [2]

[Total: 12]

2 (a) Fig. 2.1 shows a diagram of a leaf.

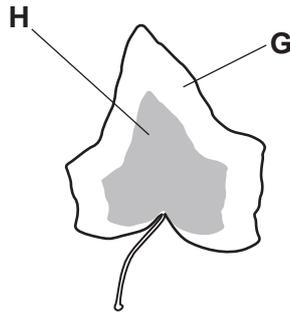


Fig. 2.1

- The part of the leaf labelled **G** contains no chlorophyll and is a white colour.
- The part of the leaf labelled **H** contains chlorophyll and is a green colour.

Glucose produced during photosynthesis is stored in the leaf as starch.

The leaf was boiled in ethanol to remove the chlorophyll. The leaf was then tested for the presence of starch with iodine solution.

(i) Predict the colour of the part of the leaf labelled **G** after iodine solution has been added.
.....[1]

(ii) Predict the colour of the part of the leaf labelled **H** after iodine solution has been added.
.....[1]

(iii) State a conclusion about chlorophyll from this investigation.
.....
.....
.....[1]

(b) A similar leaf was kept in the dark for 24 hours and then tested for the presence of starch.

The leaf contained no starch.

Explain why the leaf contained no starch.

.....
.....
.....[1]

(c) Water is required for the process of photosynthesis.

(i) Describe where **and** how water enters a plant.

.....
.....
.....
.....
.....
.....
.....
.....[3]

(ii) Describe **one** function of water in a plant other than for photosynthesis.

.....[1]

(iii) State the name of the tissue in a plant that transports water.

.....[1]

(iv) State the name of the part of a leaf through which water vapour is lost from the plant.

.....[1]

[Total: 10]

3 (a) Eating food contaminated by bacteria can cause illness.

This type of illness is called food poisoning.

Fig. 3.1 shows the number of cases of food poisoning per 100 000 people in the population in one country.

(i) State the year with the highest number of cases of food poisoning in Fig. 3.1.

.....[1]

(ii) State the number of cases of food poisoning per 100 000 people in the population in the year 1996 in Fig. 3.1.

..... cases per 100 000 people [1]

(iii) Describe the trend in the number of cases of food poisoning between 2003 and 2011 in Fig. 3.1.

.....
.....
.....
.....
.....
.....
.....
.....[3]

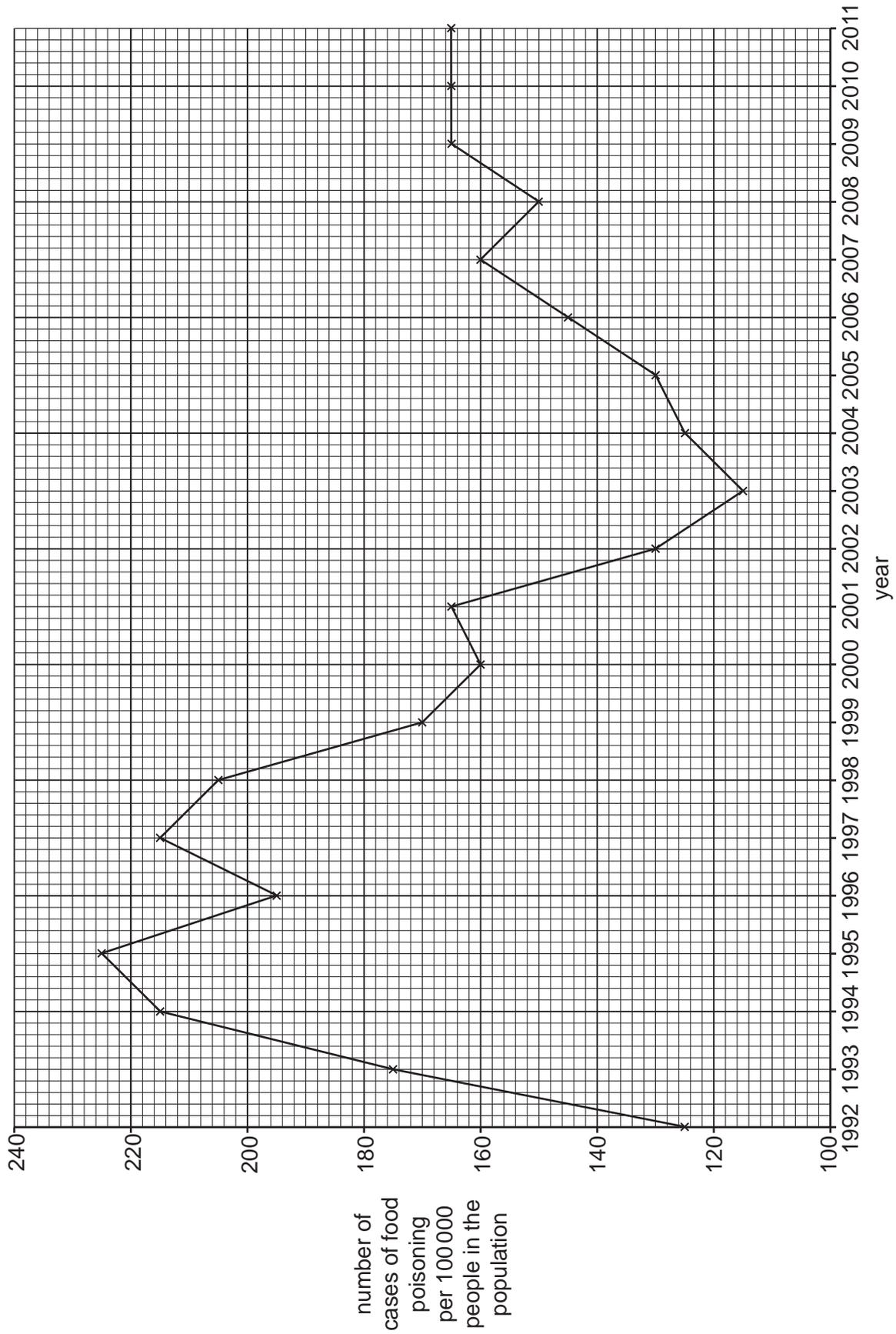


Fig. 3.1

(b) Food poisoning is caused by different types of bacteria.

A common type of bacterium that causes food poisoning is *Campylobacter jejuni*.

State the genus of this species.

.....[1]

(c) Food poisoning can result in vomiting and diarrhoea.

Outline the treatment of diarrhoea.

.....

[1]

(d) The body has several defence mechanisms against bacteria.

Table 3.1 shows three types of defence mechanism.

The word list gives examples of these defence mechanisms.

In Table 3.1 write the examples under the correct type of defence.

Use each word once only.

- antibodies**
- mucus**
- nasal hairs**
- phagocytosis**
- skin**
- stomach acid**

Table 3.1

cellular	chemical	mechanical

[3]

[Total: 10]

4 The eye is a sense organ.

Fig. 4.1 is a diagram of a section through the eye.

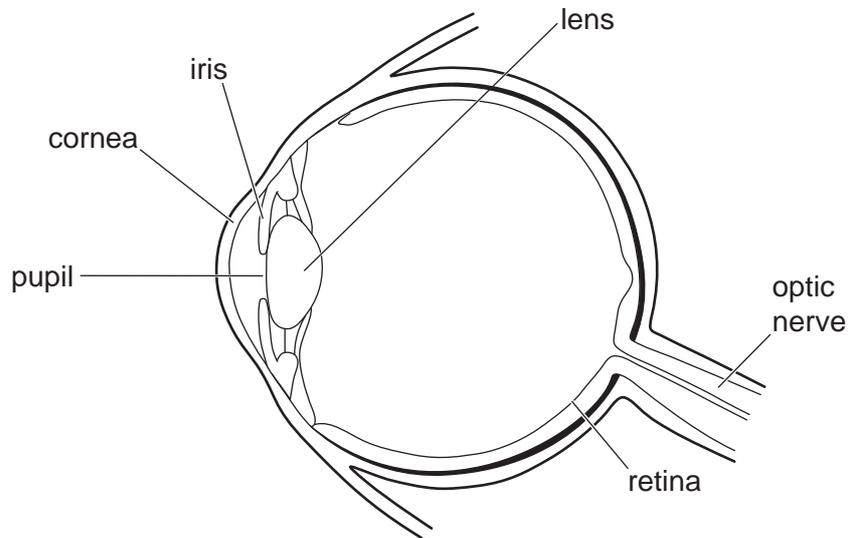


Fig. 4.1

(a) Shade in the part of the eye that gives people different eye colours on Fig. 4.1. [1]

(b) The boxes on the left show parts of the eye.

The boxes on the right show the functions of different parts of the eye.

Draw four lines to link the part of the eye with its correct function.

One has been done for you.

part	function
cornea	controls how much light enters the eye
iris	refracts light
lens	focuses light
retina	carries impulses to the brain
optic nerve	contains light receptors

[3]

(c) The skin is another sense organ.

Fig. 4.2 shows a photograph of the skin on a person's arm.

The skin of the person is responding to a stimulus.

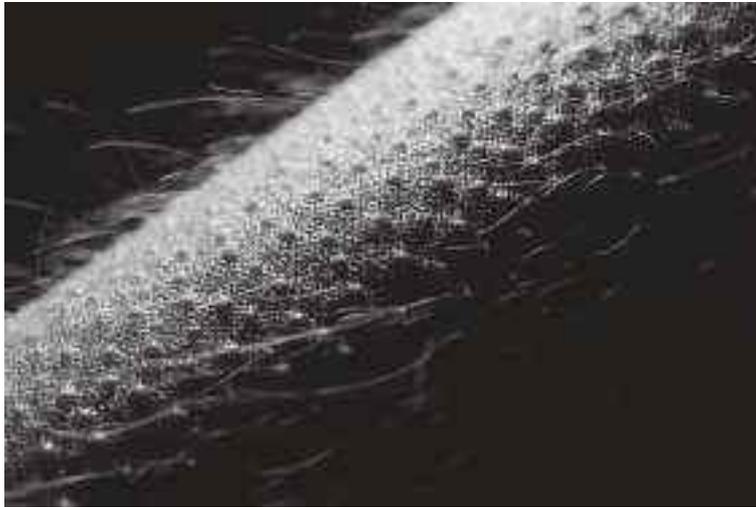


Fig. 4.2

(i) State the stimulus for the response shown in Fig. 4.2.

.....[1]

(ii) State the effector that causes the response shown in Fig. 4.2.

.....[1]

[Total: 6]

5 (a) Fig. 5.1 shows part of the carbon cycle. Some of the arrows are missing.

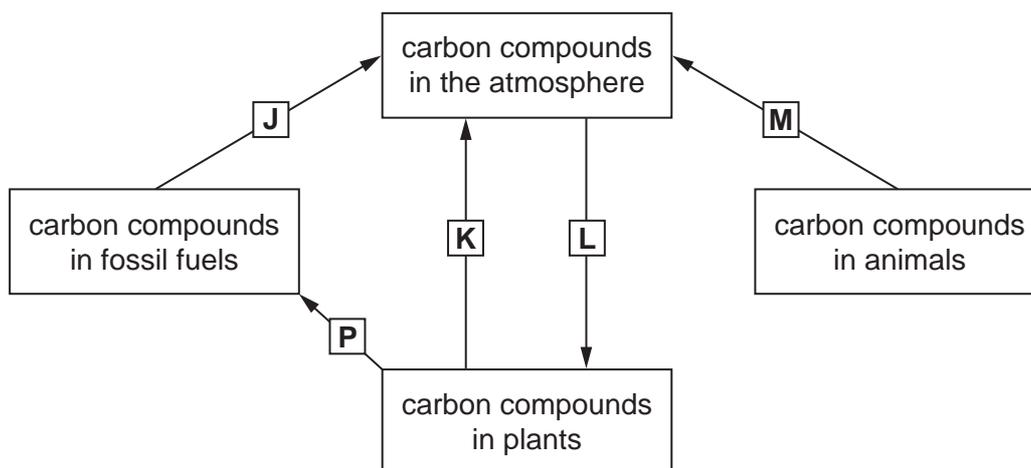


Fig. 5.1

(i) State **all** the letters in Fig. 5.1 that represent respiration.
[2]

(ii) State the name of the process that the letter **J** represents.
[1]

(iii) Draw an arrow on Fig. 5.1 to represent the process of feeding. [1]

(b) Carbon dioxide is a greenhouse gas.
 State the name of **one other** greenhouse gas.
[1]

(c) Deforestation can cause an increase in the concentration of carbon dioxide in the atmosphere.

(i) State **two** other undesirable effects of deforestation.
 1
 2 [2]

(ii) State **two** uses for land that has been cleared of trees.
 1
 2 [2]

(d) The forests in Brazil contain many endangered species.

Table 5.1 shows the area of forest that was removed in Brazil each year between 2006–2010.

Table 5.1

year	area of forest removed/km ²
2006	14 286
2007	12 651
2008	11 911
2009	7 464
2010	7 000

(i) Calculate the average area of forest removed per year from 2006 to 2010.

Show your working.

.....km²
[2]

(ii) Describe the trend in the data shown in Table 5.1.

.....
.....
.....[1]

(iii) Suggest **two** reasons for the trend you have described in part (ii).

1
2
[2]

[Total: 14]

6 Fig. 6.1 shows a diagram of the gas exchange system.

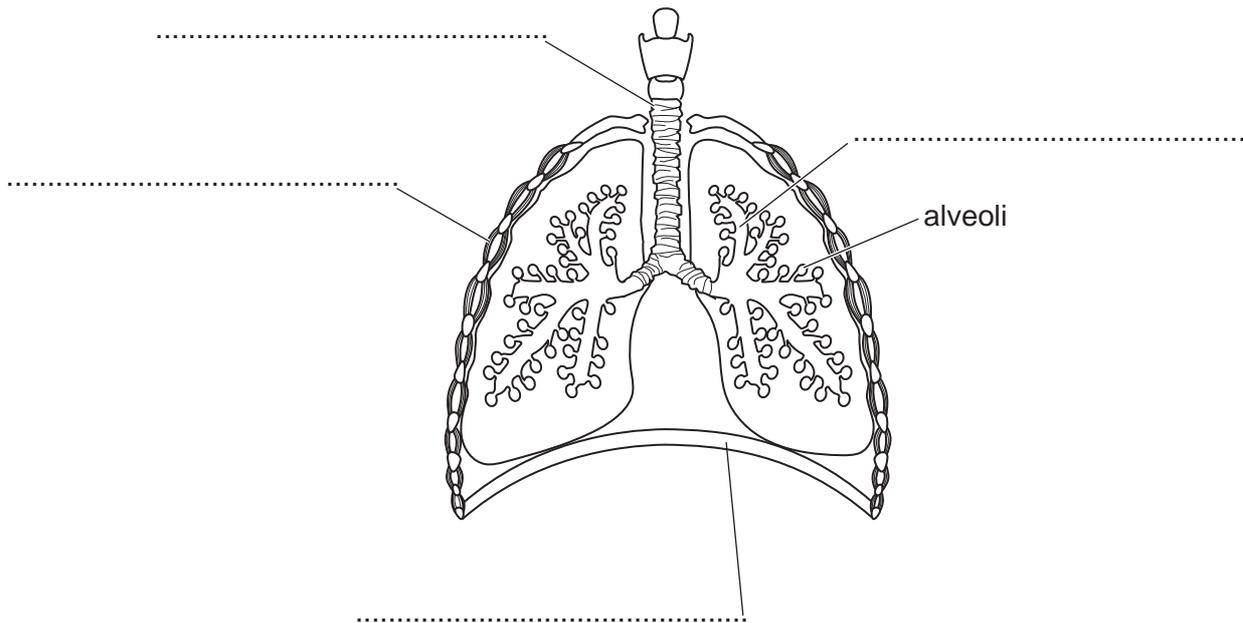


Fig. 6.1

(a) Complete the labelling of Fig. 6.1 using the words from the list.

- bronchiole diaphragm intercostal muscle trachea

[4]

(b) Alveoli are gas exchange surfaces.

State **two** features that make alveoli good gas exchange surfaces.

1

2

[2]

(c) There is less oxygen in expired air than in inspired air.

(i) Describe **two other** ways in which expired air is different from inspired air.

1

2

[2]

(ii) State the name of a process that uses oxygen in the body.

.....[1]

(d) State an example of a cell and an organ from the gas exchange system.

cell

organ

[2]

[Total: 11]

7 Excretion is the removal of toxic substances or substances in excess, from the body.

(a) Excess water is excreted from the lungs and the kidneys.

State the name of **one other** substance that is excreted from

the lungs

the kidneys

[2]

(b) The volume and concentration of urine varies with changing conditions.

Table 7.1 shows three changing conditions.

Write **increase** or **decrease** in each of the boxes in Table 7.1 to show how each change affects the volume and the concentration of urine.

Table 7.1

changing condition	volume of urine	concentration of urine
increase in water intake		
increase in temperature		
increase in exercise		

[3]

(c) Excretion is a characteristic of living organisms.

Growth is another characteristic of living organisms.

(i) Define the term *growth*.

.....

 [2]

(ii) State **three** characteristics of living organisms other than excretion and growth.

1
 2
 3

[3]

[Total: 10]

8 Blood group is an example of discontinuous variation.

The blood groups of patients in a hospital were recorded.

Fig. 8.1 shows the results.

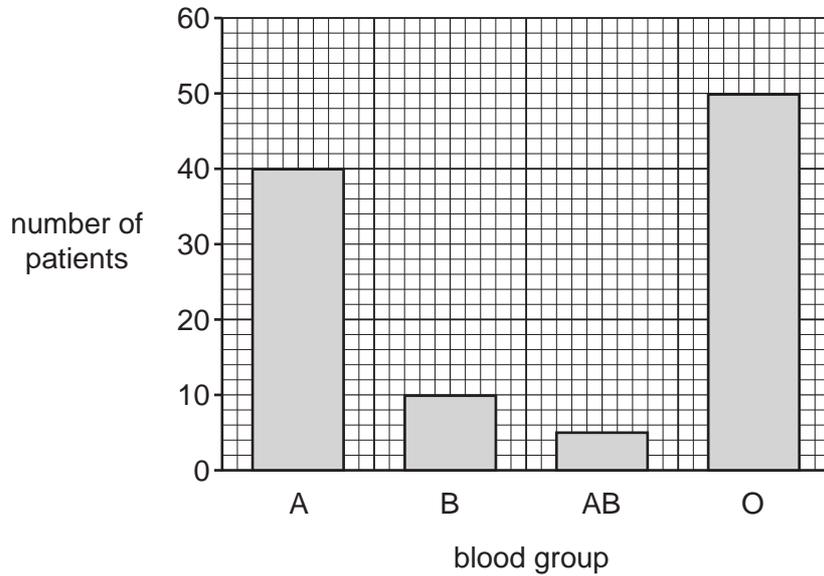


Fig. 8.1

(a) Explain how Fig. 8.1 shows that blood group is an example of discontinuous variation.

.....

.....

.....[1]

(b) Table 8.1 shows different examples of variation.

Tick all the boxes that show examples of discontinuous variation.

Table 8.1

attached or unattached earlobes	<input type="checkbox"/>
foot length	<input type="checkbox"/>
gender (male or female)	<input type="checkbox"/>
height	<input type="checkbox"/>
tongue rolling	<input type="checkbox"/>
weight	<input type="checkbox"/>

[3]

(c) Variation can be caused by mutation.

The word mutation can be connected to the words in the boxes on the right to make a complete sentence.

Draw **three** lines to join the word 'mutation' to the words in the boxes to make three correct sentences.

Mutation	is a genetic change.
	is a change in the environment.
	only occurs in plants.
	forms new alleles.
	changes your physical appearance only.
	can be caused by ionising radiation.

[3]

[Total: 7]

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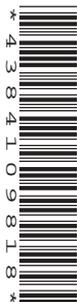
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BIOLOGY

0610/33

Paper 3 Theory (Core)

May/June 2018

1 hour 15 minutes

Candidates answer on the Question Paper.

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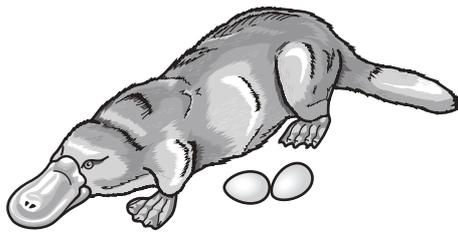
1 (a) Scientists classify organisms into groups.

State **one** feature that is used to identify vertebrates.

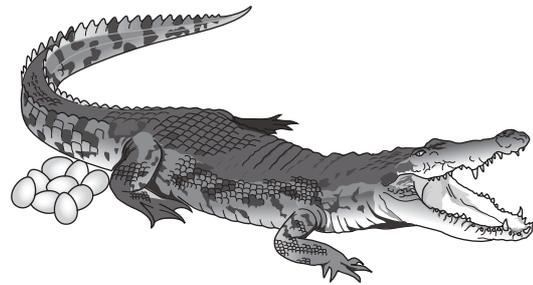
.....[1]

(b) Vertebrates are classified into five groups.

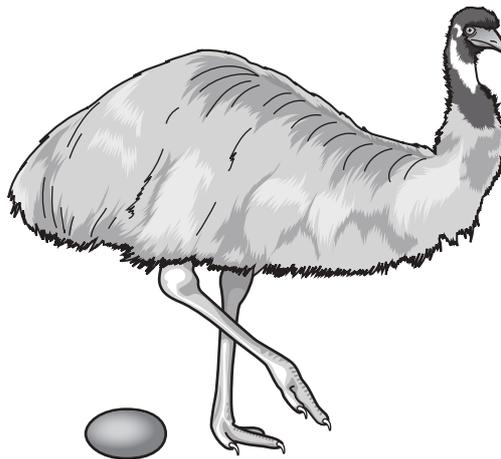
Fig. 1.1 shows three vertebrates found in Australia.



duck-billed platypus



saltwater crocodile



emu

Not to scale

Fig. 1.1

The emu, the saltwater crocodile and the duck-billed platypus each belong to a different vertebrate group.

All three animals lay eggs that develop and hatch on land.

(i) State the name of the vertebrate group to which emus belong and give **one** feature of this group that is visible in Fig. 1.1.

group

visible feature

.....

[2]

(ii) State the name of the vertebrate group to which crocodiles belong and give **one** feature of this group that is visible in Fig. 1.1.

group

visible feature

.....
[2]

(iii) The duck-billed platypus is classified as a mammal.

Give evidence from Fig. 1.1 for and against classifying the duck-billed platypus as a mammal.

evidence for

.....

.....

evidence against

.....

.....
[3]

(c) There are **two** groups of vertebrates which lay eggs that develop in water.

State the name of these two groups of vertebrates.

1

2

[2]

[Total: 10]

2 (a) (i) State the word equation for photosynthesis.

.....[2]

(ii) State the name of the green substance plants need for photosynthesis.

.....[1]

(b) A group of students used an aquatic plant to investigate the effect of temperature on the rate of photosynthesis.

Fig. 2.1. shows the apparatus the students used.

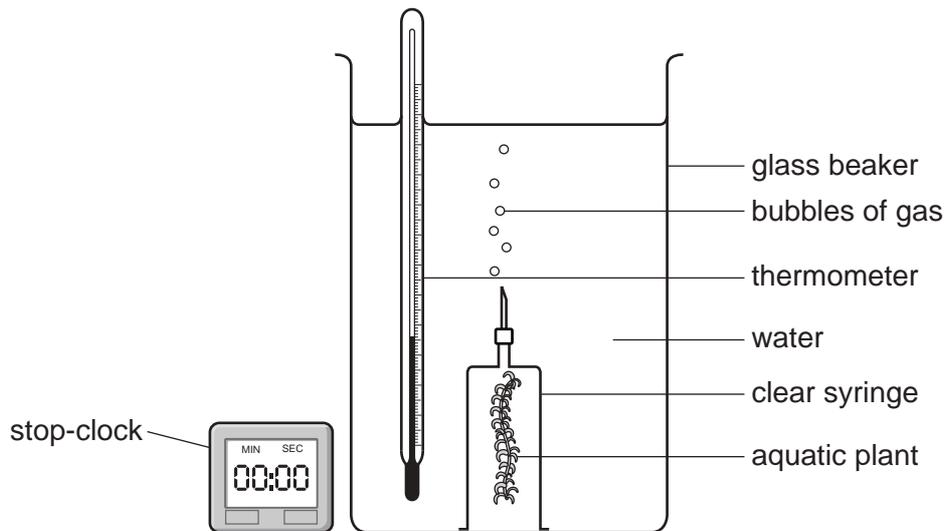


Fig. 2.1

The students counted the number of bubbles of gas the aquatic plant produced, in two minutes, at different temperatures.

Fig. 2.2 shows a graph of their results.

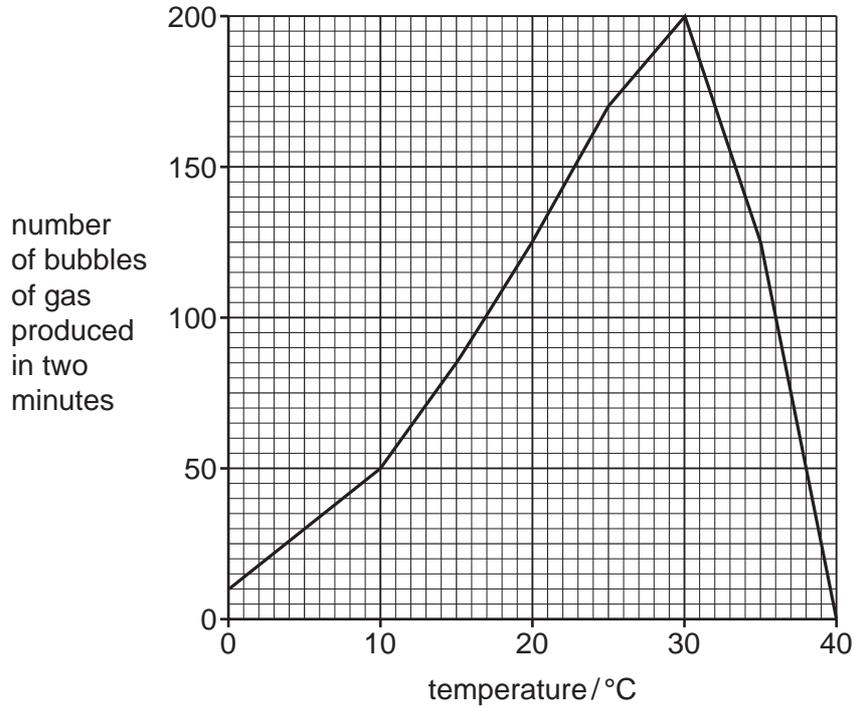


Fig. 2.2

- (i) State the temperature at which the aquatic plant produced the most bubbles of gas in two minutes.

..... °C [1]

- (ii) Use Fig. 2.2 to find the number of bubbles of gas produced by the aquatic plant, in two minutes, at 15 °C and at 25 °C.

15 °C

25 °C

[1]

- (iii) Use your answer to (b)(ii) to calculate the percentage increase in the number of bubbles of gas produced by the aquatic plant at 15 °C and at 25 °C.

Show your working.

..... %
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(c) Describe the results shown in Fig. 2.2.

.....
.....
.....
.....
.....
.....
.....[3]

(d) State **one** factor, other than temperature, that affects the rate of photosynthesis.

.....[1]

[Total: 11]

3 A man is overweight.

Fig. 3.1 shows his diet. He consumes 15000kJ a day.

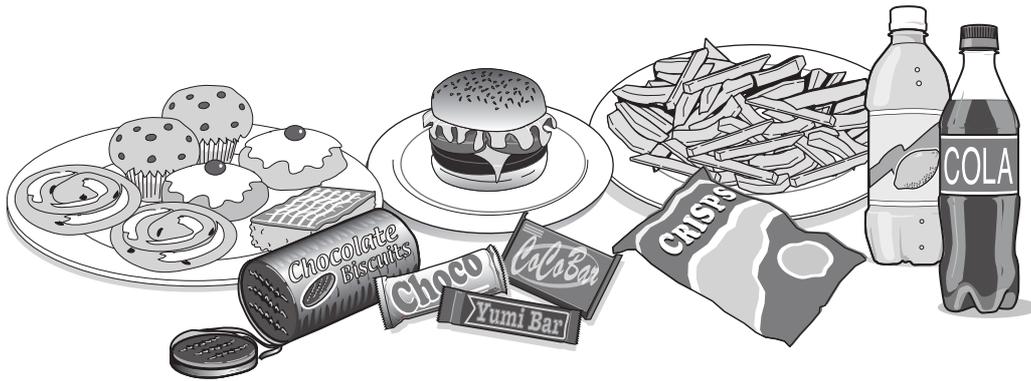


Fig. 3.1

(a) (i) Suggest why the diet shown in Fig. 3.1 is **not** considered to be a balanced diet.

.....
.....
.....
.....
.....
.....
..... [2]

(ii) Suggest and explain how the man could reduce his weight.

.....
.....
.....
.....
..... [2]

4 (a) Fig. 4.1 shows a mosquito feeding on human blood.

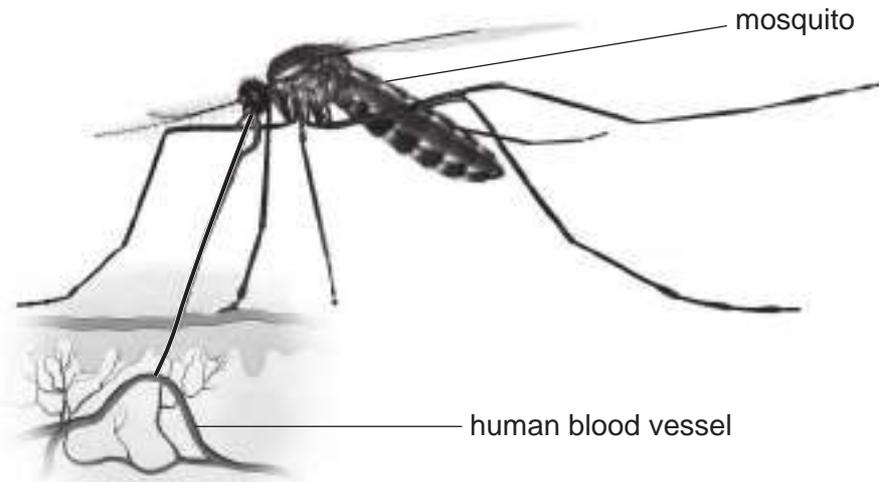


Fig. 4.1

(i) Mosquitoes can carry transmissible diseases such as malaria.

Define the term *transmissible disease*.

.....
.....
.....
.....[2]

(ii) Using information from Fig. 4.1, suggest how the mosquito is adapted for feeding on human blood.

.....
.....
.....[1]

(b) (i) The human body has a number of defences against disease.

State the name of the mechanical barrier which is broken by the mosquito.

.....[1]

(ii) Some components of blood defend the body against disease.

Table 4.1 contains the names of three of the components of blood.

It also states three defence mechanisms.

Complete Table 4.1 by placing a tick (✓) in the box that matches each defence mechanism to the correct component of blood.

Table 4.1

defence mechanism	component of blood		
	platelets	red blood cells	white blood cells
antibody production			
blood clotting			
phagocytosis			

[3]

(c) The body also has chemical barriers against disease.

State the name of **two** chemical barriers in the body.

1

2

[2]

[Total: 9]

5 Fig. 5.1 shows part of the carbon cycle.

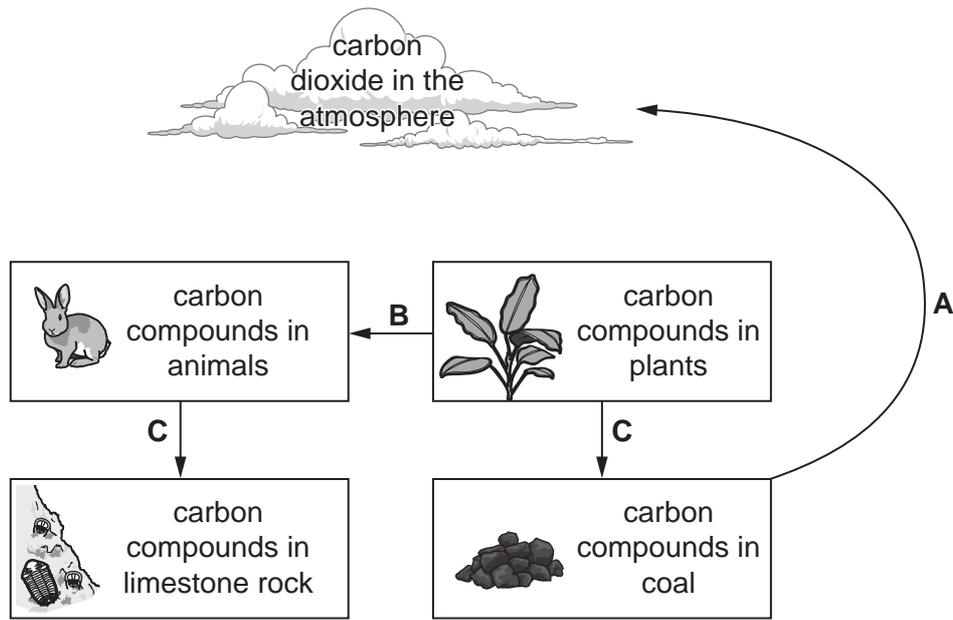


Fig. 5.1

(a) Identify the processes shown by arrows **A**, **B** and **C** on Fig. 5.1.

Choose words from the list.

- combustion decomposition excretion feeding fossilisation**

process **A**

process **B**

process **C**

[3]

(b) (i) On Fig. 5.1 draw **one** arrow to represent photosynthesis.

Label this arrow with a letter **D**.

[1]

(ii) On Fig. 5.1 draw **one** arrow to represent respiration.

Label this arrow with a letter **E**.

[1]

(c) The concentration of carbon dioxide in the atmosphere is increasing.

(i) Describe **two** possible causes of the increased carbon dioxide concentration in the atmosphere.

.....
.....
.....
.....
.....[2]

(ii) State **two** adverse effects of the increase in carbon dioxide concentration in the atmosphere.

1
.....
2
.....
[2]

(iii) Carbon dioxide is a greenhouse gas.

State the name of **one other** greenhouse gas.

.....[1]

[Total: 10]

6 (a) Organisms pass on their genetic information in their gametes.

(i) State the name of the type of cell division that produces gametes.

.....[1]

(ii) State the name of the cell formed when the nuclei of two gametes join together.

.....[1]

(b) A rabbit that was homozygous for black fur was crossed with a rabbit that was homozygous for brown fur.

All of their offspring had black fur.

This is shown in Fig. 6.1.

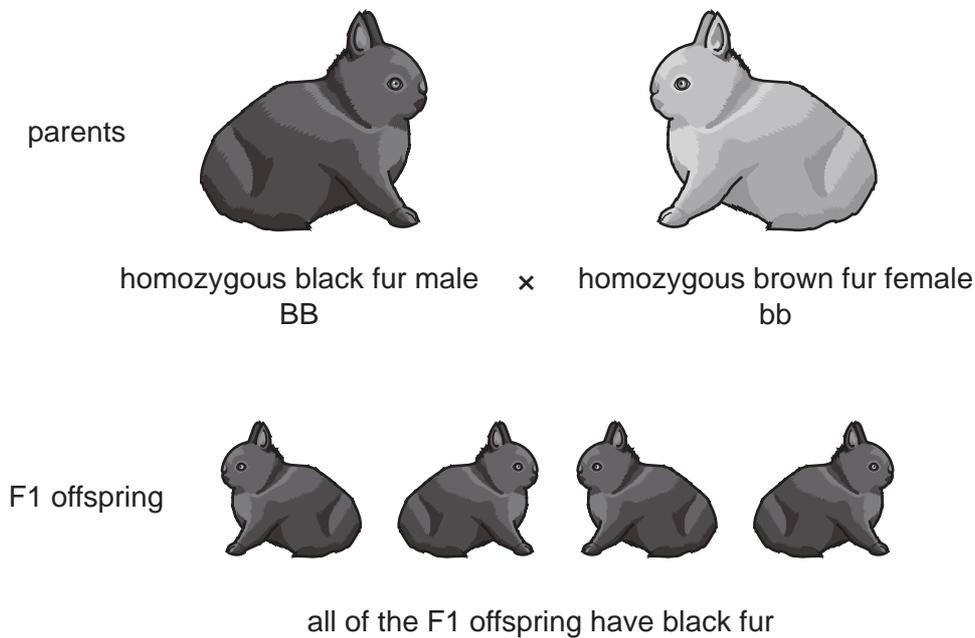


Fig. 6.1

(i) Define the term *homozygous*.

.....

[1]

(ii) State the dominant allele for fur colour and give a reason for your answer.

dominant allele

reason

.....[2]

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- (c) The F1 offspring all have the same phenotype as the male parent but their genotype is not the same as the male parent.

State how the *phenotype* of an organism is different to its *genotype*.

.....

[1]

- (d) A rabbit with brown fur is mated with one of the F1 rabbits with black fur.

Complete the genetic diagram to show the possible fur colours that could occur from this mating.

parental phenotypes

brown fur

×

black fur

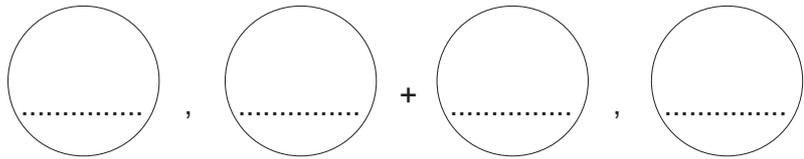
parental genotypes

bb

×

Bb

gametes



offspring genotypes

.....

offspring phenotypes

.....

ratio

..... brown : black

[4]

7 Fig. 7.1 is part of a newspaper article about pollution.

How safe is your water?

A source of safe drinking water is important for life.

Water is also important for transport, industry and for producing crops to feed people.

Many of the world’s largest cities and towns developed near large rivers or lakes.

The increase in population has resulted in many of the rivers and lakes becoming polluted.

More water treatment plants are needed to deal with raw sewage and to produce water free from pathogens.

Fig. 7.1

(a) State **four** sources of water pollution other than raw sewage.

- 1
- 2
- 3
- 4 [4]

(b) Outline the steps in the treatment of raw sewage that make it safe to return to the environment.

-
-
-
-
-
-
-
- [3]

(c) Define the term pathogen.

- [1]

[Total: 8]

8 Fig. 8.1 shows the human female reproductive system.

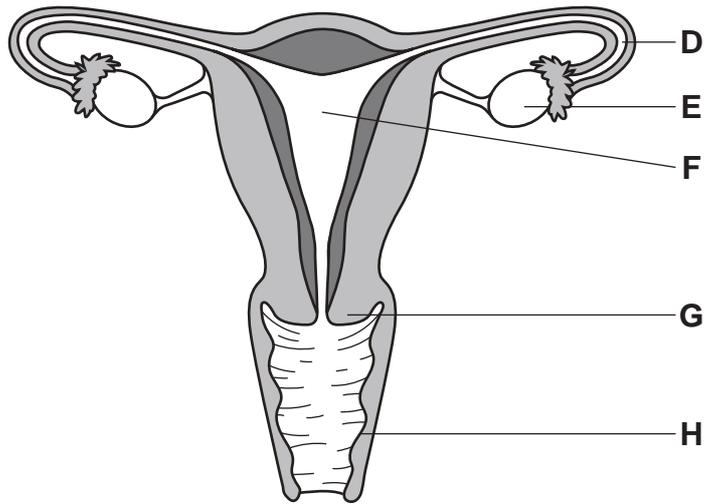


Fig. 8.1

(a) Use the letters on Fig. 8.1 to identify:

the cervix

the oviduct

the uterus

the vagina

[4]

(b) On Fig. 8.1, write an **X** to show where female gametes are produced.

[1]

(c) State the name of the structure where fertilisation normally takes place.

.....[1]

[Total: 6]

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- 1 (a) The reactions of chemical digestion are catalysed by enzymes.

Fig. 1.1 shows the stages of an enzyme-catalysed reaction.

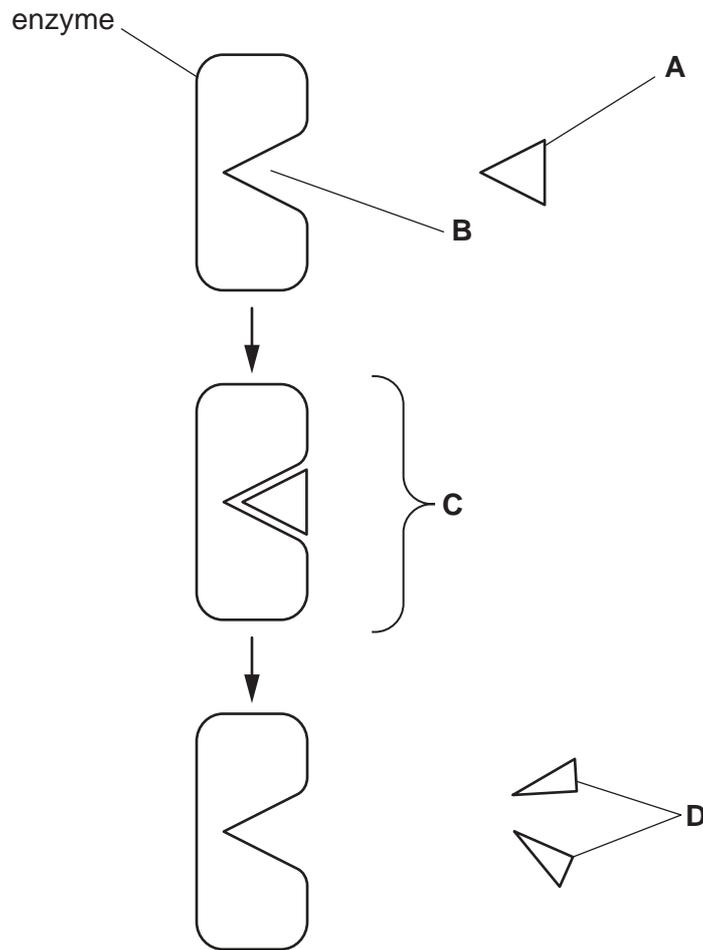


Fig. 1.1

State the names of **A** to **D** in Fig. 1.1.

A

B

C

D

[4]

Complete Table 1.1. One row has been done for you.

Table 1.1

function	letter from Fig. 1.2	name of structure
site of starch digestion		
reabsorption of water		
secretion of pepsin		
site of maltose digestion		
secretion of bile		
storage of faeces	F	rectum
secretion of lipase and trypsin		

[6]

[Total: 12]

2 (a) Adaptive features are defined as the inherited features of an organism that increase its fitness.

State what is meant by *fitness* in this context.

.....
.....
.....[1]

(b) Rodents are the most common mammals in many hot deserts.

Fig. 2.1 shows the lesser Egyptian jerboa, *Jaculus jaculus*, which lives in North Africa and the Middle East in areas that have high daytime temperatures and very little rainfall.



Fig. 2.1

Like many desert-living mammals, jerboas are active at night.

Suggest **two** features of *J. jaculus* that adapt it to each of the following challenges of living in desert ecosystems:

(i) very high daytime temperatures

1
2
[2]

(ii) very little or no light at night

1
2
[2]

- (c) A scientist studied communities in different parts of a desert and estimated the biomass of the organisms in each area.

He divided the organisms into four groups according to their roles in the food web as shown in Table 2.1.

Detritivores are animals that eat dead organisms or parts of organisms.

Table 2.1

groups of organisms in the food web	biomass/g per m ²
producers	480
herbivores	220
detritivores	120
carnivores	40

Some of these results are shown as a pyramid of biomass in Fig. 2.2.

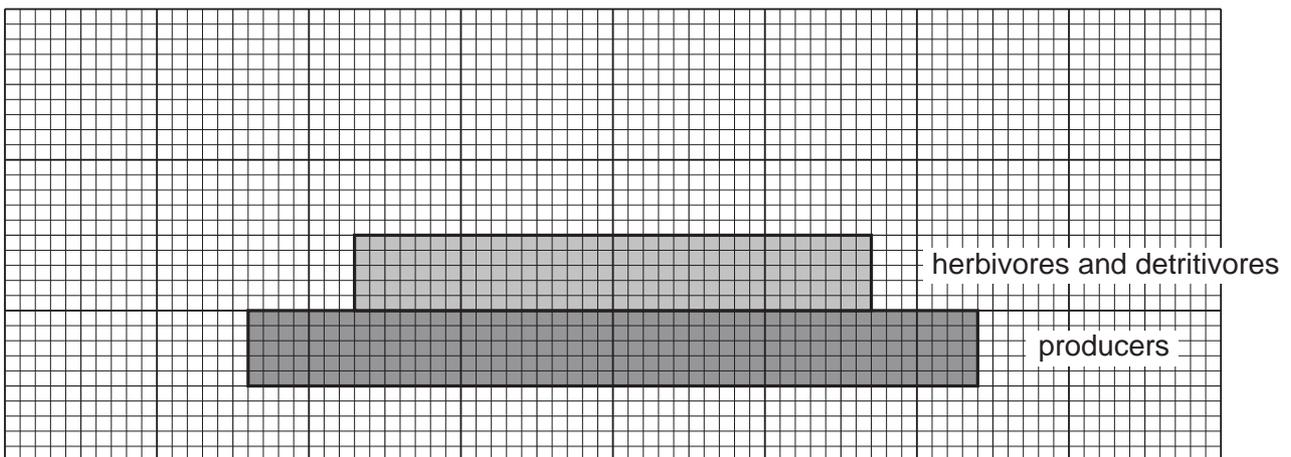


Fig. 2.2

- (i) Use the information in Table 2.1 to complete the pyramid of biomass in Fig. 2.2. [2]
- (ii) The scientist observed the detritivores and decided to include them with herbivores in this pyramid of biomass.

Suggest what the scientist discovered about the detritivores that made him make this decision.

.....

.....

.....[1]

(iii) Explain why there are rarely more than four or five trophic levels in ecosystems.

.....
.....
.....
.....
.....[2]

(iv) Explain the advantages of presenting information about food webs as a pyramid of biomass and **not** as a pyramid of numbers.

.....
.....
.....
.....
.....
.....
.....
.....
.....[3]

[Total: 13]

3 A student cut a section of a root and made an outline drawing of the distribution of tissues as shown in Fig. 3.1.

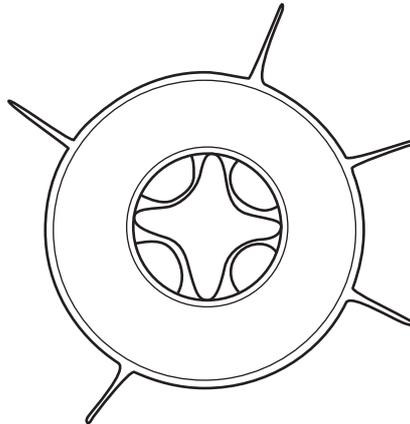


Fig. 3.1

(a) (i) Identify the position of the xylem tissue by drawing a label line and the letter X on Fig. 3.1. [1]

(ii) State why xylem is a tissue.

.....
.....
.....
.....[2]

(b) Water absorbed by the roots moves through the stem and enters the leaves. Most of this water is lost in transpiration.

Explain how the internal structure of leaves results in the loss of large quantities of water in transpiration.

.....
.....
.....
.....
.....
.....
.....
.....[3]

[Total: 6]

4 The flow of blood through the skin can be investigated by using a flow-meter.

Fig. 4.1 shows a flow-meter above a section through the skin.

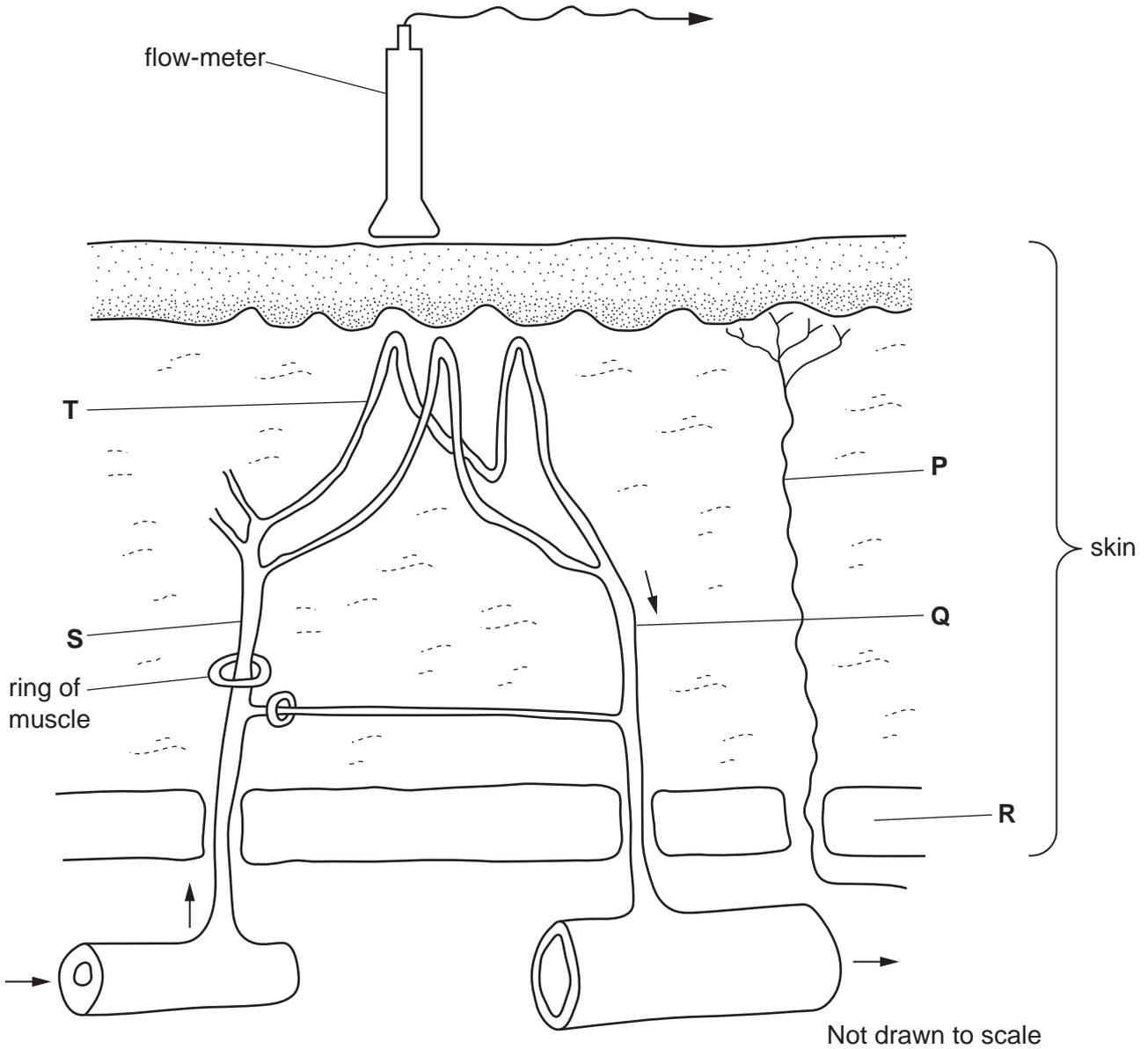


Fig. 4.1

(a) (i) State the name of cell P.

.....[1]

(ii) State the types of blood vessel labelled Q, S and T.

Q

S

T

[3]

(iii) State the name of the tissue at R that provides insulation.

.....

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(ii) Explain the mechanism that increases blood flow through the skin.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....[3]

(iii) State the difference between the average blood flow for the treatments (with and without capsaicin) at 35°C.

Space for working.

..... % [1]

(iv) The researchers thought that capsaicin stimulated receptors in the skin.

Explain the process by which capsaicin could reach these receptors.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....[3]

- 5 (a) State the balanced chemical equation for aerobic respiration.

.....[2]

- (b) Researchers in the Czech Republic investigated oxygen consumption in horses. They measured the oxygen consumption of the horses while they were exercising at four different paces: walking, trotting, cantering and galloping.

The results are shown in Fig. 5.1.

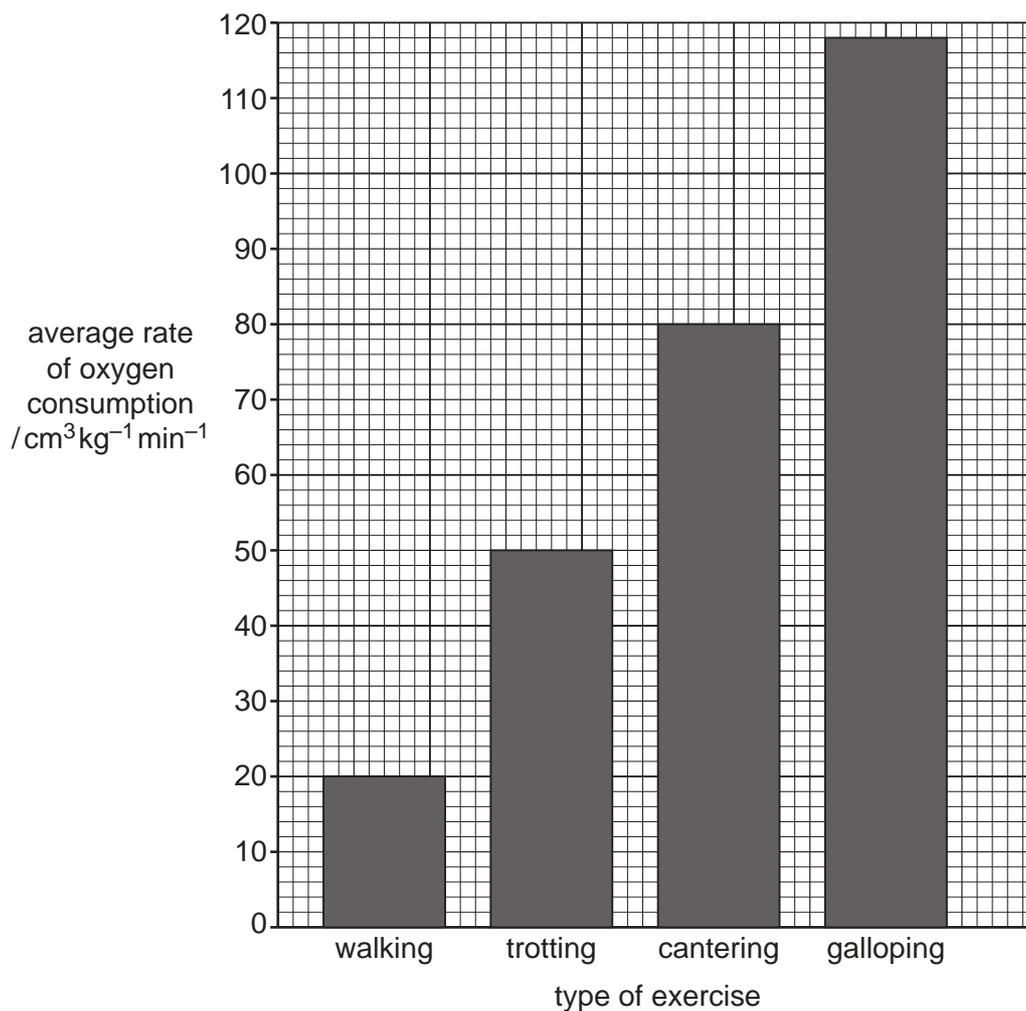


Fig. 5.1

6 (a) Fig. 6.1 is a diagram of the human female reproductive system.

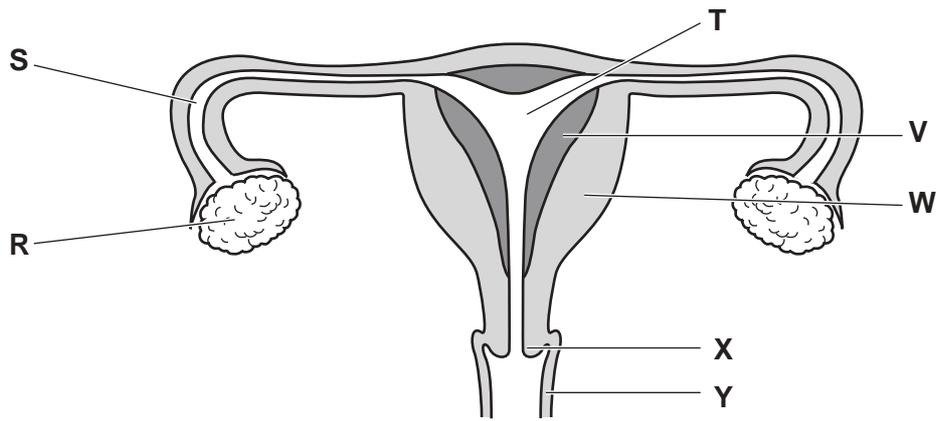


Fig. 6.1

(i) Complete Table 6.1 by stating the letter from Fig. 6.1 that identifies the structure where each process occurs.

Table 6.1

process	letter from Fig. 6.1
meiosis	
fertilisation	
implantation	

[3]

(ii) State the name of the part of the female reproductive system labelled **S** in Fig. 6.1.

..... [1]

(b) Fig. 6.2 is a diagram of a human sperm cell.

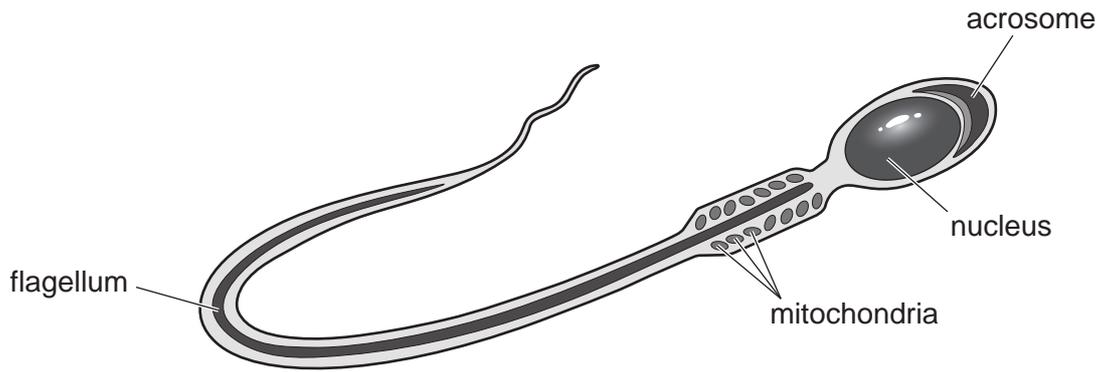


Fig. 6.2

(i) Write the formula that would be used to calculate the magnification of the diagram.

[1]

(ii) The actual length of the sperm cell in Fig. 6.2 is 0.055 mm.

Convert this value to micrometres (μm).

Space for working.

..... μm [1]

(c) Explain why the nuclei of sperm cells differ from those of other cells in the male.

.....

 [2]

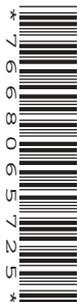
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BIOLOGY

0610/42

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.

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 and **4** blank pages.

- 1 (a) Red pandas, *Ailurus fulgens*, and humans have a similar arrangement of teeth.

Fig. 1.1 shows a section through one tooth of a red panda. Fig. 1.2 shows the side view of the lower jaw of a red panda.

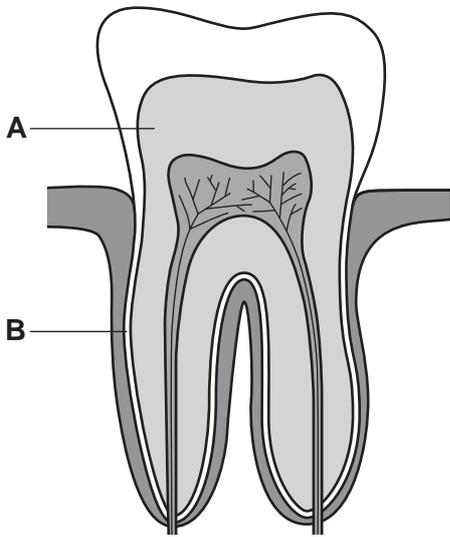


Fig. 1.1

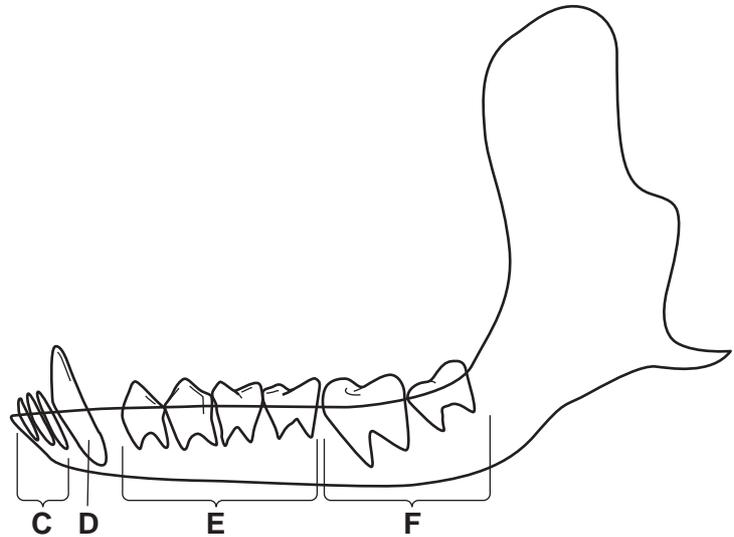


Fig. 1.2

- (i) State the names of the structures labelled A to F in Fig. 1.1 and Fig. 1.2.

A

B

C

D

E

F

[3]

- (ii) State the type of digestion that breaks down large pieces of food.

..... [1]

- (b) Food that sticks to the teeth can be used by bacteria for anaerobic respiration.

This type of respiration releases a substance that can cause tooth decay.

- (i) State the type of substance released by the bacteria, during respiration, that causes tooth decay.

..... [1]

(ii) State the names of the **two** parts of a tooth that are dissolved by the substance released by bacterial respiration.

1

2

[2]

(c) The teeth of red pandas do not decay as much as human teeth.

Suggest the component of a human diet that causes teeth to decay as a result of bacterial respiration.

..... [1]

[Total: 8]

2 Mangrove trees are hydrophytes because they grow in water.

Fig. 2.1 shows a young mangrove tree.



Fig. 2.1

(a) An adaptive feature is a feature that increases the fitness of an organism.

(i) Define the term *fitness*.

.....
.....
..... [1]

(ii) Mangrove trees have many aerial roots and floating seeds.

Suggest how these adaptive features allow mangrove trees to survive in water.

many aerial roots
.....
.....
floating seeds
.....
..... [2]

(b) Fig. 2.2 shows a food chain in a mangrove forest.

mangrove tree → fiddler crab → seagull

Fig. 2.2

Table 2.1 gives the number of organisms and their biomass in a mangrove forest.

Table 2.1

organism	number of organisms	biomass of organisms/kg
mangrove trees	1 000	450 000
fiddler crabs	7 500 000	8 000
seagulls	150 000	1 200

(i) Estimate the biomass of one fiddler crab in grams.

Write your answer to two significant figures.

Show your working.

..... g
[2]

(ii) Sketch a **pyramid of numbers**, using the information in Table 2.1, for the food chain shown in Fig. 2.2.

Write the number of each trophic level on the appropriate part of your pyramid.

3 Aphids are insects that feed on the phloem sap in plants.

Fig. 3.1 shows a diagram of an aphid with its mouth parts inserted into the stem of a plant.

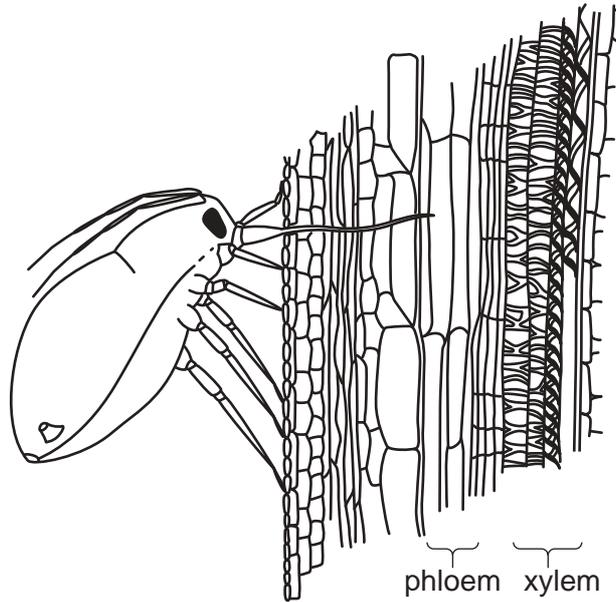


Fig. 3.1

(a) The mouth parts of the aphid reach the phloem tissue of the stem.

(i) State the name of the foods the aphid could suck out of the phloem tissue.

1

2

[2]

(ii) Explain the role of phloem in plant transport. Use the words **source** and **sink** in your answer.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
..... [4]

- 4 One of the roles of the Centers for Disease Control and Prevention (CDC) in Atlanta, US, is to try to reduce the number of people who are infected with pathogens.

The CDC conducted a survey. They asked women which, if any, contraceptive methods they used.

(a) Suggest why the CDC collected data on contraceptive methods.

.....

.....

.....

.....

.....

.....

.....

.....

..... [3]

Fig. 4.1 shows the results of the survey.

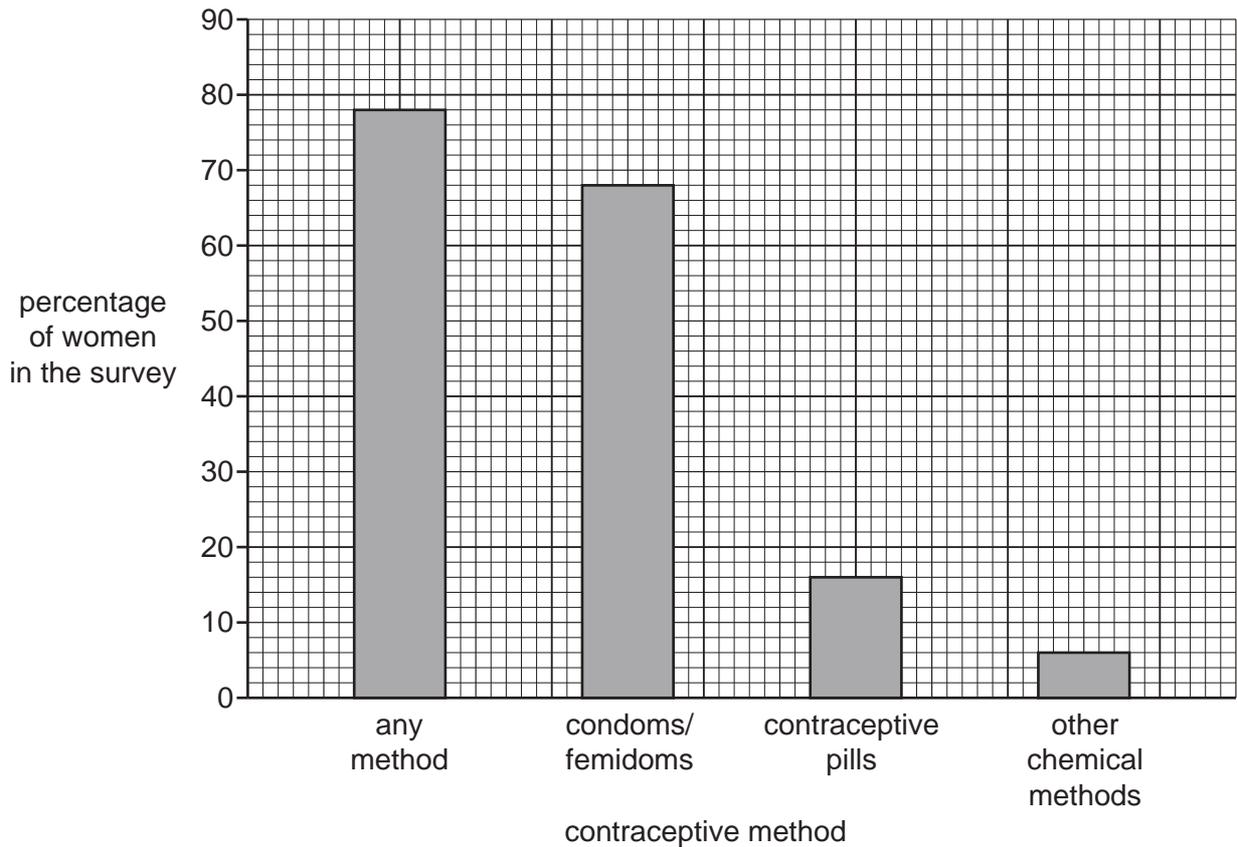


Fig. 4.1

(b) (i) State **two** hormones that are used in contraceptive pills.

1

2

[2]

(ii) Suggest why contraceptive pills do **not** contain FSH.

.....

.....

.....

.....

..... [3]

(iii) Give **one** example of 'other chemical methods' (fourth bar) that could be included in the bar in Fig. 4.1.

..... [1]

(iv) State **two** methods of birth control that were not listed in the survey.

1

2

[2]

(v) The percentage of the last three bars in Fig. 4.1 added together is 90%.

Suggest why the percentage of women who used any type of contraceptive method (first bar) is not equal to the sum of the last three bars.

.....

.....

..... [1]

[Total: 12]

5 Fig. 5.1 shows an adult fly, *Chrysomya megacephala*.

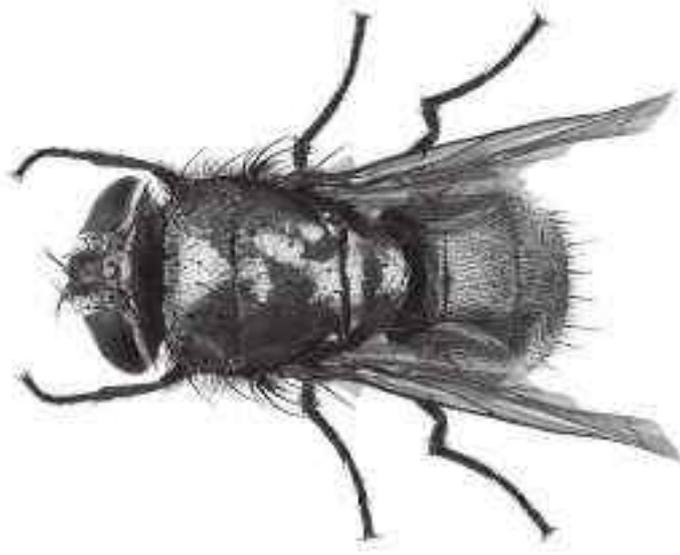


Fig. 5.1

(a) State **three** visible features from Fig. 5.1 that could be used to distinguish adult insects from other arthropods.

1

2

3

[3]

(b) Fly larvae are immature insects that are often used in experiments on respiration.

Give the balanced chemical equation for aerobic respiration.

..... [2]

(c) A respirometer is shown in Fig. 5.2. It can be used to estimate an organism's rate of respiration.

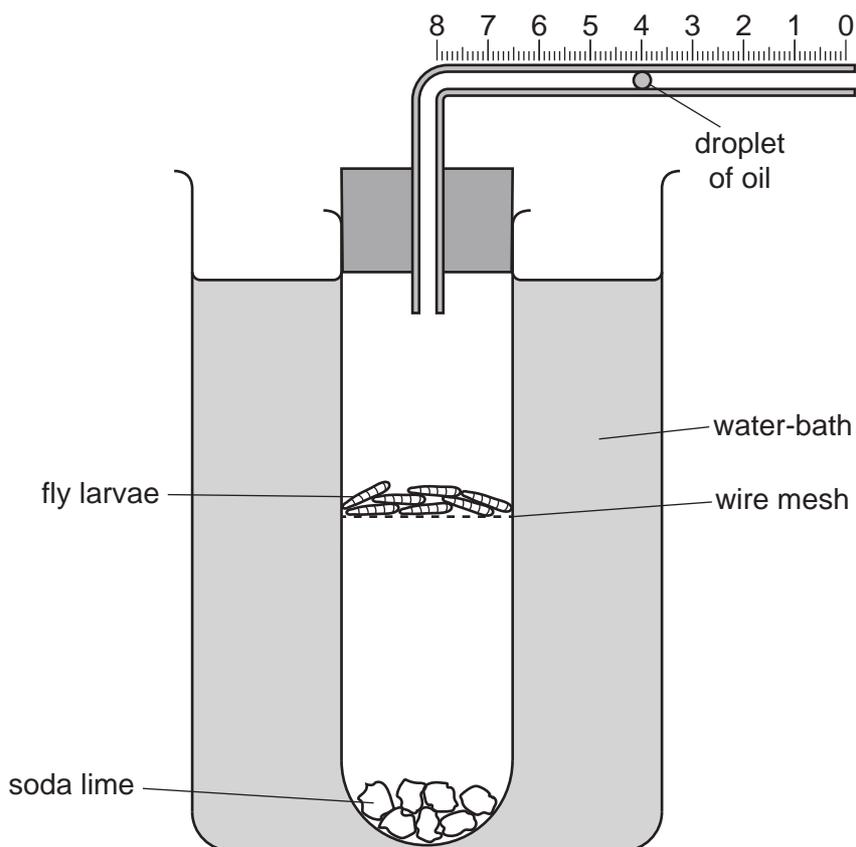


Fig. 5.2

(i) Complete the sentences:

A respirometer can be used to calculate the of oxygen used by the fly larvae by measuring the the droplet of oil moves in one minute. A water-bath is used to the temperature of the apparatus.

[3]

(ii) The soda lime in the respirometer absorbs carbon dioxide.

Explain why this is important in this investigation.

.....

 [1]

(iii) Fly larvae respire to release energy.

State **two** uses of energy in a fly larva.

1
 2

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[Turn over

- (d) A student used a respirometer to investigate the effect of temperature on the rate of respiration of germinating seeds.

Predict the results of this investigation and explain your prediction.

prediction

.....

.....

explanation

.....

.....

.....

.....

.....

[4]

[Total: 15]

6 Bacteria are useful in biotechnology and genetic engineering.

Fig. 6.1 shows a photomicrograph of a bacterium.



magnification $\times 27\,000$

Fig. 6.1

(a) State the name of the process that is taking place in Fig. 6.1.

..... [1]

(b) (i) Write the formula that would be used to calculate the actual width of the bacterium.

(ii) The actual width of the bacterium is 0.0008 mm. [1]

Convert this value to micrometres (μm).

Space for working.

..... μm [1]

(c) Genetically modified bacteria can produce human insulin.

(i) State the name of the disease that can be treated with insulin injections.

..... [1]

(e) Crop plants can also be genetically modified.

Describe the advantages of genetically modifying crops.

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 19]

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BIOLOGY

0610/43

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.

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 **17** printed pages and **3** blank pages.

(c) Substances that are absorbed from the alimentary canal may enter cells and become part of the cells.

(i) State the storage carbohydrate made from glucose in liver cells.

.....[1]

(ii) State the type of protein used in the immune system that is produced from amino acids by lymphocytes.

.....[1]

(iii) Fat is produced from fatty acids and glycerol by cells in the fatty tissue beneath the skin.

State **one** function of this layer of fat.

.....[1]

[Total: 10]

- 2 Fig. 2.1 shows an Arctic wolf, *Canis lupus*. These wolves are one of the few mammals adapted to the extreme cold of the tundra in the Canadian Arctic and in Alaska.



Fig. 2.1

- (a) (i) State **two** features, **visible** in Fig. 2.1, that identify Arctic wolves as mammals.

1

2 [2]

- (ii) Arctic wolves show many adaptive features to a cold environment.

Explain what is meant by the term *adaptive feature*.

.....

.....

.....

.....

.....

..... [3]

- 3 Fig. 3.1 is a scanning electron micrograph of a vertical section through part of the leaf of a broad bean plant, *Vicia faba*.

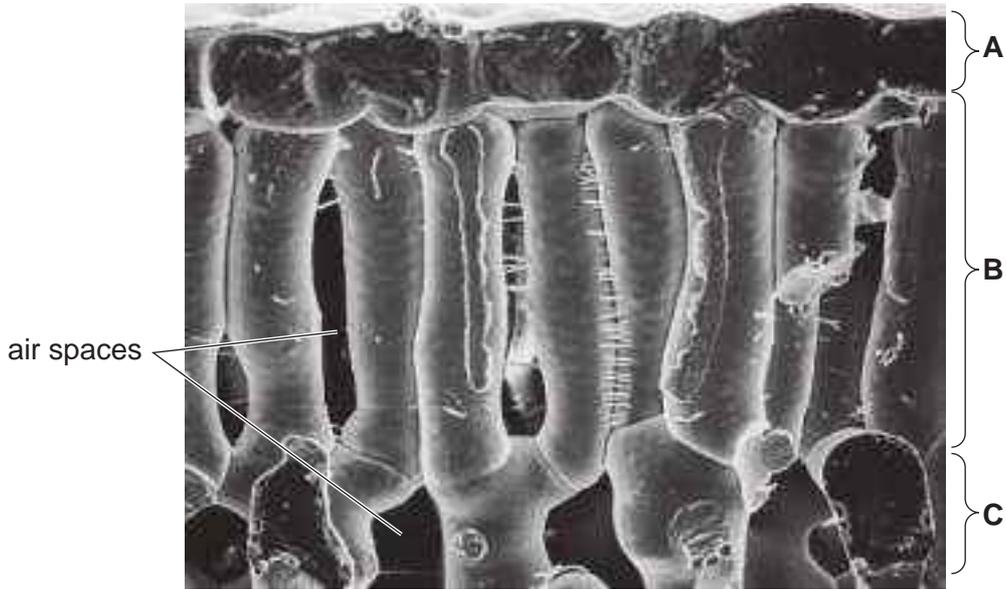


Fig. 3.1

- (a) (i) State the names of the tissues labelled **A** and **B**.

A

B

[2]

- (ii) The cells in regions **B** and **C** in Fig. 3.1 have a large surface area.

Explain why this is necessary for the functioning of the leaf cells.

.....

 [3]

- (iii) Explain why there are many interconnecting air spaces within the leaf.

.....

 [2]

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4 (a) The endocrine system in mammals produces hormones.

Define the term *hormone*.

.....

.....

.....

.....

.....[2]

(b) The responses of the human body to danger are coordinated by the nervous and endocrine systems.

Fig. 4.1 shows the sequence of events that occurs in response to a dangerous situation that is detected by the eyes.

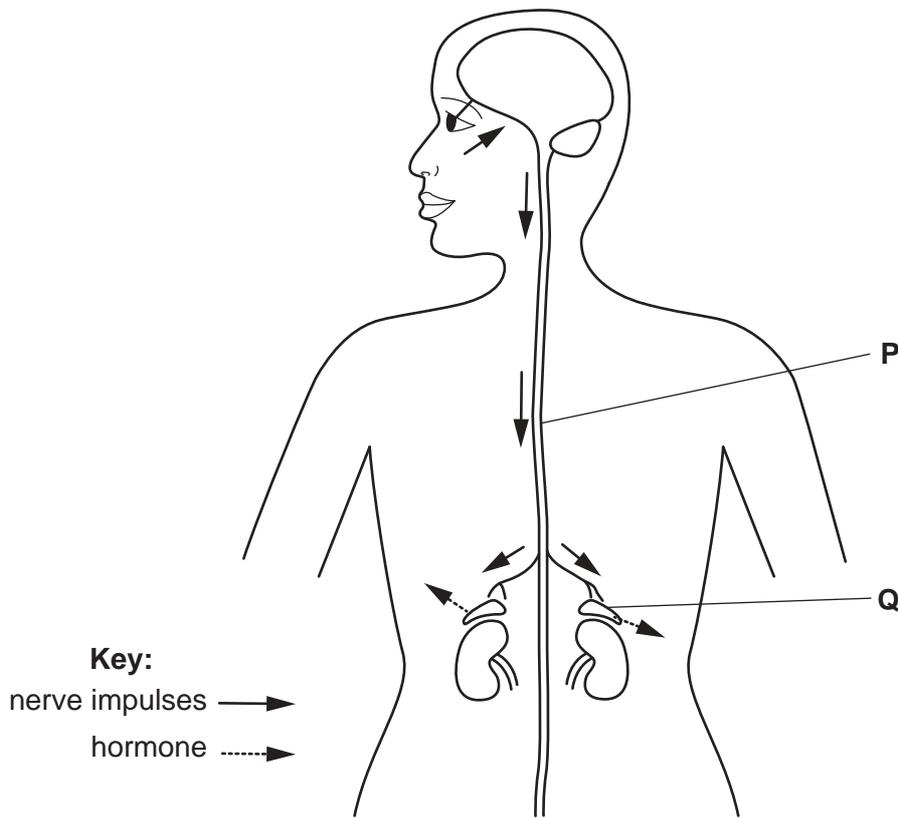


Fig. 4.1

- (i) State the tissue in the eye that converts light energy into nerve impulses.
[1]
- (ii) State the part of the eye that has the highest concentration of light-sensitive cells and gives the most detailed image.
[1]
- (iii) State the type of neurone that conducts impulses from the eye to the brain.
[1]
- (iv) State the nerve that contains these neurones that conduct impulses from the eye to the brain.
[1]
- (v) Identify the organ labelled **P**.
[1]
- (vi) Identify the gland labelled **Q**.
[1]
- (c) Complete Table 4.1 to describe the effects of the hormone released when a person is in a dangerous situation.

Table 4.1

organ	effect of the hormone
heart	
liver	
lungs	
eyes	

[4]

(d) Explain the advantages of coordinating the response to a dangerous situation using both the nervous system and the endocrine system.

.....
.....
.....
.....
.....
.....
.....
.....[4]

(e) (i) Plants also make hormones.

State the name of **one** hormone made by plants.

.....[1]

(ii) Some plant hormones are manufactured and applied to crops to alter aspects of plant growth.

Describe how the synthetic plant hormone 2,4-D is used in agriculture.

.....
.....
.....
.....
.....[2]

[Total: 19]

- 5 (a) State the balanced chemical equation for aerobic respiration.

.....[2]

- (b) Students investigated the rate of respiration of crickets (a type of insect) using a carbon dioxide sensor and laptop as shown in Fig. 5.1. The sensor was fitted inside an airtight glass jar. The apparatus was set up in a room with a constant temperature of 17 °C.



Fig. 5.1

The students found that the concentration of carbon dioxide inside the jar increased by 50 ppm in 120 seconds.

Calculate the rate of carbon dioxide production as ppm per second.

Show your working and express your answer to two significant figures.

..... ppm s⁻¹ [1]

- (c) After 10 minutes, the students opened the jar by removing the sensor. They left the jar open for 5 minutes but made sure that the crickets remained in the jar. They then replaced the sensor and took more readings for another 10 minutes.

State **and** explain one reason for opening the jar after 10 minutes.

.....

.....

.....

.....

.....

.....[2]

- (d) During the investigation the temperature inside the jar increased. The temperature outside the jar remained constant.

Explain why the temperature inside the jar increased.

.....

.....

.....

.....

.....

.....[2]

- 6 (a) Fig. 6.1 is a half-flower drawing of pride of Barbados, *Caesalpinia pulcherrima*.

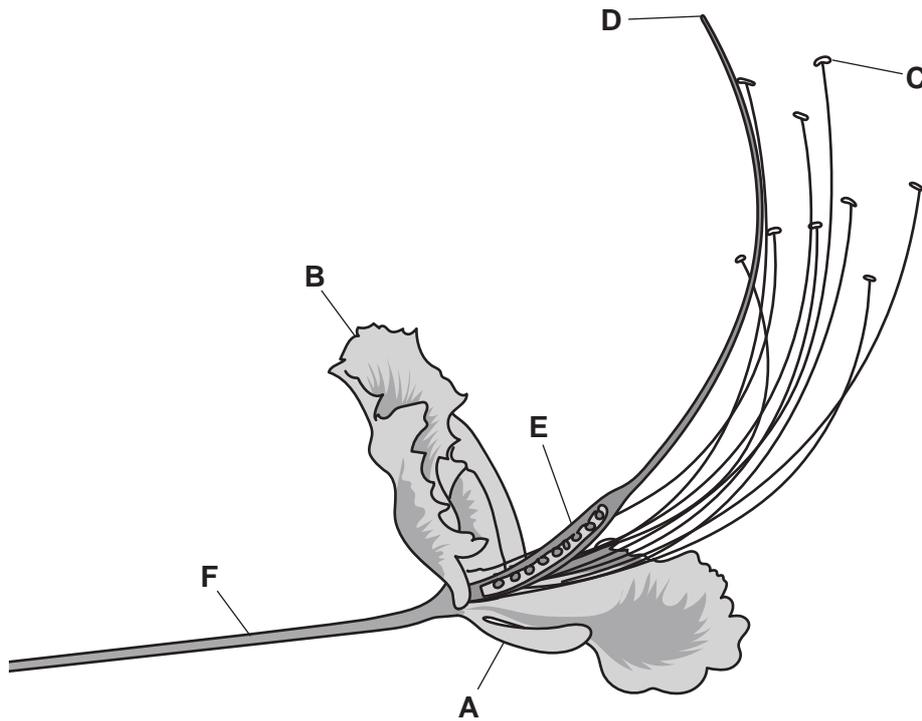


Fig. 6.1

Complete Table 6.1 by stating the letter from Fig. 6.1 that indicates the organ where each function occurs and the name of the organ.

Table 6.1

function	letter from Fig. 6.1	name of the organ
meiosis to produce pollen grains		
pollination		
development of seeds		
protection of flower in the bud		

[4]

(c) Pollen grains grow tubes, which contain haploid male gamete nuclei.

(i) One of these male gamete nuclei fuses with the female gamete.

State the part of the flower that contains the female gamete.

.....[1]

(ii) Define the term *haploid nucleus*.

.....
.....
.....[1]

(iii) Explain why it is important for gametes to be haploid.

.....
.....
.....[1]

[Total: 11]

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BIOLOGY

0610/51

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 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.
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1 Young mammals feed on milk. Milk contains protein.

Some mammals produce an enzyme called rennin. Rennin changes the protein in milk so that it can be digested by another enzyme.

The action of rennin causes small lumps or clots to form in the milk.

You are going to investigate the effect of pH on the activity of the enzyme rennin.

Read all the instructions but DO NOT CARRY THEM OUT until you have drawn a table for your results in the space provided in 1(a).

Use the gloves and eye protection provided while carrying out the practical work.

- Step 1 Label three test-tubes **P**, **Q** and **R**.
- Step 2 Use a syringe to add 5 cm³ of milk into each of test-tubes **P**, **Q** and **R**.
- Step 3 Add two drops of acid to test-tube **P**.
- Step 4 Add two drops of distilled water to test-tube **Q**.
- Step 5 Add two drops of alkali to test-tube **R**.
- Step 6 Label another three test-tubes **P1**, **Q1** and **R1**.
- Step 7 Use a clean syringe to add 1 cm³ of 0.1% rennin solution into each of test-tubes **P1**, **Q1** and **R1**.
- Step 8 Raise your hand when you are ready for water to be added to the beaker labelled **water-bath**.
- Step 9 Place all six test-tubes into the filled water-bath and leave them for three minutes.
- Step 10 Pour the contents of test-tube **P1** into test-tube **P**.
Pour the contents of test-tube **Q1** into test-tube **Q**.
Pour the contents of test-tube **R1** into test-tube **R**.
- Step 11 Leave test-tubes **P**, **Q** and **R** in the water-bath.
Immediately start the stop-clock.
The empty test-tubes, **P1**, **Q1** and **R1** can be placed in the test-tube rack.
- Step 12 After one minute, take test-tube **P** out of the water-bath.
Tip and rotate test-tube **P** as shown in Fig. 1.1.
Observe the milk, and decide which stage of clotting (**no clotting**, **some clotting** or **all clotted**) it has reached.
Record your result in your table.

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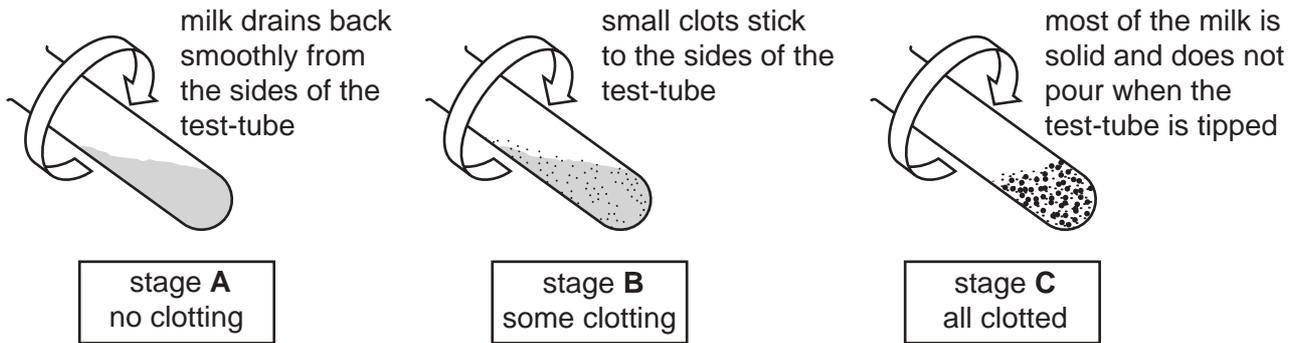


Fig. 1.1

Step 13 Put test-tube **P** back into the water-bath.

Step 14 Repeat steps 12 and 13 for test-tubes **Q** and **R**.

Step 15 Repeat steps 12, 13 and 14 every minute for five minutes.

(a) Prepare a table in which to record your results.

(b) State a conclusion for your results.

.....
.....
.....
.....
..... [2]

(c) (i) Suggest why, in step 9, all the test-tubes were placed into the water-bath for three minutes before mixing the contents together in Step 10.

.....
.....
..... [1]

(ii) State **two** variables which have been kept constant in this investigation.

1
2 [2]

(d) Identify **four** sources of error in this investigation.

1
.....
2
.....
3
.....
4
..... [4]

(e) Identify **one** hazard associated with this procedure that required you to wear eye protection.

.....
.....
..... [1]

(f) Clotting separates milk into a solid part and a liquid part.

Describe how you could find out if there was any protein remaining in the liquid part.

.....
.....
..... [2]

(g) After rennin has changed the protein in milk into a white solid, protease enzymes can be used to digest the protein. The digested protein forms a colourless liquid.

A hypothesis stated:

The optimum temperature for protease enzymes to digest changed milk protein is 37°C.

Describe a method that could be used to test this hypothesis.

Do **not** carry out this investigation.

.....
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.....
..... [6]

[Total: 22]

2 A student wanted to investigate a garden ecosystem.

She counted the number of insects caught in spider webs in one small section of the garden.

She found six spider webs in the small section of garden sampled.

Diagrams of the spider webs are shown in Fig. 2.1. Each black dot represents one insect caught in a spider web.

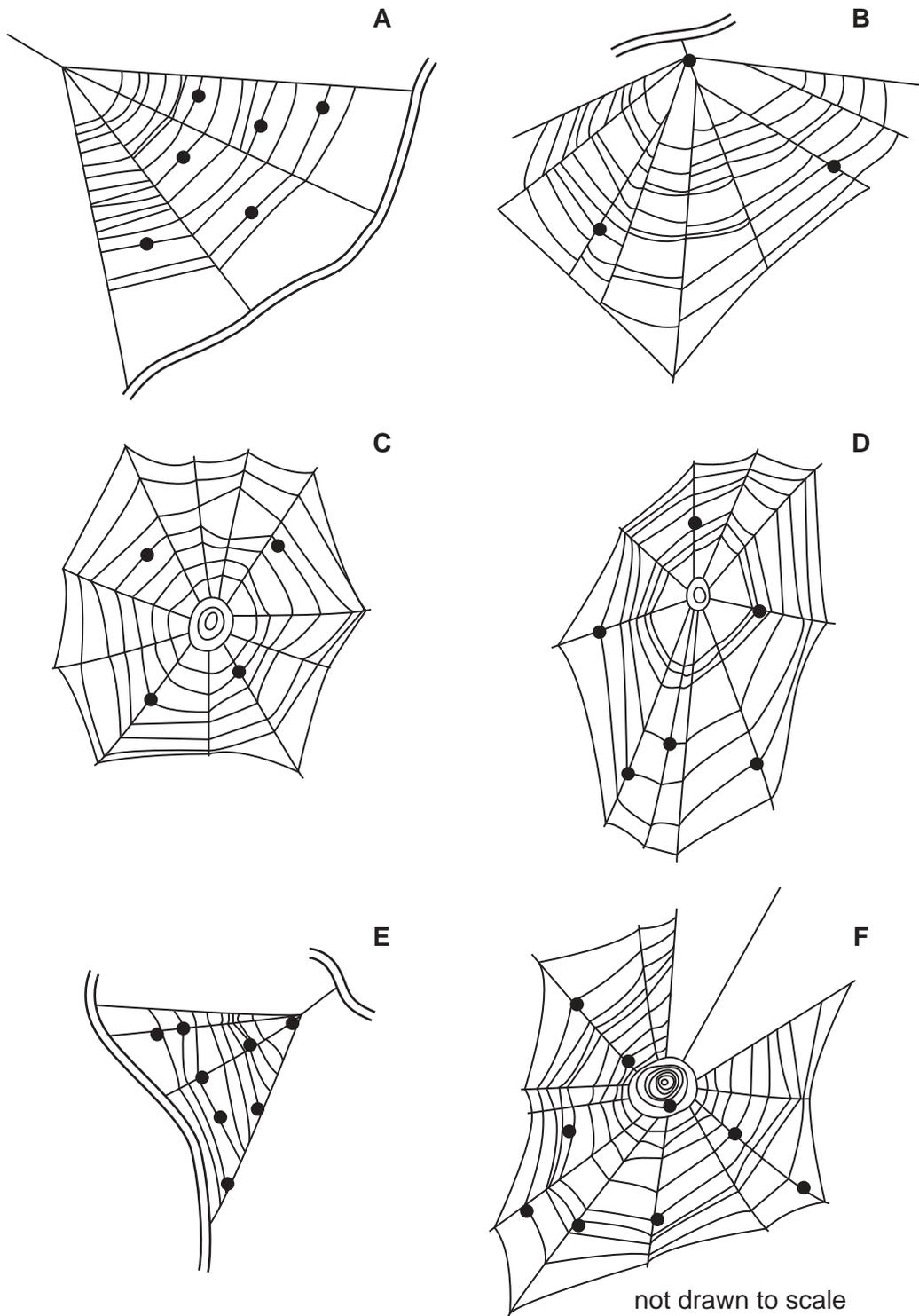


Fig. 2.1

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(a) (i) Use Fig. 2.1 to complete Table 2.1.

Table 2.1

spider web	number of insects caught in each web
A	
B	
C	
D	
E	
F	
total	

[2]

(ii) Calculate the average number of insects per web in the small section of garden, using the information in Fig. 2.1 and Table 2.1.

Space for working

..... [1]

(iii) The student counted the total number of spider webs in the whole garden and found that there were a total of 102 spider webs.

Use this information and your answer to part **2(a)(ii)** to estimate the total number of insects caught in webs in the whole garden.

Space for working.

..... [1]

(iv) Suggest **one** reason why the estimated total number of insects caught in webs in the whole garden may not be accurate.

.....

 [1]

(b) Fig. 2.2 is a photograph of a spider.

A spider's body has two main parts. The legs are all attached to the cephalothorax which is the upper part of the body and starts at label X on Fig. 2.2. The lower part of the body is called the abdomen and is nearest to label Y on Fig. 2.2.

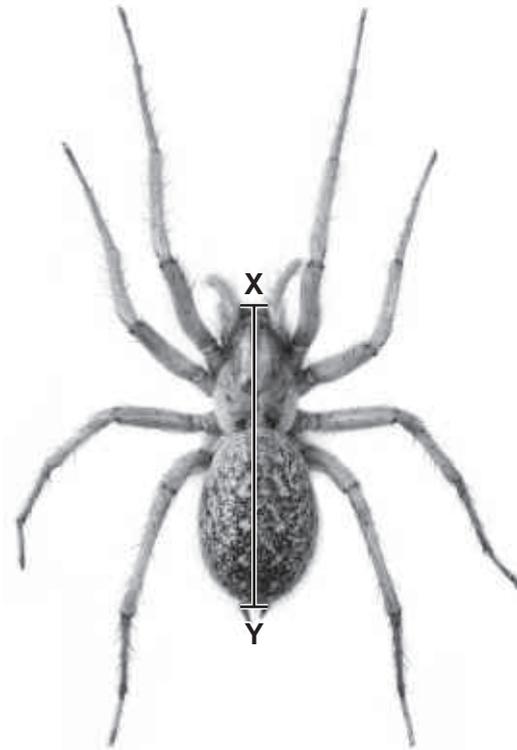


Fig. 2.2

- (i) Make a large drawing of the spider in Fig. 2.2 to show its outline, including its legs.
Label the abdomen.

[5]

- (ii) Measure the length of the spider between points **X** and **Y** on Fig. 2.2. Include the units.

Length of line **XY** on the spider in Fig. 2.2

Draw a line in the same position on your drawing and measure the length on your drawing.

Length of line **XY** on the spider in your drawing

Calculate the magnification of your drawing using your measurements and the following equation:

$$\text{magnification} = \frac{\text{length of line } \mathbf{XY} \text{ on your drawing}}{\text{length of line } \mathbf{XY} \text{ on Fig. 2.2}}$$

Space for working.

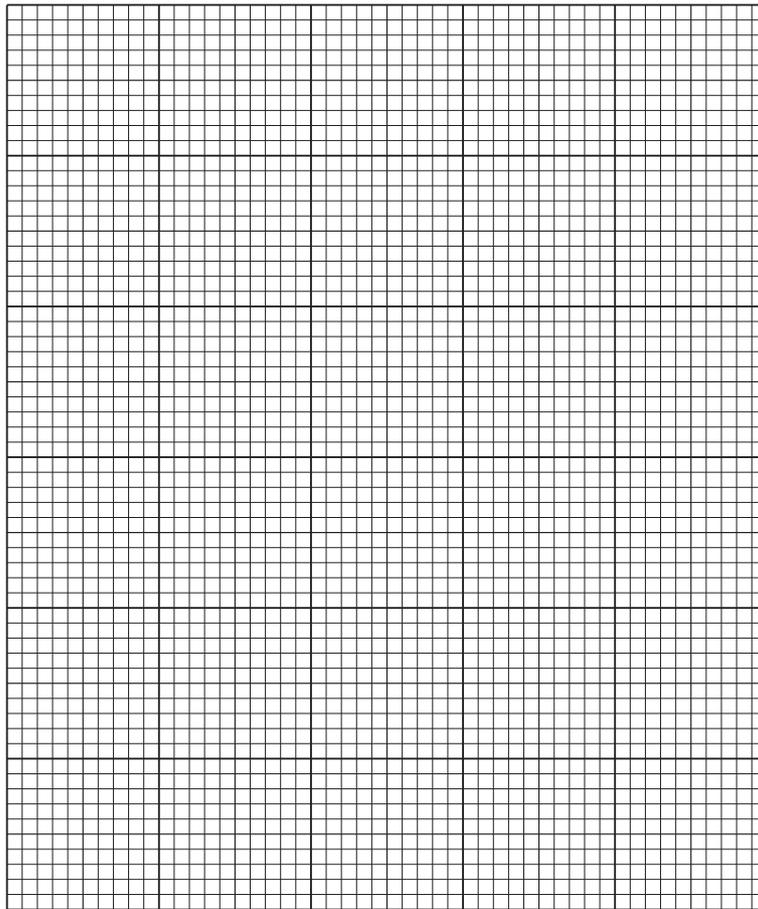
.....
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(c) Table 2.2 contains some other data collected by the student from the garden ecosystem.

Table 2.2

type of organism	number found in the garden ecosystem
trees	2
bushes	5
other plants	37
herbivores	118
carnivores	14

(i) Plot a bar chart of the data in Table 2.2.



[3]

(ii) Herbivores and carnivores are animals.

Use the data in Table 2.2 to calculate the ratio of animals to plants.

Show your working and give your answer in its simplest form.

.....
[2]

[Total: 18]

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BIOLOGY

0610/52

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.

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Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
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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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- 1 You are going to investigate the rate of respiration in yeast at two different temperatures.

Read all the instructions but **DO NOT CARRY THEM OUT** until you have drawn a table for your results in the space provided in 1(a)(ii).

You should wear the gloves provided during the practical work in question 1.

- Step 1 Use a ruler and marker pen to mark the two large test-tubes at 1 cm intervals from the base of the large test-tube to the top of the large test-tube as shown in Fig. 1.1.

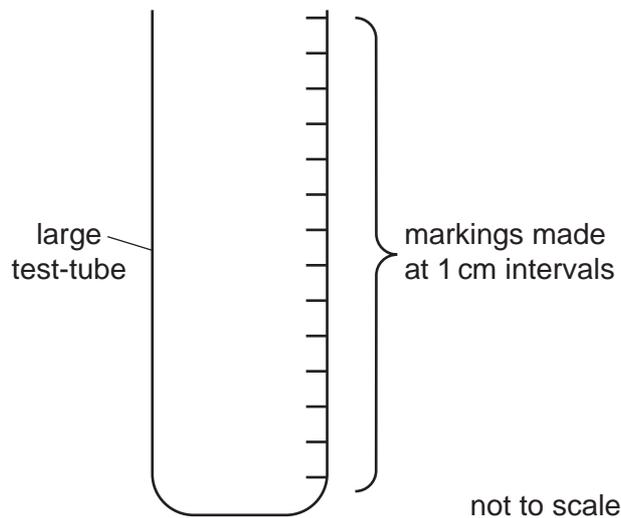


Fig. 1.1

- Step 2 Raise your hand when you are ready for the water-bath beaker, labelled **warm**, to be filled with warm water.
- Step 3 Measure the starting temperature of the water in the water-bath and record it in Table 1.1.

(a) (i)

Table 1.1

water-bath	starting temperature / °C	final temperature / °C
warm		
cool		

[1]

- Step 4 Completely fill one of the small test-tubes with yeast suspension.
- Step 5 Keep the small test-tube upright and carefully place the large test-tube over the top of the small test-tube. Push the small test-tube up to the top of the large test-tube as shown in Fig. 1.2A.
- Step 6 Quickly invert the test-tubes as shown in Fig. 1.2B. Place the test-tubes into the water-bath labelled **warm** as shown in Fig. 1.2C. It does not matter if a small amount of air remains at the top of the smaller test-tube when it is inverted.

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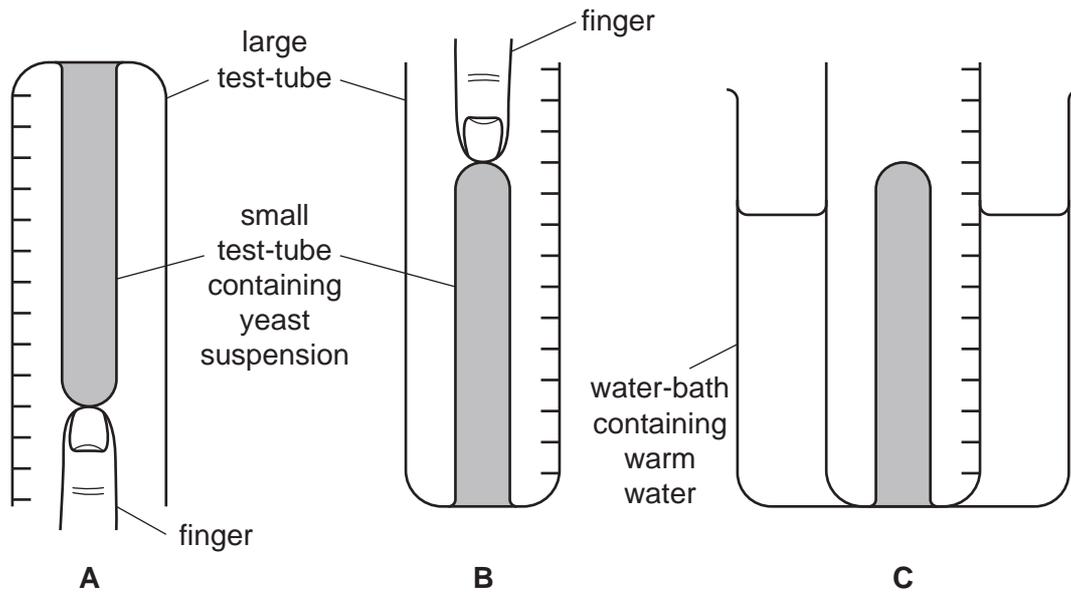


Fig. 1.2

- Step 7 Use the markings you have drawn on the large test-tube to measure the height of the yeast suspension in the large test-tube. Record this measurement in your table in **1(a)(ii)**.
- Step 8 Start the timer and measure the height of the yeast suspension in the large test-tube after one minute and record the result in your table.
- Step 9 Repeat the measurement every minute for a total of five minutes.
- Step 10 After five minutes record the final temperature of the water in the **warm** water-bath and record it in Table 1.1.
- Step 11 Repeat steps 3 to 10 using the remaining small and large test-tubes and the water-bath labelled **cool**.
- (ii) Prepare a table to record your results.

(b) (i) State a conclusion for your results.

.....
.....
.....[1]

(ii) Explain why the temperature of the water-bath was not an accurate measurement of the temperature of the yeast suspension in the small test-tube.

.....
.....
.....[1]

(iii) Identify the error present in step 7 of the method. Suggest how the method could be improved to reduce this error.

error

.....

improvement

.....

..... [2]

(iv) Identify the variable that was changed (independent variable) and the variable that was measured (dependent variable) in this investigation.

independent variable

.....

dependent variable

..... [2]

- (c) A scientist investigated the effect of different concentrations of glucose on the rate of carbon dioxide production in yeast cells. They measured the volume of carbon dioxide produced by the yeast cells in five minutes.
- (i) The scientist decided to test their method before beginning the investigation. They performed three trials using one concentration of glucose.

The results are given in Table 1.2.

Table 1.2

trial	volume of carbon dioxide produced in 5 minutes /cm ³
1	13.6
2	14.3
3	12.9

Calculate the average volume of carbon dioxide produced in 5 minutes.

..... cm³

Calculate the average rate of carbon dioxide production per minute.

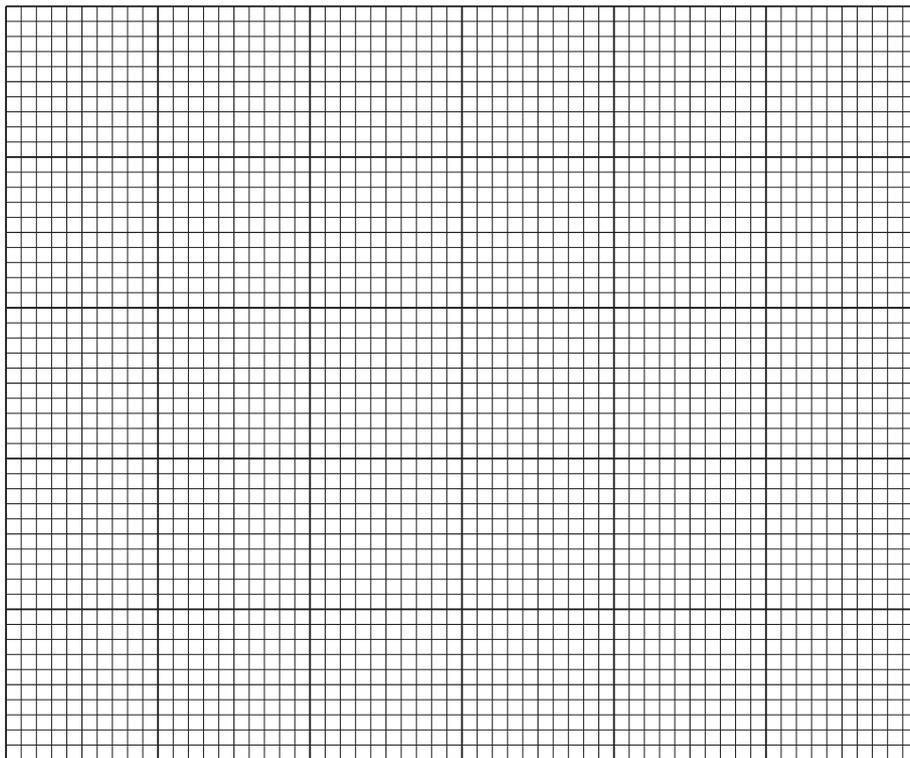
..... cm³ per minute
[2]

(ii) The scientist performed the investigation. Their results are shown in Table 1.3.

Table 1.3

percentage concentration of glucose	average rate of carbon dioxide production / cm ³ per minute
0.5	1.3
1.0	2.6
1.5	3.8
2.0	4.3
2.5	4.4
3.0	4.4

Plot a graph on the grid, using the data in Table 1.3, to show the effect of glucose concentration on the rate of carbon dioxide production. Include a line of best fit.



[4]

(iii) Describe the effect of glucose concentration on the rate of carbon dioxide production by respiring yeast cells shown in your graph.

.....
.....
.....
.....
..... [3]

(iv) Estimate the concentration of glucose the scientist used to test their method. Use your answer for 1(c)(i) and your graph to find this value.

..... % [1]

(d) (i) Describe how the student could show that the glucose used in the investigation is a simple (reducing) sugar.

.....
.....
.....
.....
..... [3]

(ii) Identify one hazard when testing for simple (reducing) sugars.

Describe one precaution that could be taken to reduce the risk.

hazard

.....

precaution

.....

[2]

[Total: 26]

2 Fig. 2.1 shows *Asterionella*, which are microscopic algae that live in fresh water.

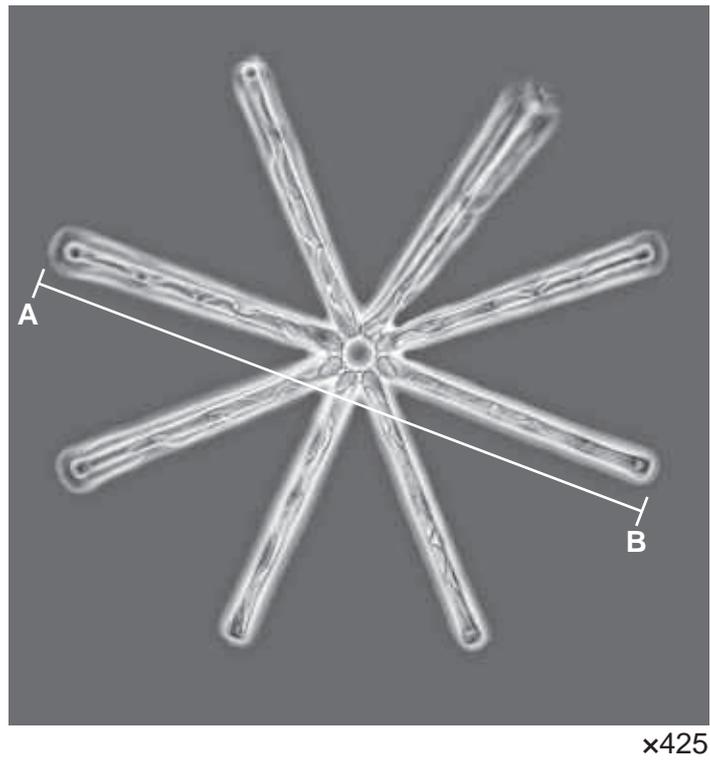


Fig. 2.1

(a) (i) Make a large outline drawing of the algae. Do not label your drawing.

- (ii) Measure the length of the line **AB** in Fig. 2.1. Include the unit.

length of **AB**

Use the formula to calculate the actual diameter of the algae shown in Fig. 2.1. Include the unit.

$$\text{magnification} = \frac{\text{length of line } \mathbf{AB}}{\text{actual diameter of algae}}$$

Show your working.

.....
[3]

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BIOLOGY

0610/53

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.

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This document consists of **10** printed pages and **2** blank pages.

- 1 You are going to investigate the effect of different concentrations of salt solution on a hollow plant stem S.

You have been provided with a 2% salt solution and distilled water. You are going to use these to make up different concentrations of salt solution.

Read all the instructions but DO NOT CARRY THEM OUT until you have drawn a table for your results in the space provided in 1(a)(ii).

Step 1 Label four test-tubes 1, 2, 3 and 4.

Step 2 Add 20 cm³ of distilled water to test-tube 1.

Step 3 Add 5 cm³ of 2% salt solution and 15 cm³ distilled water to test-tube 2.

Step 4 Use the information in Table 1.1 to make up the salt solutions in test-tubes 3 and 4.

Table 1.1

test-tube	volume of 2% salt solution/cm ³	volume of distilled water/cm ³	final percentage concentration of salt solution
1	0	20	0.0
2	5	15	
3	10	10	1.0
4	20	0	2.0

- (a) (i) Complete Table 1.1 by calculating the final percentage concentration of the salt solution in test-tube 2.

Space for working.

[1]

Step 5 Mix the contents of the test-tubes by gently shaking each test-tube.

Step 6 Label four Petri dishes, 1, 2, 3 and 4.

Step 7 Pour the contents of test-tube 1 into Petri dish 1.
Pour the contents of test-tube 2 into Petri dish 2.
Pour the contents of test-tube 3 into Petri dish 3.
Pour the contents of test-tube 4 into Petri dish 4.

- Step 8 Cut 12 identical rings, each approximately 2 mm long from stem **S**, as shown in Fig. 1.1. Take care not to crush the stem as you cut it.

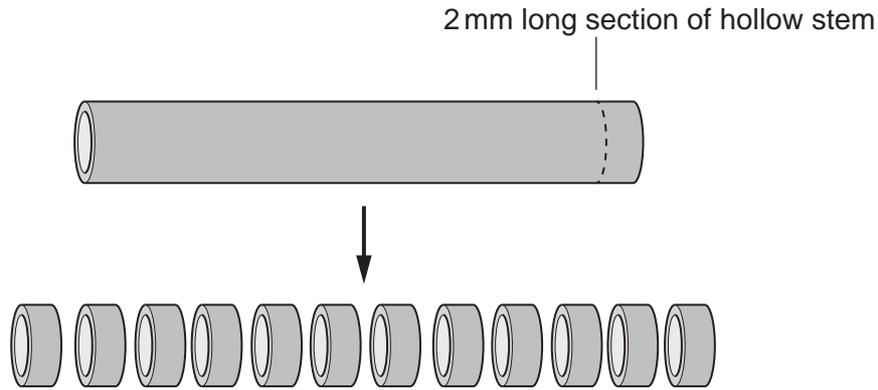


Fig. 1.1

- Step 9 Carefully cut open each stem ring using a sharp knife as shown in Fig. 1.2. Make only one cut through each ring.

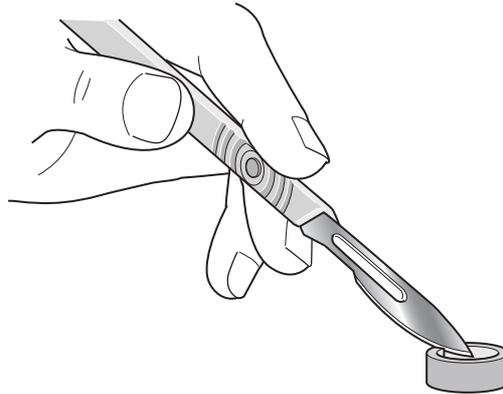


Fig. 1.2

- Step 10 Carefully place three cut stem rings into each labelled Petri dish and leave them for 10 minutes.

While you are waiting, continue to answer the remaining questions.

- Step 11 After 10 minutes, place the ruler beneath each of the Petri dishes and measure, in mm, the distance between the two cut ends of each stem ring (as shown in Fig. 1.3, where the distance is 12 mm).

Record this length in your table in **1(a)(ii)**.

Do not remove the rings from the Petri dish to measure them.

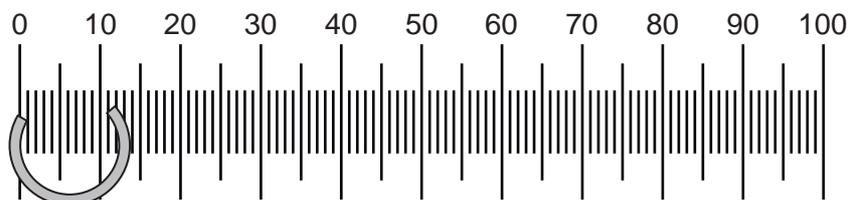


Fig. 1.3

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(ii) Prepare a table in the space provided and record your measurements in your table.

Your table should show:

- all of your results
- a calculated average for each solution.

[5]

(b) Identify one hazard in step 9 and describe a suitable safety precaution.

hazard

.....

precaution

.....

[2]

(c) Explain why more than one ring of the hollow stem was placed into each Petri dish.

.....
.....
.....
..... [2]

(d) (i) State the variable that was changed (independent variable) in this investigation.

..... [1]

(ii) Identify **two** variables that were kept constant in this investigation.

1
2 [2]

(e) There are potential errors in steps 8 and 11.

Identify **two** of these errors and suggest an improvement for each.

error 1
.....
improvement 1
.....
.....
error 2
.....
improvement 2
.....
..... [4]

(f) Fig. 1.4 is a photomicrograph of a cross-section of a hollow stem.

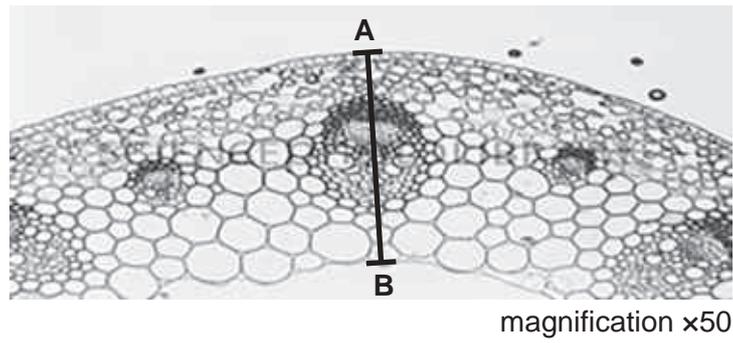


Fig. 1.4

Measure the length of **AB** on Fig. 1.4. Include the unit.

measured length of **AB** on Fig. 1.4

Calculate the actual length of **AB** using the following equation:

$$\text{magnification} = \frac{\text{measured length of AB}}{\text{actual length of AB}}$$

Show your working.

.....
[3]

[Total: 20]

2 Fig. 2.1 shows an image of a monarch butterfly, *Danaus plexippus*.

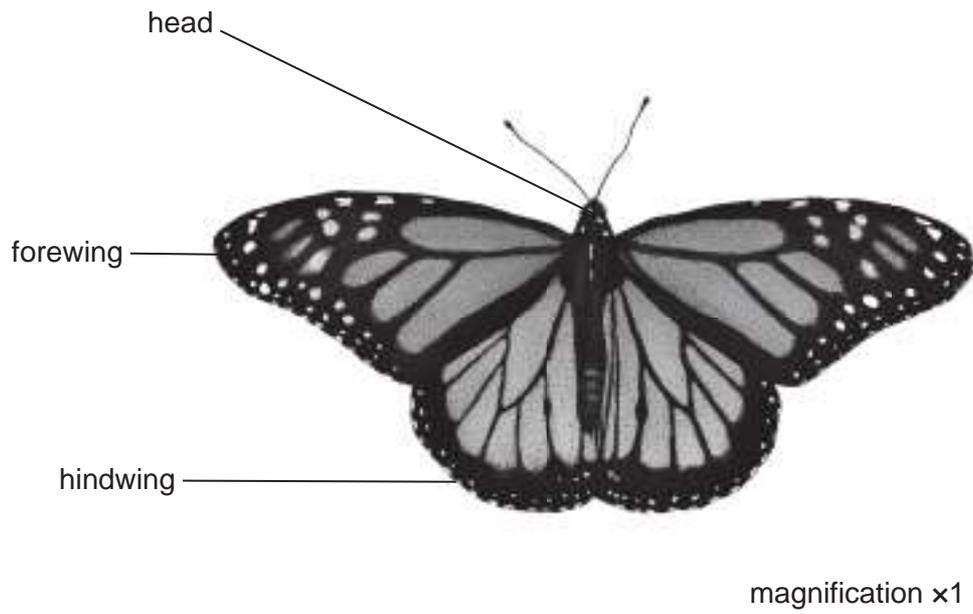


Fig. 2.1

(a) Make a large drawing of **one** of the hindwings of the monarch butterfly shown in Fig. 2.1.

(b) Fig. 2.2 shows an image of a viceroy butterfly, *Limenitis archippus*.



magnification $\times 1$

Fig. 2.2

Describe **one** visible similarity and **two** visible differences between the viceroy and the monarch butterflies' **wings**.

similarity

.....

difference 1

.....

difference 2

.....

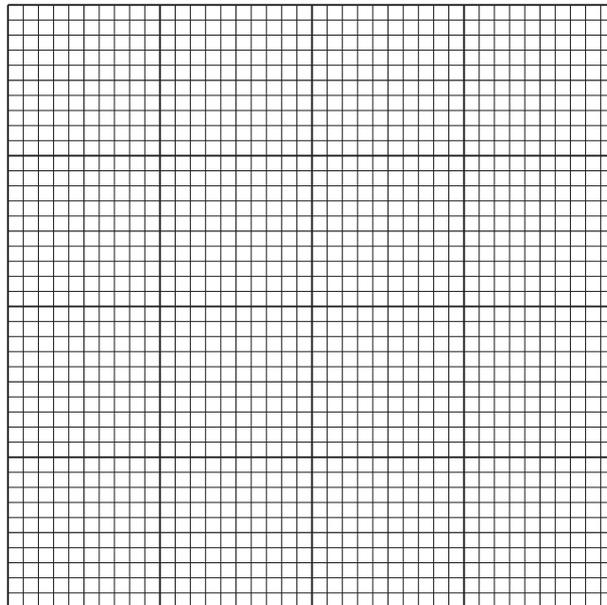
[3]

- (c) A student investigated the relationship between the body mass of monarch butterflies and the length of their forewings. The student recorded the data for five butterflies in Table 2.1.

Table 2.1

butterfly	body mass/g	forewing length/mm
A	0.2	38
B	0.3	42
C	0.5	50
D	0.7	58
E	0.8	62

- (i) Plot a graph on the grid to show the relationship between body mass and forewing length.



[4]

- (ii) Describe the relationship shown on the graph.

.....

.....

.....

.....[1]

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BIOLOGY

0610/61

Paper 6 Alternative to Practical

May/June 2018

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

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Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

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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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1 Young mammals feed on milk containing protein.

Some mammals produce an enzyme called rennin. Rennin changes the protein in milk so that it can be digested by another enzyme.

The action of rennin causes small lumps or clots to form in the milk.

An investigation was carried out to find the effect of pH on the activity of the enzyme rennin.

- Step 1 Three test-tubes were labelled **P**, **Q** and **R**.
- Step 2 A syringe was used to add 5 cm³ of milk to each of these test-tubes.
- Step 3 A dropping pipette was used to add two drops of acid to test-tube **P**.
- Step 4 A dropping pipette was used to add two drops of distilled water to test-tube **Q**.
- Step 5 A dropping pipette was used to add two drops of alkali to test-tube **R**.
- Step 6 Another three test-tubes were labelled **P1**, **Q1** and **R1**.
- Step 7 A clean syringe was used to add 1 cm³ of 0.1% rennin solution to each of test-tubes **P1**, **Q1** and **R1**.
- Step 8 All six test-tubes were placed into a water-bath at 40 °C and left for three minutes.
- Step 9 The contents of test-tube **P1** were added to test-tube **P**.
The contents of test-tube **Q1** were added to test-tube **Q**.
The contents of test-tube **R1** were added to test-tube **R**.
- Step 10 Test-tubes **P**, **Q** and **R** were kept in the water-bath and a stop-clock was started.
- Step 11 After one minute, test-tube **P** was removed from the water-bath. It was tipped and rotated as shown in Fig. 1.1. The appearance of the milk was observed, and the stage of clotting was decided by comparing it to the diagrams in Fig. 1.1.

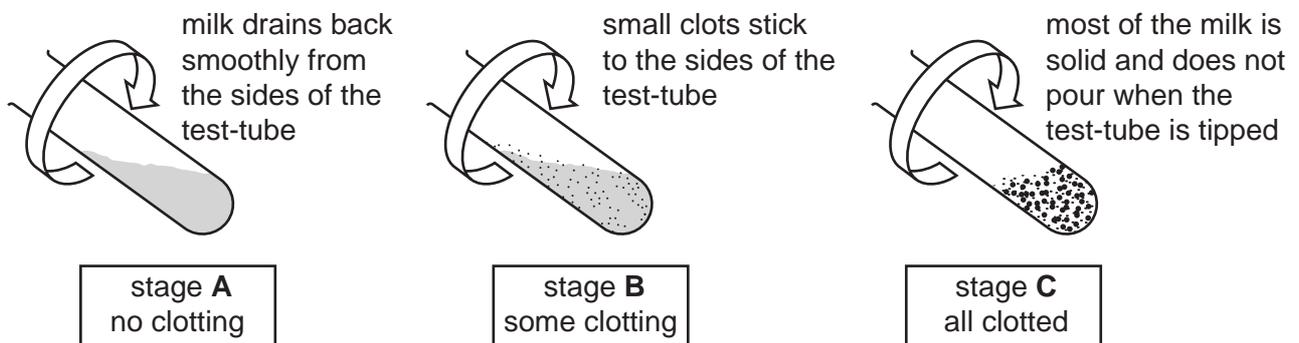


Fig. 1.1

- Step 12 Test-tube **P** was returned to the water-bath.
- Step 13 Steps 11 and 12 were repeated for test-tubes **Q** and **R**.
- Step 14 Steps 11, 12 and 13 were repeated every minute for five minutes.

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The results are shown in Fig. 1.2.

Test-tube **P** had some clotting at one minute and was all clotted at two minutes.

Test-tube **Q** had no clotting at one, two or three minutes but some clotting at four and five minutes.

Test-tube **R** had no clotting throughout the investigation, and remained unchanged after five minutes.

Fig. 1.2

(a) Prepare a table in which to record these results. Use the information in Fig. 1.2 to complete this table.

[3]

(b) State a conclusion for these results.

.....

.....

.....

.....

..... [2]

(c) (i) Suggest why, in step 8, all of the test-tubes were placed into a water-bath for three minutes before mixing the contents together in step 9.

.....
.....
..... [1]

(ii) State **two** variables that were kept constant in this investigation.

1
2 [2]

(d) Identify **four** sources of error in this investigation.

1
.....
2
.....
3
.....
4
..... [4]

(e) Identify **one** hazard associated with this procedure that would require the use of eye protection.

.....
.....
..... [1]

2 A student wanted to investigate a garden ecosystem.

She counted the number of insects caught in spider webs in one small section of the garden.

She found six spider webs in the small section of garden sampled.

Diagrams of the spider webs are shown in Fig. 2.1. Each black dot represents one insect caught in a spider web.

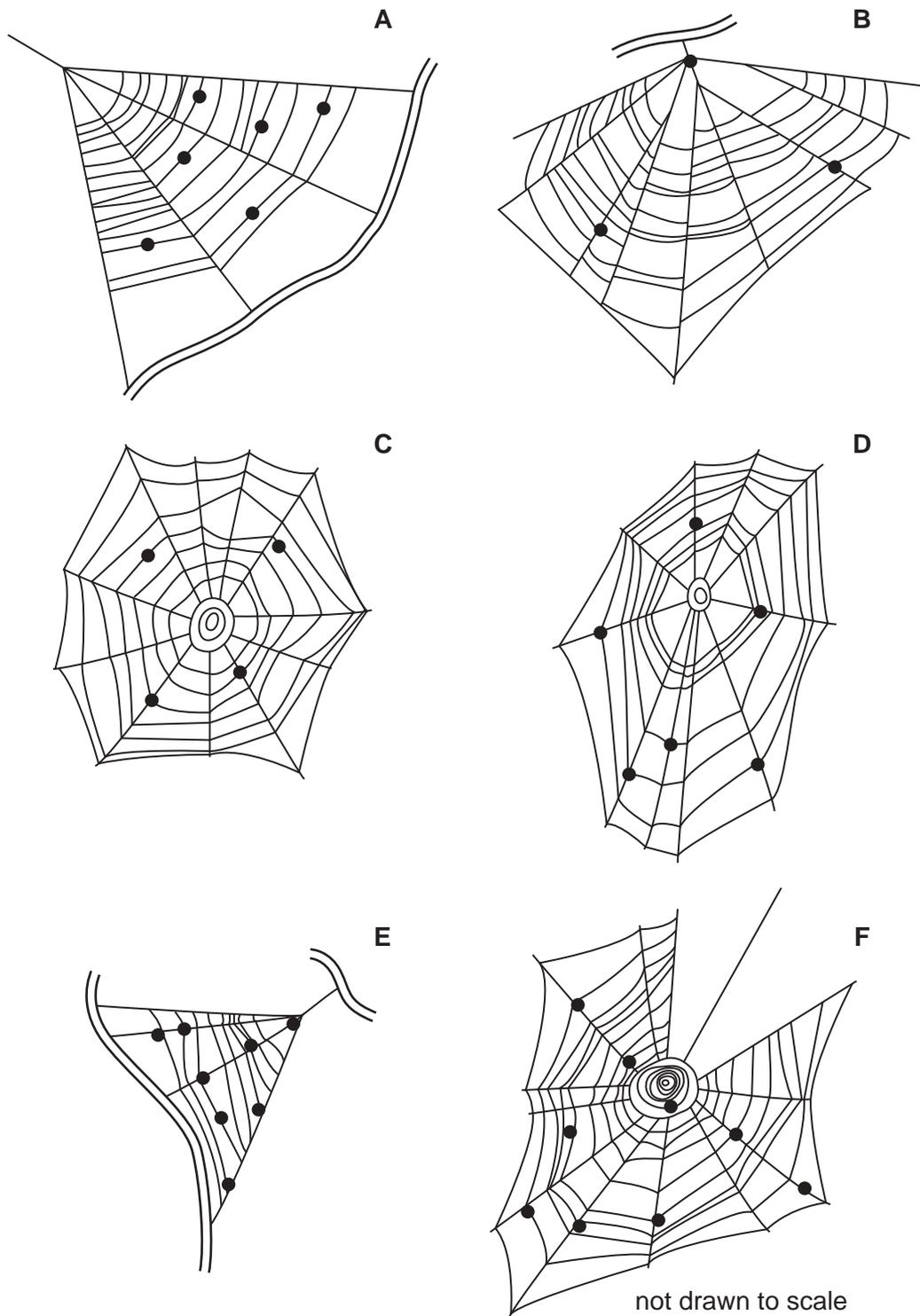


Fig. 2.1

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(a) (i) Use Fig. 2.1 to complete Table 2.1.

Table 2.1

spider web	number of insects caught in each web
A	
B	
C	
D	
E	
F	
total	

[2]

(ii) Calculate the average number of insects per web in the small section of garden, using the information in Fig. 2.1 and Table 2.1.

Space for working.

..... [1]

(iii) The student counted the total number of spider webs in the whole garden and found that there were a total of 102 spider webs.

Use this information and your answer to part **2(a)(ii)** to estimate the total number of insects caught in webs in the whole garden.

Space for working.

..... [1]

(iv) Suggest **one** reason why the estimated total number of insects caught in webs in the whole garden may not be accurate.

.....

 [1]

(b) Fig. 2.2 is a photograph of a spider.

A spider's body has two main parts. The legs are all attached to the cephalothorax which is the upper part of the body and starts at label **X** on Fig. 2.2. The lower part of the body is called the abdomen and is nearest to label **Y** on Fig. 2.2.

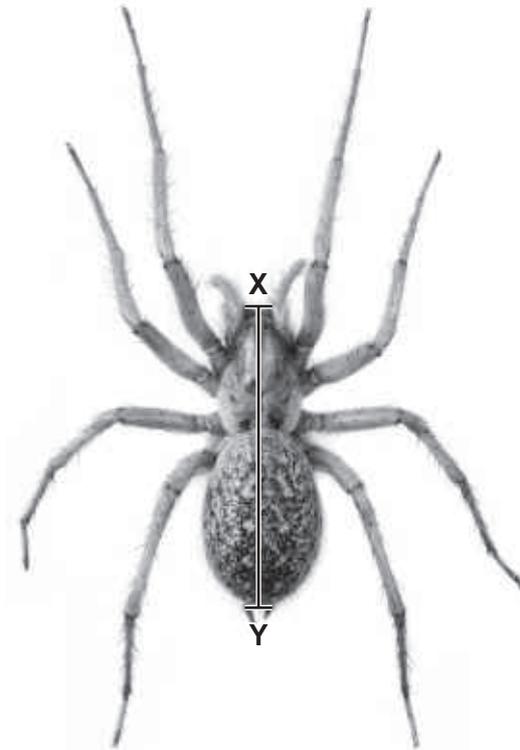


Fig. 2.2

- (i) Make a large drawing of the spider in Fig. 2.2 to show its outline, including its legs.
Label the abdomen.

[5]

- (ii) Measure the length of the spider between points **X** and **Y** on Fig. 2.2. Include the units.

Length of line **XY** on the spider in Fig. 2.2

Draw a line in the same position on your drawing and measure the length on your drawing.

Length of line **XY** on the spider in your drawing

Calculate the magnification of your drawing using your measurements and the following equation:

$$\text{magnification} = \frac{\text{length of line } \mathbf{XY} \text{ on your drawing}}{\text{length of line } \mathbf{XY} \text{ on Fig. 2.2}}$$

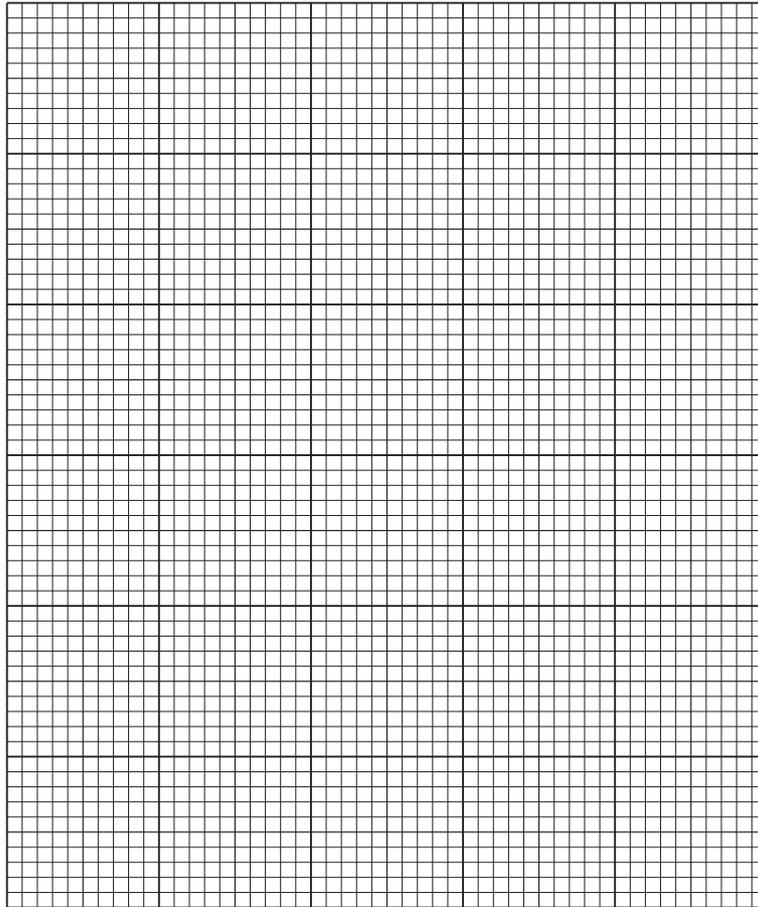
Space for working.

(c) Table 2.2 contains some other data collected by the student from the garden ecosystem.

Table 2.2

type of organism	number found in the garden ecosystem
trees	2
bushes	5
other plants	37
herbivores	118
carnivores	14

(i) Plot a bar chart of the data in Table 2.2.



[3]

(ii) Herbivores and carnivores are animals.

Use the data in Table 2.2 to calculate the ratio of animals to plants.

Show your working and give your answer in its simplest form.

.....
[2]

[Total: 18]

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BIOLOGY

0610/62

Paper 6 Alternative to Practical

May/June 2018

1 hour

Candidates answer on the Question Paper.

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Write in dark blue or black pen.

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Answer **all** questions.

Electronic calculators may be used.

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1 A student investigated the rate of respiration of yeast at two different temperatures.

Step 1 The student was provided with a yeast suspension which also contained glucose. Two identical sets of equipment were set up as shown in Fig. 1.1.

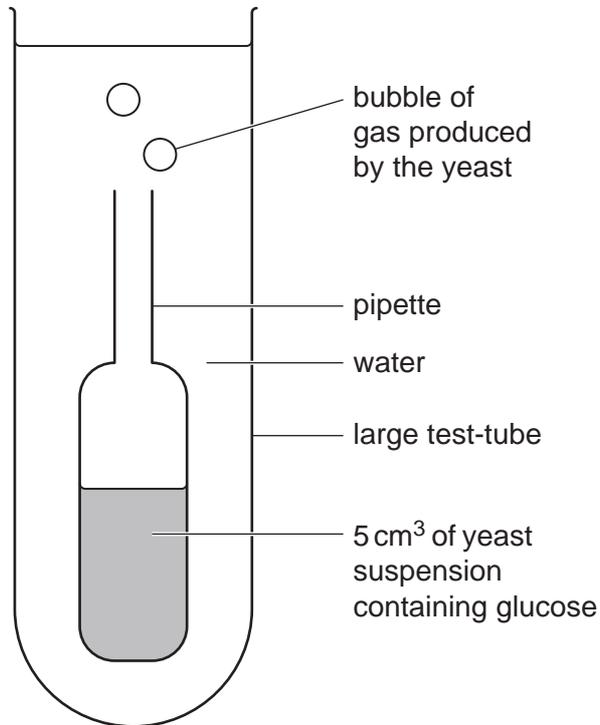


Fig. 1.1

Step 2 One set of the equipment shown in Fig. 1.1 was placed into a **warm** water-bath and the starting temperature of the water-bath was recorded as 50 °C. The other set was placed into a **cool** water-bath which had a starting temperature of 25 °C. The volume of water in each water-bath was the same.

Step 3 The student counted the number of gas bubbles produced by the yeast suspension in five minutes and recorded the results in a tally chart. This is shown in Fig. 1.2.

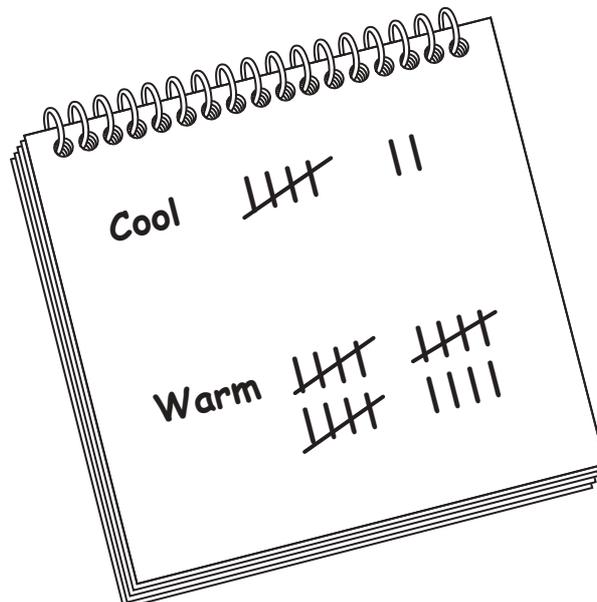


Fig. 1.2

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- (a) (i) Prepare a table and record the student's results shown in Fig. 1.2.

[3]

Step 4 At the end of the investigation the final temperature of the water in both water-baths was measured. The results are shown in Fig. 1.3.

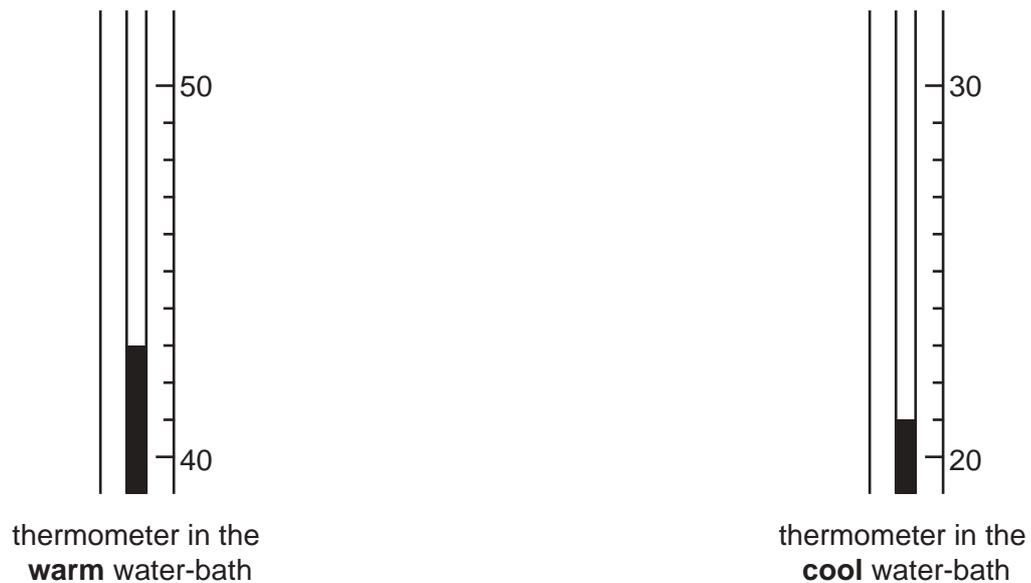


Fig. 1.3

- (ii) Use the information in step 2 and Fig. 1.3 to complete Table 1.1.

Table 1.1

water-bath	starting temperature / °C	final temperature / °C
warm		
cool		

[1]

(b) (i) State a conclusion for the results.

.....
.....
.....[1]

(ii) Counting the number of gas bubbles produced may not be an accurate method of measurement.

Explain why **and** suggest an improvement.

explanation

.....

.....

improvement

.....

.....

[2]

(iii) Identify a variable that **should** have been kept constant during this investigation but was not. Suggest how this variable could have been kept constant.

variable

.....

how this variable could have been kept constant

.....

.....

[2]

(iv) Identify the variable that was changed (independent variable) and the variable that was measured (dependent variable) in this investigation.

independent variable

.....

dependent variable

.....

[2]

(c) A scientist investigated the effect of different concentrations of glucose on the rate of carbon dioxide production in yeast cells. They measured the volume of carbon dioxide produced by the yeast cells in five minutes.

(i) The scientist decided to test their method before beginning the investigation.

They performed three trials using one concentration of glucose.

The results are given in Table 1.2.

Table 1.2

trial	volume of carbon dioxide produced in 5 minutes / cm ³
1	13.6
2	14.3
3	12.9

Calculate the average volume of carbon dioxide produced in 5 minutes.

..... cm³

Calculate the average rate of carbon dioxide production per minute.

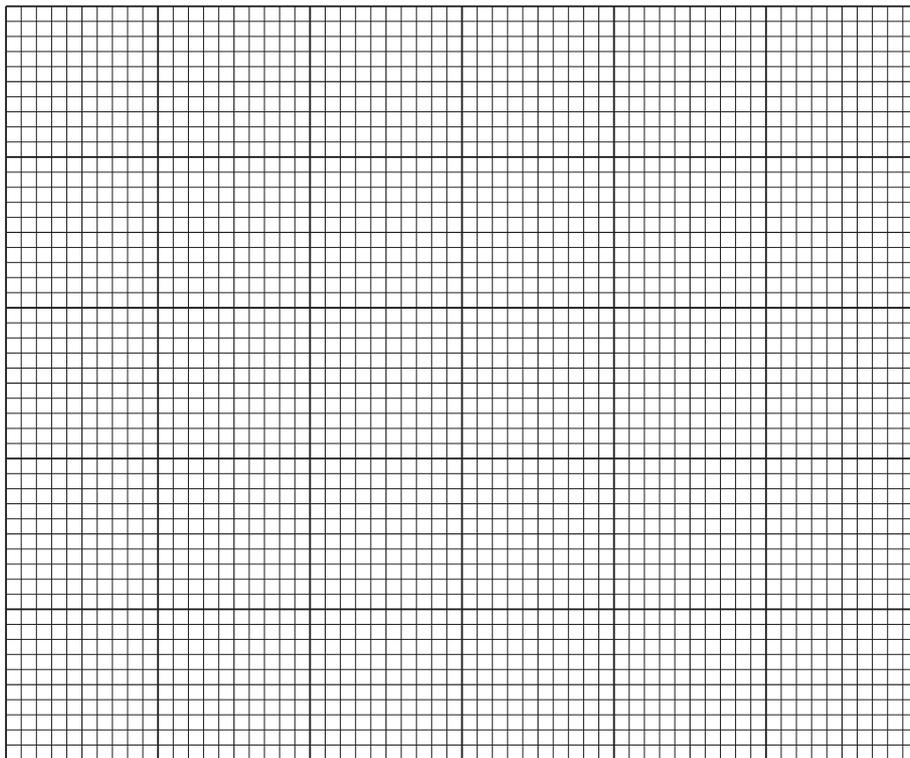
..... cm³ per minute
[2]

(ii) The scientist performed the investigation. Their results are shown in Table 1.3.

Table 1.3

percentage concentration of glucose	average rate of carbon dioxide production / cm ³ per minute
0.5	1.3
1.0	2.6
1.5	3.8
2.0	4.3
2.5	4.4
3.0	4.4

Plot a graph on the grid, using the data in Table 1.3, to show the effect of glucose concentration on the rate of carbon dioxide production. Include a line of best fit.



[4]

(iii) Describe the effect of glucose concentration on the rate of carbon dioxide production by respiring yeast cells, shown in your graph.

.....
.....
.....
.....
.....[3]

(iv) Estimate the concentration of glucose the scientist used to test their method. Use your answer for 1(c)(i) and your graph to find this value.

..... % [1]

(d) (i) Describe how the student could show that the glucose used in the investigation is a simple (reducing) sugar.

.....
.....
.....
.....
.....[3]

(ii) Identify one hazard when testing for simple (reducing) sugars.

Describe one precaution that could be taken to reduce the risk.

hazard

.....

precaution

.....[2]

[Total: 26]

2 Fig. 2.1 shows *Asterionella*, which are microscopic algae that live in fresh water.

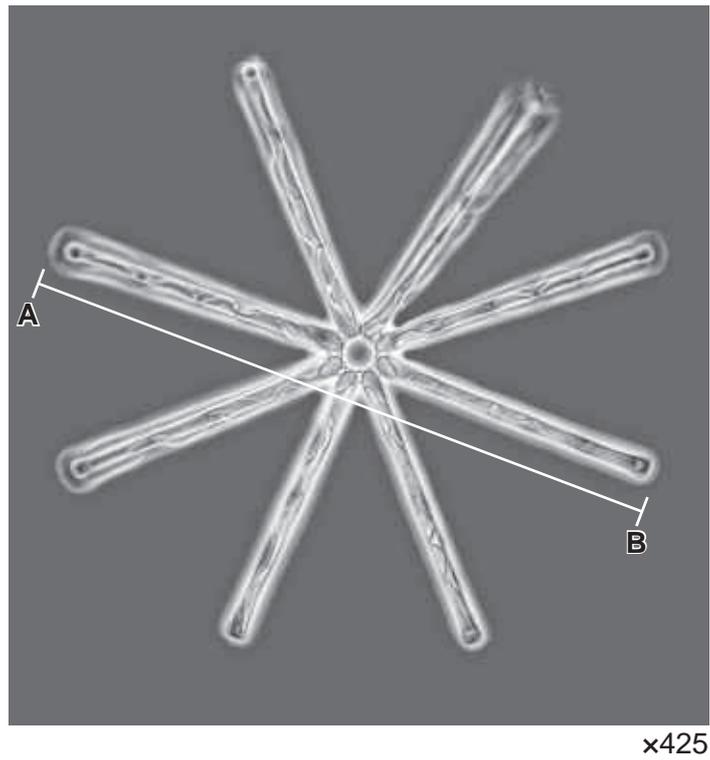


Fig. 2.1

(a) (i) Make a large outline drawing of the algae. Do not label your drawing.

- (ii) Measure the length of the line **AB** in Fig. 2.1. Include the unit.

length of **AB**

Use the formula to calculate the actual diameter of the algae shown in Fig. 2.1. Include the units.

$$\text{magnification} = \frac{\text{length of line } \mathbf{AB}}{\text{actual diameter of algae}}$$

Show your working.

.....
[3]

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BIOLOGY

0610/63

Paper 6 Alternative to Practical

May/June 2018

1 hour

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- 1 A student investigated the effect of different concentrations of salt solution on a hollow plant stem.

They were provided with a 2% salt solution and distilled water. The student used these to make up different concentrations of salt solution.

Step 1 Four test-tubes were labelled **1, 2, 3** and **4**.

Step 2 The information in Table 1.1 was used to make up the four different salt solutions in the test-tubes.

Table 1.1

test-tube	volume of 2% salt solution/cm ³	volume of distilled water/cm ³	final percentage concentration of salt solution
1	0	20	0.0
2	5	15	
3	10	10	1.0
4	20	0	2.0

- (a) (i) Complete Table 1.1 by calculating the final percentage concentration of the salt solution in test-tube **2**.

Space for working.

[1]

- Step 3 The contents of each test-tube were poured into four Petri dishes labelled **1, 2, 3** and **4**.
- Step 4 A hollow stem was cut into 12 rings using a sharp scalpel. Each stem ring was approximately 2 mm long, as shown in Fig. 1.1.

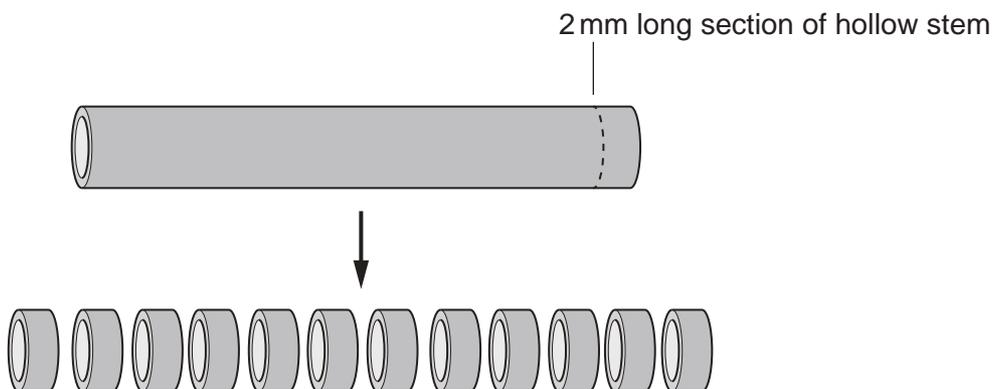


Fig. 1.1

Step 5 Each stem ring was then cut open as shown in Fig. 1.2.

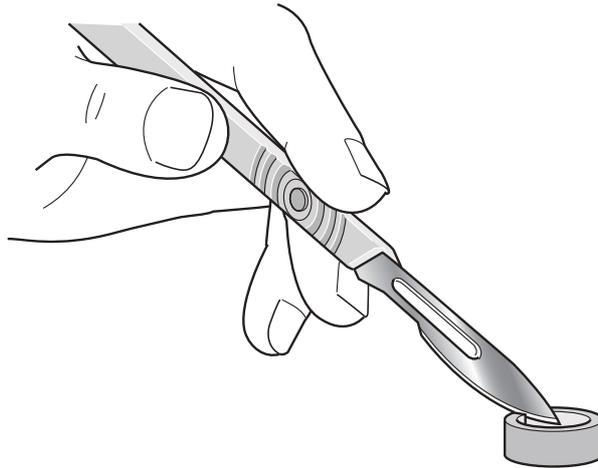


Fig. 1.2

Step 6 Three cut stem rings were put into each of the different salt solutions in the labelled Petri dishes and left for 10 minutes.

Fig. 1.3 shows the appearance of the cut stem rings **after** 10 minutes.

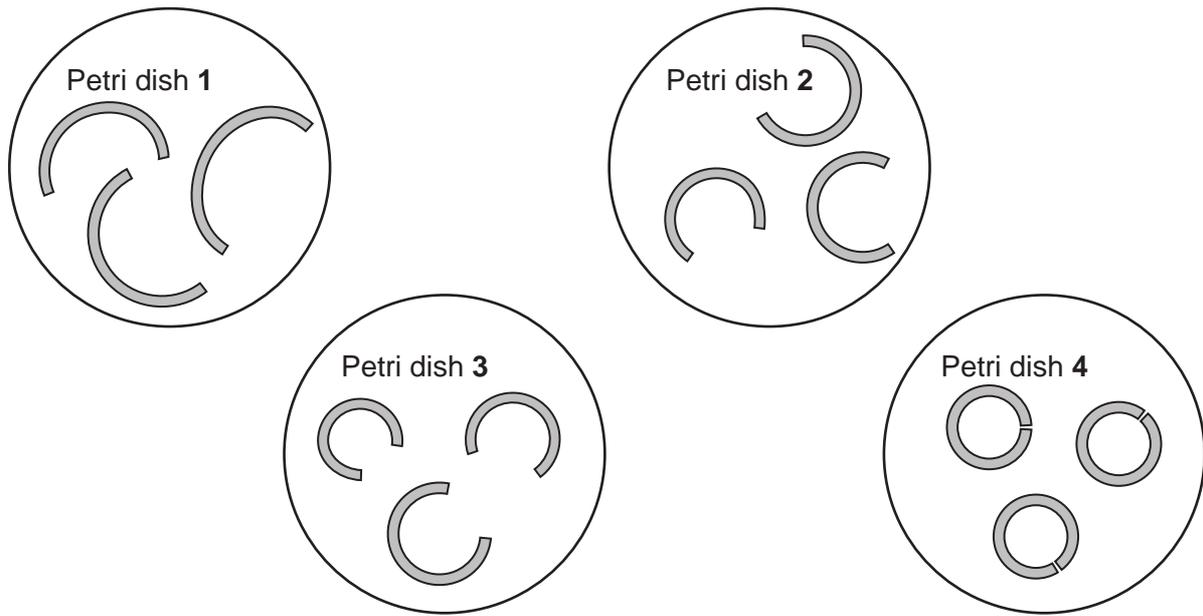


Fig. 1.3

Step 7 The distance between the two cut ends of each stem ring can be measured, as shown in Fig. 1.4.

In the example shown in Fig. 1.4 the distance is 12 mm.

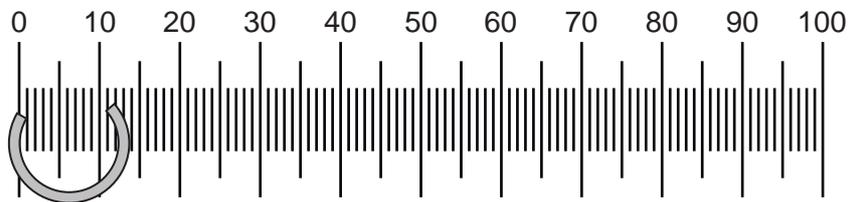


Fig. 1.4

(ii) Measure the gap between the cut ends of all of the stem rings shown in Fig. 1.3.

Prepare a table in the space provided and record your measurements in your table.

Your table should show:

- all of your results
- a calculated average for each solution.

[4]

(iii) Use Table 1.1 and your measurements to describe the results shown in Fig. 1.3.

.....
.....
.....[1]

(b) Identify one hazard in step 4 and describe a suitable safety precaution.

hazard
.....
precaution
.....

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[Turn over

(c) Explain why more than one ring of the hollow stem was placed into each Petri dish.

.....
.....
.....
..... [2]

(d) (i) State the variable that was changed (independent variable) in this investigation.

..... [1]

(ii) Identify **two** variables that were kept constant in this investigation.

1

2

[2]

(e) There are potential errors in steps 4 and 7.

Identify **two** of these errors and suggest an improvement for each.

error 1

.....

improvement 1

.....

.....

error 2

.....

improvement 2

.....

.....

[4]

(f) Fig 1.5 shows a section through a hollow plant stem observed through a light microscope.

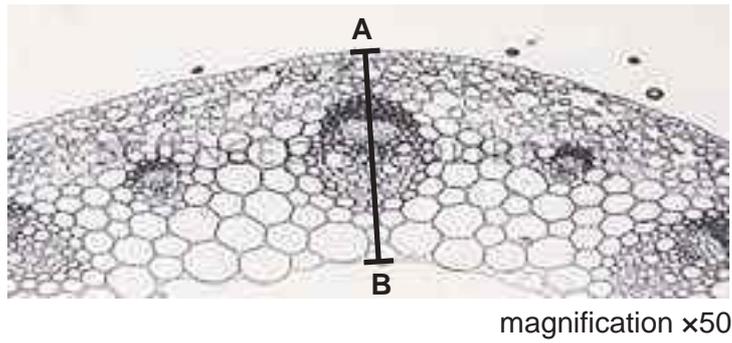


Fig. 1.5

Measure the length of **AB** on Fig. 1.5. Include the unit.

measured length of **AB** on Fig. 1.5

Calculate the actual length of **AB** using the following equation:

$$\text{magnification} = \frac{\text{measured length of } \mathbf{AB}}{\text{actual length of } \mathbf{AB}}$$

Show your working.

.....
[3]

[Total: 20]

2 Fig. 2.1 shows an image of a monarch butterfly, *Danaus plexippus*.

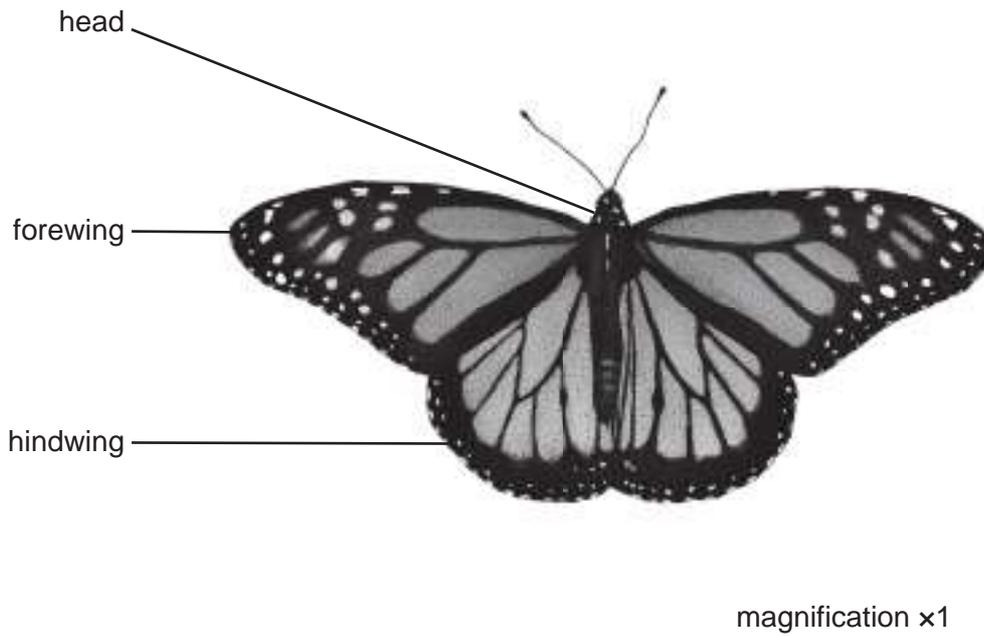


Fig. 2.1

(a) Make a large drawing of **one** of the hindwings of the monarch butterfly shown in Fig. 2.1.

(b) Fig 2.2 shows an image of a viceroy butterfly, *Limenitis archippus*.



magnification $\times 1$

Fig. 2.2

Describe **one** visible similarity and **two** visible differences between the viceroy and the monarch butterflies' **wings**.

similarity

.....

difference 1

.....

difference 2

.....

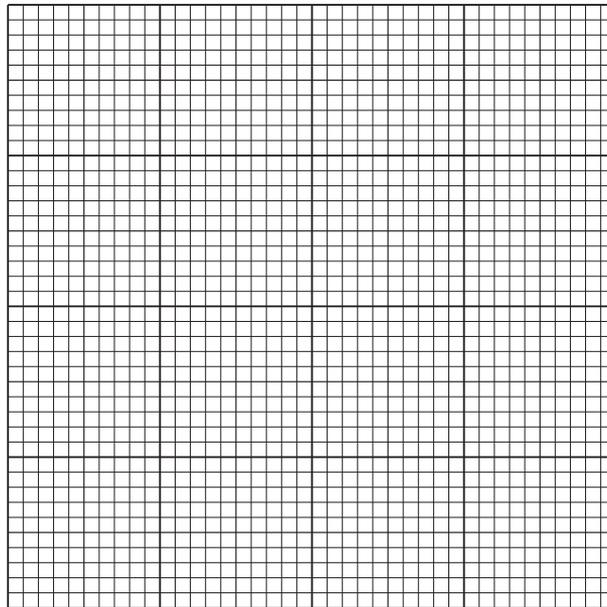
[3]

- (c) A student investigated the relationship between the body mass of monarch butterflies and the length of their forewings. The student recorded the data for five butterflies in Table 2.1.

Table 2.1

butterfly	body mass/g	forewing length/mm
A	0.2	38
B	0.3	42
C	0.5	50
D	0.7	58
E	0.8	62

- (i) Plot a graph on the grid to show the relationship between body mass and forewing length.



[4]

- (ii) Describe the relationship shown on the graph.

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.....[1]

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BIOLOGY

0610/52

Paper 5 Practical Test

February/March 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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phone +44 1223 553554
fax +44 1223 553558

This document consists of **6** printed pages and **2** blank 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 experiment in Question 1 and record their results on a spare copy of the question paper, clearly labelled 'supervisor's results'.

Question 1

Each candidate should be provided with:

hazard	materials and apparatus	quantity per candidate
	pieces of dry cloth stained with food dye	4
	glass rod	1
	white tile approximately 10 cm × 10 cm	1
	marker pen to write on the white tile	1
	stop-clock	1
refer to packaging	100 cm ³ of bio washing solution in a 250 cm ³ beaker labelled bio	1
refer to packaging	100 cm ³ of non-bio washing solution in a 250 cm ³ beaker labelled non-bio	1
	100 cm ³ of distilled water in a 250 cm ³ beaker labelled water	1
	forceps	1 pair
	gloves	1 pair
	eye protection	1
	paper towels	6

Preparation of materials

Stained cloth

Cut white cotton fabric into pieces that measure approximately 5 cm × 5 cm. Place the pieces of white cotton cloth into a solution of food dye. An intense colour such as red or blue is suitable. The food dye can be diluted by 50% but must be concentrated enough to stain the fabric.

Stir the cloth into the food dye solution so it is completely immersed and then leave for at least one hour.

Dry the pieces of cloth in a drier, or leave to air-dry for at least 24 hours. The cloth pieces must be completely dry when presented to candidates.

Bio washing solution

Dissolve approximately 20g of biological washing powder or liquid in 1 dm³ of warm tap water.

Non-bio washing solution

Dissolve approximately 20 g of non-biological washing powder or liquid in 1 dm³ of warm tap water. If non-biological washing powder is not available dish-washing liquid or liquid hand soap are suitable alternatives.

Once prepared, the solutions for candidates do not need to be kept warm. Solutions can be provided to candidates at room temperature.

Question 2

Each candidate should be provided with:

hazard	materials and apparatus	quantity per candidate
	30 cm transparent plastic ruler	1

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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)

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BIOLOGY

Paper 0610/12
Multiple Choice (Core)

<i>Question Number</i>	<i>Key</i>	<i>Question Number</i>	<i>Key</i>
1	C	21	B
2	A	22	B
3	C	23	B
4	C	24	C
5	D	25	C
6	C	26	D
7	B	27	D
8	A	28	C
9	C	29	B
10	D	30	C
11	D	31	D
12	A	32	C
13	A	33	D
14	B	34	D
15	C	35	C
16	B	36	B
17	C	37	D
18	C	38	C
19	C	39	A
20	D	40	C

General comments

The exam paper provided both a balance of questions and challenge for candidates working at this level. There was uncertainty about the convention for writing the scientific name of a species and the functions of different parts of cells. Applying knowledge of levels of organisation proved to be challenging for some. Some candidates were uncertain about the products of photosynthesis and the details of the food test for vitamin C. Some were uncertain about the approximate percentages of oxygen and carbon dioxide in inspired air. One misconception was that the chromosomes are found in the cytoplasm. There was a good understanding of how to calculate magnification and the meaning of osmosis. Most candidates also knew that the pancreas produces insulin.

Comments on specific questions

Question 1

Many candidates gave the correct response. Some found it more challenging with incorrect distractors being selected with equal frequency.

Question 2

This question was well-answered although a few did not appreciate that the first letter of the species part of the name is written in lower case.

Questions 4

Many candidates appreciated that the cell on the right is a palisade cell and can therefore make starch. The commonest incorrect response was that only one cell could control the movement of substances into the cell.

Question 5

While many candidates opted for the correct response, some incorrectly believed that the chromosomes are found in the cytoplasm.

Question 6

This proved to be a challenging question with few being able to apply their knowledge to identify the correct level of organisation.

Question 7, 9, 21, 24 and 35

These questions were well-answered by nearly all candidates.

Question 11

Most candidates identified the correct gas. The commonest incorrect response was carbon dioxide.

Question 14

Identifying the correct tissues and relating the tissues to their functions proved to be challenging for many candidates.

Question 15

Some candidates were able to identify the correct part of the leaf but many found this challenging. Similar numbers opted for each of the incorrect distractors.

Question 18

While many understood that hairs in the nose and mucus help to prevent pathogens reaching the alveoli when breathing in, some also incorrectly believed that antibodies or the skin are also involved.

Question 20

This proved to be a challenging question with most candidates not appreciating that all forms of respiration involve the action of enzymes.

Question 22

Some candidates knew that it is the iris that controls the amount of light entering the eye. Many incorrectly opted for the cornea, lens or retina.

Question 25

Although some candidates understood that antibiotics can be used to treat bacterial infections, others believed that antibiotics can be used to treat infections caused by all pathogens or caused by bacteria and viruses.

Question 26

Some realised that the presence of a flower or a fruit indicates that sexual reproduction is involved.

Question 27

The majority of candidates correctly recalled the conditions required for germination. The commonest misconception is that light is always required for germination.

Question 30

The definition of a gene was well-known. The commonest incorrect response was chromosome.

Question 34

Most candidates gave the correct response. The commonest incorrect response was glucose.

Question 37

Many knew that the transfer of genes is involved. Selective breeding was the commonest incorrect response.

BIOLOGY

Paper 0610/22
Multiple Choice (Extended)

<i>Question Number</i>	<i>Key</i>	<i>Question Number</i>	<i>Key</i>
1	C	21	C
2	A	22	D
3	D	23	B
4	C	24	A
5	C	25	D
6	B	26	B
7	A	27	D
8	C	28	A
9	A	29	C
10	D	30	C
11	B	31	B
12	D	32	A
13	C	33	D
14	A	34	A
15	C	35	D
16	B	36	B
17	C	37	C
18	C	38	B
19	C	39	D
20	C	40	B

General comments

The exam paper provided both a balance of questions and challenge for candidates working at this level.

Comments on specific questions

Question 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 20, 21, 24, 26, 29, 31, 34, 35, 37, 38 and 39.

The majority of candidates gave the correct responses to these questions.

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Question 15

While many candidates understood that the change in the concentration of maltose at X was caused by the action of maltase, some incorrectly believed it was because maltose is absorbed.

Question 16

Most candidates gave the correct response but there was some uncertainty about the positions of the xylem and phloem in a stem.

Question 22

This proved to be a challenging question with few appreciating that all forms of respiration involve the action of enzymes.

Question 27

While many candidates identified the correct option, some were uncertain about the effect of auxin on a shoot tip.

Question 28

Most candidates knew that MRSA is a bacterium. The commonest incorrect response was virus.

Question 30

While many candidates correctly identified oestrogen from the graph, some were less certain. Incorrect distractors were chosen with equal frequency.

Question 32

Many candidates were able to correctly determine which parents could produce offspring with blood group O. Some incorrectly believed that a homozygous father with blood group A and homozygous mother with blood group O could produce offspring with blood group O.

Question 40

Although most candidates knew the sequence of events involved in eutrophication, some found this question challenging.

BIOLOGY

Paper 0610/32
Theory (Core)

Key messages

Candidates must read the question carefully and then target their answer to this.

General comments

There were some excellent scripts produced by the candidates who were well prepared for the examination. Most candidates attempted all the questions and there was no evidence that any candidate had insufficient time in which to complete their work. Most of the scripts were clearly legible.

Comments on specific questions

Question 1

- (a) Many candidates could state the names of three other groups of substances in the diet. Some candidates stated the name of a specific mineral ion instead of naming the group and could not receive credit for this.
- (b) All the correct linkages between conditions and their causes were made by many candidates. Many candidates made two correct linkages only, these typically being the ones involving starvation and obesity. The cause of scurvy was not well known.

Question 2

- (a) This question discriminated well. Most candidates were able to place 'oxygen' and 'energy' correctly in the first two spaces, but many candidates did not fully understand the processes involved.
- (b) The role of carbon dioxide in making bread was widely known. The production of alcoholic drinks was a less frequently seen answer and very few candidates referred to the production of biofuels. Other correct uses, such as carbon dioxide in carbonated drinks, were accepted, but rarely cited.
- (c) Some candidates quoted the four results from the bar chart and did not attempt to convert the results into a trend. Good answers stated that the shorter the distance of the race, the greater the energy provided by anaerobic respiration (or vice versa). The majority of candidates received partial credit as the instruction to 'use data to support your answer' was not followed. Some candidates attempted to explain the results, but this had not been asked for in the question.

Question 3

- (a) Almost all candidates gained credit for drawing a pupil smaller in diameter than the first example. A very few candidates drew pupils that were either vertical or horizontal slits.
- (b)(i) Some candidates were very confident and knew the pathway for a reflex arc, other candidates found this question challenging.
- (ii) Many candidates gave synapse, spelled correctly. Some candidates gave the word 'neuro-transmitter' and whilst this chemical would be present in the gap, it is not the name of the gap itself.

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- (c) A very few candidates only gained the first mark for stating the action of insulin. Insulin acts to lower the blood glucose concentration and those candidates who stated that insulin 'regulates' or 'controls' did not gain credit as this answer is not precise enough. References to blood glucose level in the body and the role of pancreatic secretions in digestion were not awarded credit.

Adrenaline was more widely known and nearly every candidate knew that testosterone was made in the testes. Many could also state a function for testosterone.

Question 4

- (a) This was fairly well answered, with many candidates naming three different examples of modern technology. The majority of answers cited various forms of machinery and categories of chemicals that are applied to crops. Genetic engineering and selective breeding were infrequent answers. Some candidates could give one or two examples only of modern technological used in food production.
- (b) Most candidates answered the question by describing the disadvantages of a monoculture system, whereas the question asked for its effects on the wider eco-system. There were a few excellent and comprehensive answers, but these were rare.

Question 5

- (a) The general pattern was for candidates to state an adaptive feature of a sperm (usually that it had a flagellum/tail or that it had a streamlined shape) but be unable to state an adaptive feature of an egg cell. Some candidates merely described the functions of the gametes in general reproductive terms.
- (b) Many candidates stated two actions that a woman should avoid during pregnancy. There was a widespread misconception amongst candidates that women should avoid any type of physical activity during pregnancy, whereas the latest research indicates that physical activity is beneficial.
- (c) (i) Widespread confusion exists between the functions of the amnion and of the placenta. Many candidates who gained credit gave combined answers with the salient facts about placental functions contained somewhere therein.
- (ii) Many candidates wrote about changes that would occur during pregnancy rather than during the birth process.

Question 6

- (a) (i) A significant number of candidates did not attempt to draw the path of the water molecule. Others seemed unfamiliar with the section through a root and ended their lines in the cortex. A considerable number of the remaining candidates ended their line on the phloem.
- (ii) Many candidates gave the correct answer of osmosis. Other processes frequently named were diffusion, absorption, assimilation and active transport.
- (iii) Most candidates named xylem.
- (b) (i) The vast majority of candidates selected the correct information from the graph.
- (ii) Candidates were asked to describe and explain the results shown in the graph. Very few candidates attempted the explanation. There were many sound descriptions given but also many answers where figures were quoted in isolation without any conclusions being drawn.
- (c) To gain both marks, it was necessary for candidates to give a precise function for the mineral ion that had been selected, i.e. chlorophyll production or amino acid formation for magnesium and nitrate ions respectively. Some candidates citing other mineral ions were unable to give a precise function. Some statements, such as 'for good growth' are too vague to gain any credit.

Question 7

- (a) (i) This was well answered by some candidates. Other candidates named two specific blood vessels and not the types of vessels.
- (ii) Very many candidates wrote about the function of arteries and not about their structure.
- (b) (i) Prevalent misconceptions were that the blockage was caused by a lump of fat, that the blockage could occur in any artery or that it could be in one of the heart chambers. Many candidates said that the heart muscle had died because there was a blockage without being more precise.
- (ii) On the whole this was well answered with many candidates stating three correct risk factors. Some candidates incorrectly referred to dietary factors.

Question 8

This was answered accurately by most candidates. The main misconceptions were that diffusion occurs in plants only and that sexual reproduction occurs in animals only.

Question 9

- (a) The definition of a pathogen was known by many candidates. Some candidates tended to confuse that the pathogen was the disease caused.
- (b) Many candidates could give an example of each type of body defence. Some candidates answered the question by giving examples of contraceptive devices.
- (c) (i) The main purpose of washing is to remove something from the surface of the skin. This removal process was frequently not stated. As before, there was confusion between a pathogen and the disease caused.
- (ii) Some candidates referred to the greater efficiency of biological powders which was not credit-worthy. More able candidates pinpointed the fact that these powders contain enzymes. Frequently no further information about the names of the enzymes or the products of digestion were given.
- (d) This was not well answered. Most candidates did not refer to transmission of pathogens. Many referred to the transmission of diseases. A large number wrote about the processes involved in hygienic food preparation.

Question 10

- (a) Many candidates did not know this definition.
- (b) Candidates could usually name a relevant lung disease.
- (c) Many candidates identified the liver correctly.
- (d) Most candidates could name the class of drugs as antibiotics, or some gave the name of a specific antibiotic. Other candidates referred to medicinal drugs or to antibodies.

BIOLOGY

Paper 0610/42
Theory (Extended)

Key messages

A very high standard of scientific knowledge and understanding was displayed by many of the candidates. It was pleasing to see so many articulate and accurate responses.

- There were some questions where candidates had to identify parts from diagrams such as questions **1(b)** and **6(a)(i)**. It is important to study diagrams carefully and in particular the part that each label line is pointing to.
- Candidates should be encouraged to read the stimulus material carefully. Questions such as **1(c)(ii)** and **5(a)(i)** required a description of the data. The best responses provided additional information rather than just quoting figures. Not all were clear as to the difference between the command words describe and explain.

General comments

Candidates generally showed good use of scientific terminology and expressed their ideas in continuous prose.

A good understanding of the key command words will ensure that candidates answer the question asked.

Comments on specific questions

Question 1

- (a) Most candidates could describe some of the main points from the definition of the term *excretion*. Descriptions of examples of excretion or excretory products were not required.
- (b) Many candidates identified the correct parts of the kidney. A common error was to give cortex for medulla and vice versa. The renal vein was sometimes incorrectly identified as the ureter or pelvis.
- (c) (i) The majority of candidates identified the correct values for the solute concentration of the blood in the renal artery and the urine. Fewer were able to calculate the percentage increase. The most common incorrect response was 99 per cent and where candidates had divided the difference by the value of the solute concentration of the urine rather than dividing by the solute concentration of the blood in the renal artery.
- (ii) It was evident that not all understood the type of response required for a 'describe' question. Some tried to explain the similarities and differences in concentration by referring to absorption and filtration. The question required a description of the results. This required more than simply quoting data straight from the table. The best responses described the concentration of salts being the same in the blood, in the renal artery and in the fluid of the kidney tubule and that the concentration of salts increases in the urine.
- (iii) Many candidates could correctly state that proteins would be too large to enter the fluid in the kidney tubule.
- (iv) Many candidates could correctly state that glucose is reabsorbed.

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- (d) A few excellent descriptions of the advantages of kidney transplants were seen. The best responses referred to the lack of restrictions on diet and lifestyle. Some included the idea of a transplant being more cost effective in the long run with most correctly describing a transplant as being more convenient than frequent dialysis.

Question 2

- (a) (i) The question required **visible** features. General features of insect-pollinated plants that were not visible were not required.
- (ii) A few responses gave details of plant fertilisation rather than pollination. The majority of candidates identified that self-pollination occurred in the same plant.
- (iii) Candidates found this question more challenging depending on their approach. It was evident that many confused self-pollination with asexual reproduction and gave the advantages of asexual reproduction. This was not usually successful. The best responses included the ideas that there were more chances of pollination and fertilisation and this is useful if the plant is geographically isolated, thus preventing extinction.
- (b) (i) Most candidates had some correct ideas about co-dominance, with the majority of candidates stating that both alleles are expressed. It was pleasing to see that there was very little confusion between the terms genes and alleles. Fewer referred to the phenotype being intermediate.
- (ii) There were many excellent genetic diagrams seen. The most common error was to give a ratio without any reference to the phenotype so it was not clear which colours the candidates were referring to.
- (iii) A common error was to state the genotypes rather than the phenotypes. Most candidates were able to gain the second mark available by describing the inheritance of a C^W and a C^R allele or referring to the offspring all being heterozygous.

Question 3

- (a) Most candidates could state the correct sequence of a reflex action. A common error was to reverse the order of the relay and the motor neurone.
- (b) Most candidates were able to name neurotransmitters and their release from vesicles and subsequent diffusion across the synapse. A significant number referred to the binding of the neurotransmitter with receptor **cells**. This was a common misconception. In a small number of cases there was some confusion between the electrical impulses and the chemical neurotransmitter, with some using these terms interchangeably.
- (c) (i) Many candidates could state at least one effect of heroin use. A few gave long-term effects or the effects of withdrawal which did not answer the question.
- (ii) This question was well-answered with many candidates able to give two correct withdrawal symptoms.
- (iii) Many candidates suggested that people turned to crime to finance their addiction.

Question 4

- (a) This question was well-answered. Some candidates gave natural sources of the chemical substances stated rather than sources of pollution caused by humans which was not accepted.
- (b) (i) Candidates should be congratulated as many excellent and clear responses were seen. Most candidates could give a detailed explanation of how eutrophication was caused referring to the causes of the death of plants, the aerobic respiration of decomposers and the death of organisms due to lack of oxygen. A minority mistook algae for decomposers and stated that algae were responsible for the reduction in the oxygen concentration in the water. A very small number of candidates suggested that death of marine organisms was caused by toxicity of the fertilisers entering the lake which did not answer the question.

- (ii) Most candidates suggested using less fertiliser. Several additional good suggestions were seen such as not applying fertiliser during the rainy season.

Question 5

- (a) (i) This question required a description of the data and an explanation. A few attempted an explanation of the data but did not refer to the data explicitly and responded in abstract terms. Some simply gave data quotes without any form of description or explanation. The best responses referred to the loss of mass of the leaves and related this to thickness of cuticle and loss of water by transpiration. A few calculated the loss in mass but these values were often inaccurate due to misreading the data from the graph.
- (ii) Many candidates could relate that an increase in humidity would decrease the transpiration rate and so less water and mass would be lost. Some tried to relate this to water potential, which was not required. One misconception was to state that an increase in humidity would increase the transpiration rate.
- (b) Many candidates gave two correct adaptations. A common error was to give adaptations of hydrophytes instead of xerophytes.
- (c) (i) This was answered very well with most candidates stating the correct raw material.
- (ii) A common error was to refer to the processes rather than substances that glucose is converted to. A common misconception was that respiration produces rather than releases energy.

Question 6

- (a) (i) This question was generally well-answered. A common error was to identify the protein coat as the cell wall or membrane. Occasionally the answer for X was given for Y and vice versa.
- (ii) A few responses seemed to refer to fungi rather than bacteria. The question referred to differences in structure, responses stating differences in reproduction methods were not accepted. A common error was to describe bacteria as having a nucleus.
- (b) (i) The most common error was to give two methods of direct transmission. Most candidates were able to give at least one example of indirect transmission.
- (ii) This question was generally well-answered. Occasionally candidates incorrectly gave chemical or cellular examples of barriers to infection. A common misconception was for candidates to refer to cilia in the nose rather than nasal hairs.
- (c) The difference between the terms antibodies, antigens and pathogens was not clearly understood by all. A significant number of responses described antibodies as making lymphocytes and phagocytes to destroy pathogens. Some responses described antigens as being made by antibodies. The best responses identified that antibodies bind to specific antigens on the pathogens surface and destroy them. The additional role of phagocytes was generally not well explained with few stating that antibodies marked pathogens for destruction by phagocytes. A number of candidates described the antibodies engulfing pathogens, which was not accepted.
- (d) Most candidates could describe some differences between active and passive immunity. Most candidates referred to the length of immunity and the production of memory cells. It was pleasing to see that only a handful of responses were unclear as to the difference between active and passive immunity. Some responses described how active immunity worked rather than the difference between active and passive immunity.

BIOLOGY

Paper 0610/52
Practical Test

Key messages

Candidates should have plenty of experience of the practical procedures outlined in the syllabus. It is important that they can plan investigations, identify variables and sources of error.

Candidates should be familiar with performing calculations and should remember to show their working.

A sharp pencil should be used for drawings and graphs.

General comments

Many excellent responses were seen which showed a good understanding of practical procedures.

Comments on specific questions

Question 1

- (a) (i) Most candidates were able to construct a table with the correct number of rows and columns to report all the relevant data. A few responses did not include column headings or did not use the correct intensity scale.
- (ii) Most candidates gave the correct response. The most common error was to identify the variable that was changed.
- (iii) This proved to be a challenging question for some candidates. It was important that the error was paired with the improvement. The most common correct response was that the same glass rod was used for all the beakers and this would lead to contamination of the solutions.
- (iv) Many identified the unwashed cloth as being a control but the explanation lacked sufficient detail and was not specific to the experiment. The best responses went on to explain that a control is used to compare the effect of the solutions on the cloth. A common error was to state a variable that should be kept constant i.e. a controlled variable rather than identify a control in the experiment.
- (v) In general, this was well-answered. Candidates were able to discuss the idea that the colour would need to be judged and that this was subjective.
- (b) (i) It was lovely to see that so many candidates were able to identify the independent variable for this experiment.
- (ii) A common error was to explain enzyme action in great detail, without considering the information given in the question. The commonest correct response was that the areas that were stained blue-black contained starch, whilst those that remained brown, did not have starch.
- (iii) Most candidates were able to draw a suitable graph. The most common error was extrapolating the line beyond the first or last plotted points. A less common error was to omit the units for the axes.
- (iv) This question was answered well by most candidates. They discussed the trend in the data and supported this by quoting suitable data points with units.

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- (v) It was clear that most candidates were able to identify additional measurements for the experiment. Many correctly stated that smaller intervals of temperature should be measured but fewer were able to correctly match this with the 40–50 °C range.

Question 2

- (a) (i) Some excellent drawings of the lung tissue were seen. Common errors included diagrams that were so large that they went into the printed text and the addition of shading.
- (ii) Most were able to correctly measure the length of the line. Many were able to correctly calculate the magnification. The most common errors were not rounding to the nearest whole number or not drawing a line on their diagram.
- (iii) The majority of responses gave three correct differences. It was not clear in some responses as to which image they were referring to, in these cases examiners had to assume that the response referred to the healthy tissue.
- (b) (i) The large number of correct responses in identifying a suitable hazard was very encouraging.
- (ii) Some candidates could correctly identify another substance that could be used to determine the concentration of carbon dioxide. A range of indicators were accepted with the most common choice being hydrogencarbonate indicator.
- (iii) Those candidates who were confident in handling data and ratios were able to calculate the concentration of carbon dioxide easily. A few did not show their working. This meant that they were not able to obtain credit for their processing where their final answer was incorrect.
- (c) A number of very thorough investigations were planned with many gaining maximum credit. Almost all candidates were able to describe that they would use the apparatus before and after exercise and record the time for the limewater to go cloudy. Most also recognised the need to keep at least one variable the same and also suggested that the experiment should be repeated many times or should involve numerous participants. A common error was to omit a suitable type of exercise. Safety precautions that related directly to their procedure gained credit but too often general statements were made, for example use of lab coat and tying back hair. Some responses recognised the opportunity to use refine the method to judge 'cloudiness' and these were credited.

BIOLOGY

Paper 0610/62
Alternative to Practical

Key messages

Candidates should have plenty of experience of the practical procedures outlined in the syllabus. It is important that they can plan investigations, identify variables and sources of error.

Candidates should be familiar with performing calculations and should remember to show their working.

A sharp pencil should be used for drawings and graphs.

General comments

Almost all candidates answered all the questions fully and many excellent scripts were seen. Making and recording observations from images (**2(a)(i)**), suggesting improvements to a method (**1b(v)**) and evaluating procedures (**1(a)(iv)**, **1(a)(vi)**, **2(b)(i)**) were the skills that seemed to be the most challenging.

Comments on specific questions

Question 1

- (a) (i) Most candidates were able to construct a table with the correct number of rows and columns to report all the relevant data. A few responses did not include column headings or did not use the correct intensity scale.
- (ii) The majority of candidates identified the correct variable. Common errors were temperature and enzymes.
- (iii) Almost all candidates were able to state a variable that was kept constant in this investigation.
- (iv) This proved to be a challenging question for some candidates. It is important that the error is paired with the improvement. The most common correct response was that the same glass rod was used for all the beakers and this would lead to contamination of the solutions.
- (v) Most candidates recognised one of the control experiments, but they did not always explain why they had chosen it. There were incorrect references to time and the amount of washing powder. This question provides an example of a situation where candidates must provide convincing supporting evidence. Simple statements such as 'to compare results' were insufficient, better responses went on to explain that a control is used to compare the effect of the solutions on the cloth.
- (vi) Fewer responses were able to describe a reason why the results determined in step 7 might not be accurate. Mostly commonly responses referred to the subjectivity associated with judging intensity by eye, but a range of other acceptable reasons were also seen.
- (b) (i) Most candidates were able to identify temperature as the variable that was changed in this investigation.
- (ii) Most candidates were familiar with the results of the iodine test and were able to apply their knowledge to this context although a small number of candidates gave incorrect food groups associated with the iodine test. A number of candidates extended their answers to include some

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theory of enzyme activity, even though an understanding of the associated theory is not required in this paper.

- (iii) Most candidates were able to draw neat, accurate graphs. The most common errors were to extrapolate the line to the origin, or to omit the units on the axes titles. A less common error was to use a scale that was too small so that less than half the available grid space was used. Those who chose non-standard scales (increments of 3, for example) increased their chance of a plotting error.
- (iv) Many very detailed descriptions of the trends in the data were seen which was pleasing. Errors included omitting the units when quoting key data points or misinterpreting the temperature at which a decrease in the area started as 60 °C rather than 50 °C. A large number of candidates referred to rate of enzyme activity rather than referring to diameter.
- (v) The best responses stated that more measurements between the temperature range where the highest diameters had been recorded (i.e. 40 – 50 °C) would be required to determine the optimum temperature. Common incorrect responses included using a thermometer, checking pH and repeating the whole experiment.

Question 2

- (a) (i) Some excellent drawings of the lung tissue were seen. Common errors included diagrams that were so large that they went into the printed text and the addition of shading.
- (ii) Almost every candidate was able to correctly measure the length of the line. A minority omitted the unit or gave an incorrect unit. A few did not include the line CD on their drawings. A considerable number did not give their answer to the magnification calculation to the nearest whole number.
- (iii) Many candidates found it challenging to describe three differences between the lung tissue of a healthy person and a person with COPD. Where candidates did not write which of the two images they were describing, examiners had to assume that the response referred to healthy tissue. A less common error was to identify each alveolus as a cell and make incorrect reference to features such as ribosomes and cell walls.
- (b) (i) Many candidates were able to identify a correct possible hazard.
- (ii) The most common correct substance that could be used as an alternative to limewater was hydrogencarbonate indicator. The most common incorrect responses included hydrogen peroxide, sodium hydroxide and calcium hydroxide.
- (iii) Those candidates who were confident in handling data and ratios were able to calculate the concentration of carbon dioxide easily. A few did not show their working. This meant that they were not able to obtain credit for their processing where their final answer was incorrect.
- (c) A number of very thorough investigations were planned with many gaining maximum credit. Almost all candidates were able to describe that they would use the apparatus before and after exercise and record the time for the limewater to go cloudy. Most also recognised the need to keep at least one variable the same and also suggested that the experiment should be repeated many times or should involve numerous participants. A common error was to omit a suitable type of exercise. Safety precautions that related directly to their procedure gained credit but too often general statements were made, for example use of lab coat and tying back hair. Some responses recognised the opportunity to use refine the method to judge 'cloudiness' and these were credited.

Grade thresholds – March 2019

Cambridge IGCSE™ Biology (0610)

Grade thresholds taken for Syllabus 0610 (Biology) in the March 2019 examination.

	maximum raw mark available	minimum raw mark required for grade:						
		A	B	C	D	E	F	G
Component 12	40	–	–	27	25	23	21	19
Component 22	40	33	28	24	22	20	17	14
Component 32	80	–	–	46	39	31	23	15
Component 42	80	55	48	41	34	27	20	14
Component 52	40	27	25	23	20	17	14	11
Component 62	40	27	24	21	18	16	13	10

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	163	145	127	110	95	81	65	49
CY	22, 42, 62	164	145	126	108	94	80	64	48
FY	12, 32, 52	–	–	–	121	105	90	74	58
GY	12, 32, 62	–	–	–	119	104	89	73	57

BIOLOGY

0610/12

Paper 1 Multiple Choice (Core)

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.

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 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

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

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

BIOLOGY

0610/22

Paper 2 Multiple Choice (Extended)

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.

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

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



BIOLOGY

0610/32

Paper 3 Theory (Core)

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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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.

PUBLISHED**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	Guidance
1(a)	protein ; carbohydrate ; minerals (ions) ; water ;	3	
1(b)	<p style="text-align: right;">♦♦♦♦ ♦♦♦♦</p>	4	

Question	Answer	Marks	Guidance
2(a)	oxygen ; energy ; muscle ; lactic acid ; carbon dioxide ;	5	
2(b)	(bio)fuel ; bread making ; drinking / medicinal, alcohol ; AVP ;;	2	
2(c)	the shorter the distance, the greater the energy (used from anaerobic sources) / AW ; ora relationship (almost), linear / proportional ; data quoted with units ;	2	

Question	Answer	Marks	Guidance
3(a)	pupil draw smaller in diameter than in Fig. 3.1 approximately central and circular ;	1	
3(b)(i)	<pre> graph TD Receptor --> Sensory[sensory neurone] Sensory --> Relay[relay neurone] Relay --> Motor[motor neurone] Motor --> Effector </pre> <p style="text-align: right;">⋮</p>	3	
3(b)(ii)	synapse ;	1	

Question	Answer			Marks	Guidance
3(c)	hormone	production site	action	4	
insulin	pancreas	decreases blood glucose concentration ;			
adrenaline ;	adrenal gland	wide pupils, increased heart rate, raised blood glucose concentration			
testosterone	testes ;	development of (secondary) <u>male</u> characteristics / development of testes / growth of facial hair / growth of penis / growth of pubic hair / voice deepening / increased musculature / AVP ;			

Question	Answer	Marks	Guidance
4(a)	(named) agricultural machinery ; (chemical / artificial) fertilisers ; insecticides ; herbicides ; selective breeding ; genetic engineering ; intensive livestock production ; AVP ;;;	3	
4(b)	habitat destruction ; reduction of species ; species extinction ; pollution ; AVP ;;	2	

Question	Answer	Marks	Guidance
5(a)	<i>egg cell:</i> contains, energy / food, store ; has a jelly coating that changes after fertilisation ; AVP ; <i>sperm:</i> has flagellum / tail / can swim ; has enzymes (to break down outer membrane of egg cell) ; AVP ;	2	
5(b)	smoking (tobacco) ; drinking alcohol ; taking drugs ; AVP ;	2	

Question	Answer	Marks	Guidance
5(c)(i)	transfers / provides, (named) nutrients ; transfers oxygen ; transfer of (named) waste products / urea ; transfers carbon dioxide ; AVP ;	2	
5(c)(ii)	amnion ruptures / release of amniotic fluid ; contraction of uterus (muscles) ; dilation of cervix / AW ; vagina is stretched / AW ; baby pushed out (through vagina) ; umbilical cord, tied / cut / AW ; placenta / afterbirth, expelled / AW ; AVP ;	3	

Question	Answer	Marks	Guidance
6(a)(i)	line drawn from X (going into the root hair) across the cortex and into the xylem ;	1	
6(a)(ii)	osmosis ;	1	
6(a)(iii)	xylem ;	1	
6(b)(i)	15 (arbitrary units) ;	1	

Question	Answer	Marks	Guidance
6(b)(ii)	<p><i>description:</i> as temperature increases, the rate (of mineral ion uptake) increases ; peaks at 30°C ; rate of uptake decreases, between 30°C and 40°C / after 30°C ; data quote with units ;</p> <p><i>explanation:</i> chemical reactions are faster at higher temperatures / AW ; <i>idea of</i> enzymes controlling reactions ; enzymes inactive at high(er) temperatures ; AVP ;;</p>	4	
6(c)	<p>nitrate ; making amino acids ; OR magnesium ; to make chlorophyll ; OR AVP ;;</p>	2	

Question	Answer	Marks	Guidance
7(a)(i)	<p>veins ; capillaries ;</p>	2	A arterioles ; venules ;
7(a)(ii)	<p>thick / muscular, wall ; narrow, hole / lumen / AW ; no valves / valves only in the (named) arteries in the heart ; AVP ;</p>	2	

Question	Answer	Marks	Guidance
7(b)(i)	coronary arteries become, narrowed / blocked ; cause of blockage described ; coronary arteries supply the heart muscle with blood ; (blockage) reduces / stops, blood flow to (heart) muscle ; (muscle tissue / cells die) because, cannot respire / lack of oxygen / lack of (named) nutrient / lack of energy ; AVP ;	3	
7(b)(ii)	stress ; smoking (tobacco) ; genetic predisposition / genes ; being older ; gender ; lack of exercise ; AVP ;;;	3	

Question	Answer	Marks	Guidance																								
8	<table border="1"> <thead> <tr> <th>process</th> <th>in animals</th> <th>in plants</th> </tr> </thead> <tbody> <tr> <td>absorption</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>diffusion</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>egestion</td> <td>✓</td> <td></td> </tr> <tr> <td>photosynthesis</td> <td></td> <td>✓</td> </tr> <tr> <td>respiration</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>sexual reproduction</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>transpiration</td> <td></td> <td>✓</td> </tr> </tbody> </table>	process	in animals	in plants	absorption	✓	✓	diffusion	✓	✓	egestion	✓		photosynthesis		✓	respiration	✓	✓	sexual reproduction	✓	✓	transpiration		✓	6	
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transpiration		✓																									

Question	Answer	Marks	Guidance								
9(a)	disease causing organism ;	1									
9(b)	<table border="1"> <thead> <tr> <th>type of defence</th> <th>example</th> </tr> </thead> <tbody> <tr> <td>mechanical barrier</td> <td>skin / hairs in the nose / mucus ;</td> </tr> <tr> <td>chemical barrier</td> <td>mucus / stomach acid ;</td> </tr> <tr> <td>cell</td> <td>phagocytosis / antibody production / (named) white blood cell ;</td> </tr> </tbody> </table>	type of defence	example	mechanical barrier	skin / hairs in the nose / mucus ;	chemical barrier	mucus / stomach acid ;	cell	phagocytosis / antibody production / (named) white blood cell ;	3	
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mechanical barrier	skin / hairs in the nose / mucus ;										
chemical barrier	mucus / stomach acid ;										
cell	phagocytosis / antibody production / (named) white blood cell ;										

Question	Answer	Marks	Guidance
9(c)(i)	pathogens / AW, removed or microbes / AW, live on skin ; dead skin cells / secretions / sweat, removed ; acquired substances / AW , on skin removed ; (so) pathogens / chemicals not transferred to people / food / objects ; reduces odour ; AVP ;	2	
9(c)(ii)	(washing powder) contains enzymes ; proteases / lipases ; digest / break down, into, fatty acids / glycerol / amino acids ; <i>idea of</i> , soluble in water ;	2	
9(d)	to prevent pathogens contaminating food ; <i>idea that</i> pathogens can be transferred to food by, insects / animals / objects / air ; <i>idea of</i> pathogens in food, can make people ill / cause food poisoning ;	2	

Question	Answer	Marks	Guidance
10(a)	any substance taken into the body ; modifies or affects chemical reactions in the body ;	2	
10(b)	(lung) cancer ; COPD ; AVP ;	1	

Question	Answer	Marks	Guidance
10(c)	liver ;	1	
10(d)	antibiotics ;	1	

BIOLOGY

0610/42

Paper 4 Theory (Extended)

March 2019

MARK SCHEME

Maximum Mark: 80

Published

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GENERIC MARKING PRINCIPLE 6:

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Question	Answer	Marks	Guidance
1(a)	removal from the, body / organism / cell ; toxic substances ; waste product(s), of metabolism / respiration ; (named) substances in excess (of requirements) ;	3	
1(b)	A – medulla ; B – cortex ; C – renal vein ;	3	
1(c)(i)	9900 (%) ;;	2	
1(c)(ii)	concentration of salts is the same in the blood in the renal artery and the fluid in the kidney tubule ; concentration of salts, increases between the blood in the renal artery and the fluid in the kidney tubule and the urine / (approximately) doubles ;	2	
1(c)(iii)	proteins are (too) big (to be filtered) / AW ;	1	
1(c)(iv)	(all) glucose is reabsorbed ;	1	
1(d)	<i>idea of convenience</i> : no need to visit hospital / time not taken up with dialysis ; no need for a restricted diet ; <i>idea of improved quality of life</i> / AW ; cost effective in the long term ; ref. to having a working kidney / long-lasting / ref. to cure / one-time treatment ;	3	

Question	Answer	Marks	Guidance
2(a)(i)	(large) petals ;	1	
2(a)(ii)	self-pollination is within the same, plant / flower ; OR cross-pollination is between different plants (of the same species) ;	1	
2(a)(iii)	prevents extinction / enables survival of species ; more chances of fertilisation ; more chances of pollination ; no need for (named) pollinators ; useful if plants are (geographically) isolated / on their own / AW ; parent plants adapted to the environment, pass alleles to offspring / AW ; <i>idea of</i> sexual reproduction better than asexual reproduction for variation ;	3	
2(b)(i)	<u>both alleles</u> are, expressed / neither <u>allele</u> is, dominant / recessive to the other ; the phenotype (of heterozygote is), intermediate / new / different / AW ; presence of multiple alleles, for one trait ;	2	
2(b)(ii)	<i>gametes:</i> $C^R, C^W + C^R, C^W$; <i>offspring genotypes:</i> $C^R C^R, C^R C^W, C^R C^W, C^W C^W$; <i>offspring phenotypes:</i> red pink white ; <i>ratio:</i> 1 : 2 : 1 ;	4	
2(b)(iii)	(parents phenotypes must be) red and white ; offspring must, inherit a C^R and a C^W allele / be heterozygous ;	2	

Question	Answer	Marks	Guidance
3(a)	(A) D C F B G (E) ;	1	
3(b)	correct ref. to neurotransmitter ; released from vesicles (into synapse / synaptic gap) ; ref. to movement (of neurotransmitter) by diffusion ; (neurotransmitter) binds with receptor (molecules on neurone on the other side of synapse) ; causing impulse to continue / AW ;	4	
3(c)(i)	depressant ; increases reaction times / slows down impulses / slows down the nervous system ; ref. to effect on synapse / AW ; loss of self-control / mental function is affected / inability to walk or talk ; AVP ;;;	3	
3(c)(ii)	sleeplessness / insomnia / restlessness ; fatigue / yawning ; diarrhoea ; hallucinations ; anxiety / depression / mood swings / aggression / irritation / confusion ; muscle cramps / aches / pain ; nausea / vomiting ; headaches / dizziness ; shivering / chills / fever ; itching ; runny nose / sweating / clammy skin / crying ; dehydration / (extreme) thirst ; rapid heart rate / hypotension ; AVP ; cravings / double vision	2	
3(c)(iii)	(addicts) turn to crime to finance their addiction / AW ;	1	

Question	Answer	Marks	Guidance															
4(a)	<table border="1"> <thead> <tr> <th>pollutant</th> <th>source</th> <th>effect on environment</th> </tr> </thead> <tbody> <tr> <td>sulfur dioxide ;</td> <td>(burning) fossil fuels ;</td> <td>acid rain</td> </tr> <tr> <td>carbon dioxide</td> <td>(burning fossil) fuels ;</td> <td>enhanced greenhouse effect</td> </tr> <tr> <td>methane ;</td> <td>cattle and rice farming</td> <td>enhanced greenhouse effect</td> </tr> <tr> <td>fertilisers</td> <td>arable agriculture</td> <td>eutrophication</td> </tr> </tbody> </table>	pollutant	source	effect on environment	sulfur dioxide ;	(burning) fossil fuels ;	acid rain	carbon dioxide	(burning fossil) fuels ;	enhanced greenhouse effect	methane ;	cattle and rice farming	enhanced greenhouse effect	fertilisers	arable agriculture	eutrophication	4	
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4(b)(i)	<p>(named) fertiliser leached into, rivers / streams / lakes ; producer growth / algal bloom / algae growth / plant growth ; death of producers ; increased decomposition / increased decomposers ; increased respiration (aerobic) ; decomposers use up the oxygen in the water ; organisms / fish / creatures, die / suffocate / migrate, due to lack of oxygen ; AVP ;</p>	6																
4(b)(ii)	<p>use, less / correct amount, of fertiliser / calculate how much fertiliser is needed ; use slow-release fertilisers ; do not apply, during / after, rain / when rain is forecast / limit watering ; do not use near water / make channels between land and water body ; only apply when crops, will take-up fertiliser / are growing ; ora</p>	2																

Question	Answer	Marks	Guidance
5(a)(i)	<p>1 leaf A / thick cuticle, lost the least mass / water ;</p> <p>2 leaf C / thin cuticle, lost the most mass / water ;</p> <p>3 leaf B / medium cuticle, lost more mass or water than A / less mass or water than C ;</p> <p>4 loss of mass is due to the loss of water ;</p> <p>5 the thicker the cuticle the, less water / mass, lost ;</p> <p>6 loss of, mass / water, fastest initially (then slows) ;</p> <p>7 ref. to transpiration / (reduced) evaporation ;</p> <p>8 data manipulation with ref. to mass ; e.g. calculation of loss</p>	5	
5(a)(ii)	<p>less, water / mass, loss (from leaves A, B and C) ;</p> <p><i>idea</i> of the same pattern of results as the first experiment ;</p> <p>reduced transpiration ;</p> <p>increased water (concentration) in the air ;</p> <p>ref. to a smaller concentration gradient ;</p> <p>less diffusion of water <u>vapour</u> ;</p>	3	
5(b)	<p><i>stem</i> – swollen / AW ;</p> <p><i>root</i> – extensive / widespread / shallow (root system) / AW ;</p>	2	A deep / branched
5(c)(i)	carbon dioxide ;	1	
5(c)(ii)	<p>respiration ;</p> <p>starch ;</p> <p>cellulose ;</p> <p>chlorophyll ;</p> <p>sucrose ;</p> <p>nectar ;</p> <p>amino acids / protein ;</p> <p>fats / oils ;</p> <p>nucleic acids / DNA / RNA ;</p> <p>growth of (any named part) membrane, cell wall, cytoplasm ;</p>	3	

Question	Answer	Marks	Guidance
6(a)(i)	X protein (coat) / AW ; Y genetic material ;	2	
6(a)(ii)	cell wall ; cell membrane ; cytoplasm ; loop of DNA ; (slime) capsule ; flagella ; plasmid ; ribosome ;	2	
6(b)(i)	food ; contaminated surfaces ; animals ; air ; water ; soil ;	2	
6(b)(ii)	skin / epidermis ; hairs in nose ; mucous membrane ; mucus ; ear wax ;	2	
6(c)	a pathogen has antigens (on their surface) ; ref. to specificity / antibodies have complementary shape (to antigen) ; lock onto (specific) antigens / pathogen ; destroy pathogens ; marking for destruction / phagocytosis ; AVP ;	4	
6(d)	long-term / ref. to permanent / protects against some recurring diseases ; produces memory cells ; antibodies are produced (by the body) ; slower response ;	3	



BIOLOGY

0610/52

Paper 2 Practical Test

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 **7** printed pages.

PUBLISHED**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.

Abbreviations used in the Mark Scheme

- ; separates marking points
- / alternatives
- **I** ignore
- **R** reject
- **A** accept (for answers correctly cued by the question, or guidance for examiners)
- AW alternative wording (where responses vary more than usual)
- AVP any valid point
- ecf credit a correct statement/calculation that follows a previous wrong response
- **ora** or reverse argument
- () the word/phrase in brackets is not required, but sets the context
- underline actual word given must be used by candidate (grammatical variants excepted)
- max indicates the maximum number of marks that can be given

Question	Answer	Marks	Guidance
1(a)(i)	table drawn with internal lines and two columns ; column headings ; correct use of the scale to record the intensity score ; correct trend in results ;	4	
1(a)(ii)	(size / type / dryness) of cloth ; (type of) food / stain ; time (treatment / stirring) ;	1	
1(a)(iii)	using same / only one (unwashed) glass rod in each solution ; <i>idea of contamination</i> ; OR stirring will not happen at same intervals in each solution ; some have a longer soaking time ; OR inconsistent use of rod ; uneven removal of stain ;	2	
1(a)(iv)	(distilled) water / not washed ; to compare with the effect of the other treatments ; as a colour reference ;	2	
1(a)(v)	because it is subjective / qualitative / judged by eye / different people have different eyesight ; <i>idea of limited number of categories of intensity</i> ; <i>idea of uneven distribution of the stain, across the cloth / on the other side of the cloth</i> ;	1	
1(b)(i)	temperature ;	1	
1(b)(ii)	brown (iodine) stain indicates that the starch has disappeared / AW ; blue-black stain indicates that starch is still present ; washing power solution moves through the agar ;	1	

Question	Answer	Marks	Guidance
1(b)(iii)	A axes labelled with units ; S linear scale for plotted points that uses more than half of the grid ; P <u>all</u> points plotted accurately ; L lines with no extrapolation ;	4	
1(b)(iv)	as temperature increases diameter increases and then decreases ; increase is more shallow than decrease ; ora data quote with correct units ;	2	
1(b)(v)	smaller intervals (at different temperatures) ; between 40°C and 50°C ;	2	

Question	Answer	Marks	Guidance
2(a)(i)	outline ; size ; detail ;;	4	
2(a)(ii)	(line CD on Fig. 2.1) 36 ± 1 <u>mm</u> ; line CD drawn on their drawing and value recorded for line ; correct answer from candidate values rounded to a whole number ;	3	A 3.6 <u>cm</u>
2(a)(iii)	<i>in the healthy person:</i> (more) alveoli / (higher) density of alveoli / more spaces ; smaller, alveoli / air spaces / AW ; thinner (alveolar) walls ; more wavy edges in the lung tissue / AW ; larger surface area ; ref. to bronchiole / additional structure present ;	3	
2(b)(i)	limewater, swallowed / inhaled / AVP ;	1	
2(b)(ii)	hydrogencarbonate indicator ;	1	A correct named alternative
2(b)(iii)	4(%) ;;	2	
2(c)	test before <u>and</u> after exercise ; description of method of, exercise / rest ; named controlled variables ;;; record time taken for limewater to go cloudy ; method to judge cloudiness ; refresh equipment before next measurement ; at least three participants sampled ; repeat (whole experiment) with the same individual three times ; suitable safety precaution ;	6	

BIOLOGY**0610/62**

Paper 6 Alternative to Practical

March 2019

MARK SCHEME

Maximum Mark: 40

Published

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- max indicates the maximum number of marks that can be given

Question	Answer	Marks	Guidance
1(a)(i)	table drawn with internal lines and two columns ; column headings ; correct use of the scale to record the intensity score ;	3	
1(a)(ii)	(amount / intensity of) stain / AW ;	1	
1(a)(iii)	(size / type / dryness) of cloth ; (type of) food / stain ; time (treatment / stirring) ;	1	
1(a)(iv)	using same / only one (unwashed) glass rod in each solution ; <i>idea of</i> contamination ; OR stirring will not happen at same intervals in each solution ; some have a longer soaking time ; OR inconsistent use of rod ; uneven removal of stain ;	2	
1(a)(v)	(distilled) water / not washed ; to compare with the effect of the other treatments ; as a colour reference ;	2	
1(a)(vi)	because it is subjective / qualitative / judged by eye / different people have different eyesight ; <i>idea of</i> limited number of categories of intensity ; <i>idea that</i> the stain on the underside of the cloth was not considered ;	1	
1(b)(i)	temperature ;	1	
1(b)(ii)	brown (iodine) stain indicates that the starch has disappeared / AW ; blue-black stain indicates that starch is still present ; washing power solution moves through the agar ;	1	

Question	Answer	Marks	Guidance
1(b)(iii)	A axes labelled with units ; S linear scale for plotted points that uses more than half of the grid ; P <u>all</u> points plotted accurately ; L lines with no extrapolation ;	4	
1(b)(iv)	as temperature increases diameter increases and then decreases ; increase is more shallow than decrease ; ora data quote with correct units ;	2	
1(b)(v)	smaller intervals (at different temperatures) ; between 40°C and 50°C ;	2	

Question	Answer	Marks	Guidance
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2(a)(iii)	<i>in the healthy person:</i> (more) alveoli / (higher) density of alveoli / more spaces ; smaller, alveoli / air spaces / AW ; thinner (alveolar) walls ; more wavy edges in the lung tissue / AW ; larger surface area ; ref. to bronchiole / additional structure present ;	3	
2(b)(i)	limewater, swallowed / inhaled / AVP ;	1	
2(b)(ii)	hydrogencarbonate indicator ;	1	A correct named alternative
2(b)(iii)	4(%) ;;	2	

Question	Answer	Marks	Guidance
2(c)	test before <u>and</u> after exercise ; description of method of, exercise / rest ; named controlled variables ;;; record time taken for limewater to go cloudy ; method to judge cloudiness ; refresh equipment before next measurement ; at least three participants sampled ; repeat (whole experiment) with the same individual three times ; suitable safety precaution ;	6	



Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

BIOLOGY

0610/12

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 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.

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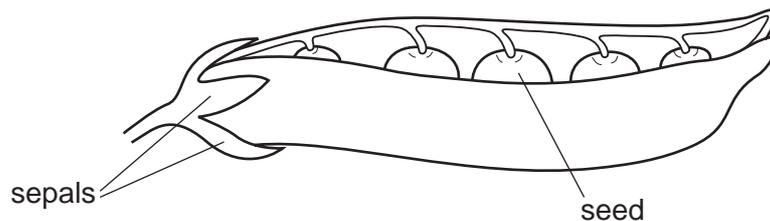
This document consists of **14** printed pages and **2** blank pages.

- 1 A living organism, X, can make its own food, get rid of toxic materials and detect and respond to stimuli.

What **other** four processes must organism X carry out to stay alive?

- A excretion, growth, movement, sensitivity
 B excretion, growth, nutrition, respiration
 C growth, movement, reproduction, respiration
 D movement, reproduction, respiration, sensitivity
- 2 What is a correct way of naming a species using the binomial system?
- A *Homo sapiens*
 B *Homo Sapiens*
 C human being
 D sapiens

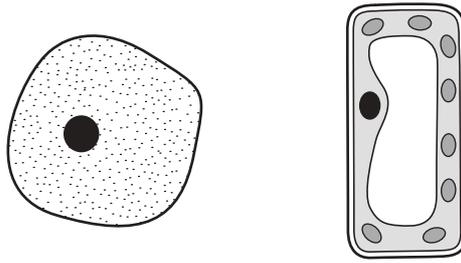
- 3 The diagram shows a pea pod, which is a fruit.



Use the key to identify the fruit.

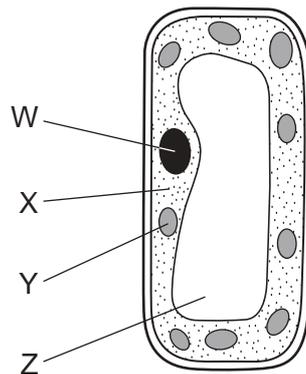
- 1 sepals fall off as soon as the flower is fertilised go to 2
 sepals do not fall off as soon as the flower is fertilised go to 3
- 2 pod contains fewer than four seeds **A**
 pod contains more than four seeds **B**
- 3 fruit splits to release several seeds **C**
 fruit splits to release only one seed **D**

4 The diagram shows two cells.



Which process can be carried out by only one of these cells?

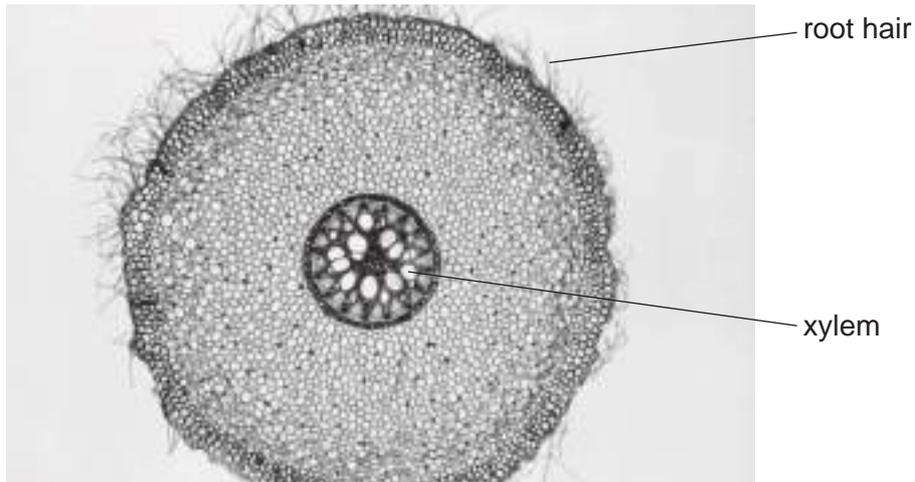
- A controlling the chemical reactions in the cell
 - B controlling the movement of substances into the cell
 - C making starch inside the cell
 - D using glucose inside the cell
- 5 The diagram shows a palisade mesophyll cell from a green leaf.



In which labelled part does photosynthesis occur and where are chromosomes found?

	photosynthesis occurs	where chromosomes are found
A	X	W
B	X	Z
C	Y	X
D	Y	W

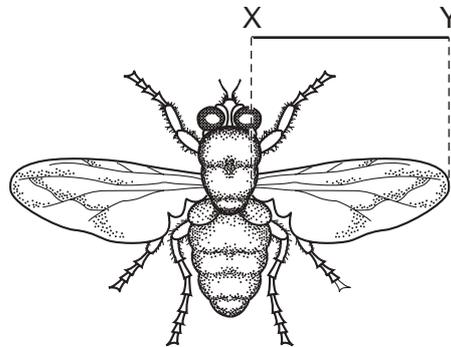
6 The photograph shows a cross-section of a root.



The root hair and the xylem are part of the same

- A cell and organism.
- B cell and tissue.
- C organ and organism.
- D tissue and organ.

7 The diagram shows a fly.



The line XY represents the length of the wing.

The length of line XY is 26 mm.

The actual size of the wing between XY is 4 mm.

What is the magnification of the image?

- A $\times 0.15$
- B $\times 6.5$
- C $\times 22$
- D $\times 104$

- 8 A frog is an animal. A frog's skin is permeable to oxygen and carbon dioxide.

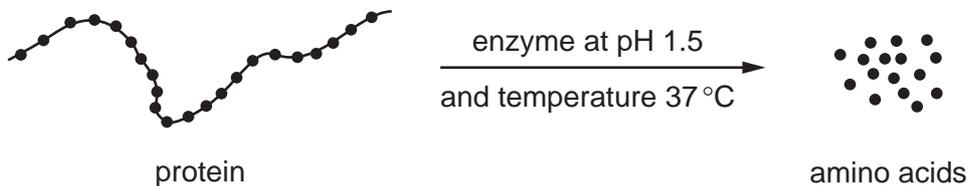
When a frog is swimming in pond water, in which directions will there be a net diffusion of oxygen and carbon dioxide?

	from the frog into the water	from the water into the frog
A	carbon dioxide	oxygen
B	carbon dioxide and oxygen	no movement
C	oxygen	carbon dioxide
D	no movement	carbon dioxide and oxygen

- 9 Which process only involves the movement of water through the partially permeable membrane of a cell?

- A absorption
- B evaporation
- C osmosis
- D transpiration

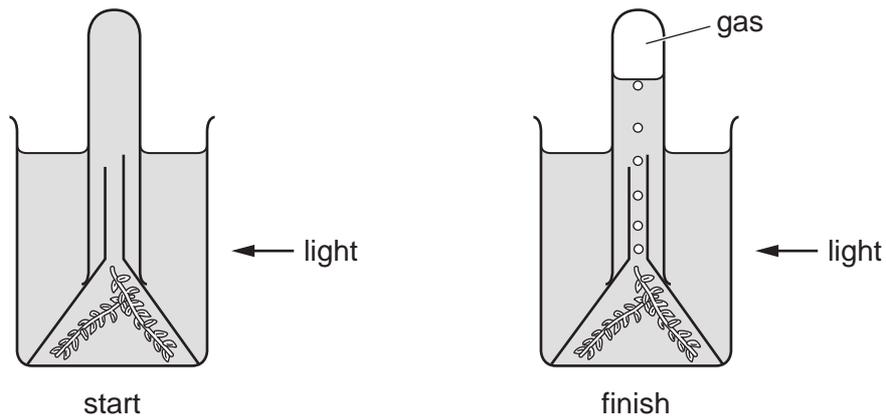
- 10 The diagram shows the effect of an enzyme working in the human digestive system.



What would **reduce** the rate of production of amino acids?

- A removing the amino acids as they are formed
- B increasing the amount of protein
- C raising the temperature to 37.1 °C
- D raising the pH to 7.5

11 The diagram shows an experiment to investigate photosynthesis.



What is the most abundant gas present at the top of the tube at the end of the experiment?

- A carbon dioxide
- B methane
- C sulfur dioxide
- D oxygen

12 DCPIP can be used to test for vitamin C in food. Lemon juice contains vitamin C.

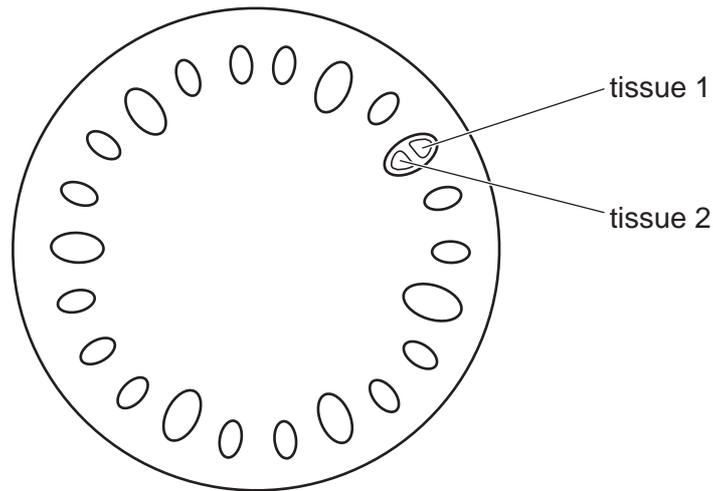
When lemon juice is tested what are the results?

- A starts blue, finishes colourless
- B starts colourless, finishes blue
- C stays blue
- D stays colourless

13 What is meant by chemical digestion?

- A Large insoluble molecules are broken down into small soluble molecules.
- B Large soluble molecules are broken down into small insoluble molecules.
- C Small insoluble molecules are built up into large soluble molecules.
- D Small soluble molecules are built up into large insoluble molecules.

14 The diagram shows a cross-section through a plant stem.

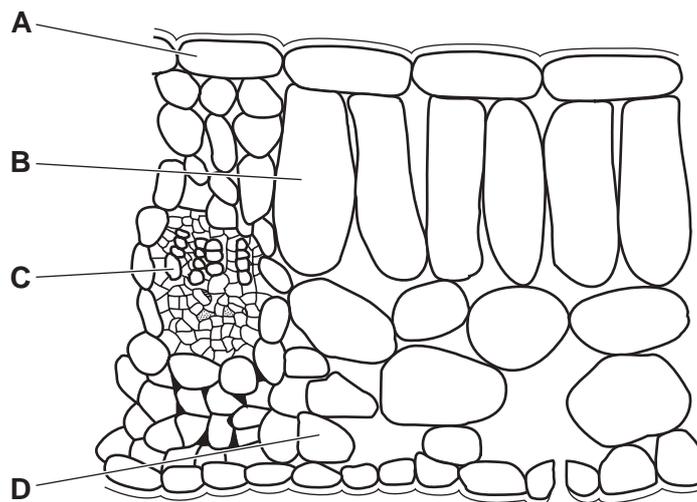


What are the functions of the two labelled tissues?

	tissue 1	tissue 2
A	transport only	support only
B	transport only	transport and support
C	transport and support	transport only
D	support only	transport only

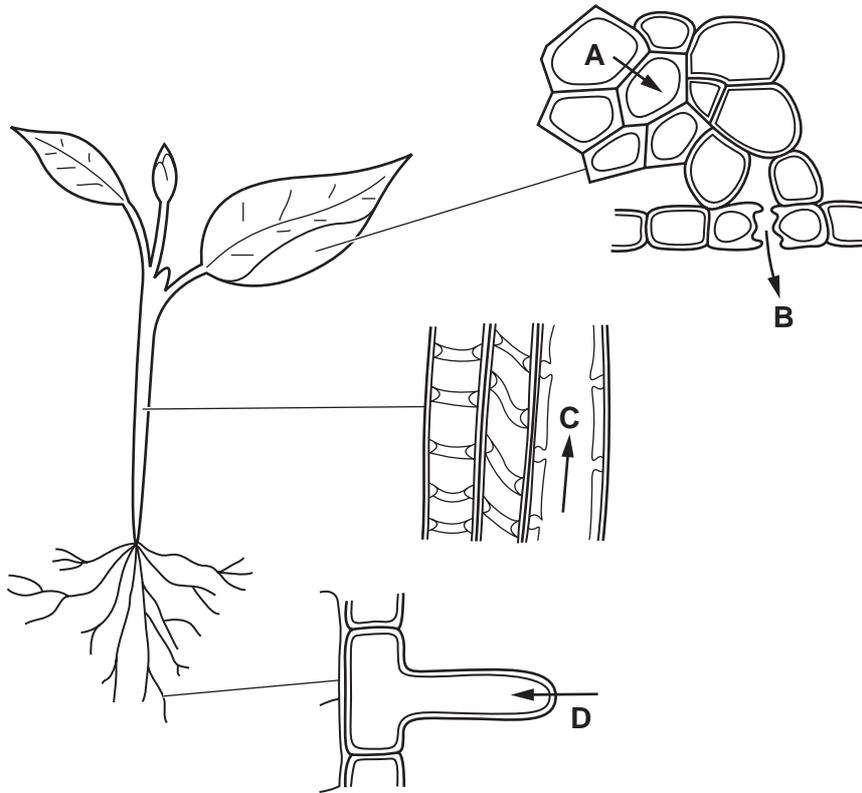
15 A leafy shoot is placed in a solution of a red dye.

After 30 minutes, which part of a leaf from this shoot will contain the red dye?

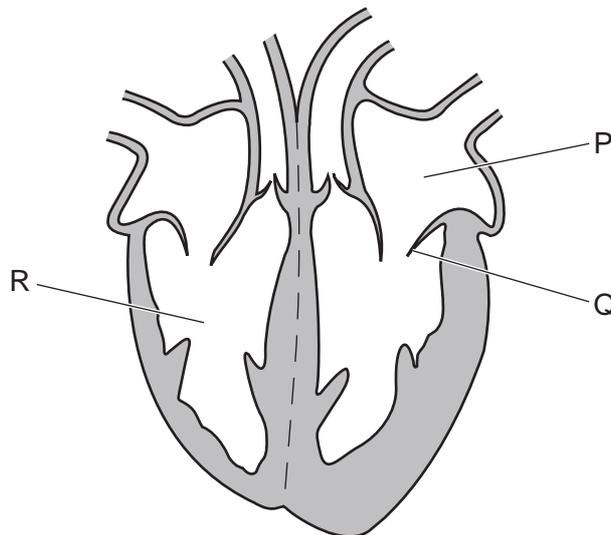


16 The diagrams show stages in the passage of water through a plant.

Which arrow shows water moving in the form of water vapour?



17 The diagram shows a section of the heart.



What is the function of the structure labelled Q?

- A It controls the amount of blood leaving the heart.
- B It increases the pressure in part R.
- C It prevents backflow of blood into part P.
- D It prevents blood flowing into the vena cava.

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18 The body has different types of defences against pathogens.

- 1 antibodies
- 2 hairs in the nose
- 3 mucus
- 4 skin

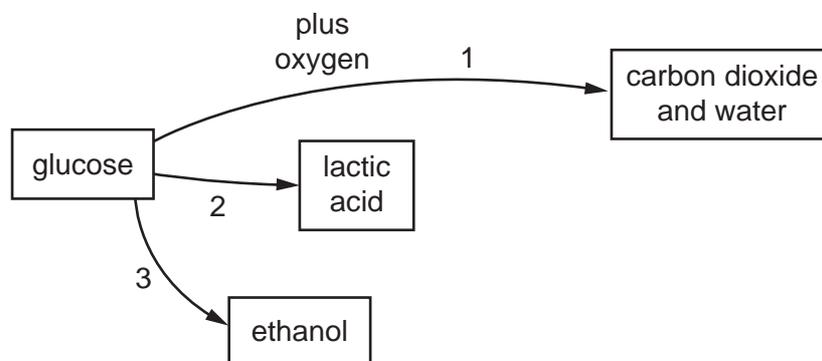
Which defences help to prevent pathogens reaching the alveoli when breathing in?

- A** 1, 2, and 3 **B** 2, 3, and 4 **C** 2 and 3 only **D** 2 only

19 What are the approximate percentages of oxygen and carbon dioxide in inspired air?

	percentage of oxygen	percentage of carbon dioxide
A	16	4.00
B	16	8.00
C	20	0.04
D	20	4.00

20 The flow diagram summarises three different ways that glucose can be broken down to release energy.



Which routes involve the action of enzymes?

- A** 1 only **B** 1 and 2 only **C** 2 and 3 only **D** 1, 2 and 3

21 Which of these would increase the volume of urine produced by a human?

- A** being in a hot environment
- B** drinking large volumes of water
- C** suffering from diarrhoea
- D** running a long distance

22 Which structure controls the amount of light entering the eye?

- A cornea
- B iris
- C lens
- D retina

23 Which hormone is secreted by the pancreas?

- A adrenaline
- B insulin
- C oestrogen
- D testosterone

24 In which organ is alcohol broken down?

- A brain
- B kidney
- C liver
- D stomach

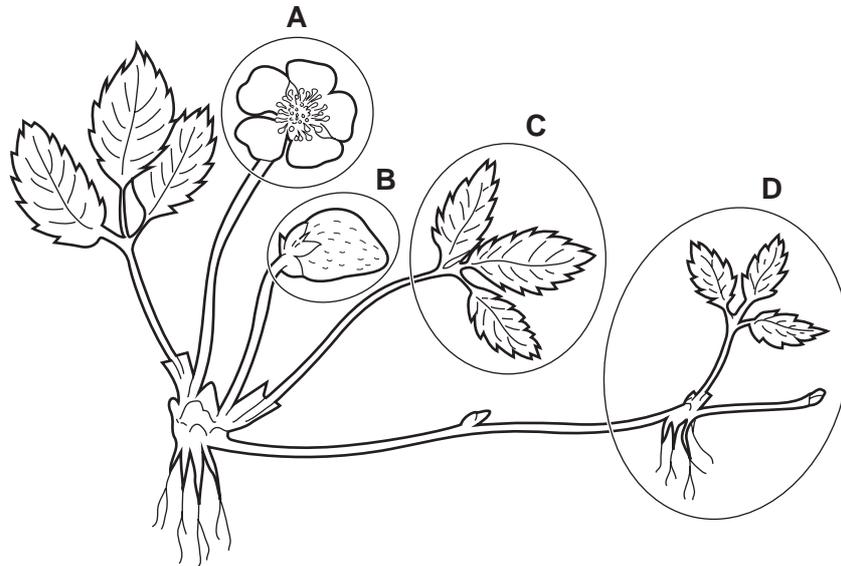
25 Antibiotics can be used to treat some infections.

Antibiotics can treat infections caused by

- A all pathogens.
- B bacteria and viruses only.
- C bacteria only.
- D viruses only.

26 The diagram shows a strawberry plant.

Which labelled part of the plant can only be produced by asexual reproduction?



27 What must always be available to allow seeds to germinate?

- A carbon dioxide
- B light
- C mineral salts
- D water

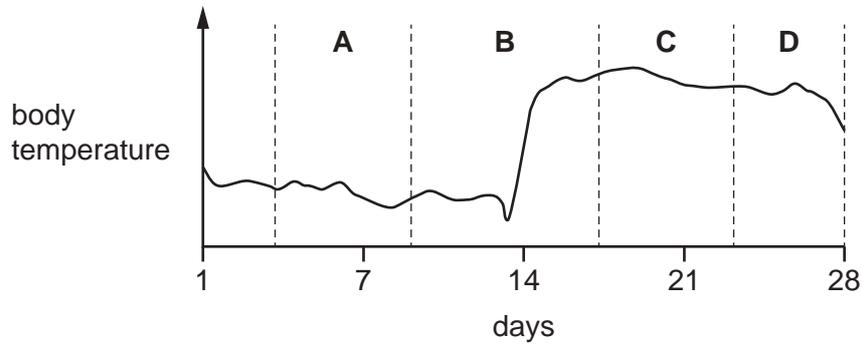
28 What is a possible order of events during labour and birth?

	1st	2nd	3rd	4th
A	cervix dilates	baby passes through vagina	amniotic sac breaks	uterus muscles begin to contract
B	baby passes through vagina	cervix dilates	amniotic sac breaks	uterus muscles begin to contract
C	uterus muscles begin to contract	cervix dilates	amniotic sac breaks	baby passes through vagina
D	uterus muscles begin to contract	baby passes through vagina	cervix dilates	amniotic sac breaks

29 The diagram shows a woman's body temperature during a menstrual cycle.

Monitoring body temperature is one natural method of birth control.

During which part of the menstrual cycle should sexual intercourse be avoided to try to prevent pregnancy?



30 What is the name of a length of DNA that codes for a protein?

- A amino acid
- B chromosome
- C gene
- D nucleus

31 Which cells in the human body are produced by the process of meiosis?

- A blood cells
- B muscle cells
- C skin cells
- D sperm cells

32 Which human characteristic is an example of discontinuous variation?

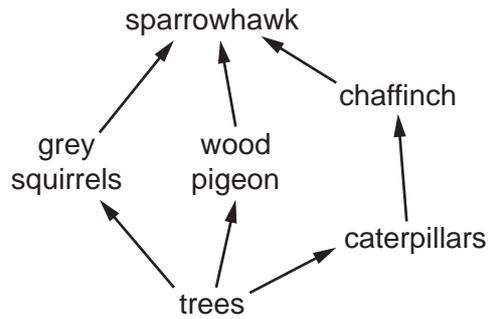
- A height
- B skin colour
- C tongue rolling
- D weight

- 33 An adaptive feature of an organism is defined as one that helps the organism to
- A change.
 - B disperse to new habitats.
 - C grow.
 - D survive and reproduce.
- 34 What is the principal source of energy input to biological systems?
- A carbon dioxide in air
 - B glucose
 - C minerals in soil
 - D sunlight
- 35 Which process involves water falling from clouds towards the ground?
- A evaporation
 - B cloud formation
 - C precipitation
 - D transpiration
- 36 Which enzyme in a biological washing powder will help remove fatty stains?
- A amylase
 - B lipase
 - C pectinase
 - D protease
- 37 Corn is a crop plant. Glow-worms are organisms which give off light.
- Which process could use these two species to make corn plants which glow?
- A breeding the organisms together
 - B causing mutations in the organisms
 - C selective breeding
 - D transferring genes from one species to another species

38 What is used to reduce competition from weeds when growing crops?

- A deforestation
- B fertiliser
- C herbicide
- D insecticide

39 The food web shows the feeding relationships in a woodland.



If all the chaffinches in the food web die, which effect would this have?

- A The amount of damage to trees will increase.
 - B The food supply for grey squirrels will increase.
 - C The number of wood pigeons will increase.
 - D The population of caterpillars will decrease.
- 40 What is an example of a non-renewable resource?
- A biofuels
 - B fish
 - C fossil fuels
 - D trees

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BIOLOGY

0610/22

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 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.

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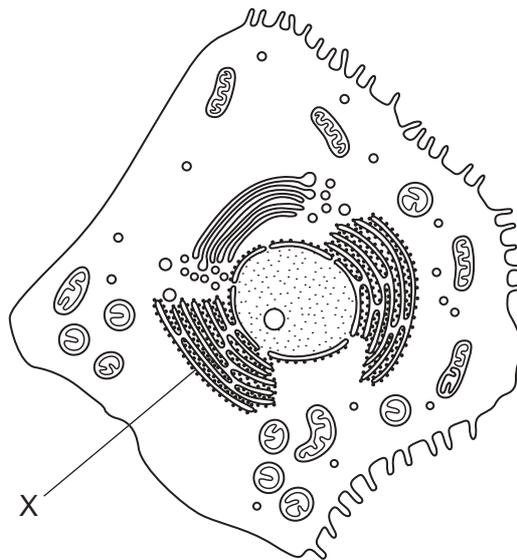
This document consists of **15** printed pages and **1** blank page.



- 1 A living organism, X, can make its own food, get rid of toxic materials and detect and respond to stimuli.

What **other** four processes must organism X carry out to stay alive?

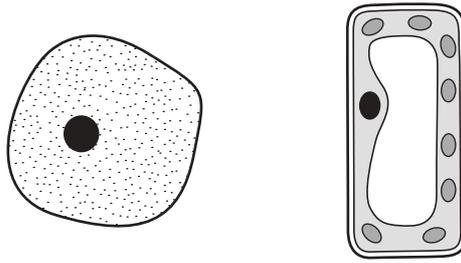
- A excretion, growth, movement, sensitivity
 B excretion, growth, nutrition, respiration
 C growth, movement, reproduction, respiration
 D movement, reproduction, respiration, sensitivity
- 2 What is a correct way of naming a species using the binomial system?
- A *Homo sapiens*
 B *Homo Sapiens*
 C human being
 D sapiens
- 3 The drawing is of a magnified human liver cell.



What is structure X?

- A cytoplasm
 B mitochondrion
 C nucleus
 D rough endoplasmic reticulum

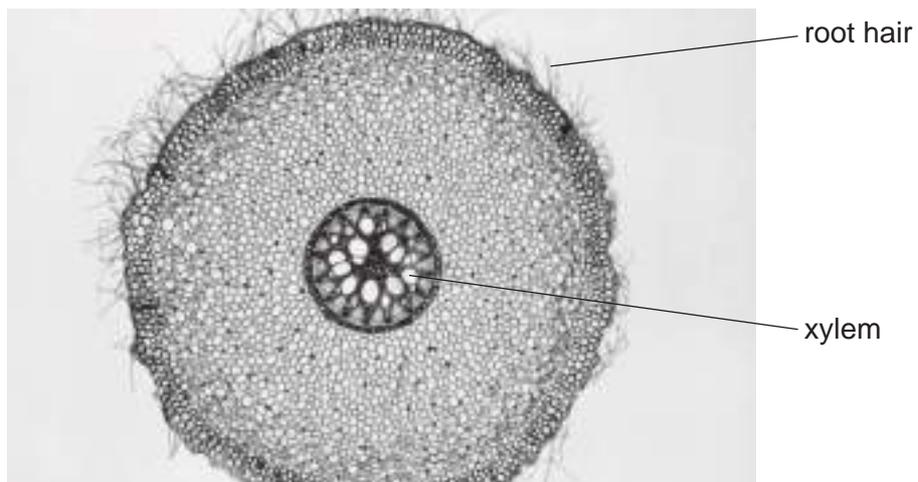
4 The diagram shows two cells.



Which process can be carried out by only one of these cells?

- A controlling the chemical reactions in the cell
- B controlling the movement of substances into the cell
- C making starch inside the cell
- D using glucose inside the cell

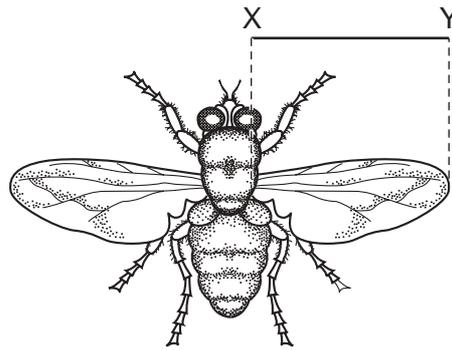
5 The photograph shows a cross-section of a root.



The root hair and the xylem are part of the same

- A cell and organism.
- B cell and tissue.
- C organ and organism.
- D tissue and organ.

- 6 The diagram shows a fly.



The line XY represents the length of the wing.

The length of line XY is 26 mm.

The actual size of the wing between XY is 4 mm.

What is the magnification of the image?

- A** $\times 0.15$ **B** $\times 6.5$ **C** $\times 22$ **D** $\times 104$
- 7 A frog is an animal. A frog's skin is permeable to oxygen and carbon dioxide.

When a frog is swimming in pond water, in which directions will there be a net diffusion of oxygen and carbon dioxide?

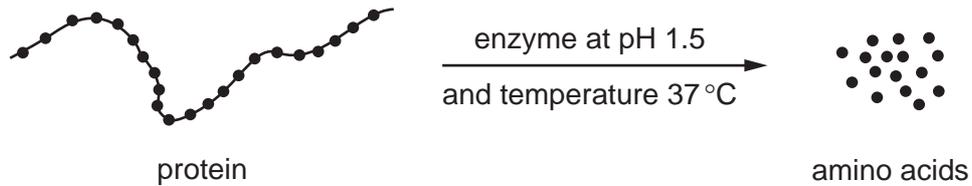
	from the frog into the water	from the water into the frog
A	carbon dioxide	oxygen
B	carbon dioxide and oxygen	no movement
C	oxygen	carbon dioxide
D	no movement	carbon dioxide and oxygen

- 8 Which process only involves the movement of water through the partially permeable membrane of a cell?
- A** absorption
- B** evaporation
- C** osmosis
- D** transpiration

9 Which statement about biological molecules is correct?

- A DNA contains the bases A, C, G and T.
- B Glycogen is made from glycerol molecules.
- C Oils are made from amino acids and glucose.
- D Proteins are made from fatty acids.

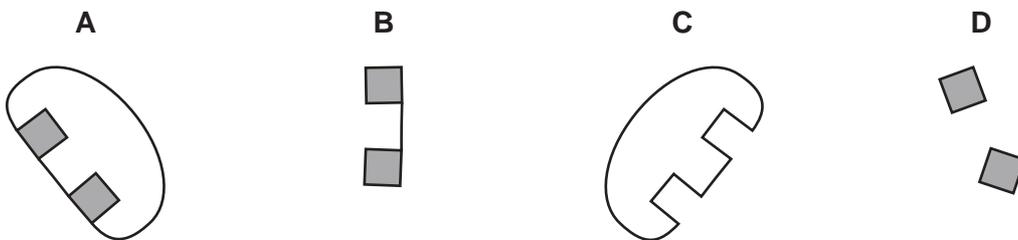
10 The diagram shows the effect of an enzyme working in the human digestive system.



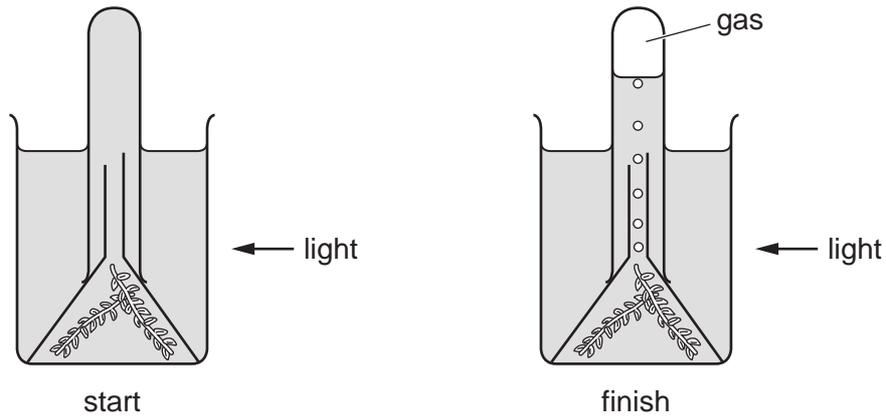
What would **reduce** the rate of production of amino acids?

- A removing the amino acids as they are formed
 - B increasing the amount of protein
 - C raising the temperature to 37.1 °C
 - D raising the pH to 7.5
- 11 The diagrams show molecules involved in the action of a digestive enzyme such as maltase.

Which is the substrate?



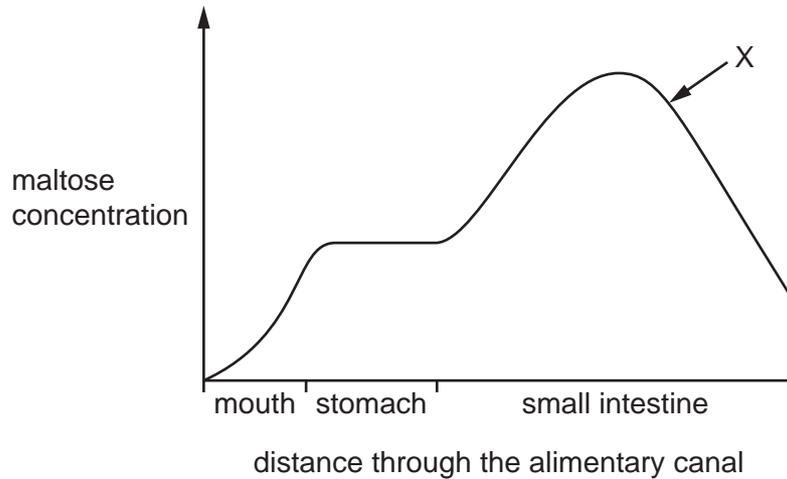
12 The diagram shows an experiment to investigate photosynthesis.



What is the most abundant gas present at the top of the tube at the end of the experiment?

- A carbon dioxide
 - B methane
 - C sulfur dioxide
 - D oxygen
- 13 What will happen to a green plant grown in soil that is deficient in nitrate ions?
- A It will have large leaves and good root growth.
 - B It will have purple leaves and poor root growth.
 - C It will have small leaves and a thin stem.
 - D It will have white leaves and a thick stem.
- 14 What is meant by chemical digestion?
- A Large insoluble molecules are broken down into small soluble molecules.
 - B Large soluble molecules are broken down into small insoluble molecules.
 - C Small insoluble molecules are built up into large soluble molecules.
 - D Small soluble molecules are built up into large insoluble molecules.

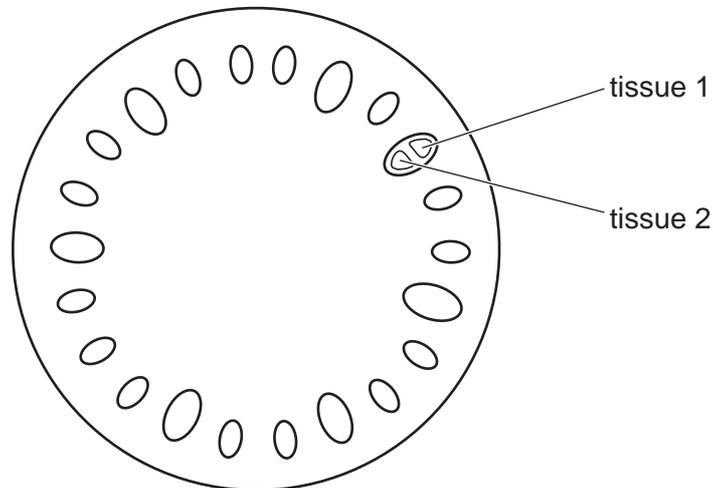
15 The graph shows the concentration of maltose in different parts of the alimentary canal.



What causes the change in concentration at X?

- A absorption of maltose
- B action of amylase
- C action of maltase
- D assimilation of maltose

16 The diagram shows a cross-section through a plant stem.

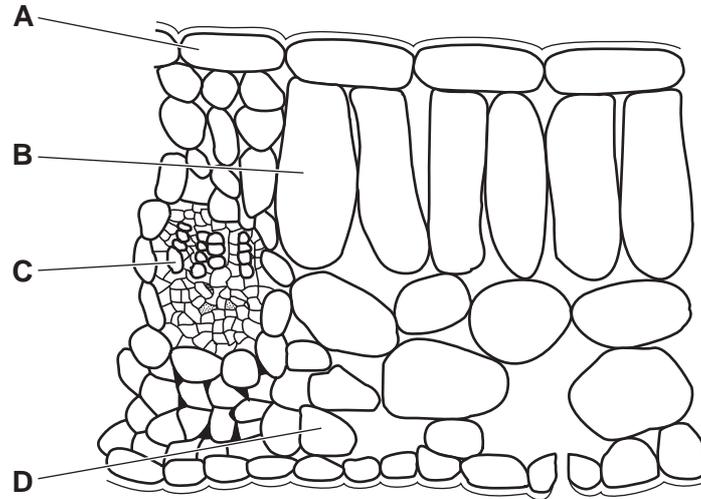


What are the functions of the two labelled tissues?

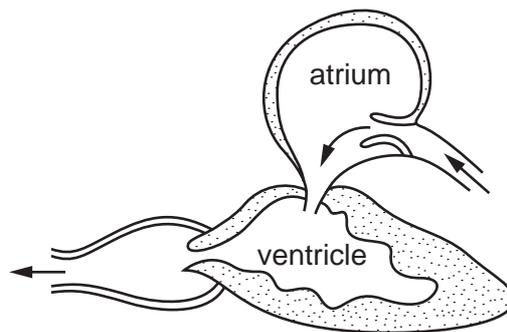
	tissue 1	tissue 2
A	transport only	support only
B	transport only	transport and support
C	transport and support	transport only
D	support only	transport only

17 A leafy shoot is placed in a solution of a red dye.

After 30 minutes, which part of a leaf from this shoot will contain the red dye?



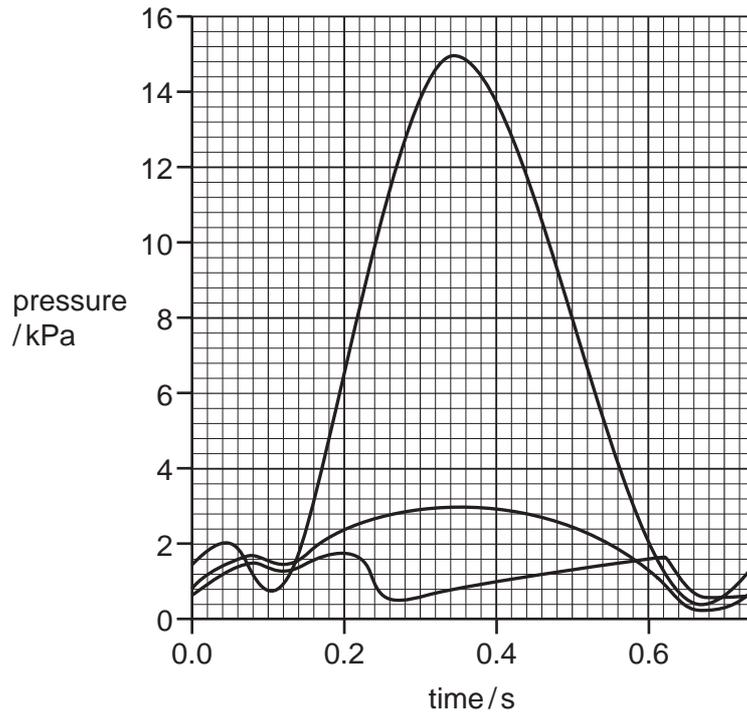
18 The diagram shows a section through a fish heart and the direction of blood flow.



After leaving the heart, where will the blood flow to next?

- A eyes
- B fins
- C gills
- D tail muscle

- 19 The graph shows pressure changes that take place in the right atrium, right ventricle and left ventricle of a human heart when the muscle walls contract and relax.



What is the pressure in the right ventricle when the left ventricle is at its maximum pressure?

- A 0.4 kPa B 2.0 kPa C 3.0 kPa D 15.0 kPa

- 20 The body has different types of defences against pathogens.

- 1 antibodies
- 2 hairs in the nose
- 3 mucus
- 4 skin

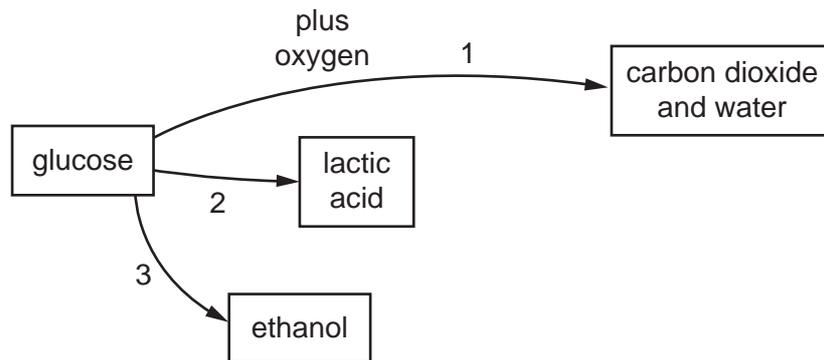
Which defences help to prevent pathogens reaching the alveoli when breathing in?

- A 1, 2, and 3 B 2, 3, and 4 C 2 and 3 only D 2 only

- 21 What are the approximate percentages of oxygen and carbon dioxide in inspired air?

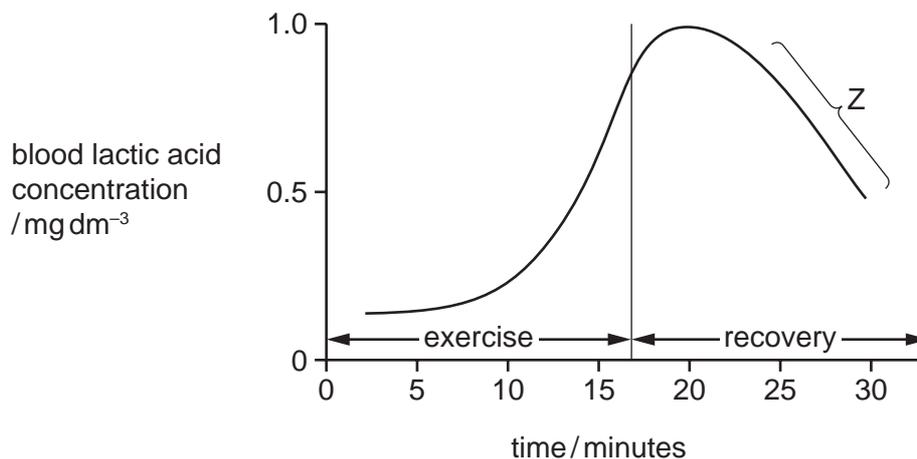
	percentage of oxygen	percentage of carbon dioxide
A	16	4.00
B	16	8.00
C	20	0.04
D	20	4.00

- 22 The flow diagram summarises three different ways that glucose can be broken down to release energy.



Which routes involve the action of enzymes?

- A 1 only B 1 and 2 only C 2 and 3 only D 1, 2 and 3
- 23 The graph shows the lactic acid concentration in blood during and after exercise.

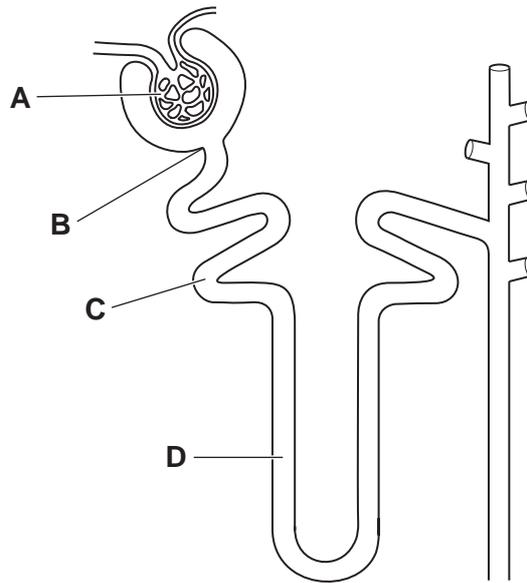


Which process accounts for the shape of the graph at Z?

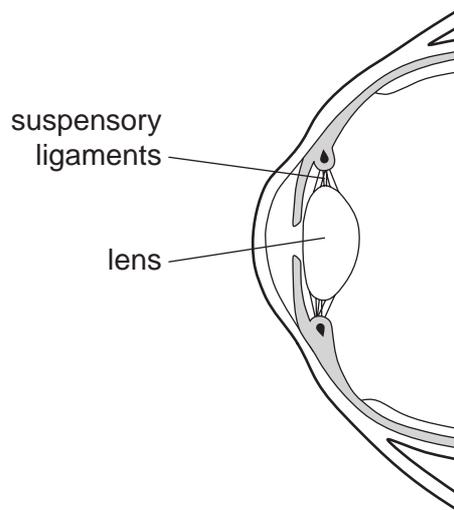
- A aerobic respiration of lactic acid in the kidney
 B aerobic respiration of lactic acid in the liver
 C anaerobic respiration of lactic acid in the kidney
 D anaerobic respiration of lactic acid in the liver

24 The diagram shows the structure of a kidney tubule.

Where does filtration occur?



25 The diagram shows a section through part of the human eye.



What takes place when a person looks at an object which is far away from their eye?

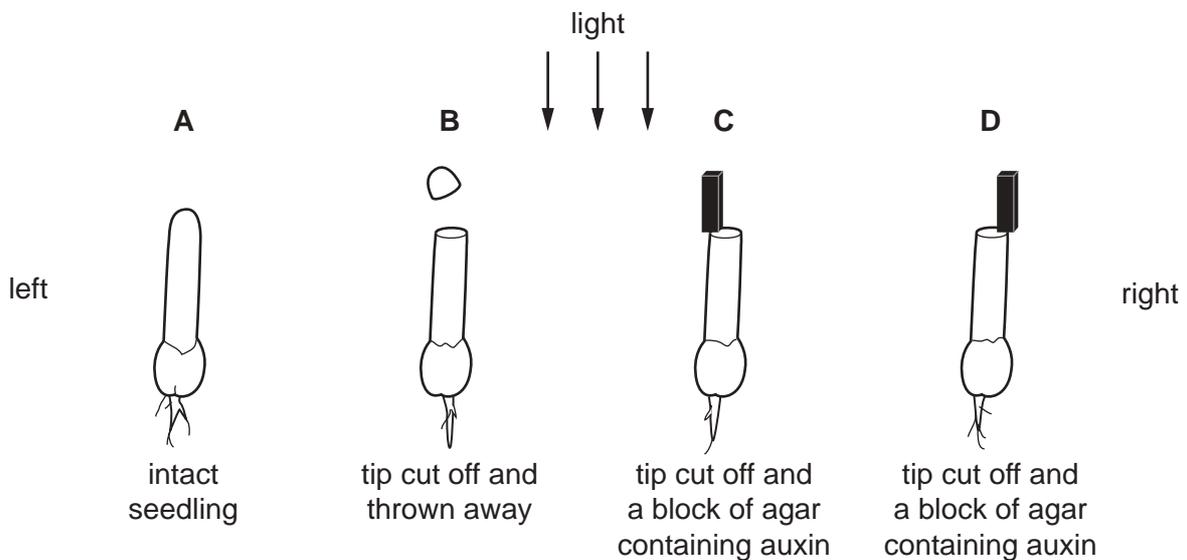
	suspensory ligaments	lens
A	slacken	becomes fatter
B	slacken	becomes thinner
C	tighten	becomes fatter
D	tighten	becomes thinner

26 Which statement about adrenaline is correct?

- A Adrenaline causes the pupils to narrow.
- B Adrenaline increases blood glucose concentration.
- C Adrenaline secretion increases when at rest.
- D Adrenaline slows down the pulse rate.

27 The diagram shows an experiment on oat seedlings. All the seedlings are exposed to light from directly above.

Which seedling will grow to the left?



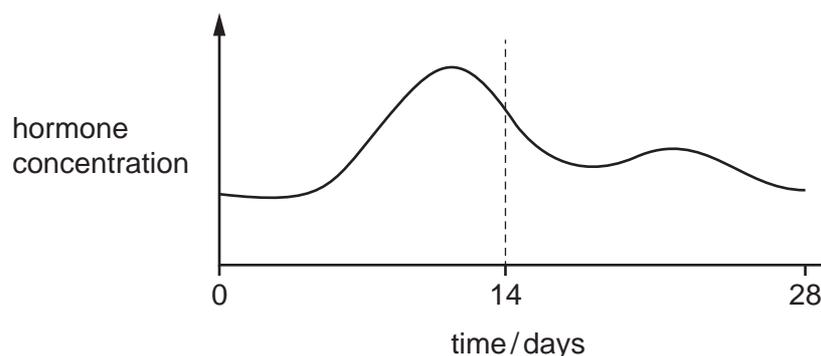
28 What type of organism is MRSA?

- A bacterium
- B fungus
- C protoctist
- D virus

29 What describes the nuclei in human reproduction?

	egg	sperm	zygote
A	diploid	diploid	diploid
B	diploid	diploid	haploid
C	haploid	haploid	diploid
D	haploid	haploid	haploid

30 The graph shows a hormone that is involved in controlling the menstrual cycle.



What is the hormone?

- A FSH
- B LH
- C oestrogen
- D progesterone

31 What happens as a result of mitosis?

	genetically identical cells produced	chromosome number is halved	
A	✓	✓	key ✓ = yes X = no
B	✓	X	
C	X	✓	
D	X	X	

32 Which parents could produce offspring with blood group O?

- A heterozygous father with blood group A and heterozygous mother with blood group B
- B heterozygous father with blood group A and homozygous mother with blood group B
- C homozygous father with blood group A and heterozygous mother with blood group B
- D homozygous father with blood group A and homozygous mother with blood group O

33 The development of antibiotic resistant bacteria is an example of

- A artificial selection.
- B genetic engineering.
- C humans developing immunity to antibiotics.
- D natural selection.

34 What is the correct definition of a gene mutation?

- A a change in the base sequence of DNA
- B a change in the gene or chromosome
- C a change in the number of amino acids
- D a change in the number of chromosomes

35 Energy flows through a food chain.

In which form does the energy first enter the food chain?

- A chemical
- B heat
- C kinetic
- D light

36 Which organisms are responsible for removing nitrate ions from soil?

- A denitrifying bacteria and nitrogen-fixing bacteria in root nodules
- B denitrifying bacteria and plants
- C nitrifying bacteria and plants
- D nitrogen-fixing bacteria in root nodules

37 What are **all** reasons why bacteria are useful in genetic engineering?

- A They are very small. They do not need large containers. They have no mitochondria.
- B They reproduce asexually. They can double their numbers in twenty minutes in good conditions. They have cell walls.
- C They have the same genetic code as other organisms. They have plasmids. There is a lack of ethical concern about their use.
- D Their DNA is not in a nucleus. They have a cell membrane. They have a large surface area to volume ratio.

38 Which statement describes the role of DNA ligase in genetic engineering?

- A cuts open a bacterial plasmid
- B joins the human gene to the plasmid
- C inserts plasmid back into bacterium
- D isolates a human gene

39 What must always be available to allow seeds to germinate?

- A carbon dioxide
- B light
- C mineral salts
- D water

40 Which list correctly describes the sequence of events in the eutrophication of a river or lake?

A

- 1 decreased growth of plants
- 2 dead plants decompose
- 3 increase in anaerobic bacteria
- 4 decrease in dissolved oxygen

B

- 1 increased growth of plants
- 2 dead plants decompose
- 3 increase in aerobic bacteria
- 4 decrease in dissolved oxygen

C

- 1 decreased growth of plants
- 2 dead plants decompose
- 3 decrease in anaerobic bacteria
- 4 increase in dissolved oxygen

D

- 1 plants die
- 2 dead plants decompose
- 3 decrease in aerobic bacteria
- 4 increase in dissolved oxygen

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BIOLOGY

0610/32

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.

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 **18** printed pages and **2** blank pages.

1 A balanced diet contains seven different groups of substances.

Three of these groups of substances are fats, fibre (roughage) and vitamins.

(a) State the names of **three** other groups of substances in a balanced diet.

- 1
 - 2
 - 3
- [3]

(b) The boxes on the left contain the names of conditions that can develop if the diet is not balanced for a long period of time.

The boxes on the right contain descriptions of how these conditions may be caused.

Draw **one** straight line from each box on the left to a box on the right to link the condition to its cause.

name of condition	description of cause
constipation	diet contains very little fibre
obesity	diet very high in protein
scurvy	eating more food than is necessary
starvation	lack of enough food
	lack of fruits such as oranges

[4]

[Total: 7]

2 (a) Complete the sentences about aerobic and anaerobic respiration.

Use words or phrases from the list.

Each word or phrase may be used once, more than once, or not at all.

- | | | |
|-----------------------|------------------------|--------------------|
| carbon dioxide | carbon monoxide | energy |
| fatty acids | glycerol | guard |
| mesophyll | muscle | nitrogen |
| | | oxygen |
| | | lactic acid |

Anaerobic respiration is different to aerobic respiration because
is not needed to break down glucose molecules.

The amount of released from each glucose molecule is much
smaller in anaerobic respiration.

Anaerobic respiration in humans takes place in cells during
vigorous exercise. It produces from glucose.

A different form of anaerobic respiration takes place in yeast cells. Here the glucose is broken
down into alcohol and

[5]

(b) State **two** ways in which the products of anaerobic respiration in yeast can be used by
humans.

1

2

[2]

(c) Fig. 2.1 shows the percentage of energy provided by anaerobic respiration when athletes run in races of different distances.

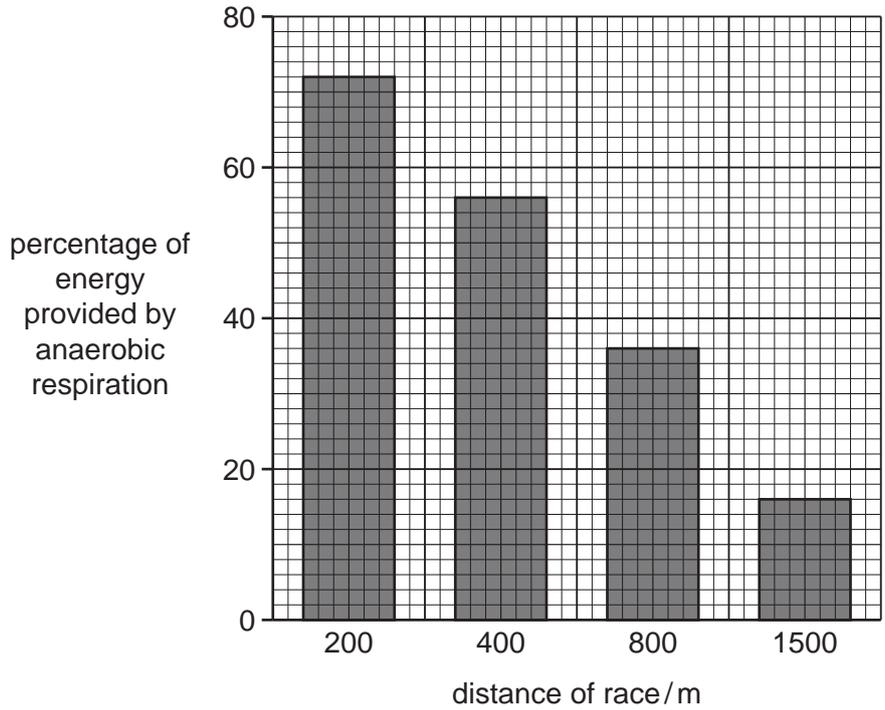


Fig. 2.1

Describe the results shown in Fig. 2.1.

Use the data to support your answer.

.....

.....

.....

.....

..... [2]

[Total: 9]

- 3 (a) Fig. 3.1 shows the eye of a person in normal daylight.

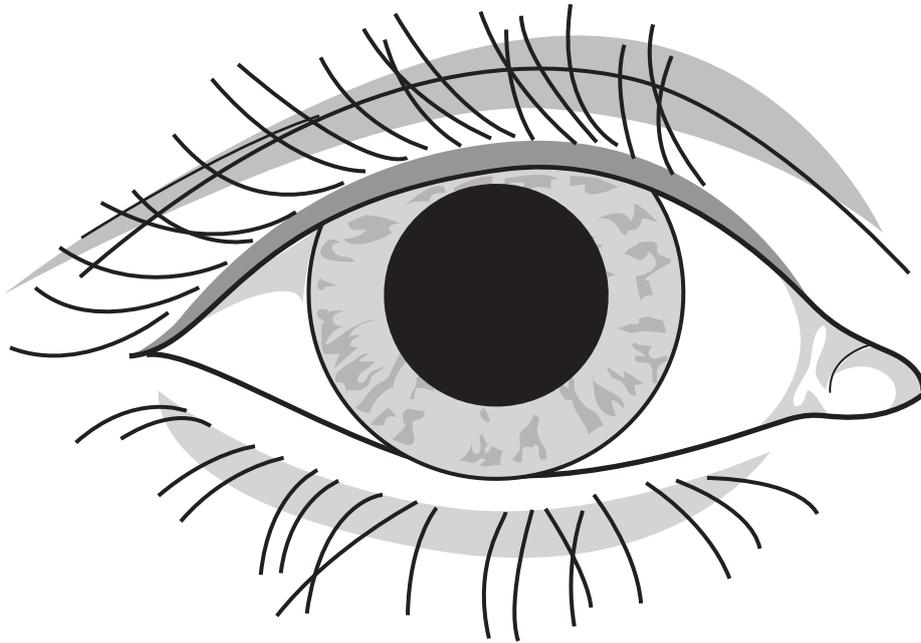


Fig. 3.1

Complete Fig. 3.2 by drawing the pupil to show the effect of shining a bright light into the eye.

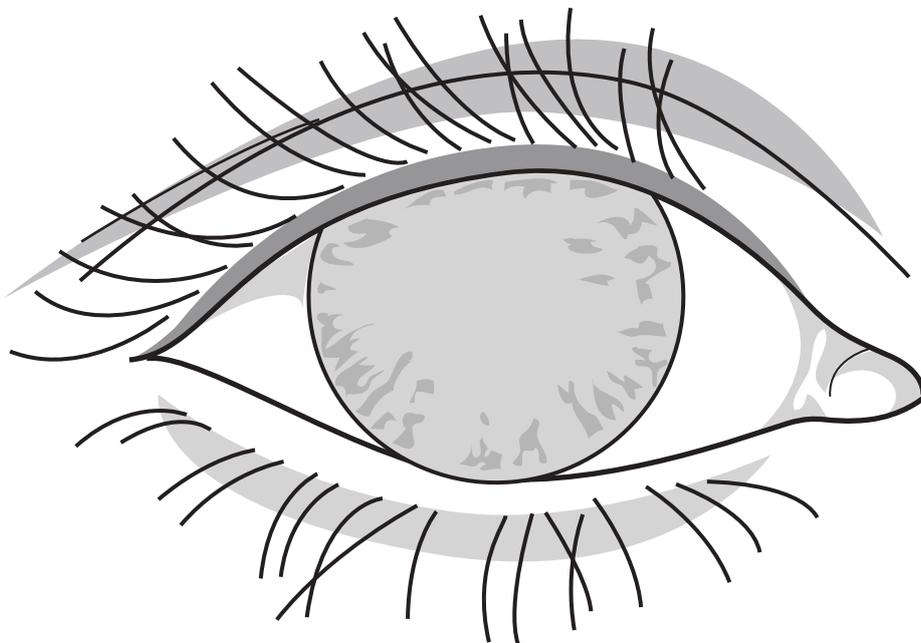


Fig. 3.2

[1]

(b) (i) Fig. 3.3 shows the names of five structures involved in a reflex arc.

Complete Fig. 3.3 by drawing **four** arrows to show the pathway and direction a nerve impulse travels during a reflex action.

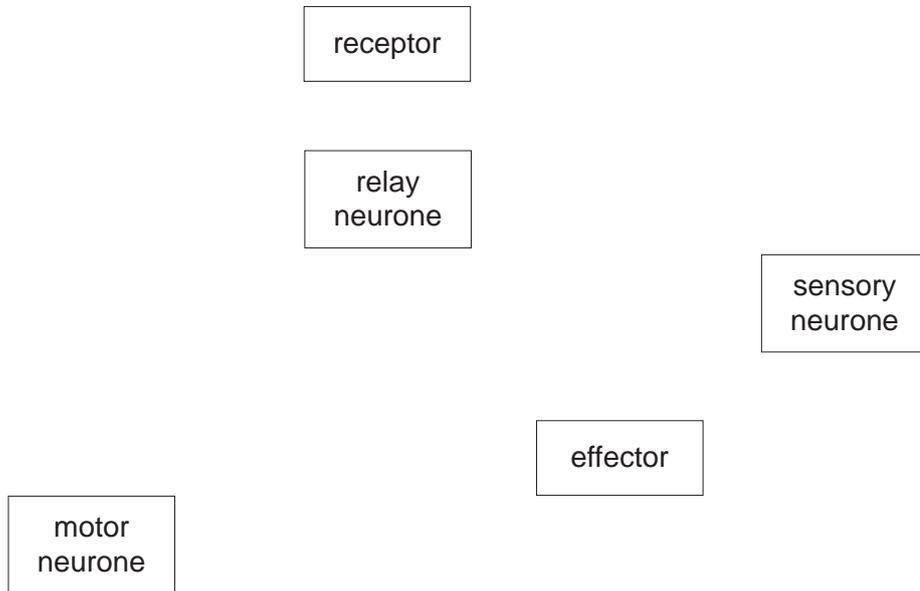


Fig. 3.3

[3]

(ii) State the name of the junction between two neurones.

..... [1]

(c) The body is regulated by both the nervous system and by hormones.

Table 3.1 shows information about the names of hormones, where they are produced and their actions in the body.

Complete Table 3.1.

Table 3.1

name of hormone	where the hormone is produced in the body	action the hormone has in the body
insulin	pancreas	
	adrenal gland	widened pupils, increased heart rate, raised blood glucose concentration
testosterone		

[4]

4 Modern technology has resulted in increased food production.

(a) State **three** examples of modern technology that are used to increase food production.

- 1
- 2
- 3 [3]

(b) Many farms grow one type of crop plant on a large area of land. This type of crop production is called large-scale monoculture.

State **two** negative impacts to an ecosystem of large-scale monocultures.

- 1
.....
- 2
..... [2]

[Total: 5]

5 (a) State **one** adaptive feature of an egg cell and **one** adaptive feature of a sperm.

egg cell

.....

sperm

.....

[2]

(b) Some actions can damage the health of a fetus during pregnancy.

State **two** actions a woman should avoid during pregnancy.

1

.....

2

.....

[2]

(c) Fig. 5.1 shows a fetus in its mother's body shortly before it is born.

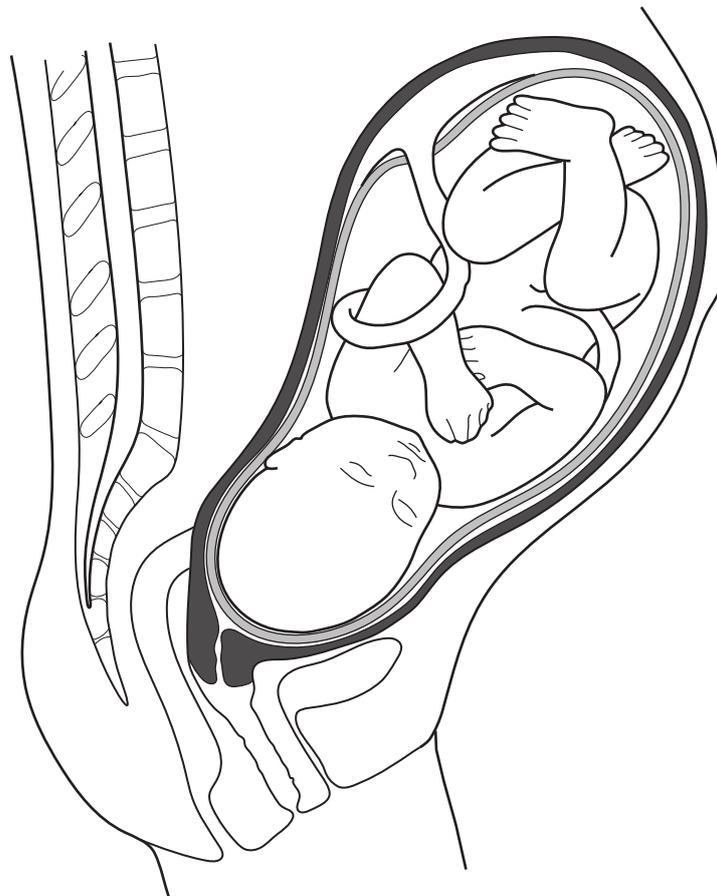


Fig. 5.1

(i) State the functions of the placenta.

.....
.....
.....
.....
..... [2]

(ii) Describe **three** events, other than pain, that occur in the mother's body during the process of labour and birth.

1
.....
2
.....
3
..... [3]

[Total: 9]

6 Fig. 6.1 shows a section through a plant root.

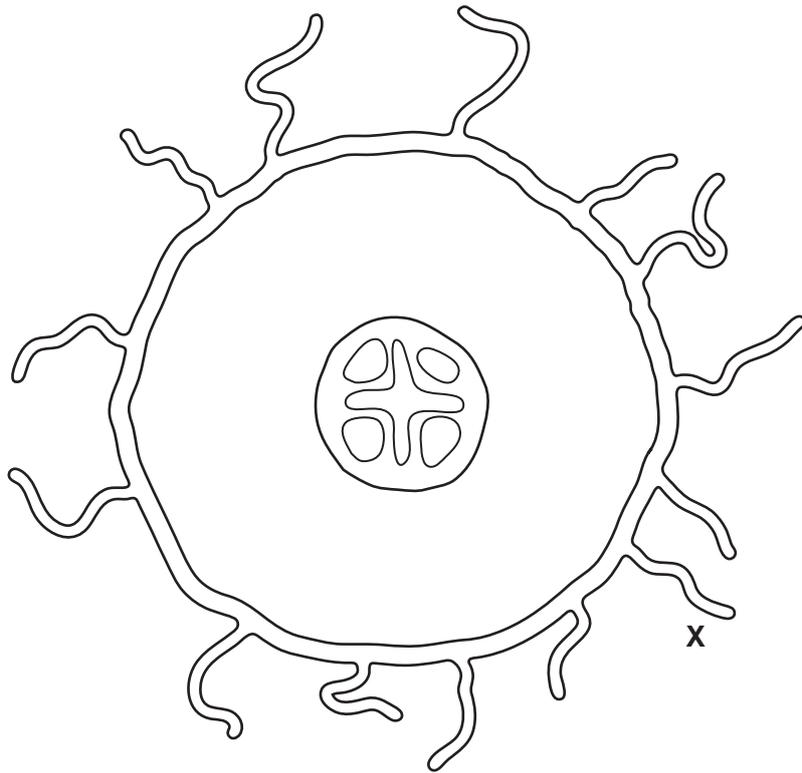


Fig. 6.1

(a) (i) The X on Fig. 6.1 represents a molecule of water.

On Fig. 6.1, draw a line from the X to show the pathway this water molecule takes to pass into the tissue that transfers it to the leaves. [1]

(ii) State the name of the process by which the water molecule moves into the root.

..... [1]

(iii) State the name of the tissue that transports the water to the leaves.

..... [1]

(b) Fig. 6.2 shows the apparatus used in an investigation.

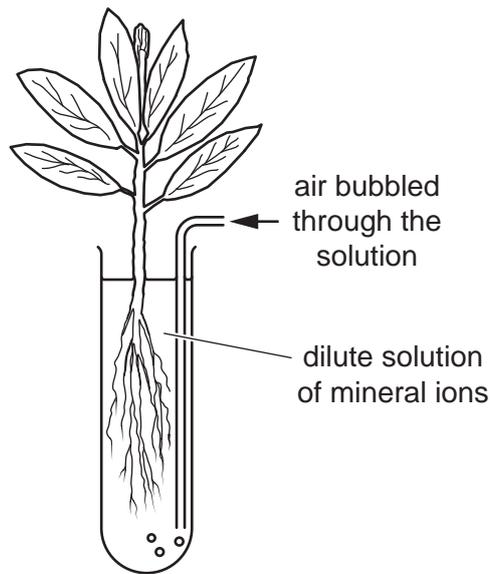


Fig. 6.2

In the investigation, several sets of this apparatus were set up.

Each set of apparatus was placed in a different temperature.

The rate of mineral ion uptake by the plants was measured.

The results are shown in Fig. 6.3.

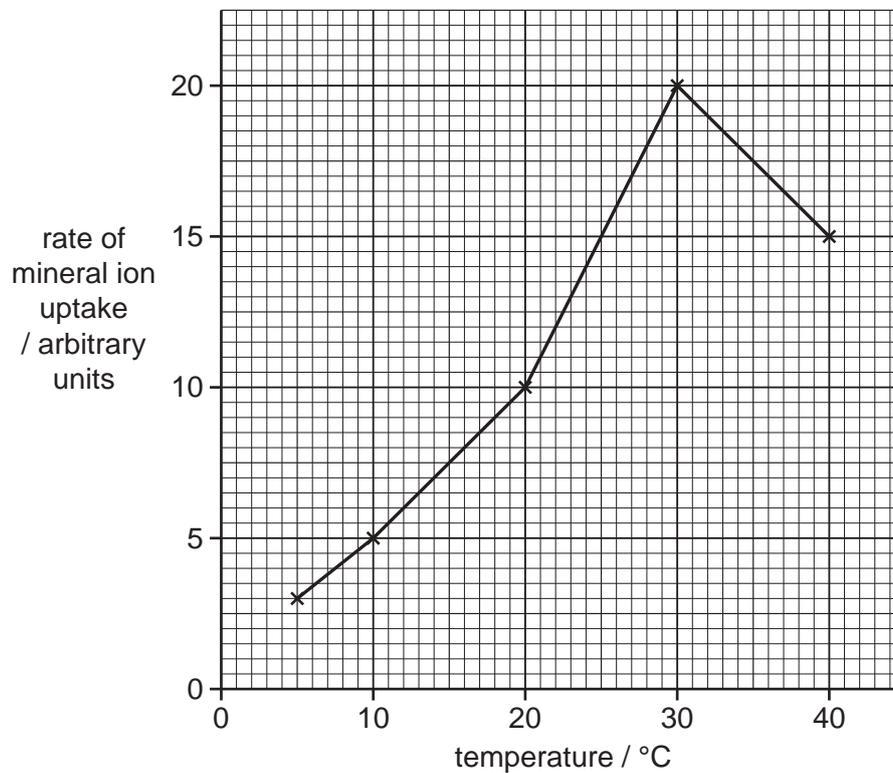


Fig. 6.3

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(i) State the rate of mineral ion uptake at 25 °C in Fig. 6.3.

..... arbitrary units [1]

(ii) Describe **and** explain the results shown in Fig. 6.3.

Use the data to support your answer.

.....
.....
.....
.....
.....
.....
.....
.....
..... [4]

(c) State the name of **one** mineral ion that plants absorb through their roots and state why the plants need this mineral ion.

name of mineral ion

needed for

..... [2]

[Total: 10]

7 (a) Fig. 7.1 shows an external view of the heart of a person who has coronary heart disease.

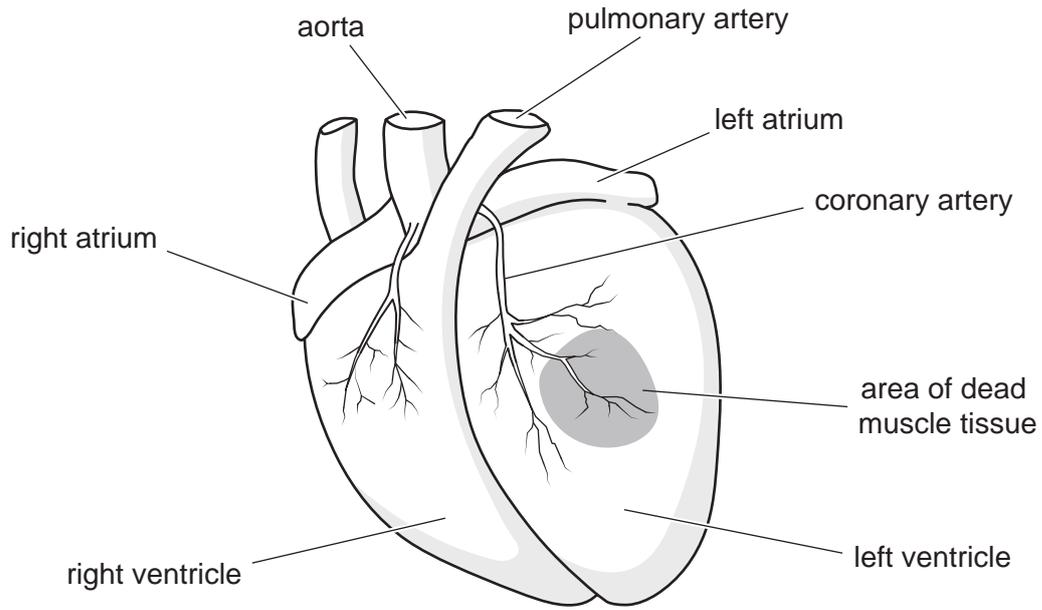


Fig. 7.1

(i) On Fig. 7.1 three arteries are labelled.

State the name of **two** other types of blood vessel.

1

2

[2]

(ii) Describe the structure of an artery.

.....

[2]

(b) (i) Fig. 7.1 shows an area of dead muscle tissue.

Describe what is meant by the term coronary heart disease and suggest why the heart muscle tissue has died.

.....
.....
.....
.....
.....
.....
..... [3]

(ii) One factor that increases the risk of developing coronary heart disease is having a diet that contains a lot of fat.

State **three other** factors that increase the risk of a person developing coronary heart disease.

1
2
3 [3]

[Total: 10]

- 8 Table 8.1 lists some processes carried out by living organisms.

Place a tick (✓) in a box to show the type of process that occurs in animals, occurs in plants, or occurs in both.

An example has been done for you.

Table 8.1

name of process	occurs in animals	occurs in plants
absorption	✓	✓
diffusion		
egestion		
photosynthesis		
respiration		
sexual reproduction		
transpiration		

[6]

9 (a) Define the term *pathogen*.

.....
 [1]

(b) The body has defences against pathogens.

The defences can be grouped into three types and these are listed in Table 9.1.

Complete Table 9.1 by giving a specific example for each type of defence.

Table 9.1

type of body defence	example
mechanical barrier	
chemical barrier	
cells	

[3]

(c) (i) Suggest **two** reasons why it is important for people to wash their bodies frequently.

1

.....

2

.....

[2]

(ii) A student's shirt has food stains on it.

The food stain contains proteins and fats.

The shirt is washed in a biological washing powder.

Explain why a biological washing powder is effective at removing the stain.

.....

 [2]

(d) Fig. 9.1 shows an example of an unhygienic practice in a kitchen.



Fig. 9.1

Explain why hygienic food preparation is important.

.....

.....

.....

.....

..... [2]

[Total: 10]

10 (a) Define the term *drug*.

.....
.....
.....
..... [2]

(b) State the name of **one** lung disease linked to smoking cigarettes.

..... [1]

(c) Alcohol is a drug.

State the name of the organ in the body that breaks down alcohol.

..... [1]

(d) State the name of the group of drugs that are used to treat bacterial infections.

..... [1]

[Total: 5]

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BIOLOGY

0610/42

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.

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 **15** printed pages and **1** blank page.

1 The kidney is one of the main excretory organs of the body.

(a) Define the term *excretion*.

.....
.....
.....
.....
..... [3]

(b) One of the roles of the kidney is to filter the blood.

Fig. 1.1 shows a section of a kidney.

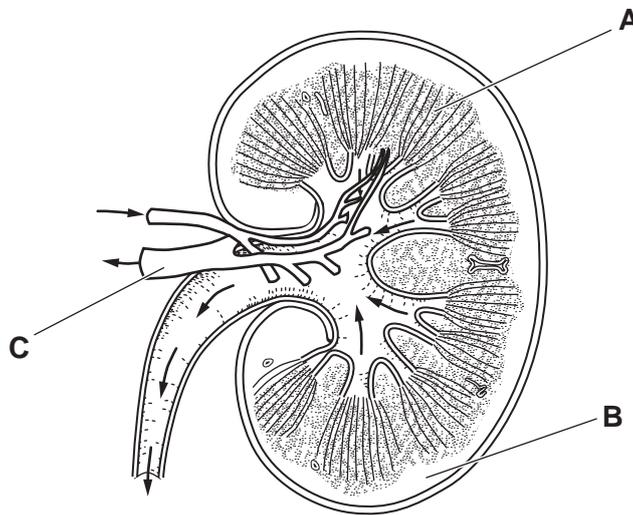


Fig. 1.1

State the name of the parts labelled **A**, **B** and **C** on Fig. 1.1.

A

B

C [3]

(c) Table 1.1 shows the concentrations of four solutes:

- in the blood in the renal artery
- in the fluid in the kidney tubule
- in the urine.

Table 1.1

solute	solute concentration/gdm ⁻³		
	blood in the renal artery	fluid in the kidney tubule	urine
glucose	0.9	0.9	0.0
protein	83.0	0.0	0.0
salts	8.0	8.0	16.5
urea	0.2	0.2	20.0

(i) Calculate the percentage increase in the concentration of urea between the blood in the renal artery and the urine.

Show your working.

..... %
[2]

(ii) Describe the results for the concentration of salts shown in Table 1.1.

.....

 [2]

(iii) State the reason for the difference in the concentration of protein between the blood in the renal artery and the fluid in the kidney tubule.

.....
 [1]

(iv) State the reason for the difference in the concentration of glucose between the fluid in the kidney tubule and the urine.

.....
..... [1]

(d) Dialysis is a treatment used for people with kidney failure.

Some people with kidney failure are given a kidney transplant.

State the advantages of having a kidney transplant instead of dialysis.

.....
.....
.....
.....
.....
.....
.....
..... [3]

[Total: 15]

2 (a) Fig. 2.1 shows some flowers of a snapdragon plant, *Antirrhinum majus*.

Snapdragons are insect-pollinated plants.



Fig. 2.1

(i) State **one** feature visible in Fig. 2.1 that suggests these flowers are insect-pollinated.

..... [1]

(ii) State how self-pollination differs from cross-pollination.

.....
.....
..... [1]

(iii) Suggest why self-pollination might be advantageous to a population of plants.

.....
.....
.....
.....
.....
.....
.....
..... [3]

(b) Petal colour in the flowers of snapdragon plants shows co-dominance.

The gene for petal colour has two co-dominant alleles:

- C^R for red petals
- C^W for white petals

Table 2.1 shows the genotypes and phenotypes of snapdragon plants with different petal colours.

Table 2.1

genotype	phenotype
$C^R C^R$	red
$C^W C^W$	white
$C^R C^W$	pink

(i) Explain the term *co-dominance*.

.....

.....

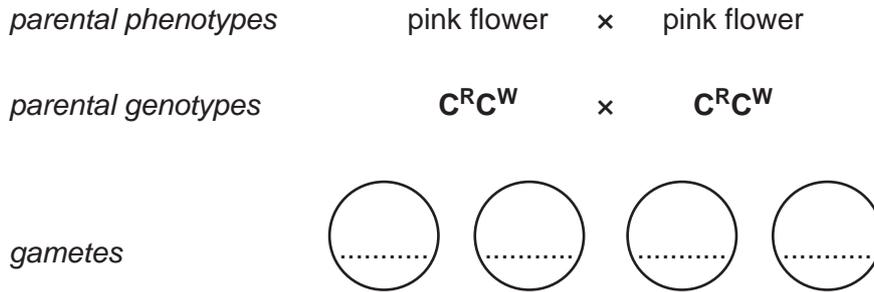
.....

.....

..... [2]

(ii) A botanist crossed two snapdragon plants with pink flowers.

Complete the genetic diagram to show the ratio of expected phenotypes in the offspring.



offspring genotypes

offspring phenotypes

phenotypic ratio [4]

(iii) The botanist wanted to produce a generation of snapdragons that all had pink flowers.

State the phenotypes of the parent plants that the botanist would need to cross.

Explain your answer.

parent phenotypes

explanation

.....

..... [2]

[Total: 13]

(c) Drugs such as heroin affect the nervous system. When users stop taking heroin they may experience withdrawal symptoms.

(i) Outline the short-term effects of heroin on the body.

.....
.....
.....
.....
.....
.....
..... [3]

(ii) State **two** withdrawal symptoms that heroin users may experience.

.....
..... [2]

(iii) Suggest why heroin abuse may increase criminal activity.

.....
..... [1]

[Total: 11]

- (ii) Suggest ways in which a farmer could reduce the chances of eutrophication occurring when applying fertiliser to crops.

.....

.....

.....

.....

..... [2]

[Total: 12]

- 5 Scientists investigated the effect of cuticle thickness on water loss from the leaves of the balsam fir tree, *Abies balsamea*.

The leaves were divided into three groups:

- A** – thick cuticle
- B** – medium cuticle
- C** – thin cuticle

Samples of leaves from each group were weighed. The leaves were placed on a tray in dry air at 20 °C. The samples of leaves were reweighed, at intervals, over 15 hours.

The scientists calculated the mass of each sample of leaves as a percentage of the initial mass.

Fig. 5.1 shows the results.

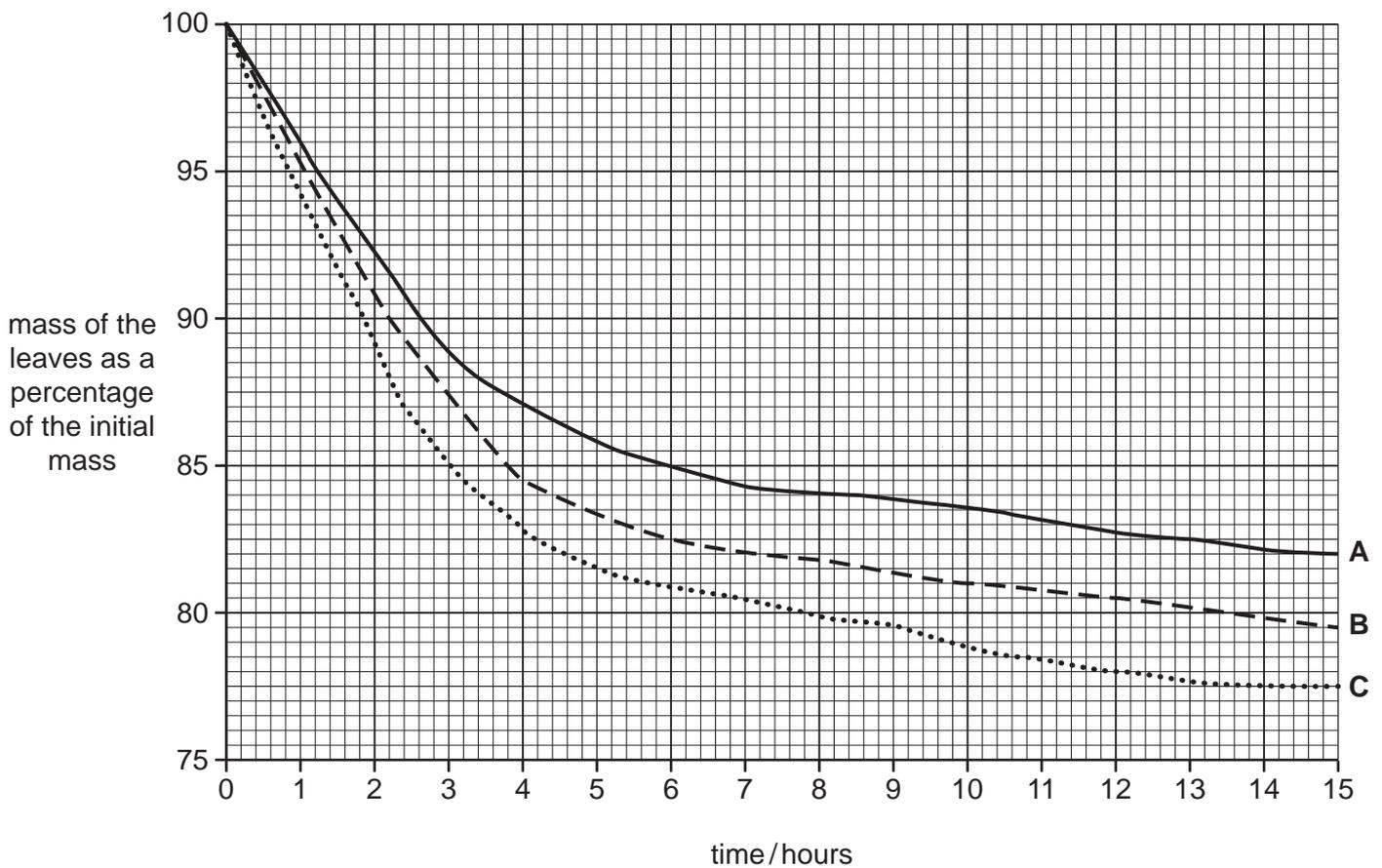


Fig. 5.1

(c) Water is one of the raw materials needed for the production of sugars in photosynthesis.

(i) State the name of the other raw material needed for photosynthesis.

..... [1]

(ii) State **three** ways a plant uses the sugars produced in photosynthesis.

1

2

3

[3]

[Total: 14]

6 Fig. 6.1 is a diagram of the virus that causes measles.

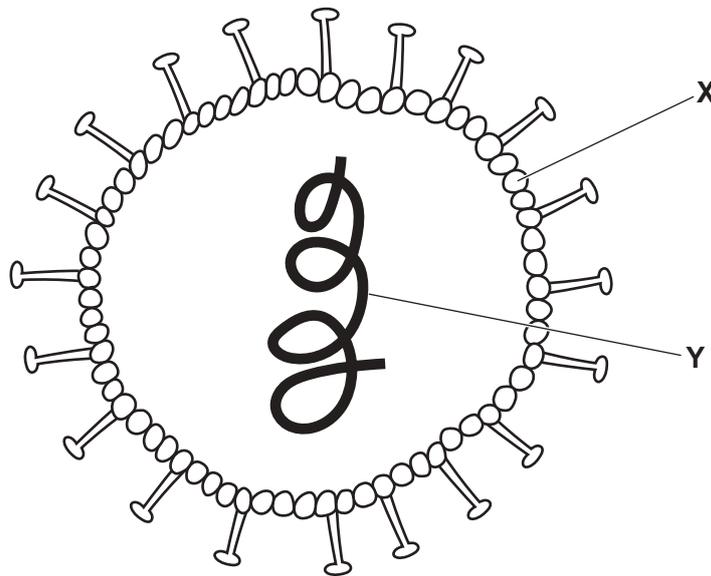


Fig. 6.1

(a) (i) State the name of the parts of the virus shown in Fig. 6.1 labelled X and Y.

X

Y

[2]

(ii) Bacteria belong to the Prokaryote kingdom.

State **two** ways in which the structure of bacteria differs from the structure of viruses.

1

2

[2]

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BIOLOGY

0610/52

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 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.

For Examiner's Use	
1	
2	
Total	

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 **11** printed pages and **1** blank page.

- 1 You are going to investigate the effect of two different types of washing powder on stained cloth. One of these is biological and contains enzymes and detergent. The other is non-biological and contains only detergent.

You are provided with:

- four pieces of dry cloth that have been stained with the same food
- a solution of biological washing powder in a beaker labelled **bio**
- a solution of non-biological washing powder in a beaker labelled **non-bio**
- distilled water in a beaker labelled **water**.

Read all the instructions but DO NOT CARRY THEM OUT until you have drawn a table for your results in the space provided in 1(a)(i).

You should use the safety equipment provided while you are carrying out the practical work.

- Step 1 Use a marker pen to divide a white tile into four sections. Label the four sections **bio**, **non-bio**, **water** and **not washed** as shown in Fig. 1.1.

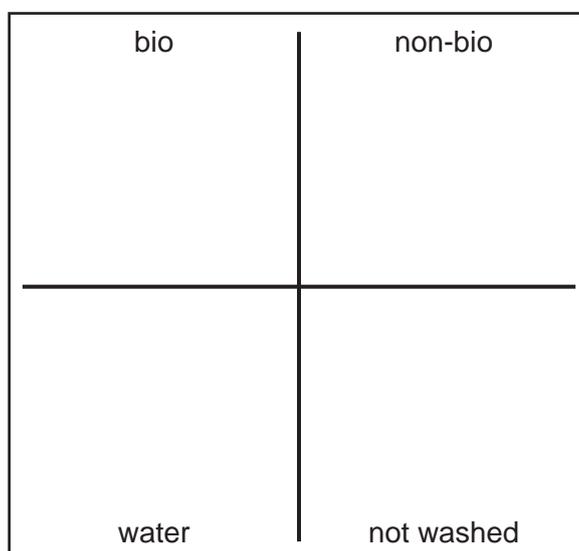


Fig. 1.1

- Step 2 Place one piece of stained cloth on the **not washed** section of the white tile.
- Step 3 Put one piece of stained cloth into each of the beakers labelled **bio**, **non-bio** and **water**.
- Step 4 Use a glass rod to push the pieces of cloth into the liquid in each beaker. Stir the liquid in each beaker for 10 seconds.
- Step 5 Start a stop-clock.
- Step 6 After 5 minutes, stir the liquid in each beaker for 10 seconds.
- Step 7 Let the pieces of cloth soak in the liquid for a further 5 minutes and then repeat step 6.
- Step 8 Remove the pieces of cloth from the beakers and place them on the labelled sections of the white tile.

Step 9 Observe the stain on each piece of cloth and use the intensity score in Table 1.1 to match the intensity of the stain on each piece of cloth. Record the intensity score in your table in **1(a)(i)**.

Table 1.1

intensity score	
lowest intensity	+
↓	++
	+++
highest intensity	++++

(a) (i) Prepare a table to record your results in the space provided.

[4]

(ii) State **one** variable that was kept the same in this investigation.

..... [1]

(iii) Identify **one** source of error in step 4 and explain how it might affect the results.

error

explanation

.....

..... [2]

(iv) Identify a control in this experiment and explain why this control was used.

.....

.....

.....

.....

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(v) State why the method used in step 9 may not give accurate results.

.....
.....
..... [1]

(b) Some students wanted to find the optimum (best) temperature for using biological washing powder.

A Petri dish was filled with agar jelly containing starch. A circular hole was cut into the centre of the agar. A solution of the biological washing powder was put into the hole. The Petri dish was incubated at 10 °C for 10 hours.

After 10 hours iodine solution was poured onto the agar in the Petri dish.

This procedure was repeated at different temperatures.

A typical result is shown in Fig. 1.2.

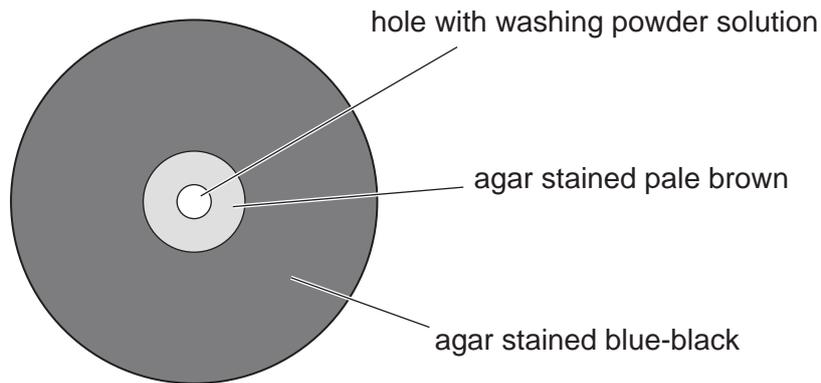


Fig. 1.2

(i) State the variable that was changed (independent variable) in the investigation described in 1(b).

..... [1]

(ii) Some of the agar is stained blue-black and some is stained pale brown.

State a conclusion for this result.

.....
.....
..... [1]

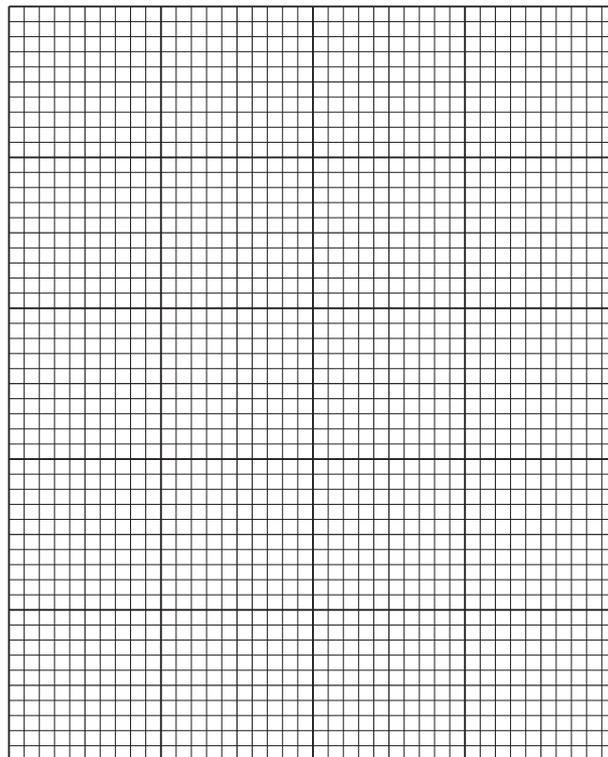
(iii) The diameter of the pale brown stained area was measured during the investigation.

The results are shown in Table 1.2.

Table 1.2

temperature/°C	diameter of pale brown stained area/mm
10	11
20	14
30	18
40	22
50	22
60	7
70	5

Plot a line graph on the grid of the data in Table 1.2.



[4]

(iv) Describe the trend shown by the data in Table 1.2 and your graph.

.....
.....
.....
.....
..... [2]

(v) The students were unable to determine the optimum temperature from their results.

Describe what additional measurements would be needed to find the optimum temperature.

.....
.....
.....
.....
..... [2]

[Total: 20]

- 2 Fig. 2.1 shows photomicrographs of lung tissue at the same magnification. One shows healthy lung tissue and the other shows lung tissue from a person with COPD.

Line **AB** shows the diameter of one healthy alveolus. Line **CD** shows the diameter of an area of lung where the alveoli have been destroyed.

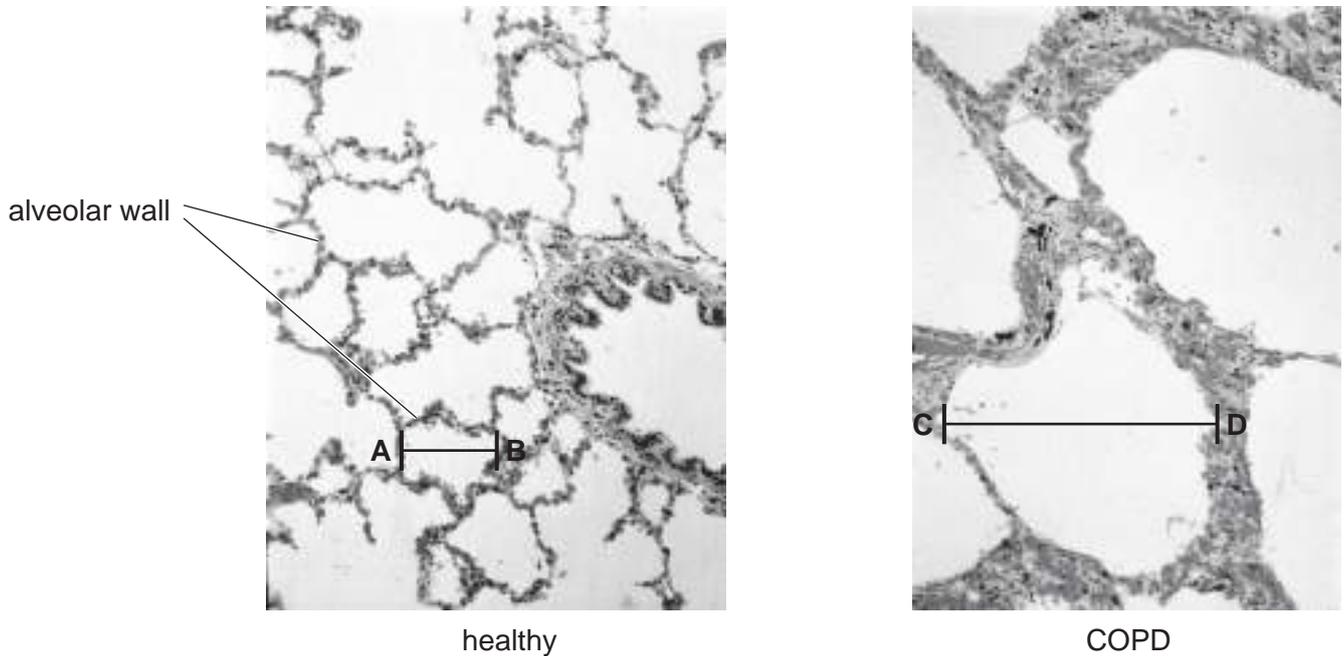


Fig. 2.1

- (a) (i) Make a large drawing of the lung tissue of the person with COPD shown in Fig. 2.1. Do not draw individual cells.

(ii) Measure the length of **CD** as shown on Fig. 2.1. Include the unit.

length of **CD**

Mark on your drawing the position of the line **CD** and measure the length of the line you have drawn. Include the unit.

length of line on your drawing

Calculate the magnification of your drawing. Give your answer to the nearest whole number.

$$\text{magnification} = \frac{\text{length of line on your drawing}}{\text{length of **CD** on Fig. 2.1}}$$

Space for working.

.....
[3]

(iii) Describe **three** visible ways that the lungs of the healthy person differ from the person with COPD in Fig. 2.1.

1
.....

2
.....

3
.....

[3]

- (b) Some students decided to investigate the concentration of carbon dioxide in expired air compared to that in inspired air.

They used the apparatus shown in Fig. 2.2 by breathing into the tube labelled T.

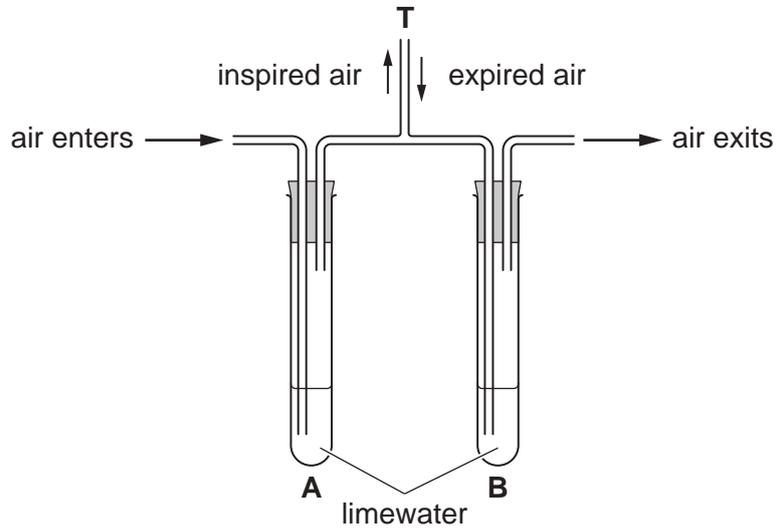


Fig. 2.2

- (i) Suggest **one** possible hazard in this investigation.

..... [1]

- (ii) State **one** other substance which could be used instead of limewater to determine the concentration of carbon dioxide.

.....
 [1]

- (iii) When the students used the apparatus shown in Fig. 2.2, inspired air passed through the limewater in test-tube **A** and expired air passed through the limewater in test-tube **B**.

The students timed how long it took for the limewater in test-tubes **A** and **B** to go cloudy.

Their results are shown in Table 2.1.

Table 2.1

time taken for limewater to go cloudy/s	
test-tube A	test-tube B
600	6

The concentration of carbon dioxide in inspired air is 0.04%.

Calculate, using the results in Table 2.1, the concentration of carbon dioxide in expired air.

Show your working.

..... %
[2]



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BIOLOGY

0610/62

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.

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This document consists of **12** printed pages.

- 1 A student investigated the effect of two different types of washing powder on stained cloth. One was biological and contained enzymes and detergent. The other was non-biological and contained only detergent.

They were provided with:

- four pieces of dry cloth that had been stained with the same food
- a solution of biological washing powder in a beaker labelled **bio**
- a solution of non-biological washing powder in a beaker labelled **non-bio**
- distilled water in a beaker labelled **water**.

Step 1 A marker pen was used to divide a white tile into four sections. The four sections were labelled **bio**, **non-bio**, **water** and **not washed**.

Step 2 One piece of stained dry cloth was placed on the **not washed** section of the white tile.

Step 3 One piece of stained dry cloth was placed into each of the solutions labelled **bio**, **non-bio** and **water**.

Step 4 One glass rod was used to push the pieces of cloth into the liquid in each beaker. The liquid in each beaker was then stirred for 10 seconds.

Step 5 The liquid in each beaker was stirred again, for 10 seconds, after 5, 10 and 15 minutes.

Step 6 After 15 minutes each piece of cloth was removed from the liquid and placed on the labelled area of the white tile.

Step 7 The student observed the stain on each piece of cloth and used the intensity score in Table 1.1 to determine the intensity of the stain on the four pieces of cloth.

A drawing of the four pieces of cloth at the end of the experiment is shown in Fig. 1.1.

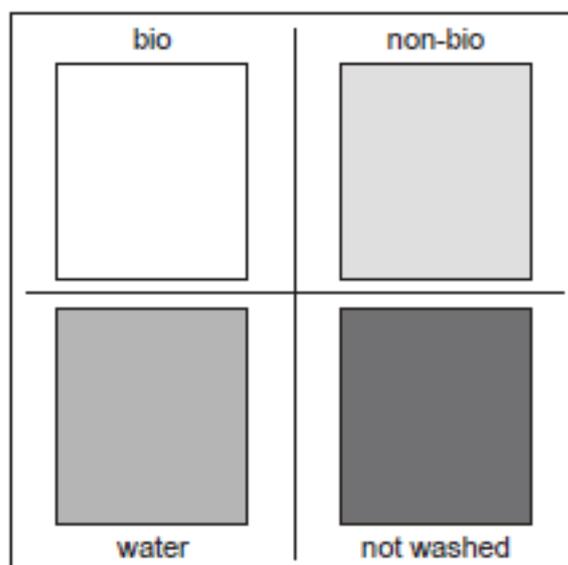


Fig. 1.1

Table 1.1

intensity score	
lowest intensity	+
↓	++
	+++
highest intensity	++++

(a) (i) Prepare a table to record the results in the space provided.

Use the information in Fig. 1.1 and Table 1.1 to match the intensity of the stain to a score for each piece of cloth. Record the intensity scores in your table.

[3]

(ii) State the variable that was measured (dependent variable) in this investigation.

..... [1]

(iii) State **one** variable that was kept the same in this investigation.

..... [1]

(iv) Identify **one** source of error in step 4 and explain how it might affect the results.

error

explanation

.....

.....

[2]

(v) Identify a control in this experiment and explain why this control was used.

.....
.....
.....
..... [2]

(vi) State why the method used in step 7 may not give accurate results.

.....
.....
..... [1]

- (b) Some students wanted to find the optimum (best) temperature for using biological washing powder.

A Petri dish was filled with agar jelly containing starch. A circular hole was cut into the centre of the agar. A solution of the biological washing powder was put into the hole. The Petri dish was incubated at 10 °C for 10 hours.

After 10 hours iodine solution was poured onto the agar in the Petri dish.

This procedure was repeated at different temperatures.

A typical result is shown in Fig. 1.2.

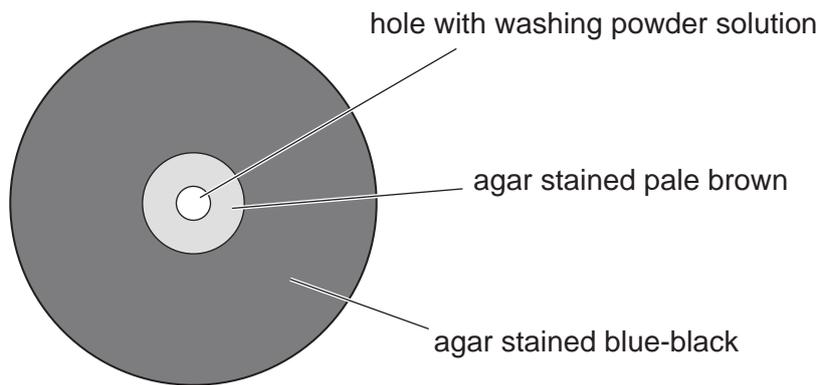


Fig. 1.2

- (i) State the variable that was changed (independent variable) in the investigation described in 1(b).

..... [1]

- (ii) Some of the agar is stained blue-black and some is stained pale brown.

State a conclusion for this result.

.....
.....
..... [1]

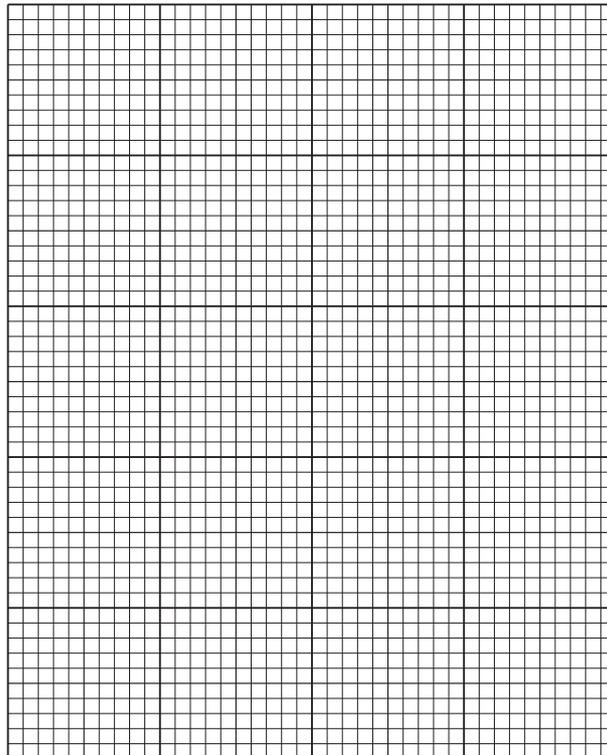
(iii) The diameter of the pale brown stained area was measured during the investigation.

The results are shown in Table 1.2.

Table 1.2

temperature/°C	diameter of pale brown stained area/mm
10	11
20	14
30	18
40	22
50	22
60	7
70	5

Plot a line graph on the grid of the data in Table 1.2.



[4]

(iv) Describe the trend shown by the data in Table 1.2 and your graph.

.....
.....
.....
..... [2]

(v) The students were unable to determine the optimum temperature from their results.

Describe what additional measurements would be needed to find the optimum temperature.

.....
.....
.....
..... [2]

[Total: 20]

- 2 Fig. 2.1 shows photomicrographs of lung tissue at the same magnification. One shows healthy lung tissue and the other shows lung tissue from a person with COPD.

Line **AB** shows the diameter of one healthy alveolus. Line **CD** shows the diameter of an area of lung where the alveoli have been destroyed.

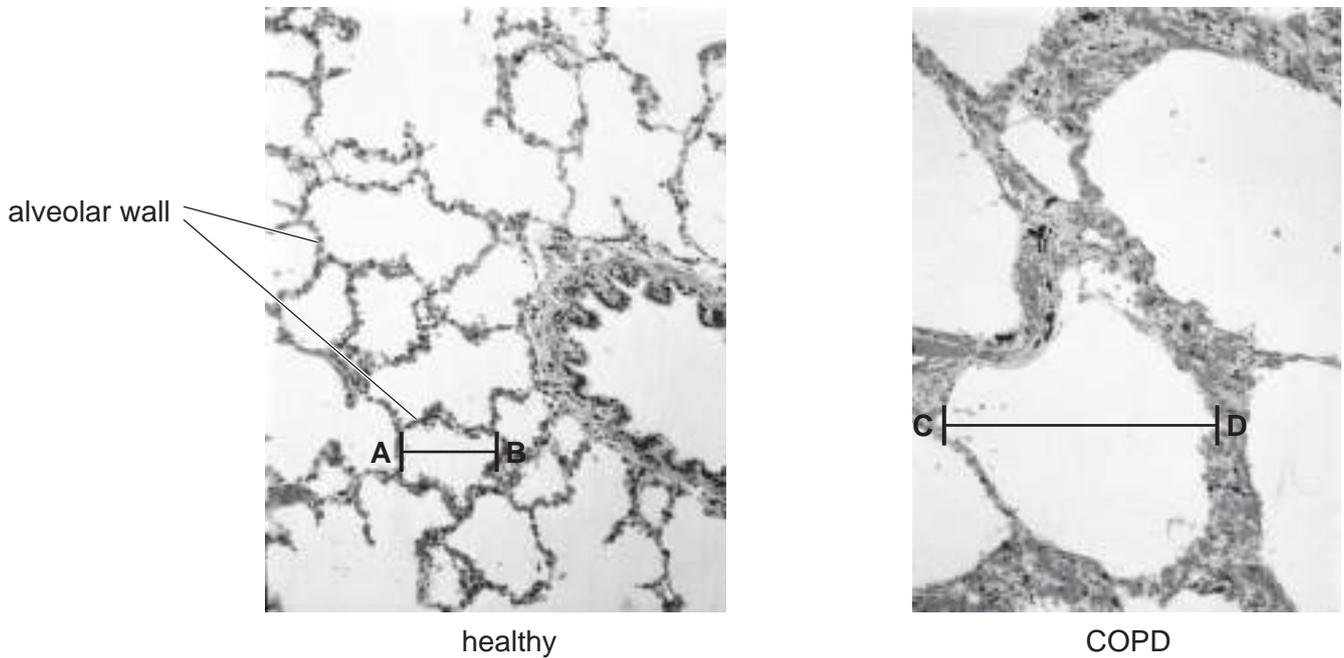


Fig. 2.1

- (a) (i) Make a large drawing of the lung tissue of the person with COPD shown in Fig. 2.1. Do not draw individual cells.

(ii) Measure the length of **CD** as shown on Fig. 2.1. Include the unit.

length of **CD**

Mark on your drawing the position of the line **CD** and measure the length of the line you have drawn. Include the unit.

length of line on your drawing

Calculate the magnification of your drawing. Give your answer to the nearest whole number.

$$\text{magnification} = \frac{\text{length of line on your drawing}}{\text{length of **CD** on Fig. 2.1}}$$

Space for working.

.....
[3]

(iii) Describe **three** visible ways that the lungs of the healthy person differ from the person with COPD in Fig. 2.1.

1
.....

2
.....

3
.....

[3]

- (b) Some students decided to investigate the concentration of carbon dioxide in expired air compared to that in inspired air.

They used the apparatus shown in Fig. 2.2 by breathing into the tube labelled T.

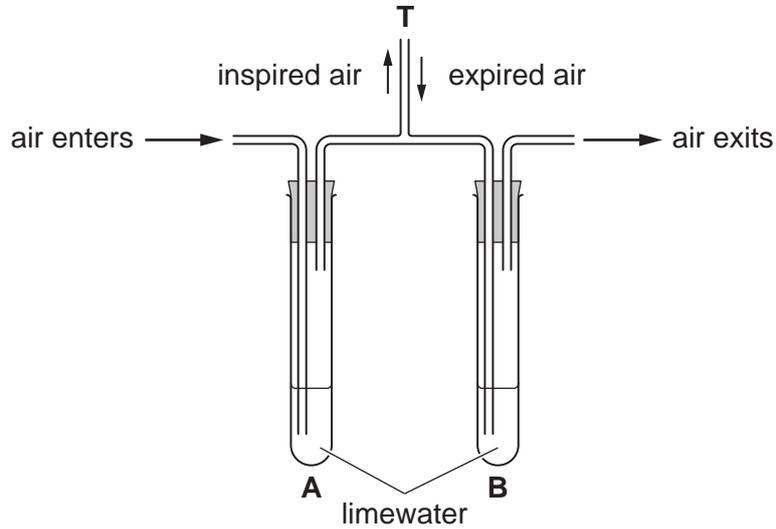


Fig. 2.2

- (i) Suggest **one** possible hazard in this investigation.

..... [1]

- (ii) State **one** other substance which could be used instead of limewater to determine the concentration of carbon dioxide.

.....
 [1]

- (iii) When the students used the apparatus shown in Fig. 2.2, inspired air passed through the limewater in test-tube **A** and expired air passed through the limewater in test-tube **B**.

The students timed how long it took for the limewater in test-tubes **A** and **B** to go cloudy.

Their results are shown in Table 2.1.

Table 2.1

time taken for limewater to go cloudy/s	
test-tube A	test-tube B
600	6

The concentration of carbon dioxide in inspired air is 0.04%.

Calculate, using the results in Table 2.1, the concentration of carbon dioxide in expired air.

Show your working.

..... %
[2]



Grade thresholds – June 2019

Cambridge IGCSE™ Biology (0610)

Grade thresholds taken for Syllabus 0610 (Biology) in the June 2019 examination.

	maximum raw mark available	minimum raw mark required for grade:						
		A	B	C	D	E	F	G
Component 11	40	–	–	24	22	20	18	16
Component 12	40	–	–	22	20	18	16	14
Component 13	40	–	–	24	22	20	18	16
Component 21	40	31	25	20	18	16	14	12
Component 22	40	31	26	21	18	16	14	12
Component 23	40	29	24	19	17	16	14	12
Component 31	80	–	–	46	40	33	26	20
Component 32	80	–	–	44	38	32	26	21
Component 33	80	–	–	46	40	34	27	20
Component 41	80	42	35	26	22	17	13	9
Component 42	80	46	38	31	26	20	15	10
Component 43	80	40	33	25	21	17	13	9
Component 51	40	25	20	16	13	11	9	7
Component 52	40	33	29	24	21	19	15	11
Component 53	40	29	25	22	20	17	15	13
Component 61	40	28	23	18	15	13	11	9
Component 62	40	32	28	23	20	18	15	12
Component 63	40	29	26	23	21	18	15	12

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	147	124	101	79	67	56	46	36
BY	22, 42, 52	159	137	115	94	81	68	55	42
BZ	23, 43, 53	144	123	102	82	72	62	52	42
CX	21, 41, 61	150	127	104	81	69	58	48	38

Grade thresholds continued
Cambridge IGCSE Biology (0610)

Option	Combination of Components	A*	A	B	C	D	E	F	G
CY	22, 42, 62	158	136	114	93	80	67	55	43
CZ	23, 43, 63	143	123	103	83	73	63	52	41
FX	11, 31, 51	–	–	–	110	96	82	69	56
FY	12, 32, 52	–	–	–	112	99	86	72	58
FZ	13, 33, 53	–	–	–	116	103	90	76	62
GX	11, 31, 61	–	–	–	112	98	84	71	58
GY	12, 32, 62	–	–	–	111	98	85	72	59
GZ	13, 33, 63	–	–	–	117	104	91	76	61



BIOLOGY

0610/11

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.

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

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



BIOLOGY

0610/12

Paper 1 Multiple Choice (Core)

May/June 2019

MARK SCHEME

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

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



BIOLOGY

0610/13

Paper 1 Multiple Choice (Core)

May/June 2019

MARK SCHEME

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

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



BIOLOGY

0610/21

Paper 2 Multiple Choice (Extended)

May/June 2019

MARK SCHEME

Maximum Mark: 40

Published

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

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



BIOLOGY

0610/22

Paper 2 Multiple Choice (Extended)

May/June 2019

MARK SCHEME

Maximum Mark: 40

Published

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

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



BIOLOGY

0610/23

Paper 2 Multiple Choice (Extended)

May/June 2019

MARK SCHEME

Maximum Mark: 40

Published

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

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



BIOLOGY

0610/31

Paper 3 Theory (Core)

May/June 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.

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.

PUBLISHED**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	Guidance
1(a)	<p style="text-align: right;">.....</p>	5	one mark for each correct line
1(b)	<p>small(er) ; light(er) / less mass ; smooth(er) / not rough / not spiky / AW ; not sticky ; have, wings / extensions / air bladders or sacs ;</p>	2	

Question	Answer	Marks	Guidance
1(c)	sexual ; oxygen ; water ; gravity / light ; water / oxygen / mineral ions ;;	6	mp2 and mp3 in either order

Question	Answer	Marks	Guidance																			
2(a)	<table border="1"> <thead> <tr> <th rowspan="2">characteristic</th> <th colspan="3">arthropod group</th> </tr> <tr> <th>arachnids</th> <th>crustaceans</th> <th>myriapods</th> </tr> </thead> <tbody> <tr> <td>four pairs legs</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>one pair antennae</td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>two main body parts</td> <td>✓</td> <td></td> <td></td> </tr> </tbody> </table> ;;;	characteristic	arthropod group			arachnids	crustaceans	myriapods	four pairs legs	✓			one pair antennae			✓	two main body parts	✓			3	one mark for each correct row
characteristic	arthropod group																					
	arachnids	crustaceans	myriapods																			
four pairs legs	✓																					
one pair antennae			✓																			
two main body parts	✓																					
2(b)	movement ; respiration ; sensitivity ; growth ; reproduction ; excretion ; nutrition ;	4																				

Question	Answer	Marks	Guidance
2(c)(i)	oxygen used by arthropods ; correct reference to (aerobic) respiration ; carbon dioxide / water (vapour), is given out / released ; carbon dioxide / water (vapour), is absorbed ; (so) volume of air (in the container) decreases / pressure in the container decreases ;	3	
2(c)(ii)	as the temperature increases the (rate of) dye movement increases / AW ;	1	
2(c)(iii)	90(%) ;;	2	

Question	Answer	Marks	Guidance										
3(a)	<table border="1"> <thead> <tr> <th>function</th> <th>letter</th> </tr> </thead> <tbody> <tr> <td>egestion</td> <td>K ;</td> </tr> <tr> <td>lipase made</td> <td>G ;</td> </tr> <tr> <td>mechanical digestion</td> <td>A / F ;</td> </tr> <tr> <td>most water absorption</td> <td>J ;</td> </tr> </tbody> </table>	function	letter	egestion	K ;	lipase made	G ;	mechanical digestion	A / F ;	most water absorption	J ;	4	
function	letter												
egestion	K ;												
lipase made	G ;												
mechanical digestion	A / F ;												
most water absorption	J ;												
3(b)(i)	bacterium / bacteria ;	1											
3(b)(ii)	loss of watery faeces / AW ;	1											
3(b)(iii)	<u>oral rehydration</u> therapy ; intake of water containing, salt / ions, and sugar ; AVP ;;	2											
3(c)	skin ; hairs in the nose ; mucus (traps pathogens) ; acid in the stomach ; white blood cells / phagocytosis / antibodies ;; AVP ;;	2											

Question	Answer	Marks	Guidance
4(a)	line ending on and labelled nucleus ; line ending on one of the chloroplasts and labelled ;	2	
4(b)(i)	cell contents / cytoplasm / (cell) membrane, shrunk ; vacuole smaller ; cell membrane separates from cell wall ; external solution fills space between cell wall and cell membrane ;	2	
4(b)(ii)	water moves out of the cell ; osmosis (in correct context) ; through a partially permeable membrane / AW ; sugar solution more concentrated than cell contents / AW ;	3	
4(b)(iii)	add / place in, water OR dilute / less concentrated, sugar solution / AW ;	1	
4(c)(i)	xylem ;	1	
4(c)(ii)	xylem correctly labelled W on all three diagrams ;;;	3	

Question	Answer	Marks	Guidance
5(a)	animal that gets its energy ; by eating plants ;	2	
5(b)	increased, food supply / plants; less predation / less hunting / AW ; less disease / AW ; more births / fewer deaths ;	2	
5(c)	damage / destroy, (marine) habitats ; extinction of species ; reference to pollution (of sea) ; global warming / ref. to increase in sea temperature ; rise in sea levels / melting of ice-caps ; overfishing / disruption of food chain ;	3	

Question	Answer	Marks	Guidance										
6(a)	testis / testes ; ovary / ovaries ;	2											
6(b)(i)	P egg cell / ovum / ova ; Q sperm ; S zygote / fertilised egg cell ;	3											
6(b)(ii)	P X ; Q X ; S XX ;	3											
6(b)(iii)	R fertilisation ; T mitosis ;	2											
6(b)(iv)	uterus ;	1											
6(c)	<table border="1"> <thead> <tr> <th>method</th> <th>example</th> </tr> </thead> <tbody> <tr> <td>natural</td> <td>abstinence / monitoring body temperature / testing cervical mucus ;</td> </tr> <tr> <td>barrier</td> <td>condom / femidom / diaphragm ;</td> </tr> <tr> <td>chemical</td> <td>IUD / IUS / (contraceptive) pill / implant / injection ;</td> </tr> <tr> <td>surgical</td> <td>vasectomy / sterilisation ;</td> </tr> </tbody> </table> <p style="text-align: right;">;;;</p>	method	example	natural	abstinence / monitoring body temperature / testing cervical mucus ;	barrier	condom / femidom / diaphragm ;	chemical	IUD / IUS / (contraceptive) pill / implant / injection ;	surgical	vasectomy / sterilisation ;	4	
method	example												
natural	abstinence / monitoring body temperature / testing cervical mucus ;												
barrier	condom / femidom / diaphragm ;												
chemical	IUD / IUS / (contraceptive) pill / implant / injection ;												
surgical	vasectomy / sterilisation ;												

Question	Answer	Marks	Guidance												
7(a)	<table border="1"> <tr> <td>structure / function</td> <td>arteries</td> </tr> <tr> <td>blood at high pressure</td> <td>✓ ;</td> </tr> <tr> <td>blood towards heart</td> <td></td> </tr> <tr> <td>thick wall</td> <td>✓ ;</td> </tr> <tr> <td>narrow lumen</td> <td>✓ ;</td> </tr> <tr> <td>valves</td> <td></td> </tr> </table>	structure / function	arteries	blood at high pressure	✓ ;	blood towards heart		thick wall	✓ ;	narrow lumen	✓ ;	valves		3	
structure / function	arteries														
blood at high pressure	✓ ;														
blood towards heart															
thick wall	✓ ;														
narrow lumen	✓ ;														
valves															
7(b)(i)	carries / supplies oxygen ;	1													
7(b)(ii)	white blood cells / phagocytes / lymphocytes ; platelets ; plasma ;	2													

Question	Answer	Marks	Guidance										
8	<table border="1"> <tr> <td>number</td> <td>genotype</td> </tr> <tr> <td>1</td> <td>bb ;</td> </tr> <tr> <td>2</td> <td>Bb ;</td> </tr> <tr> <td>4</td> <td>Bb ;</td> </tr> <tr> <td>14</td> <td>bb ;</td> </tr> </table>	number	genotype	1	bb ;	2	Bb ;	4	Bb ;	14	bb ;	4	
number	genotype												
1	bb ;												
2	Bb ;												
4	Bb ;												
14	bb ;												

BIOLOGY**0610/32**

Paper 3 Theory (Core)

May/June 2019

MARK SCHEME

Maximum Mark: 80

Published

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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	Guidance												
1(a)	<table border="1"> <tr> <td>structure</td> <td>function</td> </tr> <tr> <td>anus ;</td> <td>where egestion occurs</td> </tr> <tr> <td>gall bladder</td> <td>stores bile ;</td> </tr> <tr> <td>mouth ;</td> <td>where ingestion occurs</td> </tr> <tr> <td>salivary glands</td> <td>produce / secrete, saliva / amylase ;</td> </tr> <tr> <td><u>small</u> intestine ;</td> <td>where most absorption occurs</td> </tr> </table>	structure	function	anus ;	where egestion occurs	gall bladder	stores bile ;	mouth ;	where ingestion occurs	salivary glands	produce / secrete, saliva / amylase ;	<u>small</u> intestine ;	where most absorption occurs	5	
structure	function														
anus ;	where egestion occurs														
gall bladder	stores bile ;														
mouth ;	where ingestion occurs														
salivary glands	produce / secrete, saliva / amylase ;														
<u>small</u> intestine ;	where most absorption occurs														
1(b)	fatty acids ; glycerol ;	2													
1(c)	C H O ; N ;	2													

Question	Answer	Marks	Guidance						
2(a)	(a disease in which the) pathogen ; can be passed from one host to another ;	2							
2(b)	boil ; chlorinate ; UV treatment ; sterilising, solution / tablets ; AVP ;	2							
2(c)(i)	10 (%) ;;	2							
2(c)(ii)	bacterium / bacteria ;	1							
2(d)(i)	(loss of) watery faeces / AW ;	1							
2(d)(ii)	<u>oral rehydration</u> therapy ; intake of water containing, salt / ions, and sugar ; AVP ;;	2							
2(e)	genetic ; rapid ; complex ;	3							
3(a)	xylem labelled ; phloem labelled ; root hair labelled ;	3							
3(b)	<table border="1"> <thead> <tr> <th>tissue</th> <th>organ</th> <th>organ system</th> </tr> </thead> <tbody> <tr> <td>fat (under the skin) ;</td> <td>kidney ; heart ; lung ;</td> <td>(nervous system)</td> </tr> </tbody> </table>	tissue	organ	organ system	fat (under the skin) ;	kidney ; heart ; lung ;	(nervous system)	4	
tissue	organ	organ system							
fat (under the skin) ;	kidney ; heart ; lung ;	(nervous system)							

Question	Answer	Marks	Guidance
3(c)	(smallest) chloroplast ; palisade cell (then) phloem tissue (then) root ; (largest) whole plant ;	3	

Question	Answer	Marks	Guidance												
4(a)	<table border="1"> <thead> <tr> <th>name of part</th> <th>letter in Fig. 4.1</th> <th>function</th> </tr> </thead> <tbody> <tr> <td>amniotic sac</td> <td>E ;</td> <td>contains amniotic fluid</td> </tr> <tr> <td>cervix ;</td> <td>D ;</td> <td>dilates during birth</td> </tr> <tr> <td>umbilical cord ;</td> <td>F ;</td> <td>carries materials between mother and fetus</td> </tr> </tbody> </table>	name of part	letter in Fig. 4.1	function	amniotic sac	E ;	contains amniotic fluid	cervix ;	D ;	dilates during birth	umbilical cord ;	F ;	carries materials between mother and fetus	5	
name of part	letter in Fig. 4.1	function													
amniotic sac	E ;	contains amniotic fluid													
cervix ;	D ;	dilates during birth													
umbilical cord ;	F ;	carries materials between mother and fetus													
4(b)	<u>zygote</u> ; grows / divides ; reference to <u>mitosis</u> ; forms a ball of cells ; becomes an embryo ;	3													
4(c)	early stage increases in complexity ; late stages increases in size ;	2													

Question	Answer	Marks	Guidance
5(a)	movement ; respiration ; sensitivity ; growth ; nutrition ; excretion ;	2	
5(b)	nerve (cell) ; ciliated (cell) ; root hair (cell) ; red blood (cell) ; xylem (cell) ; phloem (cell) ; palisade (mesophyll cell) ; spongy (mesophyll cell) ; white blood (cell) ; AVP ;	2	

Question	Answer	Marks	Guidance
5(c)	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin-right: 10px;">Sexual reproduction</div> <div style="display: flex; flex-direction: column; gap: 10px;"> <div style="border: 1px solid black; padding: 5px;">always involves only one parent.</div> <div style="border: 1px solid black; padding: 5px;">involves gametes.</div> <div style="border: 1px solid black; padding: 5px;">includes the process of fertilisation.</div> <div style="border: 1px solid black; padding: 5px;">only occurs in animals.</div> <div style="border: 1px solid black; padding: 5px;">only produces genetically identical offspring.</div> <div style="border: 1px solid black; padding: 5px;">results in the formation of a zygote.</div> </div> </div>	3	one mark for each correct line
5(d)	A ; C ; involves only one <u>parent</u> / does not involve two <u>parents</u> ;	3	

Question	Answer	Marks	Guidance
6(a)	population is constant then increases ; change occurs at 1700 ; rapid / exponential, increase (from 1800) ; data quote ;	3	
6(b)	increased food production ; increased medical, facilities / care ; better, sanitation / clean water / sewage facilities ; increased hygiene ; increased (health) education ;	3	
6(c)	disease ; war ; (named) natural disaster ; famine ; migration ; AVP ;	2	

Question	Answer	Marks	Guidance
7(a)(i)	A (upper) epidermis ; B spongy mesophyll (layer) ;	2	
7(a)(ii)	vascular bundle circled on Fig.7.1 ;	1	
7(a)(iii)	arrow drawn to end on an air space in spongy mesophyll tissue on Fig. 7.1 ;	1	
7(b)	cell membrane ; cytoplasm ; nucleus ; AVP ;	3	

Question	Answer	Marks	Guidance
8(a)		4	5 correct = 4 marks 3 or 4 correct = 3 marks 2 correct = 2 marks 1 correct = 1 mark
8(b)	loss of biodiversity ; reduction in genetic variation ; production of, (named) greenhouse gases / global warming ; water pollution / AW ; habitat destruction ;	2	

Question	Answer	Marks	Guidance
9(a)(i)	(potato cylinder in test-tube 1) increased in mass (by 5g) ; (potato cylinder in test-tube 2) mass stayed the same ;	2	
9(a)(ii)	6 (g) ;	1	
9(a)(iii)	water moves out of the potato (cylinder) ; by osmosis ; because there is more water inside the potato than in the solution / AW ;	2	
9(b)	nitrate ; for making amino acids / proteins ; OR magnesium ; for making chlorophyll ;	2	



BIOLOGY

0610/33

Paper 3 Theory (Core)

May/June 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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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.

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Marks awarded are always **whole marks** (not half marks, or other fractions).

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GENERIC MARKING PRINCIPLE 4:

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GENERIC MARKING PRINCIPLE 6:

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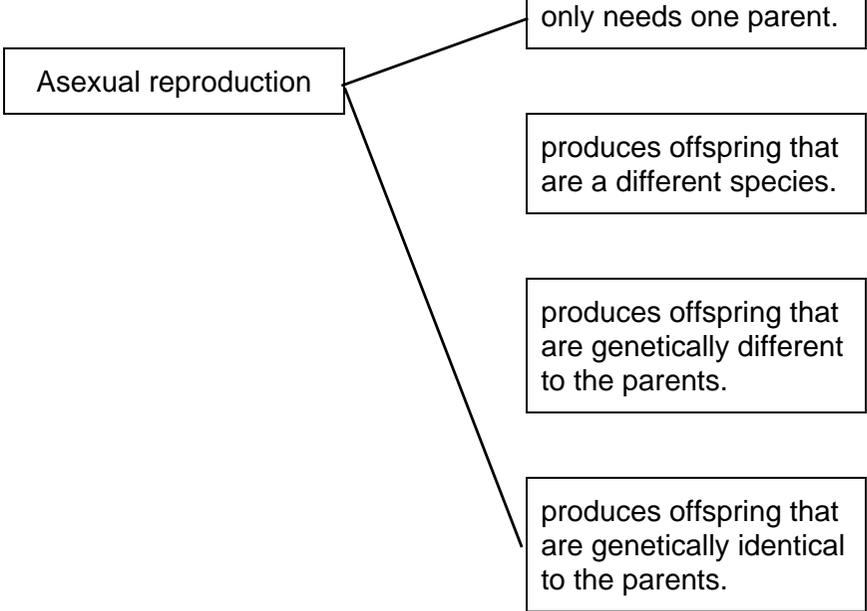
Question	Answer	Marks	Guidance														
1(a)(i)	<table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 50%;">process</th> <th style="text-align: left; width: 50%;">description</th> </tr> </thead> <tbody> <tr> <td style="vertical-align: top; padding: 5px;">absorption</td> <td style="vertical-align: top; padding: 5px;">breakdown of food into smaller pieces</td> </tr> <tr> <td style="vertical-align: top; padding: 5px;">chemical digestion</td> <td style="vertical-align: top; padding: 5px;">breakdown of large, insoluble molecules into small, soluble molecules</td> </tr> <tr> <td style="vertical-align: top; padding: 5px;">egestion</td> <td style="vertical-align: top; padding: 5px;">movement of digested food molecules into cells</td> </tr> <tr> <td style="vertical-align: top; padding: 5px;">ingestion</td> <td style="vertical-align: top; padding: 5px;">movement of small food molecules and ions into the blood</td> </tr> <tr> <td style="vertical-align: top; padding: 5px;">mechanical digestion</td> <td style="vertical-align: top; padding: 5px;">passing out of food that has not been digested or absorbed</td> </tr> <tr> <td></td> <td style="vertical-align: top; padding: 5px;">taking of substances into the body</td> </tr> </tbody> </table> <p style="text-align: right; margin-top: 10px;">♦♦♦♦</p>	process	description	absorption	breakdown of food into smaller pieces	chemical digestion	breakdown of large, insoluble molecules into small, soluble molecules	egestion	movement of digested food molecules into cells	ingestion	movement of small food molecules and ions into the blood	mechanical digestion	passing out of food that has not been digested or absorbed		taking of substances into the body	5	one mark for each correct linked
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mechanical digestion	passing out of food that has not been digested or absorbed																
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Question	Answer	Marks	Guidance
1(a)(ii)	glucose ; amino acids ; fatty acids ; glycerol ;	1	
1(b)(i)	bacterium / bacteria ;	1	
1(b)(ii)	loss of watery faeces / AW ;	1	
1(b)(iii)	<u>oral rehydration</u> therapy ; intake of water containing, salt / ions, and sugar ; AVP ;;	2	

Question	Answer	Marks	Guidance
2(a)	spongy mesophyll ; evaporates ; diffusion ; stomata ;	4	
2(b)(i)	0.27 ;	1	
2(b)(ii)	F lost the most mass ; J lost the least / did not lose any mass ; H lost less mass than G / G lost more mass than H ; leaves with the lower surface uncovered lost the most mass / AW ;	3	
2(b)(iii)	more (exposed) stomata on H / AW ; ora	1	
2(c)(i)	K ;	1	
2(c)(ii)	L ; xylem ;	2	

Question	Answer	Marks	Guidance												
3(a)(i)	(antibiotic), killed the bacteria / stopped the growth of bacteria ;	1													
3(a)(ii)	(most effective) 2 1 3 (least effective) ; <i>reason:</i> more bacteria killed / more clear area / AW ;	2													
3(b)	cytoplasm ; DNA ; cell wall ; cell membrane ;	3	A ribosome ;												
3(c)	<table border="1"> <thead> <tr> <th>example</th> <th>direct contact</th> </tr> </thead> <tbody> <tr> <td>air</td> <td></td> </tr> <tr> <td>blood</td> <td>✓ ;</td> </tr> <tr> <td>body fluids</td> <td>✓ ;</td> </tr> <tr> <td>contaminated food</td> <td></td> </tr> <tr> <td>contaminated surfaces</td> <td></td> </tr> </tbody> </table>	example	direct contact	air		blood	✓ ;	body fluids	✓ ;	contaminated food		contaminated surfaces		2	
example	direct contact														
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Question	Answer	Marks	Guidance
4(a)(i)	mammal / vertebrates ;	1	
4(a)(ii)	fur / hair ;	1	
4(b)	fusion of the nuclei of two gametes ; to form a zygote ; production of genetically different offspring ;	3	

Question	Answer	Marks	Guidance
4(c)	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">needs male and female gametes.</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">needs two parents.</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">only needs one parent.</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Asexual reproduction</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">produces offspring that are a different species.</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">produces offspring that are genetically different to the parents.</div> <div style="border: 1px solid black; padding: 5px;">produces offspring that are genetically identical to the parents.</div> </div> 	2	1 mark for each correctly linked box

Question	Answer	Marks	Guidance															
5(a)	large surface area ; thin (membrane) ; good blood supply ;	2																
5(b)(i)	limewater ; cloudy / milk appearance ;	2																
5(b)(ii)	<table border="1"> <thead> <tr> <th>gas</th> <th>percentage in inspired air</th> <th>percentage in expired air</th> </tr> </thead> <tbody> <tr> <td>carbon dioxide</td> <td>0.04</td> <td>4.00 ;</td> </tr> <tr> <td>oxygen</td> <td>21.00 ;</td> <td>16.00</td> </tr> <tr> <td>Z</td> <td>1.00</td> <td>2.00</td> </tr> <tr> <td>nitrogen</td> <td>78.00</td> <td>78.00</td> </tr> </tbody> </table>	gas	percentage in inspired air	percentage in expired air	carbon dioxide	0.04	4.00 ;	oxygen	21.00 ;	16.00	Z	1.00	2.00	nitrogen	78.00	78.00	2	
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5(b)(iii)	water vapour ;	1																
5(c)(i)	increase / AW ; (increases) then constant ; (constant) from 10 minutes (onwards) ; data quote with units ;	3																
5(c)(ii)	150(%) ;;	2																
5(c)(iii)	ECG ; pulse rate / heart rate ; listening to the valves closing ; AVP ; e.g. stethoscope	2																

Question	Answer	Marks	Guidance															
6(a)(i)	<table border="0" style="width: 100%; text-align: center;"> <tr> <td style="width: 33%;">letter on Fig. 6.1</td> <td style="width: 33%;">name</td> <td style="width: 33%;">function</td> </tr> <tr> <td><div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">Q</div></td> <td><div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">amniotic fluid</div></td> <td><div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">exchange of nutrients or gases</div></td> </tr> <tr> <td><div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">R</div></td> <td><div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">placenta</div></td> <td><div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">protects the fetus from damage</div></td> </tr> <tr> <td><div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">S</div></td> <td><div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">vagina</div></td> <td><div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">receives sperm during sexual intercourse</div></td> </tr> <tr> <td></td> <td>;;</td> <td>;;</td> </tr> </table>	letter on Fig. 6.1	name	function	<div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">Q</div>	<div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">amniotic fluid</div>	<div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">exchange of nutrients or gases</div>	<div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">R</div>	<div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">placenta</div>	<div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">protects the fetus from damage</div>	<div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">S</div>	<div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">vagina</div>	<div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;">receives sperm during sexual intercourse</div>		;;	;;	4	per column: 3 correct = 2 marks 1 or 2 correct = 1 mark
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6(a)(ii)	E and D in either order before B ; A after B ; A before F or C ;	3	<table border="1" style="width: 100%; text-align: center; border-collapse: collapse;"> <tr> <td style="width: 12.5%; padding: 5px;">E or D</td> <td style="width: 12.5%; padding: 5px;">D or E</td> <td style="width: 12.5%; padding: 5px; background-color: #cccccc;">(B)</td> <td style="width: 12.5%; padding: 5px;">A</td> <td style="width: 12.5%; padding: 5px;">F</td> <td style="width: 12.5%; padding: 5px;">C</td> </tr> </table>	E or D	D or E	(B)	A	F	C									
E or D	D or E	(B)	A	F	C													
6(b)(i)	calcium / vitamin D ;	1																
6(b)(ii)	red blood cells / haemoglobin ;	1																
6(b)(iii)	meat / fish / poultry / seafood / soya / lentils / beans / peas / green vegetables / spinach / fortified cereals / tablets / AVP ;	1																
6(b)(iv)	crosses the placenta / harms the fetus / AW ;	1																

Question	Answer	Marks	Guidance
7(a)	glucose and oxygen \longrightarrow ; carbon dioxide and water ;	2	
7(b)(i)	oxygen used by woodlice ; correct reference to (aerobic) respiration ; carbon dioxide given out (by woodlice) ; carbon dioxide does not increase volume of air as it is absorbed by soda lime ; volume of air in the tube decreases / pressure decreases in the tube / AW ;	3	
7(b)(ii)	respiration uses enzymes ; at high temperatures enzymes stop working / woodlice die ; AVP ; e.g. ethical treatment of woodlice / AW	2	
7(b)(iii)	muscle contraction / movement / AW ; protein synthesis ; cell division ; active transport ; growth ; passage of nerve impulses ; maintenance of body temperature ;	2	

Question	Answer	Marks	Guidance								
8(a)(i)	caterpillar ;	1									
8(a)(ii)	thrush ;	1									
8(a)(iii)	the Sun ;	1									
8(b)(i)	Fig.8.1 has fewer producers than Fig. 8.2 / AW ; ora	1									
8(b)(ii)	<i>frogs</i> population increase ; lack of, predator / trout ; <i>insects</i> population decrease ; increased predation ;	4									
8(c)	<table border="0" style="width: 100%;"> <tr> <td style="border: 1px solid black; padding: 5px; width: 150px;">carnivores</td> <td style="border: 1px solid black; width: 40px; height: 30px; margin-left: 20px;"></td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">decomposers</td> <td style="border: 1px solid black; width: 40px; height: 30px; margin-left: 20px; text-align: center;">✓ ;</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">herbivores</td> <td style="border: 1px solid black; width: 40px; height: 30px; margin-left: 20px;"></td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">producers</td> <td style="border: 1px solid black; width: 40px; height: 30px; margin-left: 20px;"></td> </tr> </table>	carnivores		decomposers	✓ ;	herbivores		producers		1	
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BIOLOGY

0610/41

Paper 4 Theory (Extended)

May/June 2019

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks	Guidance
1(a)	(group of) organisms that can reproduce ; to produce fertile offspring ;	2	
1(b)	pinna(e) / external ears ; mammary glands / milk glands / production of milk / lactating / suckling / breast feeding / nipples / AW ; diaphragm ; (three) <u>bones</u> in the middle ear ; (four) different types of teeth / two sets of teeth ; sweat glands ; enucleated red blood cells ; uterus / placenta / navel / AW ; AVP ;	2	
1(c)	select, parent(s) / sheep / AW, with, fine / thin, hairs (in wool) OR use Merino sheep from South Africa and NZ sheep ; cross them together / use artificial insemination / IVF / AW ; measure / AW, the hairs in the wool of all the offspring ; select offspring with, fine / thin, hairs (in wool) ; cross / AW, offspring together ; continue / repeat, selection and/or breeding ; over many generations ; AVP ;	5	max 4 if no reference to quality of wool
1(d)	features are, adaptive / adaptations (for environment) ; caused by / AW, the, environment / surroundings ; competition between individuals for (named) resource(s) ; reference to named selective agent(s) ; slow(er) ; increase in fitness ; explained: ability to survive AND reproduce (in natural environment) ; maintains (genetic) variation / less (genetic) variation in selective breeding ; random mating ;	3	

Question	Answer	Marks	Guidance
2(a)	carbon dioxide is, raw material / substrate / reactant / AW ; concentration of carbon dioxide is higher outside leaf than inside (so carbon dioxide diffuses into the leaf) ;	2	
2(b)	subtract the concentration of carbon dioxide at the end from the concentration at the start / AW ; divide by the time (taken) / per unit time ; ref. to taking (rate of) respiration into account ;	2	
2(c)(i)	light <u>intensity</u> ; water (supply) ; humidity ;	1	
2(c)(ii)	increases and, reaches a plateau / remains constant / 'levels off' ; increases (between 10 °C) to 30 °C / levels off at 30 °C ; any comparative use of figures for rate with units at least once ;	3	
2(c)(iii)	36 ;;	2	

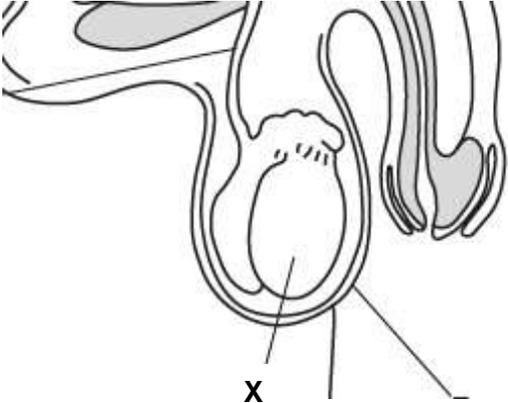
Question	Answer	Marks	Guidance
2(c)(iv)	<p><u>temperature</u> is the limiting factor (over whole range) ; increased temperature increases, <u>kinetic</u> energy / <u>KE</u>, (of molecules) ; increases rate of diffusion of carbon dioxide (into leaf) ; temperature, influences / affects, (activity of) <u>enzymes</u> ; <i>idea of more (effective) collisions between substrate molecules and enzymes (in plant) / more enzyme-substrate complexes formed ;</i> more carbon dioxide is, fixed / used in photosynthesis / converted into sugar / AW ; carbon dioxide (concentration) is not limiting ;</p>	3	
2(c)(v)	<p>B shows that: rate of photosynthesis is, higher / continues to increase, if carbon dioxide is increased (at all temperatures / AW) ;</p>	1	
2(d)	<p><i>prediction:</i> rate of photosynthesis, remains constant / decreases / slows ;</p> <p><i>any explanation one from:</i> enzymes / active sites, are denatured (at high temperatures) ; stomata close, so, little / no, carbon dioxide can enter leaves ; plant is adapted to survive at high temperatures ;</p>	2	

Question	Answer	Marks	Guidance
3(a)	accommodation ; antagonistic ; peripheral ; optic ; brain ;	5	
3(b)	involves, proteins / carriers / pumps (in neurone membrane) ; (named) ion(s) bind to, proteins / carriers / pumps, to move ions / AW ; move ions, against concentration gradient / from low to high concentration ; using energy ; AVP ; e.g. change in shape of carrier (protein)	3	

Question	Answer	Marks	Guidance
3(c)	<p><i>general marking point</i> neurotransmitters move across, synapse / gap / junction / AW ;</p> <p><i>atropine</i> neurotransmitter cannot, bind to / enter / reach, receptors ; therefore no impulses (along, next / postsynaptic, neurone) / no impulses reach the CNS ; no sensitivity to stimuli / feels no pain / painkiller ; no, contraction of muscle / response ; depressant ;</p> <p><i>eserine</i> neurotransmitter stays in, synapse / synaptic gap ; neurotransmitter can bind to receptor (rather than stay in synapse) ; continuously stimulates the, next / postsynaptic, neurone ; (more) impulses are sent (in, next / postsynaptic, neurone) ; repeated, contraction of muscle / response ; stimulant ;</p>	6	A reaction time is longer / no reflex

Question	Answer	Marks	Guidance
3(d)	anabolic steroids increase, muscle mass / AW ; gives athletes unfair advantage / ref. to cheating / unethical / immoral ; (named), side effect / effect on health ; can be banned from taking part in sport if found using them ; ref. to illegality ; AVP ; e.g. can lose sponsorship / loss of reputation / AW	3	

Question	Answer	Marks	Guidance																		
4(a)	tissue ; cell structure ; cell ; organ ;	4																			
4(b)	<table border="1"> <thead> <tr> <th>name of structure</th> <th>function</th> <th>letter on Fig. 4.1</th> </tr> </thead> <tbody> <tr> <td>testis</td> <td>production of sperm / produces <i>or</i> releases testosterone</td> <td>C ;</td> </tr> <tr> <td>sperm duct</td> <td>transports sperm but not urine</td> <td>D ;</td> </tr> <tr> <td><u>urethra</u></td> <td>passage for urine and seminal fluid through the penis</td> <td>A ;</td> </tr> <tr> <td>prostate gland</td> <td>secretes / produces, seminal fluid / nutrient-rich fluid / alkaline fluid / AW</td> <td>E ;</td> </tr> <tr> <td>scrotum / scrotal sac</td> <td>contains testes</td> <td>B ;</td> </tr> </tbody> </table>	name of structure	function	letter on Fig. 4.1	testis	production of sperm / produces <i>or</i> releases testosterone	C ;	sperm duct	transports sperm but not urine	D ;	<u>urethra</u>	passage for urine and seminal fluid through the penis	A ;	prostate gland	secretes / produces, seminal fluid / nutrient-rich fluid / alkaline fluid / AW	E ;	scrotum / scrotal sac	contains testes	B ;	5	one mark per row
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Question	Answer	Marks	Guidance
4(c)	<p>X on testis / label line on testis with X ;</p> 	1	
4(d)(i)	one set of chromosomes ;	1	
4(d)(ii)	23 ;	1	

Question	Answer	Marks	Guidance
5(a)(i)	liquid / fluid / watery, part of blood ;	1	
5(a)(ii)	amino acid(s) ;	1	
5(b)(i)	plasmid ;	1	
5(b)(ii)	<u>restriction</u> (enzyme) ;	1	
5(b)(iii)	cutting / opening, A / the plasmid, with <u>same</u> (restriction) enzyme(s) ; forming, sticky ends ; <i>idea that</i> (sticky) ends of human DNA and plasmid DNA are <u>complementary</u> ; reference to, bases / base sequences (of sticky ends) ; correct reference to (DNA) ligase ; e.g. inserting gene / sticky ends joining / splicing AVP ; e.g. B is a recombinant (plasmid / DNA)	3	
5(b)(iv)	reliable / constant, supply ; produce, large(er) quantities / in a fermenter / bacteria reproduce quickly (to make more genetically engineered bacteria) ; not dependent on blood donations ; <i>idea that</i> no (named) health risk(s) ; higher quality of product ; AVP ;	1	
5(b)(v)	mRNA moves through the cytoplasm ; mRNA molecules, move to / through, ribosomes ; sequence of bases in mRNA determines order of amino acids (in TPA) ; for protein synthesis / to make proteins ; AVP ;	2	
6(a)(i)	cell wall ; cells are a regular shape / described ; vacuole(s) ; AVP ;	1	

Question	Answer	Marks	Guidance
6(a)(ii)	growth ; producing cells ; increase length of shoot / elongation of shoot ;	1	
6(b)	dividing cell / cell division / mitosis, needs (lot of) energy ; carry out <u>aerobic respiration</u> ; provide / release, energy ; (for) a named function in dividing cells ; e.g. movement of chromosomes making cell wall making new (named) molecules (e.g. protein / DNA) making (named) organelle(s)	3	

Question	Answer	Marks	Guidance
6(c)(i)	auxin ;	1	
6(c)(ii)	<i>auxin / hormone:</i> made in the, shoot / stem, tip ; moves away from the tip ; moves to / collects on, lower side of stem ; stimulates cell elongation ; stem, bends / grows, upwards ; AVP ;	4	
6(d)	plants have different, structures / parts / specialised cells ; <i>idea that</i> different parts / specialised cells, have different, functions / roles / features ; <i>idea that</i> specific proteins are required in, parts / specialised cells ; genes code for proteins ; therefore some genes, are required / are not required ; AVP ; e.g. <i>idea that</i> waste of (named) resource(s) if all genes expressed	3	



BIOLOGY

0610/42

Paper 4 Theory (Extended)

May/June 2019

MARK SCHEME

Maximum Mark: 80

Published

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Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
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- 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:

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GENERIC MARKING PRINCIPLE 4:

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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	Guidance
1(a)	yeast ;	1	
1(b)(i)	flour / starch / sugar / glucose / sucrose / carbohydrate ;	1	
1(b)(ii)	respiration ;	1	
1(b)(iii)	carbon dioxide ;	1	
1(c)	<p><i>step 3 / 35 °C / low(er) temperature:</i> optimum / best / suitable / AW, temperature for, respiration / enzymes / gas production ; to allow the dough to, rise / expand / AW ;</p> <p><i>step 5 / 200 °C / high(er) temperature</i> organism A / microorganisms / yeast, killed / enzymes denature ; to cook the dough ; to allow ethanol to evaporate ;</p>	2	
1(d)	biofuels ; wine / beer, making ; penicillin / antibiotic (production) ; AVP ;;	2	

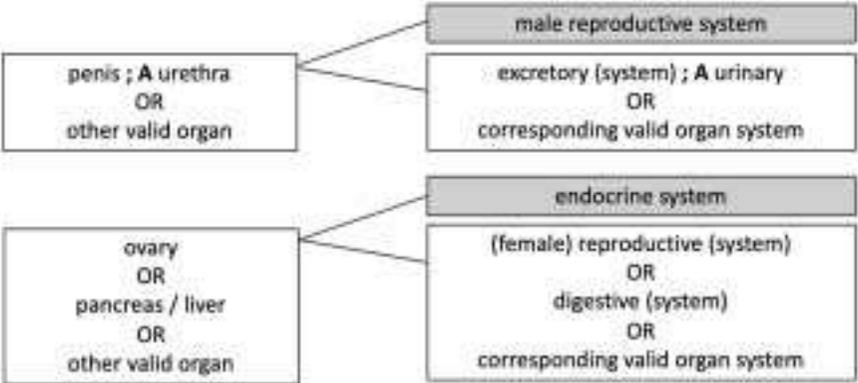
Question	Answer	Marks	Guidance
2(a)	burning / use, (named) <u>fuels</u> ; deforestation / AW ; increased human population ; example of named relevant human activity ; AVP ;	3	
2(b)	<p><i>description:</i> rate (of photosynthesis) peaks at, 12:00 / midday / noon ; photosynthesis starts at, 06:00 / stops at, 20:00 / 8 <u>pm</u> ; rate (of photosynthesis) at 550 (ppm) / AW, is greater than at, 370 (ppm) / AW ; both plots / 550 and 370 ppm, follow same trend / pattern ; comparative data quote between two plots with units at least once ;</p> <p><i>explanation:</i> maximum light at 12:00 / dark until 6:00 / after, 20:00 / 8 <u>pm</u> ; <i>reference to light intensity as a <u>limiting</u> factor ;</i> because light is required for photosynthesis ;</p> <p><i>reference to CO₂ as a <u>limiting</u> factor ;</i> (at high atmospheric CO₂) the concentration gradient (to air spaces) is steeper / diffusion is faster ; effect of CO₂ concentration is most at high light intensities ; ora</p> <p><i>reference to temperature as a <u>limiting</u> factor ;</i> higher temperature causes increased rate of photosynthesis ; ora AVP ;</p>	6	

Question	Answer	Marks	Guidance																
2(c)	<p><i>epidermis</i></p> <table border="1"> <thead> <tr> <th>feature</th> <th>adaptation</th> </tr> </thead> <tbody> <tr> <td>transparent / clear / no chloroplasts</td> <td>allows light to pass through ;</td> </tr> <tr> <td>thin / flat</td> <td>so less cytoplasm / more light, to pass through / AW ;</td> </tr> <tr> <td>guard cells / stomata</td> <td>allow gases to enter / leave the leaf / gas exchange ;</td> </tr> </tbody> </table> <p><i>mesophyll</i></p> <table border="1"> <thead> <tr> <th>feature</th> <th>adaptation</th> </tr> </thead> <tbody> <tr> <td>contains many chloroplasts (palisade)</td> <td>trapping light energy ;</td> </tr> <tr> <td>vertically / tightly, packed / column-shaped (palisade)</td> <td>maximise light received (by cells) / reduce number of, cross / cell, walls ;</td> </tr> <tr> <td>contain (air) spaces / loosely packed (spongy)</td> <td>for diffusion / movement of gases (within leaf) ;</td> </tr> </tbody> </table>	feature	adaptation	transparent / clear / no chloroplasts	allows light to pass through ;	thin / flat	so less cytoplasm / more light, to pass through / AW ;	guard cells / stomata	allow gases to enter / leave the leaf / gas exchange ;	feature	adaptation	contains many chloroplasts (palisade)	trapping light energy ;	vertically / tightly, packed / column-shaped (palisade)	maximise light received (by cells) / reduce number of, cross / cell, walls ;	contain (air) spaces / loosely packed (spongy)	for diffusion / movement of gases (within leaf) ;	4	one mark per row, max two from each tissue
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2(d)	<p>more carbon dioxide in the blood ; low pH / acid, in blood ; (high) carbon dioxide detected by brain ; increases impulses to (named) muscles used in breathing / AW ; <i>correct reference to negative feedback / homeostasis ;</i></p>	2																	

Question	Answer	Marks	Guidance
3(a)(i)	1.2×10^8 (g) / 120 000 000 (g) / 1.2×10^5 (kg) / 120 000 (kg) ;; kg or g (per day) ;	3	
3(a)(ii)	avoid too much (named) sugar in diet ; flossing ; regular visits to, dentist / hygienist / AW ; AVP ;	1	
3(b)(i)	diatom (→) lugworm (→) (wading) bird ; arrows in correct direction ;	2	
3(b)(ii)	<i>description:</i> more ammonium ions remain in bucket / less ammonium, absorbed (by diatoms) ; less faeces ; higher respiration rates ; lower body mass ; <i>explanation:</i> less, diatoms / food / ammonium ions, for lugworms ; (high respiration of lugworms) to, release more energy / for finding food / stress etc. ; slower growth rate of (lugworms) ; (non-biodegradable) microplastics (negatively) affect digestion ;	4	
3(c)(i)	protein / urea / amino acid ;	1	
3(c)(ii)	nitrification ;	1	
3(c)(iii)	plants absorb (nitrogen as) nitrate (ions) ; needed to make, amino acids / (named) proteins ; to make DNA / RNA / nucleotides / bases ; protein / DNA, is needed for, growth / cell division / mitosis ;	3	

Question	Answer	Marks	Guidance
3(d)	visual pollution ; chokes / strangles / traps / blocks digestive systems / AW (of animals) ; <i>reference to</i> , chemical exposure / fumes / toxins ; (plastic) accumulates in an organism / is passed down a food chain ; (described) habitat destruction ; e.g. plastic covers the habitats (plastic) blocks (light / water for) photosynthesis (for land plants) ; (plastic) block roots / prevents root growth ; remain in the ecosystem (for a very long time) ; AVP ;	5	

Question	Answer	Marks	Guidance
4(a)	long, to transmit (impulse), over (long) distance / faster / direct connection ; <u>mitochondria</u> to (release energy), for transmission impulse / protein synthesis / active transport / making (neuro)transmitters ; <u>vesicles</u> to, carry / hold / release, chemicals / (neuro)transmitters (into synapse) ; (neuro)transmitters are released, to allow connection to other neurones / across a synapse ; receptors / vesicles, allow unidirectional transmission ; AVP ;;	3	
4(a)(ii)	brain <u>and</u> spinal cord (only) ;	1	
4(b)(i)	stimulus / light (detected by) retina / rod / cone / receptor ; <i>reference to</i> (electrical) <u>impulse</u> / <u>electrical signal</u> ; sensory neurone → relay / connector, neurone → motor neurone ; <i>reference to</i> synapses between neurones ; effector / (circular) muscles (in iris), contract / <u>respond</u> ;	3	
4(b)(ii)	automatic / involuntary ; receptors / neurones / nerve, still function ;	1	
4(c)(i)	E – vesicle ; F – <u>neurotransmitter</u> ; G – (neurotransmitter) receptor (molecule / site / protein) ;	3	
4(c)(ii)	arrow drawn from right to left, pointing left ;	1	

Question	Answer	Marks	Guidance
5(a)(i)	testosterone ;	1	
5(a)(ii)	one mark per box but organ system must match organ ;;; 	4	
5(b)	to produce, gametes / sperm ; for <u>sexual</u> reproduction ; to halve the number of chromosomes / produce haploid cells ; so that when fertilisation occurs the number of chromosomes return to the, same / diploid, number / AW ; creates (genetic) variation / AW ;	3	

Question	Answer	Marks	Guidance															
5(c)(i)	<table border="1"> <thead> <tr> <th>letter</th> <th>name</th> <th>function</th> </tr> </thead> <tbody> <tr> <td>P</td> <td>acrosome</td> <td>contain enzymes / digests jelly coat ;</td> </tr> <tr> <td>Q</td> <td>haploid nucleus</td> <td>contains / AW, DNA / half number / unpaired, single set of / chromosomes / genes ;</td> </tr> <tr> <td>R</td> <td>mitochondrion ;</td> <td>releases energy</td> </tr> <tr> <td>S</td> <td>flagellum</td> <td>swimming / AW ;</td> </tr> </tbody> </table>	letter	name	function	P	acrosome	contain enzymes / digests jelly coat ;	Q	haploid nucleus	contains / AW, DNA / half number / unpaired, single set of / chromosomes / genes ;	R	mitochondrion ;	releases energy	S	flagellum	swimming / AW ;	4	one mark per row
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5(d)	drawing detail ; additional drawing detail / any drawn and labelled common cell structure e.g. nucleus, cytoplasm, cell membrane, mitochondria / DNA / ribosome / (r)ER ; drawn and labelled unique cell structure ; e.g. jelly (coat) / energy store / protein-rich layer / yolk / large volume of cytoplasm	3																
5(e)	jelly coat (of fertilised egg) hardens ; <i>reference to</i> zygote ; mitosis / cell division ; embryo forms ; moves down oviduct ; AVP ; e.g. use of nutrients in cytoplasm	3																

Question	Answer	Marks	Guidance
6(a)	(group of) organisms that can reproduce ; produce fertile offspring ;	2	
6(b)	<u>genetically</u> identical ; quick ; can reproduce even if variety is sterile ; described consequence of being genetically identical ; AVP ; e.g. no pollinators required / reliable / no harmful variation	3	
6(c)	<u>energy</u> (store / sink) ; example of use of starch in plant ; as a reserve / source / store (of energy), when plant cannot photosynthesise / dormancy / winter / no leaves / dark / night ; AVP ; e.g. insoluble	2	



BIOLOGY

0610/43

Paper 4 Theory (Extended)

May/June 2019

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks	Guidance
1(a)	nucleus ; mitochondria ; (rough) endoplasmic reticulum ; AVP ;	2	
1(b)(i)	<i>nitrogen</i> for making, amino acids / proteins ; <i>glucose</i> for respiration / source of energy ;	2	
1(b)(ii)	for even / uniform, distribution / concentration, of contents / AW ; ensure more access of bacteria with, medium / AW ; prevent settling / clumping of, contents / AW ; so oxygen / glucose / nutrients, dissolves ; so that growth is not limited ; so bacteria can absorb substances (more easily) ; bacteria need oxygen for respiration ;	3	

Question	Answer	Marks	Guidance
1(c)	<p><i>description:</i> at least two correctly named phases ; any two phases described correctly ; i.e. A: level, B: increasing, C: level, D: decreasing (numbers of live bacteria)</p> <p>correct relevant data quote for any phase ;;</p> <p>A is the lag, phase / stage: bacteria, growing / dividing, slowly ; bacteria adjusting to conditions / absorbing resources ;</p> <p>B is the exponential / log, phase / stage: resources are, not limiting / AW ; bacteria, growing / dividing, rapidly ; growth / birth, rate greater than death rate ;</p> <p>C is the stationary, phase / stage: growth / birth, rate equal to death rate ;</p> <p>D is the death, phase / stage: death rate greater than growth, birth / rate ;</p> <p>C or D: many bacteria are dying ; concentration of resources decreasing / resources become limiting ; space becomes limiting / AW ; (named) toxins building up ;</p>	6	

Question	Answer	Marks	Guidance
2(a)	carbon dioxide + water \rightarrow ; glucose + oxygen ;	2	
2(b)(i)	temperature is a factor that affects the rate of photosynthesis ; <i>reference to</i> kinetic energy ; <i>idea of</i> effect of temperature, on enzymes / diffusion rate (of carbon dioxide) ; <i>idea that</i> temperature is a variable that should be standardised ; AVP ;	2	
2(b)(ii)	74 ;;;	3	
2(b)(iii)	rate (of photosynthesis) increases and, reaches a plateau / AW ; rate (of photosynthesis) increases until 1750 (a.u) / 25 $\mu\text{mol per m}^2 \text{ per s}$; any comparative use of figures for rate ;	3	
2(b)(iv)	light intensity is the <u>limiting</u> factor, at all light intensities used / AW ; because rate of photosynthesis does not level off (even at high light intensities) ; carbon dioxide / temperature / chlorophyll / another factor, was not a <u>limiting</u> factor ; <i>correct reference to</i> (light) <u>energy</u> ; light is absorbed by chlorophyll ; AVP ;	4	

Question	Answer	Marks	Guidance
3(a)(i)	<u>restriction</u> (enzyme) ;	1	
3(a)(ii)	sticky ends ;	1	
3(a)(iii)	plasmid is cut with the <u>same</u> (restriction) enzyme (as DNA) ; to form, sticky ends / region A , that are <u>complementary</u> to sticky ends of, gene / <i>cry</i> ; <i>reference to</i> base sequences (being complementary / AW) ; (DNA) ligase used to join plasmid and, <i>cry</i> / gene ; AVP ; e.g. formation of recombinant DNA / plasmid	3	
3(b)	gene / <i>cry</i> , codes for the sequence of amino acids in, (toxic) protein ; DNA / gene / <i>cry</i> , is copied / transcribed, to form mRNA ; <i>cry</i> / gene / DNA, remains in nucleus ; mRNA moves from nucleus to, cytoplasm / ribosome ; <u>mRNA</u> passes through ribosomes / AW ; ribosomes assemble amino acids (into protein molecules) ; ribosomes make proteins ; AVP ; e.g. order of amino acids determined by base sequence of, mRNA / DNA / gene	4	
3(c)	to kill / harm / deter, caterpillars / insects / pests ; higher yield / reduce losses due to, (certain) caterpillars / insects / pests ; higher quality of cotton ; use less insecticide ; (so) less pollution ; (so) less money spent on, insecticides / spraying ; (so) less risk to workers' health (from using insecticides) ; (so) less chance of insecticide resistance ; AVP ;	3	

Question	Answer	Marks	Guidance
4(a)	one loop to lungs / pulmonary circulation, and one loop to rest of the body / systemic circulation ; blood flows through heart twice, for one (complete) circuit / to get back to the same point ;	1	
4(b)	lymphocyte / AW ; engulf/ digest / kill / destroy, bacteria / pathogens ; platelet ; red blood cell ;	4	
4(c)	wall of artery thicker than wall of vein ; lumen labelled in both drawings ;	2	
4(d)(i)	arrow(s) start in right-hand side of heart in correct direction ; arrow(s) point upwards inside pulmonary artery ;	2	

Question	Answer			Marks	Guidance																		
4(d)(ii)	<table border="1"> <thead> <tr> <th>statement</th> <th>name of structure</th> <th>letter from Fig. 4.1</th> </tr> </thead> <tbody> <tr> <td>chamber that creates the highest blood pressure</td> <td>left ventricle</td> <td>F ;</td> </tr> <tr> <td>blood vessel containing blood with the highest concentration of oxygen</td> <td>pulmonary vein / aorta</td> <td>C / A ;</td> </tr> <tr> <td>structure that prevents blood going from ventricle to atrium</td> <td>atrioventricular valve</td> <td>E ;</td> </tr> <tr> <td>structure that prevents backflow of blood from artery to ventricle</td> <td>semilunar valve</td> <td>K ;</td> </tr> <tr> <td>chamber that receives blood from vena cava</td> <td>right atrium</td> <td>J ;</td> </tr> </tbody> </table>			statement	name of structure	letter from Fig. 4.1	chamber that creates the highest blood pressure	left ventricle	F ;	blood vessel containing blood with the highest concentration of oxygen	pulmonary vein / aorta	C / A ;	structure that prevents blood going from ventricle to atrium	atrioventricular valve	E ;	structure that prevents backflow of blood from artery to ventricle	semilunar valve	K ;	chamber that receives blood from vena cava	right atrium	J ;	5	one mark per row
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chamber that receives blood from vena cava	right atrium	J ;																					

Question	Answer	Marks	Guidance
4(e)	tissue fluid drains (into lymphatic vessels) ; transports tissue fluid ; back into the blood / circulatory system ; contains, lymphocytes / antibodies (in lymph nodes) ; defence against infection / provide (active) immunity / AW ; (lacteals) absorbs / transports, fats / fatty acids ; from small intestine / duodenum / ileum ; AVP ;	3	

Question	Answer	Marks	Guidance
5(a)	caused by a mutation ; change in, DNA / base sequence ; of gene for haemoglobin ; (causes) a different sequence of amino acids ; (so) abnormal haemoglobin produced ; AVP ;	3	
5(b)	both parents carry the, recessive allele / allele for (sickle cell) anaemia ; both parents are heterozygous ; half the gametes of both parents have the recessive allele ; people / children, who are homozygous recessive have (sickle cell) anaemia ; there is a, $0.5 \times 0.5 / 0.25$, chance of, being homozygous recessive / having (sickle cell) anaemia ;	4	
5(c)(i)	(group of) organisms that can reproduce ; to produce fertile offspring ;	2	
5(c)(ii)	people with sickle cell anaemia / heterozygotes / carriers / are resistant to, malaria / AW ; people with (homozygous) sickle cell anaemia are, less likely to survive / die of sickle cell disease ; people who are heterozygous / have one copy of the sickle cell allele, are more likely to survive / have selective advantage ; <i>idea that they are more likely to breed ;</i> pass on allele for sickle cell ; so increase in frequency of sickle cell allele (in population) ; selective advantage for sickle cell only exists where, (mosquitoes carrying) malaria are present ; AVP ; ref. to evolution / adaptation to (local) conditions	5	

Question	Answer	Marks	Guidance
6(a)(i)	stores / contains, DNA / chromosomes / genes ; controls the cell ; AVP ;	1	
6(a)(ii)	P – endoplasmic reticulum / (rough) ER / ribosome ; R – mitochondrion / mitochondria ;	2	
6(b)	catalysts ; starch ; maltose / glucose ; pepsin ; liver ; neutralises ; <u>emulsification</u> ;	7	



BIOLOGY

0610/51

Paper 5 Practical Test

May/June 2019

MARK SCHEME

Maximum Mark: 40

Published

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GENERIC MARKING PRINCIPLE 6:

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Question	Answer	Marks	Guidance
1(a)(i)	(agar closest to the well is) pink / red / orange / yellow ;	1	
1(a)(ii)	from (edge of) hole to (edge of) the (red or yellow) circle / zone ; diameter / radius of (red or yellow) circle ;	1	
1(a)(iii)	table drawn with header line and at least two columns ; headings: concentration of citric acid and distance / diameter ; units in headers only; percentage / % and mm / cm ; three distances recorded in correct column / row ;	4	
1(a)(iv)	the higher the concentration (of solution) the further (the acid) moves / AW;	1	
1(a)(v)	6.5 ;;	2	
1(b)(i)	number of drops / three drops (of citric acid / solution in the holes) ; agar , concentration / depth / volume / type ; holes/wells, depth/size/width ; indicator, concentration / volume / type ; time / 30 minutes ; same temperature ; AVP ; e.g. same type of acid/volume of stock solution	2	

Question	Answer	Marks	Guidance																				
1(b)(ii)	<table border="1"> <thead> <tr> <th><i>error</i></th> <th><i>effect on results</i></th> </tr> </thead> <tbody> <tr> <td>drop sizes vary ;</td> <td>larger volume produces greater diffusion distance ; ora</td> </tr> <tr> <td>no repeats ;</td> <td>unable identify anomalous results ;</td> </tr> <tr> <td>one dropping pipette used for all (three) solutions / contamination ;</td> <td>a weaker solution would produce a smaller diffusion distance ;</td> </tr> <tr> <td>longer diffusion time / citric acid added at different times / circles measured at different times ; ora</td> <td>greater / lesser distance travelled ;</td> </tr> <tr> <td>difficult to judge edge of colour change / subjective ;</td> <td>results overestimated or underestimated ;</td> </tr> <tr> <td>uneven shape / not circular ;</td> <td>distance moved may be more/less than measured ;</td> </tr> <tr> <td>difficult to cut holes ;</td> <td>greater / less, surface area or volume contained may have less effect on distance ;</td> </tr> <tr> <td>spillage ;</td> <td>area may be larger ;</td> </tr> <tr> <td>AVP ; e.g. solutions not mixed</td> <td>AVP ; more / less concentrated so diffuse more/less</td> </tr> </tbody> </table>	<i>error</i>	<i>effect on results</i>	drop sizes vary ;	larger volume produces greater diffusion distance ; ora	no repeats ;	unable identify anomalous results ;	one dropping pipette used for all (three) solutions / contamination ;	a weaker solution would produce a smaller diffusion distance ;	longer diffusion time / citric acid added at different times / circles measured at different times ; ora	greater / lesser distance travelled ;	difficult to judge edge of colour change / subjective ;	results overestimated or underestimated ;	uneven shape / not circular ;	distance moved may be more/less than measured ;	difficult to cut holes ;	greater / less, surface area or volume contained may have less effect on distance ;	spillage ;	area may be larger ;	AVP ; e.g. solutions not mixed	AVP ; more / less concentrated so diffuse more/less	2	AW throughout mark as a pair, effect must match the source of error
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AVP ; e.g. solutions not mixed	AVP ; more / less concentrated so diffuse more/less																						

Question	Answer	Marks	Guidance
1(c)	<p><i>any two from given method</i> ;;</p> <ul style="list-style-type: none"> • agar plates used • indicator (in agar) • holes made in agar • (citric) acid added • left for fixed (stated) time • measure distance moved/diameter/radius <p><i>any three from novel method</i> ;;;</p> <ul style="list-style-type: none"> • using range of at least 2 temperatures • temperatures specified and all less than 70 (°C) • idea of keeping temperature constant • ref to temperature equilibration time prior to adding citric acid • measure time taken to reach specified diameter <p><i>any additional points:</i> same concentration of citric acid ; wear gloves / goggles ; repeating the investigation at least twice / three holes in each plate / use three dishes at each temperature ; AVP ;</p>	6	
2(a)(i)	<p><i>line:</i> clear single continuous lines without shading ;</p> <p><i>size:</i> occupies at least half the space available ;</p> <p><i>detail:</i> layers in correct proportions ;</p>	3	
2(a)(ii)	<p>length of line AB = 40mm ;</p> <p>actual length =0.4 mm ;;</p>	3	<p>A ±1 mm</p> <p>A ±0.01 mm</p>
2(a)(iii)	X written on the spongy mesophyll of drawing ;	1	
2(b)(i)	<p>to obtain a representative leaf size ;</p> <p>to identify anomalous results ;</p>	1	

Question	Answer	Marks	Guidance
2(b)(ii)	to avoid bias / gain a representative sample / AW ; so that a comparison can be made (between the different light intensities) ;	1	A leaves at different heights may be different sizes
2(b)(iii)	draw round the outline of the leaf on a grid / place leaf under a (transparent) grid ; count the squares ; include any squares more than half covered / other valid method described ;	2	
2(b)(iv)	light intensity ;	1	
2(c)(i)	67(%) ;;	2	
2(c)(ii)	<i>axes labelled with units:</i> light intensity / arbitrary units or au and average leaf area / mm ² and species A and B labelled / key given ; <i>scale and size:</i> even scale for leaf area sequential for x-axis bars/plotting area to occupy at least half the grid in both directions ; <i>plots:</i> 6 values plotted accurately $\pm \frac{1}{2}$ small square ; 4 bars: bars the same width (at least 1 small square wide) gaps present between bars /pairs of bars ;	4	

Question	Answer	Marks	Guidance
2(c)(iii)	<i>species A:</i> as the light intensity decreases the (average) leaf area increases / ; ora <i>species B:</i> (average) leaf area increases with increasing light intensity (to maximum at 50 au) and then decreases ; ora	2	
2(c)(iv)	measure leaf growth at a narrower range of light intensities around 50 (au) ;	1	

BIOLOGY

0610/52

Paper 5 Practical Test

May/June 2019

MARK SCHEME

Maximum Mark: 40

Published

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Question	Answer	Marks	Guidance
1(a)(i)	four measurements in which the starting temperature for warm water is higher than the starting temperature for cool water ;	1	
1(a)(ii)	table drawn with minimum two columns and a header line ; appropriate column / row headings, with unit ; both times recorded in seconds ; suitable trend ;	4	i.e. test-tube / temperature with warm and cool in the data cell OR temperature / °C, and time / s
1(a)(iii)	at higher temperatures the methylene blue became, colourless / disappeared, more quickly / AW ;	1	
1(a)(iv)	volume / amount / type of yeast (suspension) ; number of drops / concentration / amount / type, of methylene blue / indicator / AW ; idea of equilibration time in water-bath / beaker ; depth / amount / type / volume / height / AW, of oil ;	2	
1(b)(i)	<i>error from Table 1.1</i> temperature (of the water-bath) not controlled / temperature changes / AW ; <i>improvement</i> thermostatically controlled water-bath / maintain water-bath temperature / insulation of the beaker ;	2	

Question	Answer	Marks	Guidance
1(b)(ii)	<p><i>error step 15</i></p> <ol style="list-style-type: none"> 1 subjective / difficult to judge when the colour had disappeared / qualitative ; 2 idea that both tubes are observed at the same time ; 3 the indicator did not change within the ten minutes ; <p><i>improvement</i></p> <ol style="list-style-type: none"> 1 compare to, a test-tube containing yeast with no methylene blue / test-tube that had already changed colour / use a colorimeter / colour standard ; 2 idea that they should conduct each experiment at different times ; 3 measure for more than 10 minutes or dilute the methylene blue or use a different dye ; 	2	
1(c)	<p>hydrogencarbonate / bicarbonate ; yellow or orange colour ;</p> <p>OR</p> <p>limewater ; goes cloudy / milky / white ;</p>	2	

Question	Answer	Marks	Guidance
1(d)	<p><i>independent variable:</i> at least <u>two</u> different concentrations of ethanol ;</p> <p><i>dependent variable:</i> measuring the time taken for methylene blue to decolourise ;</p> <p><i>constant variables:</i> two from ;;</p> <ul style="list-style-type: none"> • same temperature • same pH • same volume of ethanol (solution) • same volume / amount / concentration of sugar <p>one from ;</p> <ul style="list-style-type: none"> • same volume / amount / concentration / type, of yeast • same volume / amount / concentration, of methylene blue / indicator • same volume / depth of oil <p><i>methodology</i> idea of leaving to equilibrate at set temperature ; use of a water-bath / insulation to maintain one temperature ; detail of a comparison / control e.g. test with no ethanol / yeast, present ; two or more repeats / three or more trials ;</p> <p><i>safety</i> relevant safety e.g. gloves / goggles / no flames ;</p>	6	A suitable alternative methods

Question	Answer	Marks	Guidance
2(a)(i)	outline – clear continuous line around stigmatic disc ; size – larger than 70 mm ; details: nine stigmatic rays shown as double lines ; circle approximately one third of the way out from the centre of the stigmatic disc ;	4	
2(a)(ii)	length of line PQ 26 mm / 2.6 cm \pm 1 mm ; 16 mm / 2 cm ;;	3	
2(b)(i)	60(%) ;;	2	
2(b)(ii)	A (xes) – labelled ; pH and percentage germination S (cale) – suitable scale and plots occupy at least half the grid in both directions ; P (lot) – correct plots \pm half a small square ; L (ine) – suitable line ;	4	
2(b)(iii)	percentage (germination) increases and then decreases ; peaks at pH 6 / highest percentage of (germination) is at pH 6 ;	2	A optimum at pH 6
2(b)(iv)	(test at pH values at) smaller intervals ; between pH 5 and 7 or 5 / 6 or 6 / 7	2	
2(c)	grind up seeds / AW ; add Benedict's (reagent/solution) ; heat ; red / orange / yellow / green, if reducing sugars present ;	3	



BIOLOGY

0610/53

Paper 5 Practical Test

May/June 2019

MARK SCHEME

Maximum Mark: 40

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Question	Answer	Marks	Guidance
1(a)	<i>any two from MP1–3</i> use ethanol emulsion test ; mix the sample (with ethanol) ; add water ; <i>positive test result</i> look for cloudy suspension / formation of emulsion ;	3	
1(b)	(changes from blue to) lilac / purple ; protein present ;	2	
1(c)(i)	table, two columns with suitable headings underlined ; headings: test-tube and observation / colour ; three colours recorded and test-tube P result is purple ;	3	
1(c)(ii)	pH / acid ;	1	A presence of enzyme
1(c)(iii)	as a control / to compare with enzyme test-tubes / AW ;	1	
1(c)(iv)	to keep, volume / concentration, the same ;	1	
1(c)(v)	<i>error</i> syringes not clean / cross-contamination ; <i>effect</i> dilution of, solutions / enzymes in control / acid in wrong place / AW ;	2	
1(c)(vi)	use of acid / enzymes ;	1	

Question	Answer	Marks	Guidance
2(a)	Line – clear inner line and outer line, with no shading ; Size – occupies at least half the space available ; Detail D1 – detail showing two or more layers ; D2 – crinkled inner line and smooth outer line ;	4	
2(b)(i)	length of AB recorded as 37 mm ; 2.8 mm / 2.9 mm ;;	3	A \pm 1 mm
2(b)(ii)	<i>similarity</i> both have layers / same number of layers / presence of lumen (described) / contain material in lumen / dotted appearance / AW ; <i>difference</i> size / size of lumen / wall thickness / thickness of layers / material in lumen / shape / striations of middle layer /AW ;	2	

Question	Answer	Marks	Guidance
2(c)(i)	105 ;;	2	
2(c)(ii)	A (xes) – labelled time / minutes and pulse rate / beats per minute or bpm ; S (cale) – suitable scale and scale that occupies at least half the grid ; P (lot) – correct plots ; L (ine) – suitable line joining points ;	4	
2(c)(iii)	indication on graph at 15 minutes ; correct value from graph ;	2	
2(c)(iv)	constant before exercise ; rises during exercise and then falls ; does not return to resting value by 18 minutes ; data quote with units ;	3	
2(d)	description of method of exercise ; different speeds indicated ; measure pulse during / immediately after ; method for measuring pulse rate ; named constant variables ;;; <ul style="list-style-type: none"> • distance run / time taken • age / gender / health of participants / same person • same (named) environment conditions of exercise e.g. temperature / wind /slope • rest breaks between measurements / return to resting bpm at least three participants sampled or carry out three times with the same person ; relevant safety precaution ;	6	



BIOLOGY

0610/61

Paper 6 Alternative to Practical

May/June 2019

MARK SCHEME

Maximum Mark: 40

Published

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GENERIC MARKING PRINCIPLE 6:

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Question	Answer	Marks	Guidance
1(a)(i)	table drawn with a minimum of two columns and a line separating headings from data ; headings with correct units: percentage concentration of citric acid (solution) and distance (travelled) / cm or mm ; three correct distances recorded ;	3	
1(a)(ii)	from (edge of) hole to (edge of) the (red or yellow) circle ; diameter / radius of (red or yellow) circle ;	1	
1(a)(iii)	the higher the concentration (of solution) the further (the acid) moves / AW;	1	
1(a)(iv)	6.5 ;;	2	
1(a)(v)	<i>green agar pH: 7 ;</i> <i>red agar pH: 1 / 2 ;</i>	2	A value in range 7–8 / neutral A value lower than 7/ acidic
1(b)(i)	number of drops / three drops (of citric acid / solution in the holes) ; agar / agar concentration / depth of agar / volume of agar ; size of, holes / wells / AW ; type of indicator / concentration or volume of indicator ; time / 30 minutes ; temperature ; AVP ; e.g. one type of acid / same stock solution of citric acid	2	

Question	Answer	Marks	Guidance												
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AVP; e.g. edge of colour change difficult to judge / subjective	matching AVP effect; e.g. over/under estimation of diffusion distance														

Question	Answer	Marks	Guidance
1(c)	<p><i>any two from given method ;;</i></p> <ul style="list-style-type: none"> • agar plates used • indicator (in agar) • holes made in agar • (citric) acid added • left for fixed (stated) time • measure distance moved/diameter/radius <p><i>any three from novel method ;;;</i></p> <ul style="list-style-type: none"> • using range of at least 2 temperatures • temperatures specified and all less than 70 (°C) • idea of keeping temperature constant • ref to temperature equilibration time prior to adding citric acid • measure time taken to reach specified diameter <p><i>any additional points:</i> same concentration of citric acid ; wear gloves / goggles ; repeating the investigation at least twice / three holes in each plate / use three dishes at each temperature ; AVP ;</p>	6	

Question	Answer	Marks	Guidance
2(a)(i)	<i>line:</i> clear single continuous lines without shading ; <i>size:</i> occupies at least half the space available ; <i>detail:</i> layers in correct proportions ;	3	
2(a)(ii)	length of line AB = 40mm ; actual length =0.4 mm ;;	3	A ±1 mm A ±0.01 mm
2(a)(iii)	X written on the spongy mesophyll of drawing ;	1	
2(b)(i)	to obtain a representative leaf size ; to identify anomalous results ;	1	
2(b)(ii)	to avoid bias / gain a representative sample / AW ; so that a comparison can be made (between the different light intensities) ;	1	A leaves at different heights may be different sizes
2(b)(iii)	draw round the outline of the leaf on a grid / place leaf under a (transparent) grid ; count the squares ; include any squares more than half covered / other valid method described ;	2	
2(b)(iv)	light intensity ;	1	
2(c)(i)	67(%) ;;	2	

Question	Answer	Marks	Guidance
2(c)(ii)	<p><i>axes labelled with units:</i> light intensity / arbitrary units or au and average leaf area / mm² and species A and B labelled / key given ;</p> <p><i>scale and size:</i> even scale for leaf area sequential for x-axis bars/plotting area to occupy at least half the grid in both directions ;</p> <p><i>plots:</i> 6 values plotted accurately $\pm \frac{1}{2}$ small square ;</p> <p>4 bars: bars the same width (at least 1 small square wide) gaps present between bars / pairs of bars ;</p>	4	
2(c)(iii)	<p><i>species A:</i> as the light intensity decreases the (average) leaf area increases / ; ora</p> <p><i>species B:</i> (average) leaf area increases with increasing light intensity (to maximum at 50 au) and then decreases ; ora</p>	2	
2(c)(iv)	measure leaf growth at a narrower range of light intensities around 50 (au) ;	1	

BIOLOGY

0610/62

Paper 6 Alternative to Practical

May/June 2019

MARK SCHEME

Maximum Mark: 40

Published

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GENERIC MARKING PRINCIPLE 6:

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Question	Answer	Marks	Guidance									
1(a)(i)	table drawn with minimum two columns and a header line ; appropriate column headings with units in heading only ; both times records in seconds (warm) <u>233</u> and (cool) <u>565</u> ;	3	i.e. test-tube / temperature with warm and cool in the data cell OR temperature / °C, and time / s									
1(a)(ii)	at high(er) temperatures the methylene blue became, colourless / disappeared, more quickly / AW ; ora	1										
1(a)(iii)	<table border="1"> <thead> <tr> <th>beaker</th> <th>temperature at start / °C</th> <th>temperature at end / °C</th> </tr> </thead> <tbody> <tr> <td>warm water</td> <td>45</td> <td>35</td> </tr> <tr> <td>cool water</td> <td>20</td> <td>15</td> </tr> </tbody> </table> ;	beaker	temperature at start / °C	temperature at end / °C	warm water	45	35	cool water	20	15	1	
beaker	temperature at start / °C	temperature at end / °C										
warm water	45	35										
cool water	20	15										
1(a)(iv)	temperature ;	1										
1(a)(v)	volume / amount / type of yeast (suspension) ; number of drops / concentration / amount / type, of methylene blue / indicator / AW ; idea of equilibration time in water-bath / beaker ; depth / amount / type, of oil ;	2										

Question	Answer	Marks	Guidance
1(b)(i)	<p><i>error step 6</i> subjective / difficult to judge when the colour had disappeared / qualitative ; <i>improvement</i> compare to, a test-tube containing yeast with no methylene blue / test-tube that had already changed colour / use a colorimeter / colour standard ;</p> <p>OR</p> <p><i>error step 6</i> idea that both tubes are observed at the same time ; <i>improvement</i> idea that they should conduct each experiment at different times ;</p>	2	
1(b)(ii)	<p><i>error from Table 1.1</i> temperature (of the water-bath) not controlled / temperature changes / AW ;</p> <p><i>improvement</i> (thermostatically) controlled water-bath / insulation of the beaker ;</p>	2	
1(c)	<p>hydrogencarbonate / bicarbonate ; yellow / orange ;</p> <p>OR</p> <p>limewater ; goes cloudy / milky / white ;</p>	2	

Question	Answer	Marks	Guidance
1(d)	<p><i>independent variable:</i> at least <u>two</u> different concentrations of ethanol ;</p> <p><i>dependent variable:</i> measuring the time taken for methylene blue to decolourise ;</p> <p><i>constant variables:</i> two from ;;</p> <ul style="list-style-type: none"> • same temperature • same pH • same volume of ethanol (solution) • same volume / amount / concentration of sugar <p>one from ;</p> <ul style="list-style-type: none"> • same volume / amount / concentration / type, of yeast • same volume / amount / concentration, of methylene blue / indicator • same volume / depth of oil <p><i>methodology</i> idea of leaving to equilibrate at set temperature ; use of a water-bath / insulation to maintain one temperature ; detail of a comparison / control e.g. test with no ethanol / yeast, present ; two or more repeats / three or more trials ;</p> <p><i>safety</i> relevant safety e.g. gloves / goggles / no flames ;</p>	6	A suitable alternative methods

Question	Answer	Marks	Guidance
2(a)(i)	outline – clear continuous line around stigmatic disc ; size – larger than 70 mm ; details: nine stigmatic rays shown as double lines ; circle approximately one third of the way out from the centre of the stigmatic disc ;	4	
2(a)(ii)	length of line PQ 26 mm / 2.6 cm \pm 1 mm ; 16 mm / 2 cm ;;	3	
2(b)(i)	60(%) ;;	2	
2(b)(ii)	A (xes) – labelled ; pH and percentage germination S (cale) – suitable scale and plots occupy at least half the grid in both directions ; P (lot) – correct plots \pm half a small square ; L (ine) – suitable line ;	4	
2(b)(iii)	percentage (germination) increases and then decreases ; peaks at pH 6 / highest percentage of germination is at pH 6 ;	2	A optimum at pH 6
2(b)(iv)	(test at pH values at) smaller intervals ; between pH 5 and 7 / 5–6 / 6–7 ;	2	
2(c)	grind up seeds / AW ; add Benedict's (reagent/solution) ; heat ; red / orange / yellow / green, if reducing sugars present ;	3	

BIOLOGY**0610/63**

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Question	Answer	Marks	Guidance
1(a)	<p>any two from MP1–3 use ethanol emulsion test ; mix the sample (with ethanol) ; add water ;</p> <p><i>positive test result</i> look for cloudy suspension / formation of emulsion ;</p>	3	
1(b)(i)	heating (to 80 °C) ;	1	
1(b)(ii)	colour change to yellow / green / orange / brick-red / red ;	1	
1(c)(i)	table, two columns with suitable headings ; e.g. test-tube and observation(s) all colours recorded: P purple Q purple R blue ;	2	
1(c)(ii)	P and Q contain protein and R contains no protein ; albumen contains protein ; acid needed for the enzyme to work ; AVP ;	1	AW throughout
1(c)(iii)	pH / acid / enzyme ;	1	
1(c)(iv)	as a control / AW / to compare with enzyme test-tubes ; to see if albumin was affected by water alone / to see if it was the enzyme or acid causing the effect	1	
1(c)(v)	to keep, volume / albumin concentration, the same ;	1	
1(c)(vi)	<p><i>error</i> syringes not clean / cross-contamination ;</p> <p><i>effect</i> dilution of solutions in P, Q and R / enzymes in control P / acid in wrong place P or Q / AW ;</p>	2	
1(c)(vii)	use of acid / enzymes ;	1	

Question	Answer	Marks	Guidance
2(a)	Line – clear inner line and outer line, with no shading ; Size – occupies at least half the space available ; Detail D1 – detail showing two or more layers ; D2 – crinkled inner line and smooth outer line ;	4	
2(b)(i)	length of AB recorded as 37 mm ; 2.8 mm / 2.9 mm ;;	3	A ±1 mm
2(b)(ii)	<i>similarity</i> both have layers / same number of layers / presence of lumen (described) / contain material in lumen / dotted appearance / AW ; <i>difference</i> size / size of lumen / wall thickness / thickness of layers / material in lumen / shape / striations of middle layer /AW ;	2	
2(c)(i)	105 ;;	2	
2(c)(ii)	A (xes) – labelled time / minutes and pulse rate / beats per minute or bpm ; S (cale) – suitable scale and scale that occupies at least half the grid ; P (lot) – correct plots ; L (ine) – suitable line joining points ;	4	
2(c)(iii)	indication on graph at 15 minutes ; correct value from graph ;	2	
2(c)(iv)	constant before exercise ; rises during exercise and then falls ; does not return to resting value by 18 minutes ; data quote with units ;	3	

Question	Answer	Marks	Guidance
2(d)	<p>description of method of exercise ; different speeds indicated ; measure pulse during / immediately after ; method for measuring pulse rate ;</p> <p>named constant variables ;;;</p> <ul style="list-style-type: none"> • distance run / time taken • age / gender / health of participants / same person • same (named) environment conditions of exercise e.g. temperature / wind /slope • rest breaks between measurements / return to resting bpm <p>at least three participants sampled or carry out three times with the same person ; relevant safety precaution ;</p>	6	



Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

BIOLOGY

0610/11

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 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.

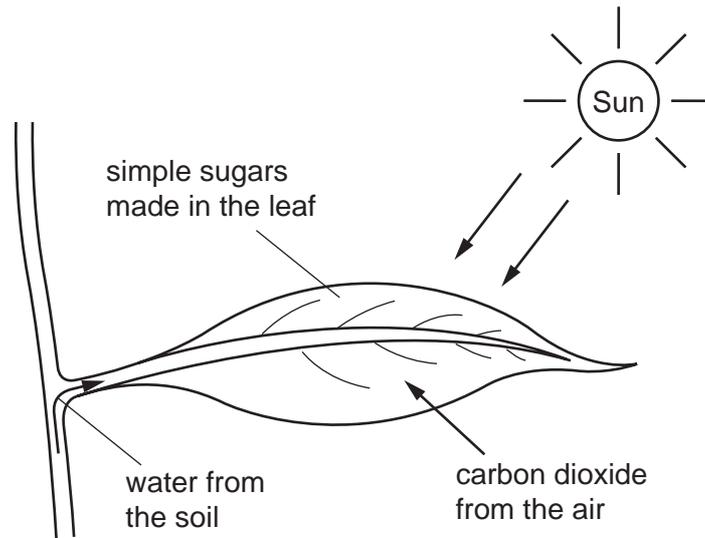
Electronic calculators may be used.

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.

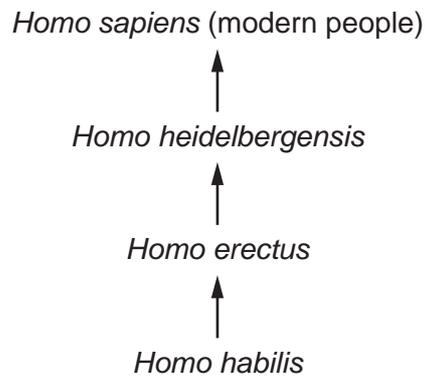


- 1 The diagram shows a leaf on a plant.



Which characteristic of life is represented by this diagram?

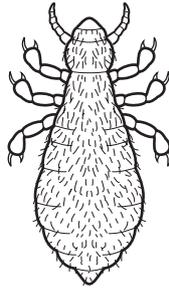
- A excretion
 - B nutrition
 - C respiration
 - D sensitivity
- 2 The diagram shows how *Homo sapiens* (modern people) could have evolved from earlier ancestors.



Which statement about modern people and their ancestors is correct?

- A They are in the same species and the same genus.
- B They are in the same species but not the same genus.
- C They are in the same genus but not the same species.
- D They are neither the same species nor the same genus.

3 The diagram shows an insect.



What is the insect?

- 1 insect has no wings go to 2
 insect has wings go to 3
- 2 legs longer than, or as long as the body **A**
 legs shorter than the body **B**
- 3 abdomen long and thin **C**
 abdomen shorter and wider **D**

4 Which features are possessed by **all** plant cells?

	a cell wall	chloroplasts
A	✓	✓
B	✓	x
C	x	✓
D	x	x

key

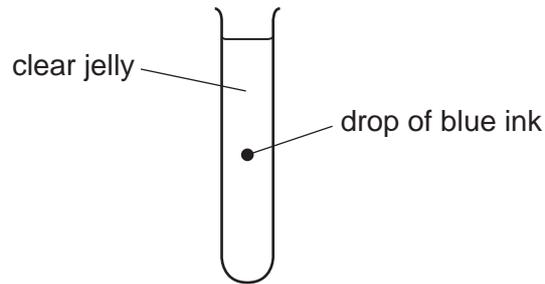
✓ = present

x = absent

5 Which organ is part of the digestive system?

- A** colon
B larynx
C trachea
D ureter

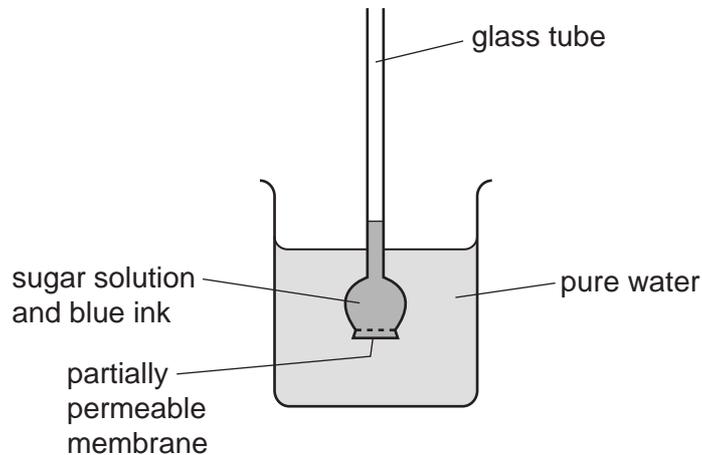
- 6 The diagram shows a test-tube containing clear jelly. A drop of blue ink is injected into the middle of the jelly.



The blue colour of the ink spreads throughout the jelly.

By which process does the blue ink spread through the jelly?

- A active transport
 - B catalysis
 - C diffusion
 - D osmosis
- 7 The apparatus shown was set up.



Some hours later, the water in the beaker had turned blue, and the liquid in the glass tube had moved upwards.

Which processes caused these changes?

	water turned blue	liquid in glass tube moved upwards
A	osmosis	diffusion
B	active transport	osmosis
C	diffusion	active transport
D	diffusion	osmosis

8 Four solutions were tested to see whether they contained protein, starch or glucose.

The colours of the solutions after the tests are recorded in the table.

Which solution contained protein and glucose but **not** starch?

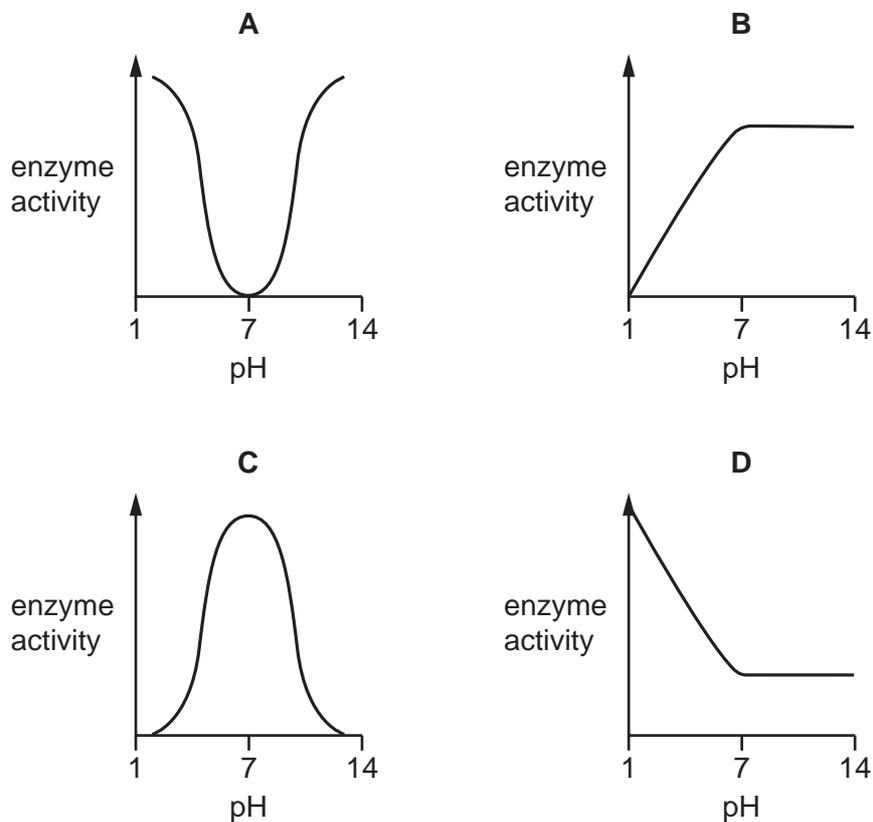
	biuret test	iodine test	Benedict's test
A	blue	brown	orange
B	blue	blue-black	blue
C	purple	brown	orange
D	purple	blue-black	blue

9 Small molecules are used as the basic units in the synthesis of large food molecules.

Which statement is correct?

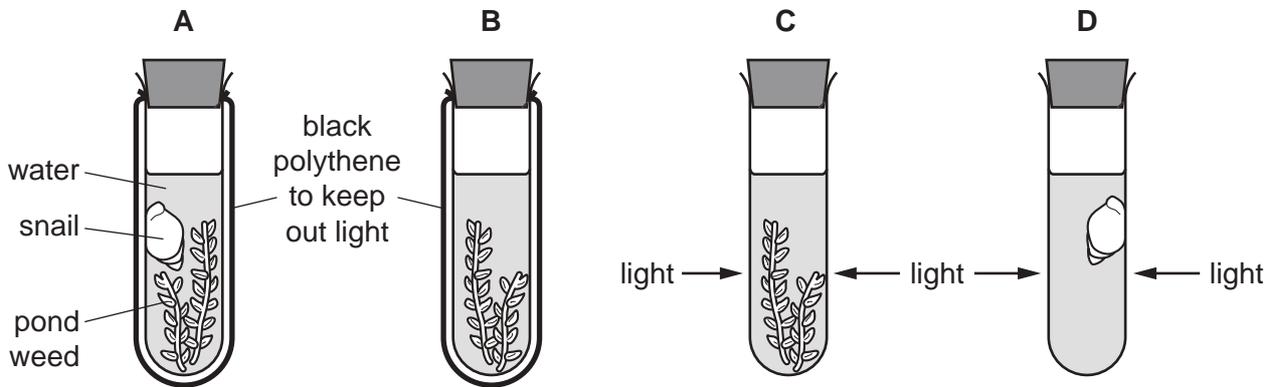
- A** Amino acids are basic units of carbohydrates.
- B** Fatty acids are basic units of glycogen.
- C** Glycerol is a basic unit of oils.
- D** Simple sugar is a basic unit of protein.

10 Which graph shows the effect of pH on enzyme activity?



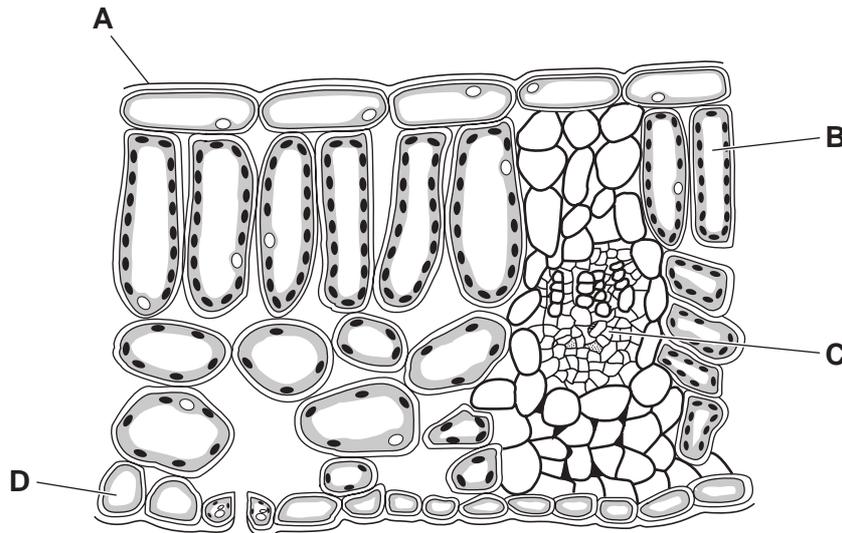
- 11 The diagram shows an experiment to investigate the balance between respiration and photosynthesis.

In which tube are photosynthesis and respiration taking place at the same time?

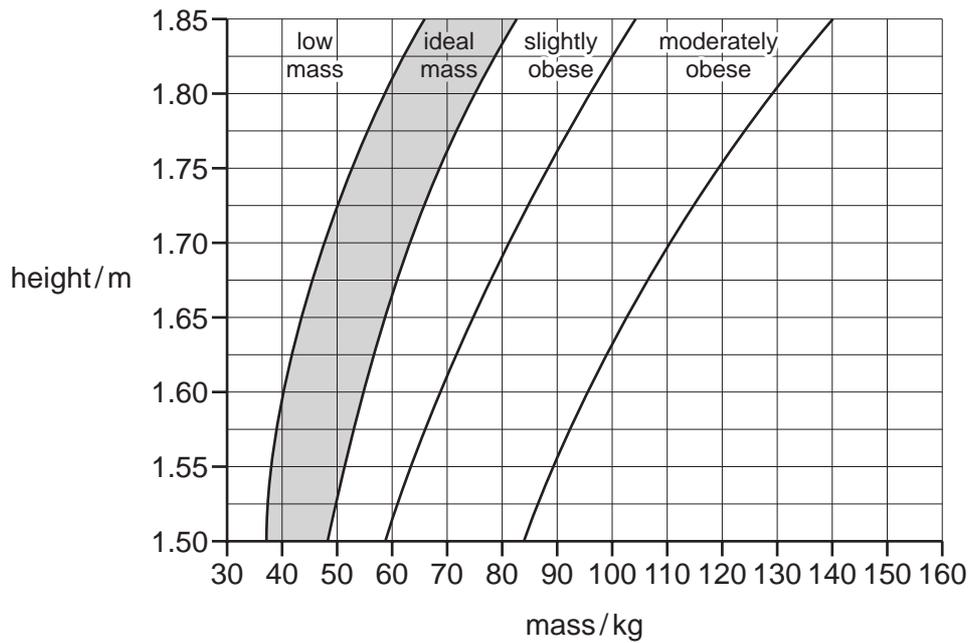


- 12 The diagram shows a cross-section of a leaf as seen under a microscope.

Which structure is a palisade mesophyll cell?



13 The chart is used to find a person's recommended mass.



For the data provided about body mass and height, which person would benefit most from the introduction of a calorie-controlled diet and regular exercise?

	body mass /kg	height /m
A	40	1.55
B	50	1.75
C	70	1.80
D	90	1.75

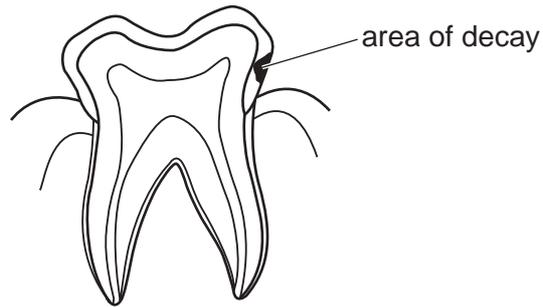
14 The following statements are about enzymes.

- 1 enzymes are catalysts
- 2 enzyme are proteins
- 3 enzymes are used up during chemical reactions

Which statements are correct?

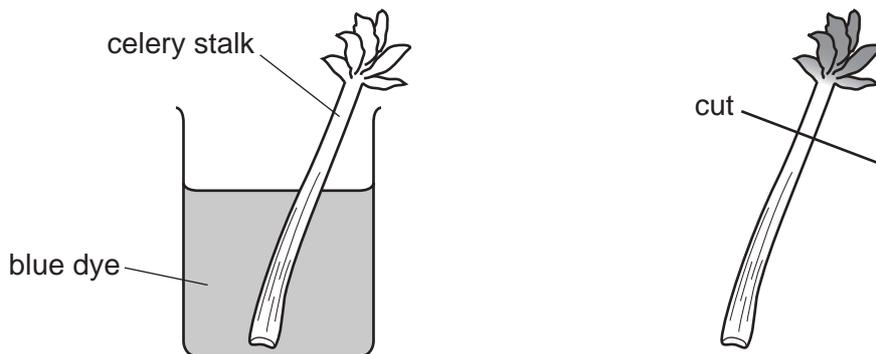
- A** 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

- 15 The diagram shows a human tooth with an area of decay.

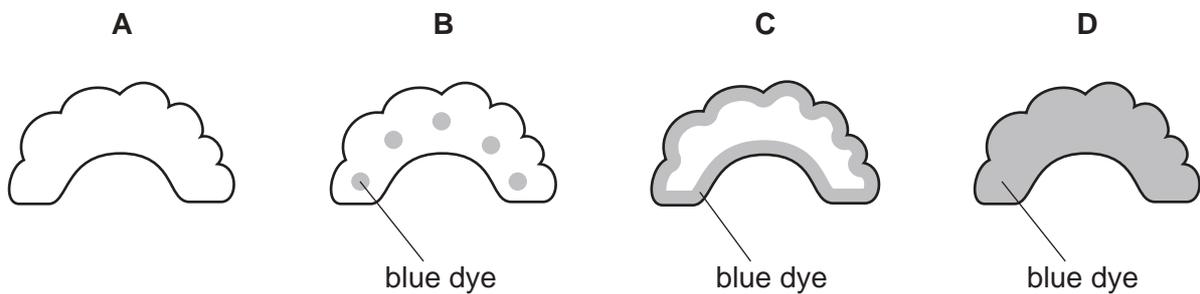


What is likely to have caused the decay?

- A acids released by bacteria
 - B digestion of the tooth by bacteria
 - C excess of fat in the food
 - D lack of fibre in the food
- 16 A celery stalk was placed into a beaker of blue dye. When the dye reached the leaves, the stalk was taken out and a section was cut, as shown in the diagram.



Which diagram shows the appearance of the cut end of the stalk?



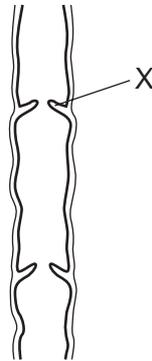
17 The table shows the rate of water flow through a tree over a 12 hour period.

time of day	rate of flow / cm per hour
7:00	100
9:00	120
11:00	140
13:00	250
15:00	300
17:00	260
19:00	180

What conclusion can be drawn from the table?

- A Between 7:00 and 17:00 hours the rate of flow continuously increases.
- B The greatest increase in rate of flow in a two-hour period is between 11:00 and 13:00 hours.
- C Water does not flow up through a tree at night.
- D Water flow is affected by humidity.

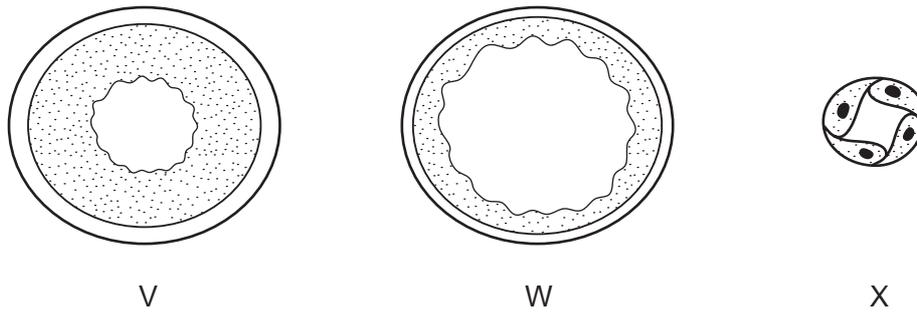
18 The diagram shows a section of a human vein.



What is the function of the part labelled X?

- A to make sure the blood flows to the heart
- B to make sure the blood flows to the kidneys
- C to make sure the blood flows to the brain
- D to make sure the blood flows to the lungs

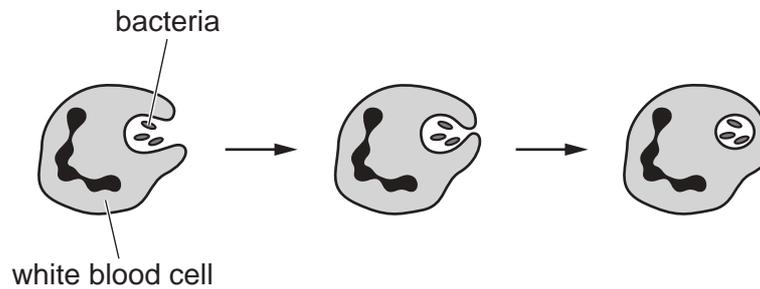
- 19 The diagram shows cross-sections through three types of blood vessel, **not** drawn to the same scale.



Which section is from a vein and which is from a capillary?

	vein	capillary
A	V	W
B	W	V
C	W	X
D	X	W

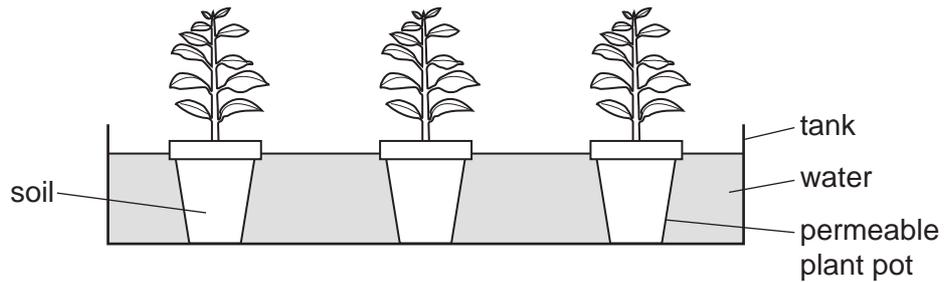
- 20 The diagram shows one way the body defends itself against pathogens.



What is the name of this defence mechanism?

- A** antibody production
B egestion
C phagocytosis
D vaccination
- 21 What is the approximate percentage of oxygen in expired air?
- A** 0.04% **B** 4% **C** 16% **D** 21%

22 Potted plants are left for a week in a tank of water as shown.

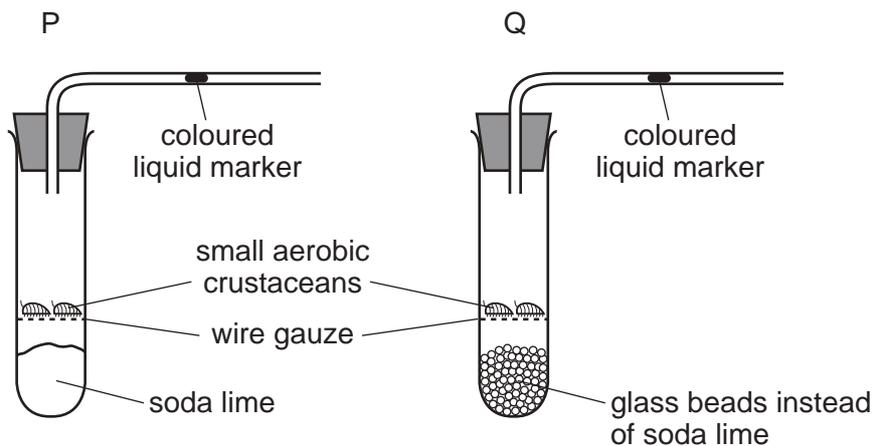


Why do the plants die?

- A The roots do not have enough oxygen.
- B The roots do not have enough water.
- C The roots have too much oxygen.
- D The roots have too much carbon dioxide.

23 The diagram shows two experiments investigating gas exchange in small aerobic crustaceans.

Soda lime absorbs carbon dioxide.



Which way does the liquid marker move?

	P	Q
A	left	right
B	left	stays still
C	right	left
D	right	stays still

24 Yeast is placed inside a container full of a glucose solution with no air.

Which word equation summarises the process that takes place inside the container?

- A glucose \rightarrow ethanol + carbon dioxide
 B glucose \rightarrow lactic acid
 C glucose + oxygen \rightarrow carbon dioxide + water
 D glucose + oxygen \rightarrow ethanol

25 Which substances are excreted by humans?

	carbon dioxide	urea	urine
A	✓	✓	✓
B	✓	x	✓
C	✓	✓	x
D	x	✓	✓

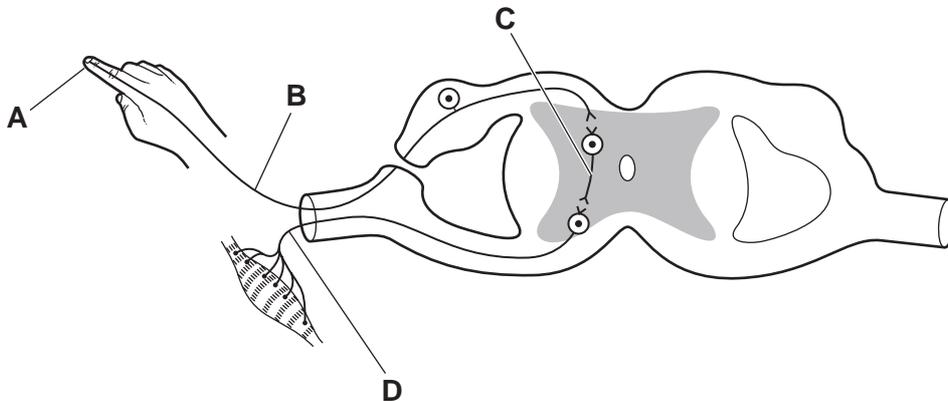
key

✓ = involved

x = not involved

26 The diagram shows a simple reflex arc.

Which labelled part is the sensory neurone?



27 Some structures in the eye are listed.

- 1 cornea
- 2 iris
- 3 lens
- 4 retina

Which structures contain light receptors?

- A** 1, 2 and 3 **B** 2, 3 and 4 **C** 2 and 4 only **D** 4 only

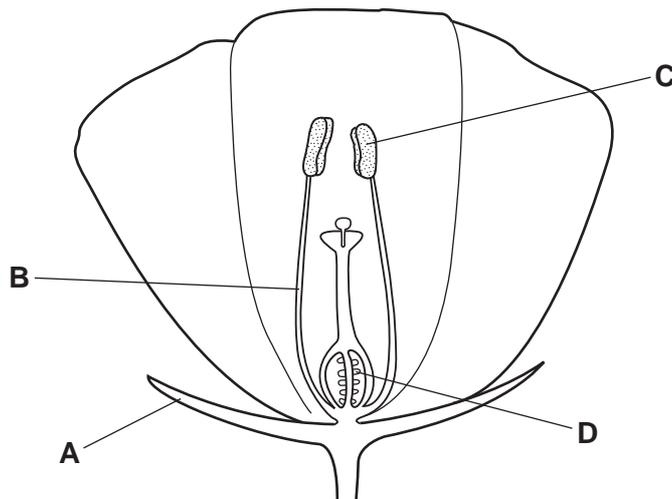
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28 Which type of drug is used to treat bacterial infection?

- A antibody
- B antibiotic
- C depressant
- D vaccine

29 The diagram shows a section of an insect-pollinated flower.

Which structure is the anther?



30 In humans, what is an example of a secondary sexual characteristic in **both** males and females?

- A hair grows on face
- B hips widen
- C fat is deposited on hips and thighs
- D sexual organs grow

31 Which contraceptive method could provide protection from sexually transmitted infections?

- A condom
- B diaphragm
- C hormone implant
- D vasectomy

32 Which human characteristics are inherited?

	earlobe shape	eye colour	language	skin colour
A	✓	✓	x	✓
B	✓	✓	x	x
C	✓	x	x	✓
D	x	✓	✓	✓

key

✓ = inherited

x = not inherited

33 A rabbit has 44 chromosomes in each of its body cells.

Which row correctly describes the gamete cells?

	number of chromosomes	gametes compared to body cells
A	22	genetically identical
B	22	genetically different
C	44	genetically identical
D	44	genetically different

34 Which definition of continuous variation is correct?

- A** variation that results in a limited number of phenotypes between two extremes
- B** variation that results in a limited number of phenotypes with no intermediates
- C** variation that results in a range of phenotypes between two extremes
- D** variation that results in a range of phenotypes with no intermediates

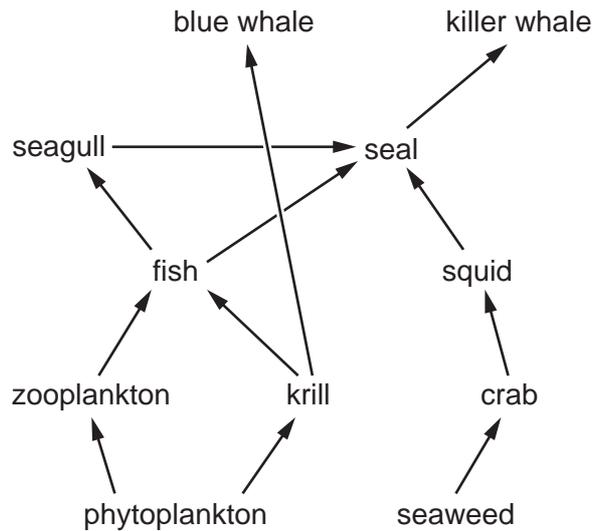
35 When is evolution by natural selection most likely to occur?

- A** when there is a stable population of predators
- B** when there is a stable environment
- C** when there is less variation in the population
- D** when there is more variation in the population

36 What process uses the principal source of energy input to biological systems?

- A ingestion
- B decomposition
- C photosynthesis
- D respiration

37 The diagram shows an aquatic food web.



Which statement is correct?

- A There are two producers and three herbivores.
 - B There are two primary consumers and two secondary consumers.
 - C There are three producers and two primary consumers.
 - D There are two herbivores and two tertiary consumers.
- 38 Why are bacteria useful in biotechnology and genetic engineering?
- A They can reproduce rapidly.
 - B They live in soil.
 - C They may be pathogens.
 - D They need complex nutrients.

- 39 What is a description of genetic engineering?
- A cross breeding individuals with different important characteristics
 - B cross breeding individuals with recessive alleles
 - C inserting a gene from one organism into another
 - D selecting random mutations to produce new varieties
- 40 Large areas of tropical forests have been cleared to grow monocultures of palm oil plants.
- Which effect will this have on the ecosystem?
- A The use of fossil fuels in the area will decrease.
 - B The use of pesticides in the area will decrease.
 - C The variety of species in the area will decrease.
 - D The variety of species in the area will increase.

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Cambridge International General Certificate of Secondary Education

BIOLOGY

0610/12

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 is recommended)

* 9 7 3 6 2 5 4 0 1 3 *

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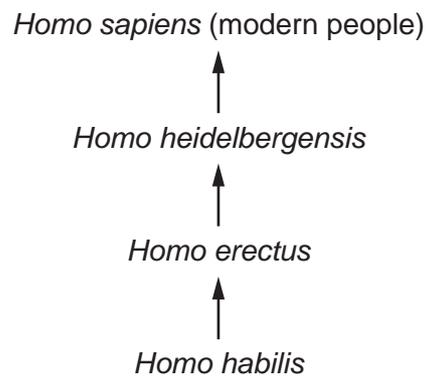
This document consists of **14** printed pages and **2** blank pages.



- 1 Carbon dioxide diffuses into a leaf.

Which characteristic of living things requires this?

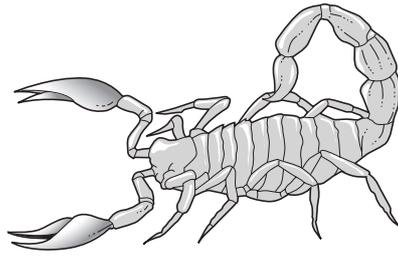
- A excretion
 - B movement
 - C nutrition
 - D respiration
- 2 The diagram shows how *Homo sapiens* (modern people) could have evolved from earlier ancestors.



Which statement about modern people and their ancestors is correct?

- A They are in the same species and the same genus.
- B They are in the same species but not the same genus.
- C They are in the same genus but not the same species.
- D They are neither the same species nor the same genus.

3 The diagram shows an animal.



Using the key, what is the animal?

- 1 has three pairs of legs go to 2
 has four pairs of legs go to 3
- 2 has wings **A**
 has no wings **B**
- 3 large claws (pedipalps) **C**
 no large claws (pedipalps) **D**

4 Which features are possessed by **all** plant cells?

	a cell wall	chloroplasts
A	✓	✓
B	✓	x
C	x	✓
D	x	x

key

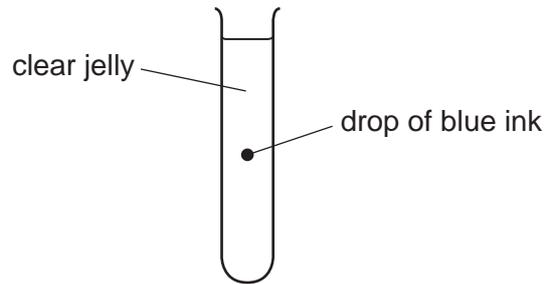
✓ = present

x = absent

5 Which group of organs belongs to the same organ system?

- A** diaphragm, oesophagus, trachea
B heart, liver, lungs
C heart, stomach, trachea
D oesophagus, intestine, stomach

- 6 The diagram shows a test-tube containing clear jelly. A drop of blue ink is injected into the middle of the jelly.



The blue colour of the ink spreads throughout the jelly.

By which process does the blue ink spread through the jelly?

- A** active transport
B catalysis
C diffusion
D osmosis
- 7 Which process describes osmosis?
- A** diffusion of water through a cell wall
B diffusion of water through a partially permeable membrane
C diffusion of water through the cell sap
D diffusion of water through the cytoplasm

- 8 Which row shows the chemical elements contained in fats?

	carbon	hydrogen	nitrogen	oxygen	
A	✓	✓	x	✓	key ✓ = present x = absent
B	✓	✓	✓	✓	
C	x	✓	✓	x	
D	✓	x	✓	✓	

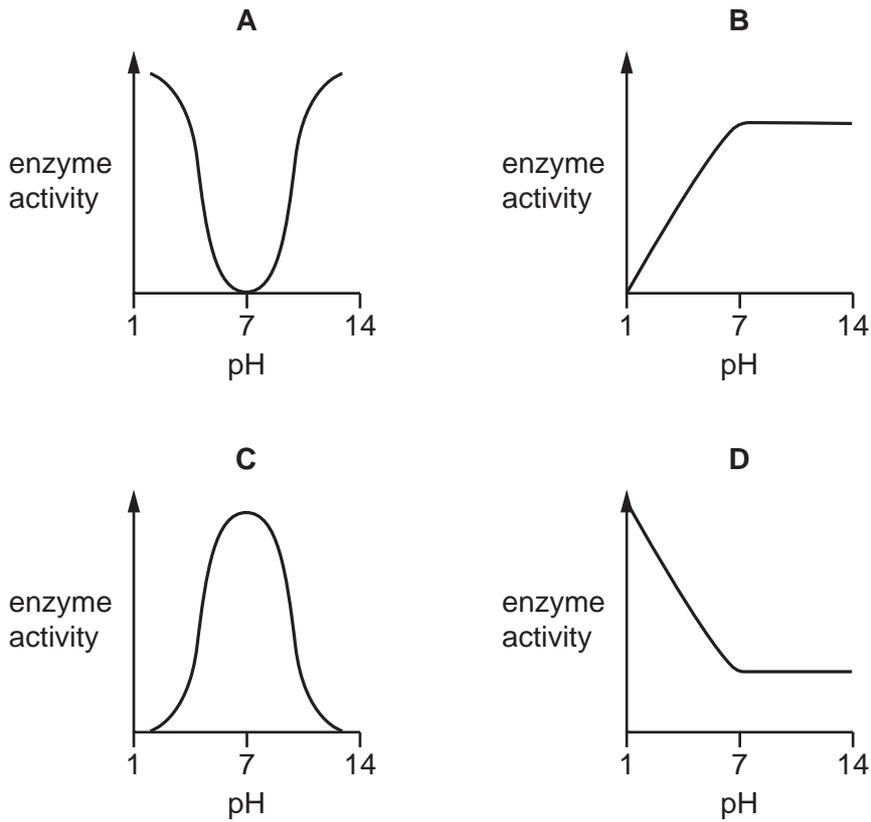
- 9 Small molecules are used as the basic units in the synthesis of large food molecules.

Which statement is correct?

- A** Amino acids are basic units of carbohydrates.
B Fatty acids are basic units of glycogen.
C Glycerol is a basic unit of oils.
D Simple sugar is a basic unit of protein.

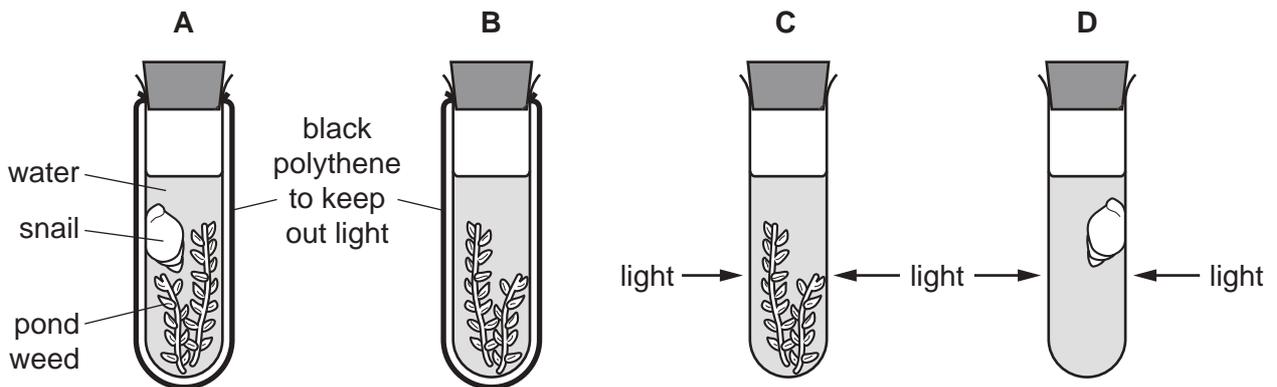
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10 Which graph shows the effect of pH on enzyme activity?

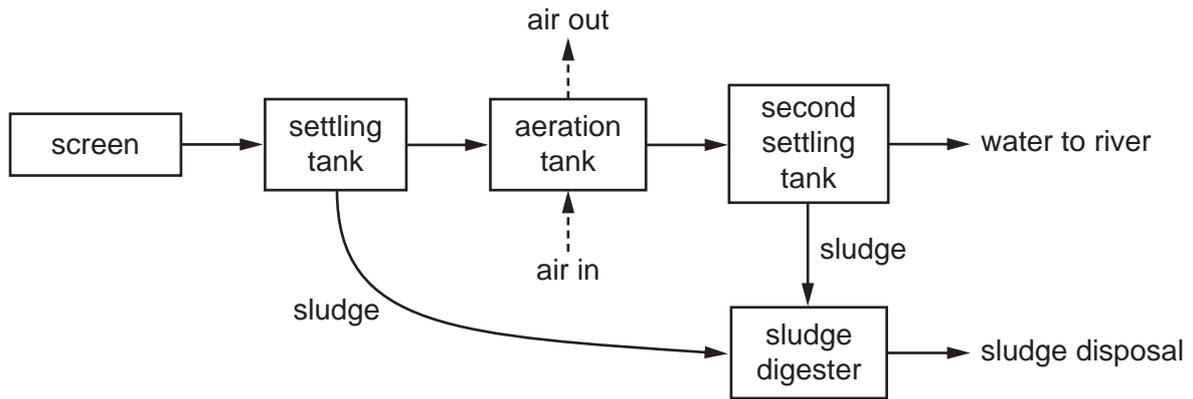


11 The diagram shows an experiment to investigate the balance between respiration and photosynthesis.

In which tube are photosynthesis and respiration taking place at the same time?



12 The diagram shows how sewage is treated.



Why is air bubbled through the aeration tank?

- A to encourage microorganisms to reproduce quickly
- B to float the sludge
- C to settle the sludge
- D to stop microorganisms from reproducing too quickly

13 The food label is from a packet of cereal.

The label can help someone who is concerned about their diet.

Nutrition	
Typical values	100 g contains
Energy	985 kJ 235 kcal
Fat	1.5 g
of which saturates	0.3 g
Carbohydrate	45.5 g
of which sugars	3.8 g
Fibre	2.8 g
Protein	7.7 g
Salt	0.5 g

A person eats 45 g of cereal.

One of the food types listed in the label can help prevent constipation.

How many grams of this food type does the person eat?

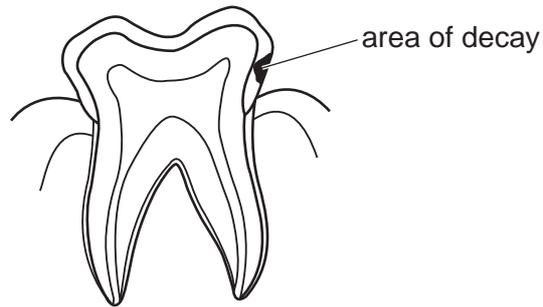
- A 1.3g
- B 2.8g
- C 3.5g
- D 7.7g

- 14 Digested food molecules move into the cells of the body where they are used and become part of the cells.

What is this a definition of?

- A absorption
- B assimilation
- C digestion
- D ingestion

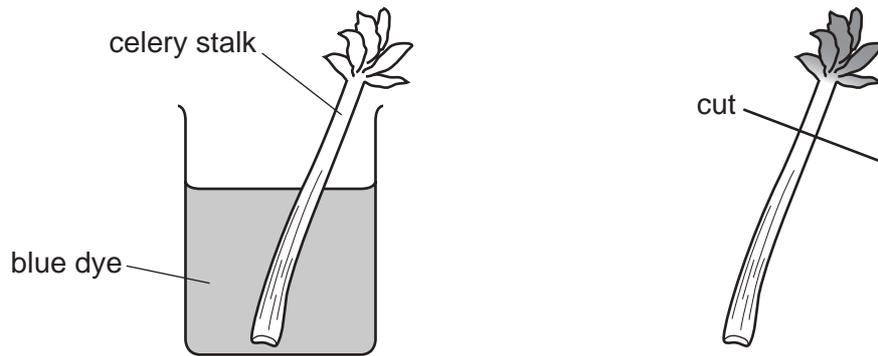
- 15 The diagram shows a human tooth with an area of decay.



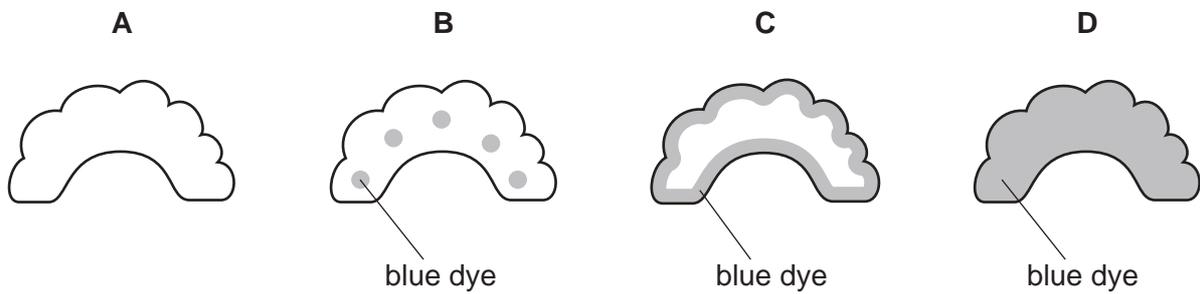
What is likely to have caused the decay?

- A acids released by bacteria
- B digestion of the tooth by bacteria
- C excess of fat in the food
- D lack of fibre in the food

- 16 A celery stalk was placed into a beaker of blue dye. When the dye reached the leaves, the stalk was taken out and a section was cut, as shown in the diagram.



Which diagram shows the appearance of the cut end of the stalk?



- 17 The table shows the rate of water flow through a tree over a 12 hour period.

time of day	rate of flow / cm per hour
7:00	100
9:00	120
11:00	140
13:00	250
15:00	300
17:00	260
19:00	180

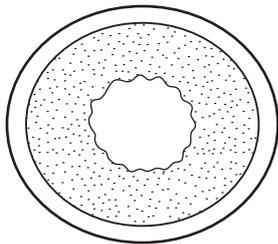
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- A** Between 7:00 and 17:00 hours the rate of flow continuously increases.
B The greatest increase in rate of flow in a two-hour period is between 11:00 and 13:00 hours.
C Water does not flow up through a tree at night.
D Water flow is affected by humidity.

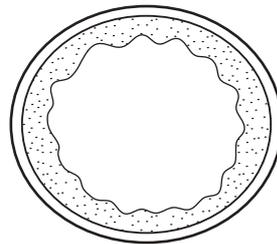
18 How does the transport system of a human differ from the transport system of a tree?

	human	tree
A	carries mineral ions	does not carry mineral ions
B	must carry oxygen	does not need to carry oxygen
C	does not transport cells	transports cells
D	vessels	no vessels

19 The diagram shows cross-sections through three types of blood vessel, **not** drawn to the same scale.



V



W



X

Which section is from a vein and which is from a capillary?

	vein	capillary
A	V	W
B	W	V
C	W	X
D	X	W

20 Which disease is transmissible?

- A** cholera
- B** coronary heart disease
- C** lung cancer
- D** scurvy

21 What is the approximate percentage of oxygen in expired air?

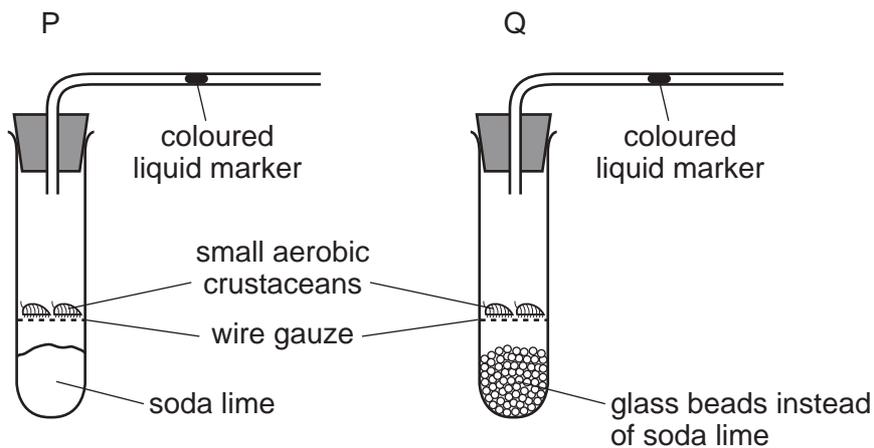
- A** 0.04%
- B** 4%
- C** 16%
- D** 21%

22 Which pathway is followed by air passing into the body?

- A larynx → trachea → bronchi → bronchioles → alveoli
- B larynx → trachea → bronchioles → bronchi → alveoli
- C trachea → larynx → bronchi → alveoli → bronchioles
- D trachea → larynx → bronchi → bronchioles → alveoli

23 The diagram shows two experiments investigating gas exchange in small aerobic crustaceans.

Soda lime absorbs carbon dioxide.



Which way does the liquid marker move?

	P	Q
A	left	right
B	left	stays still
C	right	left
D	right	stays still

24 Yeast is placed inside a container full of a glucose solution with no air.

Which word equation summarises the process that takes place inside the container?

- A glucose → ethanol + carbon dioxide
- B glucose → lactic acid
- C glucose + oxygen → carbon dioxide + water
- D glucose + oxygen → ethanol

25 Where is urea formed and excreted?

	formed	excreted
A	bladder	heart
B	heart	liver
C	kidney	bladder
D	liver	kidney

26 Which structure is an effector?

- A** adrenal gland
- B** motor neurone
- C** optic nerve
- D** spinal cord

27 When we get hot and the temperature of our blood rises, one of the ways we can cool down is by sweating.

What detects the rise in temperature of the blood?

- A** skin
- B** sweat glands
- C** hair erector muscles
- D** brain

28 A person suffering from influenza was given antibiotics. Influenza is caused by a virus.

Why did the antibiotics **not** cure the person with influenza?

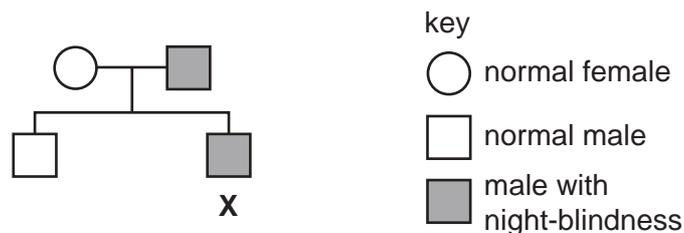
- A** Antibiotics do not affect viruses.
- B** The antibiotic course was not long enough.
- C** The influenza virus became resistant to the antibiotics.
- D** The person was immune to antibiotics.

29 Which parts of the gametes fuse during fertilisation?

- A** cell membranes
- B** cell walls
- C** cytoplasm
- D** nuclei

- 30 Which environmental conditions **must** be present for germination?
- A carbon dioxide and water
 - B light and suitable temperature
 - C oxygen and carbon dioxide
 - D water and oxygen
- 31 What happens to the lining of the human uterus in the days before the release of an egg cell?
- A breaks down
 - B lost from body
 - C thickens
 - D thins
- 32 Which word describes an individual who has two identical alleles for a particular gene?
- A dominant
 - B heterozygous
 - C homozygous
 - D phenotype
- 33 One type of night-blindness is an inherited condition, caused by a dominant allele.

The chart shows how this condition was passed on in one family.

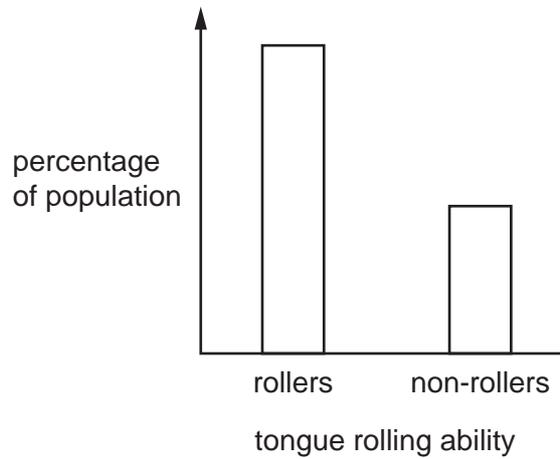


Person **X** marries someone with normal sight.

What is the chance that their first child will have night-blindness?

- A 0%
- B 25%
- C 50%
- D 75%

34 The diagram shows the percentage of tongue rollers and non-rollers in a human population.

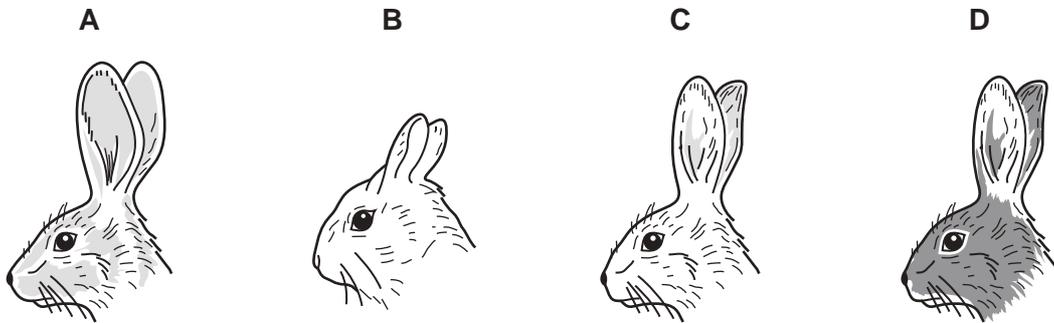


Which word describes this type of variation?

- A adaptive
- B continuous
- C discontinuous
- D environmental

35 The diagram shows the average head and ear shapes of rabbits from four different regions.

Which is best adapted to living in the coldest region?



36 The food chain shows how energy is transferred to a human.

lettuce → snails → duck → human

Where did the energy in the lettuce come from?

- A snails
- B soil
- C Sun
- D water

- 37 Which process forms part of the carbon cycle?
- A condensation
 - B fossilisation
 - C precipitation
 - D transpiration
- 38 Which statement correctly explains why bacteria are used in biotechnology?
- A Bacteria reproduce slowly.
 - B Bacteria need complex molecules.
 - C Bacteria can make complex molecules.
 - D Bacteria are all pathogens.
- 39 Which enzyme is used in fruit juice production to make the juice clear?
- A amylase
 - B pectinase
 - C protease
 - D lipase
- 40 What is **not** a reason for using chemical fertilisers in food production?
- A improving growth rate
 - B improving mineral content of the soil
 - C increasing yields
 - D reducing competition with weeds

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BIOLOGY

0610/13

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 is recommended)

* 0 0 2 9 1 7 3 0 1 5 *

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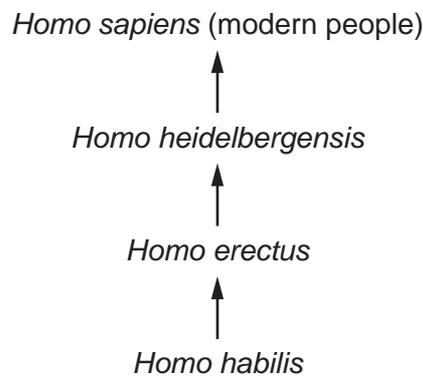
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This document consists of **15** printed pages and **1** blank page.

- 1 Students find a small organism in a pond. They catch it and put it into a large jar of water. They see that the organism swims away from light. It lays some eggs before they put it back into the pond.

Which characteristics of living things did the students see in this organism?

- A excretion, growth and respiration
 - B growth, nutrition and sensitivity
 - C movement, reproduction and sensitivity
 - D movement, reproduction and respiration
- 2 The diagram shows how *Homo sapiens* (modern people) could have evolved from earlier ancestors.



Which statement about modern people and their ancestors is correct?

- A They are in the same species and the same genus.
- B They are in the same species but not the same genus.
- C They are in the same genus but not the same species.
- D They are neither the same species nor the same genus.

3 The photograph shows an organism.



Use the key to identify the organism.

- 1 The mouth is at the front of the head. go to 2
 The mouth is between the eye and the fins. **A**
- 2 The long fin on the back has pale spots. go to 3
 There are no spots on the long fin. **B**
- 3 The tail fin is longer than the body. **C**
 The tail fin is shorter than the body. **D**

4 Which features are possessed by **all** plant cells?

	a cell wall	chloroplasts
A	✓	✓
B	✓	x
C	x	✓
D	x	x

key

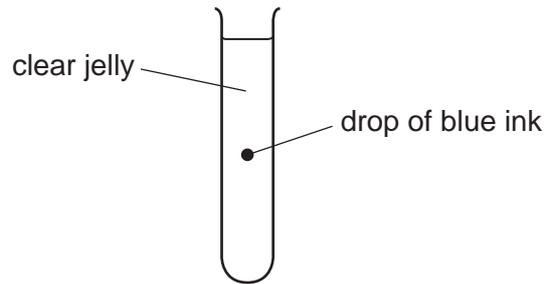
✓ = present

x = absent

5 Which level of organisation is shown by the oesophagus, pancreas, stomach and liver?

- A** cells
B organs
C organisms
D tissues

- 6 The diagram shows a test-tube containing clear jelly. A drop of blue ink is injected into the middle of the jelly.



The blue colour of the ink spreads throughout the jelly.

By which process does the blue ink spread through the jelly?

- A active transport
- B catalysis
- C diffusion
- D osmosis

- 7 Which row describes active transport?

	movement of water	uses energy from respiration	through a cell membrane
A	yes	no	no
B	yes	no	yes
C	no	yes	no
D	no	yes	yes

- 8 Which reagent is used when testing a food for vitamin C?

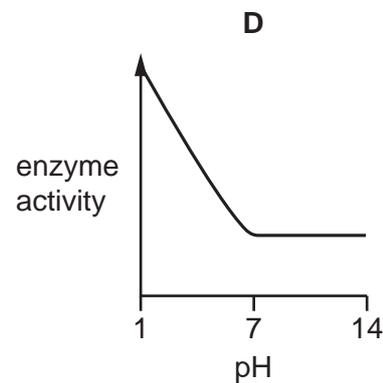
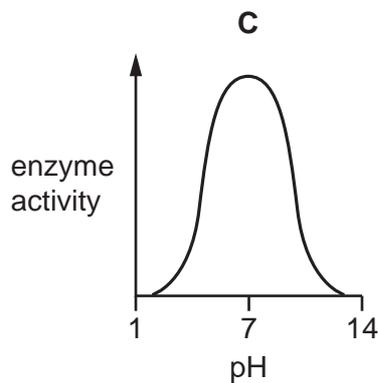
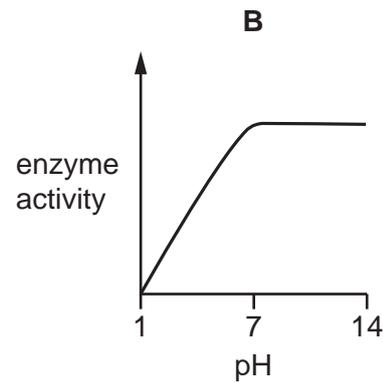
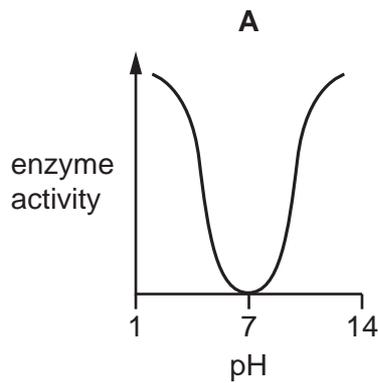
- A Benedict's solution
- B DCPIP
- C ethanol
- D iodine solution

9 Small molecules are used as the basic units in the synthesis of large food molecules.

Which statement is correct?

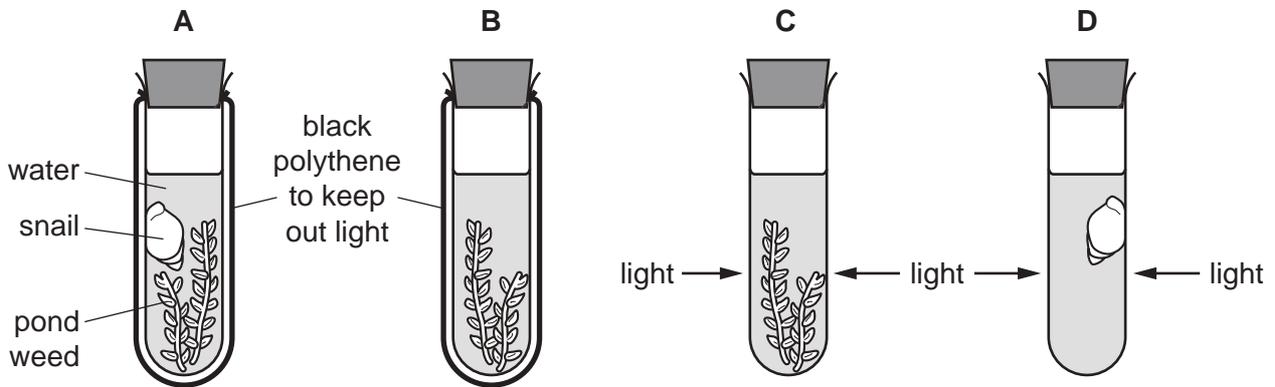
- A Amino acids are basic units of carbohydrates.
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- D Simple sugar is a basic unit of protein.

10 Which graph shows the effect of pH on enzyme activity?



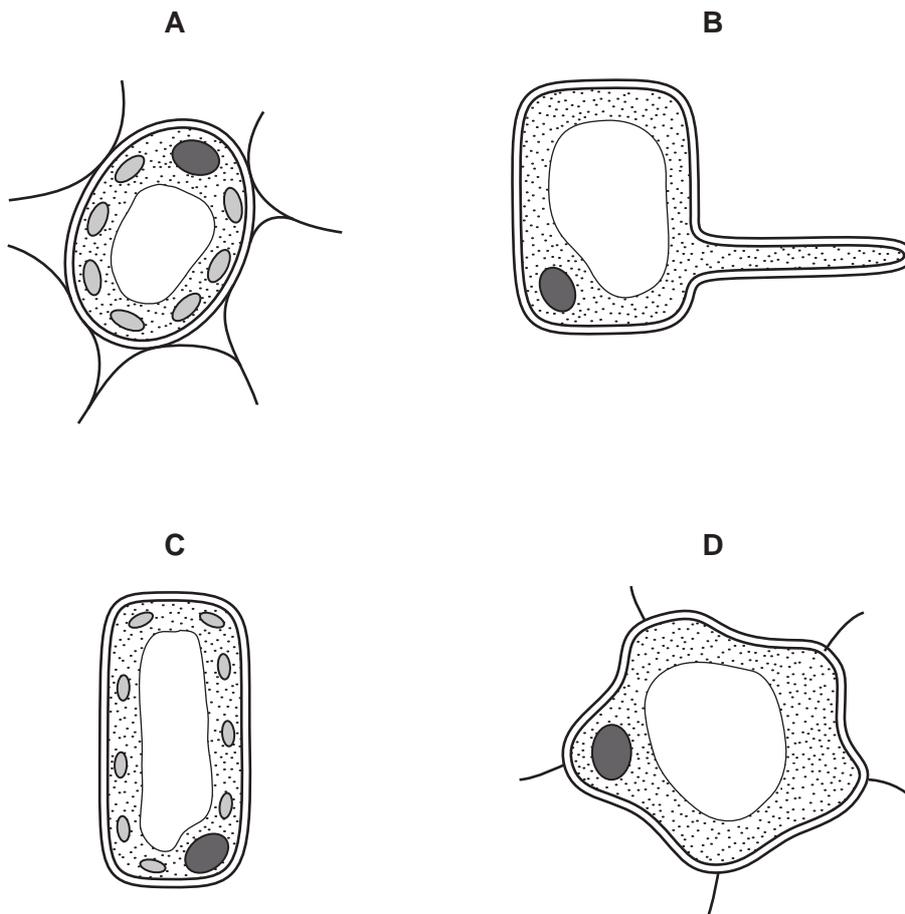
- 11 The diagram shows an experiment to investigate the balance between respiration and photosynthesis.

In which tube are photosynthesis and respiration taking place at the same time?

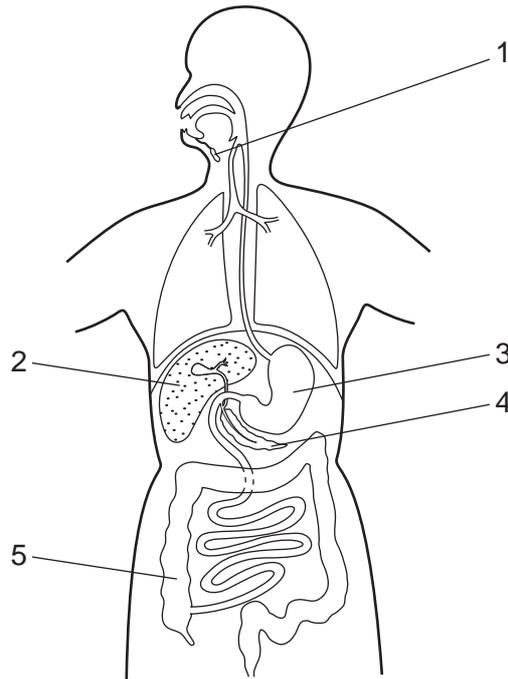


- 12 The diagrams show the structure of four different cells from a plant.

Which cell is from the upper epidermis of a leaf?



13 The diagram shows the human alimentary canal.



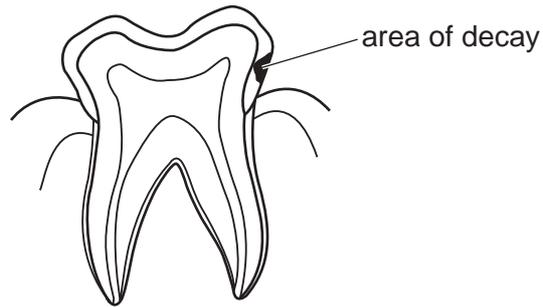
Which pair of structures both produce digestive enzymes?

- A** 1 and 2 **B** 1 and 3 **C** 2 and 4 **D** 3 and 5

14 Where is water absorbed?

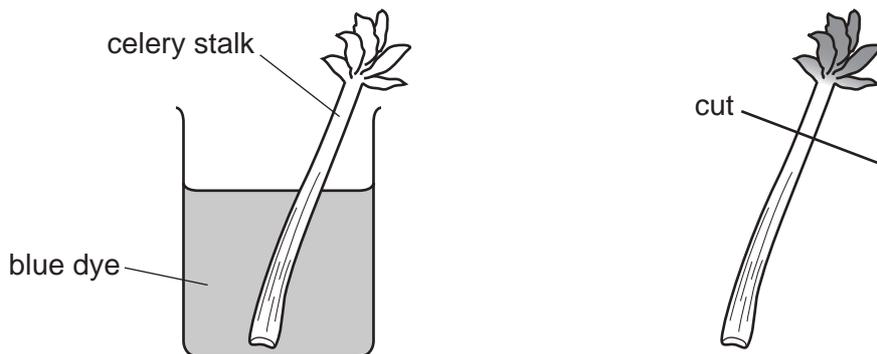
- A** colon and small intestine
B large intestine only
C liver and colon
D small intestine only

- 15 The diagram shows a human tooth with an area of decay.

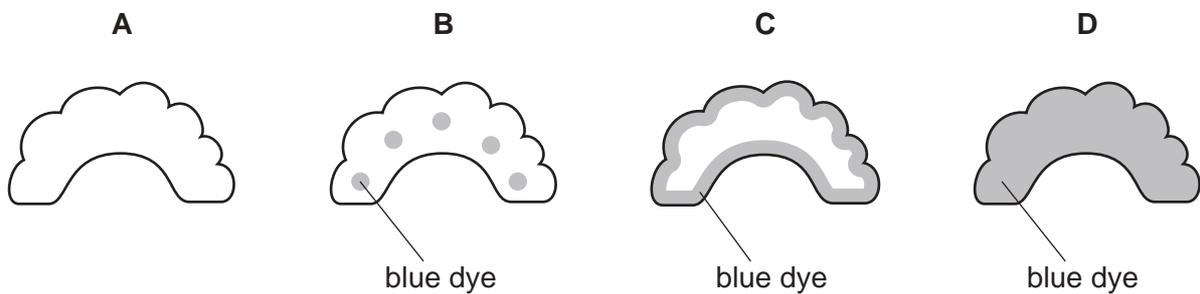


What is likely to have caused the decay?

- A acids released by bacteria
 - B digestion of the tooth by bacteria
 - C excess of fat in the food
 - D lack of fibre in the food
- 16 A celery stalk was placed into a beaker of blue dye. When the dye reached the leaves, the stalk was taken out and a section was cut, as shown in the diagram.



Which diagram shows the appearance of the cut end of the stalk?



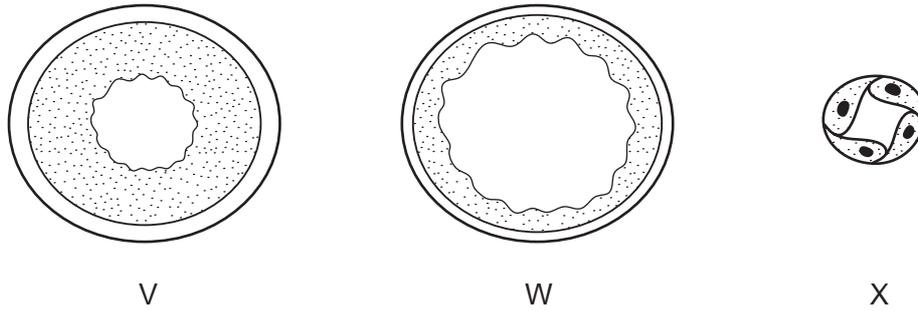
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7:00	100
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What conclusion can be drawn from the table?

- A** Between 7:00 and 17:00 hours the rate of flow continuously increases.
- B** The greatest increase in rate of flow in a two-hour period is between 11:00 and 13:00 hours.
- C** Water does not flow up through a tree at night.
- D** Water flow is affected by humidity.
- 18 What is the correct order of blood flow through the blood vessels entering and leaving the heart?
- A** aorta → pulmonary artery → pulmonary vein → vena cava
- B** aorta → pulmonary vein → pulmonary artery → vena cava
- C** vena cava → pulmonary artery → pulmonary vein → aorta
- D** vena cava → pulmonary vein → pulmonary artery → aorta

- 19 The diagram shows cross-sections through three types of blood vessel, **not** drawn to the same scale.



Which section is from a vein and which is from a capillary?

	vein	capillary
A	V	W
B	W	V
C	W	X
D	X	W

- 20 By which route would an HIV infection **not** be transmissible?

- A blood
- B saliva
- C sharing needles for injections
- D semen

- 21 What is the approximate percentage of oxygen in expired air?

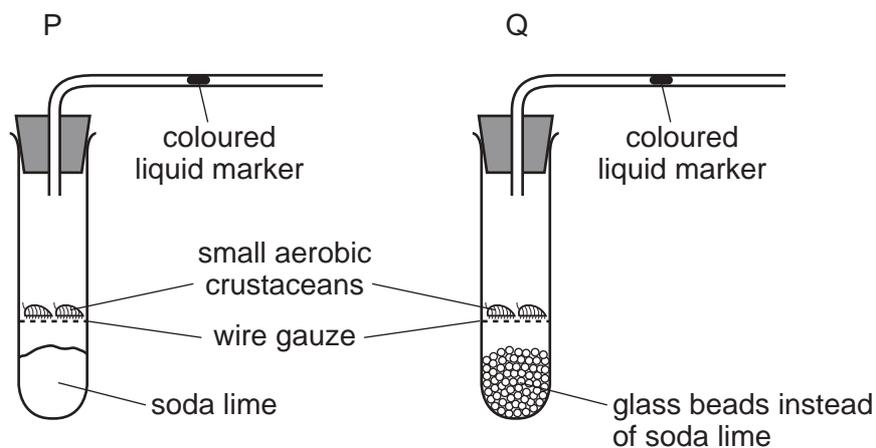
- A 0.04%
- B 4%
- C 16%
- D 21%

- 22 Which process uses energy released by respiration?

- A diffusion
- B evaporation
- C growth
- D osmosis

23 The diagram shows two experiments investigating gas exchange in small aerobic crustaceans.

Soda lime absorbs carbon dioxide.



Which way does the liquid marker move?

	P	Q
A	left	right
B	left	stays still
C	right	left
D	right	stays still

24 Yeast is placed inside a container full of a glucose solution with no air.

Which word equation summarises the process that takes place inside the container?

- A** glucose → ethanol + carbon dioxide
- B** glucose → lactic acid
- C** glucose + oxygen → carbon dioxide + water
- D** glucose + oxygen → ethanol

25 What is a function of the kidneys?

- A** breakdown of hormones
- B** formation of urea
- C** removal of oxygen
- D** removal of urea

26 Which list describes the correct sequence of a simple reflex arc?

- A receptor, relay neurone, motor neurone, sensory neurone, effector
- B receptor, relay neurone, sensory neurone, motor neurone, effector
- C receptor, sensory neurone, motor neurone, relay neurone, effector
- D receptor, sensory neurone, relay neurone, motor neurone, effector

27 What are the effects on the body when adrenaline is released?

	breathing rate and pulse rate	pupil diameter
A	decreases	decreases
B	decreases	increases
C	increases	increases
D	increases	decreases

28 Which effects does excessive alcohol consumption have on the body?

	acts as a stimulant	increases reaction time
A	yes	yes
B	yes	no
C	no	yes
D	no	no

29 Female greenfly can multiply by producing eggs by mitosis. These eggs are not fertilised, but they develop into a new generation of female greenfly.

What is this type of reproduction?

- A asexual reproduction, leading to genetically different offspring
- B asexual reproduction, leading to genetically identical offspring
- C sexual reproduction, leading to genetically different offspring
- D sexual reproduction, leading to genetically identical offspring

30 What is **not** essential for germination?

- A carbon dioxide
- B oxygen
- C warmth
- D water

31 Which is the main hormone responsible for the development of male secondary sexual characteristics?

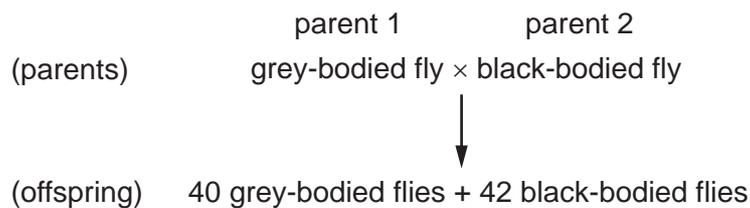
- A adrenaline
- B insulin
- C oestrogen
- D testosterone

32 What determines the sex of a baby?

- A the father's XX chromosomes
- B the father's XY chromosomes
- C the mother's XX chromosomes
- D the mother's XY chromosomes

33 In fruit flies, the allele for grey body, G, is dominant over the allele for black body, g.

The result of a mating between two flies is shown.



What were the genotypes of the parents?

	parent 1	parent 2
A	Gg	gg
B	gg	Gg
C	GG	gg
D	gg	GG

34 Which is a genetic change?

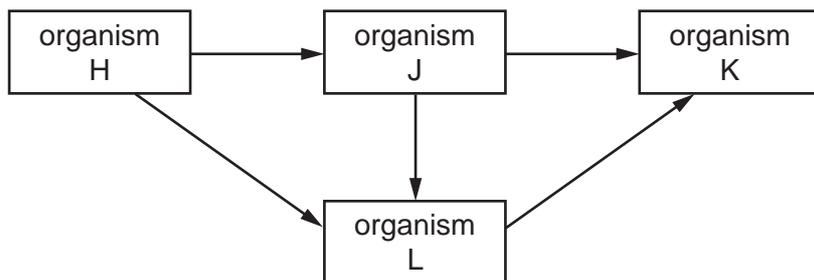
- A allele
- B genotype
- C mutation
- D phenotype

35 Wheat is a crop plant. Since the 1960s the average yield of wheat has doubled. A reason for this is that modern wheat varieties have shorter, stronger stems and more seeds per stem.

What has caused these changes?

- A competition for resources between individuals
- B reproduction by individuals better adapted to their environment
- C selection of individuals with desirable characteristics by humans
- D struggle for survival between individuals

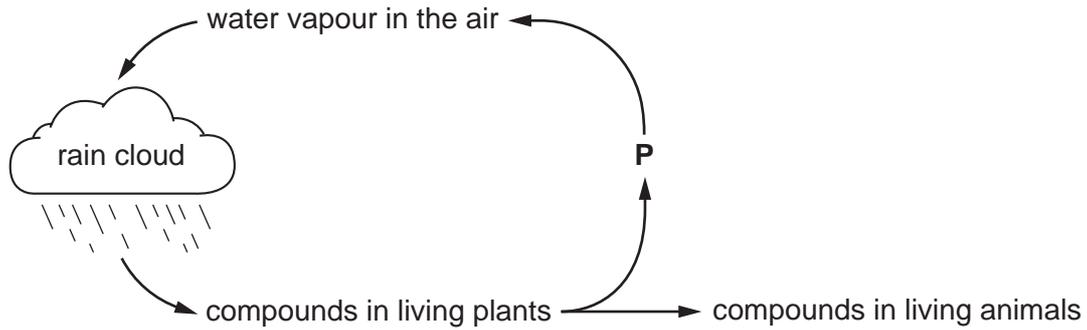
36 Letters H, J, K and L show the organisms that make up a simple food web.



What must organism H be?

- A a carnivore
- B a decomposer
- C a herbivore
- D a producer

37 The diagram shows part of the water cycle.



Which process in living plants is responsible for returning water vapour to the air at **P**?

- A combustion
 - B condensation
 - C photosynthesis
 - D transpiration
- 38 Bacteria are useful for manufacturing products for human use.
- Which statement explains why they are useful?
- A Bacteria can be grown without nutrients.
 - B Bacteria do not have a nucleus.
 - C Bacteria infect human cells.
 - D Bacteria reproduce very rapidly.
- 39 Which of the processes involved in genetic engineering uses a human gene?
- A herbicide resistance
 - B pesticide resistance
 - C insulin production in bacteria
 - D vitamin production in plants
- 40 What is an undesirable effect of deforestation?
- A habitat creation
 - B loss of soil
 - C more species
 - D reduced carbon dioxide in the atmosphere

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BIOLOGY

0610/21

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 is recommended)

* 2 1 3 2 1 0 4 9 3 8 *

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.

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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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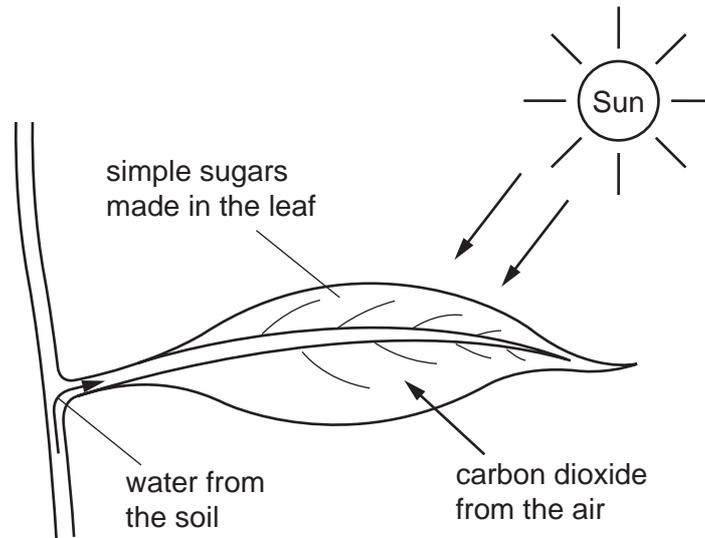
Electronic calculators may be used.

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This document consists of **17** printed pages and **3** blank pages.

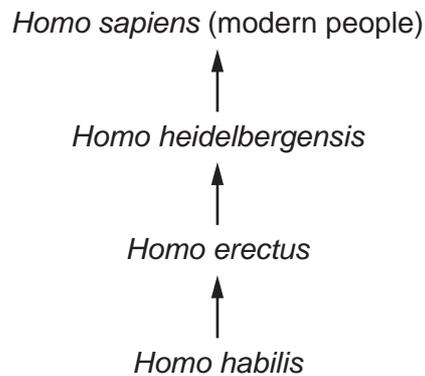


- 1 The diagram shows a leaf on a plant.



Which characteristic of life is represented by this diagram?

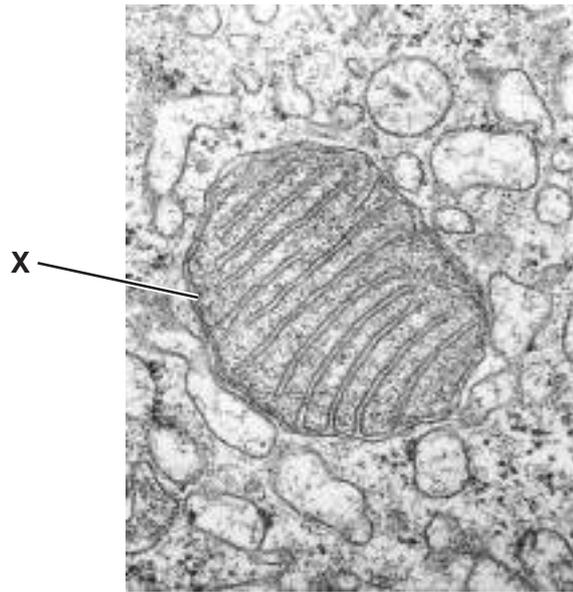
- A excretion
 - B nutrition
 - C respiration
 - D sensitivity
- 2 The diagram shows how *Homo sapiens* (modern people) could have evolved from earlier ancestors.



Which statement about modern people and their ancestors is correct?

- A They are in the same species and the same genus.
- B They are in the same species but not the same genus.
- C They are in the same genus but not the same species.
- D They are neither the same species nor the same genus.

3 The photomicrograph shows part of an animal cell.



What is the structure labelled X?

- A chloroplast
- B mitochondrion
- C ribosome
- D vacuole

4 Which features are possessed by **all** plant cells?

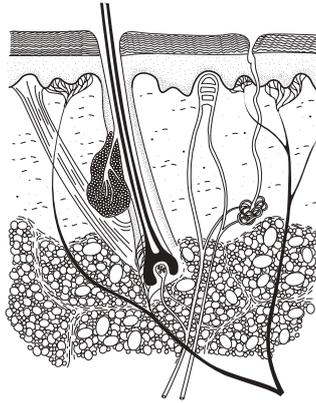
	a cell wall	chloroplasts
A	✓	✓
B	✓	x
C	x	✓
D	x	x

key

✓ = present

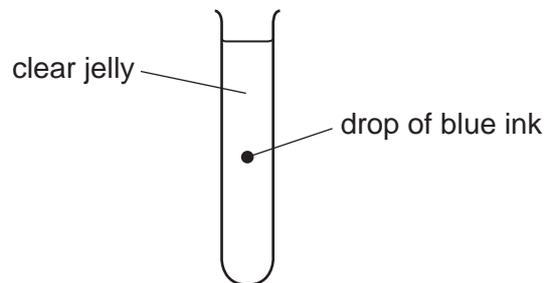
x = absent

- 5 The diagram shows part of the skin.



What is the correct level of organisation for the skin?

- A cell
 - B organ
 - C organ system
 - D tissue
- 6 The diagram shows a test-tube containing clear jelly. A drop of blue ink is injected into the middle of the jelly.

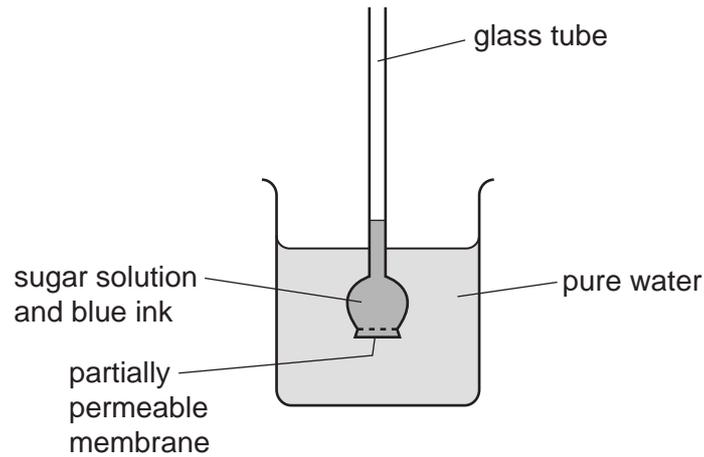


The blue colour of the ink spreads throughout the jelly.

By which process does the blue ink spread through the jelly?

- A active transport
- B catalysis
- C diffusion
- D osmosis

7 The apparatus shown was set up.



Some hours later, the water in the beaker had turned blue, and the liquid in the glass tube had moved upwards.

Which processes caused these changes?

	water turned blue	liquid in glass tube moved upwards
A	osmosis	diffusion
B	active transport	osmosis
C	diffusion	active transport
D	diffusion	osmosis

8 Four solutions were tested to see whether they contained protein, starch or glucose.

The colours of the solutions after the tests are recorded in the table.

Which solution contained protein and glucose but **not** starch?

	biuret test	iodine test	Benedict's test
A	blue	brown	orange
B	blue	blue-black	blue
C	purple	brown	orange
D	purple	blue-black	blue

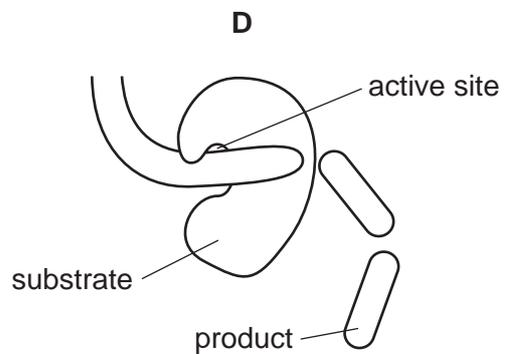
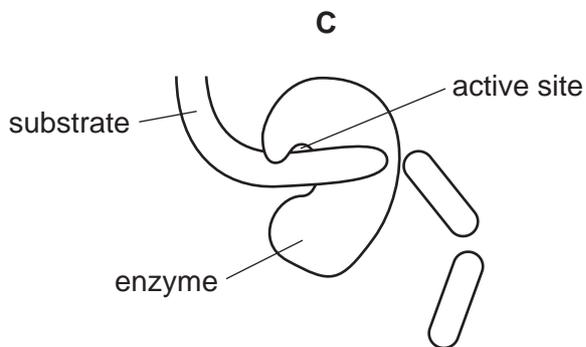
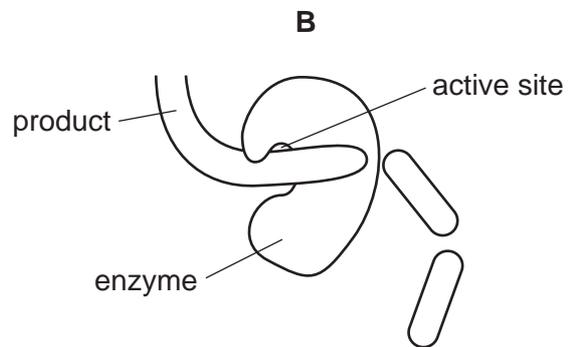
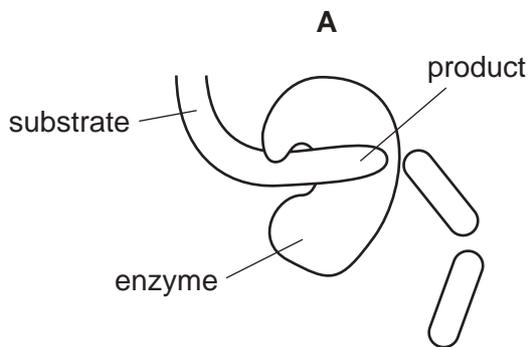
- 9 Small molecules are used as the basic units in the synthesis of large food molecules.

Which statement is correct?

- A Amino acids are basic units of carbohydrates.
- B Fatty acids are basic units of glycogen.
- C Glycerol is a basic unit of oils.
- D Simple sugar is a basic unit of protein.

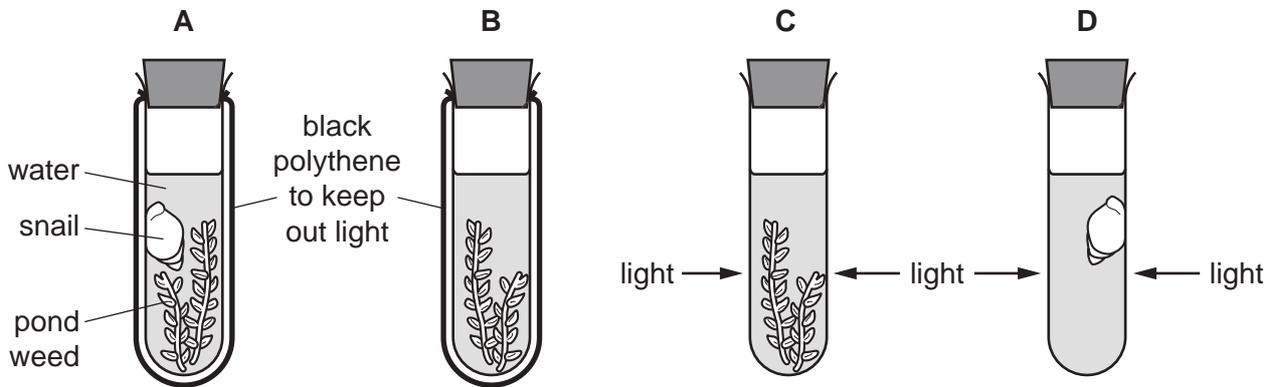
- 10 The diagrams show a protease enzyme catalysing the breaking of part of a protein molecule into smaller pieces.

Which diagram has three correct labels?



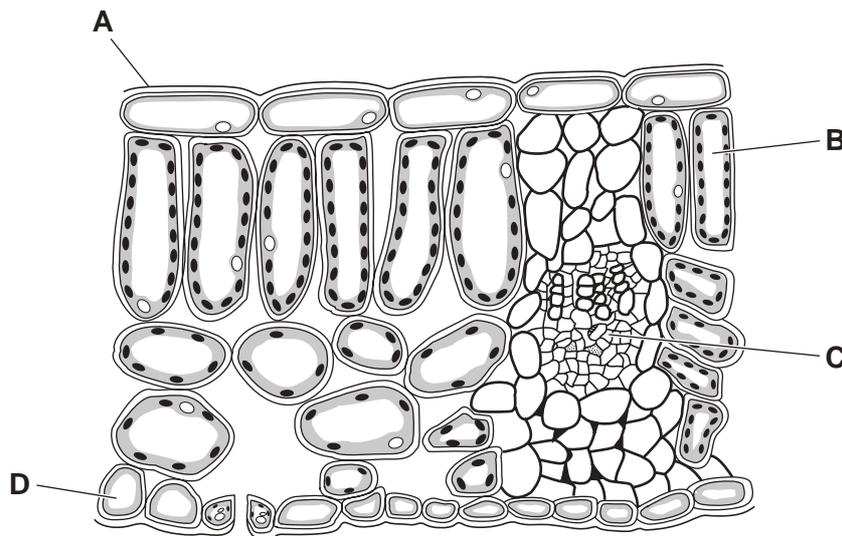
- 11 The diagram shows an experiment to investigate the balance between respiration and photosynthesis.

In which tube are photosynthesis and respiration taking place at the same time?

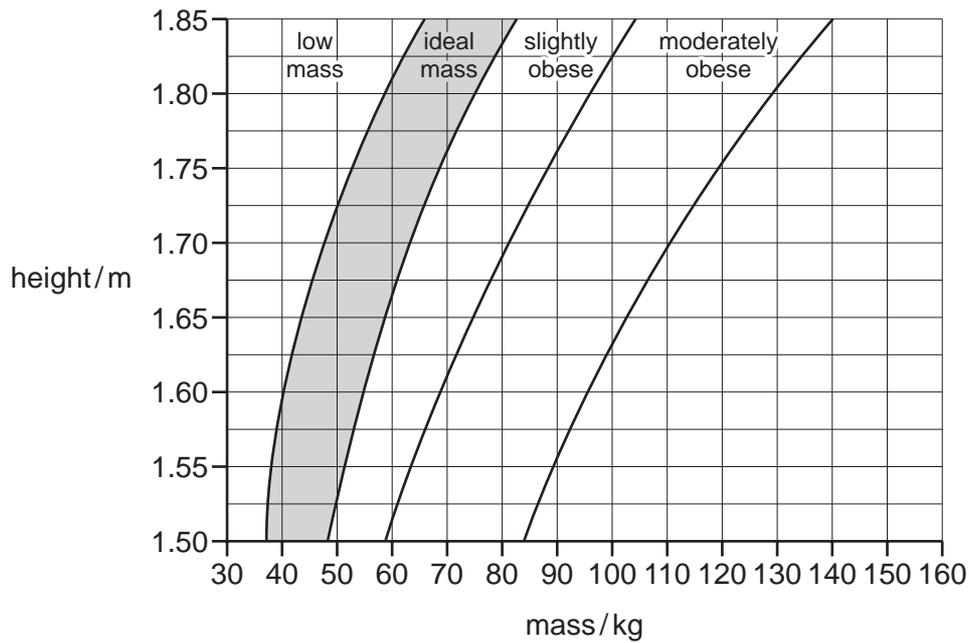


- 12 The diagram shows a cross-section of a leaf as seen under a microscope.

Which structure is a palisade mesophyll cell?



13 The chart is used to find a person's recommended mass.



For the data provided about body mass and height, which person would benefit most from the introduction of a calorie-controlled diet and regular exercise?

	body mass /kg	height /m
A	40	1.55
B	50	1.75
C	70	1.80
D	90	1.75

14 The cholera bacterium produces toxins that cause chloride ions to be secreted into the small intestine.

How does this affect the water potential of blood in the intestinal capillaries and the intestinal contents?

	water potential	
	blood in capillaries	contents of small intestine
A	lowered	lowered
B	lowered	raised
C	raised	lowered
D	raised	raised

- 15 A student investigates the breakdown of fats in milk by lipase. Four test-tubes labelled A to D are set up.

The table shows the contents of each test-tube.

In which test-tube will the contents become acidic most quickly?

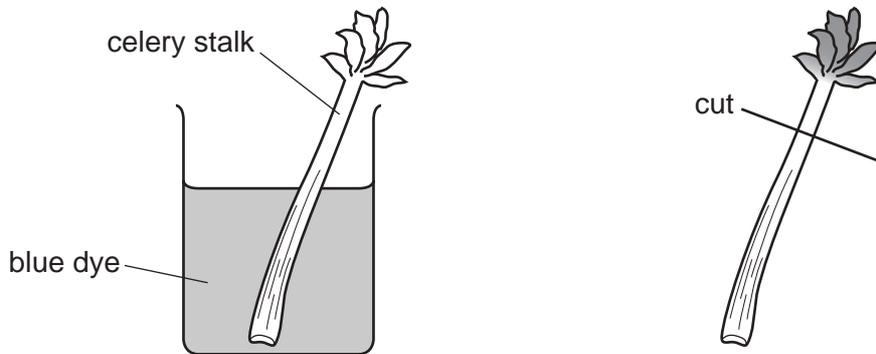
	milk	bile	boiled lipase	lipase
A	✓	✓	✗	✓
B	✓	✓	✓	✗
C	✓	✗	✓	✗
D	✓	✗	✗	✓

key

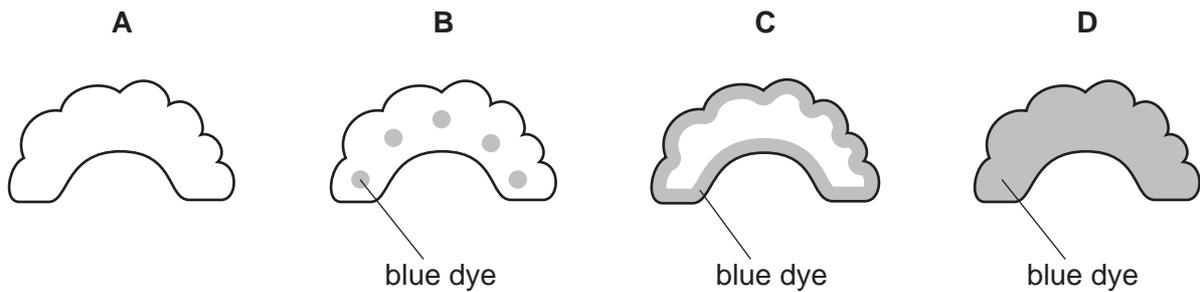
✓ = present

✗ = absent

- 16 A celery stalk was placed into a beaker of blue dye. When the dye reached the leaves, the stalk was taken out and a section was cut, as shown in the diagram.



Which diagram shows the appearance of the cut end of the stalk?



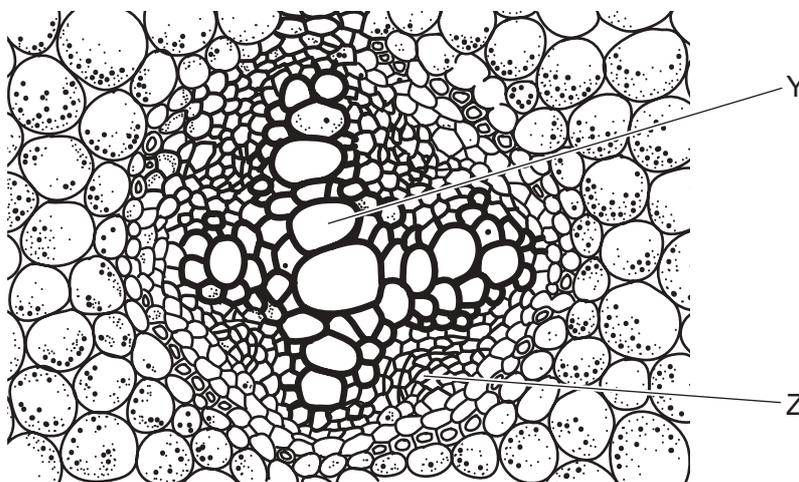
17 The table shows the rate of water flow through a tree over a 12 hour period.

time of day	rate of flow / cm per hour
7:00	100
9:00	120
11:00	140
13:00	250
15:00	300
17:00	260
19:00	180

What conclusion can be drawn from the table?

- A Between 7:00 and 17:00 hours the rate of flow continuously increases.
- B The greatest increase in rate of flow in a two-hour period is between 11:00 and 13:00 hours.
- C Water does not flow up through a tree at night.
- D Water flow is affected by humidity.

18 The diagram shows some of the transport tissues in a plant root.

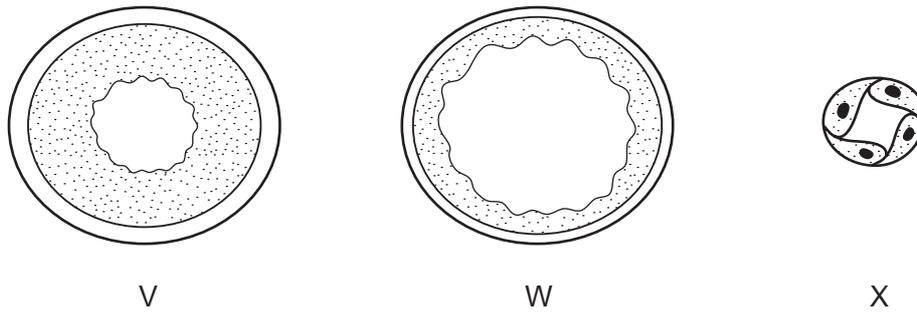


Which row about tissues Y and Z in the diagram is correct?

	tissue Y		tissue Z	
	name	transports	name	transports
A	phloem	mineral ions & water	xylem	sucrose
B	phloem	sucrose	xylem	mineral ions & water
C	xylem	mineral ions & water	phloem	sucrose
D	xylem	sucrose	phloem	mineral ions & water

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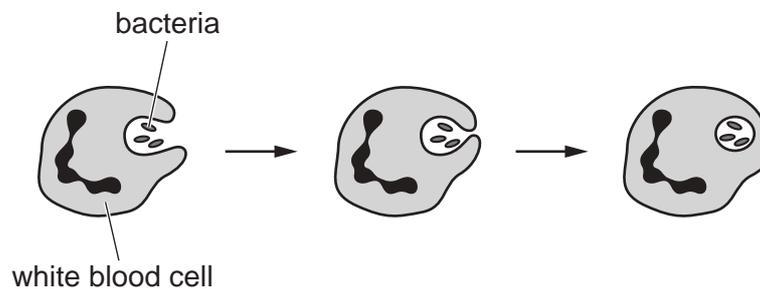
- 19 The diagram shows cross-sections through three types of blood vessel, **not** drawn to the same scale.



Which section is from a vein and which is from a capillary?

	vein	capillary
A	V	W
B	W	V
C	W	X
D	X	W

- 20 The diagram shows one way the body defends itself against pathogens.

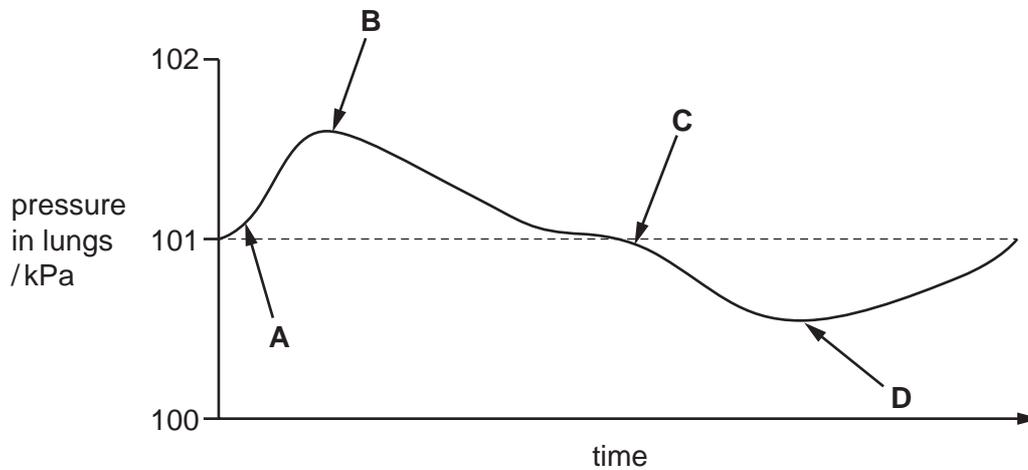


What is the name of this defence mechanism?

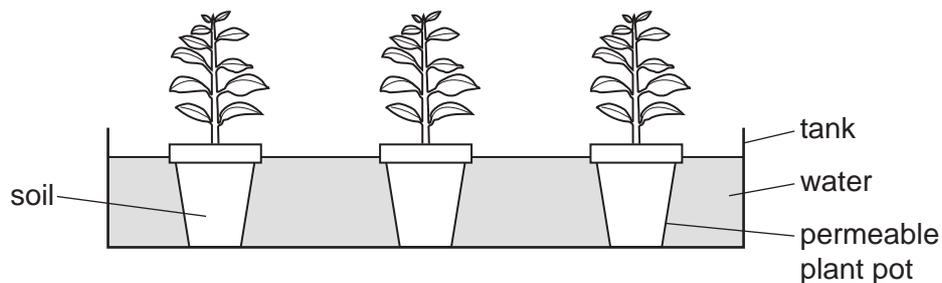
- A** antibody production
- B** egestion
- C** phagocytosis
- D** vaccination

- 21 The diagram illustrates changes in air pressure taking place inside the lungs during a complete cycle of breathing. Atmospheric pressure is 101 kPa.

At which point on the diagram are the ribs beginning to be lowered?



- 22 Potted plants are left for a week in a tank of water as shown.



Why do the plants die?

- A The roots do not have enough oxygen.
 - B The roots do not have enough water.
 - C The roots have too much oxygen.
 - D The roots have too much carbon dioxide.
- 23 Which statement about both aerobic and anaerobic respiration is correct?
- A They break down $C_6H_{12}O_6$.
 - B They produce an oxygen debt.
 - C They use CO_2 .
 - D They use O_2 .

24 The components of a reflex arc are shown in the flow diagram.

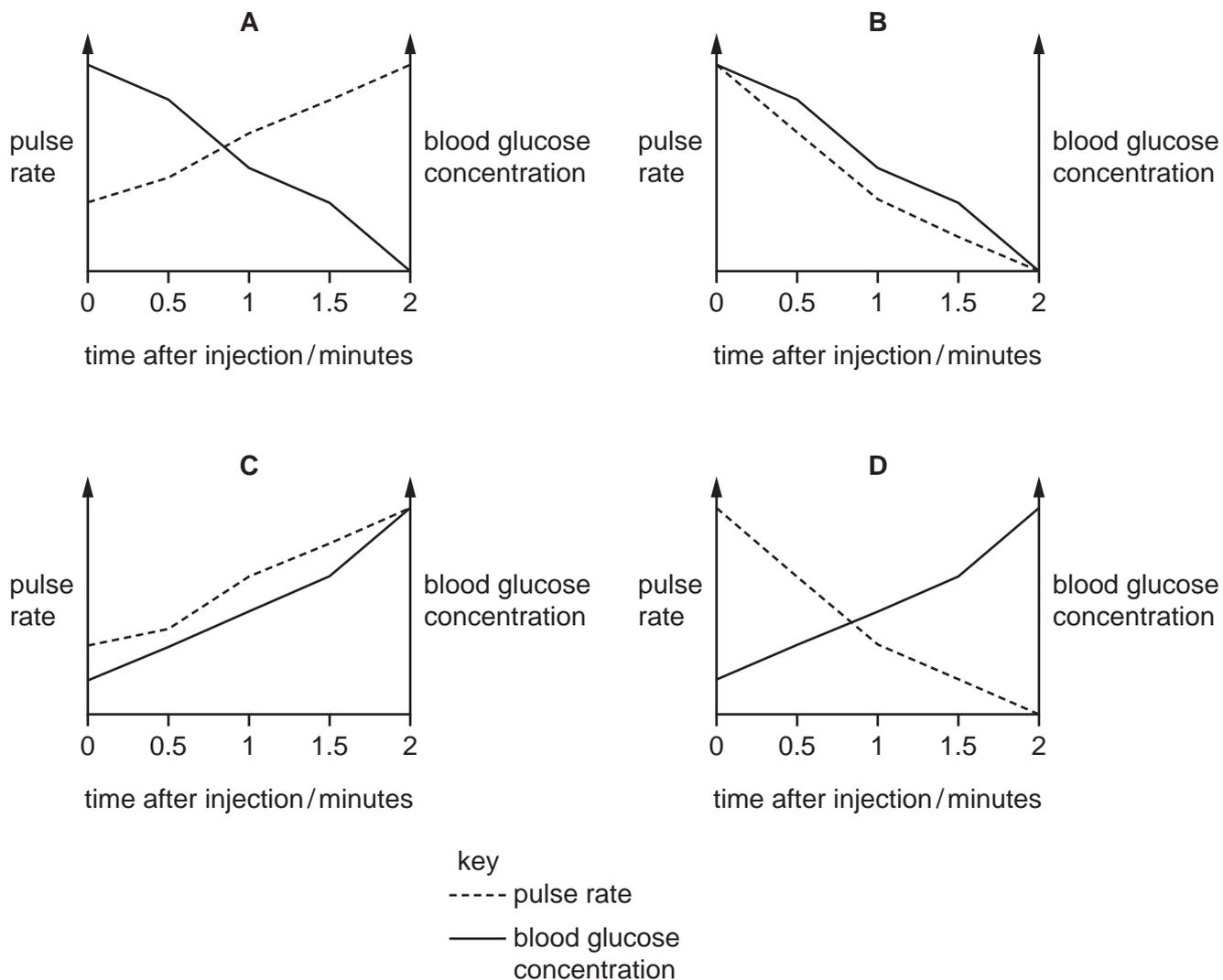
receptor → sensory neurone → synapse → relay neurone → synapse → motor neurone → effector

Which component is responsible for ensuring that the nerve impulses travel in one direction only?

- A motor neurone
 - B receptor
 - C sensory neurone
 - D synapse
- 25 What is a function of the liver?
- A converting bile to urea
 - B converting urea to amino acids
 - C deamination of amino acids
 - D deamination of carbon dioxide
- 26 Which statement about light receptors in the retina of a normal human eye is correct?
- A The cones only work in dim light.
 - B The rods are found in the fovea.
 - C There are three types of cone.
 - D There are three types of rod.

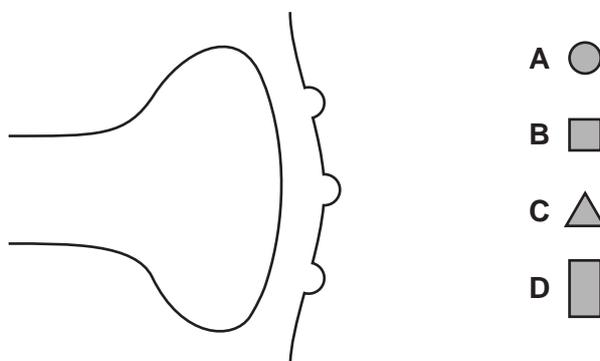
27 A patient is injected with adrenaline.

Which graph shows the expected changes to pulse rate and blood glucose concentration?



28 The diagram represents a synapse in the brain involved in the perception of pain.

Which labelled molecule represents heroin?



29 A human zygote is a diploid cell.

Which statement about human diploid cells is correct?

- A They do not have a nucleus.
- B They fuse to form gametes.
- C The nucleus contains a single set of chromosomes.
- D The nucleus contains two sets of chromosomes.

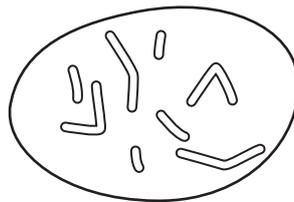
30 Which feature allows the sperm to dissolve the jelly coating of the egg cell?

- A acrosome
- B flagellum
- C mitochondria
- D nucleus

31 Which statement about HIV is correct?

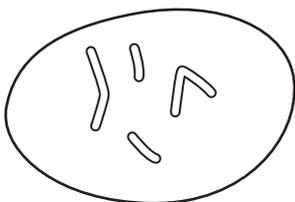
- A It causes an increase in the number of lymphocytes.
- B It is caused by bacteria.
- C It increases the ability to produce antibodies.
- D It is transmitted through sexual contact.

32 The diagram shows the chromosomes in the nucleus of a cell that divides by mitosis.

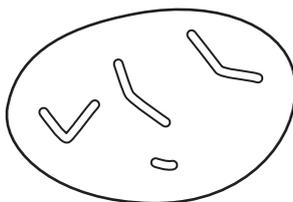


Which diagram shows the chromosomes in the nucleus of one of the daughter cells produced?

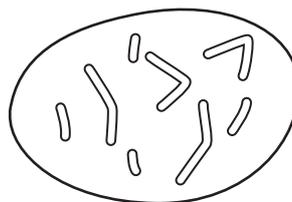
A



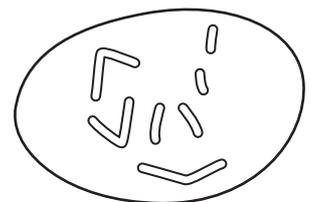
B



C



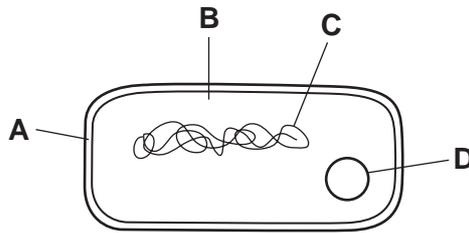
D



- 33** What happens as a result of meiosis?
- A** Diploid cells are produced.
 - B** Diploid and haploid cells are produced.
 - C** Genetically identical cells are produced.
 - D** Haploid cells are produced.
- 34** Why is the allele for sickle-cell anaemia common in some parts of the world?
- A** Malaria protects against sickle-cell anaemia.
 - B** Sickle-cell anaemia is caused by malaria.
 - C** Sickle-cell anaemia is transmitted by mosquitoes.
 - D** The sickle-cell anaemia allele protects against malaria.
- 35** Which statement describes how a species becomes adapted to its environment?
- A** Genetic similarities give rise to different genotypes which may have a reproductive advantage.
 - B** Genetic variation gives rise to different phenotypes which may have a reproductive advantage.
 - C** Phenotypic similarities give rise to different genotypes which may have a reproductive advantage.
 - D** Phenotypic variation gives rise to different phenotypes which may have a reproductive advantage.
- 36** Decomposers play an important role in the carbon cycle. They release carbon dioxide.
- Which process is responsible for this?
- A** feeding
 - B** fossilisation
 - C** photosynthesis
 - D** respiration
- 37** Which term describes a group of organisms of one species, living in the same area, at the same time?
- A** community
 - B** ecosystem
 - C** genus
 - D** population

38 The diagram shows a bacterial cell.

Which part of its structure is particularly useful in genetic engineering?



39 What can be managed sustainably?

- A taking coal from a coalfield
- B taking gas from under the earth's surface
- C taking oil from an oilfield
- D taking wood from a woodland

40 Large areas of tropical forests have been cleared to grow monocultures of palm oil plants.

Which effect will this have on the ecosystem?

- A The use of fossil fuels in the area will decrease.
- B The use of pesticides in the area will decrease.
- C The variety of species in the area will decrease.
- D The variety of species in the area will increase.

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BIOLOGY

0610/22

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 is recommended)

* 2 8 4 9 5 5 2 1 2 7 *



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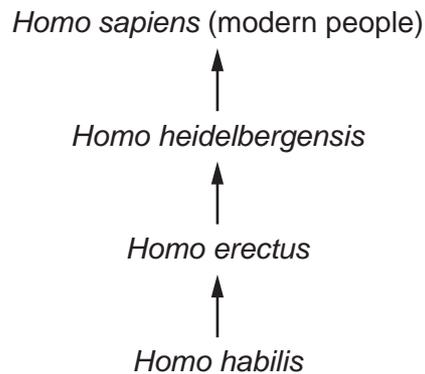
This document consists of **16** printed pages.



- 1 Carbon dioxide diffuses into a leaf.

Which characteristic of living things requires this?

- A excretion
 - B movement
 - C nutrition
 - D respiration
- 2 The diagram shows how *Homo sapiens* (modern people) could have evolved from earlier ancestors.



Which statement about modern people and their ancestors is correct?

- A They are in the same species and the same genus.
 - B They are in the same species but not the same genus.
 - C They are in the same genus but not the same species.
 - D They are neither the same species nor the same genus.
- 3 Heart muscle cells have a high rate of metabolism.
- Which structure do they require to be present in high numbers?
- A chloroplasts
 - B mitochondria
 - C cell walls
 - D vacuoles

4 Which features are possessed by **all** plant cells?

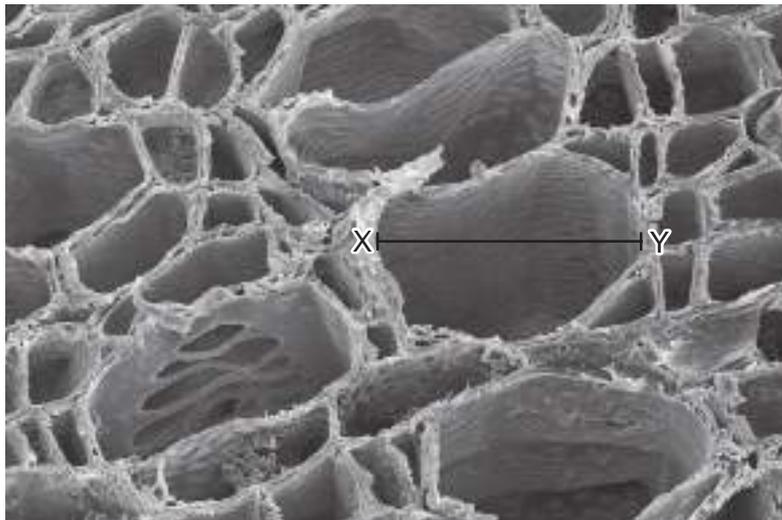
	a cell wall	chloroplasts
A	✓	✓
B	✓	x
C	x	✓
D	x	x

key

✓ = present

x = absent

5 The diagram shows a xylem vessel in a plant stem. The magnification is $\times 400$.

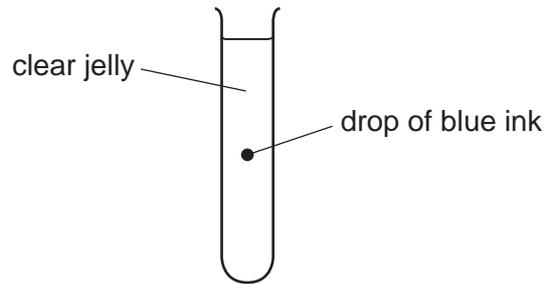


$\times 400$

What is the actual width of the xylem vessel along the line XY?

- A** $8.75\ \mu\text{m}$ **B** $14\ \mu\text{m}$ **C** $87.5\ \mu\text{m}$ **D** $140\ \mu\text{m}$

- 6 The diagram shows a test-tube containing clear jelly. A drop of blue ink is injected into the middle of the jelly.



The blue colour of the ink spreads throughout the jelly.

By which process does the blue ink spread through the jelly?

- A** active transport
B catalysis
C diffusion
D osmosis
- 7 Which process describes osmosis?
- A** diffusion of water through a cell wall
B diffusion of water through a partially permeable membrane
C diffusion of water through the cell sap
D diffusion of water through the cytoplasm
- 8 Which row shows the chemical elements contained in fats?

	carbon	hydrogen	nitrogen	oxygen	
A	✓	✓	x	✓	key ✓ = present x = absent
B	✓	✓	✓	✓	
C	x	✓	✓	x	
D	✓	x	✓	✓	

- 9 Small molecules are used as the basic units in the synthesis of large food molecules.

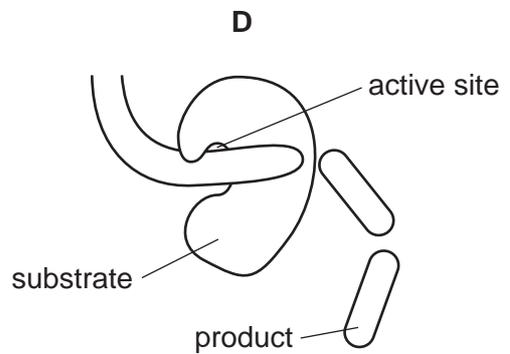
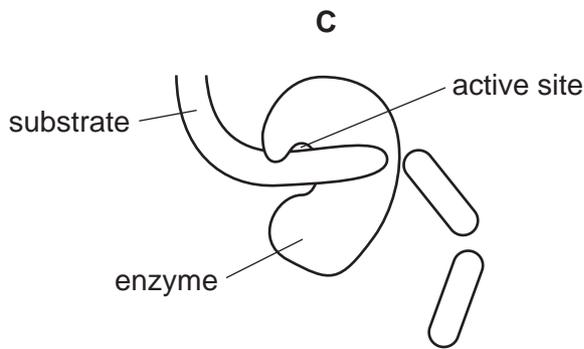
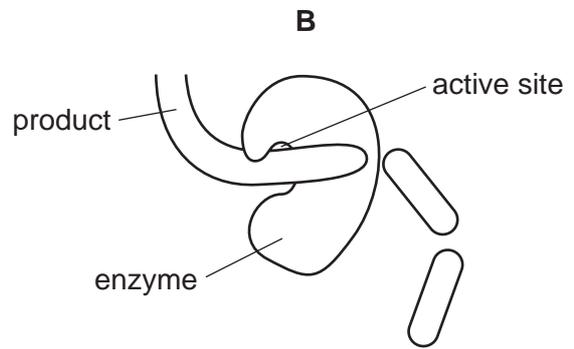
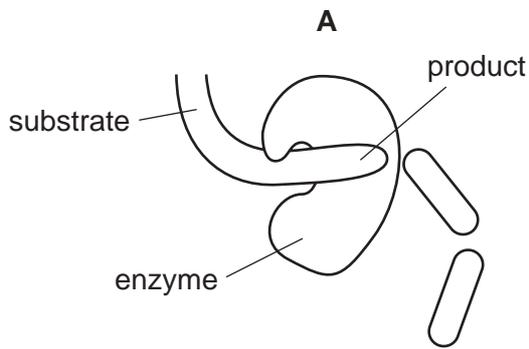
Which statement is correct?

- A** Amino acids are basic units of carbohydrates.
B Fatty acids are basic units of glycogen.
C Glycerol is a basic unit of oils.
D Simple sugar is a basic unit of protein.

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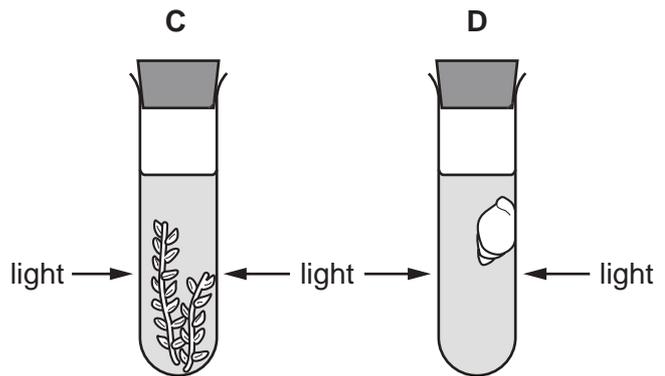
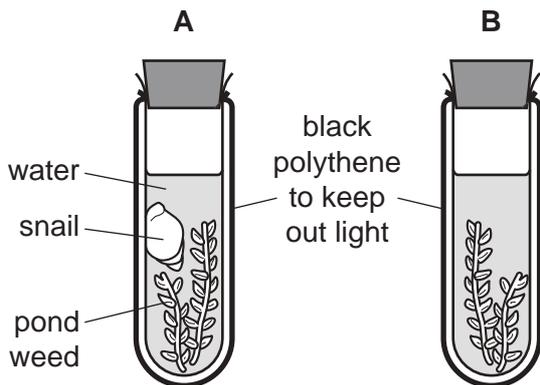
10 The diagrams show a protease enzyme catalysing the breaking of part of a protein molecule into smaller pieces.

Which diagram has three correct labels?



11 The diagram shows an experiment to investigate the balance between respiration and photosynthesis.

In which tube are photosynthesis and respiration taking place at the same time?



- 12 Some gardeners use Epsom salts (magnesium sulfate) as a fertiliser for their plants. Epsom salts release magnesium ions into the soil.

How would this benefit the plants?

- A prevents pests from eating the leaves
- B prevents the leaves from going yellow
- C prevents water loss from the leaves
- D prevents the growth of weeds

- 13 The food label is from a packet of cereal.

The label can help someone who is concerned about their diet.

Nutrition	
Typical values	100 g contains
Energy	985 kJ 235 kcal
Fat	1.5 g
of which saturates	0.3 g
Carbohydrate	45.5 g
of which sugars	3.8 g
Fibre	2.8 g
Protein	7.7 g
Salt	0.5 g

A person eats 45 g of cereal.

One of the food types listed in the label can help prevent constipation.

How many grams of this food type does the person eat?

- A 1.3 g
- B 2.8 g
- C 3.5 g
- D 7.7 g

- 14 The cholera bacterium produces toxins that cause chloride ions to be secreted into the small intestine.

How does this affect the water potential of blood in the intestinal capillaries and the intestinal contents?

	water potential	
	blood in capillaries	contents of small intestine
A	lowered	lowered
B	lowered	raised
C	raised	lowered
D	raised	raised

- 15 A person eats some cheese which contains a lot of fats and protein.

Which row shows the combination of substances that will digest the cheese most effectively?

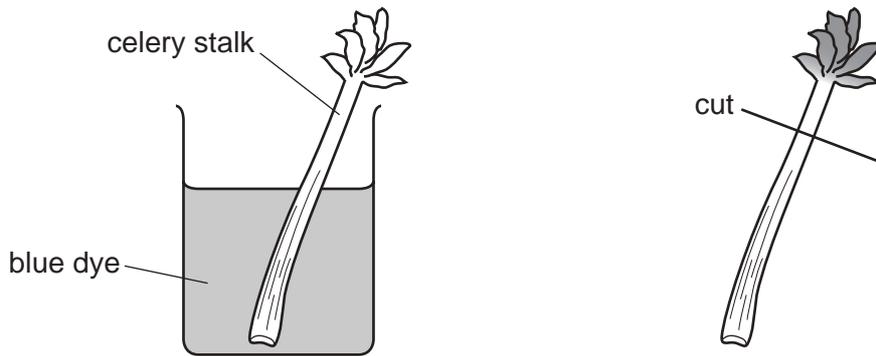
	substances present			
	amylase	bile	lipase	protease
A	✓	x	✓	x
B	x	✓	x	✓
C	✓	x	✓	✓
D	x	✓	✓	✓

key

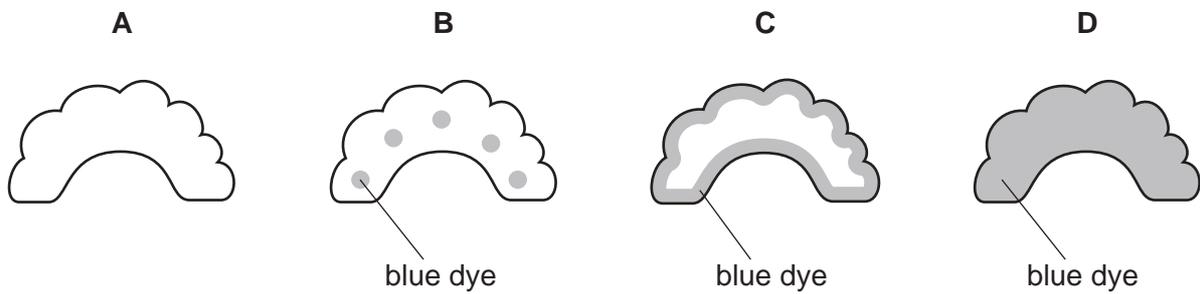
✓ = present

x = absent

- 16 A celery stalk was placed into a beaker of blue dye. When the dye reached the leaves, the stalk was taken out and a section was cut, as shown in the diagram.



Which diagram shows the appearance of the cut end of the stalk?



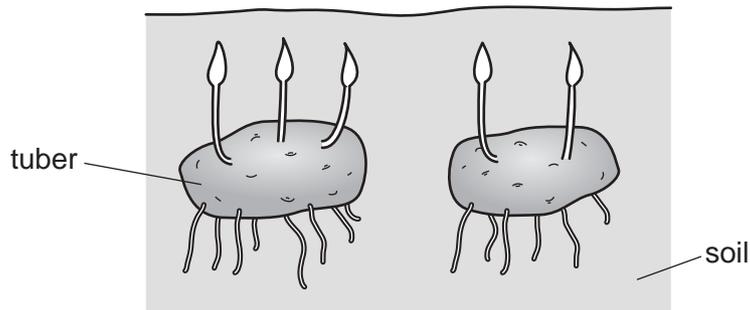
- 17 The table shows the rate of water flow through a tree over a 12 hour period.

time of day	rate of flow / cm per hour
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15:00	300
17:00	260
19:00	180

What conclusion can be drawn from the table?

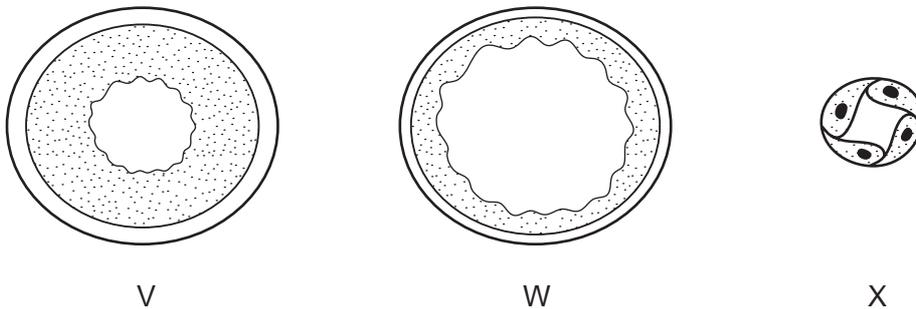
- A** Between 7:00 and 17:00 hours the rate of flow continuously increases.
B The greatest increase in rate of flow in a two-hour period is between 11:00 and 13:00 hours.
C Water does not flow up through a tree at night.
D Water flow is affected by humidity.

- 18 The diagram shows some potato tubers. New shoots are beginning to grow.
Sucrose is being translocated from source to sink.



Which statement is correct?

- A The tuber is a sink.
B The soil is a sink.
C The shoots are sources.
D The shoots are sinks.
- 19 The diagram shows cross-sections through three types of blood vessel, **not** drawn to the same scale.



Which section is from a vein and which is from a capillary?

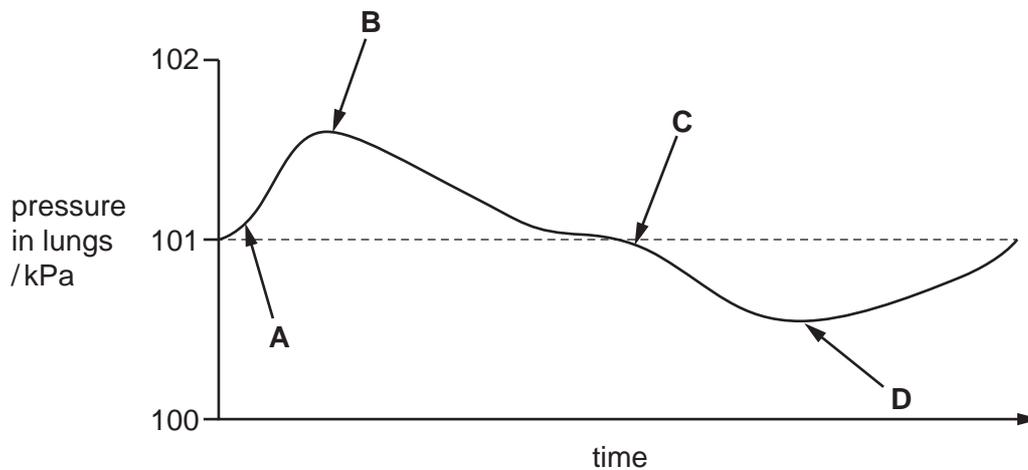
	vein	capillary
A	V	W
B	W	V
C	W	X
D	X	W

20 Which disease is transmissible?

- A cholera
- B coronary heart disease
- C lung cancer
- D scurvy

21 The diagram illustrates changes in air pressure taking place inside the lungs during a complete cycle of breathing. Atmospheric pressure is 101 kPa.

At which point on the diagram are the ribs beginning to be lowered?



22 Which pathway is followed by air passing into the body?

- A larynx → trachea → bronchi → bronchioles → alveoli
- B larynx → trachea → bronchioles → bronchi → alveoli
- C trachea → larynx → bronchi → alveoli → bronchioles
- D trachea → larynx → bronchi → bronchioles → alveoli

23 Oxygen is required for aerobic respiration.

How many molecules of oxygen are required for the aerobic respiration of three molecules of glucose?

- A 3
- B 6
- C 12
- D 18

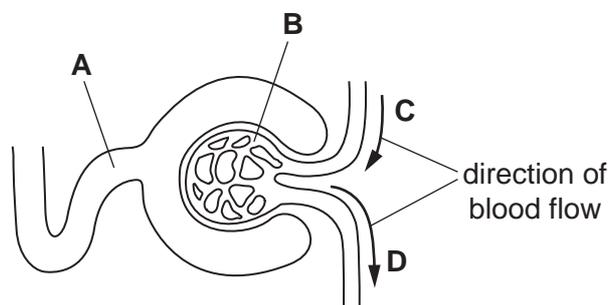
24 Which statement about involuntary responses is correct?

- A They always result in the same response to the same stimulus.
- B They are learned responses.
- C They are slower than voluntary responses.
- D They never use voluntary muscles.

25 The diagram shows the first part of a kidney tubule and its blood supply.

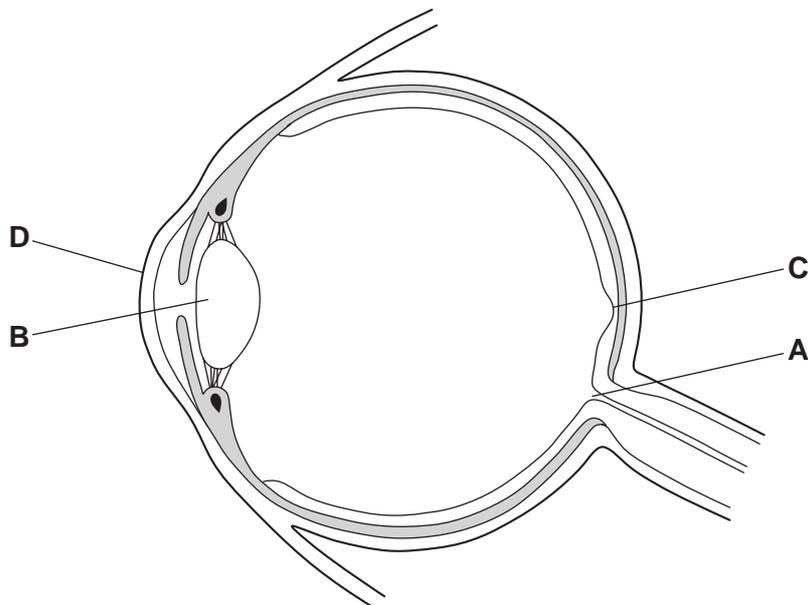
During filtration, protein molecules do not pass through the wall of the glomerulus.

Which part contains the highest concentration of protein?

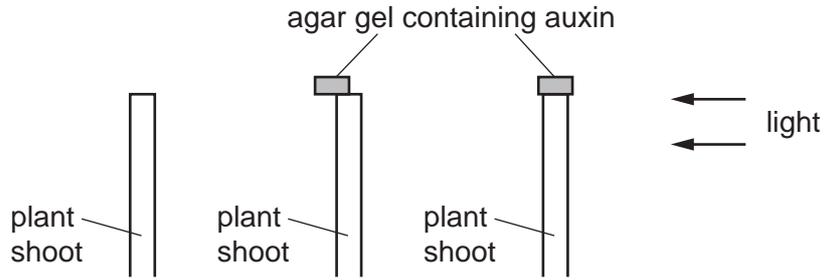


26 The diagram shows a cross-section of the human eye.

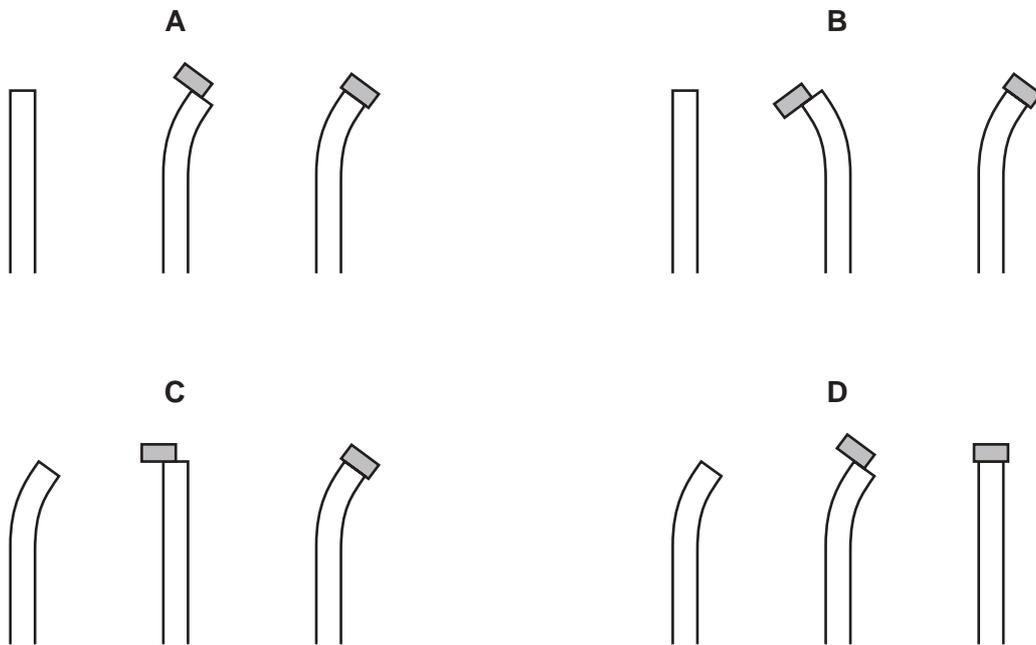
Which label points to the spot in the eye where vision is the sharpest?



- 27 Three plant shoots have their tips removed. Two of the shoots have a piece of agar gel placed on them, as shown in the diagram. The agar gel contains auxin. The shoots are exposed to light coming from one direction.



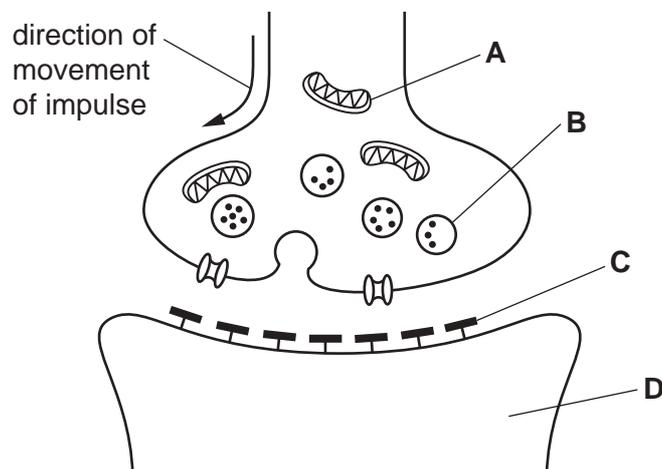
What is the appearance of the shoots after two days?



- 28 The diagram shows a synapse.

Heroin affects the neurone.

Which labelled part does the heroin directly affect?



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29 What is an advantage of self-pollination?

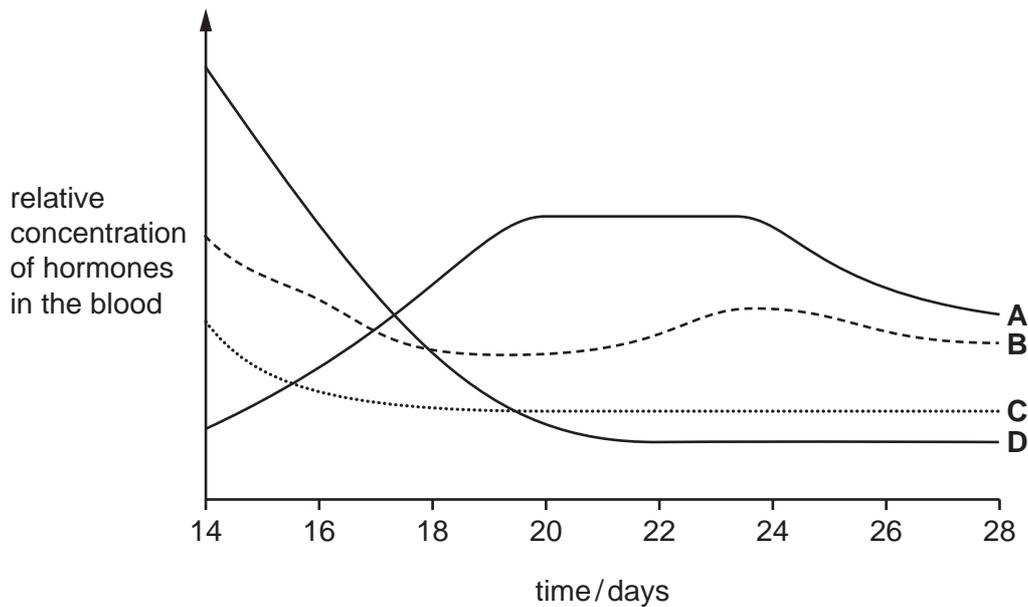
- A Evolution is not possible.
- B Genetic variation cannot occur.
- C Isolated individuals can reproduce.
- D It does not require gametes.

30 Which feature allows the sperm to dissolve the jelly coating of the egg cell?

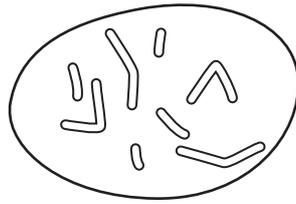
- A acrosome
- B flagellum
- C mitochondria
- D nucleus

31 The graph shows the relative concentration of hormones in the blood during days 14–28 of the menstrual cycle.

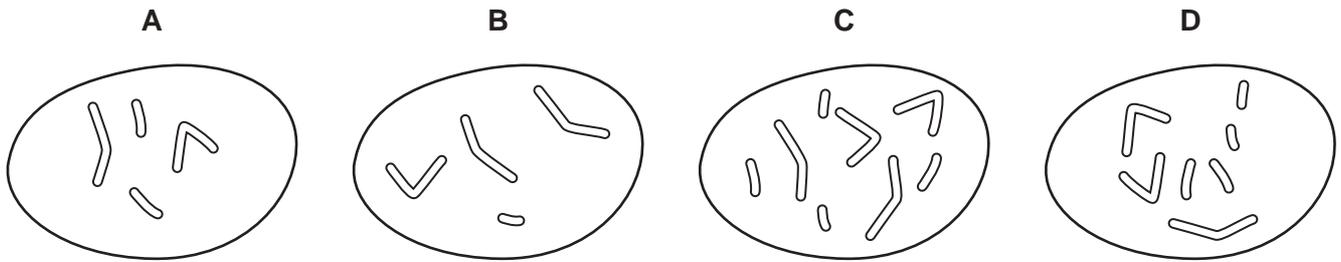
Which letter represents the hormone progesterone in a woman who is not pregnant?



32 The diagram shows the chromosomes in the nucleus of a cell that divides by mitosis.



Which diagram shows the chromosomes in the nucleus of one of the daughter cells produced?



33 The diploid number for mice is 40 chromosomes.

How many chromosomes will be in a mouse cell formed by meiosis?

- A 10 B 20 C 40 D 80

34 Which statement is correct?

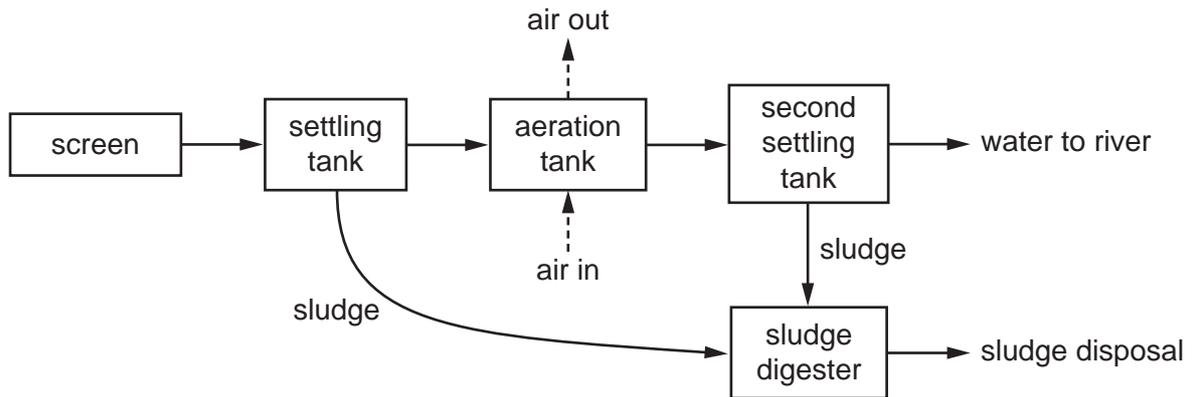
- A People who are heterozygous for the sickle-cell allele have a resistance to malaria.
- B Sickle-cell anaemia is caused by a change in the amino acid sequence of the haemoglobin gene.
- C Sickle-cell anaemia is caused by both genetic and environmental factors interacting.
- D The sickle-cell allele is rare in human populations in areas where there is malaria.

35 When antibiotics are overused they become less effective.

Which statement is correct?

- A Artificial selection results in resistant strains of bacteria.
- B Patients become resistant to the antibiotic.
- C The antibiotic causes the bacteria to mutate.
- D The antibiotic does not kill resistant bacteria.

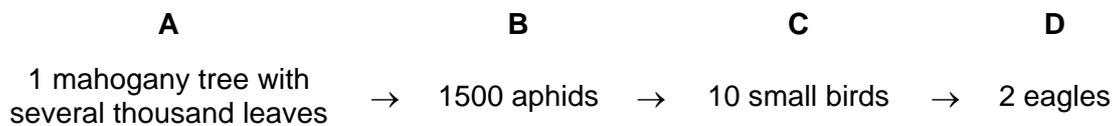
36 The diagram shows how sewage is treated.



Why is air bubbled through the aeration tank?

- A to encourage microorganisms to reproduce quickly
- B to float the sludge
- C to settle the sludge
- D to stop microorganisms from reproducing too quickly

37 Which trophic level has the greatest amount of energy?



38 All organisms share the same genetic code.

This means that bacteria can be used to

- A improve the health of the digestive system.
- B manufacture biofuels in large quantities.
- C produce foods such as yoghurt and cheese.
- D make proteins using human DNA.

39 Evidence shows that some aquatic organisms have been feminised.

What is the most likely cause of this?

- A increased nitrates running off farmland into the rivers
- B female hormones excreted by women taking contraceptive pills
- C infectious diseases in the fish
- D decreasing levels of oxygen in the rivers

- 40 What is **not** a reason for using chemical fertilisers in food production?
- A improving growth rate
 - B improving mineral content of the soil
 - C increasing yields
 - D reducing competition with weeds

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BIOLOGY

0610/23

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 is recommended)

* 2 4 5 7 0 1 6 5 0 2 *



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.

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

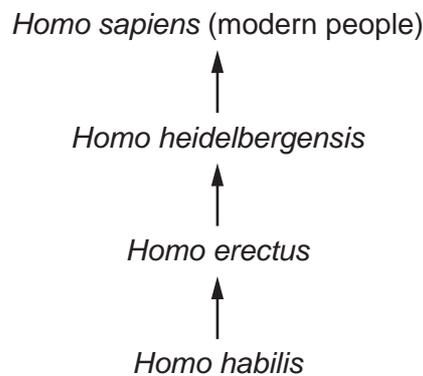
This document consists of **18** printed pages and **2** blank pages.



- 1 Students find a small organism in a pond. They catch it and put it into a large jar of water. They see that the organism swims away from light. It lays some eggs before they put it back into the pond.

Which characteristics of living things did the students see in this organism?

- A excretion, growth and respiration
 B growth, nutrition and sensitivity
 C movement, reproduction and sensitivity
 D movement, reproduction and respiration
- 2 The diagram shows how *Homo sapiens* (modern people) could have evolved from earlier ancestors.



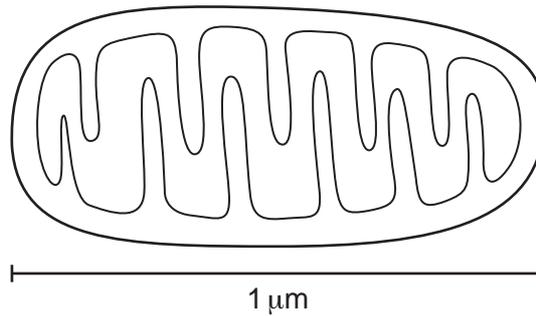
Which statement about modern people and their ancestors is correct?

- A They are in the same species and the same genus.
 B They are in the same species but not the same genus.
 C They are in the same genus but not the same species.
 D They are neither the same species nor the same genus.
- 3 In cells with a high respiration rate, what would be found in the cytoplasm in increased numbers?
- A mitochondria
 B ribosomes
 C rough endoplasmic reticulum
 D vesicles

4 Which features are possessed by **all** plant cells?

	a cell wall	chloroplasts	
A	✓	✓	key ✓ = present x = absent
B	✓	x	
C	x	✓	
D	x	x	

5 The diagram shows a mitochondrion.

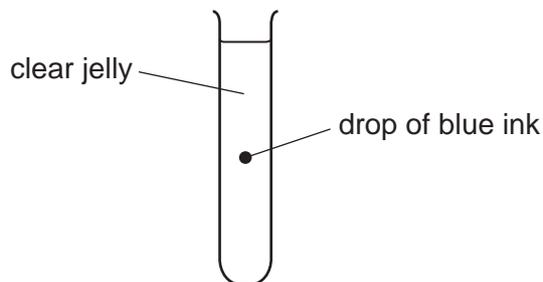


The diagram is 70 mm long.

What is the magnification of the diagram?

- A** $\times 0.0007$ **B** $\times 70$ **C** $\times 7000$ **D** $\times 70\,000$

6 The diagram shows a test-tube containing clear jelly. A drop of blue ink is injected into the middle of the jelly.



The blue colour of the ink spreads throughout the jelly.

By which process does the blue ink spread through the jelly?

- A** active transport
B catalysis
C diffusion
D osmosis

7 Which row describes active transport?

	movement of water	uses energy from respiration	through a cell membrane
A	yes	no	no
B	yes	no	yes
C	no	yes	no
D	no	yes	yes

8 Which reagent is used when testing a food for vitamin C?

- A** Benedict's solution
- B** DCPIP
- C** ethanol
- D** iodine solution

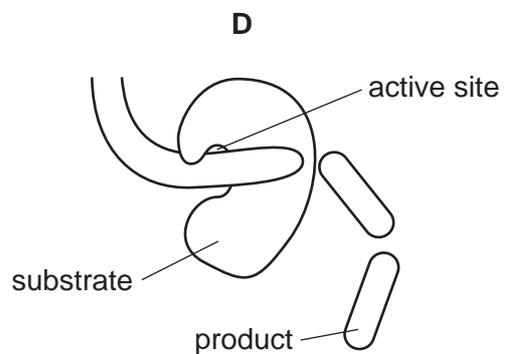
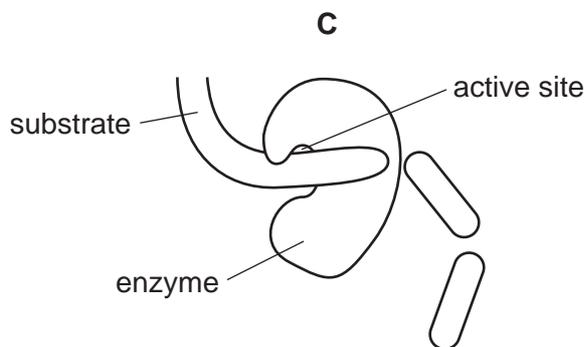
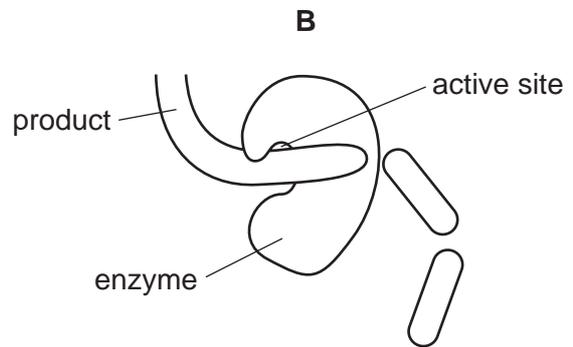
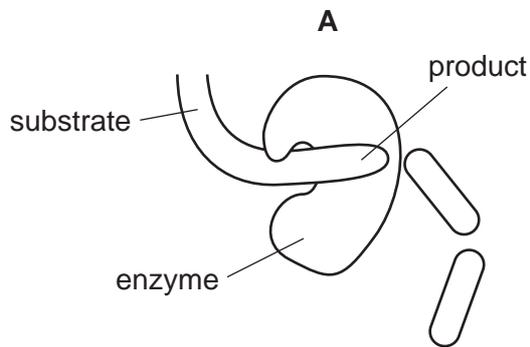
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Which statement is correct?

- A** Amino acids are basic units of carbohydrates.
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- C** Glycerol is a basic unit of oils.
- D** Simple sugar is a basic unit of protein.

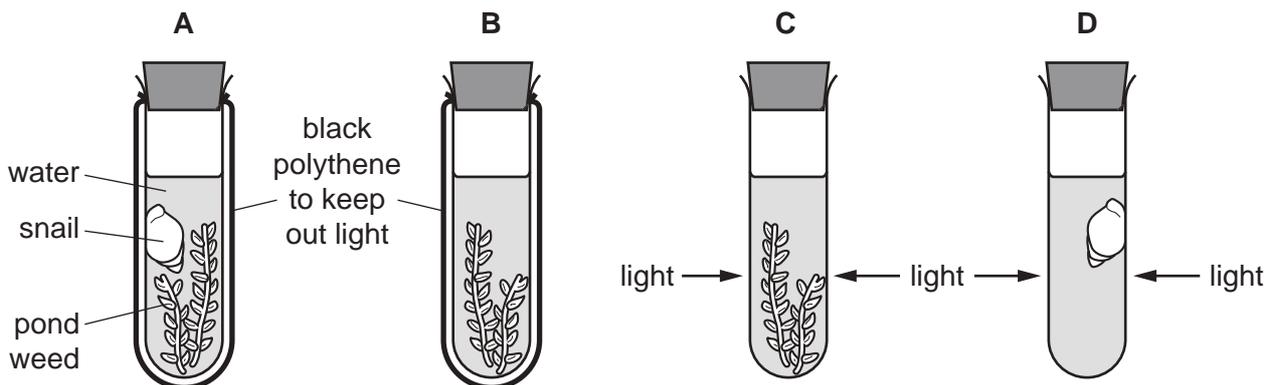
- 10 The diagrams show a protease enzyme catalysing the breaking of part of a protein molecule into smaller pieces.

Which diagram has three correct labels?



- 11 The diagram shows an experiment to investigate the balance between respiration and photosynthesis.

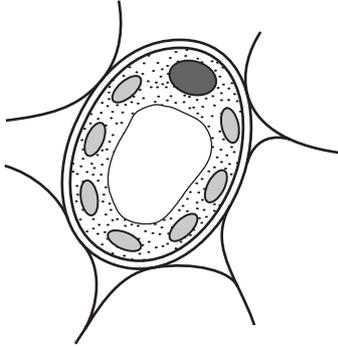
In which tube are photosynthesis and respiration taking place at the same time?



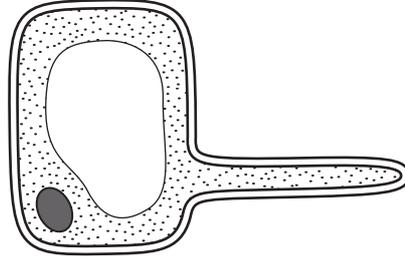
12 The diagrams show the structure of four different cells from a plant.

Which cell is from the upper epidermis of a leaf?

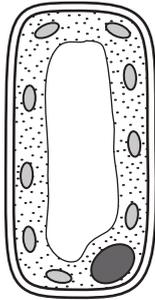
A



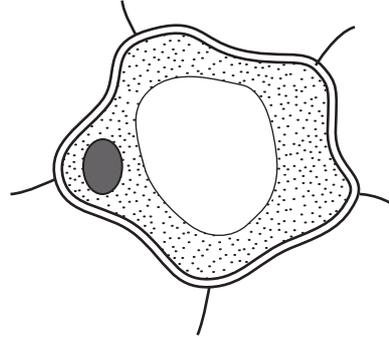
B



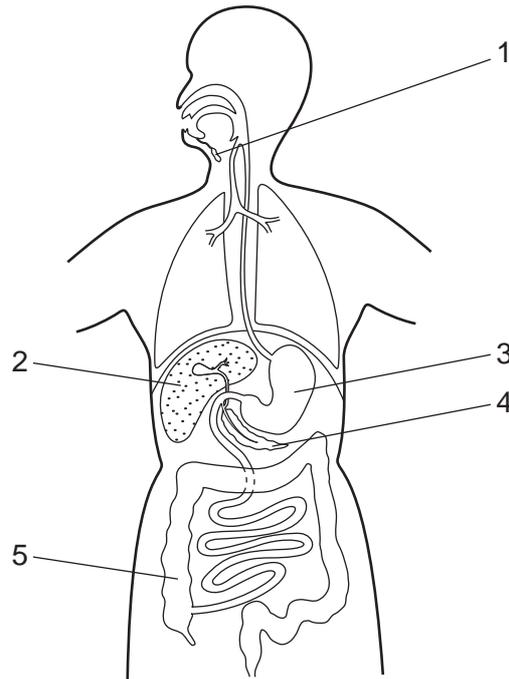
C



D



13 The diagram shows the human alimentary canal.



Which pair of structures both produce digestive enzymes?

- A** 1 and 2 **B** 1 and 3 **C** 2 and 4 **D** 3 and 5

14 The cholera bacterium produces toxins that cause chloride ions to be secreted into the small intestine.

How does this affect the water potential of blood in the intestinal capillaries and the intestinal contents?

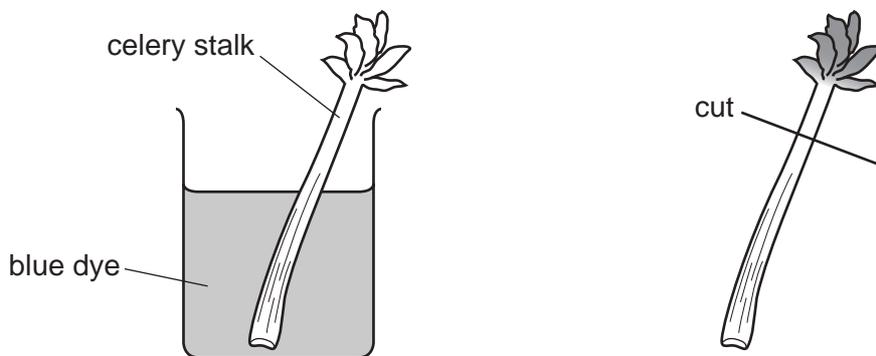
	water potential	
	blood in capillaries	contents of small intestine
A	lowered	lowered
B	lowered	raised
C	raised	lowered
D	raised	raised

15 Starch in food is digested in two stages.

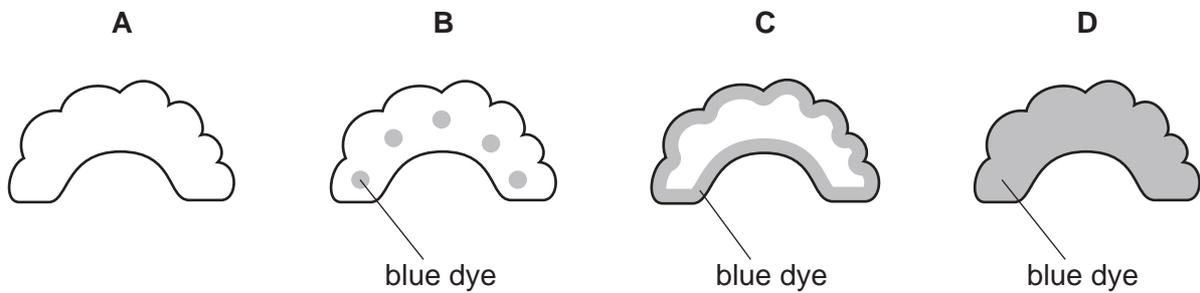
In which parts of the alimentary canal do the two stages occur?

	starch into maltose	maltose into glucose
A	duodenum	stomach
B	lining of small intestine	mouth
C	mouth	lining of small intestine
D	stomach	duodenum

16 A celery stalk was placed into a beaker of blue dye. When the dye reached the leaves, the stalk was taken out and a section was cut, as shown in the diagram.



Which diagram shows the appearance of the cut end of the stalk?



17 The table shows the rate of water flow through a tree over a 12 hour period.

time of day	rate of flow / cm per hour
7:00	100
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What conclusion can be drawn from the table?

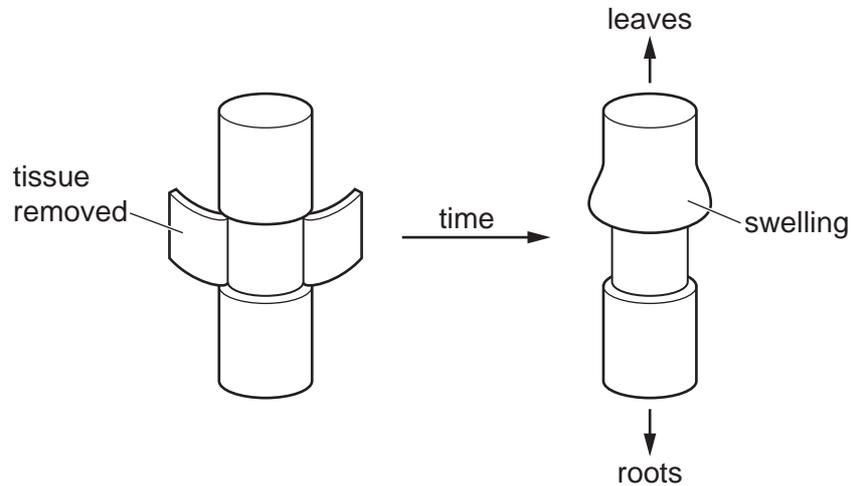
- A Between 7:00 and 17:00 hours the rate of flow continuously increases.
- B The greatest increase in rate of flow in a two-hour period is between 11:00 and 13:00 hours.
- C Water does not flow up through a tree at night.
- D Water flow is affected by humidity.

18 Scientists investigate the movement of substances in a plant.

They cut a ring of tissue from the stem.

Removing the tissue removes some of the transport vessels found around the edge of the stem.

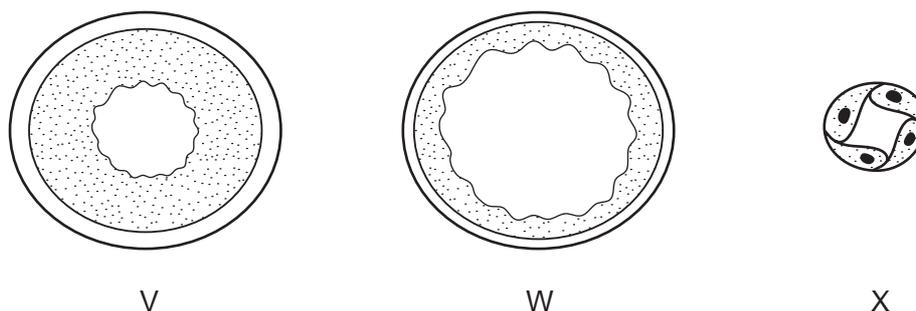
A few days later they notice swelling above the area where the tissue has been removed.



What causes the swelling?

- A Phloem vessels have been removed and sucrose cannot move to the sink.
- B Phloem vessels have been removed and sucrose cannot move to the source.
- C Xylem vessels have been removed and minerals cannot move to the sink.
- D Xylem vessels have been removed and minerals cannot move to the source.

- 19 The diagram shows cross-sections through three types of blood vessel, **not** drawn to the same scale.



Which section is from a vein and which is from a capillary?

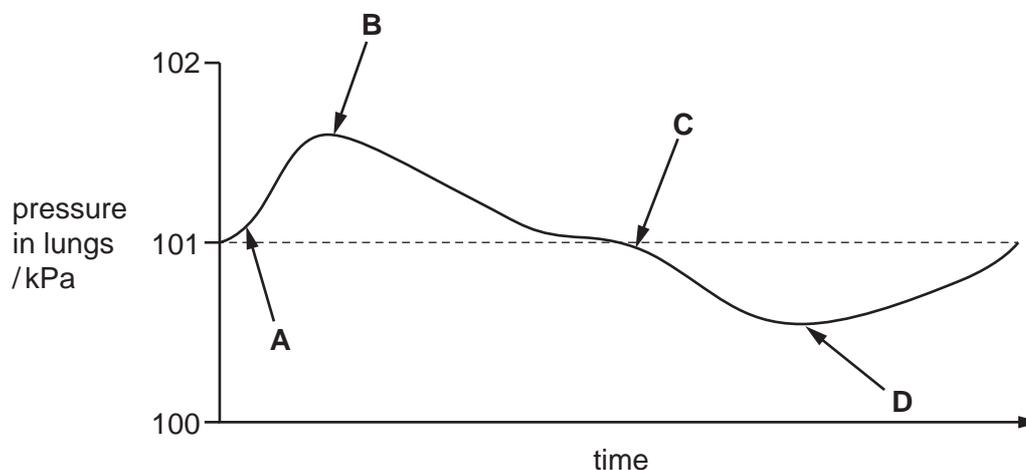
	vein	capillary
A	V	W
B	W	V
C	W	X
D	X	W

- 20 By which route would an HIV infection **not** be transmissible?

- A** blood
- B** saliva
- C** sharing needles for injections
- D** semen

- 21 The diagram illustrates changes in air pressure taking place inside the lungs during a complete cycle of breathing. Atmospheric pressure is 101 kPa.

At which point on the diagram are the ribs beginning to be lowered?

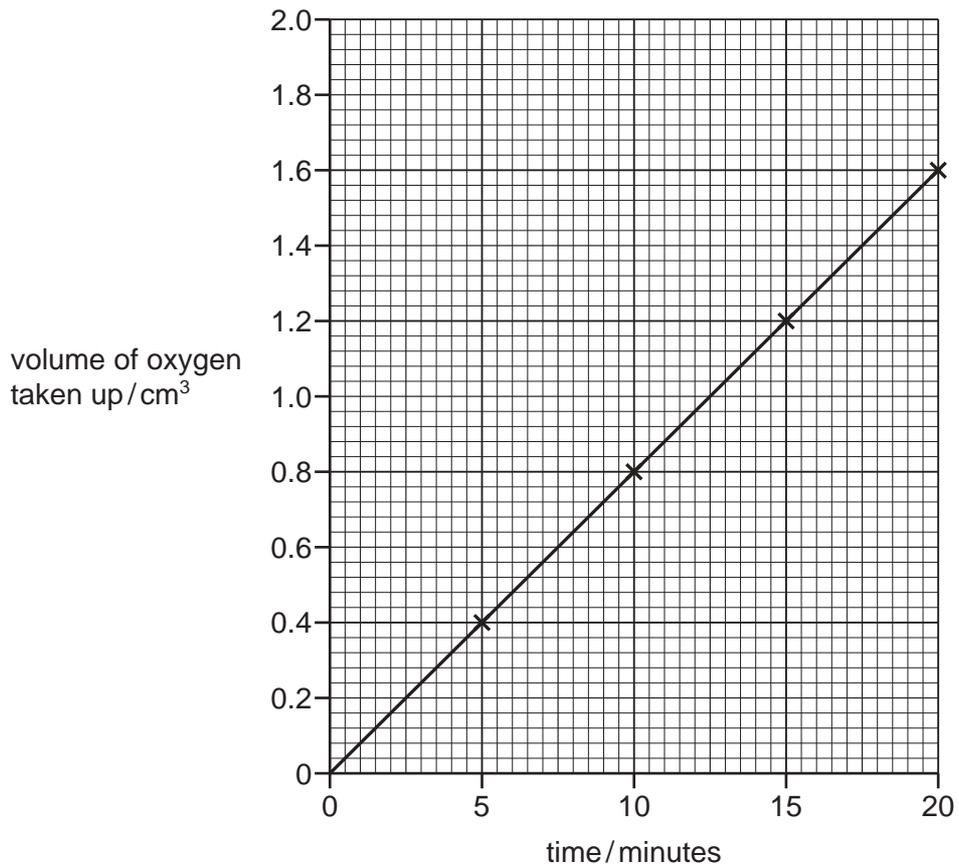


22 Which process uses energy released by respiration?

- A diffusion
- B evaporation
- C growth
- D osmosis

23 The volume of oxygen taken up by germinating seeds was measured.

The graph shows the results.

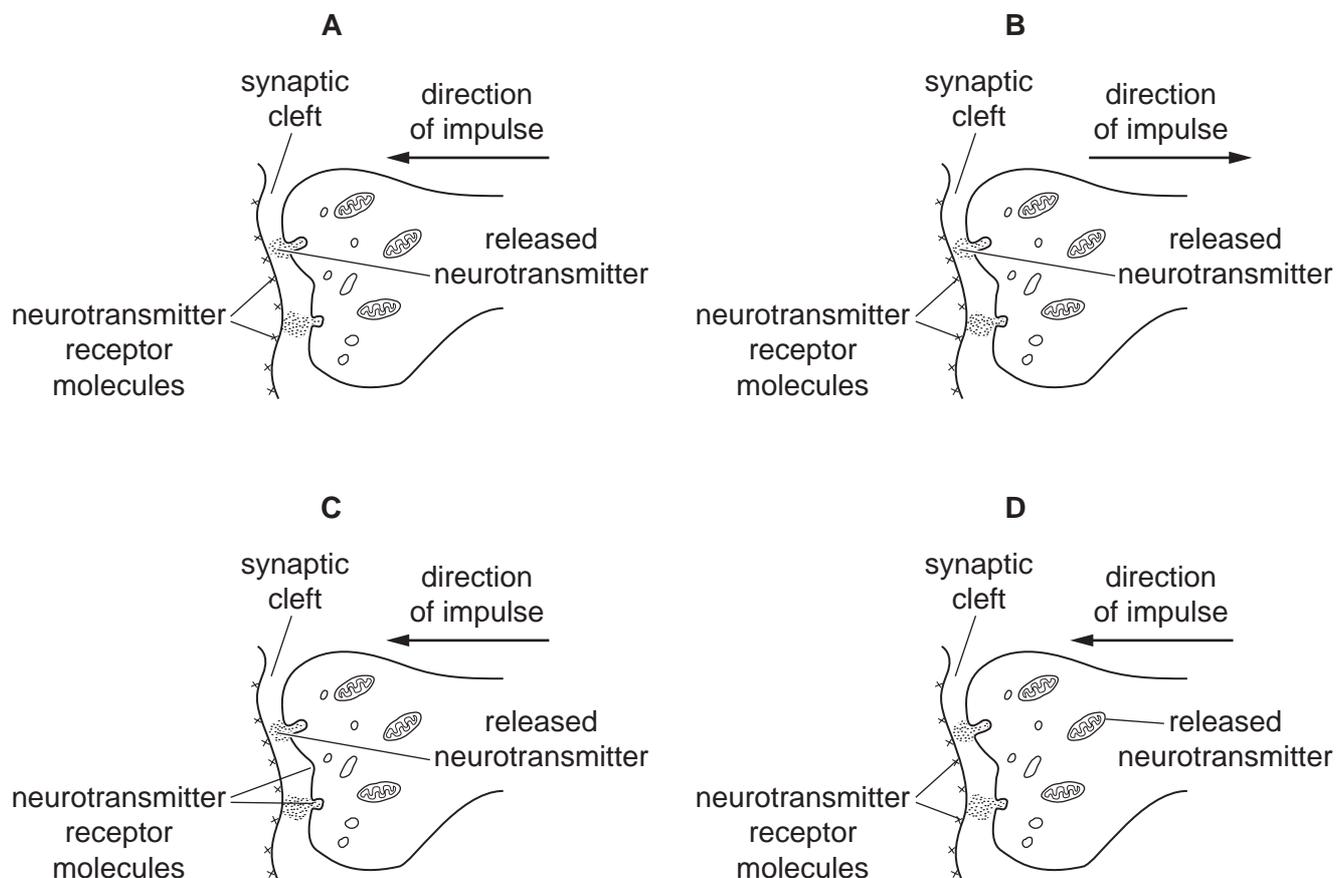


What is the rate of oxygen uptake?

- A 0.08 cm³ per minute
- B 8.00 cm³ per minute
- C 10.8 cm³ per minute
- D 12.50 cm³ per minute

24 The diagrams show the structures on each side of a synaptic cleft.

Which diagram is correctly labelled?

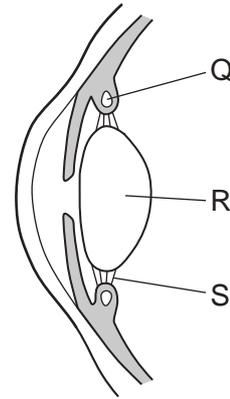


25 Dialysis is a method of regulating the composition of blood when the kidneys are not working properly.

Which substance is absent from fresh dialysis fluid?

- A bile
- B glucose
- C salt
- D water

- 26 The diagram shows a vertical section through part of a human eye. A fly is coming nearer to the eye. The eye begins to focus the image of the fly on its retina.



How do the labelled parts of the diagram change?

	Q	R	S
A	contracts	thinner	tighter
B	relaxes	fatter	slacker
C	contracts	fatter	slacker
D	relaxes	thinner	tighter

- 27 Where is glucagon secreted, and what is its effect on blood glucose concentration?

	secreted by	effect on blood glucose concentration
A	liver	increases
B	liver	decreases
C	pancreas	increases
D	pancreas	decreases

- 28 Which statement about antibiotics is correct?

- A** Antibiotics are effective against viral diseases.
- B** Antibiotics are produced by white blood cells.
- C** Antibiotics can provide pain relief.
- D** Antibiotics can stop bacteria making new cell walls.

29 Where is progesterone produced?

- A ovary
- B pituitary gland
- C prostate gland
- D uterus

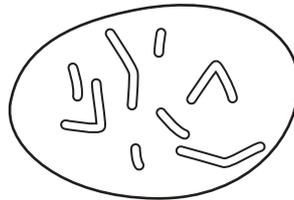
30 Which feature allows the sperm to dissolve the jelly coating of the egg cell?

- A acrosome
- B flagellum
- C mitochondria
- D nucleus

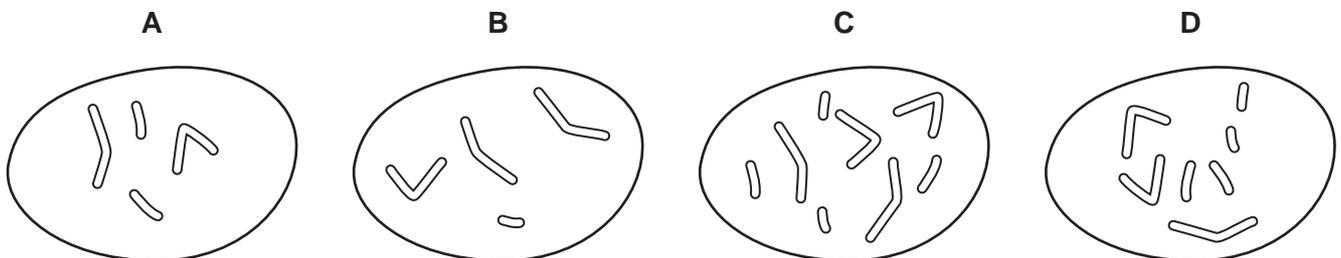
31 Parents with alleles $I^A I^B$ and $I^O I^O$ can produce children with which blood groups?

- A A and B
- B AB
- C A and O
- D B and O

32 The diagram shows the chromosomes in the nucleus of a cell that divides by mitosis.



Which diagram shows the chromosomes in the nucleus of one of the daughter cells produced?



33 During protein synthesis, what is the function of the ribosome?

- A assemble amino acids in a chain
- B carry a copy of a gene to the cytoplasm
- C contain the code for the synthesis of a protein
- D determine the order of bases in the protein

34 The table shows some inherited features.

Which features show co-dominance?

	blood group	colour blindness	sex
A	✓	✓	✗
B	✓	✗	✗
C	✗	✓	✓
D	✗	✓	✗

key

✓ = co-dominant

✗ = not co-dominant

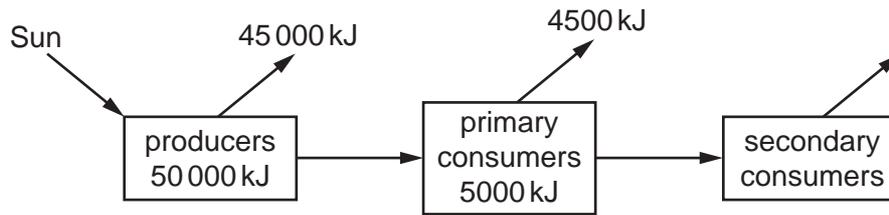
35 These events may happen when an antibiotic is used to treat a bacterial infection.

- 1 The antibiotic kills most of the bacteria.
- 2 The antibiotic resistant bacteria reproduce.
- 3 The antibiotic resistant bacteria survive.
- 4 Some bacteria mutate and are resistant to the antibiotic.

Which sequence may produce a strain of antibiotic resistant bacteria?

- A 1 → 2 → 3 → 4
- B 2 → 3 → 1 → 4
- C 3 → 1 → 4 → 2
- D 4 → 1 → 3 → 2

- 36 The diagram shows the energy within the producers in an ecosystem and how much is transferred to primary consumers and eventually lost to the environment.



How much energy is transferred from primary consumers to secondary consumers?

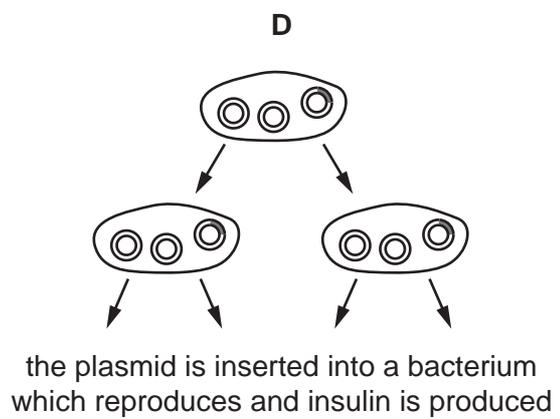
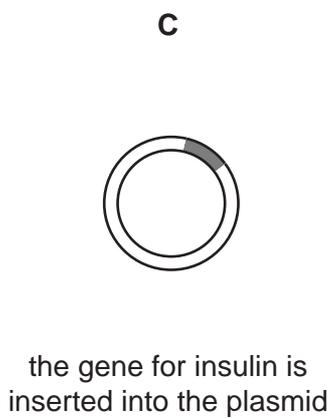
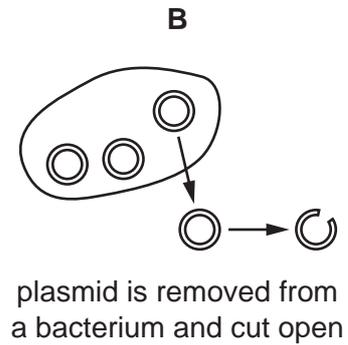
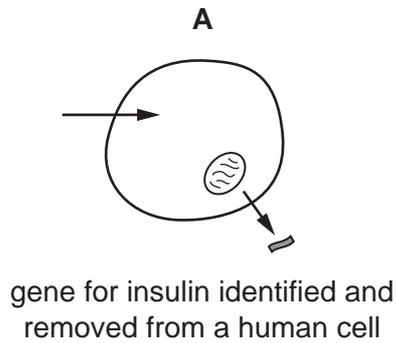
- A 5 kJ B 50 kJ C 500 kJ D 5000 kJ
- 37 Which is the tertiary consumer in this food chain?
- A B C D
- aquatic plant → pond snails → small fish → large fish → fish eagles
- 38 Scientists in one country are using bacteria to break down crude oil in abandoned oil fields. This produces natural gas which is used as a fuel.

Why are bacteria useful in this example of biotechnology?

- A Bacteria are involved in the nitrogen cycle.
- B Bacteria are microorganisms.
- C Bacteria can be pathogens.
- D Bacteria can reproduce very quickly.

39 The diagrams show the stages in the production of human insulin.

Which stage uses the enzyme DNA ligase?



40 What is an undesirable effect of deforestation?

- A habitat creation
- B loss of soil
- C more species
- D reduced carbon dioxide in the atmosphere

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CANDIDATE NAME

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BIOLOGY

Paper 3 Theory (Core)

0610/31

May/June 2019

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

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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 **19** printed pages and **1** blank page.

1 (a) The boxes on the left contain the names of flower parts.

The boxes on the right contain descriptions of the functions of the flower parts.

Draw **one** straight line from each box on the left to **one** box on the right to link the flower part to its function.

Draw **five** lines.

flower part	function
anther	attracts insects
ovary	place where pollen has to land
petal	produces ovules
sepal	produces pollen
stigma	protects the flower bud
	transports water

[5]

(b) Pollen grains from wind-pollinated flowers and insect-pollinated flowers are different.

State **two** ways in which a pollen grain from a wind-pollinated flower is different to a pollen grain from an insect-pollinated flower.

1

2

[2]

(c) Complete the sentences about seeds.

Use words from the list.

Each word may be used once, more than once, or not at all.

asexual

carbon dioxide

gravity

hormones

light

mineral ions

oxygen

sexual

vitamins

water

Plants produce seeds as a result of reproduction. Seeds germinate if they have the correct conditions. These conditions include a suitable temperature and also and

The germinating seed produces a young root which grows downwards in response to

The young root absorbs and from the soil as well as keeping the young plant in a stable position.

[6]

[Total: 13]

- 2 (a) Table 2.1 shows the names of three groups of arthropods and some of their characteristics.

Place ticks (✓) in the boxes to show the characteristics present in each group.

Table 2.1

characteristic	arthropod group		
	arachnids	crustaceans	myriapods
four pairs of legs			
one pair of antennae			
body divided into two main parts			

[3]

- (b) All living organisms show the same seven characteristics.

State **four** of the characteristics of living organisms.

1

2

3

4

[4]

(c) Fig. 2.1 shows the apparatus used by some students during an investigation.

The apparatus is drawn as seen from above.

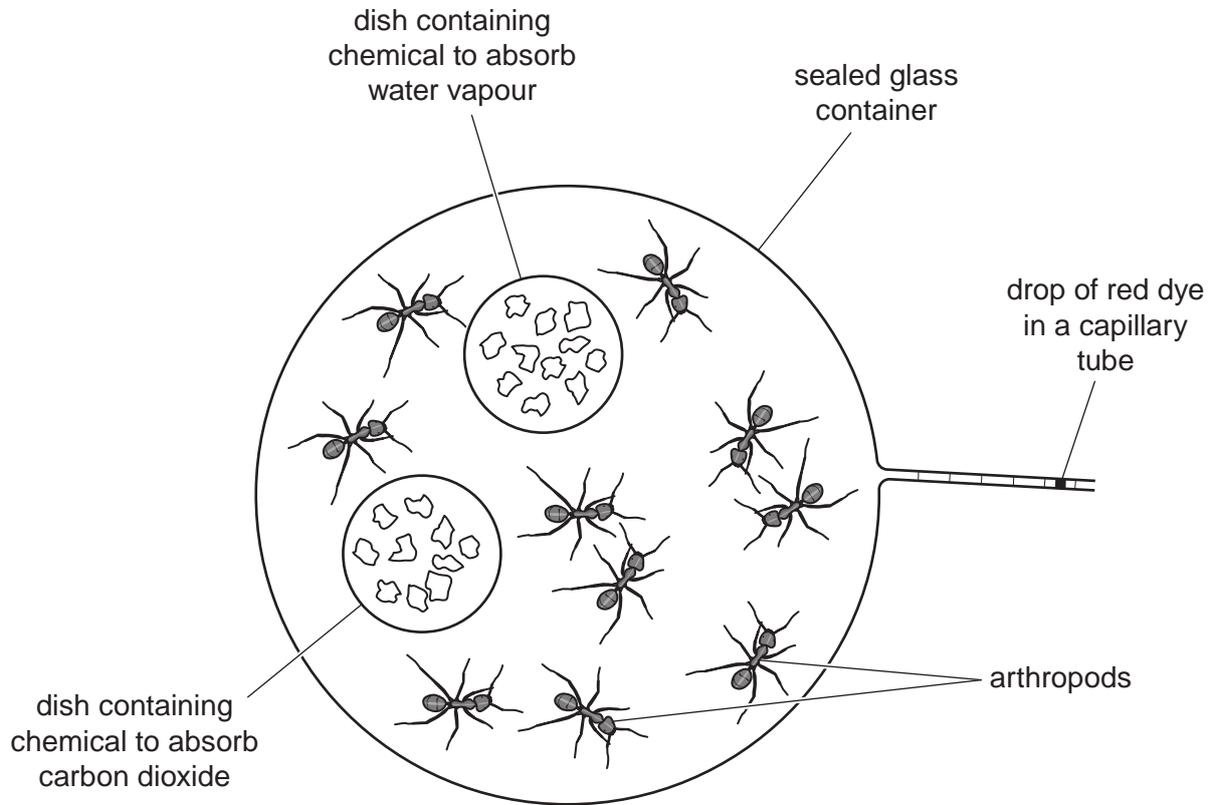


Fig. 2.1

Some arthropods were placed in the container.

A drop of red dye was inserted into the capillary tube.

The drop of red dye in the capillary tube gradually moved towards the arthropods.

(i) Explain why the drop of red dye moved towards the arthropods.

.....

.....

.....

.....

.....

.....

..... [3]

The investigation shown in Fig. 2.1 was repeated at different temperatures.

Fig. 2.2 shows the results.

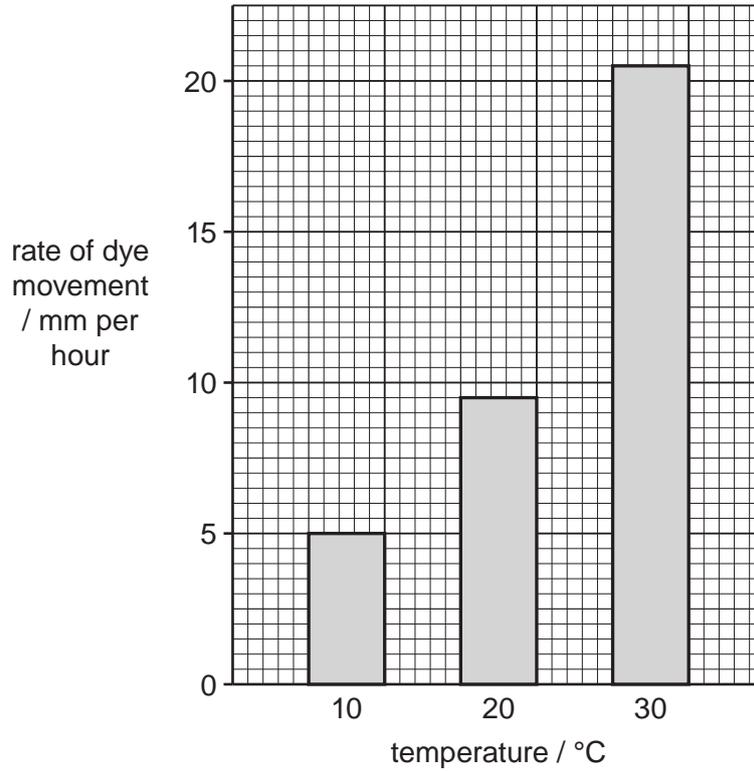


Fig. 2.2

- (ii) State the trend shown in Fig. 2.2.

.....
 [1]

- (iii) Calculate the percentage increase in the rate of dye movement between 10 °C and 20 °C.

Show your working.

.....%
 [2]

[Total: 13]

- 3 Fig. 3.1 is a diagram of the alimentary canal and associated organs.
Some parts are identified by letters.

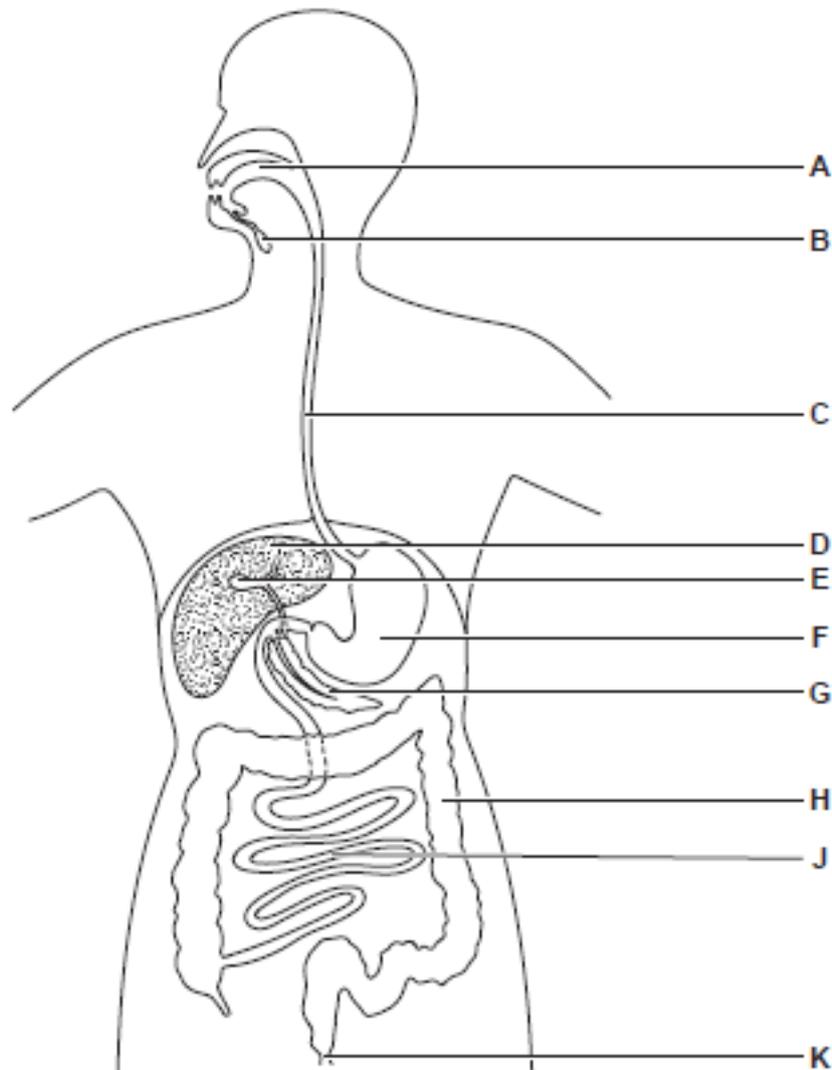


Fig. 3.1

- (a) Complete Table 3.1 by inserting the letter from Fig. 3.1 which identifies the part that carries out the function described.

Table 3.1

description of function	letter in Fig. 3.1
where egestion takes place	
where lipase is made	
where mechanical digestion occurs	
where the most water is absorbed	

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(b) Cholera is a transmissible disease.

(i) State the type of pathogen that causes cholera.

..... [1]

(ii) One of the symptoms of cholera is diarrhoea.

Describe what is meant by the term *diarrhoea*.

.....
..... [1]

(iii) Outline the treatment for diarrhoea.

.....
.....
.....
.....
..... [2]

(c) State **two** ways in which the body can defend itself against pathogens.

1

2

[2]

[Total: 10]

4 (a) Fig. 4.1 is a diagram of a palisade mesophyll cell.

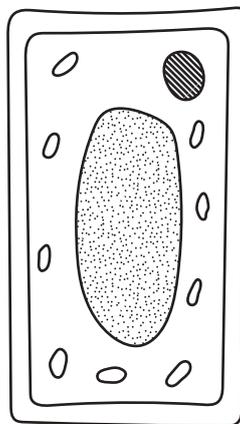


Fig. 4.1

Identify and label the nucleus and a chloroplast on Fig. 4.1.

[2]

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(b) Fig. 4.2 shows the same palisade mesophyll cell after it has been placed in a concentrated sugar solution for twenty minutes.

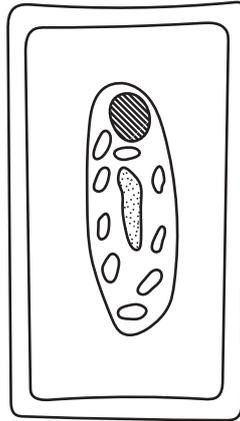


Fig. 4.2

(i) Describe the changes that have taken place in the cell between Fig. 4.1 and Fig. 4.2.

.....
.....
.....
.....
..... [2]

(ii) Explain why the cell in Fig. 4.2 has changed.

.....
.....
.....
.....
.....
..... [3]

(iii) Suggest how the cell in Fig. 4.2 could be treated so that it returned to its original appearance in Fig. 4.1.

.....
..... [1]

(c) (i) State the name of the tissue that transports water up the stem and into a leaf in a plant.

..... [1]

- (ii) Fig. 4.3 shows drawings of sections through a root, a stem and part of a leaf in a dicotyledonous plant.

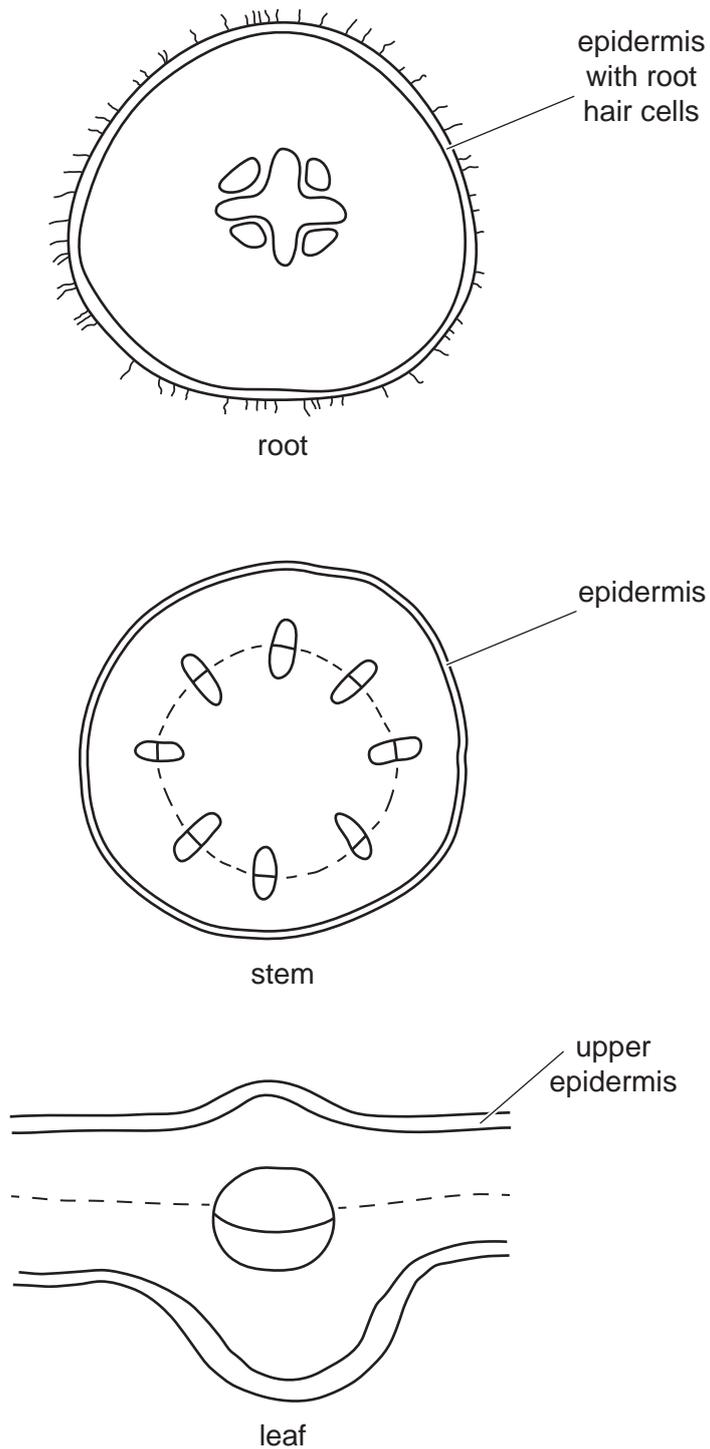


Fig. 4.3

Identify and label with the letter **W**, the position of the water transport tissue in each of the root, the stem and the leaf, on Fig. 4.3. [3]

[Total: 12]

5 (a) Rabbits are herbivores.

Define the term *herbivore*.

.....
..... [2]

(b) The size of a rabbit population can increase and decrease from year to year, as shown in Fig. 5.1.

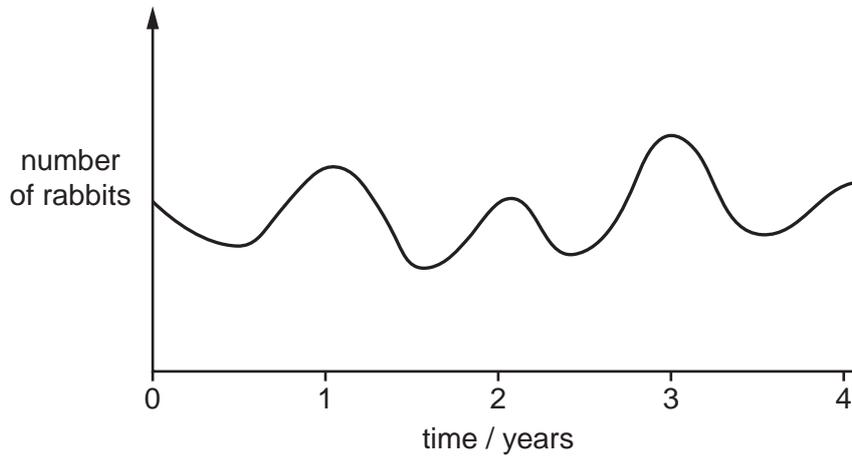


Fig. 5.1

State **two** factors that could cause an increase in a rabbit population.

1
.....
2
..... [2]

(c) Since 1800 the population of humans in the world has increased dramatically.

State **three** ways in which this increase in the human population has affected marine ecosystems.

1

.....

2

.....

3

.....

[3]

[Total: 7]

- 6 (a) Complete the sentences by stating the part of the human body that produces male gametes and the part that produces female gametes.

Male gametes are produced by the

Female gametes are produced by the

[2]

- (b) Fig. 6.1 represents the early stages in the development of a female embryo.

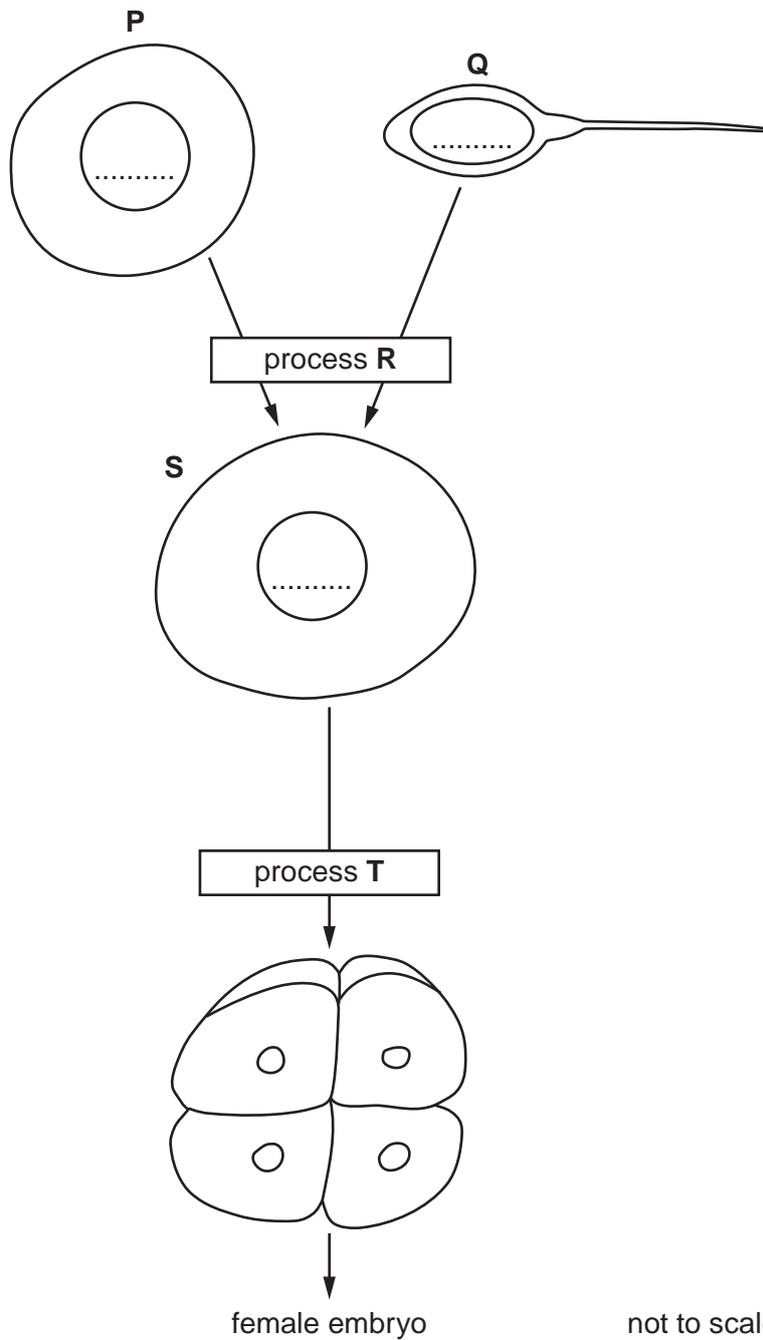


Fig. 6.1

(i) State the names of the cells labelled **P**, **Q** and **S** in Fig. 6.1.

P

Q

S

[3]

(ii) Complete Fig. 6.1 by writing the correct sex chromosomes in structures **P**, **Q** and **S**. [3]

(iii) State the names of processes **R** and **T** in Fig. 6.1.

R

T

[2]

(iv) State the name of the organ in the body in which the female embryo develops.

..... [1]

(c) Some people do not want to have a baby and so use a method of contraception.

Complete Table 6.1 by writing an example for each method of contraception.

Table 6.1

method of contraception	example of contraceptive method
natural	
barrier	
chemical	
surgical	

[4]

[Total: 15]

7 Blood circulates round the body in arteries, veins and capillaries.

(a) Place ticks (✓) in the correct boxes in Table 7.1 to show the features of arteries.

Table 7.1

structure and function	arteries
carries blood at high pressure	
carries blood towards the heart	
has a thick wall	
has a narrow lumen	
has valves present throughout the vessel	

[3]

(b) Fig. 7.1 shows a photomicrograph of a capillary with red blood cells passing through it.

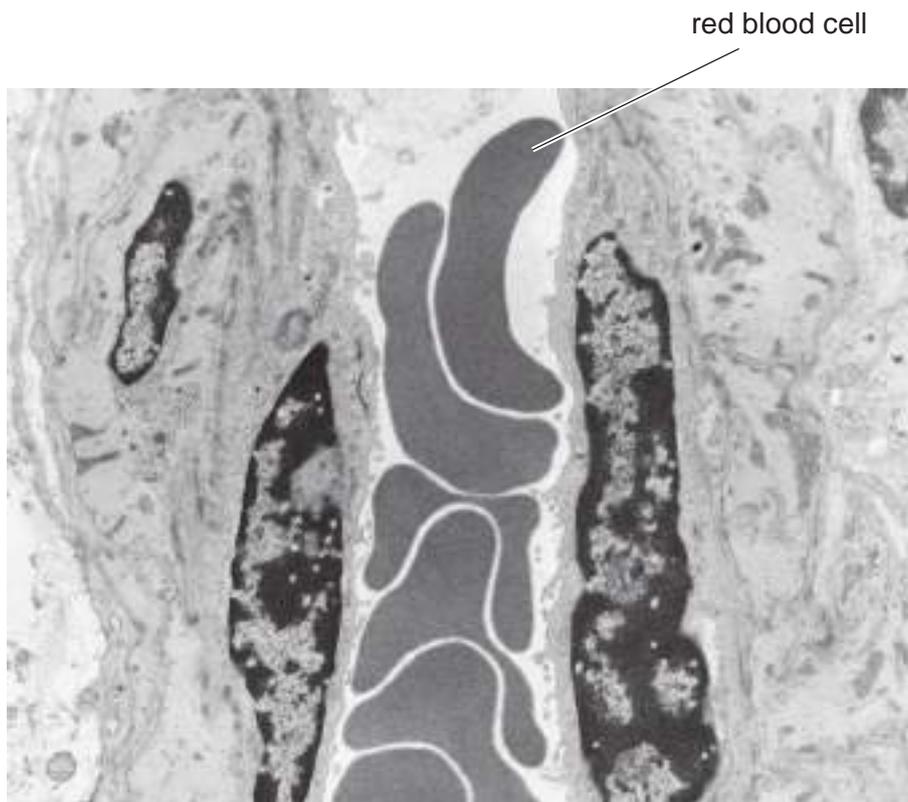


Fig. 7.1

(i) State the function of the red blood cells shown in Fig. 7.1.

.....
..... [1]

(ii) Red blood cells are one component of blood.

State the name of **two** other components of blood.

1
2 [2]

[Total: 6]

8 Fig. 8.1 shows a cat with an inherited condition that means the cat has extra toes.



Fig. 8.1

The allele that causes this condition is dominant to the allele for the normal condition.

Fig. 8.2 shows the inheritance of this condition in a family of cats.

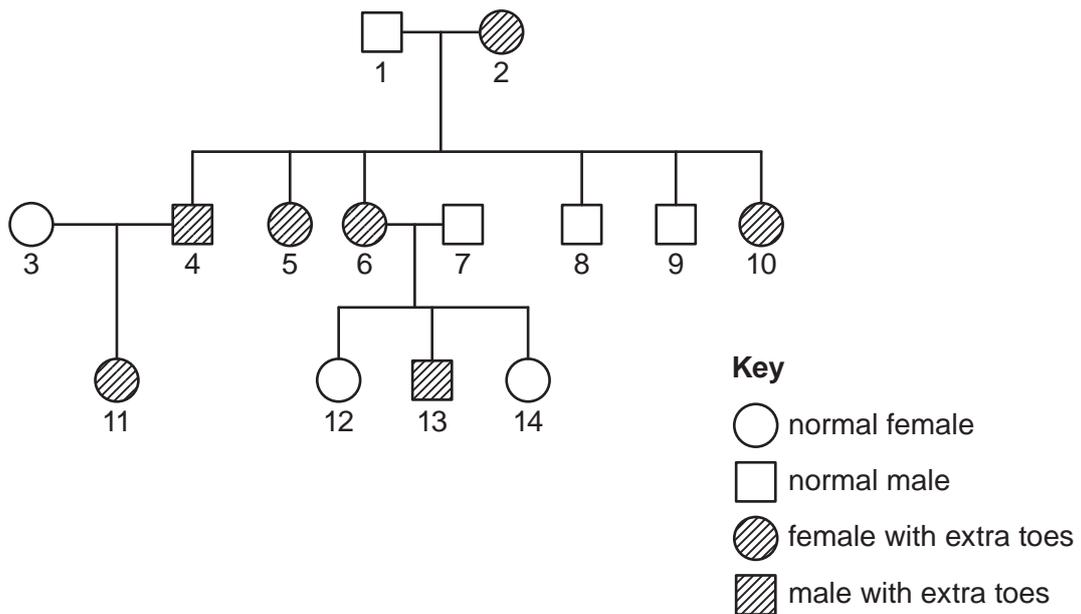


Fig. 8.2

Complete Table 8.1 by stating the genotypes of the numbered individuals.

Use **B** for the dominant allele and **b** for the recessive allele.

Table 8.1

number of individual in Fig. 8.2	genotype of individual
1	
2	
4	
14	

[4]

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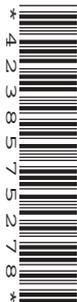
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BIOLOGY

0610/32

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.

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.

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- 1 (a) Table 1.1 shows some of the structures and parts of the alimentary canal and associated organs.

Complete Table 1.1 by identifying the five missing structures and functions.

Table 1.1

structure	function
	where egestion occurs
gall bladder	
	where ingestion occurs
salivary glands	
	where most absorption occurs

[5]

- (b) Lipase is involved in the breakdown of fats.

State the **two** products of fat digestion.

- 1
- 2

[2]

- (c) Enzymes are proteins.

State the chemical elements that enzymes are made from.

..... [2]

[Total: 9]

2 (a) Cholera is an example of a transmissible disease.

Define the term *transmissible disease*.

.....
.....
..... [2]

(b) Cholera is transmitted in contaminated water.

State **two** ways water can be treated to prevent the spread of cholera.

1
2 [2]

(c) Table 2.1 shows the number of reported cases of cholera in the world during 2014 and 2015.

Table 2.1

year	2014	2015
number of cases	191 000	172 000

(i) Calculate the percentage decrease in the number of cases of cholera between 2014 and 2015.

Show your working and give your answer to the nearest whole number.

.....%
[2]

(ii) State the name of the type of organism that causes cholera.

..... [1]

(d) Cholera causes diarrhoea.

(i) Describe what is meant by the term *diarrhoea*.

.....
..... [1]

(ii) Outline the treatment for the symptoms of cholera.

.....
.....
.....
.....
..... [2]

(e) Bacteria are often used in biotechnology.

Complete the sentences using words from the list to explain why bacteria are used.

Each word may be used once, more than once or not at all.

- | | | | |
|-----------------|----------------|------------------|----------------------|
| complex | genetic | identical | non-identical |
| physical | rapid | slow | simple |

Bacteria are useful in biotechnology and engineering due to their reproduction rate and their ability to make molecules.

[3]

[Total: 13]

3 (a) Fig. 3.1 is a drawing of a cross-section of a root.

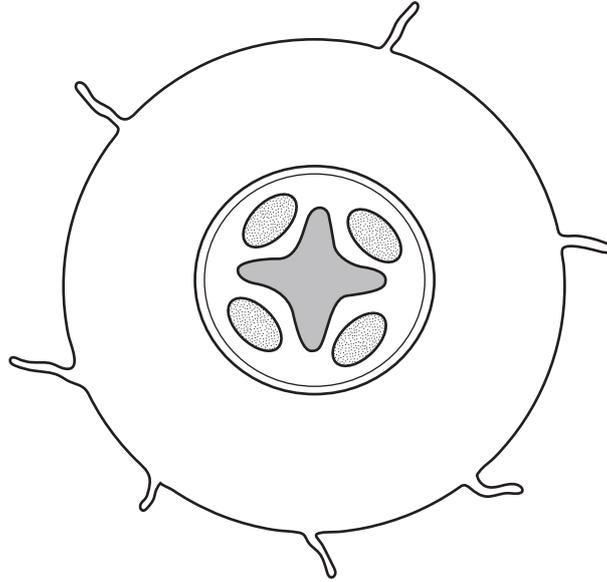


Fig. 3.1

Identify **and** label the structures on Fig. 3.1 using label lines and the labels:

- root hair
- phloem
- xylem.

[3]

(b) Xylem is an example of a plant tissue.

This list shows examples of tissues, organs and organ systems in humans.

- heart**
- fat (under the skin)**
- kidney**
- lung**
- nervous system**

Complete Table 3.1 using the examples from the list.

One has been done for you.

Table 3.1

tissue	organ	organ system
		nervous system

[4]

(c) The list shows some of the structures in a plant.

Write the structures in order of size from smallest to largest.

- chloroplast**
- palisade cell**
- phloem tissue**

root
whole plant

.....

.....

.....

.....

.....

smallest

↓

largest

[3]

[Total: 10]

4 (a) Fig. 4.1 is a diagram of a fetus in the uterus.

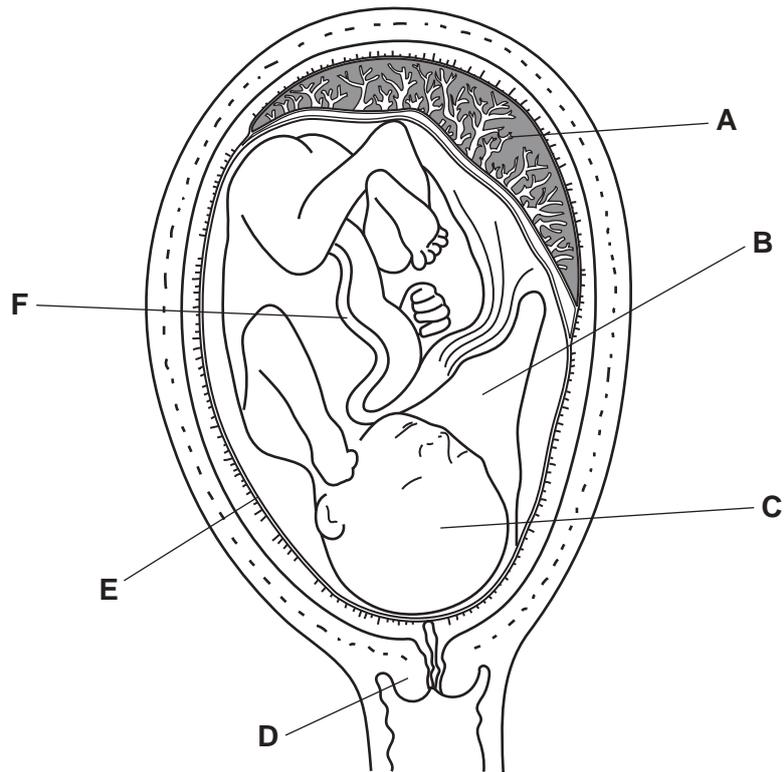


Fig. 4.1

Table 4.1 shows one of the names and the functions of some of the labelled parts shown in Fig. 4.1.

Complete Table 4.1 using the information in Fig. 4.1.

Table 4.1

name of part	letter in Fig. 4.1	function
amniotic sac		contains amniotic fluid
		dilates during birth
		carries materials between mother and fetus

[5]

(b) Describe the changes that occur in the fertilised egg cell up to the point of implantation.

.....
.....
.....
.....
.....
.....
.....
..... [3]

(c) Compare the growth and development of the fetus in the early stages of pregnancy with its growth and development in the late stages of pregnancy.

.....
.....
.....
..... [2]

[Total: 10]

5 (a) Reproduction is a characteristic of all living organisms.

State **two** other characteristics of all living organisms.

1

2

[2]

(b) A specialised cell performs a particular function.

Sperm and egg cells are two types of specialised cell that are involved in reproduction in humans.

State the names of **two other** specialised cells.

1

2

[2]

(c) The term sexual reproduction is in the box on the left.

The boxes on the right show some sentence endings.

Draw straight lines from sexual reproduction to the boxes on the right to make correct sentences.

Sexual reproduction

always involves only one parent.

involves gametes.

includes the process of fertilisation.

only occurs in animals.

only produces genetically identical offspring.

results in the formation of a zygote.

[3]

(d) Fig. 5.1 shows some examples of reproduction.

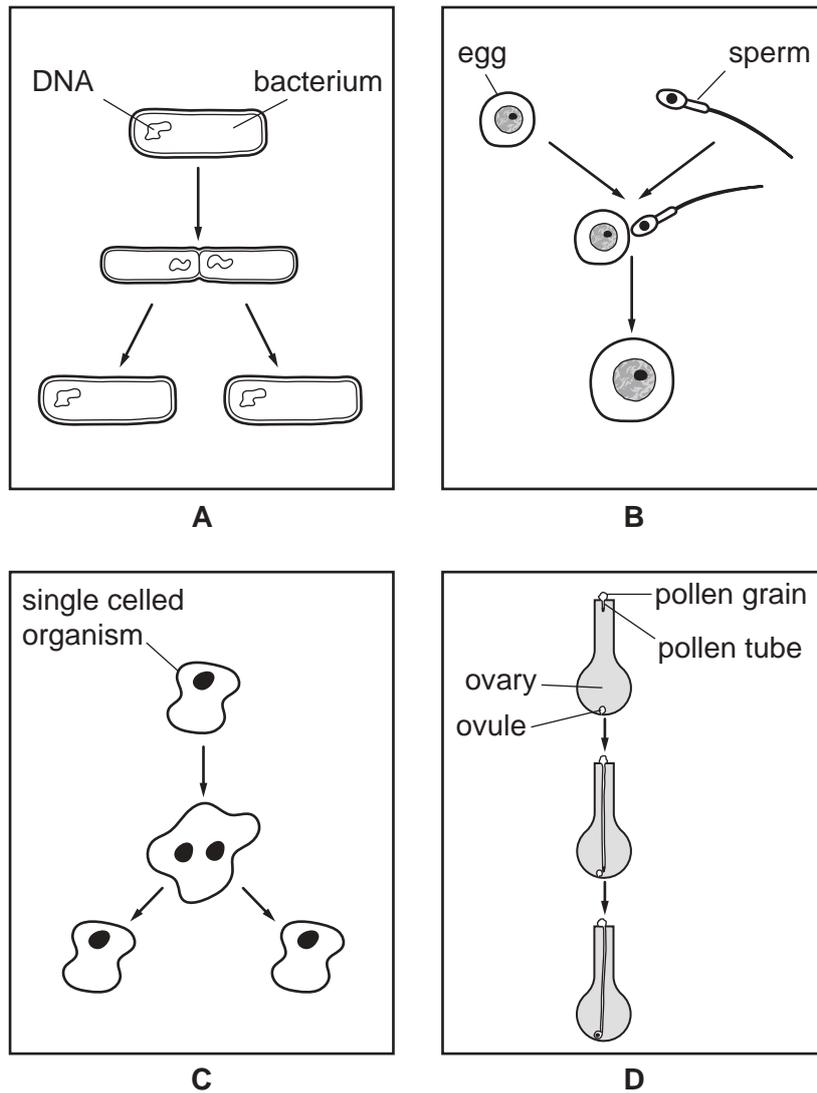


Fig. 5.1

State the letter or letters that identify examples of **asexual** reproduction.

Give a reason for your answer using evidence from Fig. 5.1.

letter(s)

reason

.....

[3]

[Total: 10]

6 Fig. 6.1 is a graph of the world's human population between the years 1000–2000.

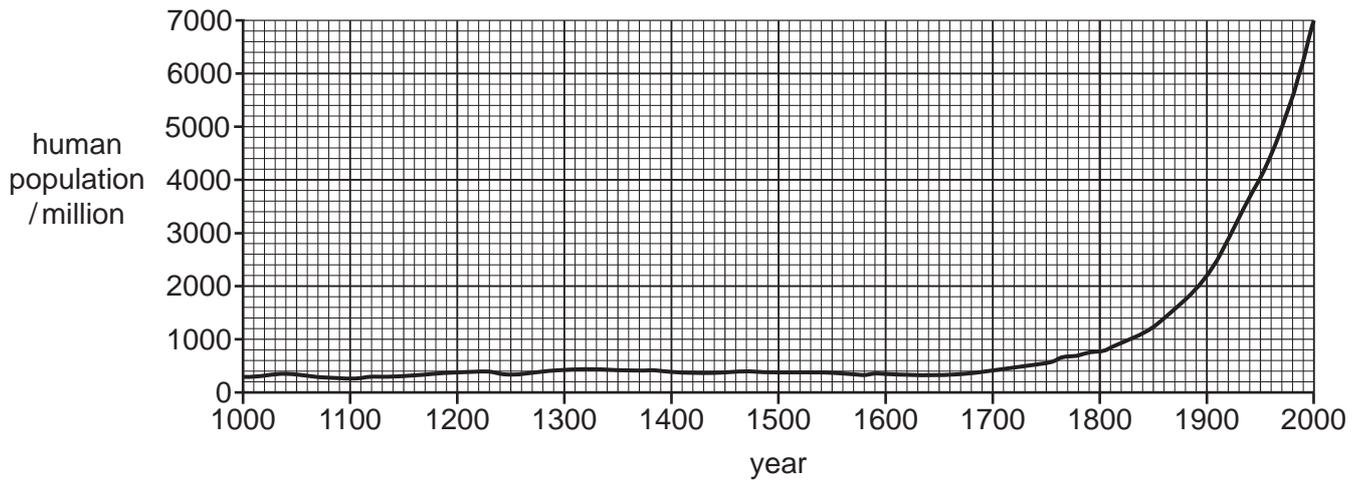


Fig. 6.1

(a) Describe the data shown in Fig. 6.1.

.....

.....

.....

.....

.....

.....

.....

.....

..... [3]

7 (a) Fig. 7.1 is a photomicrograph of a cross-section of part of a leaf.

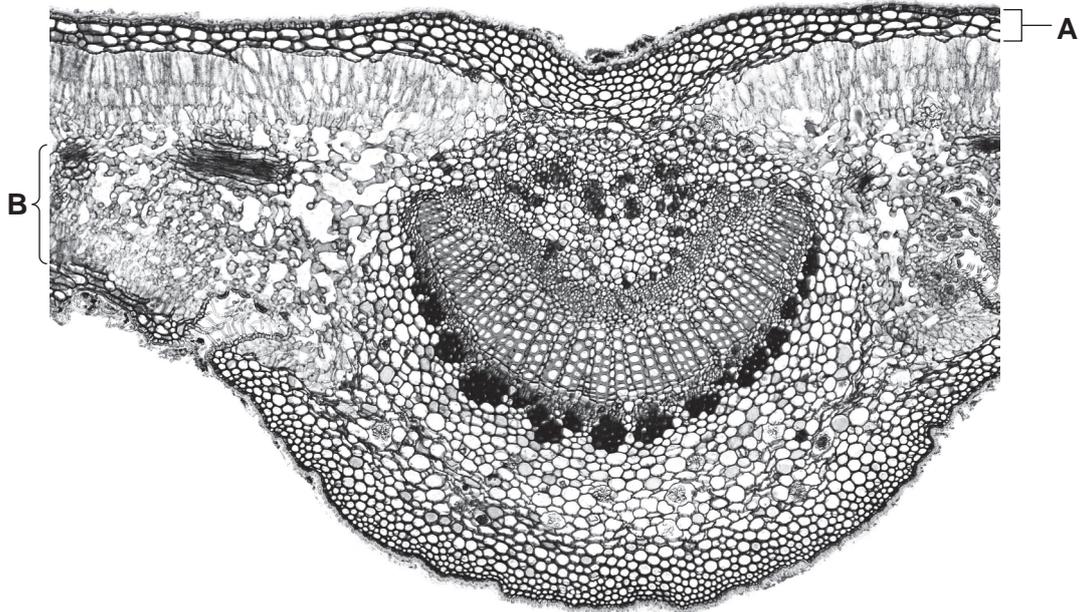


Fig. 7.1

(i) Identify the parts of the leaf labelled **A** and **B** in Fig. 7.1.

A

B

[2]

(ii) Draw a circle around **one** vascular bundle on Fig. 7.1.

[1]

(iii) Draw an arrow to show where an air space is on Fig. 7.1.

[1]

(b) State **three** structures present in both animal and plant cells.

1

2

3

[3]

[Total: 7]

8 (a) Modern technology has increased food production.

The boxes on the left show types of modern technology.

The boxes on the right show how modern technology has improved production.

Draw **five** lines to link the type of modern technology with the way in which it has improved food production.

modern technology

improvement in food production

agricultural machinery

able to use larger areas of land

chemical fertiliser

improve desired features in crops and livestock

herbicide

kills animal pests that damage crops

insecticide

provides nutrients to increase yield

selective breeding

reduce competition with weeds

[4]

(b) Describe **two** negative impacts to an ecosystem of intensive livestock production.

- 1
-
- 2
-

[2]

[Total: 6]

- 9 (a) Three identical potato cylinders were used to investigate water movement in plant cells. Cranberry juice is a red fruit juice that contains natural sugars. Three test-tubes were set up as shown in Fig. 9.1 and left for one hour.

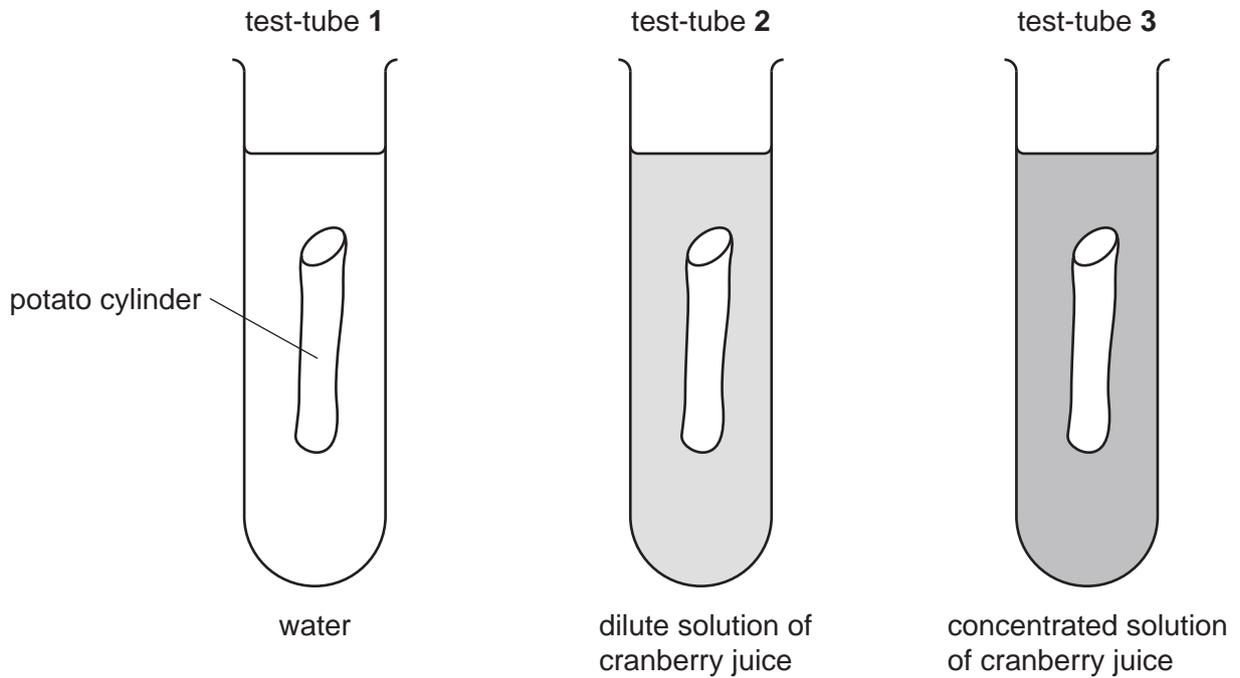


Fig. 9.1

After one hour the potato cylinders were removed from test-tubes 1 to 3.

The mass of each potato cylinder is recorded in Table 9.1.

Table 9.1

test-tube number	mass of the potato cylinder at the start/g	mass of the potato cylinder after one hour/g
1	25	30
2	25	25
3	25	19

- (i) Describe the results for test-tubes 1 and 2.

test-tube 1

.....

test-tube 2

.....

[2]

(ii) Calculate the decrease in the mass of the potato cylinder in test-tube 3.

..... g [1]

(iii) Explain why the potato cylinder lost mass in test-tube 3.

.....
.....
.....
.....
..... [2]

(b) State the name of **one** mineral ion and give a reason why it is important for plant growth.

ion

reason

..... [2]

[Total: 7]

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BIOLOGY

0610/33

Paper 3 Theory (Core)

May/June 2019

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

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Write in dark blue or black pen.

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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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1 (a) Several processes occur in the alimentary canal.

(i) The boxes on the left show the names of processes that occur in the alimentary canal.

The boxes on the right show descriptions of processes that occur in the alimentary canal.

Draw **five** straight lines to link each process with its description.

process	description
absorption	breakdown of food into smaller pieces
chemical digestion	breakdown of large, insoluble molecules into small, soluble molecules
egestion	movement of digested food molecules into cells
ingestion	movement of small food molecules and ions into the blood
mechanical digestion	passing out of food that has not been digested or absorbed
	taking of substances into the body

[5]

(ii) State the name of **one** type of digested food molecule that is absorbed.

..... [1]

(b) The cholera pathogen produces a toxin which affects part of the alimentary canal.

(i) State the type of pathogen that causes cholera.

..... [1]

(ii) One of the symptoms of cholera is diarrhoea.

Describe what is meant by the term *diarrhoea*.

.....
.....
..... [1]

(iii) Outline the treatment for diarrhoea.

.....
.....
.....
.....
..... [2]

[Total: 10]

- 2 (a) Transpiration is the loss of water from plant leaves.

Complete the sentences using the words and phrases from the list.

Each word or phrase may be used once, more than once or not at all.

active transport condenses cortex diffusion
evaporates flows gas guard
liquid osmosis root hair
stomata spongy mesophyll water vapour

Water on the surface of cells

.....

The water vapour moves out of the leaf by into the atmosphere through openings in the leaf called

[4]

- (b) A student compared the mass of water lost from four leaves.

Four similarly-sized leaves were collected from the same plant.

Some of the surfaces of the leaves were covered with a waterproof substance. The mass of each leaf was measured.

The leaves were hung on a piece of string, as shown in Fig. 2.1. The leaves were left for several hours and the mass of each leaf was measured again.

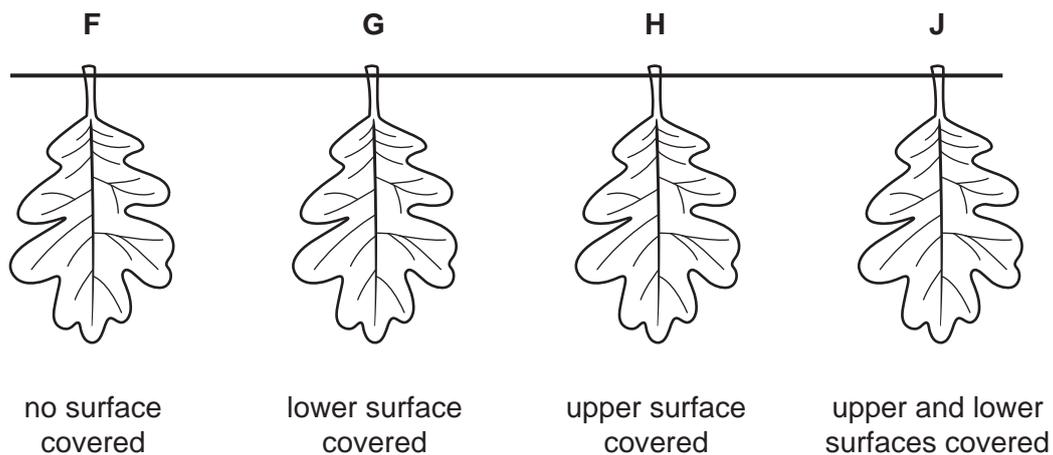


Fig. 2.1

The results from the experiment are shown in Table 2.1.

Table 2.1

leaf	mass at the start/g	mass at the end/g	difference in mass/g
F	0.67	0.40	
G	0.70	0.67	0.03
H	0.69	0.44	0.25
J	0.73	0.73	0.00

(i) Calculate the difference in mass for leaf **F** and write your answer in Table 2.1. [1]

(ii) Describe how the different treatments of the leaves affected their loss of mass.

Use the information in Fig. 2.1 and Table 2.1 to support your answer.

.....

.....

.....

.....

.....

.....

.....

.....

..... [3]

(iii) Suggest a reason for the difference in mass lost between leaves **G** and **H**.

.....

.....

..... [1]

(c) Fig. 2.2 is a photomicrograph of a cross-section of part of a leaf.

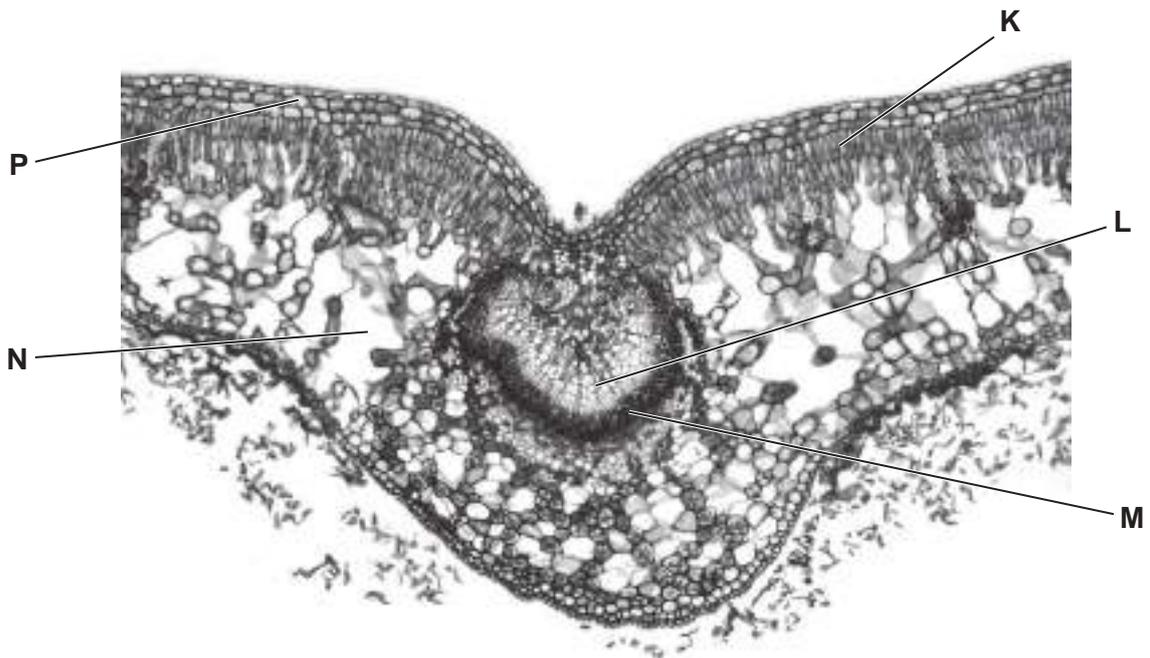


Fig. 2.2

(i) State the letter on Fig. 2.2 which identifies a cell where photosynthesis occurs.

.....

[1]

(ii) State the letter on Fig. 2.2 that identifies the part of the plant that transports water from the roots to the leaves **and** state its name.

.....

name

[2]

[Total: 12]

3 Some bacteria are pathogens.

Bacteria were grown in a Petri dish on agar jelly which contained nutrients. The bacteria covered the whole surface of the agar jelly.

Three paper discs were placed on the agar jelly. Each paper disc contained a different antibiotic. The bacteria were left to grow for 24 hours at 35 °C.

Fig. 3.1 shows the growth of the bacteria on the agar jelly at the start and after 24 hours.

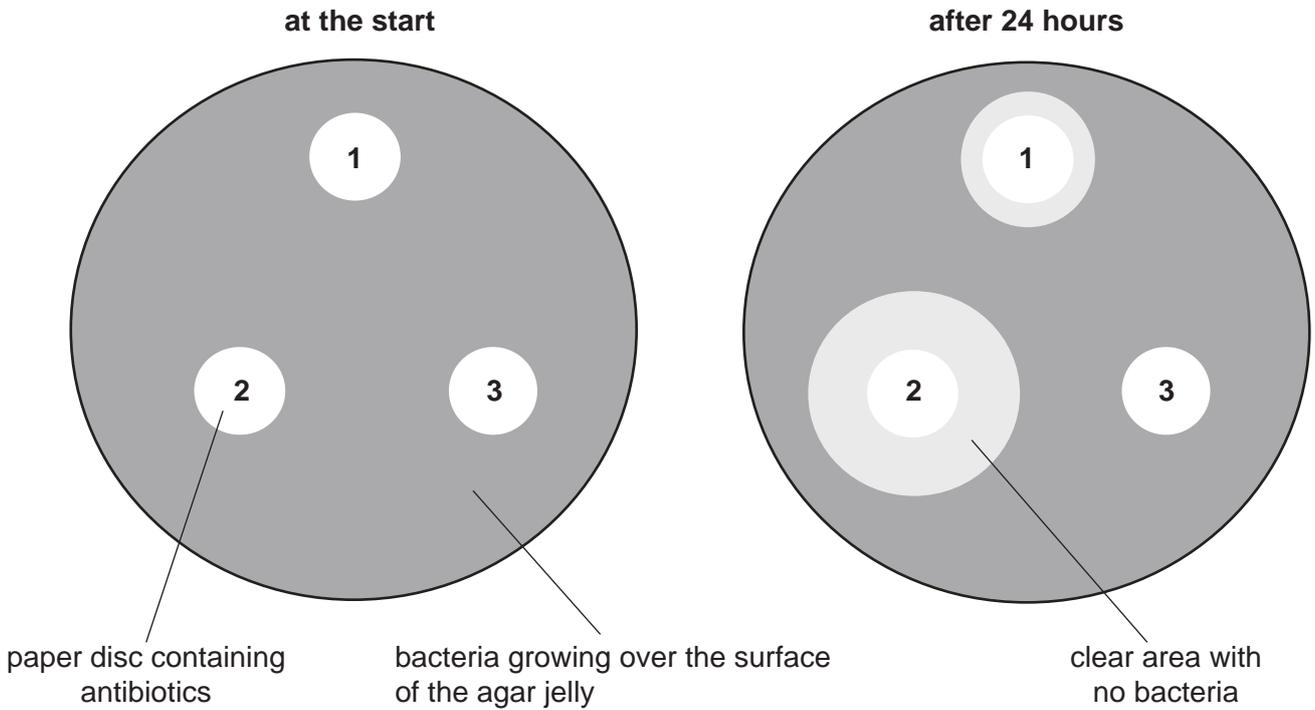


Fig. 3.1

(a) (i) Suggest why there are clear areas around some of the paper discs after 24 hours.

.....

 [1]

(ii) List the numbers of the antibiotics in order from most effective to least effective.

Give a reason for your choice.

most effective least effective

reason

[2]

(b) Fig. 3.2 is a drawing of a bacterial cell.

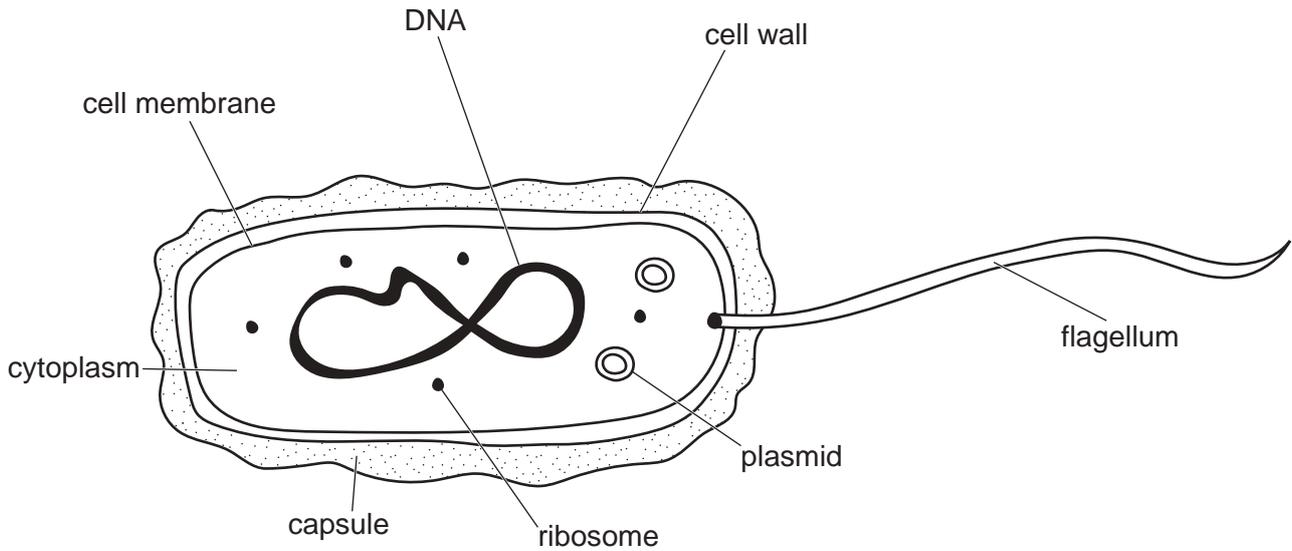


Fig. 3.2

State **three** ways in which a plant cell is similar to the bacterial cell shown in Fig. 3.2.

- 1
- 2
- 3

[3]

(c) Pathogens for transmissible diseases can be transmitted either through direct contact or indirect contact.

Table 3.1 gives examples of ways in which pathogens can be transmitted.

Identify the examples of **direct** contact by placing a tick (✓) in the correct boxes in Table 3.1.

Table 3.1

example	direct contact
air	
blood	
body fluids	
contaminated food	
contaminated surfaces	

[2]

4 Fig. 4.1 is a photograph of a zedonk.

A zedonk is the offspring of a male zebra and a female donkey.



Fig. 4.1

(a) (i) State the name of the group within the animal kingdom to which zebras, donkeys and zedonks belong.

..... [1]

(ii) State **one** feature of the group identified in 4(a)(i) that is visible in Fig. 4.1.

..... [1]

(b) The zedonk was produced by *sexual reproduction*.

Define the term *sexual reproduction*.

.....
.....
..... [3]

(c) Fig. 4.2 shows a plant.

This plant reproduces asexually by producing plantlets on side shoots.

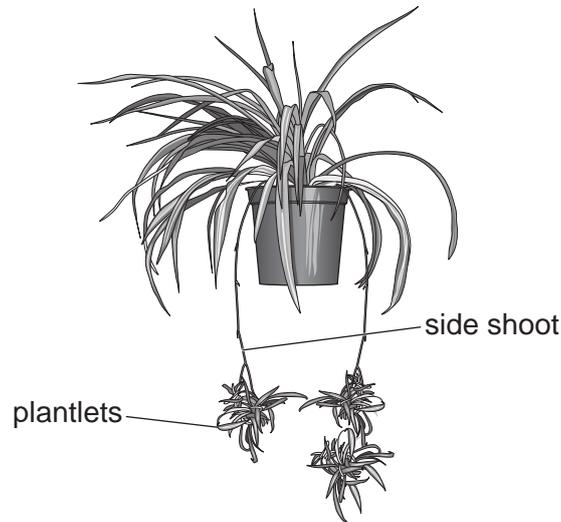


Fig. 4.2

The box on the left contains the term asexual reproduction. The boxes on the right show some sentence endings.

Draw **two** straight lines from the asexual reproduction box to the boxes on the right to make two correct sentences.

Asexual reproduction

needs male and female gametes.

needs two parents.

only needs one parent.

produces offspring that are a different species.

produces offspring that are genetically different to the parents.

produces offspring that are genetically identical to the parent.

[2]

[Total: 7]

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[Turn over

5 (a) List **two** features of human gas exchange surfaces.

- 1
- 2

[2]

(b) Carbon dioxide is excreted through the lungs.

(i) Describe a chemical test that would identify that the gas excreted through the lungs is carbon dioxide.

chemical test

.....

positive test result

.....

[2]

(ii) There are differences between the composition of inspired and expired air.

Table 5.1 shows **four** of the gases that make up air and the percentage of each gas that is in inspired and expired air.

Use numbers from the list to complete the table.

Each number can be used once, more than once or not at all.

- 4.00 58.00 21.00 16.00
- 0.04 78.00 1.00 0.96

Table 5.1

gas	percentage in inspired air	percentage in expired air
carbon dioxide	0.04	
oxygen		16.00
Z	variable	increased
nitrogen	78.00	78.00

[2]

(iii) State the name of gas **Z** shown in Table 5.1.

..... [1]

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(c) An athlete measured his breathing rate during 12 minutes of exercise.

The results are shown in Fig. 5.1.

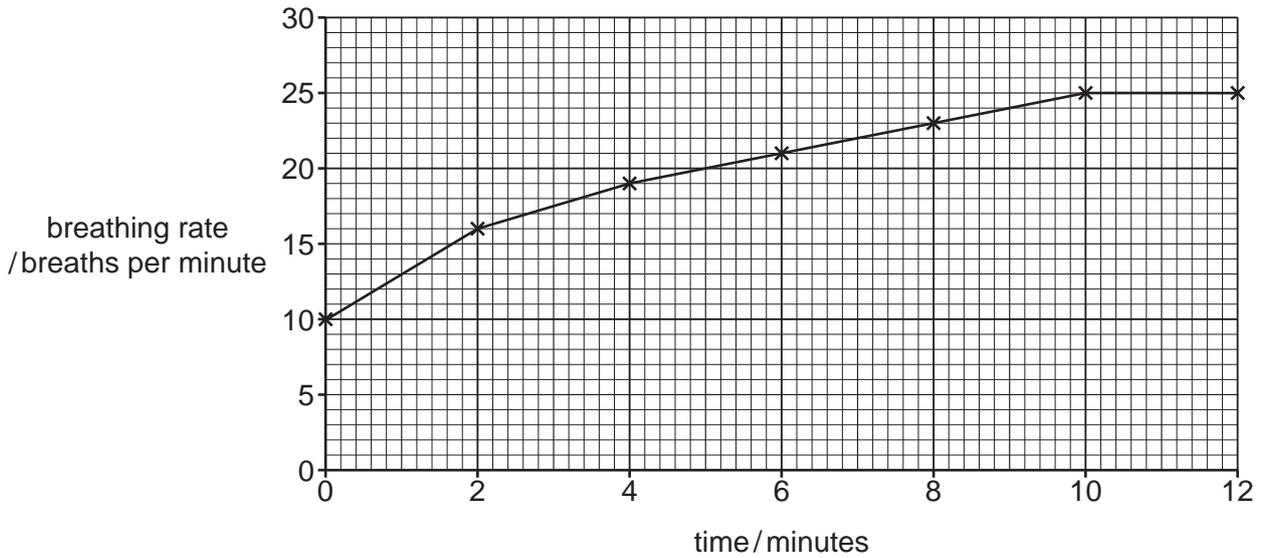


Fig. 5.1

(i) Describe the changes in the breathing rate, while the athlete was exercising, shown in Fig. 5.1.

.....

.....

.....

.....

..... [3]

(ii) Calculate the percentage change in the breathing rate between 0 and 10 minutes.

Give your answer to the nearest whole number.

Show your working.

..... %

[2]

(iii) The activity of the heart can also be used to monitor the effects of physical activity.

State **two** methods that can be used to monitor the activity of the heart.

1

2

[2]

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[Turn over

6 (a) Fig. 6.1 shows a fetus during the final stage of pregnancy.

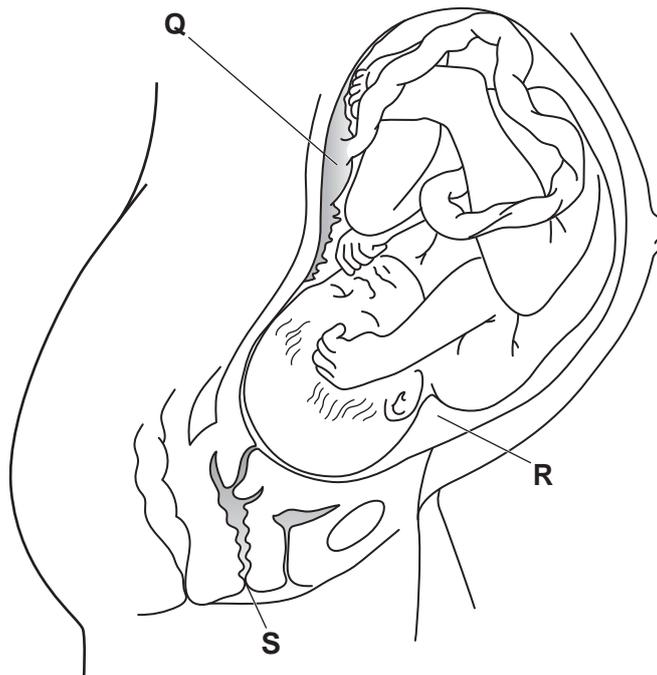


Fig. 6.1

(i) The boxes on the left show a letter from Fig. 6.1.

The boxes in the middle show the name of a part shown in Fig. 6.1.

The boxes on the right show the function of each part.

Draw **one** line to link each letter from Fig. 6.1 to its correct name.

Draw **one** line to link each name to its correct function.

Draw a total of **six** lines.

letter on Fig. 6.1	name	function
Q	amniotic fluid	exchange of nutrients or gases
R	placenta	protects the fetus from damage
S	vagina	receives sperm during sexual intercourse

[4]

(ii) Table 6.1 shows some of the events (A to F) that occur during birth.

Table 6.1

A	passage through the vagina
B	breaking of the amniotic sac
C	delivery of the afterbirth
D	dilation of the cervix
E	contraction of the muscle in the uterus wall
F	tying and cutting the umbilical cord

Put the events into the correct sequence by ordering the letters.

One has been done for you.

		B			
--	--	----------	--	--	--

[3]

(b) The diet of a woman is very important during pregnancy.

(i) State the name of **one** component of a pregnant woman's diet that is needed for the formation of bones in the fetus.

..... [1]

(ii) State the importance of iron in a pregnant woman's diet.

.....
 [1]

(iii) State **one** source of iron in the diet.

..... [1]

(iv) State why women are often advised to avoid alcohol consumption during pregnancy.

.....

 [1]

[Total: 11]

7 A student investigated the rate of oxygen uptake during aerobic respiration in woodlice. Woodlice are arthropods.

(a) State the word equation for aerobic respiration.

..... [2]

(b) Fig. 7.1 shows the apparatus the student used. Soda lime absorbs carbon dioxide.

When the tap is closed air cannot move into or out of the apparatus. The coloured liquid moves when the tap is closed.

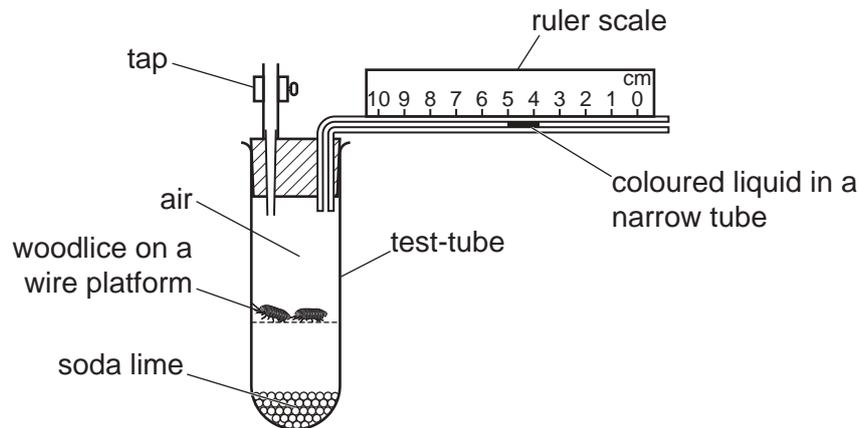


Fig. 7.1

Table 7.1 shows the results of this investigation.

Table 7.1

time/minutes	position of the coloured liquid on the ruler scale/cm
0	1.0
2	2.1
4	3.1
6	4.2
8	5.5
10	5.9
12	7.5

(i) Explain why the coloured liquid moves towards the woodlice during the investigation.

.....
.....
.....
.....
.....
.....
..... [3]

(ii) Suggest why it is important that the temperature of the apparatus did not exceed 40 °C.

.....
.....
.....
..... [2]

(iii) Respiration releases energy.

State **two** uses of energy in the body of a human.

1

2 [2]

[Total: 9]

8 (a) Fig. 8.1 shows the pyramid of numbers for a food chain in a forest.

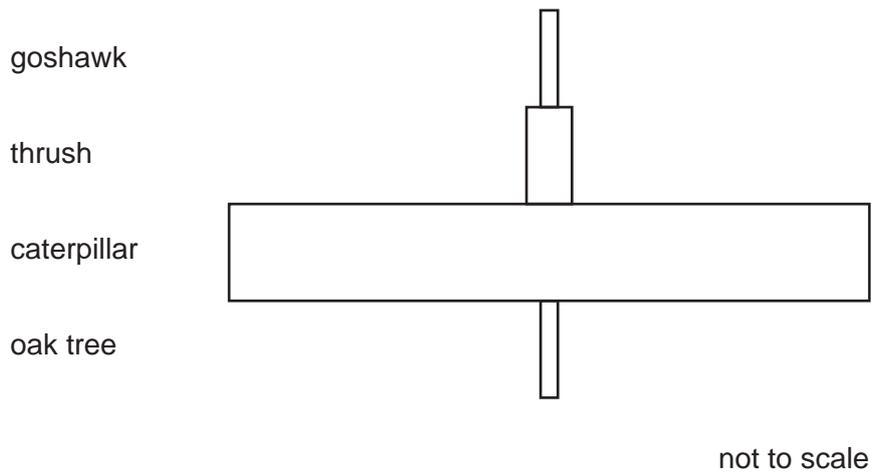


Fig. 8.1

(i) State the name of the organism in Fig. 8.1 that has the largest number of individuals in the pyramid of numbers.

..... [1]

(ii) State the name of the secondary consumer in Fig. 8.1.

..... [1]

(iii) State the principal source of energy input in a food chain.

..... [1]

(b) Fig. 8.2 shows the pyramid of numbers for a food chain in a lake.

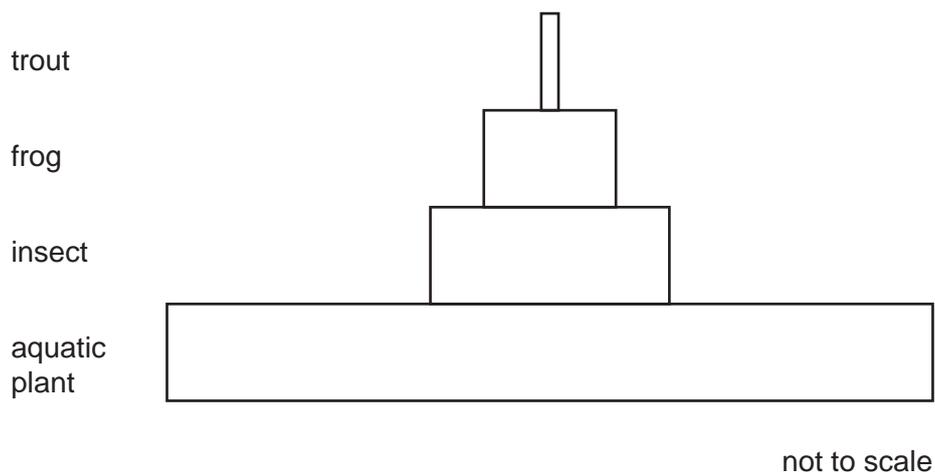


Fig. 8.2

(i) The pyramids of numbers in Fig. 8.1 and Fig. 8.2 are different shapes. Explain why they are different.

.....
.....
..... [1]

(ii) Most of the trout from the lake in Fig. 8.2 were caught by fishermen.

State **and** explain what effect this might have on the populations of frogs and insects.

frogs
.....
.....

insects
.....
.....

[4]

(c) Bacteria and fungi obtain energy from dead organic material.

Put a tick (✓) in the box that describes bacteria and fungi.

carnivores	<input type="checkbox"/>
decomposers	<input type="checkbox"/>
herbivores	<input type="checkbox"/>
producers	<input type="checkbox"/>

[1]

[Total: 9]

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BIOLOGY

Paper 4 Theory (Extended)

0610/41

May/June 2019

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

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1 All commercial breeds of sheep belong to the species *Ovis aries*.

(a) Define the term *species*.

.....

.....

.....

.....

..... [2]

The Merino is a breed of sheep that is farmed mainly for its wool. The wool is very thick and is made of lots of very thin hairs.

Fig. 1.1 shows a female Merino sheep with her newborn lamb.



Fig. 1.1

(b) The presence of hair is a feature that is only found in mammals.

State **two other** features that distinguish mammals from all other vertebrates.

1

2

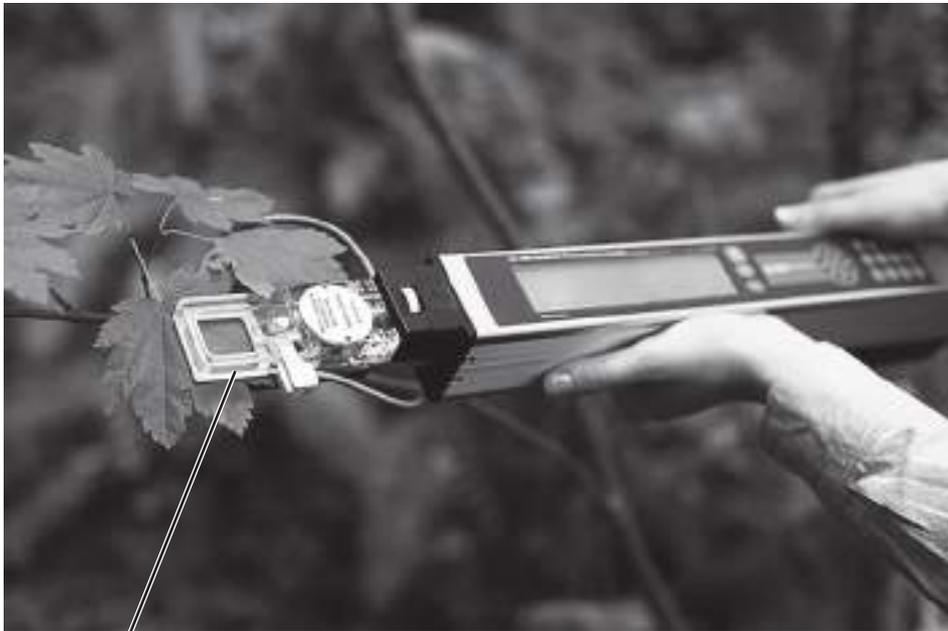
[2]

2 The rate of photosynthesis of terrestrial plants can be determined by measuring the uptake of carbon dioxide.

(a) Explain why plants take up carbon dioxide during photosynthesis.

.....
.....
.....
.....
..... [2]

(b) The rate of photosynthesis of parts of individual leaves can be measured using a hand-held device as shown in Fig. 2.1.



transparent chamber

Fig. 2.1

This apparatus allows air to flow through the transparent chamber that encloses part of the leaf. The apparatus measures the carbon dioxide concentration of the air entering and leaving the chamber.

Explain how the results from the apparatus can be used to calculate the rate of photosynthesis.

.....
.....
.....
..... [2]

- (c) A student used the apparatus shown in Fig. 2.1 to investigate the effect of temperature on the rate of photosynthesis of the leaves of Chinese plantain, *Plantago asiatica*, at two different concentrations of carbon dioxide, **A** and **B**.

Fig. 2.2 shows the results of the investigation.

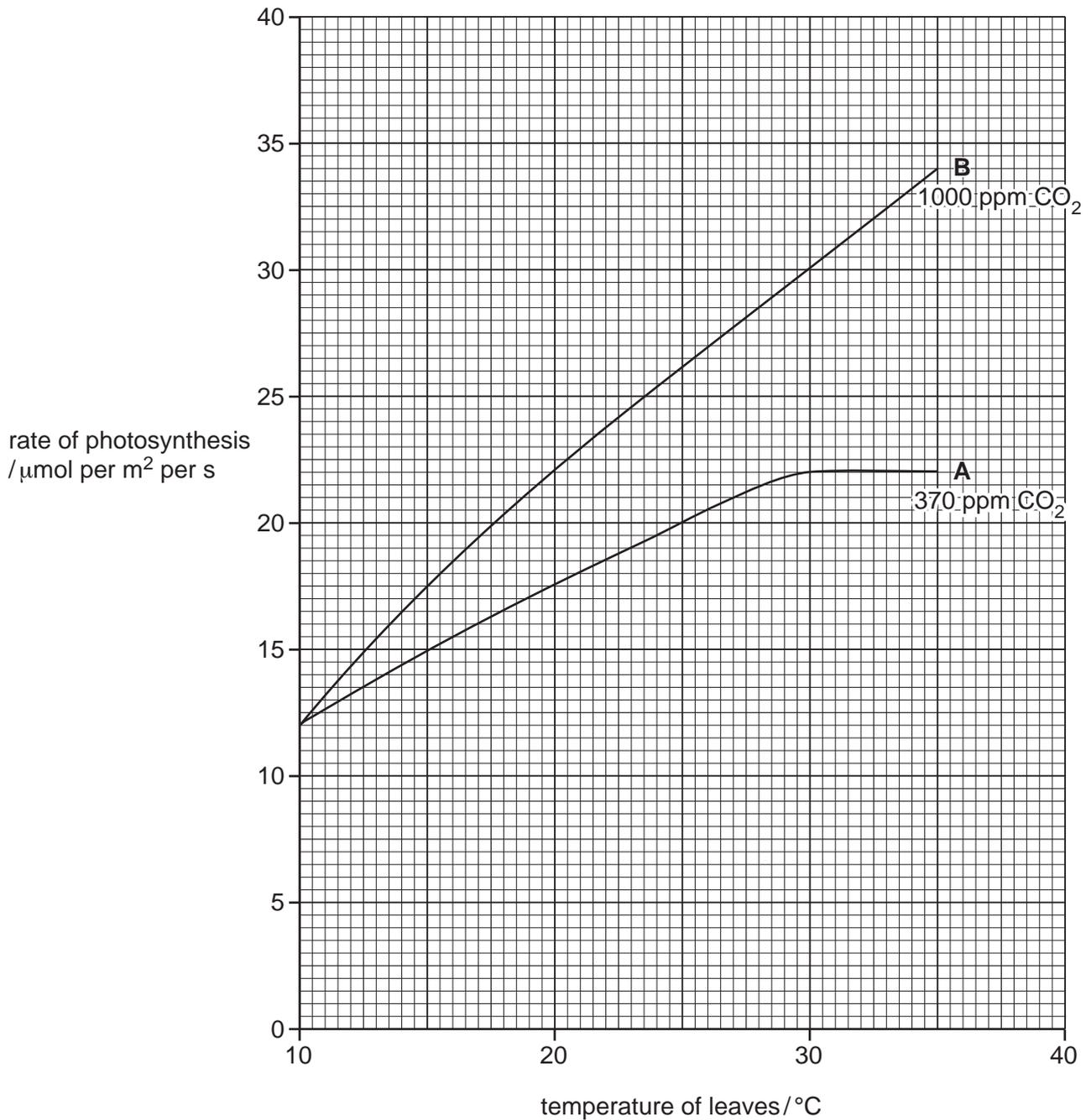


Fig. 2.2

- (i) State **one** environmental factor that should have been kept constant in this investigation.

..... [1]

- (ii) Describe the effect of temperature on the rate of photosynthesis when carbon dioxide concentration **A** was supplied.

Use the data from Fig. 2.2 in your answer.

.....

.....

.....

.....

.....

.....

.....

..... [3]

- (iii) Calculate the percentage increase in the rate of photosynthesis at 30 °C when the carbon dioxide concentration was increased from **A** to **B** as shown in Fig. 2.2.

Show your working and give your answer to the nearest whole number.

..... %

[2]

- (iv) Explain the effect of increasing temperature on the rate of photosynthesis for carbon dioxide concentration **B**.

Use the term *limiting factor* in your answer.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [3]

- (v) The student concluded that carbon dioxide concentration is the factor limiting the rate of photosynthesis between 30 °C and 35 °C for the results shown for **A** in Fig. 2.2.

State the evidence for this conclusion.

.....

.....

..... [1]

- (d) A similar investigation was carried out on Arizona honeysweet, *Tidestromia oblongifolia*, that grows in Death Valley in California where the highest temperatures may be greater than 45 °C.

The results are shown in Fig. 2.3.

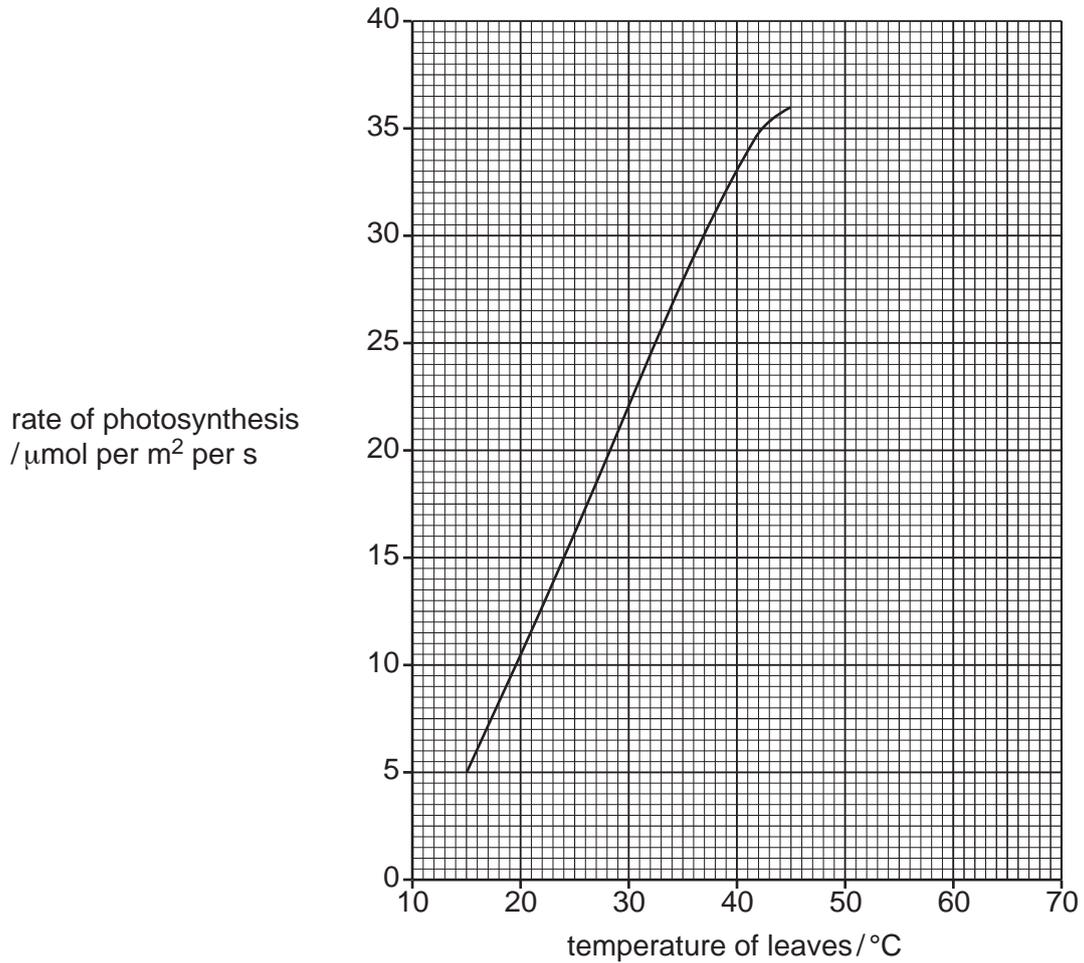


Fig. 2.3

Predict **and** explain what would happen to the rate of photosynthesis if the investigation is continued at temperatures higher than 45 °C.

.....

.....

.....

.....

..... [2]

[Total: 16]

3 (a) Complete the five sentences about the eye and the nervous system.

Structures in the eye change the shape of the lens so that the eye can focus on near and distant objects. This is called

The radial and circular muscles in the iris of the eye are a pair of muscles that work against each other.

Muscles in the eye are controlled by the nervous system. The nervous system contains only sensory and motor neurones.

The nerve from the eye contains sensory neurones that conduct impulses to the

[5]

(b) Transmission of impulses relies on the flow of ions through the cell membranes of neurones down their concentration gradients. Active transport is responsible for maintaining the concentration gradients of ions across the membranes of neurones.

Explain how ions are moved across membranes by active transport.

.....
.....
.....
.....
.....
.....
.....
..... [3]

(c) Fig. 3.1 shows the junction between two neurones.

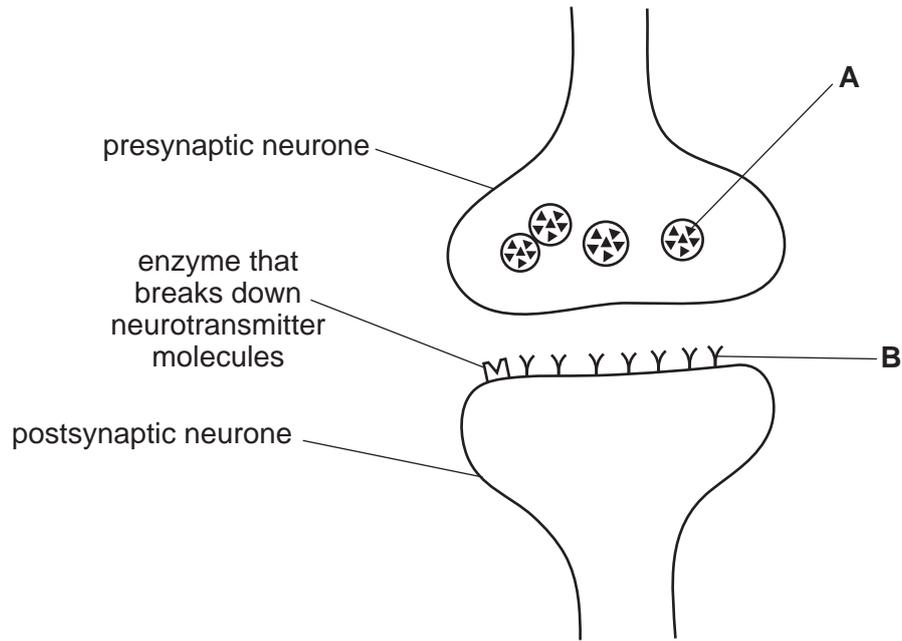


Fig. 3.1

Many drugs interfere with the action of neurotransmitters at the junctions between neurones.

Two drugs that influence the transmission of impulses between neurones are atropine and eserine. The actions of these drugs are shown in Table 3.1.

Table 3.1

drug	action at junctions between neurones
atropine	blocks receptor molecules for neurotransmitters
eserine	blocks the enzyme that breaks down neurotransmitters

- 4 (a) Table 4.1 shows four structures associated with the human male reproductive system. Complete Table 4.1 by identifying the level of organisation of each structure. Choose your answers from the list.

cell **cell structure** **organ**
organ system **organism** **tissue**

Table 4.1

structure	level of organisation
epithelium	
nucleus	
sperm	
testis	

[4]

- (b) Fig. 4.1 shows the male reproductive system.

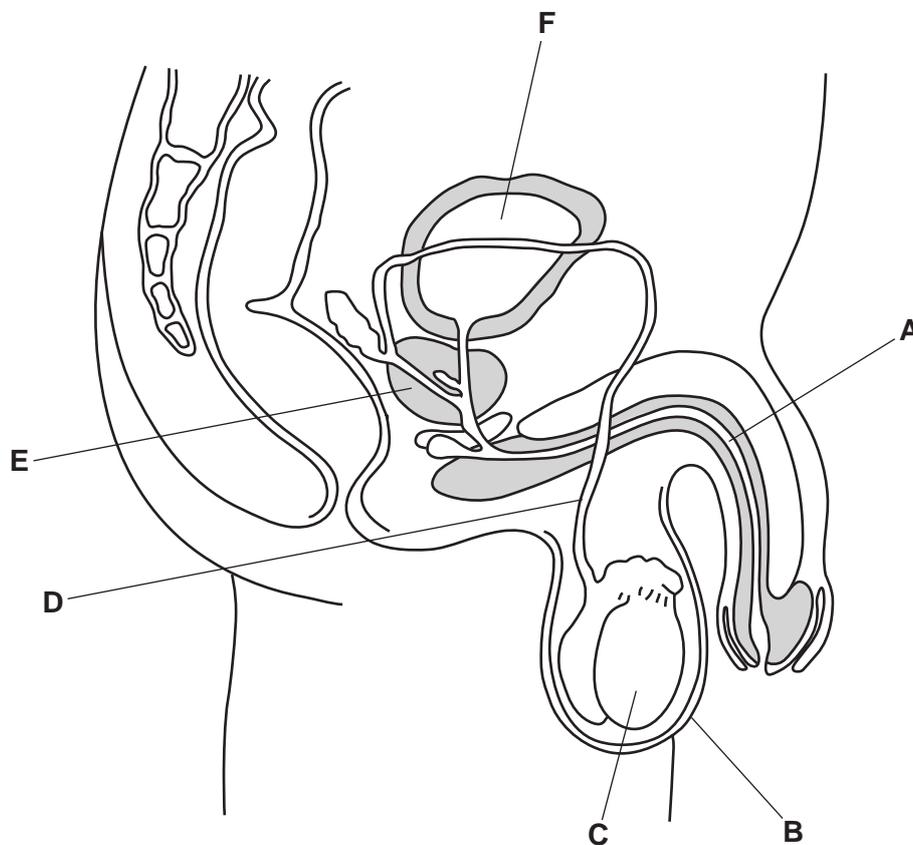


Fig. 4.1

Table 4.2 shows information about the male reproductive system shown in Fig. 4.1.

Complete Table 4.2.

Table 4.2

name of structure	function	letter in Fig. 4.1
testis		
	transports sperm but not urine	
	tube for urine and seminal fluid through the penis	
prostate gland		
	contains the testes	

[5]

(c) Draw an **X** on Fig. 4.1 on the structure where meiosis occurs.

[1]

(d) Sperm and eggs each have a nucleus which is haploid.

(i) Define the term *haploid nucleus*.

.....

 [1]

(ii) State the number of chromosomes in a human haploid nucleus.

..... [1]

[Total: 12]

- 5 (a) Tissue plasminogen activators (TPAs) are human proteins that are used as drugs to break down blood clots.

TPAs break down blood clots by activating plasminogen. Plasminogen is a protein that is always present in the blood.

When activated, plasminogen forms a protease that breaks down fibrin molecules.

- (i) Plasminogen is found in the plasma.

State what is meant by the term *plasma*.

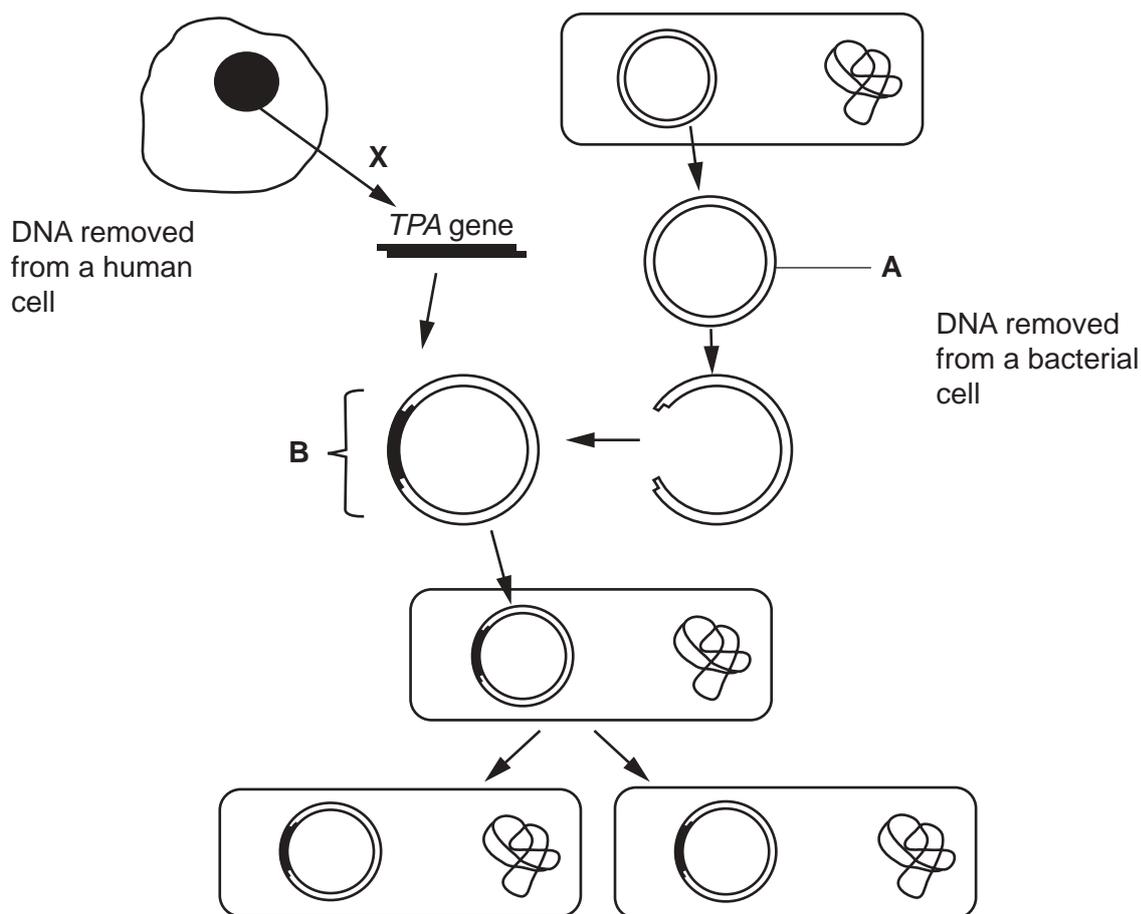
..... [1]

- (ii) State the products of the action of protease on the protein fibrin.

..... [1]

TPAs can be produced by genetically-engineered bacteria.

Fig. 5.1 shows some of the stages involved in genetically engineering a bacterium to make a TPA.



not to scale

Fig. 5.1

(b) (i) State the name of structure **A** in Fig. 5.1.

..... [1]

(ii) In the flow chart, **X** represents the action of an enzyme on a molecule of DNA.

State the name of this enzyme.

..... [1]

(iii) The *TPA* gene is inserted into structure **A**.

Explain how the gene is inserted into structure **A** to form structure **B** as shown in Fig. 5.1.

.....
.....
.....
.....
.....
.....
.....
.....
..... [3]

(iv) Before TPA was made by genetically-engineered bacteria it was only available from blood donated by people.

Suggest **one** advantage of producing TPA by genetically-engineered bacteria.

.....
..... [1]

(v) The genetically-engineered bacteria produce mRNA that is a copy of the human *TPA* gene.

Explain the role of mRNA in the bacterium.

.....
.....
.....
.....
..... [2]

[Total: 10]

6 Fig. 6.1 shows some cells from the shoot tip of an onion, *Allium cepa*.

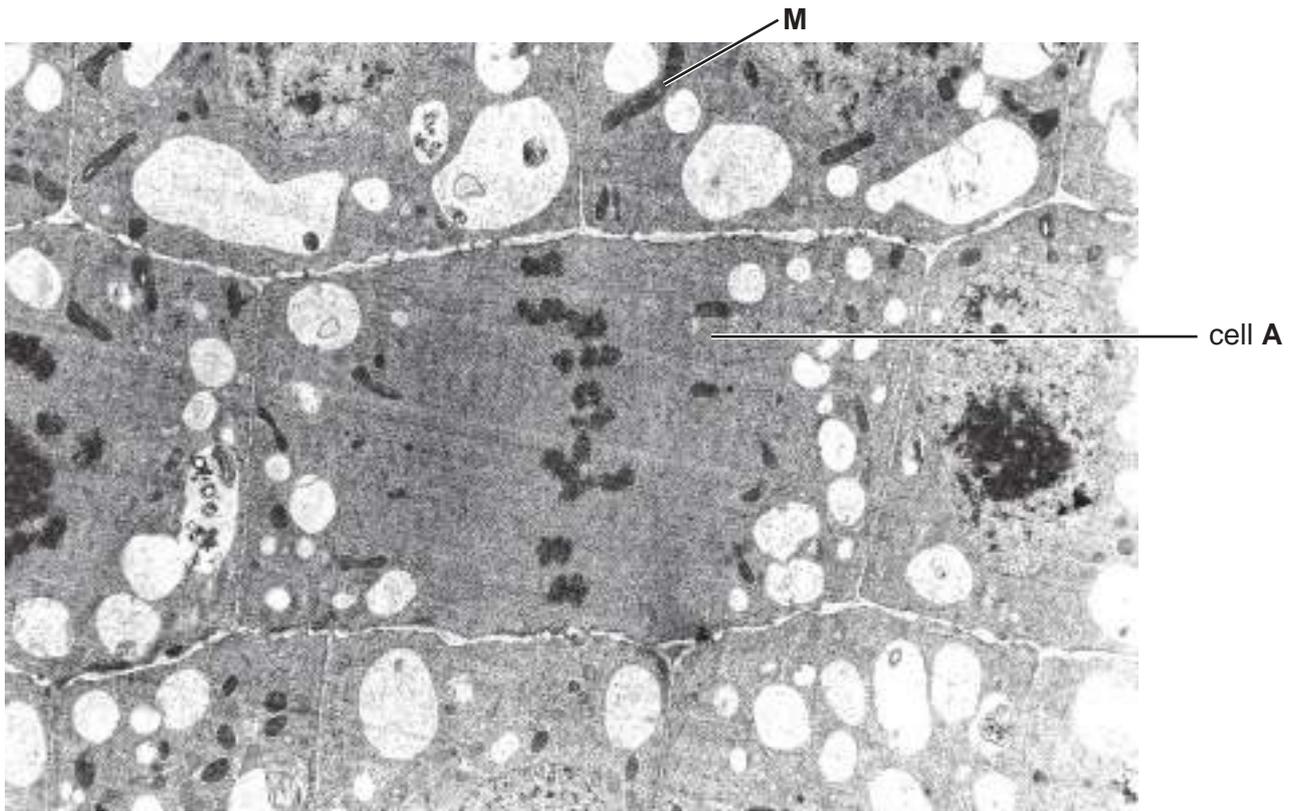


Fig. 6.1

(a) (i) State the evidence visible in Fig. 6.1 that identifies the cells of *A. cepa* as plant cells.

..... [1]

(ii) Cell A is dividing by mitosis.

State the role of mitosis in a shoot tip.

.....

 [1]

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BIOLOGY

Paper 4 Theory (Extended)

0610/42

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.

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 **18** printed pages and **2** blank pages.

1 Biotechnology is used in the process of bread-making.

Fig. 1.1 shows some of the steps in making bread.

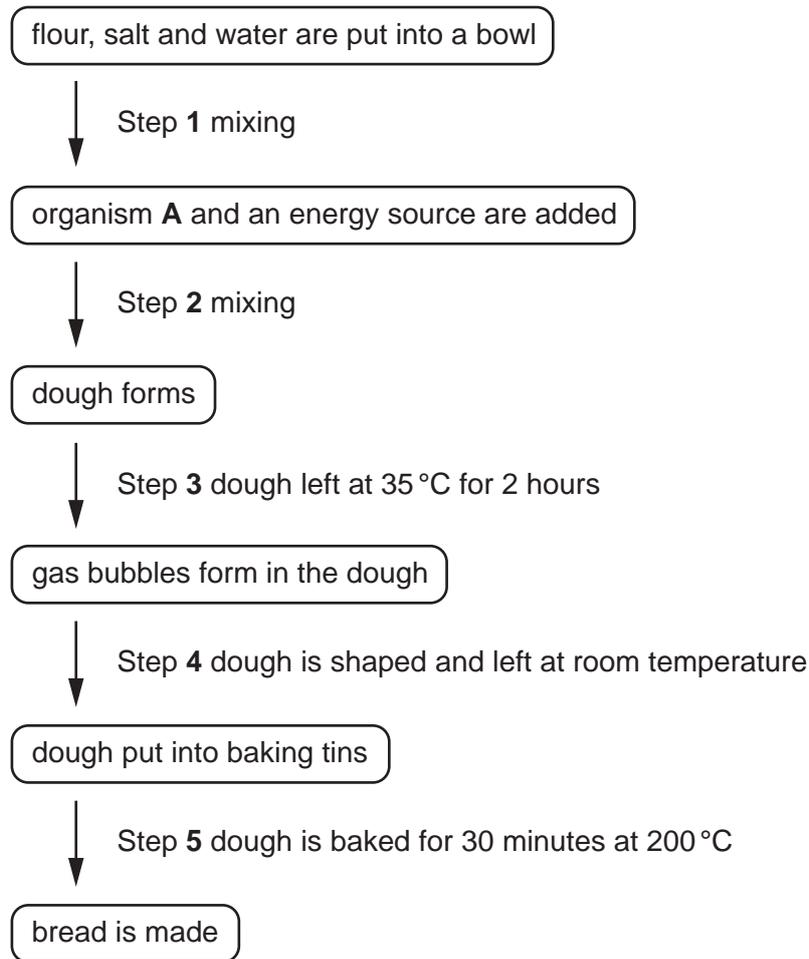


Fig. 1.1

(a) State the name of organism **A** in Fig. 1.1.

..... [1]

(b) (i) State the name of the source of energy used by organism **A**.

..... [1]

(ii) State the name of the process that occurs at step **3** that causes gas bubbles to form in the dough.

..... [1]

(iii) State the name of the gas that forms to create the gas bubbles in the dough.

..... [1]

(c) Explain the reasons for the different temperatures used in step 3 and step 5.

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.....
.....
..... [2]

(d) State the name of **two** products of biotechnology, other than bread, that make use of microorganisms.

1
2 [2]

[Total: 8]

2 The concentration of atmospheric carbon dioxide has increased considerably in recent years.

(a) Describe the possible causes of increased atmospheric carbon dioxide.

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..... [3]

(b) Soybean plants, *Glycine max*, were grown in two separate plots.

Each plot used a carbon dioxide enrichment system to control the atmospheric carbon dioxide concentration.

The atmospheric carbon dioxide concentrations in the two plots were kept at:

- 370 ppm, which is similar to the current atmospheric carbon dioxide concentration
- 550 ppm, which is a possible future atmospheric carbon dioxide concentration.

When the soybean plants were fully grown, scientists calculated the average rates of photosynthesis at regular intervals from 04:00 to 22:00 for both plots.

The results are shown in Fig. 2.1.

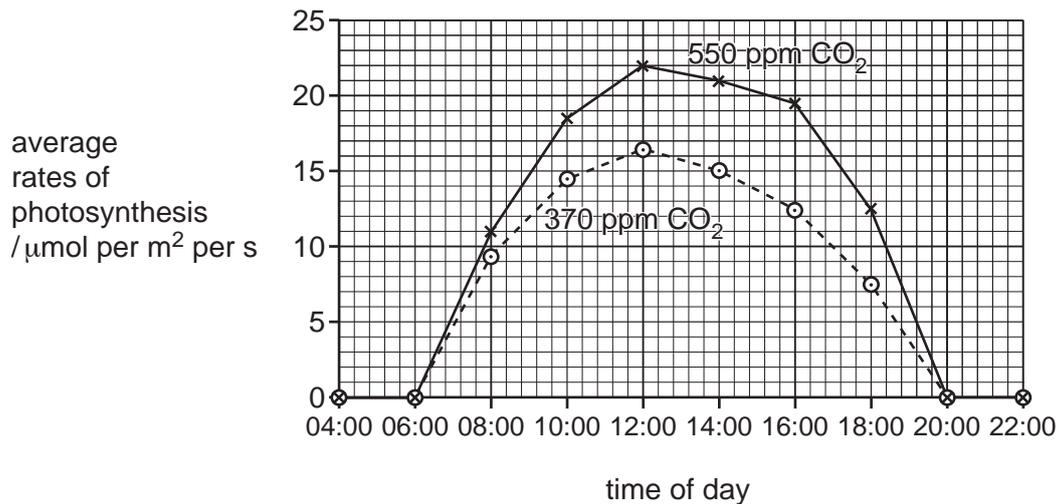


Fig. 2.1

- 3 Very small pieces of plastic, called microplastics, are found in many products such as soaps and toothpaste.

Fig. 3.1 shows toothpaste that contains microplastics.



Fig. 3.1

- (a) (i) It is estimated that microplastics make up 5% of the mass of some toothpastes.

Each person uses approximately 2 g of toothpaste a day.

There were estimated to be 1.2×10^9 people using toothpaste that contained microplastics in some countries in 2013.

Calculate the mass of microplastics contained in the toothpaste used on one day in 2013 for these countries.

Show your working and state appropriate units with your answer.

..... [3]

- (ii) State **one** recommendation, other than regular brushing, for the proper care of teeth.

..... [1]

(b) Lugworms live in sand on coastal beaches and are eaten by wading birds. Lugworms feed on diatoms. Diatoms are photosynthetic protists that require ammonium ions as a source of nitrogen. Beach sand contains ammonium ions.

(i) Construct a food chain for these marine organisms.

[2]

(ii) There is some evidence that microplastics affect ammonium ions. Affected ammonium ions cannot be used by diatoms. A group of researchers thought that this could affect lugworms living in sand polluted by microplastics.

The researchers collected 30 healthy lugworms, all with the same initial mass.

They divided them into three groups, **A**, **B** and **C**. Each group contained 10 lugworms.

Each group of lugworms was placed in a bucket containing the same mass of beach sand and ammonium ions and:

- A** biodegradable microplastics
- B** non-biodegradable microplastics
- C** no microplastics.

The measurements that were recorded at the **end** of the investigation are shown in Table 3.1.

Table 3.1

variable measured	group		
	A	B	C
ammonium ion concentration in the bucket/ $\mu\text{mol per dm}^3$	19.3	47.0	27.4
average respiration rate of lugworms /mg oxygen per hour per g mass	5.2	9.6	5.1
volume of lugworm faeces/ cm^3	60.0	25.0	40.0
average lugworm mass/g	9.1	7.0	9.1

Describe **and** explain why the researchers concluded that non-biodegradable microplastics are the most harmful to lugworms.

Use the information in Table 3.1 in your answer.

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..... [4]

(c) Ammonium ions are an important part of the nitrogen cycle. They can be converted into nitrate ions, which are used by plants and protocists such as diatoms.

(i) State the name of the molecules that are converted into ammonium ions in the nitrogen cycle.

..... [1]

(ii) State the name of the process of converting ammonium ions into nitrate ions.

..... [1]

(iii) Explain the effects of nitrate ion deficiency on plant growth.

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..... [3]

4 Neurones are part of the nervous system. Neurones are connected to each other by synapses.

(a) (i) Describe how the structure of a neurone is related to its function.

.....
.....
.....
.....
.....
.....
..... [3]

(ii) The nervous system is made up of the central nervous system and the peripheral nervous system.

State the names of the organs that make up the central nervous system.

..... [1]

(b) Reflex actions allow the body to respond rapidly to changes in the external environment.

(i) Outline the pathway in a reflex arc in response to shining a bright light into the eye.

.....
.....
.....
.....
.....
.....
..... [3]

(ii) Doctors sometimes check the reflexes of people who are unconscious.

Suggest why reflexes occur in people who are unconscious.

..... [1]

(c) Fig. 4.1 is a diagram of a synapse and parts of two neurones.

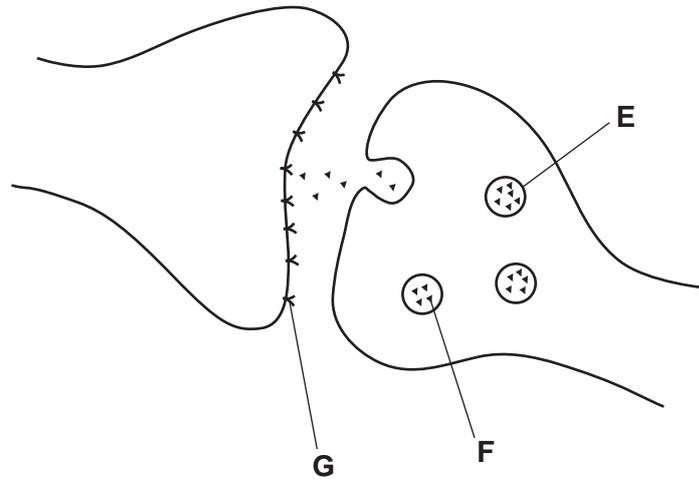


Fig. 4.1

(i) State the names of the labelled parts in Fig. 4.1.

- E
- F
- G [3]

(ii) Draw an arrow on Fig. 4.1 to show the direction in which the signal travels across the synapse. [1]

[Total: 12]

5 (a) The testes are part of the endocrine system because they produce hormones.

(i) State the name of the hormone released from the testes.

..... [1]

(ii) The testes are also part of the reproductive system. This means that the testes are part of two organ systems.

Complete Fig. 5.1 by stating **two** other organs that also belong to **two** organ systems.

One has been completed for you.

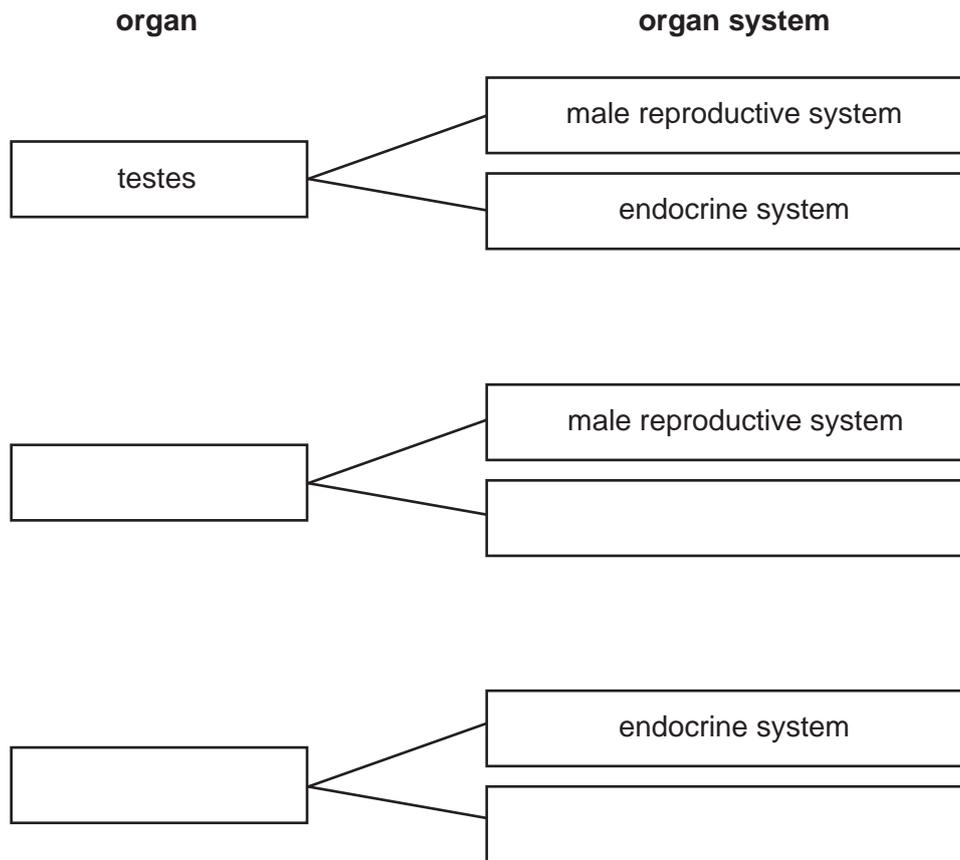


Fig. 5.1

[4]

Fig. 5.2 is a photomicrograph of part of a mammalian testis.

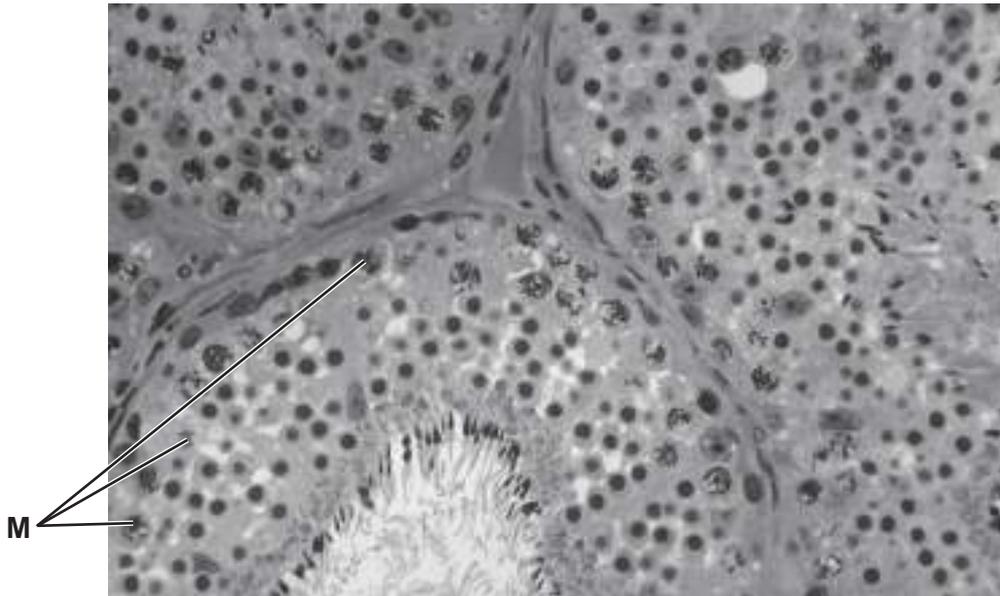


Fig. 5.2

(b) The cells labelled **M** in Fig. 5.2 are undergoing meiosis.

Explain why meiosis is necessary in the testes.

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..... [3]

(c) Fig. 5.3 is a photomicrograph of a section through a sperm.



Fig. 5.3

Table 5.1 shows information about the sperm shown in Fig. 5.3.

Complete Table 5.1.

Table 5.1

letter on Fig. 5.3	name of the structure	function
P		
	haploid nucleus	
		releases energy
	flagellum	

[4]

(d) Draw and label **one** human egg cell.

Include at least one labelled feature that is not found in a sperm cell.

[3]

(e) Describe what happens to a fertilised egg cell before implantation in the uterus.

.....

.....

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.....

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.....

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..... [3]

[Total: 18]

- 6 Fig. 6.1 shows some of the many different varieties of potato, *Solanum tuberosum*, that are cultivated across the world for food.



Fig. 6.1

All varieties of *S. tuberosum* are classified as the same species.

- (a) Define the term *species*.

.....
.....
..... [2]

(b) Fig. 6.2 shows a method of reproduction that some potato farmers use to produce more potato plants.

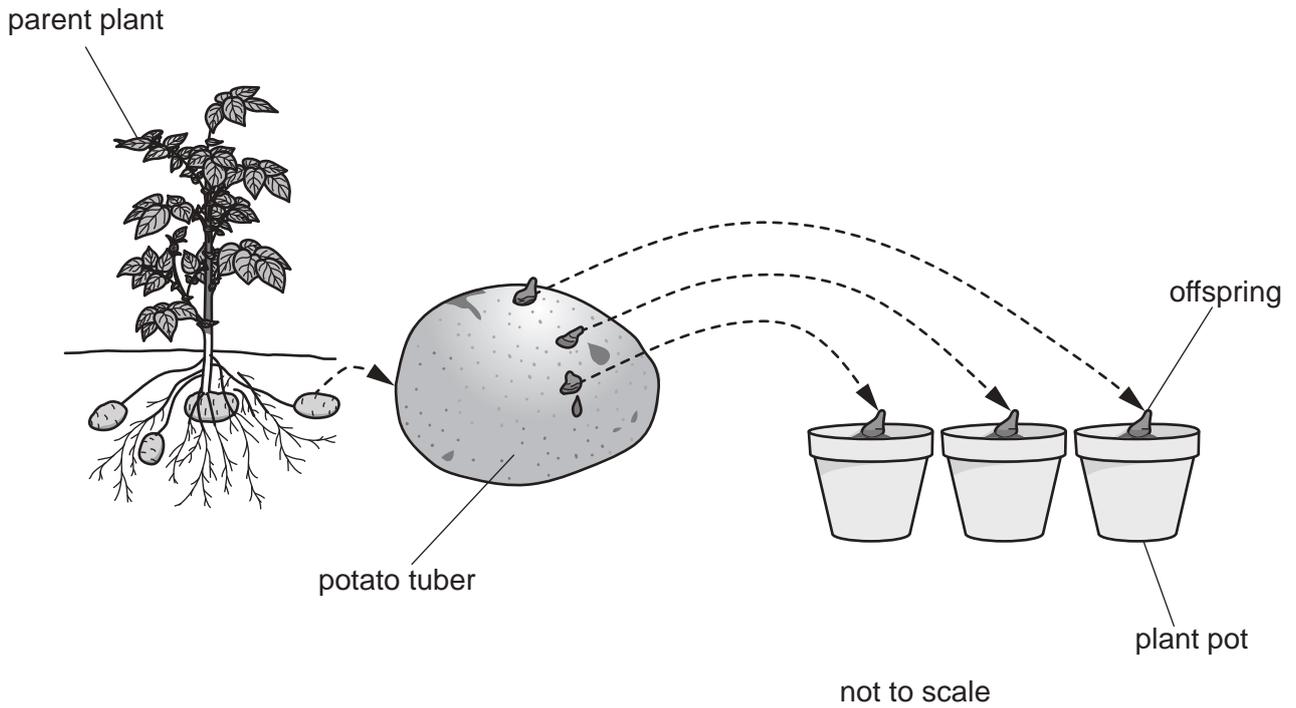


Fig. 6.2

Describe the advantages of the type of reproduction shown in Fig. 6.2 in crop production.

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..... [3]

(c) Potato tubers store starch.

Explain why plants store starch.

.....

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.....

.....

.....

..... [2]

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1 Bacteria are classified in the Prokaryote kingdom.

(a) State **two** features of animal cells that are **not** found in bacteria.

1

2

[2]

(b) The bacterium *Bacillus megaterium* was grown in the laboratory fermenter shown in Fig. 1.1.

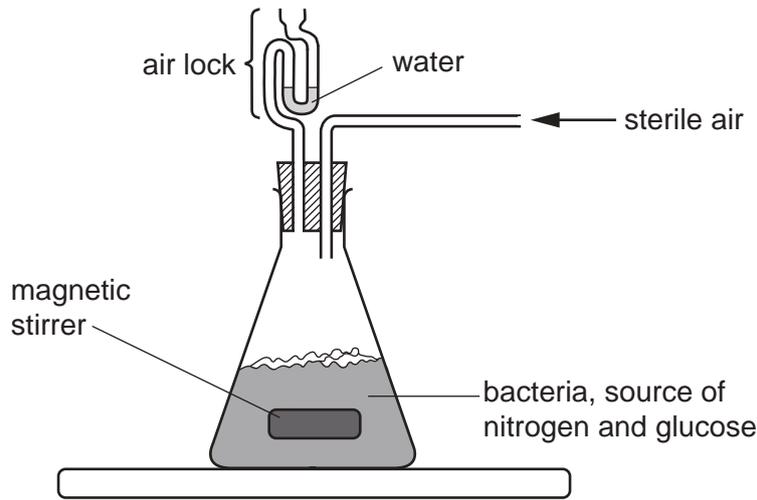


Fig. 1.1

(i) Explain why a source of nitrogen and glucose were added to the fermenter.

nitrogen

.....

glucose

.....

[2]

(ii) Suggest why it is important to stir the contents of the fermenter continuously.

.....

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..... [3]

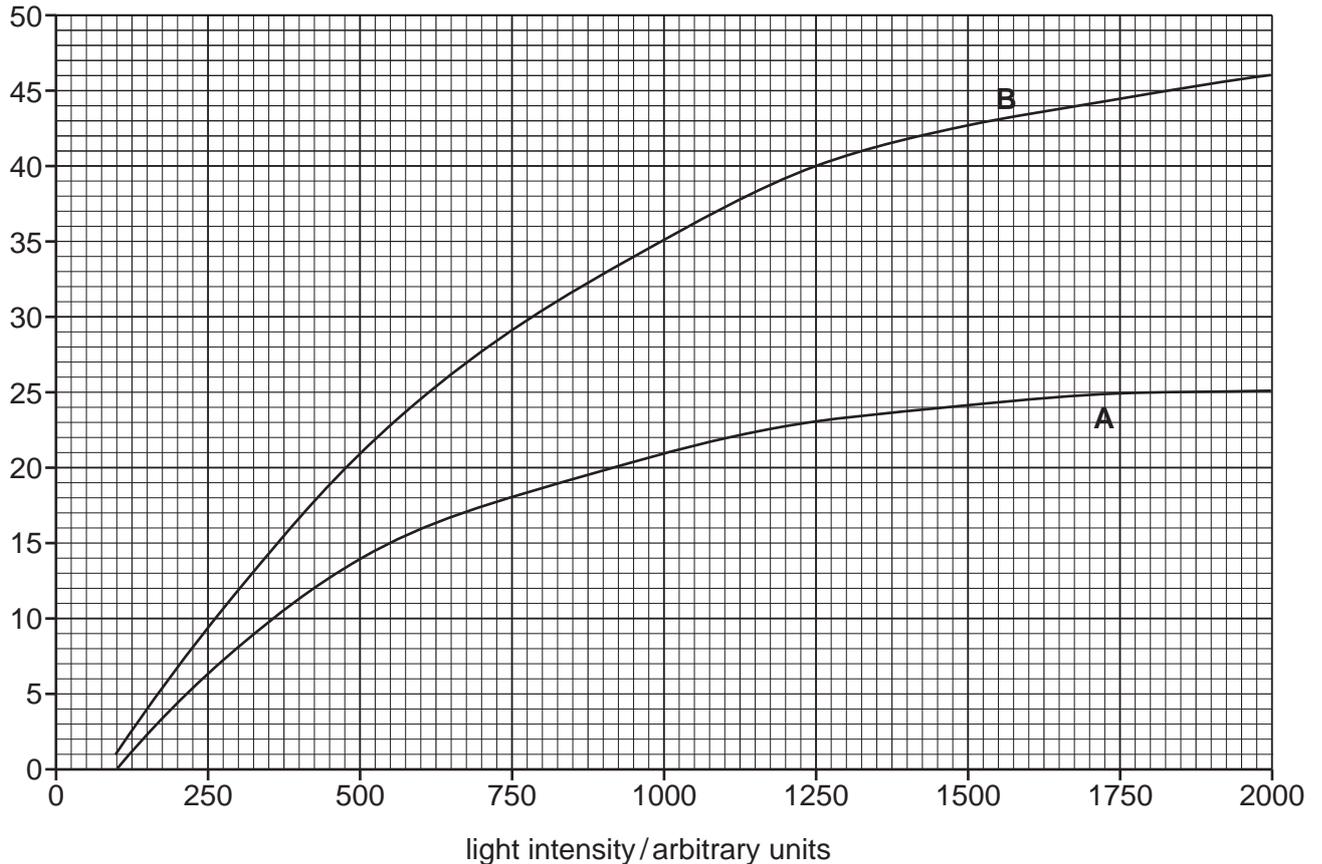
- 2 (a) State the **word** equation for photosynthesis.

..... [2]

- (b) Scientists investigated the effect of light intensity on the rate of photosynthesis in the leaves of eucalyptus trees at two different concentrations of carbon dioxide, **A** and **B**.

The results are shown in Fig. 2.1.

rate of photosynthesis
/ $\mu\text{mol per m}^2 \text{ per s}$



Key:

- A** carbon dioxide concentration
140 ppm
- B** carbon dioxide concentration
1000 ppm

Fig. 2.1

- (i) Suggest **and** explain why the scientists kept the temperature of the leaves at 20°C while they recorded results.

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.....
..... [2]

- (ii) Calculate the percentage increase in the rate of photosynthesis at a light intensity of 1250 arbitrary units when the carbon dioxide concentration was increased from 140ppm to 1000ppm.

Show your working and give your answer to the nearest whole number.

..... %
[3]

- (iii) Describe the effect of increasing light intensity on the rate of photosynthesis when the concentration of carbon dioxide was 140ppm.

.....
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..... [3]

- (iv) Explain the effect of increasing light intensity on the rate of photosynthesis when the concentration of carbon dioxide was 1000 ppm.

Use the term *limiting factor* in your answer.

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..... [4]

[Total: 14]

- 3 Cotton, *Gossypium hirsutum*, is grown for the fibres that form within the fruits after fertilisation, as shown in Fig. 3.1.

Fibres from the fruits of cotton plants are used in the textile industry.



Fig. 3.1

Cotton plants have been genetically engineered to produce a protein that is toxic to the caterpillars of several insect pests. This gives the cotton plants resistance to the pests.

The *cry* gene for pest resistance was isolated from the bacterium *Bacillus thuringiensis* and inserted into the cells of cotton plants as shown in Fig. 3.2.

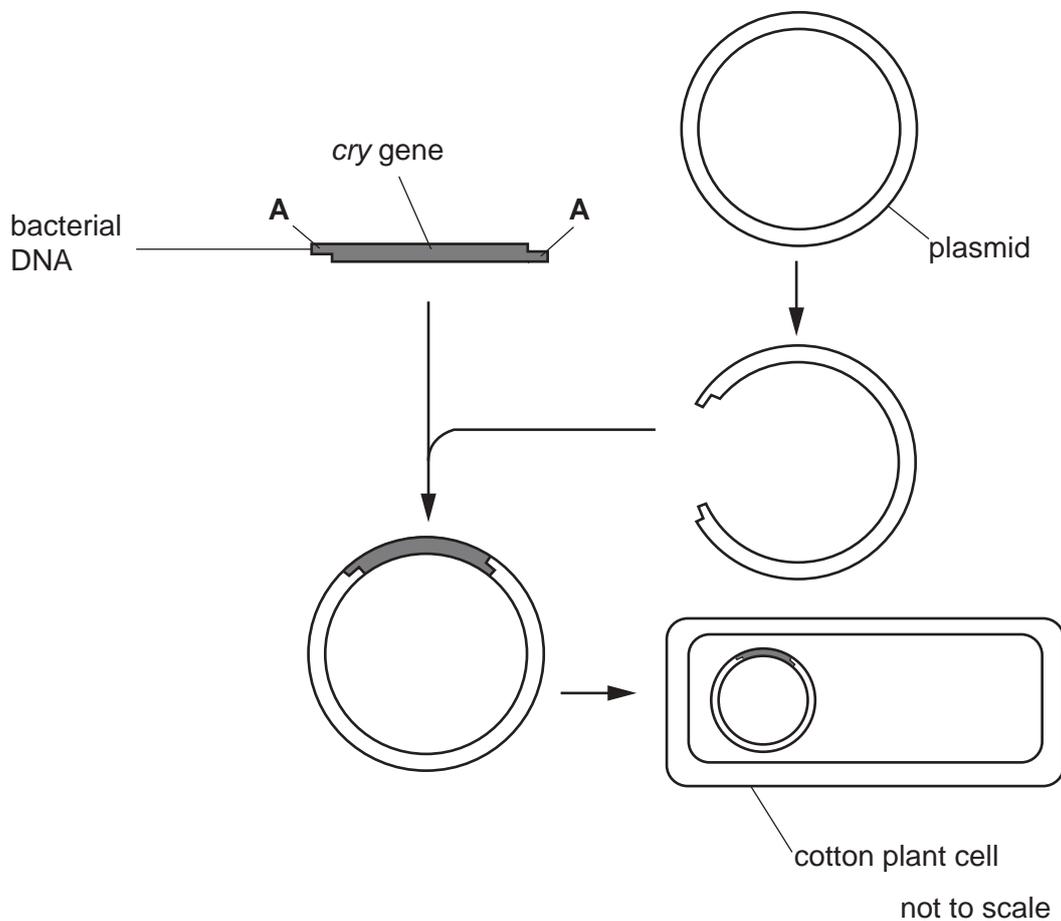


Fig. 3.2

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(a) An enzyme cuts the *cry* gene from the DNA of *B. thuringiensis*.

(i) State the name of the enzyme that cuts DNA.

..... [1]

(ii) State the name of the regions labelled **A** on Fig. 3.2.

..... [1]

(iii) Explain how the DNA is inserted into the plasmid.

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.....
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.....
.....
..... [3]

(b) The plasmids containing the *cry* gene are inserted into the cells of cotton plants.

Outline how the cells of cotton plants use the *cry* gene to make the toxic protein.

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..... [4]

4 Mammals have a double circulation.

(a) State what is meant by the term *double circulation*.

.....

 [1]

(b) Table 4.1 shows some information about the functions of the components of blood.

Complete Table 4.1.

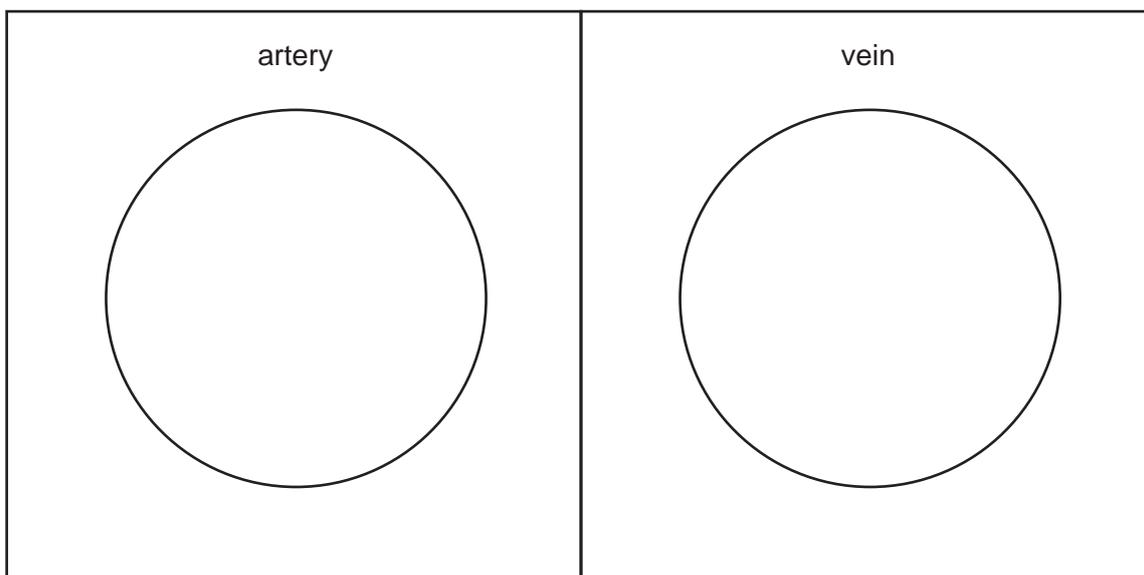
Table 4.1

function	type of cell
production of antibodies	
	phagocyte
promotes blood clotting	
transports oxygen	

[4]

(c) Blood is transported in arteries and veins.

Complete the drawings of the cross-sections of an artery and a vein to show the differences between these two types of blood vessel. Label the lumen in each drawing.



[2]

(d) A diagram of a mammalian heart and associated blood vessels is shown in Fig. 4.1.

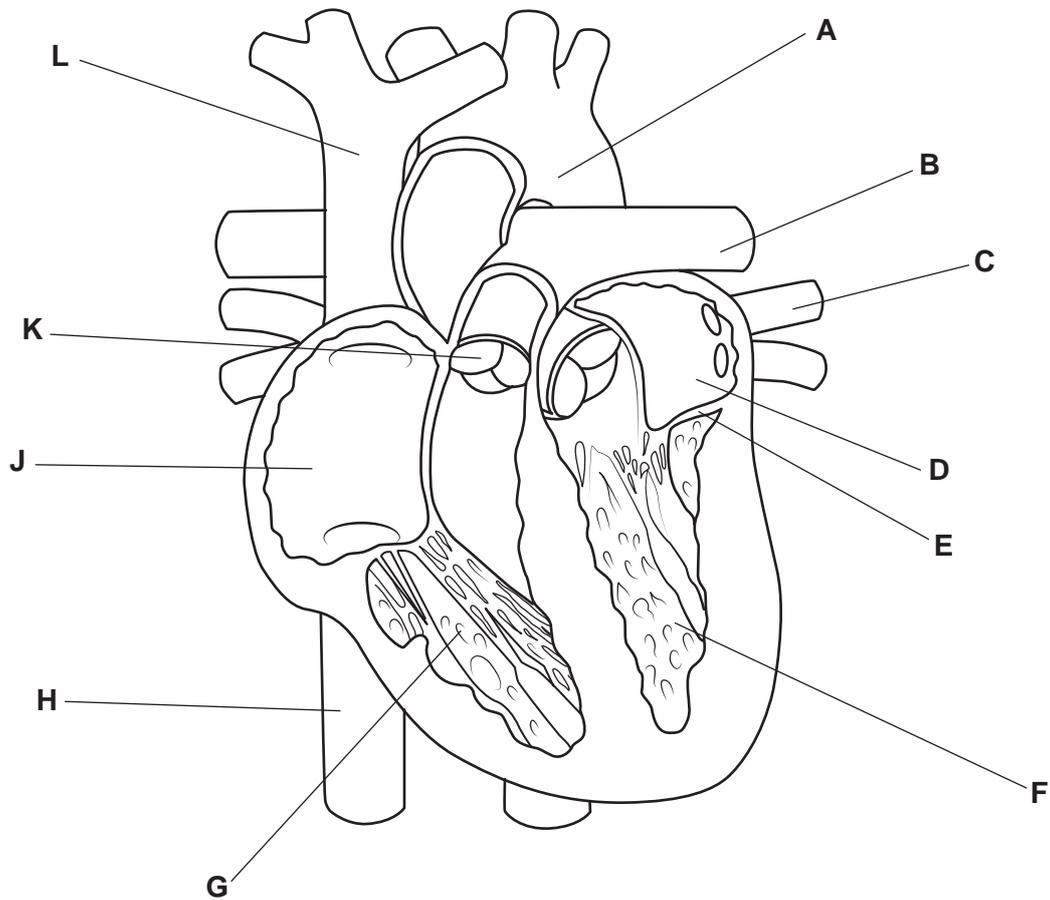


Fig. 4.1

- (i) Sketch arrows on Fig. 4.1 to show the pathway taken by deoxygenated blood from the heart towards the lungs. [2]

(ii) Table 4.2 contains statements about the structures visible in Fig. 4.1.

Complete Table 4.2 by:

- stating the name of each structure
- identifying the structure with the corresponding letter from Fig. 4.1.

Table 4.2

statement	name of structure	letter from Fig. 4.1
chamber that creates the highest blood pressure		
blood vessel containing blood with the highest concentration of oxygen		
structure that prevents blood going from ventricle to atrium		
structure that prevents backflow of blood from artery to ventricle		
chamber that receives blood from vena cava		

[5]

(e) Mammals also have a lymphatic system.

Outline the functions of the lymphatic system.

.....

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.....

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.....

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..... [3]

[Total: 17]

5 Sickle-cell anaemia is an inherited disease.

Fig. 5.1 is a photomicrograph of some blood cells from a person who has sickle-cell anaemia.



a sickle-shaped red blood cell

Fig. 5.1

(a) Explain how red blood cells become sickle-shaped.

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..... [3]

(a) (i) Structure **Q** is part of the nucleus of the cell.

State **one** function of a nucleus.

.....
.....
..... [1]

(ii) State the names of the structures labelled **P** and **R** in Fig. 6.1.

P
R [2]

(b) The structure labelled **S** transports enzymes to the cell membrane for release into the pancreatic duct. These structures contain molecules of amylase, trypsin and lipase.

Complete the sentences with the most appropriate words.

Enzymes are made of protein and act as because they increase the rate of chemical reactions, but are not changed in those reactions. Amylase speeds up the digestion of to Trypsin continues the chemical digestion of protein begun by the enzyme in the stomach.

The optimum pH for pancreatic enzymes is greater than pH7. Bile is produced by the and enters the small intestine, where it stomach acid to provide the appropriate pH. Bile also breaks down fat by to increase the surface area for the action of lipase.

[7]

[Total: 10]

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CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER



BIOLOGY **0610/51**
Paper 5 Practical Test **May/June 2019**
1 hour 15 minutes

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1	
2	
Total	

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This document consists of **12** printed pages and **4** blank pages.

- 1 You are going to measure the distance moved by different concentrations of citric acid through agar.

You are provided with a Petri dish labelled **agar plate**.

The agar in the Petri dish contains Universal Indicator which will change colour in the presence of acid.

Read all the instructions but DO NOT CARRY THEM OUT until you have drawn a table for your results in the space provided in 1(a)(iii).

You should use the safety equipment provided while you are carrying out the practical work.

Step 1 Label three test-tubes **A**, **B** and **C** and place them in a test-tube rack.

Step 2 Make three solutions, each containing a different concentration of citric acid, in the labelled test-tubes.

Use the volumes of 5% citric acid and distilled water shown in Table 1.1 to make the solutions.

Table 1.1

	test-tube		
	A	B	C
volume of 5% citric acid solution/cm ³	1.0	2.0	10.0
volume of distilled water/cm ³	9.0	8.0	0.0
percentage concentration of citric acid solution	0.5	1.0	5.0

- Step 3 Turn the Petri dish over so the base side is up. Use a marker pen to draw three lines to divide the base into approximately equal sections. Label the sections **A**, **B** and **C** as shown in Fig. 1.1.

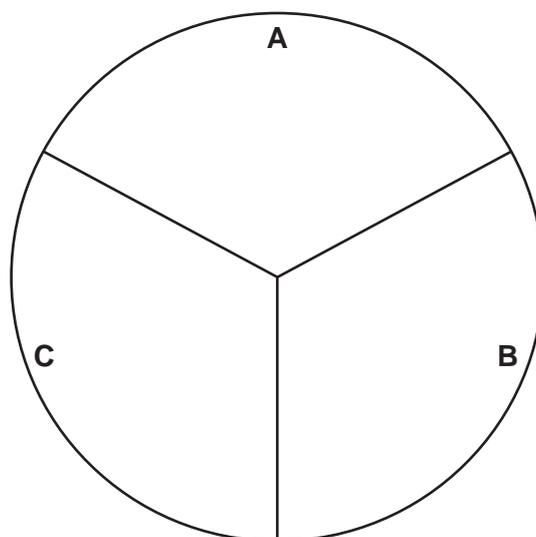


Fig. 1.1

Step 4 Turn the Petri dish so the base side is down. Use a straw to cut a hole in the centre of each section of the agar in the Petri dish, as shown in Fig. 1.2.

Hold the straw vertically and push through the agar to the bottom of the layer. As you remove the straw twist it slightly to pull out the agar. Squeeze the end of the straw gently to push the agar you have removed onto a paper towel.

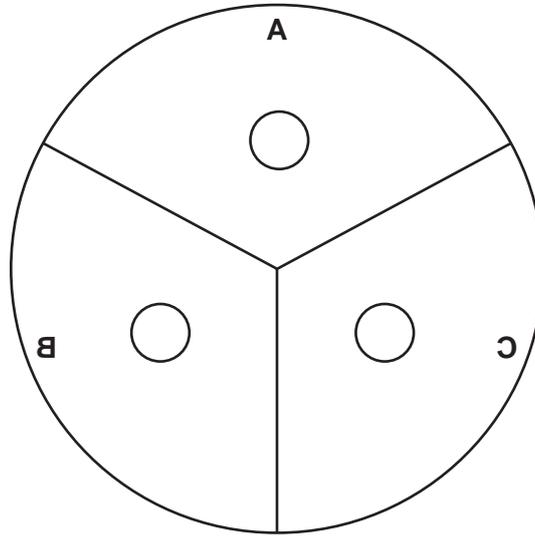


Fig. 1.2

Step 5 Use a pipette to transfer three drops of solution from test-tube **A** into the hole in the agar in section **A** of the Petri dish.

Do not let the solution drip onto the surface of the agar.

Step 6 Use a clean pipette to repeat step 5 for the solution in test-tube **B** and the hole in the agar in section **B** of the Petri dish.

Step 7 Use a clean pipette to repeat step 5 for the solution in test-tube **C** and the hole in the agar in section **C** of the Petri dish.

Step 8 Start the stop-clock and leave the Petri dish for five minutes.

Step 9 After five minutes observe the appearance of the agar around each of the holes.

(a) (i) Describe the appearance of the agar around the holes in **A**, **B** and **C** after five minutes.

.....

 [1]

Step 10 Leave the Petri dish for a further 25 minutes. During this time, continue with the other questions.

Step 11 After a total of 30 minutes use the ruler to measure the distance the citric acid has travelled from the edge of the hole in section **A**. You may need to use the hand lens.

Record your results in the table you have prepared in **1(a)(iii)**.

Step 12 Repeat step 11 for the holes in section **B** and section **C** of the Petri dish.

(ii) Describe how you decided where to measure the distance travelled by the citric acid solution.

.....
.....
..... [1]

(iii) Prepare a table to record your results.

You should include:

- the concentration of the citric acid solutions
- the distance moved by each solution in the agar.

Record your results in the table as you carry out the practical work.

[4]

(iv) State a conclusion for your results.

.....
.....
..... [1]

- (v) The citric acid moves through the agar by diffusion. The diffusion coefficient is used to show the effect of concentration on diffusion.

The formula to calculate the diffusion coefficient is:

$$\text{diffusion coefficient} = \frac{(\text{distance travelled})^2}{\text{time}}$$

Calculate the diffusion coefficient for a 10% solution of citric acid that travelled 14mm in 30 minutes.

Give your answer to two significant figures.

Space for working.

..... mm² per minute
[2]

- (b) (i) State **two** variables that have been kept constant in this investigation.

1

2
[2]

- (ii) Identify **one** source of error in this investigation and suggest how the error could affect the results.

error

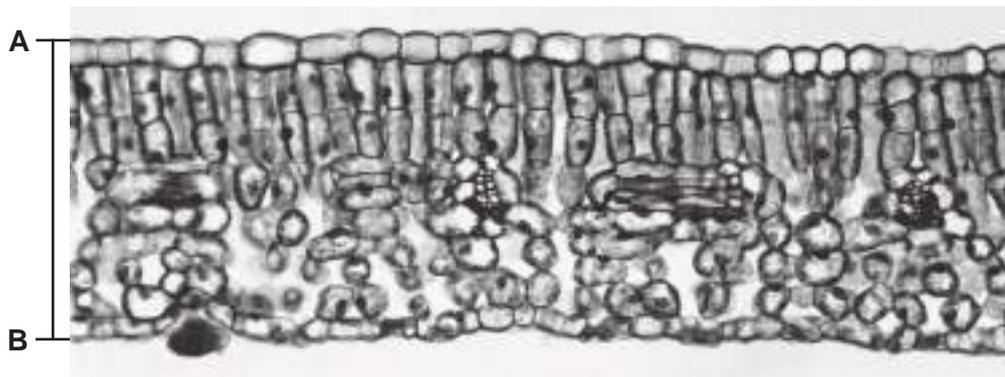
.....

effect on results

.....

.....
[2]

- 2 (a) Fig. 2.1 is a photomicrograph of a cross-section of part of a leaf.



magnification $\times 100$

Fig. 2.1

- (i) Draw a large diagram to show the layers present in the leaf section shown in Fig. 2.1.
Do not draw any cells.

[3]

(ii) Measure the thickness of the leaf along the line **AB** on Fig. 2.1.

length of line **AB**

Calculate the actual thickness of the leaf using your measurement and the formula.

Include the units.

$$\text{magnification} = \frac{\text{length of line } \mathbf{AB} \text{ on Fig. 2.1}}{\text{actual thickness of leaf}}$$

.....
[3]

(iii) Fig. 2.2 shows a photomicrograph of cells from one type of tissue found in leaves.

magnification $\times 300$

Fig. 2.2

Label the layer on your drawing, with the letter **X**, to show where this type of tissue is found. [1]

(b) Scientists carried out an investigation into the effect of light on the growth of leaves.

Plants of the same species (**A**) were grown in three different light intensities.

The plants were grown in the same soil and kept in glasshouses with automatic watering.

A sample of 100 leaves was selected at random and collected from plants in each of the three different light intensities. A total of 300 leaves were collected.

The scientists studied the variations in the size and structure of the leaves in each sample.

(i) Suggest why the scientists used large samples of leaves.

.....
..... [1]

(ii) Suggest why the leaves in each light intensity were selected at random.

.....
..... [1]

(iii) A grid, divided into millimetre squares, was used to measure the surface area of the leaves.

Outline how the grid could have been used.

.....
.....
.....
..... [2]

(iv) State the variable that was changed (independent variable) in this investigation.

..... [1]

- (c) The scientists collected data from one other plant species (**B**).

Table 2.1 shows the results.

Table 2.1

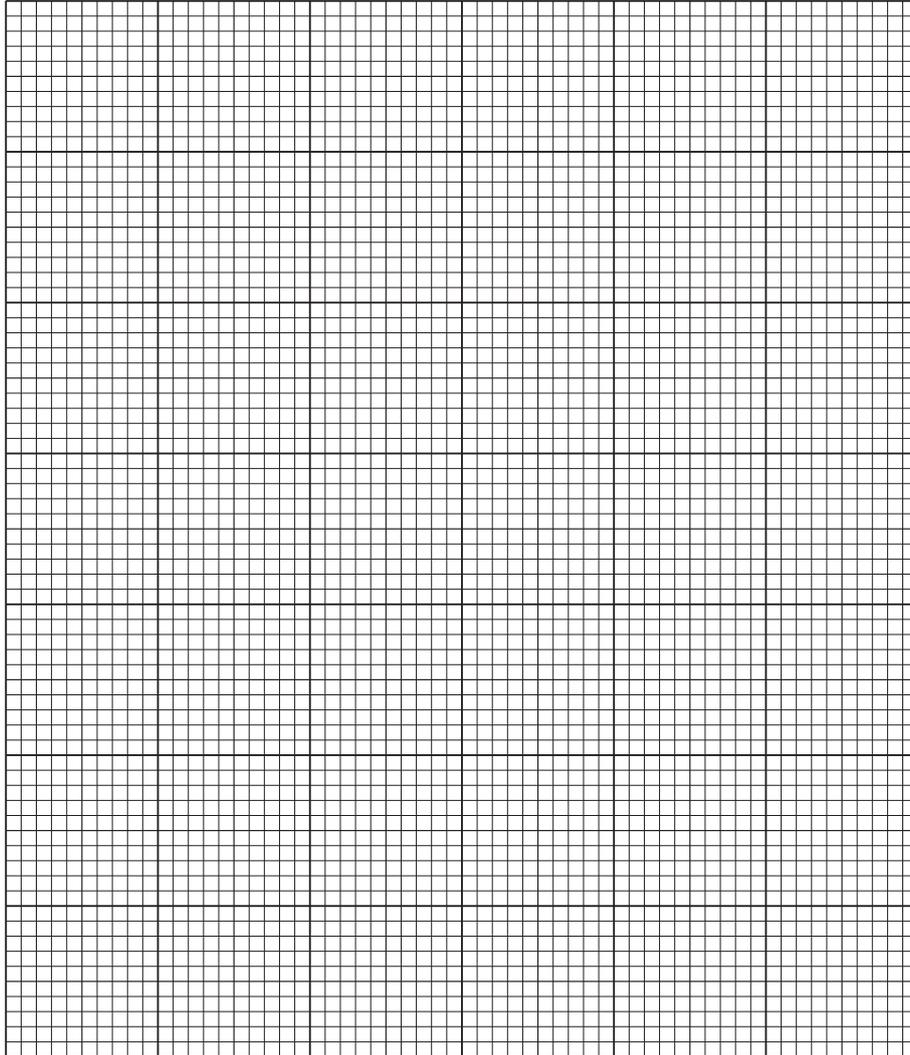
light intensity /arbitrary units	average leaf area/mm ²	
	species A	species B
100	3600	2800
50	3900	3400
10	6500	2900

- (i) Calculate the percentage difference in the average leaf area for species **A** from a light intensity of 50 arbitrary units to 10 arbitrary units.

Show your working and give your answer to the nearest whole number.

..... %
[2]

- (ii) Plot a bar chart on the grid to show the average leaf area for species **A** and **B**, at each light intensity.



[4]

- (iii) Describe the trends shown in your graph for species **A** and species **B**.

.....

.....

.....

.....

..... [2]

- (iv) The scientists want to determine more precisely the light intensity that results in the largest leaf area for species **B**.

Suggest how the method used in the investigation could be modified to achieve this.

.....
.....
..... [1]

[Total: 21]

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BIOLOGY

0610/52

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.

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 **10** printed pages and **2** blank pages.

- 1 Anaerobic respiration in yeast causes the blue dye, methylene blue, to become colourless.

You are going to investigate the effect of temperature on the rate of respiration in yeast.

Read all the instructions but DO NOT CARRY THEM OUT until you have drawn a table for your results in the space provided in 1(a)(ii).

You should wear the safety equipment provided during the practical work.

- Step 1 You are provided with a small beaker containing a yeast suspension. Stir the contents of this beaker with the glass rod.
- Step 2 Label one test-tube **W**, one test-tube **WM**, one test-tube **C** and the final test-tube **CM**. Place them in the test-tube rack provided.
- Step 3 Use a syringe to put 7 cm³ of yeast suspension into test-tube **W** and 7 cm³ of yeast suspension into test-tube **C**. Put test-tubes **W** and **C** back in the test-tube rack.
- Step 4 Raise your hand when you are ready for water to be added to the beaker labelled **warm water**.
- Step 5 Place test-tube **W** into the beaker labelled **warm water** and test-tube **C** into the beaker labelled **cool water**.
- Step 6 Use the thermometer to measure the temperatures of the warm and cool water. Record the temperatures in Table 1.1 in **1(a)(i)**.

(a) (i)

Table 1.1

beaker	temperature at the start/°C	temperature at the end/°C
warm water		
cool water		

[1]

- Step 7 Start the stop-clock and wait for three minutes.
- Step 8 During this waiting time, use a pipette to add **one** drop of methylene blue dye to test-tube **WM** and one drop of methylene blue dye to test-tube **CM**.
- Step 9 After three minutes pour the contents of test-tube **W** into test-tube **WM**. Pour the contents of test-tube **C** into test-tube **CM**.
- Step 10 Use a pipette to slowly add a layer of oil to test-tube **WM**. The layer of oil should be approximately 1 cm thick. The layer of oil will float on top of the yeast suspension and methylene blue mixture, as shown in Fig. 1.1.
- Step 11 Place test-tube **WM** into the **warm water** beaker.

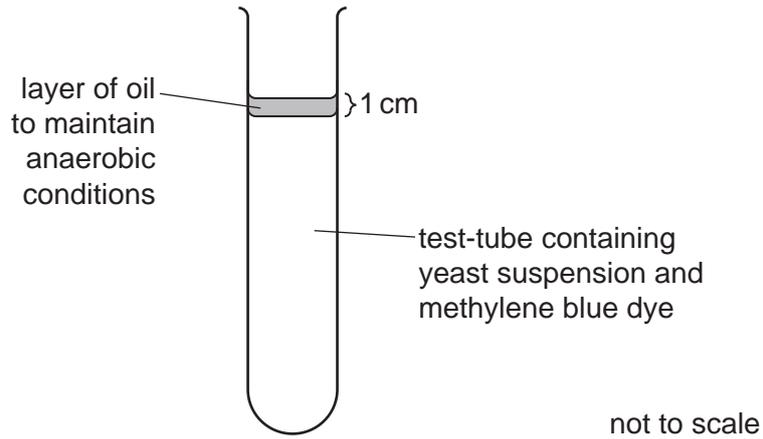


Fig. 1.1

Step 12 Repeat step 10 for test-tube **CM**.

Step 13 Place test-tube **CM** into the **cool water** beaker.

Step 14 Restart the stop-clock.

Step 15 Measure the time taken for the blue colour in test-tubes **WM** and **CM** to disappear. Record the times in seconds in your table in **1(a)(ii)**. If the time taken for the blue colour to disappear in each test-tube is more than 10 minutes stop timing and record **>600** in your table in **1(a)(ii)**.

Step 16 Measure the temperatures of the **warm water** and **cool water** beakers again and record these values in Table 1.1 in **1(a)(i)**.

(ii) Prepare a table to record your results.

[4]

(iii) State a conclusion for the results in your table in **1(a)(ii)**.

.....

.....

..... [1]

(iv) Identify **two** variables that were kept constant in this investigation.

1

2

[2]

(b) (i) The data you have recorded in Table 1.1 may indicate that there is a source of error with the method used in this investigation.

Identify the possible error and suggest an improvement to the method to reduce the effect of this error.

error

.....

improvement

.....

.....

[2]

(ii) Identify **one** possible source of error in step 15 and suggest an improvement for this error.

error

.....

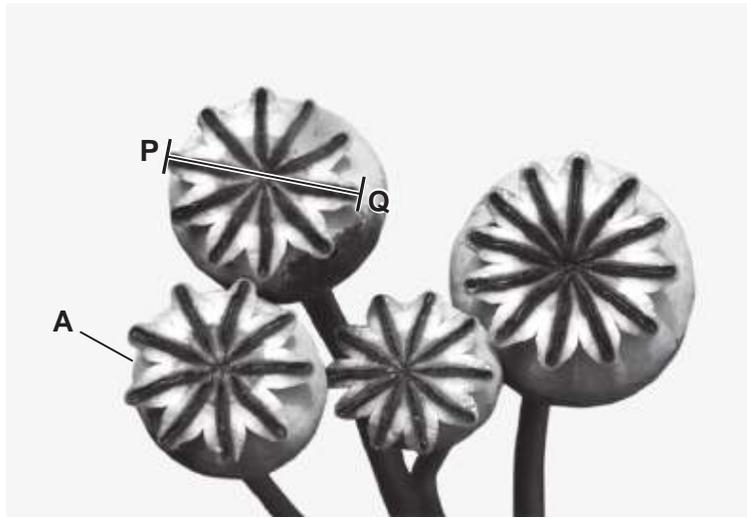
improvement

.....

.....

[2]

- 2 (a) Fig. 2.1 is a photograph showing four seed heads from a poppy plant.



magnification $\times 1.6$

Fig. 2.1

- (i) Draw a large diagram of the seed head labelled **A**.

[4]

- (ii) Measure the length of line **PQ** on Fig. 2.1. Include the unit.

length of line **PQ**

Calculate the actual size of the seed head using the formula and your measurement.

$$\text{magnification} = \frac{\text{length of line } \mathbf{PQ}}{\text{actual diameter of the seed head}}$$

Give your answer to the nearest whole number and include the unit.

Show your working.

.....
[3]

- (b) A student investigated the effect of pH on the germination of seeds. The student planted 25 seeds for each pH value.

The results of the investigation are shown in Table 2.1.

Table 2.1

pH	number of seeds that germinated	percentage of seeds that germinated
4	20	80
5	23	92
6	24	96
7	19	76
8	15	
9	10	40

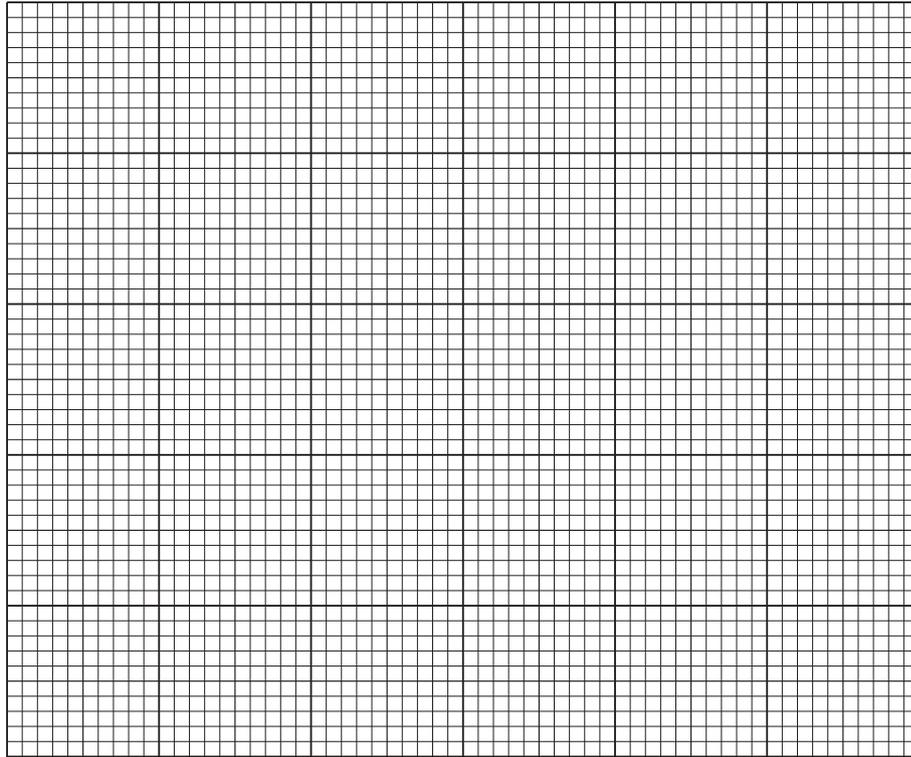
- (i) Calculate the percentage of seeds that germinated at pH8.

Show your working.

.....%

[2]

- (ii) Plot a line graph on the grid to show the effect of pH on the percentage of seeds that germinated using the data in Table 2.1.



[4]

- (iii) Describe the effect of pH on the percentage of seeds that germinated shown in your graph.

.....

.....

.....

.....

..... [2]

- (iv) The student wanted to determine a more accurate value for the optimum (best) pH for the germination of seeds.

Suggest further investigative work that the student should carry out.

.....
.....
.....
.....
..... [2]

- (c) During germination the starch within seeds is broken down to form reducing sugars.

Describe how you could test a sample of germinating seeds to find out if reducing sugars are present.

.....
.....
.....
.....
.....
.....
..... [3]

[Total: 20]

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BIOLOGY

0610/53

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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Answer **all** questions.

Electronic calculators may be used.

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1 Fig. 1.1 shows a section through an unfertilised chicken's egg.

The egg is made up of the outer shell, inner yellow yolk and albumen (egg white).

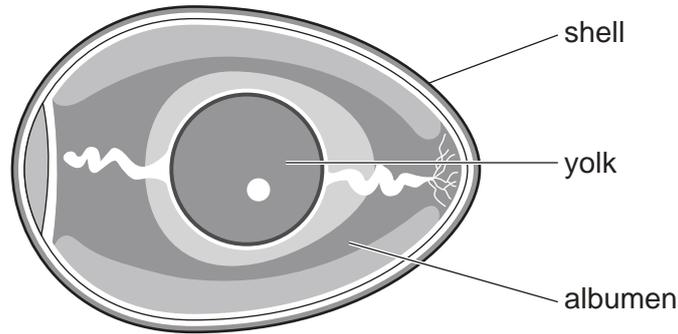


Fig. 1.1

The albumen and yolk are composed of different substances, including fats.

(a) Describe how ethanol can be used to test a sample of food for the presence of fat.

Include the result for a positive test.

.....

.....

.....

.....

.....

.....

.....

..... [3]

You should use the safety equipment provided while you are carrying out the practical work.

(b) You are provided with a sample of albumen suspension in a beaker, labelled **A**.

You are going to test the albumen suspension for the presence of protein.

- Use a syringe to put 2 cm³ of albumen suspension **A** into a test-tube.
- Add 2 cm³ of biuret solution from the beaker labelled **biuret**.
- Mix thoroughly by gently shaking the test-tube.

Describe your observations and state your conclusion.

observations

.....

conclusion

.....

[2]

(c) Proteins can be broken down by enzymes.

You will investigate the effect of acid on the breakdown of albumen by a protease enzyme.

Read all the instructions but do not carry them out until you have drawn a table for your results in the space provided in 1(c)(i).

Step 1 Label three test-tubes **P**, **Q** and **R** and place them into the test-tube rack.

Step 2 Use a syringe to add the substances, in the volumes shown in Table 1.1, to test-tubes **P**, **Q** and **R**.

Step 3 Raise your hand when you are ready for warm water to be added to your **water-bath**. Place test-tubes **P**, **Q** and **R** into the **water-bath**.

Table 1.1

test-tube	albumen suspension A /cm ³	distilled water W /cm ³	acid H /cm ³	enzyme E /cm ³
P	2	2	0	0
Q	2	1	0	1
R	2	0	1	1

Step 4 Gently shake the test-tubes to mix the contents and then leave them in the **water-bath** for 10 minutes. Continue with the questions while you wait.

Step 5 After 10 minutes remove test-tubes **P**, **Q** and **R** from the **water-bath** and place them in the test-tube rack. Add 2 cm³ of biuret solution to each test-tube and mix well.

Step 6 Observe the appearance of the solution in each test-tube.

Record your observations in your table in **1(c)(i)**.

(i) Prepare a table to record your observations.

(ii) Identify the variable that was changed (independent variable) in this investigation.
..... [1]

(iii) State the purpose of test-tube **P** in this investigation.
.....
..... [1]

(iv) Suggest why 1 cm³ of distilled water was added to test-tube **Q**.
.....
..... [1]

(v) Identify **one** potential error in step 2.
Explain how this error could affect the results.
error
.....
effect of the error
.....
..... [2]

(vi) Identify **one** potential safety hazard in this investigation.
.....
..... [1]

[Total: 14]

- 2 (a) Fig. 2.1 is a photomicrograph showing a cross-section of an artery.

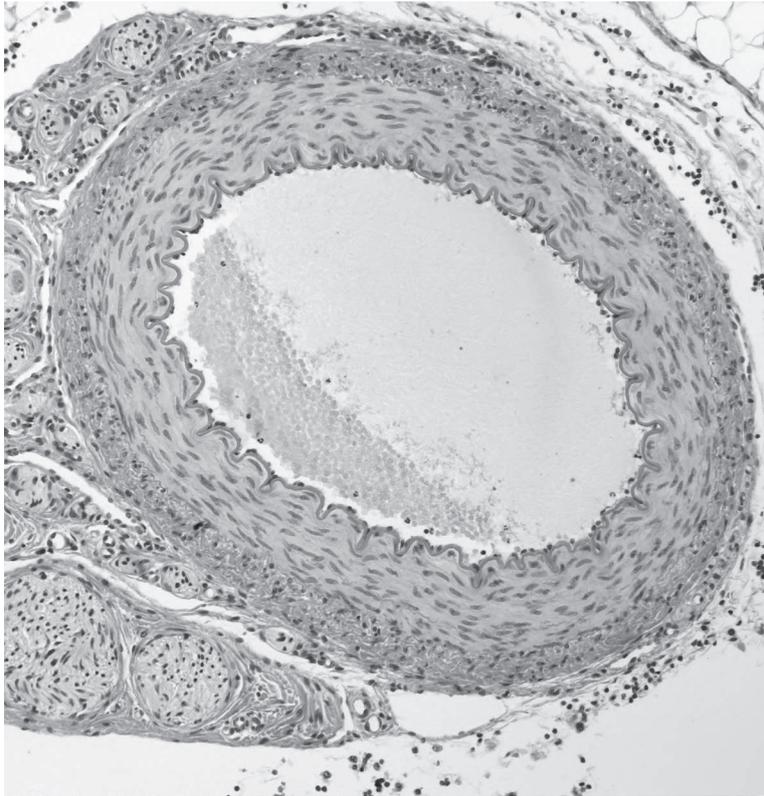
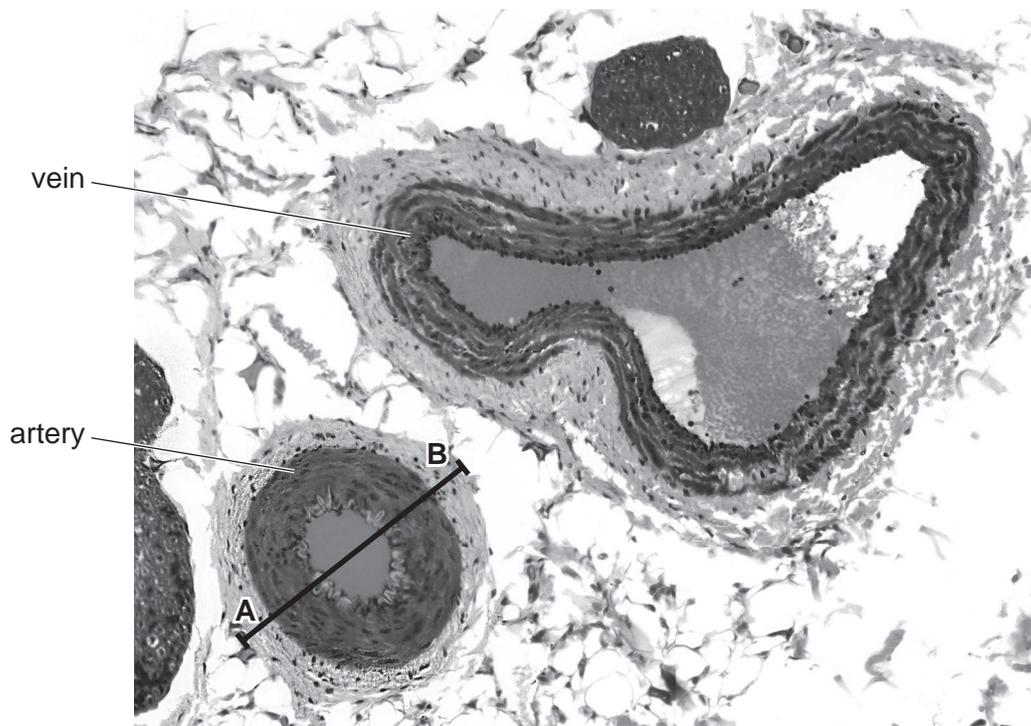


Fig. 2.1

Make a large drawing of the artery in Fig. 2.1 to show the layers that make up the artery wall.

Do not draw individual cells.

(b) Fig. 2.2 shows a photomicrograph of cross-sections of an artery and a vein.



magnification $\times 13$

Fig. 2.2

- (i) The diameter of the artery is indicated by line **AB**.

Measure the length of line **AB**, on Fig. 2.2. Include the unit.

length of line **AB**

Calculate the actual diameter of the artery using your measurement and the formula.

$$\text{magnification} = \frac{\text{length of line AB}}{\text{actual diameter of the artery}}$$

Give your answer to two significant figures. Include the unit.

Show your working.

.....
[3]

(ii) Describe **one** similarity and **one** difference between the artery and the vein shown in Fig. 2.2.

similarity

.....

difference

.....

[2]

(c) A student investigated the change in their pulse rate before and after exercise.

The student measured their pulse before exercise, during exercise and after exercise.

The results are shown in Table 2.1.

Table 2.1

activity	time /minutes	pulse rate /beats per minute
before exercise	2	78
	4	78
	6	78
during exercise	8	125
	10	148
	12	160
after exercise	14	154
	16	122
	18	94

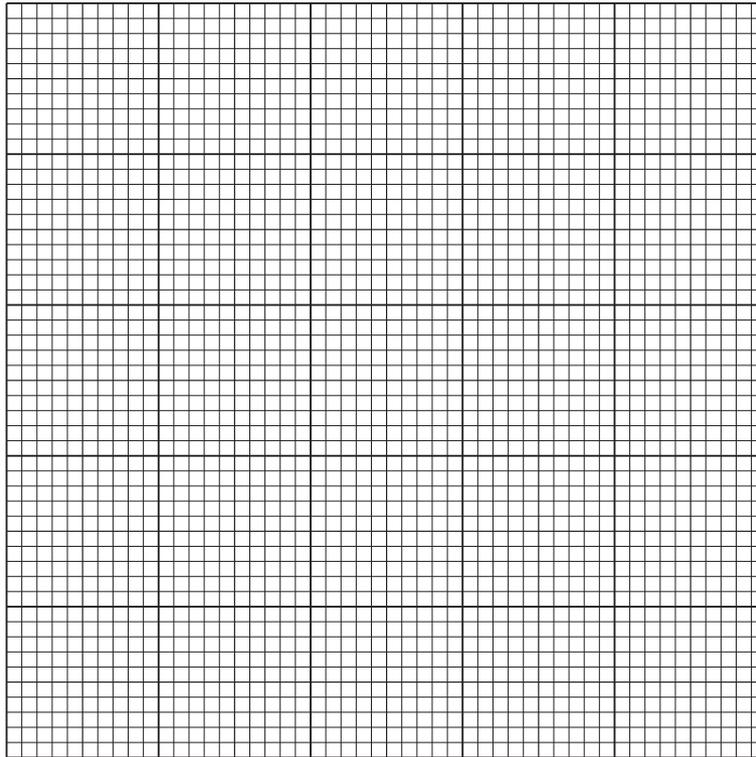
(i) Calculate the percentage increase in the pulse rate from minute 6 (before exercise) to minute 12 (during exercise).

Give your answer to the nearest whole number.

Show your working.

..... %
[2]

(ii) Plot a line graph on the grid of time against pulse rate for the results shown in Table 2.1.



[4]

(iii) Use your graph to estimate the pulse rate of the student at 15 minutes.

Show on your graph how you obtained your answer.

..... bpm
[2]

(iv) Describe the results of the student's investigation.

.....
.....
.....
.....
.....
..... [3]

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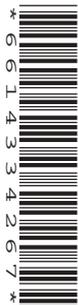
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BIOLOGY

0610/61

Paper 6 Alternative to Practical

May/June 2019

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

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Answer **all** questions.

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- 1 A student measured the distance moved by different concentrations of citric acid solution through agar jelly.

The agar contained Universal Indicator which changed colour in the presence of acid. The agar mixed with Universal Indicator was green at the beginning of the investigation.

Step 1 Three test-tubes were labelled **A**, **B** and **C**. Three different concentrations of citric acid solution were made.

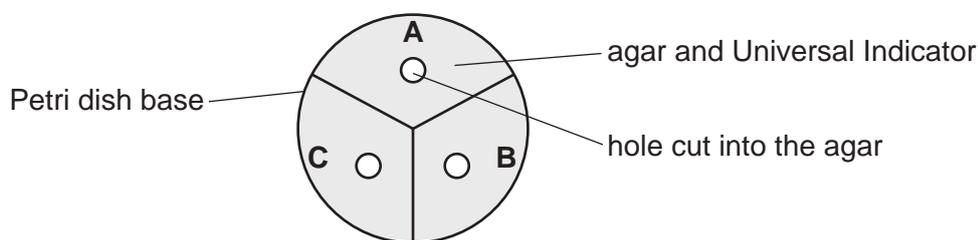
Table 1.1 shows the volumes of 5% citric acid solution and distilled water that were used to make each solution.

Table 1.1

	solution		
	A	B	C
volume of 5% citric acid solution/cm ³	1.0	2.0	10.0
volume of distilled water/cm ³	9.0	8.0	0.0
percentage concentration of citric acid solution	0.5	1.0	5.0

Step 2 The base of a Petri dish containing agar and Universal Indicator was labelled **A**, **B** and **C**.

Three holes were cut into the agar. This is shown in Fig. 1.1.



not to scale

Fig. 1.1

Step 3 The student was provided with one dropping pipette. Three drops of solution **A** were placed into the hole in section **A** of the Petri dish.

Step 4 Three drops of solution **B** were placed into the hole in section **B** of the Petri dish.

Step 5 Three drops of solution **C** were placed into the hole in section **C** of the Petri dish.

Step 6 A stop-clock was started.

Step 7 After 30 minutes the student observed the colour change in the agar around the hole in each section of the Petri dish. The colour change was caused by the diffusion of the citric acid solution through the agar.

Step 8 A ruler was used to measure the distance travelled by each concentration of citric acid solution through the agar.

Fig. 1.2 shows the appearance of the Petri dish after 30 minutes.

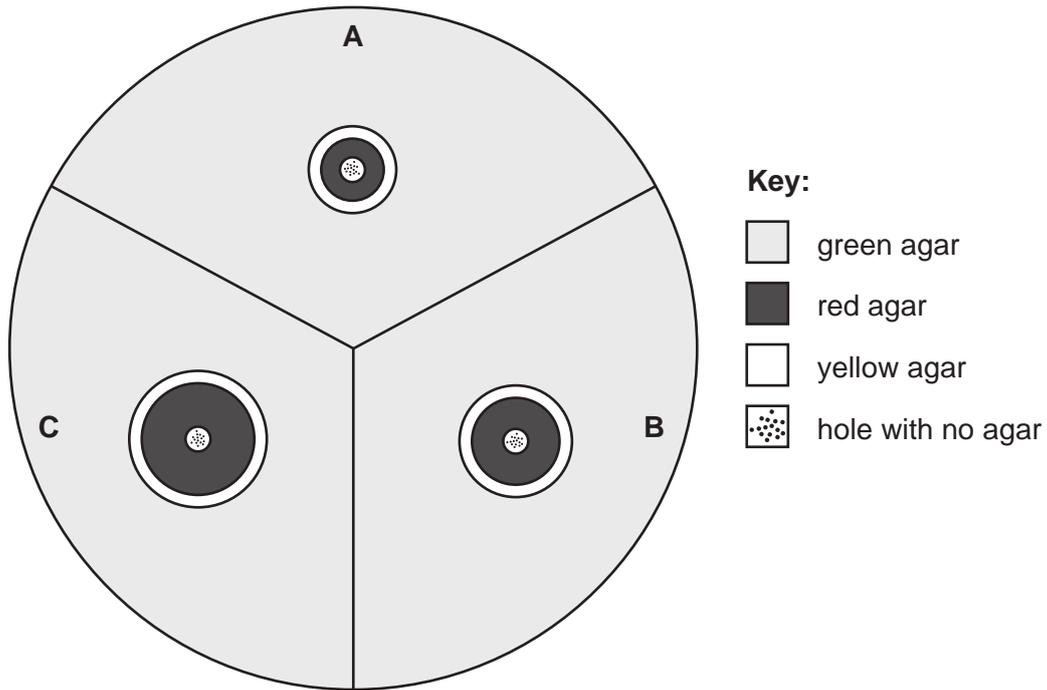


Fig. 1.2

- (a) Use a ruler to measure the distance travelled by each concentration of citric acid solution after 30 minutes in Fig. 1.2.

Record these results in your table in **1(a)(i)**.

- (i) Prepare a table to record the results.

You should include:

- the concentration of the citric acid solutions
- the distance travelled by the citric acid solutions.

[3]

- (ii) Describe how you decided where to measure the distance travelled by the citric acid solutions.

.....
.....
..... [1]

- (iii) State a conclusion for these results.

.....
.....
..... [1]

- (iv) The citric acid moves through the agar by diffusion. The diffusion coefficient is used to show the effect of concentration on diffusion.

The formula to calculate the diffusion coefficient is:

$$\text{diffusion coefficient} = \frac{(\text{distance travelled})^2}{\text{time}}$$

Calculate the diffusion coefficient for a 10% solution of citric acid that travelled 14mm in 30 minutes.

Give your answer to two significant figures.

Space for working.

..... mm² per minute
[2]

- (v) Universal Indicator is used to estimate the pH value of substances.

Estimate the pH value for the green agar and the red agar.

green agar pH

red agar pH

[2]

(b) (i) State **two** variables that have been kept constant in this investigation.

1

2

[2]

(ii) Identify **one** potential source of error in this investigation and suggest how the error could affect the results.

error

.....

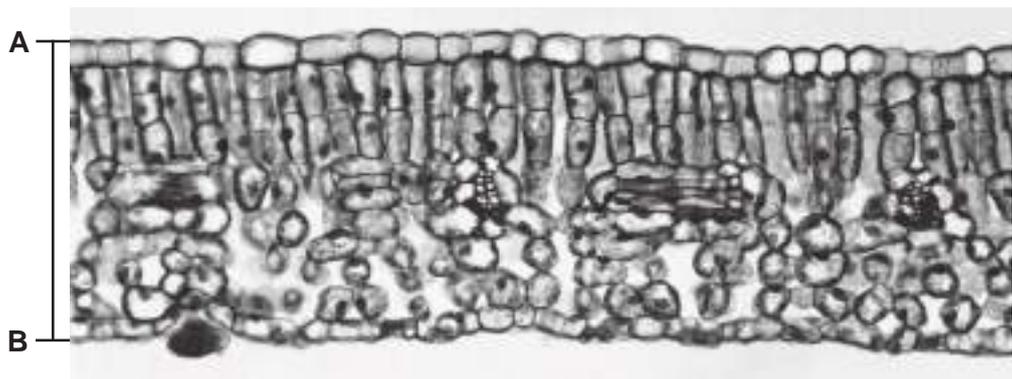
effect on results

.....

.....

[2]

- 2 (a) Fig. 2.1 is a photomicrograph of a cross-section of part of a leaf.



magnification $\times 100$

Fig. 2.1

- (i) Draw a large diagram to show the layers present in the leaf section shown in Fig. 2.1.
Do not draw any cells.

[3]

- (ii) Measure the thickness of the leaf along the line AB on Fig. 2.1.

length of line AB

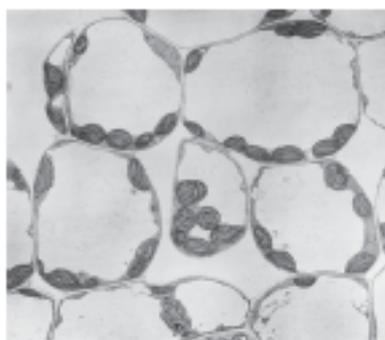
Calculate the actual thickness of the leaf using your measurement and the formula.

Include the units.

$$\text{magnification} = \frac{\text{length of line AB on Fig. 2.1}}{\text{actual thickness of leaf}}$$

.....
[3]

- (iii) Fig. 2.2 shows a photomicrograph of cells from one type of tissue found in leaves.



magnification $\times 300$

Fig. 2.2

Label the layer on your drawing, with the letter X, to show where this type of tissue is found. [1]

(b) Scientists carried out an investigation into the effect of light on the growth of leaves.

Plants of the same species (**A**) were grown in three different light intensities.

The plants were grown in the same soil and kept in glasshouses with automatic watering.

A sample of 100 leaves was selected at random and collected from plants in each of the three different light intensities. A total of 300 leaves were collected.

The scientists studied the variations in the size and structure of the leaves in each sample.

(i) Suggest why the scientists used large samples of leaves.

.....
..... [1]

(ii) Suggest why the leaves in each light intensity were selected at random.

.....
..... [1]

(iii) A grid, divided into millimetre squares, was used to measure the surface area of the leaves.

Outline how the grid could have been used.

.....
.....
.....
..... [2]

(iv) State the variable that was changed (independent variable) in this investigation.

..... [1]

- (c) The scientists collected data from one other plant species (**B**).

Table 2.1 shows the results.

Table 2.1

light intensity/ arbitrary units	average leaf area/mm ²	
	species A	species B
100	3600	2800
50	3900	3400
10	6500	2900

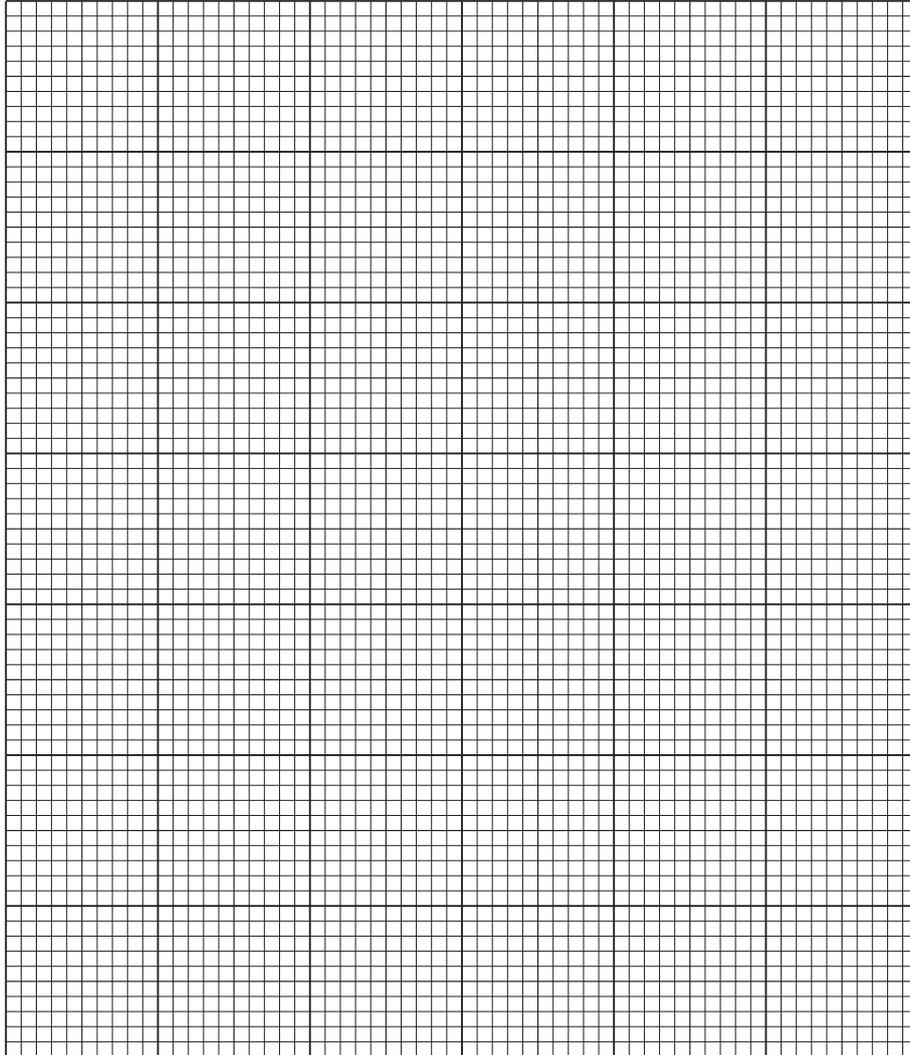
- (i) Calculate the percentage difference in the average leaf area for species **A** from a light intensity of 50 arbitrary units to 10 arbitrary units.

Show your working and give your answer to the nearest whole number.

.....%

[2]

- (ii) Plot a bar chart on the grid to show the average leaf area for species **A** and **B**, at each light intensity.



[4]

- (iii) Describe the trends shown in your graph for species **A** and species **B**.

.....

.....

.....

.....

..... [2]

- (iv) The scientists want to determine more precisely the light intensity that results in the largest leaf area for species **B**.

Suggest how the method used in the investigation could be modified to achieve this.

.....
.....
..... [1]

[Total: 21]

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BIOLOGY

0610/62

Paper 6 Alternative to Practical

May/June 2019

1 hour

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This document consists of **11** printed pages and **1** blank page.

- 1 Anaerobic respiration in yeast causes the blue dye, methylene blue, to become colourless.

A student investigated the effect of temperature on the rate of respiration in yeast.

- Step 1 7 cm³ of a yeast suspension was put into a test-tube labelled **warm**. The test-tube was then placed into a beaker of warm water. The temperature of the water in the beaker was 45°C.
- Step 2 7 cm³ of a yeast suspension was put into a test-tube labelled **cool**. The test-tube was then placed into a beaker of cool water. The temperature of the water in the beaker was 20°C.
- Step 3 After three minutes, the student added five drops of methylene blue dye to the yeast suspensions in each of the test-tubes. The yeast suspensions became blue in both test-tubes.
- Step 4 A layer of vegetable oil was carefully poured on top of the yeast suspension in each of the test-tubes, as shown in Fig. 1.1.

The layer of oil stopped air from reaching the yeast cells in the suspension so that the conditions were anaerobic

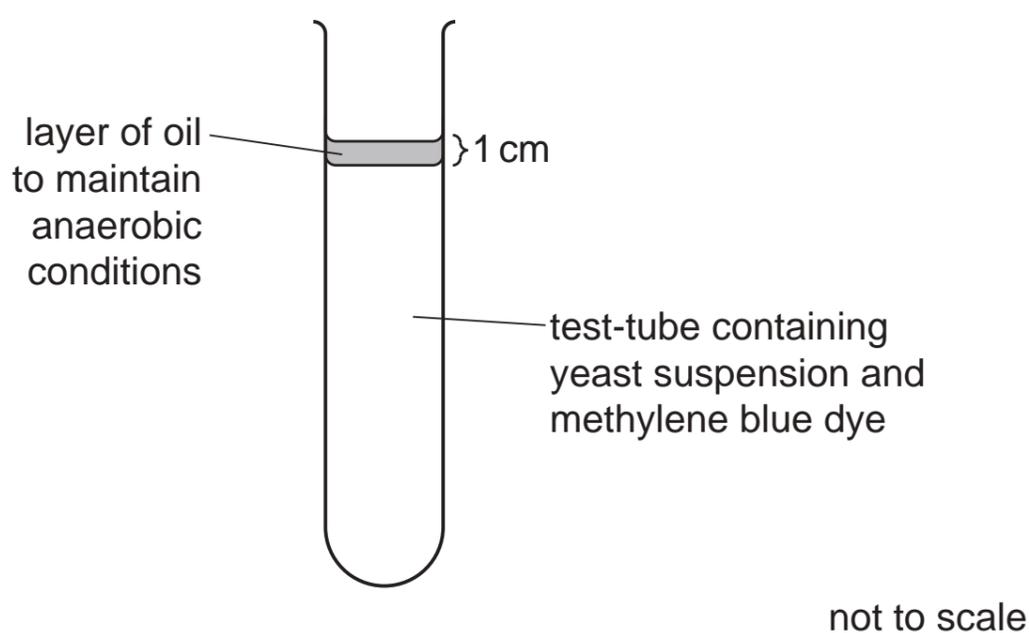


Fig. 1.1

- Step 5 A stop-clock was started.

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Step 6 The student observed the **warm** and **cool** test-tubes. When they could no longer see the blue colour they recorded the time taken for the blue colour to disappear.

Fig. 1.2 shows the time on the stop-clock for each test-tube at the end of step 6.

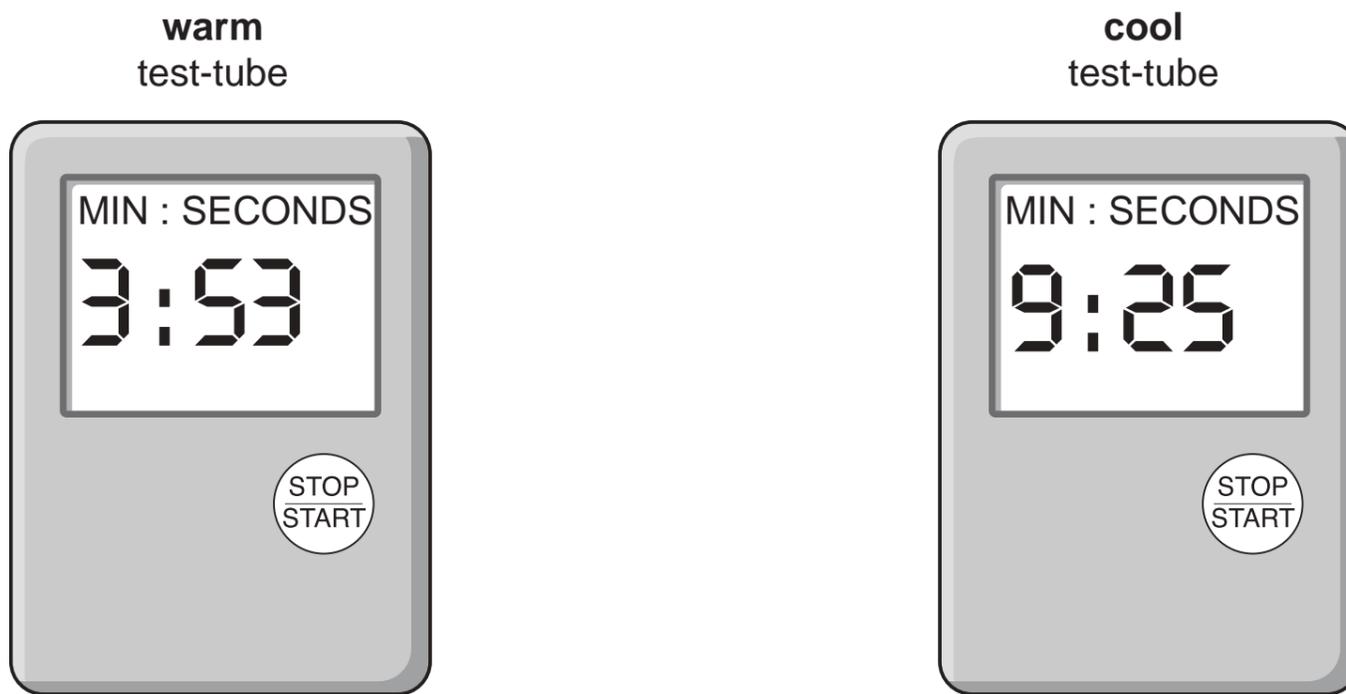


Fig. 1.2

(a) (i) Prepare a table to record the results.

Convert the times shown in Fig. 1.2 to seconds and record them in your table.

[3]

(ii) State a conclusion for the results in your table in 1(a)(i).

.....

.....

.....Need a home tutor? Visit smiletutor.sg..... [1]

Step 7 The student used a thermometer to measure the temperatures of the warm water beaker and the cool water beaker at the end of the investigation.

Fig. 1.3 shows the temperatures on the thermometer at the **end** of the investigation.

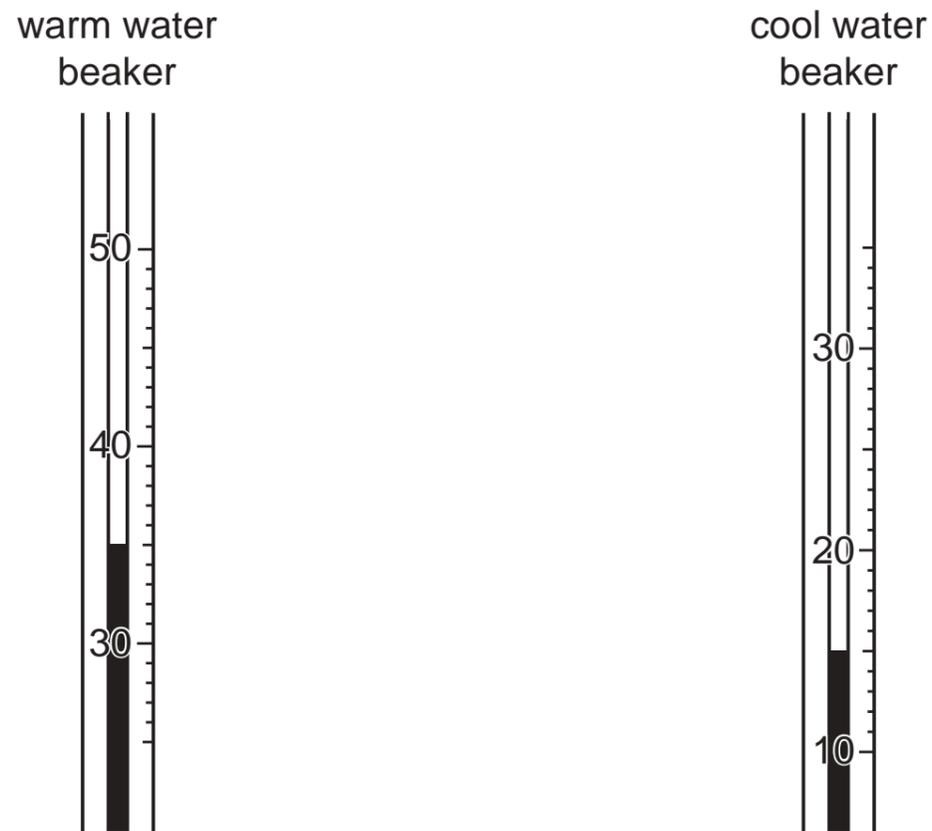


Fig. 1.3

- (iii) Complete Table 1.1 by recording the temperatures in the beakers at the start and at the end of the investigation.

Table 1.1

beaker	temperature at the start/ $^{\circ}\text{C}$	temperature at the end/ $^{\circ}\text{C}$
warm water		
cool water		

[1]

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(iv) Identify the variable that was changed (independent variable) in this investigation.

..... [1]

(v) Identify **two** variables that were kept constant in this investigation.

1

2

[2]

(b) (i) Identify **one** possible source of error in step 6 and suggest an improvement for this error.

error

.....

improvement

.....

.....

[2]

(ii) The data you have recorded in Table 1.1 may indicate that there is a source of error with the method used in this investigation.

Identify the possible error and suggest an improvement to the method to reduce the effect of this error.

error

.....

improvement

.....

.....

[2]

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- 2 (a) Fig. 2.1 is a photograph showing four seed heads from a poppy plant.

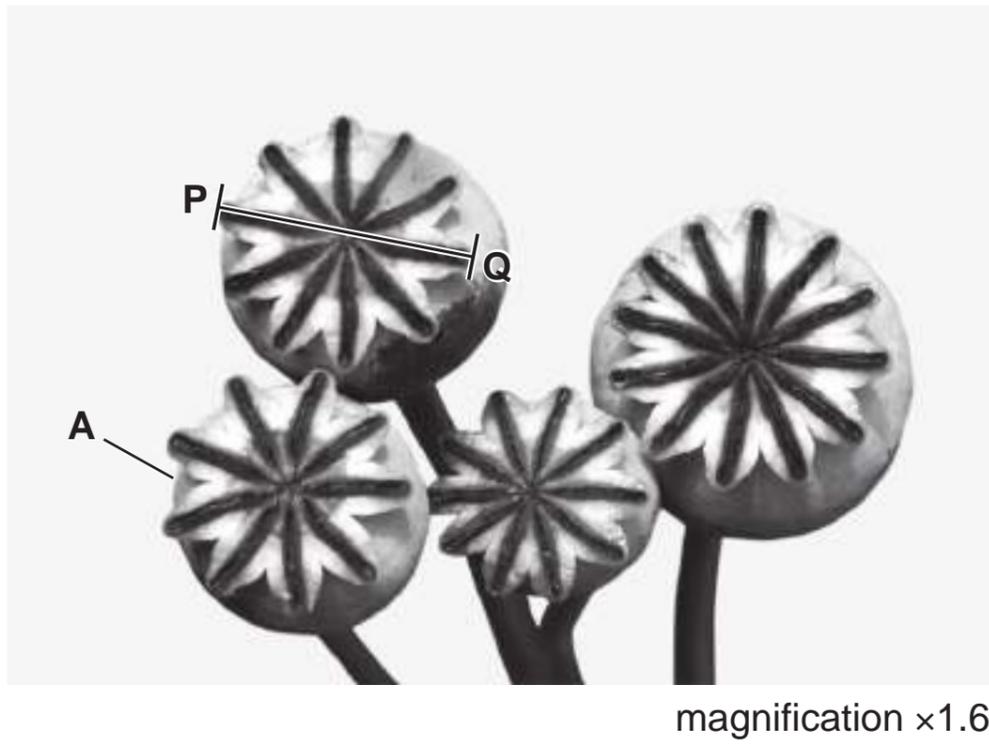


Fig. 2.1

- (i) Draw a large diagram of the seed head labelled A.

[4]

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(ii) Measure the length of line **PQ** on Fig. 2.1. Include the unit.

length of line **PQ**

Calculate the actual size of the seed head using the formula and your measurement.

$$\text{magnification} = \frac{\text{length of line } \mathbf{PQ}}{\text{actual diameter of the seed head}}$$

Give your answer to the nearest whole number and include the unit.

Show your working.

.....
[3]

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- (b) A student investigated the effect of pH on the germination of seeds. The student planted 25 seeds for each pH value.

The results of the investigation are shown in Table 2.1.

Table 2.1

pH	number of seeds that germinated	percentage of seeds that germinated
4	20	80
5	23	92
6	24	96
7	19	76
8	15	
9	10	40

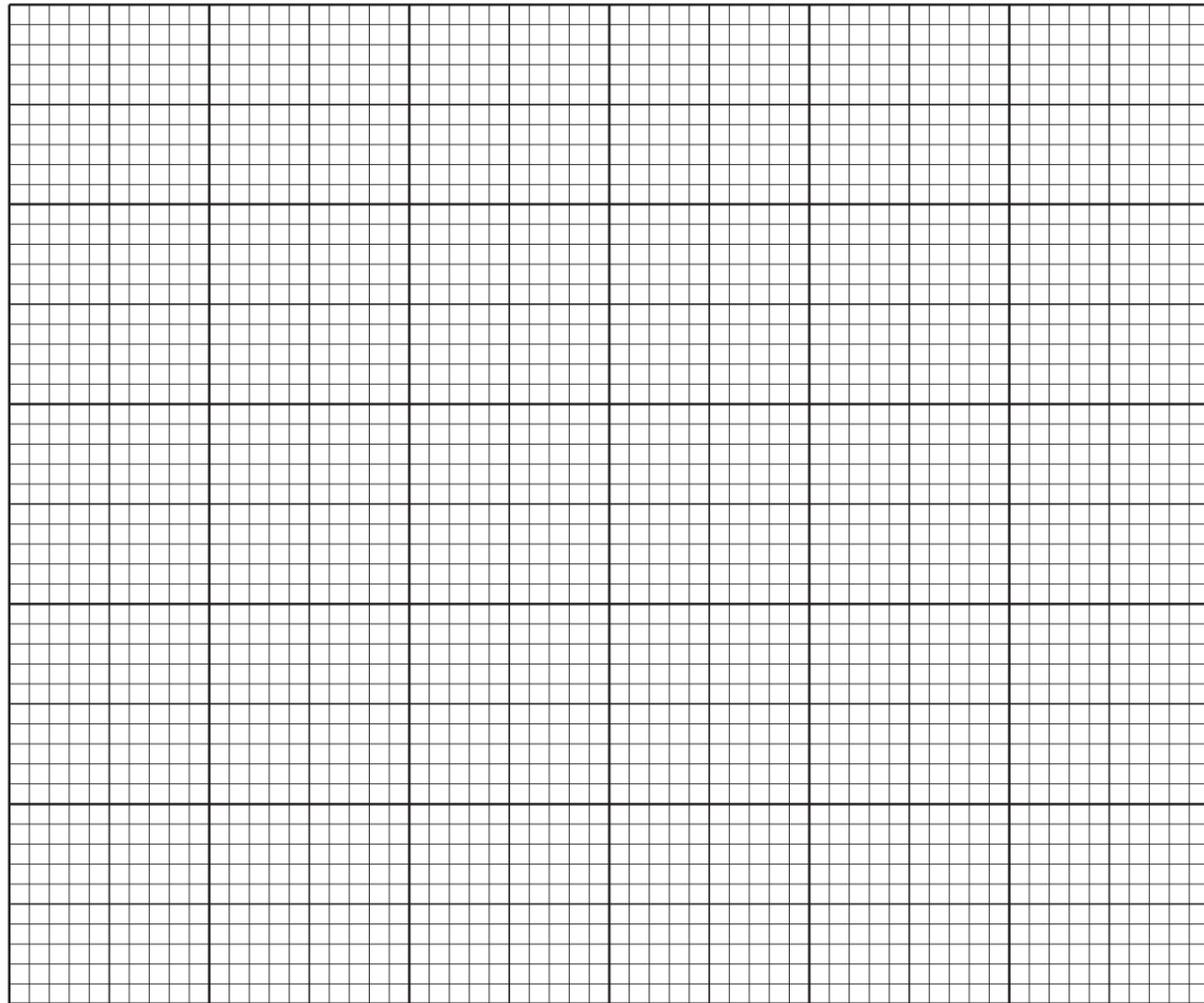
- (i) Calculate the percentage of seeds that germinated at pH 8.

Show your working.

..... %
[2]

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- (ii) Plot a line graph on the grid to show the effect of pH on the percentage of seeds that germinated using the data in Table 2.1.



[4]

- (iii) Describe the effect of pH on the percentage of seeds that germinated shown in your graph.

.....
.....
.....
.....

[2]

- (iv) The student wanted to obtain a more accurate value for the optimum (best) pH for the germination of seeds.

Suggest further investigative work that the student should carry out.

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.....
.....
.....
.....

[2]

(c) During germination the starch within seeds is broken down to form reducing sugars.

Describe how you could test a sample of germinating seeds to find out if reducing sugars are present.

.....

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 20]

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Cambridge Assessment International Education
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NUMBER

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BIOLOGY

0610/63

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 **11** printed pages and **1** blank page.

1 Fig. 1.1 shows a section through an unfertilised chicken's egg.

The egg is made up of the outer shell, inner yellow yolk and albumen (egg white).

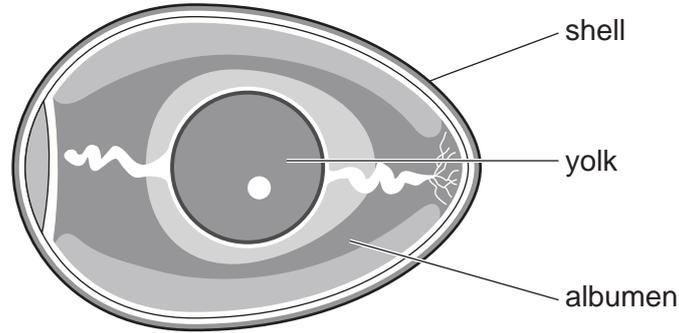


Fig. 1.1

The albumen and yolk are composed of different substances, including fats.

(a) Describe how ethanol can be used to test a sample of food for the presence of fat.

Include the result for a positive test.

.....

.....

.....

.....

.....

.....

..... [3]

(b) A student was given a sample of albumen. They tested the sample for reducing sugars by carrying out the steps shown:

- a syringe was used to put 2 cm³ of albumen suspension into a test-tube
- 2 cm³ of Benedict's reagent was added
- the solutions were mixed thoroughly by gently shaking the test-tube.

(i) State the next step required to complete the test for reducing sugars.

.....

.....

..... [1]

(ii) Describe a positive result for the presence of reducing sugars.

.....

..... [1]

(c) Proteins can be broken down by protease enzymes. Enzymes are also made of protein.

A student investigated the effect of acid on the breakdown of albumen by a protease enzyme.

Step 1 Three test-tubes **P**, **Q** and **R** were prepared.

The volumes of the substances added to the test-tubes are shown in Table 1.1.

Table 1.1

test-tube	albumen /cm ³	distilled water /cm ³	acid /cm ³	enzyme /cm ³
P	2	2	0	0
Q	2	1	0	1
R	2	0	1	1

Step 2 The test-tubes were placed in a water-bath at 40 °C for 10 minutes.

Step 3 After 10 minutes the test-tubes were removed from the water-bath and placed in a test-tube rack. 2 cm³ of biuret solution was added to each test-tube.

Step 4 The appearance of the solution in each test-tube was observed.

The student's observations are shown in Fig. 1.2.

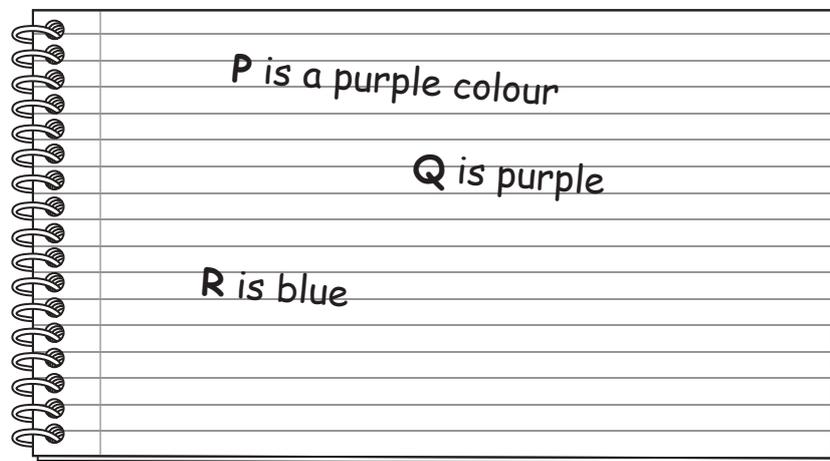


Fig. 1.2

(i) Prepare a table to record the observations shown in Fig. 1.2.

[2]

(ii) State a conclusion for these results.

.....
.....
..... [1]

(iii) Identify the variable that was changed (independent variable) in this investigation.

..... [1]

(iv) State the purpose of test-tube **P** in this investigation.

.....
..... [1]

(v) Suggest why 1 cm³ of distilled water was added to test-tube **Q**.

.....
..... [1]

(vi) The student used only one syringe to prepare the solutions in test-tubes **P**, **Q** and **R** in step 1.

Explain why this is a potential source of error and how it could affect the results.

error

.....

effect of the error

.....

..... [2]

(vii) Identify **one** potential safety hazard in this investigation.

.....

..... [1]

[Total: 14]

- 2 (a) Fig. 2.1 is a photomicrograph showing a cross-section of an artery.

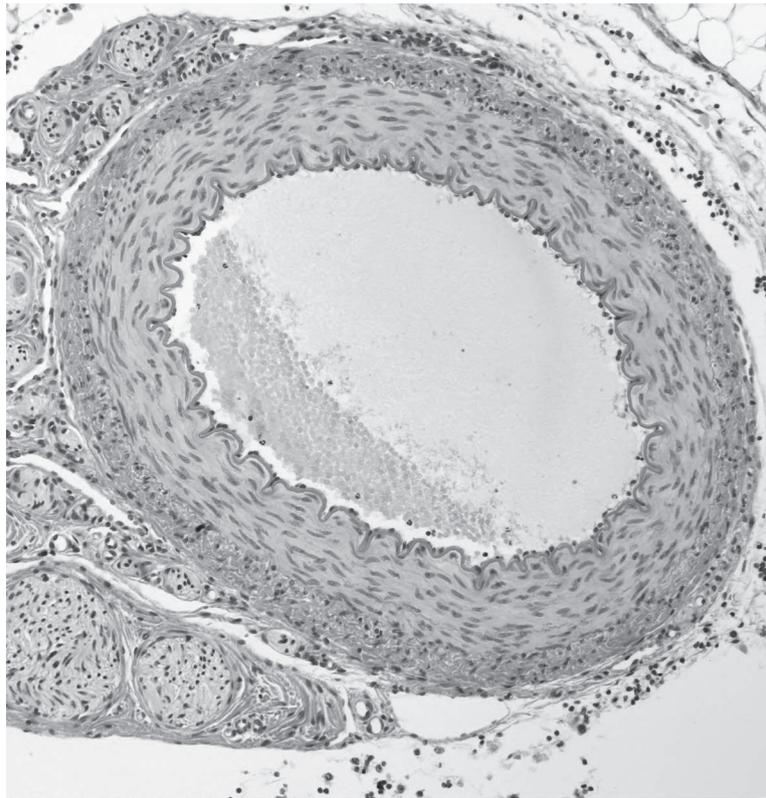


Fig. 2.1

Make a large drawing of the artery in Fig. 2.1 to show the layers that make up the artery wall.
Do not draw individual cells.

[4]

(b) Fig. 2.2 shows a photomicrograph of cross-sections of an artery and a vein.

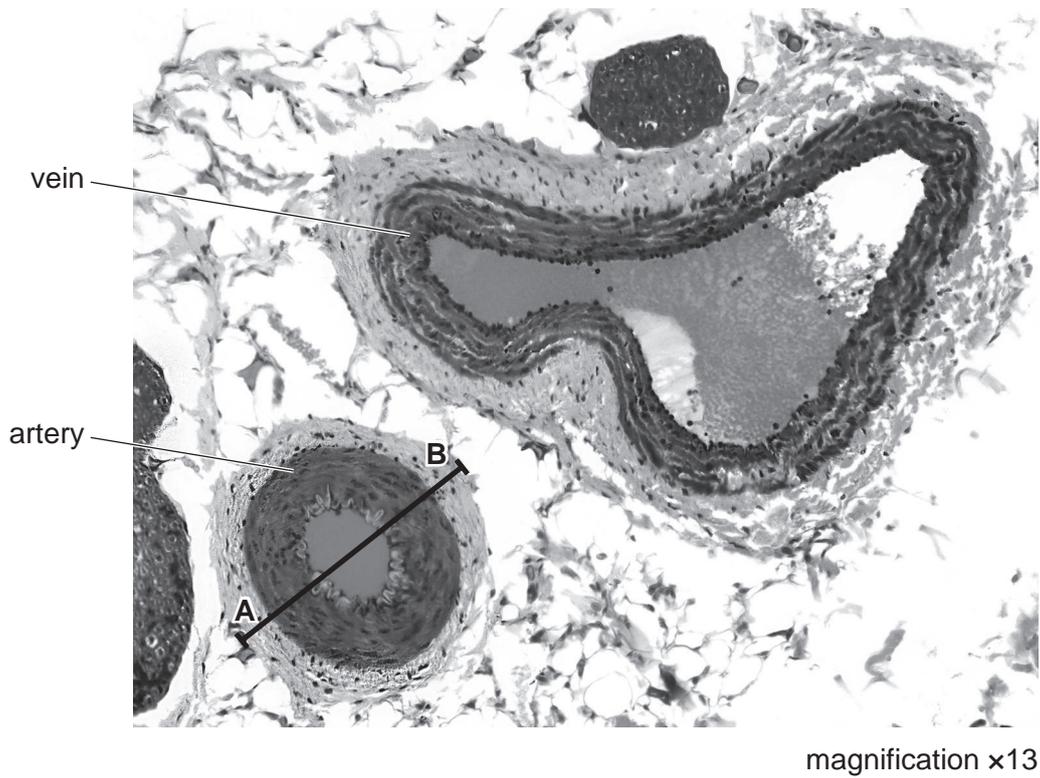


Fig. 2.2

- (i) The diameter of the artery is indicated by line **AB**.

Measure the length of line **AB**, on Fig. 2.2. Include the unit.

length of line **AB**

Calculate the actual diameter of the artery using your measurement and the formula.

$$\text{magnification} = \frac{\text{length of line AB}}{\text{actual diameter of the artery}}$$

Give your answer to two significant figures. Include the unit.

Show your working.

.....
[3]

(ii) Describe **one** similarity and **one** difference between the artery and the vein shown in Fig. 2.2.

similarity

.....

difference

.....

[2]

(c) A person investigated the change in their pulse rate before and after exercise.

The person measured their pulse before exercise, during and after exercise.

The results are shown in Table 2.1.

Table 2.1

activity	time /minutes	pulse rate /beats per minute
before exercise	2	78
	4	78
	6	78
during exercise	8	125
	10	148
	12	160
after exercise	14	154
	16	122
	18	94

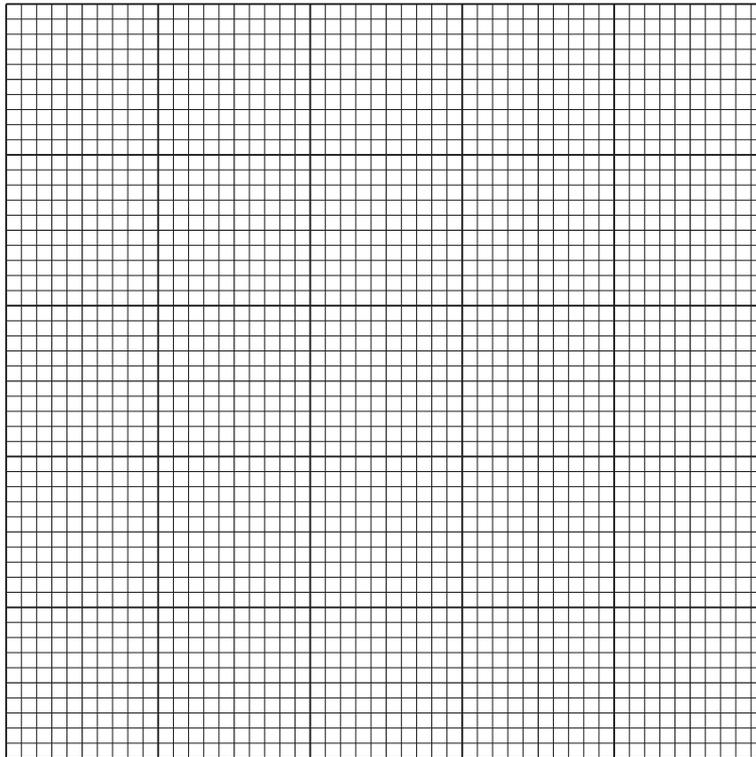
- (i) Calculate the percentage increase in the pulse rate from minute 6 (before exercise) to minute 12 (during exercise).

Give your answer to the nearest whole number.

Show your working.

..... %
[2]

(ii) Plot a line graph on the grid of time against pulse rate for the results shown in Table 2.1.



[4]

(iii) Use your graph to estimate the pulse rate of the person at 15 minutes.

Show on your graph how you obtained your answer.

..... bpm
[2]

(iv) Describe the results of the person's investigation.

.....
.....
.....
.....
.....
.....
..... [3]



BIOLOGY

0610/51

Paper 5 Practical Test

October/November 2019

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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

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- 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 experiment in Question 1 and record the results on a spare copy of the question paper, clearly labelled 'supervisor's results'.

Question 1

Each candidate should be provided with:

hazard	materials and apparatus	quantity per candidate
	Whatman's number 1 filter paper cut to size: 15 cm long and approximately 1 cm wide	1
	standard test-tube with a tightly fitting stopper	1
	test-tube rack	1
	scissors	1
	30 cm ruler with a mm scale (also required for Question 2)	1
	pencil (soft, HB, B, #2 or #1)	1
F, MH	acetone (propanone) in a closed container, labelled S1	30 cm ³
	small metal disc, at least 20 mm diameter This can be a low value round coin or a token. Plastic is not suitable.	1
	spinach leaves (in a Petri dish covered with a damp paper towel)	3
	transparent adhesive tape suitable for adhering paper to paper	15 cm
	paper towels	3
	stop-clock	1
	eye protection	1
	gloves	1 pair

Preparation of materials and solutions

Spinach leaves

These should be whole leaves that can be picked from a plant or bought from a market 1–2 days before the examination. The leaves should be stored in a cool place and supplied in a Petri dish covered with a damp paper towel.

If spinach (*Spinacea oleracea*) is not available any green dicotyledonous plant leaves can be used provided they have a thin cuticle and are easily crushed.

Solvent F, MH

Acetone (propanone) can be obtained from a commercial chemical supplier. It is not necessary to use analar quality.

Acetone is highly flammable and should be stored in a cool place (not a refrigerator) in a closed container.

It should be dispensed just before the examination in a container with a lid. Hazard labels should be on the container.

During the examination the room should be well-ventilated. There should **not** be any naked flames.

Filter paper strips

The filter paper must be able to fit into a standard test-tube without touching the sides of the test-tube. If the internal diameter of the test-tube is less than 15 mm wide reduce the width of the strip of filter paper provided to candidates so that it can be placed inside the test-tube without touching the sides of the test-tube. For example, reduce the width of the filter paper strip from 10 mm to 8 mm.

Before the examination the supervisor should test the leaves. A strip of Whatman's number 1 filter paper 1 cm × 15 cm should be cut and a pencil line drawn 3 cm from one end. A test leaf should be placed over the line and a metal disc rolled firmly over the leaf along the pencil line. The leaf should be soft enough to be crushed and should leave a green line on the filter paper. Move the leaf and roll the metal disc over the leaf along the pencil line. Roll the disc over different parts of the leaf along the pencil line a total of five times. A dark green line should be visible on the pencil line. If a green line is not visible change the source of leaves, e.g. fresher or younger leaves.

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Supervisor's report

Syllabus and component number

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Centre number

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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:

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- any difficulties experienced by candidates, e.g. due to faulty materials or apparatus
- any specific assistance given to candidates.

Declaration

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 - the supervisor's reports relevant to these candidates
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- 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)

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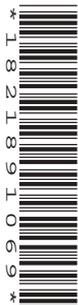
BIOLOGY

0610/52

Paper 5 Practical Test

October/November 2019

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HH	health hazard	T	acutely toxic
F	flammable	O	oxidising
N	hazardous to the aquatic environment		

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Before the exam

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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.
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After the exam

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 - the attendance register.

Specific information for this practical exam

During the exam, the supervisor (NOT the invigilator) must do the experiment in Question 1 and record their results on a spare copy of the question paper, clearly labelled 'supervisor's results'.

Question 1

Each candidate should be provided with:

hazard	materials and apparatus	quantity per candidate
MH, HH, C	1% amylase solution in a beaker labelled A	15 cm ³
	1% starch suspension in a beaker labelled S	15 cm ³
	iodine solution in a bottle labelled iodine solution with a dropper	15 cm ³
	distilled water in a beaker labelled distilled water	60 cm ³
	dialysis tubing bags in a small beaker of distilled water labelled dialysis tubing bags	2
	empty 250 cm ³ beaker labelled water-bath	1
	supply of hot water at 40–50°C Candidates will raise their hand when they are ready for hot water to be added to their water-bath.	100 cm ³
	distilled water in a beaker labelled water for washing	200 cm ³
	100 cm ³ beakers, one labelled E2 and the other labelled W2	2
	large test-tubes	2
	large test-tube rack	1
	Pasteur pipettes	4
	10 cm ³ syringe	1
	5 cm ³ syringes	3
	white tile, approximately 10 cm × 10 cm	1
	elastic bands to fit around a large test-tube	2
	paper towels	5
	suitable eye protection	1
	waterproof marker pen	1
	stop-watch	1
	plastic gloves	1 pair

Preparation of solutions

1% starch suspension

This should be prepared by adding 1 g of soluble starch to 80 cm³ of distilled water and bringing to boiling point to obtain a clear solution. Allow to cool. Make up to 100 cm³ with distilled water.

The starch suspension can be made the day before the exam and stored in a refrigerator. The starch suspension should be provided to candidates at room temperature.

1% amylase solution **MH, HH, C**

This is prepared by putting 1 g of bacterial amylase, **MH, HH, C**, into 80 cm³ of distilled water and mixing until dissolved. Make up to 100 cm³ with distilled water.

This should be prepared on the day of the exam.

iodine solution

Standard food-testing iodine solution is suitable.

dialysis tubing bags

Dialysis tubing comes in a variety of widths. Use dialysis tubing that will fit into a large test-tube when the tubing contains 6 cm³ of liquid. The dialysis tubing bags may be prepared the day before the exam but must be kept submerged in distilled water.

Prepare the dialysis tubing by soaking 20 cm lengths of dialysis tubing in distilled water for 10 minutes. Knot one end of the damp dialysis tubing tightly to form a bag. The distance of the knot from the open end of the dialysis tubing should be approximately 17 cm.

The dialysis tubing bags should be presented to candidates in a small beaker of distilled water labelled **dialysis tubing bags**.

Question 2

Each candidate should be provided with:

hazard	materials and apparatus	quantity per candidate
	30 cm transparent plastic ruler	1

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Centre number

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Signed (supervisor)

Name (in block capitals)

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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.

Specific information for this practical exam

During the exam, the supervisor (NOT the invigilator) must do the experiment in Question 1 and record the results on a spare copy of the question paper, clearly labelled 'supervisor's results'.

Question 1

Each candidate should be provided with:

hazard	materials and apparatus	quantity per candidate
	standard test-tubes	2
	stoppers to fit standard test-tubes	2
	spinach leaves	8
	pestle and mortar (If unavailable a heavyweight ceramic bowl and metal tea-spoon can be used.)	1
	cold isolation medium supplied in a 100 cm ³ beaker labelled isolation medium	50 cm ³
	small funnel to fit into large test-tube C	1
	20 cm × 20 cm pieces of muslin (If larger funnels are used, then bigger muslin may be required. Check that the muslin is sufficiently large to reach the edges of the funnel.)	3
	large test-tube labelled C in a test-tube rack	1
	empty 250 cm ³ beaker labelled water-bath	1
	20 cm × 20 cm piece of aluminium foil	1
	plastic graduated Pasteur pipette to measure 2 cm ³	1
	5 cm ³ syringe	1
	a supply of ice-cold water to distribute to candidates when they put their hand up (This can either be made using ice and water or by keeping the water in the refrigerator prior to the practical.)	200 cm ³
HH, MH, N	DCPIP in a 100 cm ³ beaker labelled DCPIP	20 cm ³
	stop-clock	1
	paper towels	3
	pair of gloves	1
	bench lamp with a 60 watt or equivalent bulb	1
	container labelled waste that is large enough to hold the funnel	1
	suitable eye protection	1

Preparation of materials

Phosphate buffer solution

Dissolve 4.48g hydrated disodium hydrogen phosphate ($\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$) and 1.7g potassium dihydrogen phosphate (KH_2PO_4) in 500 cm^3 of distilled water. Keep refrigerated until required.

Isolation medium

Dissolve 68.46g sucrose and 0.38g potassium chloride (KCl) in phosphate buffer solution and make up to 500 cm^3 with phosphate buffer solution. Keep refrigerated until just before the exam.

DCPIP solution **HH, MH, N**

Dissolve 0.01g DCPIP and 0.93g KCl in phosphate buffer solution and make up to 250 cm^3 with phosphate buffer solution. Keep refrigerated until required.

Spinach leaves

Common spinach (*Spinacia oleracea*) leaves are suitable and should be fresh. If fresh spinach is not available fresh green lettuce or cabbage leaves can be used as a substitute. Ensure that the substituted leaves are of approximately the same total size as eight spinach leaves.

Question 2

Each candidate should be provided with:

hazard	materials and apparatus	quantity per candidate
	30 cm transparent plastic ruler	1

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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)

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Grade thresholds – November 2019

Cambridge IGCSE™ Biology (0610)

Grade thresholds taken for Syllabus 0610 (Biology) in the November 2019 examination.

	maximum raw mark available	minimum raw mark required for grade:						
		A	B	C	D	E	F	G
Component 11	40	–	–	27	24	22	19	16
Component 12	40	–	–	27	24	20	17	15
Component 13	40	–	–	27	24	21	18	15
Component 21	40	34	29	24	21	18	15	12
Component 22	40	34	29	24	21	18	15	12
Component 23	40	35	30	26	22	19	16	13
Component 31	80	–	–	43	38	33	28	24
Component 32	80	–	–	45	38	31	24	16
Component 33	80	–	–	46	40	33	27	21
Component 41	80	47	38	29	25	21	16	12
Component 42	80	46	39	31	27	22	17	12
Component 43	80	46	39	31	26	20	15	10
Component 51	40	31	27	23	20	18	15	12
Component 52	40	33	27	21	18	16	13	10
Component 53	40	34	30	26	22	19	16	13
Component 61	40	32	27	23	20	18	15	12
Component 62	40	31	26	22	19	16	13	10
Component 63	40	34	30	26	22	19	16	13

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	164	141	118	95	83	71	58	45
BY	22, 42, 52	165	142	119	96	83	71	57	43
BZ	23, 43, 53	164	144	124	104	88	73	59	45
CX	21, 41, 61	166	142	118	95	83	71	58	45

Grade thresholds continued
Cambridge IGCSE Biology (0610)

Option	Combination of Components	A*	A	B	C	D	E	F	G
CY	22, 42, 62	162	140	118	97	84	71	57	43
CZ	23, 43, 63	164	144	124	104	88	73	59	45
FX	11, 31, 51	–	–	–	117	104	92	79	66
FY	12, 32, 52	–	–	–	118	101	85	69	53
FZ	13, 33, 53	–	–	–	124	108	92	77	62
GX	11, 31, 61	–	–	–	117	104	92	79	66
GY	12, 32, 62	–	–	–	119	102	85	69	53
GZ	13, 33, 63	–	–	–	124	108	92	77	62



BIOLOGY

0610/11

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.

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.

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

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



BIOLOGY

0610/12

Paper 1 Multiple Choice (Core)

October/November 2019

MARK SCHEME

Maximum Mark: 40

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

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



BIOLOGY

0610/13

Paper 1 Multiple Choice (Core)

October/November 2019

MARK SCHEME

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

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



BIOLOGY

0610/21

Paper 2 Multiple Choice (Extended)

October/November 2019

MARK SCHEME

Maximum Mark: 40

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

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



BIOLOGY

0610/22

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

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



BIOLOGY

0610/23

Paper 2 Multiple Choice (Extended)

October/November 2019

MARK SCHEME

Maximum Mark: 40

Published

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

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



BIOLOGY

0610/31

Paper 3 Theory (Core)

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.

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.

PUBLISHED**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	Guidance
1(a)(i)	carbon, hydrogen, oxygen ;	1	
1(a)(ii)	fatty acids ; glycerol ;	2	
1(b)	<i>any three from:</i> carbohydrates ; proteins ; (named) vitamins ; water ; (named) minerals ; fibre ;	3	
1(c)(i)	4 ;	1	
1(c)(ii)	marmots and lynx have a higher percentage of body fat in Alaska than in Virginia /AW ; ora marmots have a greater difference in percentage body fat (than lynx) ; ora marmots have the higher percentage body fat than lynx in Alaska / lynx have a higher percentage body fat than marmots in Virginia ; ora	2	
1(c)(iii)	<i>(Alaska is colder than Virginia)</i> so (more) fat is needed : ora for insulation ; fat helps to, maintain body temperature / keep (mammal) warm / AW ; (lynx and marmots) are mammals so they regulate their body temperature ;	2	
2(a)	inherited / hereditary ; survive ; environment / habitat ;	3	
2(b)(i)	4.4–4.5 (µm) ;	1	

Question	Answer	Marks	Guidance
2(b)(ii)	9 ;	1	
2(b)(iii)	continuous / phenotypic ;	1	
2(c)	to swim, faster / further ;	1	
2(d)	testis ;	1	

Question	Answer	Marks	Guidance
3(a)(i)	B and C ; (B) is too cold / not optimum temperature / needs warmth ; (C) is dry / lacks water / needs to be damp ;	3	
3(b)	1 : 2 ;	1	
3(c)	chlorophyll (production) ; (named), amino acids / proteins ;	2	
4(a)(i)	decreases then increases and levels off ; lowest thickness (reached) at day 6 / decreases from day 0/1 to day 6 ; increases in thickness from day 6 to day 15 ; constant thickness between days 15 and 28 / 0 / end ;	3	
4(a)(ii)	day 0 / 1, to day 6 ;	1	
4(a)(iii)	X drawn on the graph at approximately day 14 ;	1	A ± 2 days
4(b)(i)	chemical ; gland ; blood / plasma ;	3	

Question	Answer	Marks	Guidance
4(b)(ii)	increased rate of breathing ; increased, pulse / heart, rate ; widening of pupils ; AVP ;; e.g. more glucose in the blood / more alert	2	
4(b)(iii)	<u>adrenal</u> (gland) ;	1	
5(a)	both use glucose ; both occur in cells ; aerobic respiration uses oxygen ; ora aerobic respiration releases <u>more</u> energy (than anaerobic respiration) ; ora anaerobic respiration produces lactic acid ; ora aerobic respiration produces carbon dioxide ; ora	4	
5(b)	active transport ticked ; protein synthesis ticked ;	2	
5(c)	<i>Alcohol linked to:</i> can be addictive (box 2) ; increases reaction times (box 5) ; is a depressant (box 6) ;	3	
5(d)	liver / brain / pancreas / heart / stomach ;	1	

Question	Answer	Marks	Guidance
6(a)(i)	<i>any three from:</i> capillaries / coronary artery / coronary vein / pulmonary artery / aorta / pulmonary vein / vena cava / left ventricle / right ventricle / left atrium / right atrium / septum / (named) valve / AVP ;;;	3	
6(a)(ii)	presence of valves ; thinner wall ; thinner muscle layer / AW ; thinner elastic layer / AW ; wider lumen /AW ; AVP ;	3	
6(a)(iii)	carries blood, away from the heart ;	1	
6(b)(i)	red blood cell labelled with line and X ;	1	
6(b)(ii)	(named) white (blood cell) ;	1	
6(b)(iii)	plasma ; platelets ;	2	
6(c)(i)	high, fat / cholesterol / salt, diet ; smoking ; genetic predisposition ; age ; stress ; sex ; obesity ; lack of exercise / sedentary lifestyle / AW ; AVP ; high blood pressure / alcohol consumption	3	
6(c)(ii)	<u>coronary artery</u> ;	1	

Question	Answer	Marks	Guidance
7(a)	lack of biodiversity / fewer (wild) species / AW ; extinction of species ; loss of, habitats / resources (for species) / deforestation ; (crop) disease easily spread ; (crops) more susceptible to pests ; depletes soil nutrients ; <i>ref. to</i> pollution ; e.g. herbicides / pesticides / fungicides / fertilisers AVP ;; e.g. flooding / droughts	3	
7(b)	1 (first) ; (then) 3, 5, 2 ; 4 (at the end) ;	3	
8(a)(i)	whooping crane ;	1	
8(a)(ii)	574 ;;;	3	one mark for correct numbers from table one mark for correct calculation one mark for correct rounding to a whole number
8(b)(i)	hunting / collecting / poaching ; introduced species / competition (for named resource) / AW ; food, chain / web, disrupted or over predation or lack of food : (named) pollution ; disease ; loss / change, of habitat or natural disasters ; global warming / climate change ;	3	

Question	Answer	Marks	Guidance
8(b)(ii)	growing in a glasshouse / AW ; seed banks ; legislation ; nature reserves / protected areas ; botanical gardens ; AVP ;	1	
9(a)	kill / remove, pathogens / microorganisms ; to make it safe to, use / drink ; prevent disease ; to remove, toxic waste / nitrate pollution ; it can harm species in, river / sea / oceans ; AVP ;	2	
9(b)	screening ; primary treatment ; secondary treatment ; separation ; aeration ; settlement / sedimentation ; anaerobic / sludge, digestion ; disinfection / chlorination / UV light ; AVP ;	1	
9(c)(i)	microorganism / AVP ;	1	
9(c)(ii)	decompose / digest / breakdown, (sewage) ;	1	



BIOLOGY

0610/32

Paper 3 Theory (Core)

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.

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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	Guidance
1	stomach ; bacteria ; absorbed ; enzymes ; water ;	5	

Question	Answer	Marks	Guidance																		
2	<table border="1"> <thead> <tr> <th>description</th> <th>meiosis</th> <th>mitosis</th> </tr> </thead> <tbody> <tr> <td>can result in growth</td> <td></td> <td>✓ ;</td> </tr> <tr> <td>nuclear division</td> <td>✓</td> <td>✓ ;</td> </tr> <tr> <td>occurs in asexual reproduction</td> <td></td> <td>✓ ;</td> </tr> <tr> <td>produces egg cells</td> <td>✓</td> <td>(✓) ;</td> </tr> <tr> <td>replaces damaged cells</td> <td></td> <td>✓ ;</td> </tr> </tbody> </table>	description	meiosis	mitosis	can result in growth		✓ ;	nuclear division	✓	✓ ;	occurs in asexual reproduction		✓ ;	produces egg cells	✓	(✓) ;	replaces damaged cells		✓ ;	5	one mark for each correct row
description	meiosis	mitosis																			
can result in growth		✓ ;																			
nuclear division	✓	✓ ;																			
occurs in asexual reproduction		✓ ;																			
produces egg cells	✓	(✓) ;																			
replaces damaged cells		✓ ;																			

Question	Answer	Marks	Guidance
3(a)(i)	wide / large, lumen / AW ; thin wall ; vessel is flattened / AW ; valves present ;	2	
3(a)(ii)	vertical arrow pointing upwards (in longitudinal section only) ;	1	
3(b)(i)	feeling / using fingers, on, wrist / neck / AW OR listening to heart beat / using stethoscope / using a (named) monitoring device ; (counting / measuring) per unit time / stated time ;	2	
3(b)(ii)	76 (beats per min) ;	1	
3(b)(iii)	(pulse rate) increases / AW ;	1	
3(b)(iv)	<u>B1</u> ;	1	
3(b)(v)	group A has higher resting pulse rate (than group B) ; ora group B has higher pulse rate after exercise (than group A) ; ora group B has higher, increase / change, in pulse rate (after running, than group A) ; group B (pulse rate) are more varied / AW (than group A , at rest / after running ; ora	2	
3(c)	increased (rate of breathing) / AW ; increased depth (of breathing) ;	2	

Question	Answer	Marks	Guidance
4	<p>controls cell activities</p> <p>controls movement of chemicals into and out of cells</p> <p>makes glucose</p> <p>prevents cell from bursting</p> <p>cell membrane</p> <p>cell wall</p> <p>chloroplast</p> <p>nucleus</p> <p>vacuole</p> <p>♦♦♦♦ ♦♦♦♦</p>	4	

Question	Answer	Marks	Guidance
5(a)(i)	root drawn growing downwards ; shoot drawn growing upwards ;	2	
5(a)(ii)	gravitropism ;	1	
5(b)(i)	carbon dioxide + water ; \longrightarrow glucose + oxygen ;	2	
5(b)(ii)	magnesium ;	1	
5(b)(iii)	palisade (mesophyll) / spongy (mesophyll) / mesophyll / guard ;	1	
5(c)(i)	nearer the light / increasing light (intensity), increases (the rate of) photosynthesis ; <i>idea that the relationship is not linear ;</i> rate of photosynthesis peaks at 10cm / AW ;	2	
5(c)(ii)	temperature ; carbon dioxide (concentration) ; number of chloroplasts ; surface area / number / size, of leaves / plant ; AVP ; e.g. species of plant	2	
5(d)	(for) respiration ; for / release, energy ; converted to starch (for storage) / stored as starch ; made into, cellulose / cell wall ;	1	

Question	Answer	Marks	Guidance
6(a)(i)	larynx ; trachea ; bronchiole ; rib ; diaphragm ;	5	must be in this vertical order
6(a)(ii)	circulatory (system) / AW ;	1	
6(b)	large (surface) area ; thin (wall) ; good blood supply / lots of capillaries / lots of blood vessels ; good ventilation (with air) / AW ; moist ; AVP ; e.g. small / short, diffusion distance (described)	3	
6(c)	tar / carbon monoxide / nicotine ; addictive ; causes cancer ; COPD / emphysema / bronchitis ; more mucus ; paralysis / damage, of cilia / AW ; narrowing of blood vessels / raises blood pressure / blood more likely to clot ; CHD ; less oxygen, in blood / supplied to body OR to cells OR to tissues ; reduces oxygen supply to fetus / low birthweight ; AVP ;	4	

Question	Answer	Marks	Guidance
7(a)	chromosome ; gene ; phenotype ; inheritance ;	4	
7(b)(i)	46 / 23 pairs ;	1	
7(b)(ii)	there are two X chromosomes present / no Y chromosome / has only X chromosomes / is XX / is not XY ;	1	
7(b)(iii)	47 chromosomes / an extra chromosome / three number 21(chromosomes) ;	1	

Question	Answer	Marks	Guidance
8(a)	motor / effector, (neurone) ; impulse ; synapse ;	3	
8(b)	light ; sound ; temperature ; touch ; chemicals ; AVP ; e.g. gravity / movement / stretch	3	
8(c)	(stimulus detected by) receptor ; receptor passes (impulse) to sensory neurone ; sensory neurone passes (impulse) to, relay / intermediate, neurone ; relay neurone passes (impulse) to motor neurone ; motor neurone passes to muscle / gland / effector ; automatic / involuntary / AW ; AVP ;	4	

Question	Answer	Marks	Guidance
9(a)(i)	root hair (cell) ;	1	
9(a)(ii)	xylem ;	1	
9(a)(iii)	leaf / leaves ;	1	
9(b)	<i>any three from:</i> exhalation or breathing out / urine or excretion through kidney / sweat / vomit / tears or crying / blood loss / menstruation / mucus / semen / faeces / egestion / diarrhoea ;;;	3	

Question	Answer	Marks	Guidance
10(a)(i)	22 (g per hour) ;	1	
10(a)(ii)	06:00 ;	1	
10(a)(iii)	08:00 / 16:00 ;	1	
10(b)	high temperature increases water loss ; ora high humidity decreases water loss ; ora	2	
10(c)	transpiration ;	1	



BIOLOGY

0610/33

Paper 3 Theory (Core)

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.

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
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- 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:

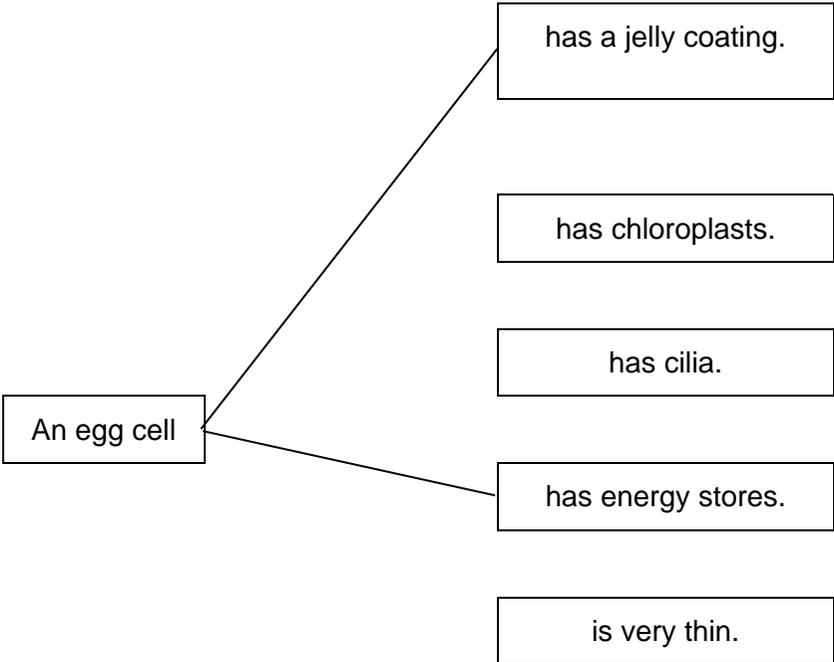
Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

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	Guidance
1(a)(i)	 <p>An egg cell</p> <ul style="list-style-type: none"> has a jelly coating. has chloroplasts. has cilia. has energy stores. is very thin. 	2	
1(a)(ii)	<p><i>drawing</i> tail drawn onto mid-piece ;</p> <p><i>main features max 2 from:</i> tail / flagellum ; enzymes; nucleus / genetic material / chromosomes ; cytoplasm ; cell membrane ; AVP ;</p>	3	A acrosome

Question	Answer	Marks	Guidance
1(b)(i)	(largest) nucleus (in the middle) chromosome (smallest) gene ;	1	
1(b)(ii)	DNA ;	1	
1(c)	xylem (vessels) ; ciliated (cell) ; palisade (mesophyll cell) ; red blood (cell) ;	4	

Question	Answer	Marks	Guidance
2(a)	sensory (neurone) ;	1	
2(b)(i)	synapse ;	1	
2(b)(ii)	electrical signal ;	1	

Question	Answer	Marks	Guidance												
2(c)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%; padding: 5px;">includes the brain and spinal cord</td> <td style="width: 20%; text-align: center; padding: 5px;"><input checked="" type="checkbox"/> ;</td> </tr> <tr> <td style="padding: 5px;">is made up of the brain, heart and spinal cord</td> <td style="text-align: center; padding: 5px;"><input type="checkbox"/></td> </tr> <tr> <td style="padding: 5px;">consists of the central nervous system only</td> <td style="text-align: center; padding: 5px;"><input type="checkbox"/></td> </tr> <tr> <td style="padding: 5px;">consists of the central and peripheral nervous system</td> <td style="text-align: center; padding: 5px;"><input checked="" type="checkbox"/> ;</td> </tr> <tr> <td style="padding: 5px;">coordinates through the release of hormones</td> <td style="text-align: center; padding: 5px;"><input type="checkbox"/></td> </tr> <tr> <td style="padding: 5px;">coordinates and regulates body functions</td> <td style="text-align: center; padding: 5px;"><input checked="" type="checkbox"/> ;</td> </tr> </table>	includes the brain and spinal cord	<input checked="" type="checkbox"/> ;	is made up of the brain, heart and spinal cord	<input type="checkbox"/>	consists of the central nervous system only	<input type="checkbox"/>	consists of the central and peripheral nervous system	<input checked="" type="checkbox"/> ;	coordinates through the release of hormones	<input type="checkbox"/>	coordinates and regulates body functions	<input checked="" type="checkbox"/> ;	3	
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coordinates through the release of hormones	<input type="checkbox"/>														
coordinates and regulates body functions	<input checked="" type="checkbox"/> ;														
2(d)	carbon, hydrogen, oxygen ; nitrogen ;	2													

Question	Answer	Marks	Guidance																					
3(a)	microscope ; membrane ; nucleus ; wall ; vacuole ; respiration ;	6																						
3(b)(i)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">feature</th> <th style="width: 25%;">mitosis</th> <th style="width: 25%;">meiosis</th> </tr> </thead> <tbody> <tr> <td>produces gametes</td> <td>(✓)</td> <td>✓</td> </tr> <tr> <td>produces genetically different cells</td> <td></td> <td>✓</td> </tr> <tr> <td>produces genetically identical cells</td> <td>✓</td> <td></td> </tr> <tr> <td>produces new cells during growth and repair to damaged tissues</td> <td>✓</td> <td></td> </tr> <tr> <td>replaces cells</td> <td>✓</td> <td></td> </tr> <tr> <td>used in asexual reproduction</td> <td>✓</td> <td></td> </tr> </tbody> </table>	feature	mitosis	meiosis	produces gametes	(✓)	✓	produces genetically different cells		✓	produces genetically identical cells	✓		produces new cells during growth and repair to damaged tissues	✓		replaces cells	✓		used in asexual reproduction	✓		4	6 correct = 4 marks 4 and 5 correct = 3 marks 2 and 3 correct = 2 marks 1 correct = 1 mark
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produces new cells during growth and repair to damaged tissues	✓																							
replaces cells	✓																							
used in asexual reproduction	✓																							
3(b)(ii)	X and X ; X and Y ;	2																						

Question	Answer	Marks	Guidance
4(a)	differences between individuals ; of the same species ;	2	
4(b)(i)	140 ;	1	
4(b)(ii)	20.0–20.9 (cm) ;	1	
4(c)	<i>type</i> : continuous / phenotypic ; <i>evidence</i> : range of phenotypes / AW ;	2	

Question	Answer	Marks	Guidance				
5(a)(i)	label line pointing to testis ; testes / testis ;	2					
5(a)(ii)	oestrogen ;	1					
5(a)(iii)	<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>girls only</th> <th>boys and girls</th> </tr> </thead> <tbody> <tr> <td>menstruation begins breasts grow pelvis broadens</td> <td>growth of under arm hair growth of pubic hair</td> </tr> </tbody> </table> <p style="text-align: right;">⋮</p>	girls only	boys and girls	menstruation begins breasts grow pelvis broadens	growth of under arm hair growth of pubic hair	3	5 correct = 3 marks 4 or 3 correct = 2 marks 2 or 1 correct = 1 mark
girls only	boys and girls						
menstruation begins breasts grow pelvis broadens	growth of under arm hair growth of pubic hair						
5(b)	increased rate of breathing ; increased, pulse / heart, rate ; widening of pupils ; AVP ; e.g. more glucose in blood / more alert	2					

Question	Answer	Marks	Guidance
6(a)(i)	(chemical reactions in cells that) break down of nutrient molecules to release energy ; without using oxygen ;	2	
6(a)(ii)	lactic acid ;	1	
6(a)(iii)	produces carbon dioxide ; produces alcohol ;	2	
6(b)(i)	24 (:1) ;;	2	
6(b)(ii)	aerobic releases more energy / anaerobic releases less energy ; run faster / run further / less fatigue / AW ; AVP ;	2	
6(c)	140 ;;	2	
6(d)	alveoli ; two(-way) ;	2	

Question	Answer	Marks	Guidance
7(a)(i)	they will grow towards the light / AW ;	1	
7(a)(ii)	phototropism ;	1	
7(a)(iii)	plants make their own food ; light provides energy ; for photosynthesis ; ref. to chlorophyll ; in chloroplasts ; to produce, carbohydrates / glucose / sugars ; (energy) needed for growth ; AVP ;	4	
7(a)(iv)	(roots) grow away from the light ;	1	
7(b)	suitable temperature ; water ; oxygen ;	3	
7(c)	(water absorbed by) osmosis ; vacuole fills with, water / fluid / AW ; pressure (of the water) ; pressing / pushing, outwards on the cell wall ;	2	

Question	Answer			Marks	Guidance																		
8(a)	<table border="1"> <thead> <tr> <th>name</th> <th>letter from Fig. 8.1</th> <th>function</th> </tr> </thead> <tbody> <tr> <td>cornea</td> <td>F ;</td> <td>refracts light</td> </tr> <tr> <td>iris</td> <td>G</td> <td>controls how much light enters the pupil</td> </tr> <tr> <td>retina</td> <td>A ;</td> <td>contains light receptors</td> </tr> <tr> <td>lens ;</td> <td>D</td> <td>focuses light on the retina</td> </tr> <tr> <td>optic nerve</td> <td>C</td> <td>carries impulses to the brain ;</td> </tr> </tbody> </table>	name	letter from Fig. 8.1	function	cornea	F ;	refracts light	iris	G	controls how much light enters the pupil	retina	A ;	contains light receptors	lens ;	D	focuses light on the retina	optic nerve	C	carries impulses to the brain ;			4	
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iris	G	controls how much light enters the pupil																					
retina	A ;	contains light receptors																					
lens ;	D	focuses light on the retina																					
optic nerve	C	carries impulses to the brain ;																					
8(b)	pupil (diameter), gets smaller / constricts ; restricts / reduces / controls, the amount of light entering the eye / AW ; reflex (action) / involuntary action / automatic / protective ;			2																			



BIOLOGY

0610/41

Paper 4 Theory (Extended)

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.

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Question	Answer	Marks	Guidance Notes										
1(a)	many (body) segments ; head and, body (segments) / AW ; many legs / many pairs of legs; elongated bodies ;	2											
1(b)	crustaceans ; arachnids ; insects ;	2											
1(c)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">class</th> <th style="width: 75%;">letter(s) of species from Fig. 1.3 in each class</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">J</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">L</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">M,</td> </tr> <tr> <td style="text-align: center;">4</td> <td style="text-align: center;">K,N,O</td> </tr> </tbody> </table> <p style="text-align: right;">⋮</p>	class	letter(s) of species from Fig. 1.3 in each class	1	J	2	L	3	M,	4	K,N,O	3	4 rows correct = 3 2 or 3 rows correct = 2 1 row correct = 1
class	letter(s) of species from Fig. 1.3 in each class												
1	J												
2	L												
3	M,												
4	K,N,O												
1(d)(i)	(genus) <i>Apheloria</i> ; (kingdom) animal ;	2											
1(d)(ii)	no (aerobic) respiration ; ora cannot release energy ; ora	1											

Question	Answer	Marks	Guidance Notes
2(a)	<p><i>carbohydrates</i> cellulose ; for cell walls ; starch ; for energy/respiration ; to attract insects to flowers / nectar / fruits ;</p> <p><i>amino acids</i> to make (named) proteins ; for enzymes ; for growth ;</p> <p>AVP ;</p>	4	
2(b)	<p>correct position labelled on the leaf ; correct position labelled on the stem ; correct position labelled on the root ;</p>	3	
2(c)(i)	<p>higher concentration in the stem / aphid D is nearer the root / is before the branching of the plant ; (sucrose moves by) <u>translocation</u> ; sucrose moves up the plant ; root / tuber, is a source ; (leaves / stems / AW) are a sink ; no photosynthesis (in the dark) ; no / less, glucose/sucrose (made in the leaves) ; plant uses stored starch (from root) / AW ;</p>	3	
2(c)(ii)	<p>insert gene / ref. to genetic engineering / ref. to genetic modification ; gene, for insect / aphid resistance ; ref. to insecticide / described ; AVP ; description of how insecticide applied / biological control / grow in glasshouses / netting</p>	3	

Question	Answer	Marks	Guidance Notes
2(c)(iii)	pollination ; AVP ; e.g. biological control described / insect products e.g. honey	1	

Question	Answer	Marks	Guidance Notes
3(a)	remove from the, body / organism / cell ; waste / poisons / toxins / harmful substances ; (waste products) of metabolism / respiration ; (named) substances in excess ;	2	
3(b)	the outline shape of a kidney, with one tube attached, drawn ; tube labelled ureter, outer portion of kidney labelled as cortex, medulla labelled inside the kidney ;	2	
3(c)(i)	ref. to capillaries ; (capillaries are) one cell thick / thin / AW ; <i>idea of fenestrations / pores ;</i> network (of capillaries) / tangled / knotted / tightly packed tubes ; description of shape e.g. round / ball-shaped ;	2	
3(c)(ii)	provides blood at high pressure ; provides a large surface area ; (ultra)filtration ; <i>ref. to small or soluble molecules / water / glucose / urea / salts, (are filtered) out ;</i> <i>ref. to (named) large OR insoluble (molecules) / blood cells, stay in the glomerulus ;</i> AVP ;	2	
3(d)(i)	(by) active transport ; from a low to a high concentration / AW ; (through cell) membrane ; ref. to proteins (pumps / channels / AW) ; uses energy ; from respiration ;	4	

Question	Answer	Marks	Guidance Notes								
3(d)(ii)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px;"><i>human</i></td> <td style="padding: 5px;"><i>mouse</i></td> </tr> <tr> <td style="padding: 5px;">$575 \div 320$</td> <td style="padding: 5px;">$0.551 \div 0.31 ;$</td> </tr> <tr> <td style="padding: 5px;">=1.797 or 1.8</td> <td style="padding: 5px;">=1.778 or 1.8 ;</td> </tr> <tr> <td colspan="2" style="padding: 5px; text-align: center;">g (salt) per day per g (kidney) ;</td> </tr> </table> <p>similar or the same, results / rates / ratios, so hypothesis is supported ;</p>	<i>human</i>	<i>mouse</i>	$575 \div 320$	$0.551 \div 0.31 ;$	=1.797 or 1.8	=1.778 or 1.8 ;	g (salt) per day per g (kidney) ;		4	
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$575 \div 320$	$0.551 \div 0.31 ;$										
=1.797 or 1.8	=1.778 or 1.8 ;										
g (salt) per day per g (kidney) ;											
3(d)(iii)	osmosis ;	1									
3(d)(iv)	glucose / AVP ;	1									

Question	Answer	Marks	Guidance Notes
4(a)	(named) mechanical (barriers) ; (named) chemical barriers ; ref. to active immunity ; white blood cells / lymphocytes / phagocytes ; (phagocytes) engulf (named) microorganisms / phagocytosis ; lymphocytes produce antibodies ; ref. to specific, antigens / pathogens ; ref. to long term immunity / memory cells ; AVP ;	5	
4(b)	antibiotics ;	1	

Question	Answer	Marks	Guidance Notes
5(a)(i)	coronary artery ;	1	
5(a)(ii)	ref. to platelets ; fibrinogen converted to fibrin ; soluble to insoluble ; forms a mesh ; traps, (red blood) cells ;	3	
5(a)(iii)	aspirin / AVP ;	1	
5(b)(i)	98 (%) ;;;	3	one mark for correct readings from graph one mark for correct calculation one mark for correctly rounding to a whole number

Question	Answer	Marks	Guidance Notes
5(b)(ii)	<p><i>argument for:</i> as exercise increased CHD deaths decreased ; ora comparative data quote with units ; the same group of people were studied ; regular measurements were taken ; large benefit for doing only a small amount of exercise (therefore easy to do) ; even if there are some doubts about the benefits no harm will be done / AW ;</p> <p><i>argument against:</i> only women in the study ; ora none younger than 35 (at the start of the study) ; ora actual number of deaths per 10 000 is very small even for those that do not exercise ; other risk factors not considered ; named examples of other risk factors ;; e.g. diet / smoking / alcohol / genetics some women may have forgotten / not answered correctly about how much exercise they did / AW ; some women may have been successfully treated for CHD / not died from the condition / AW ; other variables not considered ; e.g. pre-existing conditions / medication / type of exercise / length of exercise</p>	5	
5(c)	more <u>blood</u> , to muscles ; to deliver more, oxygen / glucose ; for muscle <u>contraction</u> ; for (aerobic) respiration ; more <u>energy</u> required ; ref. to adrenaline ;	3	

Question	Answer	Marks	Guidance Notes
6(a)	poor absorption of calcium / weak bones / weak teeth / depression / fatigue / muscle pain / joint pain / rickets / osteomalacia / AVP ;	1	
6(b)	<p><i>reasons why endangered:</i> (described) overfishing / hunting ; food chain disrupted (described); overconsumption (by humans) ; (named) pollution ; introduced diseases / species ; habitat destruction ; climate change ;</p> <p><i>risks if populations drop:</i> reduced variation ; reproduction rate is lower / harder to find a mate ; extinction ; AVP ;</p> <p><i>how to maintain fish stocks:</i> education ; quotas ; no-catch zones / nursery zones / seasonal fishing / protected areas / MPAs / Marine Protected Areas ; fines ; restocking ; fish farms ; method of fishing (described) ; AVP ;</p>	6	

Question	Answer	Marks	Guidance Notes
7(a)(i)	(named) bacteria ; lightning ; AVP ;	2	
7(a)(ii)	<i>process A</i> denitrification ; <i>process B</i> nitrification ;	2	
7(a)(iii)	ammonia / ammonium (ions) ;	1	A nitrite (ions)
7(a)(iv)	removal of nitrogen containing part of amino acids ; to form urea ;	2	
7(b)	ribosome / rough endoplasmic reticulum ;	1	
7(c)	protease / pepsin / trypsin ;	1	



BIOLOGY

0610/42

Paper 4 Theory (Extended)

October/November 2019

MARK SCHEME

Maximum Mark: 80

Published

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GENERIC MARKING PRINCIPLE 4:

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GENERIC MARKING PRINCIPLE 5:

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GENERIC MARKING PRINCIPLE 6:

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Question	Answer	Marks	Guidance
1(a)(i)	exoskeleton / AW ; jointed / segmented, limbs / legs / appendages / AW ; pairs of, limbs / legs / appendages / AW ; segmented (body) / AW ; bilateral body symmetry ;	2	
1(a)(ii)	Box 2: <i>any one from:</i> animal has, 3 pairs of legs / 6 legs / less 4 pairs of legs / less than 8 legs ; wings ; head, thorax, abdomen / body in three sections ; no, pincers / claws / carapace ; Box 3: <i>any one from:</i> (animal has) claws / pincers, of different sizes / AW ; eyes on stalks ; smooth, carapace / body / 'shell' ; body, has five sides / is angular ; hairs / bristles / AW, on, legs / claws ;	2	
1(b)(i)	4 pairs of legs / 8 legs ; fused head and thorax / cephalothorax / two sections <i>or</i> parts of the body ; (pedi)palps / described ; AVP ;	1	
1(b)(ii)	inherited feature / controlled by gene(s) / allele(s) / DNA ; functional / AW, feature ; increase, fitness / chances of survival ; increases chance of reproducing (to leave offspring) ; any suitable example visible in <i>T. gallator</i> ; e.g. camouflage / warning signal / scares predators / lure for prey / sexual attractant	3	

Question	Answer	Marks	Guidance
1(c)	<p><i>identification can be done using:</i> <u>base</u>, sequences / order / pattern, in DNA / genes ; each species, has unique / AW, DNA / genes ; <i>idea that</i> compare with, reference DNA / base sequences / genes, of known species ; <i>idea that</i> if a match with DNA from known species then DNA is from that species OR closely related species have fewer differences in their, base sequences / DNA / genes ; AVP ; e.g. any technique involved in DNA analysis</p>	2	
1(d)	<p>hunting / collecting / AW ; pollution ; pesticide(s) / insecticide / (chemical) spray(s) that kill animals / poisons ; loss of habitat / any example ; disease ; increased competition / described ; increase in predator(s) ; climate change / any example ; lack of food / loss of prey species ; AVP ;</p>	3	
2(a)	<p>any shape drawn that includes one whole vascular bundle including all of the xylem and phloem with or without sclerenchyma ; label line from X to xylem in any of the vascular bundles ;</p>	2	
2(b)	<p>cell vacuoles / cells, contain (much) water / have high water potential ; water absorbed, by osmosis / down water potential gradient ; cells, are turgid / have a turgor pressure ; cell contents / vacuole / cell membrane, pushes out (against cell wall) ; <u>cell wall</u>, does not stretch / is inelastic / is rigid ; AVP ; e.g. cells are tightly packed / AW</p>	3	

Question	Answer	Marks	Guidance
2(c)	<p>Q sucrose / ^{13}C, is in shoot <u>and</u> root ; T no, sucrose / ^{13}C, in shoot or root ; R sucrose / ^{13}C, in root only / (in root but) not in shoot ; S sucrose / ^{13}C, in shoot only / (in shoot but) not in root ;</p> <p><i>idea that</i> no transport of, sucrose / ^{13}C, where phloem is removed ; phloem transports (sucrose) in both directions ; leaf is source / carbon (dioxide) is fixed in leaf / sucrose is made in leaf ; roots / shoots, are sink(s) / described ; e.g. of descriptions respired / stored as starch / converted to another (named) compound ; AVP ; e.g. Q is a control</p>	5	
3(a)(i)	<p>provides, suitable / optimum, pH for (correct named) enzyme action ; activates, enzyme / pepsin ; kills / AW, bacteria / viruses / pathogens / microbes ; AVP ;</p>	2	
3(a)(ii)	<p>(catalyses) breaks down / (chemically) digests, of protein ; to amino acids ;</p>	2	
3(b)	<p>movement of digested food molecules <u>into cells</u> ; food molecules become part of cells ;</p>	2	
3(c)	<p>(stem cells) divide by <u>mitosis</u> ; form (named) specialised cells (in stomach) ; to replace cells (in the lining of stomach) ; <i>idea that</i> cells are worn away from the surface of the stomach ; for repair of any damage to tissues ;</p>	2	
3(d)	<p>increase / large, (surface) area ; for absorption (of named substances) / described; AVP ;</p>	2	

Question	Answer	Marks	Guidance
3(e)	54(%) ;;;	3	one mark for correct readings (78 minutes and 120 minutes) one mark for correct calculation one mark for whole number correctly rounded
4(a)	ref. to, mechanical / chemical, barriers ; nasal hairs, trap / filter / AW, pathogens ; mucus traps pathogens / pathogens stick to mucus ; mucus, produced / secreted, by goblet cells ; cilia move mucus (upwards / towards mouth / away from alveoli) ; coughing / sneezing / swallowing ; phagocytes / phagocytosis / described ;	4	
4(b)	introduces harmless form of pathogen / AW ; ref. to antigen(s) ; stimulates an <u>immune response</u> ; ref to <u>active immunity</u> ; <u>lymphocytes</u> produce antibodies ; (lymphocytes develop into) memory cells ; memory cells, remain in the body / give long-term immunity / can produce antibodies (at a later time) ; respond quickly when an infection (of the same pathogen) occurs / before symptoms occur ; AVP ;	4	
4(c)	<i>idea that</i> viruses have no antibiotic targets ; viruses, are not alive / are not living / cannot be killed / not cells ; no cell membrane ; no cell wall ; no protein synthesis / no ribosomes ; no metabolism / do not respire ; AVP ; e.g. viruses are inside (host) cells	2	

Question	Answer	Marks	Guidance
4(d)(i)	percentage of males smoking increases faster than females ; ora more men smoked than women / higher percentage of men smoked (over all the time) ; ora peak for percentage of men smoking occurred earlier ; ora decrease in percentage of men smoking is greater than in females ; ora difference between percentages smoking decreases after peaks ; any comparative use of percentages ;	3	

Question	Answer	Marks	Guidance
4(d)(ii)	<p>for from A percentage of men and women that smoke increases and decreases ; numbers of deaths from lung cancer in both groups increases and decreases ; both show lag between peak smoking and peak deaths from lung cancer ; country A shows, same time gap / 40-year gap, between peaks for smoking and deaths from smoking ;</p> <p>for from B percentage of men and women who smoke has decreased (overall) ; numbers of deaths from lung cancer in both groups increase ;</p> <p>against from B percentage female smokers, fluctuates / AW, but no fluctuation in men ; numbers of deaths in men increase (continually), whereas deaths in females does not ;</p> <p>country B may show the same but no data to be sure / no data from before 1950 ; any data quote - percentage / number and approximate year and units ;</p>	6	

Question	Answer	Marks	Guidance
5(a)(i)	anthers / stamens / filaments / stigma, hang / AW, outside (the flower) ; large, anthers / C , produce large quantities of pollen ; <i>idea that</i> anthers / C , easily release pollen ; ‘feathery’ / AW, stigma / B ; stigma has, feathery surface / large surface area, to catch pollen ; bracts / A , are, small / inconspicuous ;	3	A petals
5(a)(ii)	C ;	1	
5(b)	<i>idea that</i> pollination / fertilisation, always going to happen / AW ; no agent of pollination needed ; little wastage of pollen ; reduced / little, variation / diversity ; increased competition between plants (as have the same adaptation) ; increase chance of, genetic / inherited, disease ; all plants adapted to same, conditions / environment ; little ability to adapt to changing conditions / little ability to evolve ; an infectious disease can kill all of the population / all plants more susceptible to the same disease ; risk of <u>extinction</u> ; AVP ;	4	

Question	Answer	Marks	Guidance
5(c)	drought / lack of rain / lack of (irrigation) water ; flooding ; fire ; tsunamis / cyclones / hurricanes ; earthquakes / volcanic eruptions ; plagues of, animals / insect pests ; pests / diseases, of stored food / livestock ; conflict / war ; rising prices of food ; poverty ; unequal distribution of food ; growing, non-food crops / biomass for fuels / crops for export ; increase in population / migration of people ; soil degradation / soil erosion / desertification / salination of soils / loss of soil fertility / barren land / AW ;	3	
5(d)(i)	expose the plants to (stem), rust / fungus ; find out if plants have DNA for rust resistance ; only use those plants that show no symptoms / AW ;	2	
5(d)(ii)	to increase the, numbers of plants / population ; incorporate more genes from the high yield variety ; to maximise the yield of wheat from individual plants ; check that the plants keep their resistance to rust ; check the plants grow well in field conditions ; make sure the plants are, pure-breeding / homozygous ;	1	
5(e)	<i>one from:</i> one, cotyledon / embryonic leaf / seed leaf oblong leaves / narrow leaves / straight leaves parallel-veined leaves / straight veins (named) flower parts in multiples of three fibrous roots / adventitious roots scattered vascular bundles in stem AVP ;	1	

Question	Answer	Marks	Guidance										
6(a)	<table border="1"> <tr> <td>letter on Fig. 6.1</td> <td>name of the process in the carbon cycle</td> </tr> <tr> <td>A</td> <td>photosynthesis ;</td> </tr> <tr> <td>B</td> <td>combustion ;</td> </tr> <tr> <td>C</td> <td>respiration ;</td> </tr> <tr> <td>D</td> <td>fossilisation ;</td> </tr> </table>	letter on Fig. 6.1	name of the process in the carbon cycle	A	photosynthesis ;	B	combustion ;	C	respiration ;	D	fossilisation ;	4	
letter on Fig. 6.1	name of the process in the carbon cycle												
A	photosynthesis ;												
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C	respiration ;												
D	fossilisation ;												
6(b)	<p><i>gap 1:</i> heat OR long-wave / infra-red, radiation ;</p> <p><i>gaps 2 and 3, any two from: ;;</i> paddy fields / rice farming (named) animals / livestock decay / decomposition (by bacteria) rubbish tips / landfill sewage / dung / faeces (natural) gas extraction / fracking melting tundra waterlogged soil / swamp / marsh biomass burning / forest fires / peat fires</p> <p><i>gap 4:</i> enhanced ; <i>gap 5:</i> sulfur dioxide / sulfur trioxide / nitrogen oxide(s) ; <i>gap 6:</i> non-biodegradable / micro- / non-recyclable / single-use ;</p>	6											



BIOLOGY

0610/43

Paper 4 Theory (Extended)

October/November 2019

MARK SCHEME

Maximum Mark: 80

Published

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Question	Answer	Marks	Guidance
1(a)(i)	(level) 3 / tertiary / secondary <u>consumer</u> ;	1	
1(a)(ii)	<i>Myrmarachne</i> ;	1	
1(a)(iii)	dichotomous (key) ;	1	
1(b)(i)	exoskeleton ; jointed / segmented, legs / AW ; (at least) 1 (or more up to 6) / (at least 1) (or more up to 3) pair, of legs / AW ; segmented (body) ; bilateral body symmetry ;	2	
1(b)(ii)	two body parts ; eight legs / four pairs of legs ; AVP ;	2	
1(b)(iii)	B C D E (in any order) ;;	2	
1(c)	anatomy ; DNA (sequences) / genes ; sequences of amino acids (in proteins) ; AVP ; e.g. behaviour	1	

Question	Answer	Marks	Guidance
2(a)(i)	(glucose is produced by) photosynthesis ; light (energy) is, trapped / AW, by chlorophyll ; light energy is converted to chemical energy ; carbon dioxide and water, are used / react together / AW ; to produce (glucose and) oxygen ;	3	
2(a)(ii)	translocation ;	1	
2(a)(iii)	(sometimes roots) release / AW, energy / glucose / sucrose / (named) sugar ; for respiration ; example of use of energy in a plant ; e.g. flowering / new, leaves / growth / plant sometimes leaves cannot produce enough, glucose / carbohydrates ;	2	
2(b)(i)	Q phloem ; S xylem ;	2	
2(b)(ii)	1 ref to <u>osmosis</u> (of water / across / bag / membrane) ; 2 water moves into, (source) bag / sucrose solution ; 3 from high water <u>potential</u> to low water <u>potential</u> ; 4 sucrose (molecules) cannot cross the (partially permeable) membrane ; 5 sucrose is too large (to fit through partially permeable membrane) ; 6 (water moving in) increases the pressure / volume, of solution in (source) bag ; 7 (increased, volume / pressure / water moving in) forces / pushes, the solution up (tube Q) ; 8 volume of bags has not increased / water has moved out of the (sink) bag ; 9 sucrose diffuses (along tube Q) ; 10 down a (sucrose) concentration gradient (between source and sink) ;	4	

Question	Answer	Marks	Guidance
2(c)	the sucrose concentration / water potential (in the two bags) is the same / AW ;	1	
2(d)	nitrate (ions) ;	1	

Question	Answer	Marks	Guidance
3(a)	<p>1 ingestion / digestion / described, occurs in mouth ;</p> <p>2 chemical digestion / absorption / described, occurs in <u>small</u> intestine / duodenum / ileum ;</p> <p><i>ingestion of large biological molecules</i></p> <p>3 mechanical / physical, digestion / breaking, carbohydrate / food, into small pieces ;</p> <p>4 <i>ref to</i> chew / grind / bite / by teeth / tongue / swallow / moves through oesophagus / churned in stomach ;</p> <p><i>chemical digestion</i></p> <p>5 breakdown <u>insoluble</u> molecules into (smaller) <u>soluble</u> molecules ;</p> <p>6 salivary (glands) / pancreas, secrete amylase ;</p> <p>7 amylase breaks down, <u>starch</u>, to, maltose / glucose / sugar ;</p> <p>8 maltase is on <u>epithelium</u> of the, small intestine / duodenum / ileum ;</p> <p>9 <u>maltase</u> breaks down <u>maltose</u> to <u>glucose</u> ;</p> <p>10 bile neutralizes (stomach) acid ;</p> <p>11 <i>ref to</i> neutral / 7 / 8 pH for, amylase / maltase ;</p> <p><i>absorption into the blood via the alimentary canal</i></p> <p>12 by <u>diffusion</u> / <u>active transport</u>, into villi / microvilli / capillaries ;</p> <p>13 microvilli / villi / folds, increase the surface area (for absorption) ;</p> <p><i>increased blood glucose concentration</i></p> <p>14 <u>insulin</u>, secreted / produced / AW, from pancreas ;</p> <p>15 <u>insulin</u> reduces blood glucose concentration ;</p> <p>16 <i>ref to</i> negative feedback / homeostasis / described ;</p>	8	

Question	Answer	Marks	Guidance
3(a)	<i>assimilation in the liver</i> 17 glucose, stored as / converted to, <u>glycogen</u> (in liver) ; 18 (assimilated) into, cell / tissues to become part of cell / <i>ref. to</i> respiration / for release of energy ;		
3(b)	<i>calcium ion:</i> for (the formation / maintenance, of healthy / strong) bones ; for (the formation / maintenance, of healthy / strong) teeth ; AVP ;; <i>iron ions:</i> found in / AW, haemoglobin (molecule) / red blood cell ; transport oxygen ; prevent <u>anaemia</u> ;	4	
3(c)(i)	stress ; smoking ; genetic predisposition / family history ; age ; sex ; activity level / AW ; any pre-existing medical conditions / AW ; alcohol / drug / medication ; obesity / weight / mass / BMI / AW ;	2	
3(c)(ii)	(excess) salt is, <u>excreted</u> / removed from body (in urine) ; some salt is (re)absorbed in the, kidney / tubules / into the blood ; people are not reliable in recording / remembering / measuring how much salt they eat ;	2	
3(d)(i)	(reduce) fat / cholesterol ; (increase) fibre / roughage ; (increase) water ;	1	

Question	Answer	Marks	Guidance
3(d)(ii)	low = 16.8 (kPa) and high = 17.7 (kPa) ; 5(%) ;;	3	
3(d)(iii)	low salt diets reduce (systolic) blood pressure / risk of CHD ; ora modified diets / group 2, reduce (systolic) blood pressure / risk of CHD ; ora any description of an interaction between the salt diet <u>and</u> modified diets together affecting the, blood pressure / risk of CHD ; comparative data quote with units ;	3	
4(a)(i)	<i>use of trees</i> paper ; (as building materials) for furniture / construction / poles / boats / AW ; firewood / fuel ; to sell ; <i>clearance of trees for</i> agriculture ; urbanisation / roads / housing / factories / industry / developments ; extraction of, minerals / natural resources ;	3	
4(a)(ii)	education ; replanting / reforestation / afforestation ; government policies / legal quota / penalties / controls / bans / rules / AW ; management of conflicting demands ; co-operation with local communities ; protected area / national parks / wardens ; AVP ; e.g. selective felling	3	
4(b)(i)	house mouse ;	1	

Question	Answer	Marks	Guidance
4(b)(ii)	<p><i>for hypothesis</i> all native / nearly all / more / most, species prefer large areas of forest ; ora comparative data quote for one mammal, between both areas as a percentage or last column ; heavier / larger, mammals are more (negatively) affected by the breakup of large areas (than smaller mammals) ; ora</p> <p><i>against hypothesis</i> not true for, introduced species / black rat / house mouse ; comparative data quote for <u>black</u> rat / mouse, between both areas as a percentage ; cannot make (broad) conclusion on, only study / one area ; AVP ;</p>	4	

Question	Answer	Marks	Guidance
5(a)	<p>1 nucleus / chromosome(s) ; 2 bases ; 3 protein ;</p> <p>4 genes / alleles ; 5 <u>same</u> ; 6 sticky ;</p> <p>7 recombinant ; 8 bacteria / vectors / viruses / yeast / (prokaryotic / host) cells ; 9 insulin ;</p>	9	
5(b)	<p>washing powders ; (pectinase) for (fruit) juice production ; (lactase) for lactose-free milk ; AVP ;</p>	2	

Question	Answer	Marks	Guidance
6(a)	<i>ref. to platelets ;</i> fibrinogen is converted to fibrin / L ; fibrinogen is soluble / fibrin is insoluble ; (L / fibrin) forms a, mesh / AW ; (L / fibrin) traps / AW, blood cells / J / M ; J is a red (blood) cell ; L is fibrin ; M is a, white (blood) cell / lymphocyte / phagocyte ;	5	
6(b)	prevents blood loss / AW ; prevent (named) pathogens entering a wound ;	2	
6(c)(i)	observable features (of an organism) ;	1	
6(c)(ii)	co-dominance ;	1	
6(c)(iii)	$I^A I^A$; $I^A i^o$;	2	



BIOLOGY

0610/51

Paper 5 Practical Test

October/November 2019

MARK SCHEME

Maximum Mark: 40

Published

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Question	Answer	Marks	Guidance
1(a)(i)	pigments shown or drawn ; pigments labelled ; solvent line labelled ;	3	
1(a)(ii)	<i>idea of:</i> so that the, green line / pigment / leaf extract, will not, wash off / dissolve (into the solvent) ;	1	
1(b)(i)	not using a Bunsen / flames / AW ; using water-bath / electric heater ;	1	
1(b)(ii)	distance of orange-yellow pigment 75 ± 1 (mm) and distance of solvent front 80 ± 1 (mm) ; 0.94 ;;	3	
1(b)(iii)	table drawn with minimum of two columns and header line ; appropriate column / row headings ; three correct Rf values for green, blue-green and yellow and four colours ;	3	
1(b)(iv)	green ; moves the least (distance up the paper) / smallest Rf value ;	2	
1(c)	the extract is more concentrated / contains more chlorophyll or chloroplasts / the spot is smaller / less spread out than a line ; <i>idea that it is more pure e.g. there is no cell debris in the extract / extract was filtered so was purer ;</i> the solvent / ethanol / S2 / method 1b, was better at separating the pigments than S1 / 1a / AW ;	2	
1(d)	iodine (solution) ;	1	

Question	Answer	Marks	Guidance
1(e)	<p>1 outline of cells as clear single lines ;</p> <p>2 drawing occupies at least half the space available (wider than 65 mm) ;</p> <p>3 detail 1: approx. correct shape and proportions of three cells (i.e. 2 cells on left approx. same total size as the large cell on right) and cells up to 10 mm apart ;</p> <p>4 detail 2: 6 chloroplasts in smallest cell / 5 chloroplasts in medium cell / 9 chloroplasts in largest cell ;</p> <p>5 <u>one</u> chloroplast labelled ;</p>	5	
1(f)	<p>1 using at least 2 different colours of leaf ;</p> <p>2 identifying the dependent variable ; e.g. oxygen / gas production / indicator colour change</p> <p>3 measuring (dependent variable) after a set time ;</p> <p>4 method of collecting gas in a set time ; e.g. use of a measuring cylinder / gas syringe / counting bubbles / how long it takes leaf discs to surface</p> <p>5 method to control temperature ;</p> <p>6, 7, 8 three from: ;;;</p> <ul style="list-style-type: none"> • same surface area / size / age, of leaf / plant • same temperature • same light, intensity / amount • same carbon dioxide, concentration / amount • same volume / amount of water • same volume / concentration / amount, of indicator <p>9 2 or more repeats / three or more trials of each leaf colour ;</p>	6	

Question	Answer	Marks	Guidance
2(a)(i)	3 ;	1	A 3–6
2(a)(ii)	0.004 (mm ³) ;	1	A 4×10^{-3} or $4 \mu\text{m}^3$
2(a)(iii)	4 750 000 / 4.75×10^6 ;	1	ecf volume calculated in 2(a)(ii)
2(b)	<i>infection: D ; anaemia: A ;</i>	2	
2(c)(i)	axes labelled ; suitable even scale and plots occupy at least half the grid in both directions ; all points plotted accurately \pm half a small square ; bars drawn ; key ;	5	
2(c)(ii)	as age increases % with anaemia increases ; women (%) higher than men up to 74 then men higher ; women show a slow increase (in %) then faster increase (from age 85) / increase for men is constant / AW ;	2	
2(c)(iii)	<i>idea of:</i> more women than men were sampled ;	1	



BIOLOGY

0610/52

Paper 5 Practical Test

October/November 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 **7** printed pages.

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Question	Answer	Marks	Guidance
1(a)	table drawn with (at least) two columns and a line separating headings from data ; suitable headings ; four colours recorded / starch presence or absence recorded AND four locations identified ; blue-black for W2 AND yellow-brown / clear / AW, for E and W ;	4	
1(b)(i)	to remove contamination / to remove any starch (solution) / amylase (solution) / to remove the solutions (from the outside of the dialysis tubing bag) ;	1	
1(b)(ii)	<i>any two from:</i> as a control / comparison / AW ; to ensure that it was the enzyme that was causing the effect / AW ; to keep the starch concentration / volume the same ;	2	
1(b)(iii)	<i>any two from:</i> volume of starch (suspension) ; concentration of starch ; volume of amylase (solution) ; concentration of amylase ; (total) volume of solution (in dialysis tubing bags) ; volume of water (in test-tubes) ; time (dialysis tubing bags left in test-tubes) ; temperature ; (same) dialysis tubing / (same) diameter or size tubing / (same) surface area of tubing ;	2	
1(c)	(add) Benedict's (solution / reagent) ; heat / method of heating described ; (reducing sugars present if) colour changes to (brick-)red / orange / yellow / green ;	3	

Question	Answer	Marks	Guidance
1(d)	<p>(at least) two different temperatures used ; method of maintaining constant temperatures ;</p> <p><i>max two from given method ;;</i> add enzyme (solution) to starch (suspension) rinse tubing and place in test-tubes with distilled water testing with iodine / Benedict's solution stated volume of enzyme / amylase stated volume of substrate / starch stated volume of (distilled) water (in test-tubes) decant into beakers</p> <p><i>new method:</i> same, enzyme / amylase concentration ; same, substrate / starch concentration performing each temperature separately ; testing for results at set time intervals ; use of spotting tile ;</p> <p>two more repeats (for each temperature) ; use of gloves / goggles / tongs / test-tube holders ; AVP ;</p>	6	
1(e)	<p>biuret (solution / reagent) ; (positive test gives) colour change to lilac / purple / mauve ;</p>	2	

Question	Answer	Marks	Guidance
2(a)(i)	(leaf 6) 26, (leaf 7) 31, (leaf 8) 26 ;	1	all ± 1 mm
2(a)(ii)	28 ;	1	ecf 2(a)(i)
2(a)(iii)	<i>axes labelled with units:</i> average (maximum) leaf width / mm AND light intensity with low medium high ; <i>scale and size:</i> even scale AND plotting area to fill at least half the available grid in both directions ; <i>plots and bars:</i> three bars accurately plotted and of the same width with at least one small square wide gaps between each bar ;	3	
2(a)(iv)	value 12 circled for medium light intensity leaf 7 ; result is different from other results / it does not fit the pattern / AW ;	2	
2(b)(i)	light intensity ;	1	
2(b)(ii)	(maximum) leaf width / AW ;	1	! growth / diameter, of leaf
2(c)(i)	<i>lines:</i> all clear, single continuous ; <i>size:</i> minimum 82 mm wide ; <i>details:</i> at least three layers plus stele ; indented shape of central vascular tissue (see examples);	4	
2(c)(ii)	<i>length of AB:</i> 81 (mm) ± 1 (mm) ; <i>magnification:</i> (\times) 40–41 ;	2	ecf

Question	Answer	Marks	Guidance																		
2(c)(iii)	<p><i>any two from:</i></p> <table border="1"> <thead> <tr> <th>feature</th> <th>root / Fig. 2.2</th> </tr> </thead> <tbody> <tr> <td>outer surface</td> <td>uneven / AW</td> </tr> <tr> <td>(outer) shape</td> <td>circular</td> </tr> <tr> <td>size of whole structure</td> <td>small(er)</td> </tr> <tr> <td>cell (walls) in central area</td> <td>unbroken</td> </tr> <tr> <td>xylem (cell) position</td> <td>central</td> </tr> <tr> <td>size of xylem</td> <td>large(r)</td> </tr> <tr> <td>xylem</td> <td>are together / joined</td> </tr> <tr> <td>AVP</td> <td></td> </tr> </tbody> </table> <p style="text-align: right;">;;</p>	feature	root / Fig. 2.2	outer surface	uneven / AW	(outer) shape	circular	size of whole structure	small(er)	cell (walls) in central area	unbroken	xylem (cell) position	central	size of xylem	large(r)	xylem	are together / joined	AVP		2	
feature	root / Fig. 2.2																				
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AVP																					
2(d)(i)	<p>draw / trace, around the outline of leaf on a grid / AW / place <u>transparent</u> grid on leaf ; count number of squares occupied / put a dot in each square counted ; count squares at least half occupied as one square / AW ; ora</p>	2																			
2(d)(ii)	<p>leaves may differ in length / a leaf may differ in width / AW ;</p>	1																			



BIOLOGY

0610/53

Paper 5 Practical Test

October/November 2019

MARK SCHEME

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Published

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GENERIC MARKING PRINCIPLE 6:

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Question	Answer	Mark	Guidance
1(a)(i)	table drawn with lines, minimum two columns + row headings underlined + suitable headings ; colour matches condition ; correct trend ;	3	
1(a)(ii)	<i>independent variable</i> : light (and dark) / amount of light ; <i>dependent variable</i> : colour (of the chloroplast suspension) ;	2	
1(a)(iii)	volume of chloroplast suspension ; concentration of chloroplast suspension ; volume of DCPIP ; concentration of DCPIP ; time ; (same) age / type of leaf ; temperature / ice-cold ; buffer solution / pH ;	2	
1(a)(iv)	light is needed for photosynthesis / AW ; ora	1	

PUBLISHED

Question	Answer	Mark	Guidance
1(b)(i)	to identify, anomalous results / outliers / AW ;	1	
1(b)(ii)	<i>any two from:</i> 1 chloroplasts settle out ; 2 (plastic) pipettes are used to measure volume / volume of chloroplasts was inaccurate ; 3 temperature not maintained ; 4 DCPIP and chloroplast extract not mixed ; 5 subjective end-point / AW ; 6 mixture of leaves ; 7 different time for each test-tube ; 8 test-tubes not the same temperature as water-bath at the start ; 9 AVP; e.g. insufficient carbon dioxide available	2	
1(b)(iii)	1 stir the chloroplast suspension ; 2 use a syringe / burette, to measure the chloroplasts ; 3 insulate beaker / use heat shield / add more ice ; 4 stir or shake ; 5 use colour chart / white surface / colorimeter ; 6 select leaves of same type ; 7 stagger start / do sequentially ; 8 leave in water-bath for some time before starting / equilibrate ; 9 AVP; e.g. add (sodium) hydrogencarbonate	1	improvement must match one of the errors given in 1(b)(ii)

Question	Answer	Mark	Guidance
1(c)	<p><i>given method (max 2):</i></p> <ol style="list-style-type: none"> 1 method of extracting chloroplasts ; 2 add DCPIP to chloroplasts ; 3 concentration / (stated) volume of chloroplast suspension ; 4 concentration / (stated) volume of DCPIP ; 5 buffer solution / pH ; <p><i>new method:</i></p> <ol style="list-style-type: none"> 6 two or more different temperatures ; 7 method to maintain temperature ; 8 measure time taken for DCPIP to become colourless / determine reduction in blue colour after set time / AW ; 9 equilibrate ; 10 same carbon dioxide / CO₂, concentration ; 11 leaves / chloroplasts, from same plant ; 12 same light intensity / same distance from light source ; 13 AVP ; 14 set up a test-tube with no DCPIP to compare to / method of telling when it has become colourless ; 15 set up control with boiled / no chloroplasts / glass beads ; 16 two or more repeats / replicates ; 17 safety ; e.g. goggles / gloves / ref. to safe method of heating / ref. to use of tongs for hot objects 	6	A correct alternative methods

Question	Answer	Mark	Guidance
2(a)(i)	<i>lines</i> : single clear lines, no shading ; <i>size</i> : at least half available space ; <i>detail</i> : bottom epidermal cell larger than top epidermal cell ; thickening of guard cell inner cell indicated ;	4	
2(a)(ii)	31 ±1 (mm) ; 0.08 (mm) ;;	3	ecf from measurements
2(b)(i)	5 (20% sucrose, repeat 7) circled or indicated ;	1	
2(b)(ii)	3.0 ; µm ;	2	
2(c)(i)	410 ;;	2	
2(c)(ii)	axes labelled with units ; even scale and working area occupies at least half the grid in both directions + bars clearly identified ; all values plotted accurately ± half a small square ;	3	
2(c)(iii)	(average number of stomata open) decreases and then increases ; suitable data quote ; e.g. fewest open at 12:00 / highest number open at 00:00 / (decreases) from 0:00 (hours) to 12:00 / (increases) from 12:00	2	

Question	Answer	Mark	Guidance
2(d)(i)	iodine solution ;	1	
2(d)(ii)	<i>procedure:</i> add Benedict's (solution / reagent) ; heat ; green / yellow / orange / (brick) red ; <i>safety:</i> goggles / gloves / appropriate precaution with hot water described ;	4	



BIOLOGY

0610/61

Paper 6 Alternative to Practical

October/November 2019

MARK SCHEME

Maximum Mark: 40

Published

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Question	Answer	Marks	Guidance
1(a)(i)	3 ;	1	
1(a)(ii)	<i>idea of:</i> so that the, green line / pigment / leaf extract, will not, wash off / dissolve (into the solvent) ;	1	
1(a)(iii)	type of solvent ; time (for leaving filter paper in the solvent / test tube) ; depth / height, of solvent ; concentration of solvent ; diameter of test-tube ; temperature ; distance of pigment, from the end of the paper / distance between line to solvent ; type of (chromatography) paper ; length of (chromatography) paper ; pH ; method of transfer of pigment to paper / amount of pigment ;	2	
1(b)(i)	not using a Bunsen / flames / AW ; using water-bath / electric heater ;	1	
1(b)(ii)	distance of orange-yellow pigment 75 ± 1 (mm) and distance of solvent front 80 ± 1 (mm) ; 0.94 ;;	3	
1(b)(iii)	table drawn with minimum of two columns and header line ; appropriate column / row headings ; three correct Rf values for green, blue-green and yellow and four colours ;	3	
1(b)(iv)	green ; moves the least (distance up the paper) / smallest Rf value ;	2	

Question	Answer	Marks	Guidance
1(c)	the extract is more concentrated / contains more chlorophyll or chloroplasts / the spot is smaller / less spread out than a line ; idea that it is more pure e.g. there is no cell debris in the extract / extract was filtered so was purer ; the solvent / ethanol / S2 / method 1b, was better at separating the pigments than S1 / 1a / AW ;	2	
1(d)	iodine (solution) ;	1	
1(e)	1 outline of cells as clear single lines ; 2 drawing occupies at least half the space available (wider than 65 mm) ; 3 detail 1: approx. correct shape and proportions of three cells (i.e. 2 cells on left approx. same total size as the large cell on right) and cells up to 10 mm apart ; 4 detail 2: 6 chloroplasts in smallest cell / 5 chloroplasts in medium cell / 9 chloroplasts in largest cell ; 5 <u>one</u> chloroplast labelled ;	5	

Question	Answer	Marks	Guidance
1(f)	<p>1 using at least 2 different colours of leaf ;</p> <p>2 identifying the dependent variable ; e.g. oxygen / gas production / indicator colour change</p> <p>3 measuring (dependent variable) after a set time ;</p> <p>4 method of collecting gas in a set time ; e.g. use of a measuring cylinder / gas syringe / counting bubbles / how long it takes leaf discs to surface</p> <p>5 method to control temperature ;</p> <p>6, 7, 8 three from: ;;;</p> <ul style="list-style-type: none"> • same surface area / size / age, of leaf / plant • same temperature • same light, intensity / amount • same carbon dioxide, concentration / amount • same volume / amount of water • same volume / concentration / amount, of indicator <p>9 2 or more repeats / three or more trials of each leaf colour ;</p>	6	

Question	Answer	Marks	Guidance
2(a)(i)	3 ;	1	A 3–6
2(a)(ii)	0.004 (mm ³) ;	1	A 4×10^{-3} or $4 \mu\text{m}^3$
2(a)(iii)	4 750 000 / 4.75×10^6 ;	1	ecf volume calculated in 2(a)(ii)
2(b)	<i>infection: D ; anaemia: A ;</i>	2	
2(c)(i)	axes labelled ; suitable even scale and plots occupy at least half the grid in both directions ; all points plotted accurately \pm half a small square ; bars drawn ; key ;	5	
2(c)(ii)	as age increases % with anaemia increases ; women (%) higher than men up to 74 then men higher ; women show a slow increase (in %) then faster increase (from age 85) / increase for men is constant / AW ;	2	
2(c)(iii)	<i>idea of:</i> more women than men were sampled ;	1	



BIOLOGY

0610/62

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October/November 2019

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Question	Answer	Marks	Guidance
1(a)	iodine (solution) ;	1	
1(b)	(add) Benedict's, solution / reagent ; heat ;	2	
1(c)	to remove contamination / to remove any starch (solution) / amylase (solution) / to remove the solutions (from the outside of the dialysis tubing bag) ;	1	
1(d)(i)	table drawn with (at least) three columns and a line separating headings from data ; suitable headings ; eight colours recorded correctly ;	3	
1(d)(ii)	starch absent / negative starch test in, bag 1 / test-tube 1 / test-tube 2 ; starch present / positive starch test, in bag 2 ; (reducing) sugar present / positive (reducing) sugar test, in bag 1 ; (reducing) sugar absent / (reducing) sugar test negative, in bag 2 / test-tube 2 ; starch cannot pass / diffuse, through the tubing bag ; (reducing) sugars can pass / diffuse, through the tubing bag ; amylase / enzyme, breaks down starch ; water does not break down starch ;	3	
1(e)	<i>any two from:</i> volume of starch (solution) ; volume of amylase (solution) ; (total) volume of solution (in dialysis tubing bags) ; volume of water (in test-tubes); time (dialysis tubing bags left in test-tubes) ; temperature ;	2	

Question	Answer	Marks	Guidance
1(f)	<p>(at least) two different temperatures used ; method of maintaining constant temperatures ;</p> <p><i>max two from given method ;;</i> add enzyme (solution) to starch (suspension) in dialysis tubing rinse tubing and place in test-tubes with distilled water testing with iodine / Benedict's solution same volume of enzyme / amylase same volume of substrate / starch same volume of (distilled) water in test-tubes</p> <p><i>new method:</i> same, enzyme / amylase solution concentration ; same. substrate / starch suspension concentration ; performing each temperature at different times ; testing for results at set time intervals ; use of spotting tile ;</p> <p>two more repeats (for each temperature) ; use of gloves / goggles / tongs / test-tube holders ; AVP ;</p>	6	
1(g)	<p>biuret (solution / reagent) ; (positive test gives) colour change to lilac / purple / mauve ;</p>	2	

Question	Answer	Marks	Guidance
2(a)(i)	(leaf 6) 26, (leaf 7) 31, (leaf 8) 26 ;	1	all ± 1 mm
2(a)(ii)	28 ;	1	ecf 2(a)(i)
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2(a)(iv)	value 12 circled for medium light intensity leaf 7 ; result is different from other results / it does not fit the pattern / AW ;	2	
2(b)(i)	light intensity ;	1	
2(b)(ii)	(maximum) leaf width / AW ;	1	
2(c)(i)	<i>lines:</i> all clear, single continuous ; <i>size:</i> minimum 82 mm wide ; <i>details:</i> at least three layers plus stele ; indented shape of central vascular tissue (see examples);	4	
2(c)(ii)	<i>length of AB:</i> 81 (mm) ± 1 (mm) ; <i>magnification:</i> (\times) 40–41 ;	2	ecf

Question	Answer	Marks	Guidance																		
2(c)(iii)	<p><i>any two from:</i></p> <table border="1"> <thead> <tr> <th>feature</th> <th>root / Fig. 2.2</th> </tr> </thead> <tbody> <tr> <td>outer surface</td> <td>uneven / AW</td> </tr> <tr> <td>(outer) shape</td> <td>circular</td> </tr> <tr> <td>size of whole structure</td> <td>small(er)</td> </tr> <tr> <td>cell (walls) in central area</td> <td>unbroken</td> </tr> <tr> <td>xylem (cell) position</td> <td>central</td> </tr> <tr> <td>size of xylem</td> <td>large(r)</td> </tr> <tr> <td>xylem</td> <td>are together / joined</td> </tr> <tr> <td>AVP</td> <td></td> </tr> </tbody> </table> <p style="text-align: right;">;;</p>	feature	root / Fig. 2.2	outer surface	uneven / AW	(outer) shape	circular	size of whole structure	small(er)	cell (walls) in central area	unbroken	xylem (cell) position	central	size of xylem	large(r)	xylem	are together / joined	AVP		2	
feature	root / Fig. 2.2																				
outer surface	uneven / AW																				
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xylem (cell) position	central																				
size of xylem	large(r)																				
xylem	are together / joined																				
AVP																					
2(d)(i)	<p>draw / trace, around the outline of leaf on a grid / AW / place <u>transparent</u> grid on leaf ; count number of squares occupied / put a dot in each square counted ; count squares at least half occupied as one square / AW ; ora</p>	2																			
2(d)(ii)	<p>leaves may differ in length / a leaf may differ in width / AW ;</p>	1																			



BIOLOGY

0610/63

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	Mark scheme	Mark	Guidance
1(a)(i)	table drawn with lines, minimum two columns + row headings underlined + suitable headings ; colour matches condition ;	2	
1(a)(ii)	<i>independent variable</i> : light (and dark) / amount of light ; <i>dependent variable</i> : colour (of the chloroplast suspension) ;	2	
1(a)(iii)	volume of chloroplast suspension ; concentration of chloroplast suspension ; volume of DCPIP ; concentration of DCPIP ; time ; (same) age / type of leaf ; temperature / ice-cold ; buffer solution / pH ;	2	
1(a)(iv)	light is needed for photosynthesis / AW ; ora	1	
1(b)	2 and 8 ; °C ;	2	
1(c)(i)	to identify, anomalous results / outliers / AW ;	1	

Question	Mark scheme		Mark	Guidance
1(c)(ii)	error ;	improvement ;	2	the improvement must match the error given
	chloroplasts settle out	stir the chloroplast suspension		
	(plastic) pipettes are used to measure volume / volume of chloroplasts was inaccurate	use a syringe / burette, to measure the chloroplasts		
	temperature not maintained	insulate beaker / use heat shield / add more ice		
	DCPIP and chloroplast extract not mixed	stir or shake		
	subjective end-point / AW	use colour chart / white surface / colorimeter		
	mixture of leaves	select leaves of same type		
	different time for each test-tube	stagger start / do sequentially		
	test-tubes not the same temperature as water-bath at the start	leave in water-bath for some time before starting / equilibrate		
	AVP, e.g. insufficient CO ₂	AVP, e.g. add HCO ₃		

Question	Mark scheme	Mark	Guidance
1(d)	<p><i>given method (max 2):</i></p> <ol style="list-style-type: none"> 1 method of extracting chloroplasts ; 2 add DCPIP to chloroplasts ; 3 concentration / (stated) volume of chloroplast suspension ; 4 concentration / (stated) volume of DCPIP ; 5 buffer solution / pH ; <p><i>new method:</i></p> <ol style="list-style-type: none"> 6 two or more different temperatures ; 7 method to maintain temperature ; 8 measure time taken for DCPIP to become colourless / determine reduction in blue colour after set time / AW ; 9 equilibrate ; 10 same carbon dioxide / CO₂, concentration ; 11 leaves / chloroplasts, from same plant ; 12 same light intensity / same distance from light source ; 13 AVP ; 14 set up a test-tube with no DCPIP to compare to / method of telling when it has become colourless ; 15 set up control with boiled / no chloroplasts / glass beads ; 16 two or more repeats / replicates ; 17 safety ; e.g. goggles / gloves / ref. to safe method of heating / ref. to use of tongs for hot objects 	6	A correct alternative methods

Question	Mark scheme	Mark	Guidance
2 (a)(i)	<i>lines</i> : single clear lines, no shading ; <i>size</i> : at least half available space ; <i>detail</i> : bottom epidermal cell larger than top epidermal cell ; thickening of guard cell inner cell indicated ;	4	
2 (a)(ii)	31 ±1 (mm) ; 0.08 (mm) ;;	3	ecf from measurements
2 (b)(i)	5 (20% sucrose, repeat 7) circled or indicated ;	1	
2 (b)(ii)	3.0 ; µm ;	2	
2(c)(i)	410 ;;	2	
2(c)(ii)	axes labelled with units ; even scale and working area occupies at least half the grid in both directions + bars clearly identified ; all values plotted accurately ± half a small square ;	3	
2(c)(iii)	(average number of stomata open) decreases and then increases ; suitable data quote ; e.g. fewest open at 12:00 / highest number open at 00:00 / (decreases) from 0:00 (hours) to 12:00 / (increases) from 12:00	2	

Question	Mark scheme	Mark	Guidance
2(d)(i)	iodine solution ;	1	
2(d)(ii)	<i>procedure:</i> add Benedict's (solution / reagent) ; heat ; green / yellow / orange / (brick) red ; <i>safety:</i> goggles / gloves / appropriate precaution with hot water described ;	4	



Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

BIOLOGY

0610/11

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 is recommended)

* 3 5 6 7 3 0 2 2 1 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.

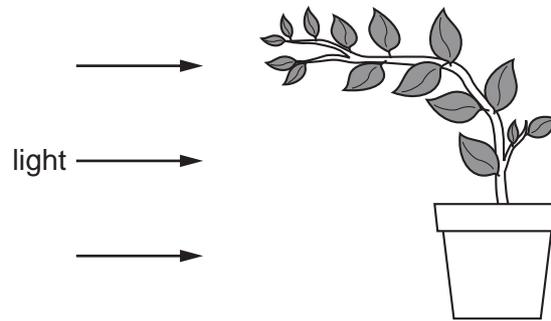
Electronic calculators may be used.

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 **17** printed pages and **3** blank pages.



1 The diagram shows a plant.



Which characteristic of living organisms is shown by the plant in the diagram?

- A excretion
 - B reproduction
 - C respiration
 - D sensitivity
- 2 Using the binomial system of naming organisms, the name of the lion is *Panthera leo*.

Which statement is correct?

- A The lion belongs to the kingdom *Panthera*.
 - B The lion belongs to the genus *Panthera*.
 - C The lion belongs to the species *Panthera*.
 - D The lion belongs to the genus *leo*.
- 3 The table shows the number of animals collected in a sample from a woodland and the groups to which they belong.

animal group	number in sample
arachnids	10
crustaceans	8
insects	80
myriapods	7

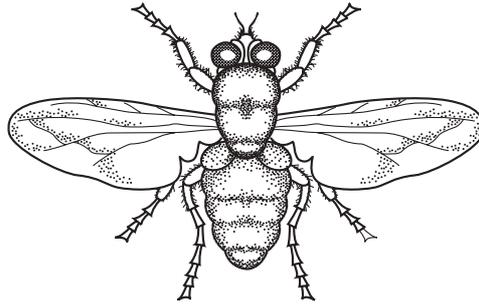
How many arthropods in total, in this sample, have six or eight legs?

- A 15
- B 88
- C 90
- D 98

4 Which features do animal cells share with plant cells?

	chloroplast	cytoplasm	nucleus	
A	✓	✓	✓	key ✓ = yes X = no
B	✓	X	✓	
C	X	✓	✓	
D	X	X	X	

5 The diagram shows an animal.



Use the key to identify the animal.

- 1 wings present go to 2
wings absent go to 3
- 2 one pair of wings visible **A**
two pairs of wings visible **B**
- 3 three pairs of legs **C**
four pairs of legs **D**

6 At which level of organisation is a root?

- A** organ
B organ system
C organism
D tissue

7 What is an example of diffusion?

- A** dust particles being moved by ciliated cells in the trachea
B oxygen molecules moving into a red blood cell in the lungs
C pollen grains moving from anthers to stigmas in the wind
D red blood cells moving in a blood capillary in a muscle

8 Which identifies the chemical elements found in proteins?

	carbon	hydrogen	oxygen	nitrogen
A	✓	✓	✓	✓
B	✓	✓	✓	x
C	✓	x	✓	x
D	x	✓	x	✓

key

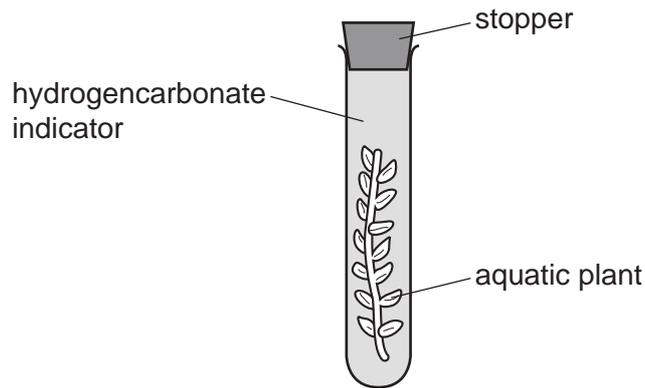
✓ = present

x = absent

9 What is the correct definition of the term *enzyme*?

- A** carbohydrates that act as biological catalysts
- B** carbohydrates that act as substrates
- C** proteins that act as biological catalysts
- D** proteins that act as substrates

10 Two sealed test-tubes containing aquatic plants and hydrogencarbonate indicator were set up.



The indicator in the sealed test-tubes shows the concentration of dissolved carbon dioxide present.

concentration of carbon dioxide	colour of indicator
low	red
medium	orange
high	yellow

One of the sealed test-tubes was kept in the light for 24 hours and one of the sealed test-tubes was kept in the dark for 24 hours.

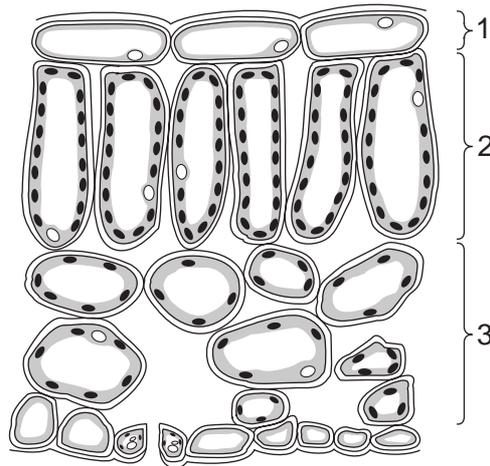
The results are shown in the table.

test-tube kept in	start colour	end colour
light	orange	red
dark	orange	yellow

What is the correct explanation of what has taken place?

- A Photosynthesis and respiration both occur in the light, but the rate of photosynthesis is higher.
- B Photosynthesis occurs in the light, but respiration does not.
- C Respiration can only occur when photosynthesis is not taking place.
- D The amount of carbon dioxide used and produced in the light is equal.

11 The diagram shows a leaf as seen in cross-section under the microscope.

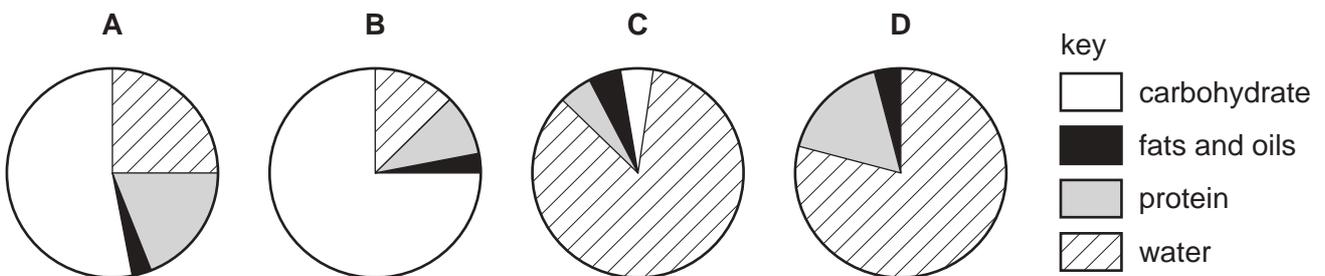


What are tissues 1, 2 and 3?

	1	2	3
A	epidermis	palisade mesophyll	spongy mesophyll
B	epidermis	spongy mesophyll	palisade mesophyll
C	palisade mesophyll	epidermis	spongy mesophyll
D	spongy mesophyll	palisade mesophyll	epidermis

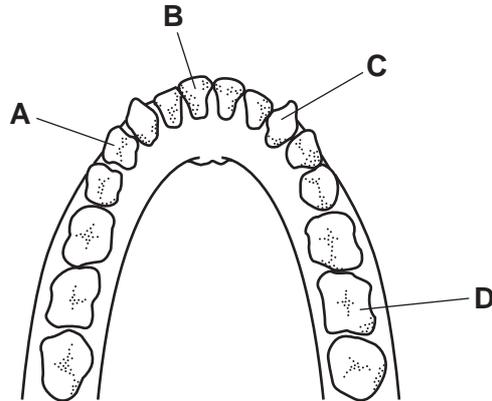
12 The pie charts show the composition of 100 g of four different foods.

Which food provides the most energy?

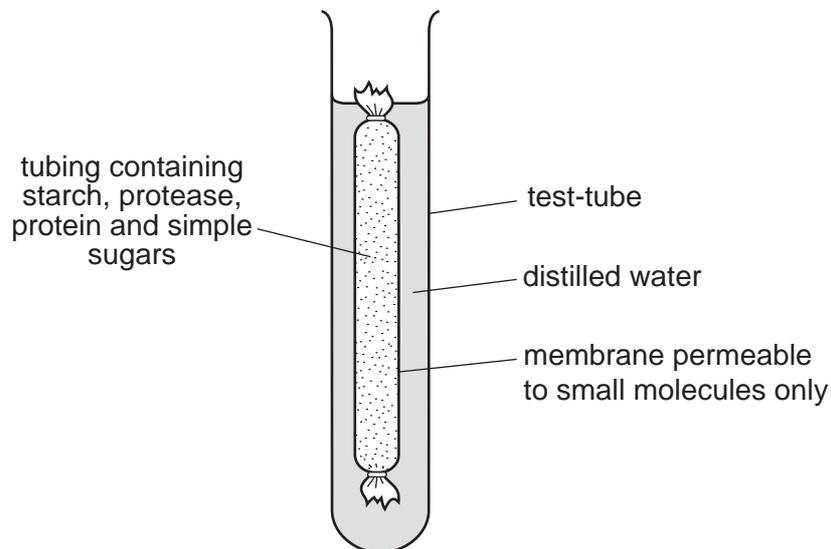


13 The diagram shows the teeth of the lower jaw of a human.

Which tooth is a premolar?



14 The diagram shows an experiment kept at room temperature.

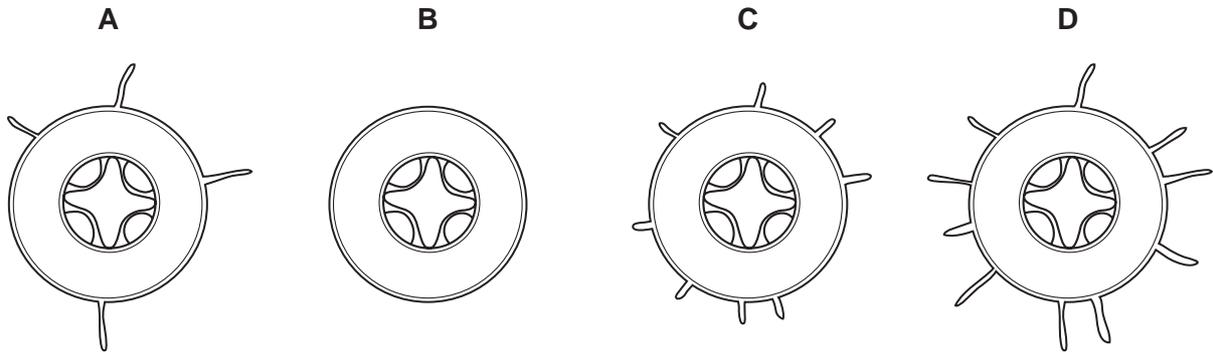


What is present in the water surrounding the membrane after 45 minutes?

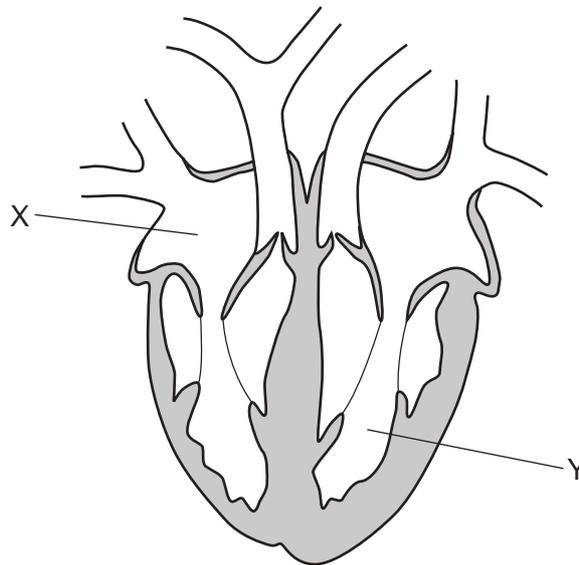
- A amino acids and simple sugars
- B protein and amino acids
- C protein and simple sugars
- D starch and simple sugars

15 The diagrams show cross-sections through four roots.

Which root is best adapted for absorbing water from the soil?



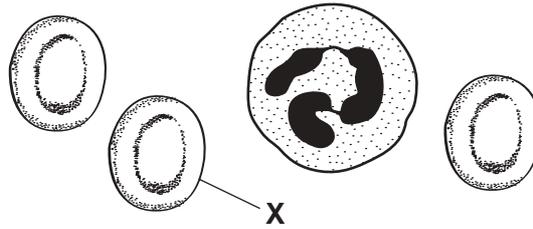
16 The diagram shows a vertical section through a human heart.



What are X and Y?

	X	Y
A	left atrium	right ventricle
B	left ventricle	right atrium
C	right atrium	left ventricle
D	right ventricle	left atrium

17 The diagram shows human blood cells, as seen under a microscope.



What is the function of cell X?

- A to carry glucose
 - B to carry oxygen
 - C to defend against disease
 - D to make the blood clot
- 18 A pathogen is defined as
- A a contaminated surface or food.
 - B a disease-causing organism.
 - C a transmissible disease.
 - D a virus.
- 19 Which row shows the approximate percentage of gases in expired air?

	percentage of carbon dioxide	percentage of oxygen
A	12	9
B	4	16
C	24	24
D	27	20

20 Mammals maintain a constant body temperature.

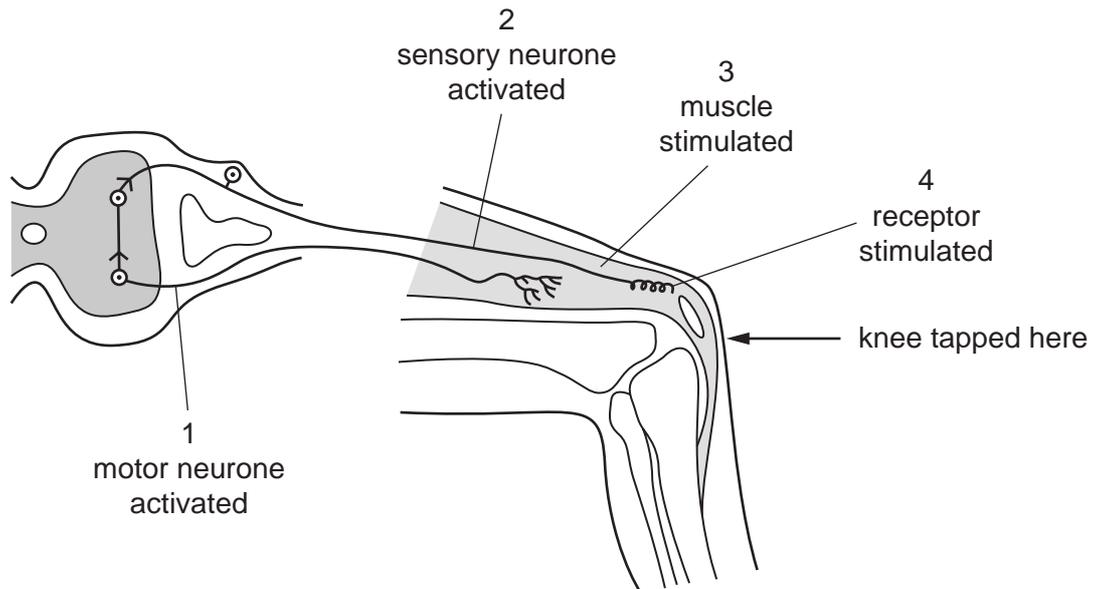
What process must occur continuously to maintain a constant body temperature?

- A excretion
- B respiration
- C shivering
- D sweating

21 Which process releases the most energy from one molecule of glucose?

- A aerobic respiration
- B anaerobic respiration in muscle
- C anaerobic respiration in yeast
- D photosynthesis

22 The diagram shows a simple reflex arc.



What is the correct order of events after the knee is tapped?

- A 1 → 2 → 3 → 4
- B 1 → 4 → 2 → 3
- C 4 → 2 → 1 → 3
- D 4 → 3 → 2 → 1

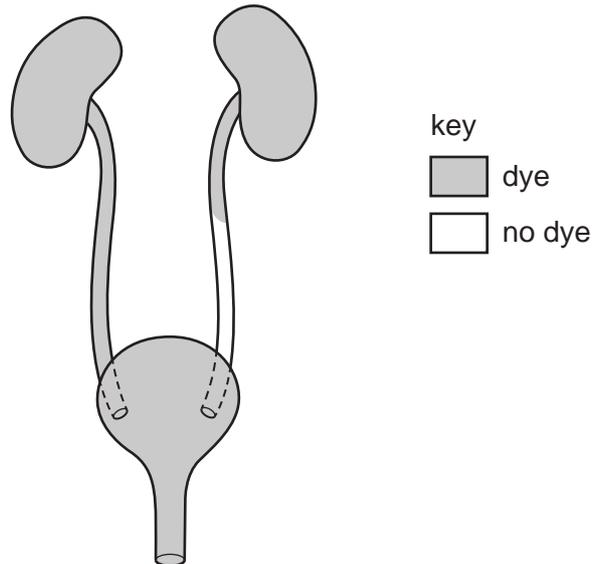
23 Which type of cell is found in sense organs?

- A ciliated
- B effector
- C receptor
- D palisade

24 What is meant by the term *tropism*?

- A absorption of light by chlorophyll
- B growth of parts of a plant towards or away from a stimulus
- C growth of seed into a small plant
- D level at which an organism feeds in a food chain

25 A patient has dye injected into the blood supply to his kidneys. The dye appears in his excretory system as shown.

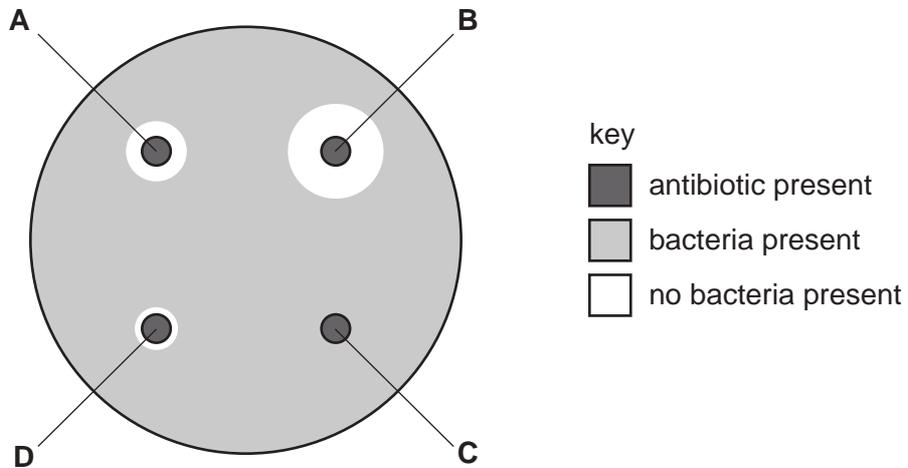


Which part is blocked?

- A the kidney
- B the ureter
- C the bladder
- D the urethra

- 26 The diagram shows the effect of four different antibiotics, A, B, C and D, on the growth of bacteria.

Which antibiotic are the bacteria most resistant to?



- 27 Excess alcohol affects the body.

Which statement explains the risk of driving after consuming excessive alcohol?

- A Alcohol can be addictive.
 - B Alcohol causes liver damage.
 - C Alcohol slows down reaction times.
 - D Alcohol speeds up reaction times.
- 28 To which part of the flower is pollen transferred in pollination?
- A anther
 - B petal
 - C sepal
 - D stigma

29 The table shows some of the stages that happen during labour and birth.

What is the correct order?

- A** amniotic sac breaks → cutting umbilical cord → cervix fully dilated → afterbirth delivered → passage through vagina
- B** amniotic sac breaks → cervix fully dilated → passage through vagina → cutting umbilical cord → afterbirth delivered
- C** cervix fully dilated → amniotic sac breaks → cutting umbilical cord → passage through vagina → afterbirth delivered
- D** afterbirth delivered → cervix fully dilated → cutting umbilical cord → amniotic sac breaks → passage through vagina

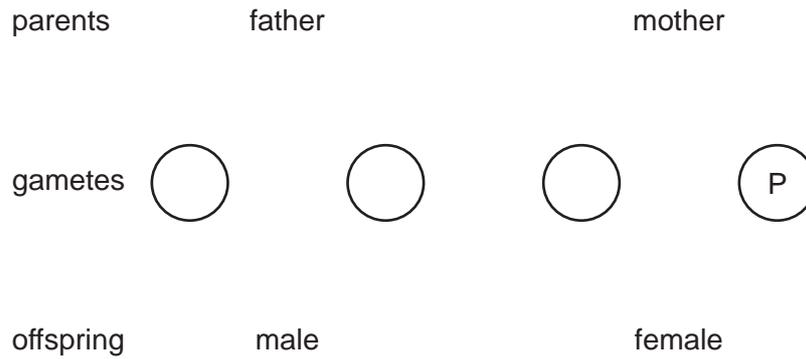
30 The table shows the percentage effectiveness of four methods of contraception when used correctly.

method	percentage effectiveness
male condom	98
diaphragm	94
femidom	95
vasectomy	99

What would be the expected percentage of unplanned pregnancies if the surgical method of contraception was used?

- A** 1% **B** 2% **C** 5% **D** 6%

31 The diagram shows part of a genetic diagram for the inheritance of sex in humans.



What are the sex chromosomes in gamete P and the male offspring?

	P	male offspring
A	X	XX
B	X	XY
C	Y	XX
D	Y	XY

32 A mouse with grey hair breeds with a mouse with white hair, producing offspring with genotypes Bb, Bb, bb and bb. (B represents the dominant allele for grey hair, and b represents the recessive allele for white hair.)

Which correctly describes the genotypes of the parents?

- A** both heterozygous
- B** both homozygous dominant
- C** one heterozygous and one homozygous dominant
- D** one heterozygous and one homozygous recessive

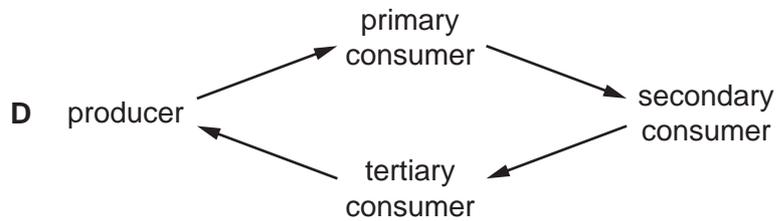
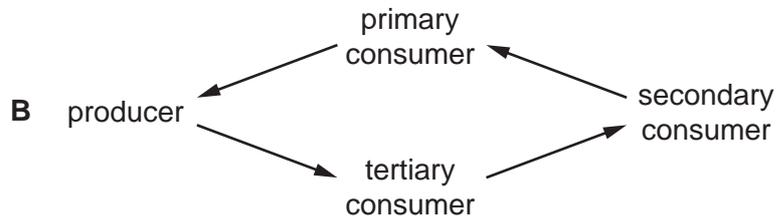
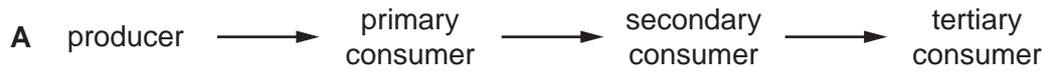
33 The following features were observed in a pair of identical twins.

feature	twin 1	twin 2
tongue rolling	yes	yes
eye colour	brown	brown
lobed ears	yes	yes
weight	60 kg	65 kg
hair length	short	long

Which features show phenotypic variation?

- A eye colour and weight
 - B lobed ears and hair length
 - C tongue rolling and lobed ears
 - D weight and hair length
- 34 Which statement about selective breeding is correct?
- A The inheritance of alleles is not involved.
 - B Only individuals better adapted to the environment will survive.
 - C Individuals are crossed to produce the next generation.
 - D There is competition for resources.

35 Which diagram shows energy passing along a food chain?



36 Which organisms remove carbon dioxide from the atmosphere?

- A consumers
- B decomposers
- C herbivores
- D producers

37 Which feature of bacteria makes them especially useful in biotechnology?

- A They are often pathogens.
- B They have a unique genetic code.
- C They have cell walls.
- D They reproduce rapidly.

38 Which process makes use of a genetically engineered organism?

- A using bacteria to produce insulin
- B using enzymes in biological washing powders
- C using pectinase in fruit juice production
- D using yeast to produce ethanol

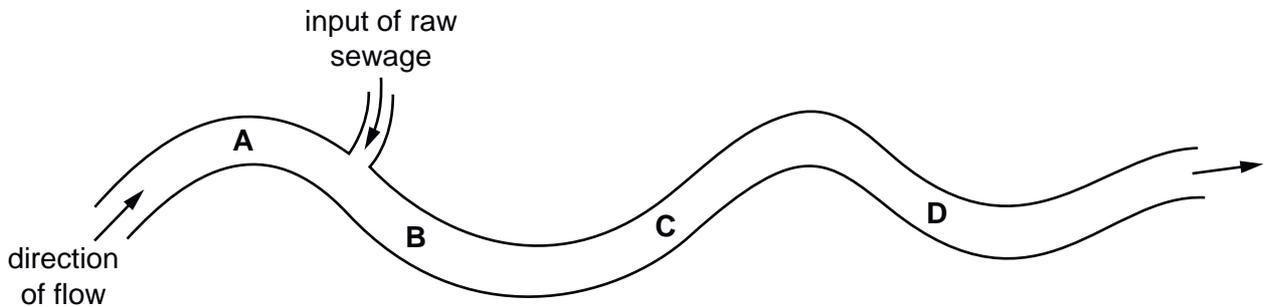
39 What are the possible effects of deforestation?

	loss of soil	flooding	decrease in atmospheric carbon dioxide
A	yes	yes	no
B	yes	no	yes
C	no	yes	no
D	no	no	yes

40 The bloodworm is an organism that is found in heavily polluted water.

The diagram shows where raw sewage flows into a river.

Where would there be fewest bloodworms?



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Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

BIOLOGY

0610/12

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 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.

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Electronic calculators may be used.

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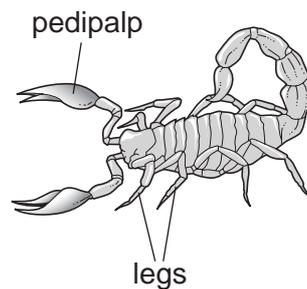
This document consists of **16** printed pages.

- 1 The diagrams show a test-tube containing pond water. The green colour is caused by microorganisms that have chloroplasts.



Which characteristics of living organisms are shown?

- A excretion, growth and movement
 - B movement, nutrition and sensitivity
 - C nutrition, reproduction and respiration
 - D reproduction, sensitivity and growth
- 2 Which shows an organism that has been named using the binomial system?
- A *Brown seaweed*
 - B *Polar bear*
 - C *Red fox*
 - D *Vulpes vulpes*
- 3 The diagram shows an arthropod.



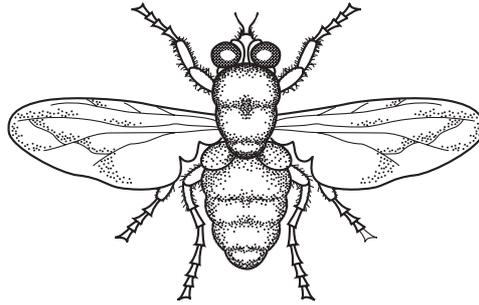
To which group does it belong?

- A arachnids
- B crustaceans
- C insects
- D myriapods

4 Which features do animal cells share with plant cells?

	chloroplast	cytoplasm	nucleus	
A	✓	✓	✓	key ✓ = yes X = no
B	✓	X	✓	
C	X	✓	✓	
D	X	X	X	

5 The diagram shows an animal.



Use the key to identify the animal.

- 1 wings present go to 2
wings absent go to 3
- 2 one pair of wings visible **A**
two pairs of wings visible **B**
- 3 three pairs of legs **C**
four pairs of legs **D**

6 At which level of organisation is a root?

- A** organ
B organ system
C organism
D tissue

- 7 Some pieces of potato were placed in a very concentrated sugar solution. Other pieces of potato were placed in distilled water.

What happened to the mass of the potato pieces in the two liquids?

	mass of the potato pieces in a very concentrated sugar solution	mass of the potato pieces in distilled water
A	decreased	decreased
B	decreased	increased
C	increased	decreased
D	increased	increased

- 8 Which identifies the chemical elements found in proteins?

	carbon	hydrogen	oxygen	nitrogen
A	✓	✓	✓	✓
B	✓	✓	✓	x
C	✓	x	✓	x
D	x	✓	x	✓

key

✓ = present

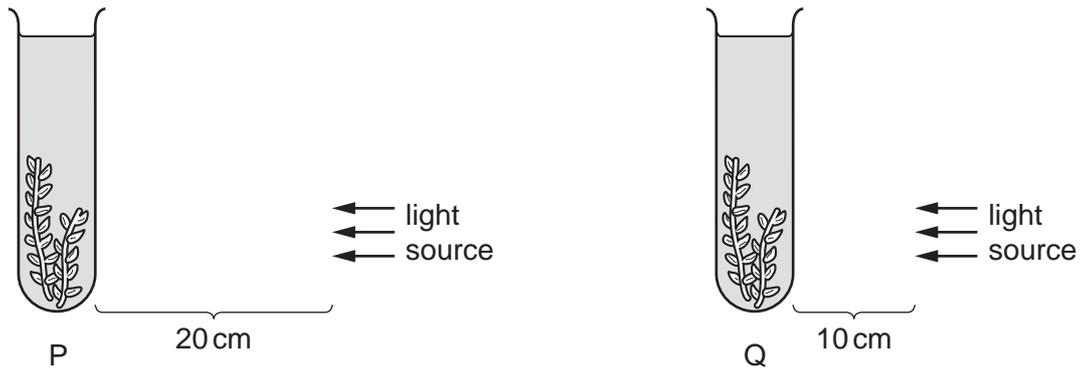
x = absent

- 9 A student carries out a test to see whether the solution in a test-tube contains protein.

Which row shows the correct food test and a positive result?

	name of test	colour seen with a positive result
A	Benedict's test	blue-black
B	Benedict's test	purple
C	biuret test	blue-black
D	biuret test	purple

10 The diagram shows an experiment investigating the effect of light intensity on an aquatic plant.



Photosynthesis occurred in both test-tube P and test-tube Q. Both test-tubes were kept at the same temperature. The number of bubbles produced in test-tube P was 12 bubbles per minute.

What is the most likely number of bubbles produced in one minute in test-tube Q?

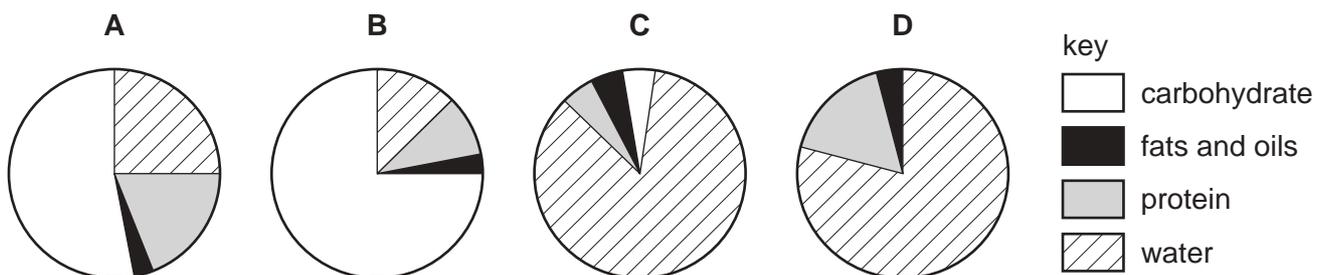
- A** 0 **B** 3 **C** 12 **D** 48

11 In which situation would insulin secretion usually increase?

- A** after eating a meal
B hearing a loud bang immediately behind you
C listening to music
D reading a book

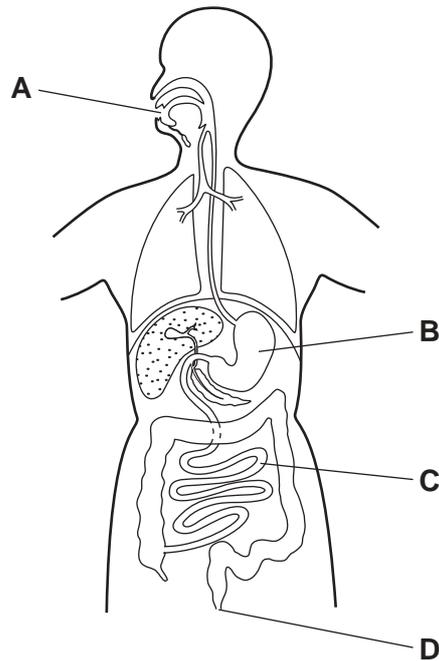
12 The pie charts show the composition of 100 g of four different foods.

Which food provides the most energy?

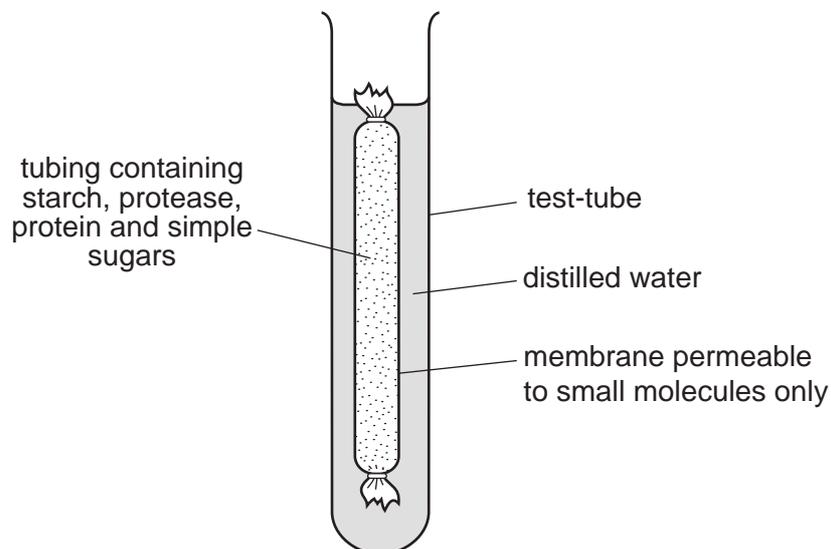


13 The diagram shows the digestive system.

Where does egestion take place?



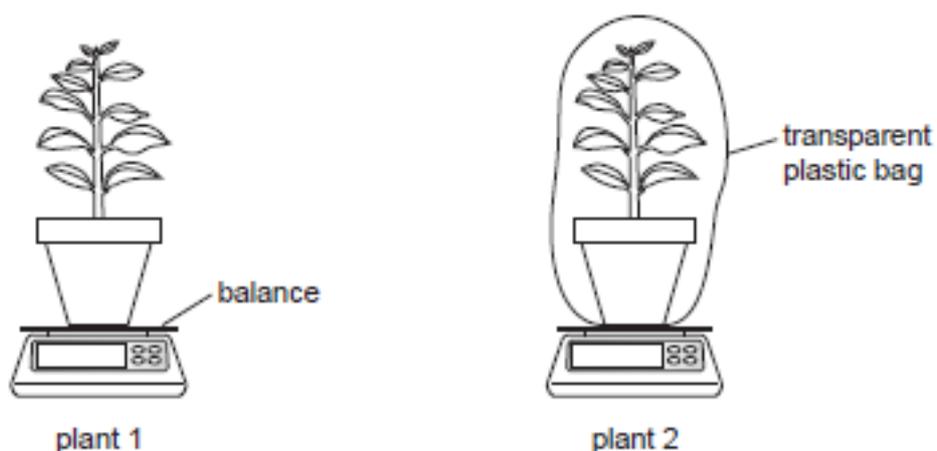
14 The diagram shows an experiment kept at room temperature.



What is present in the water surrounding the membrane after 45 minutes?

- A amino acids and simple sugars
- B protein and amino acids
- C protein and simple sugars
- D starch and simple sugars

15 The diagram shows an experiment to investigate transpiration.



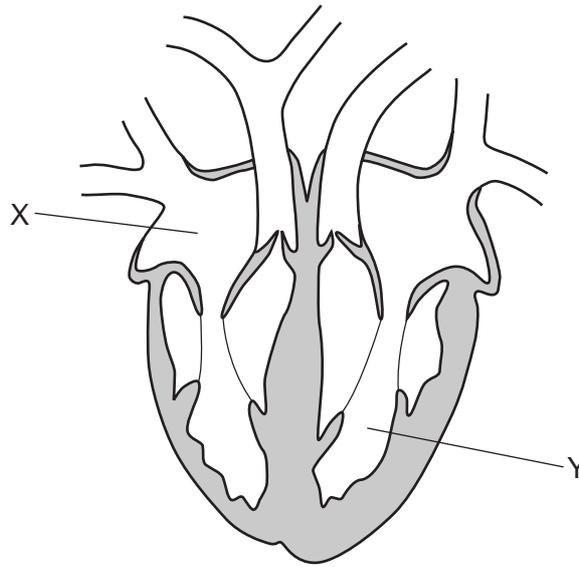
Plant 1 is not covered. Plant 2 and its pot are covered by a transparent plastic bag.

The mass of each plant and its pot is measured. The masses are measured again after two hours.

What is the result?

- A The mass of both plants decreases by the same percentage.
- B The mass of both plants stays the same.
- C The mass of plant 1 decreases more than the mass of plant 2.
- D The mass of plant 2 decreases more than the mass of plant 1.

16 The diagram shows a vertical section through a human heart.



What are X and Y?

	X	Y
A	left atrium	right ventricle
B	left ventricle	right atrium
C	right atrium	left ventricle
D	right ventricle	left atrium

17 Which factor increases the risk of developing coronary heart disease?

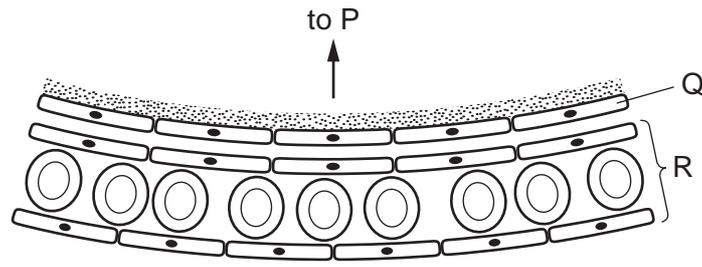
- A** low fat diet
- B** regular exercise
- C** relaxation
- D** smoking

18 The body has several defence mechanisms to protect the body against disease.

Which is a chemical barrier?

- A** hair in the nose
- B** mucus
- C** skin
- D** white blood cells

19 The diagram shows part of the human gas exchange system.



Which row identifies P, Q and R?

	P	Q	R
A	alveolus wall	capillary wall	vein
B	bronchiole	alveolus wall	capillary
C	capillary	layer of moisture	bronchiole
D	alveolus wall	bronchiole	capillary

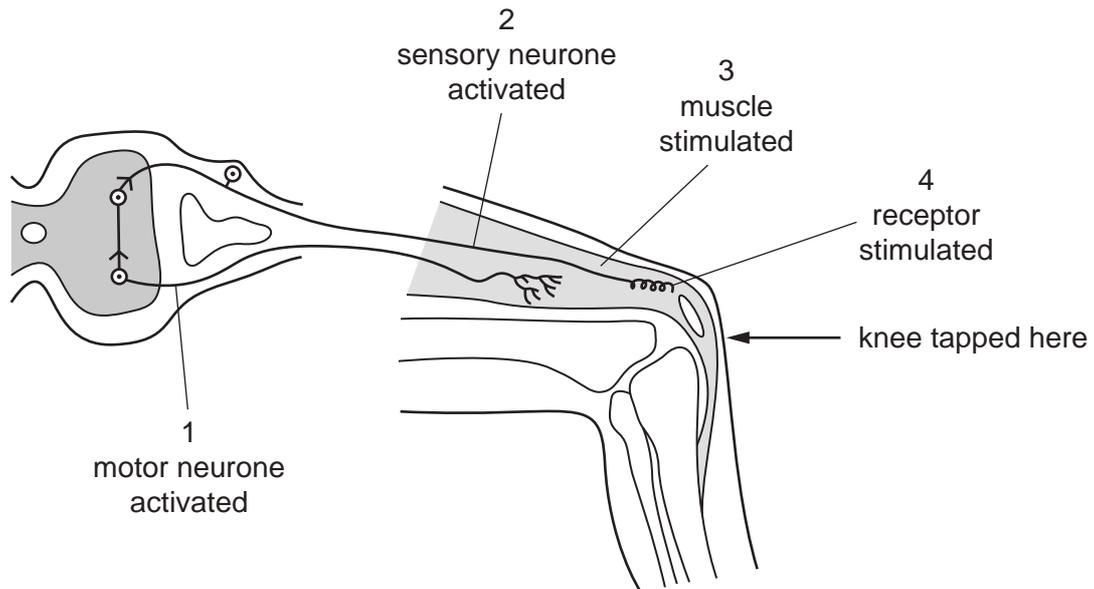
20 When is respiration carried out by green plants?

- A** at all times
- B** at dusk and dawn only
- C** during the night only
- D** never

21 Which process releases the most energy from one molecule of glucose?

- A** aerobic respiration
- B** anaerobic respiration in muscle
- C** anaerobic respiration in yeast
- D** photosynthesis

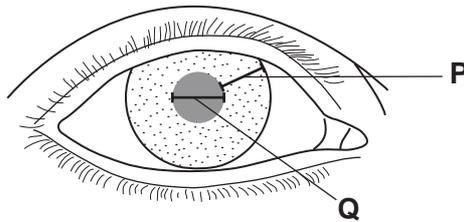
22 The diagram shows a simple reflex arc.



What is the correct order of events after the knee is tapped?

- A 1 → 2 → 3 → 4
- B 1 → 4 → 2 → 3
- C 4 → 2 → 1 → 3
- D 4 → 3 → 2 → 1

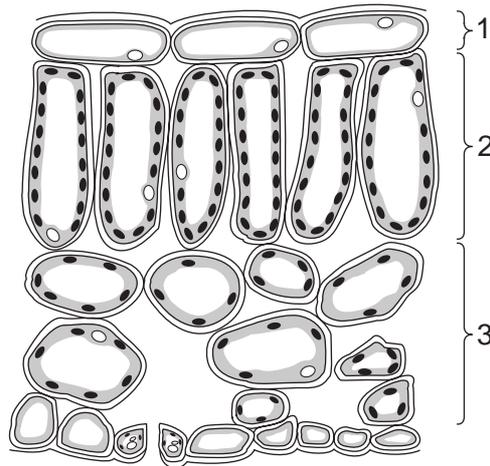
23 The diagram shows the eye of a person in a brightly-lit room.



What happens to distance **P** and distance **Q** when this person moves from the brightly-lit room into a dark room?

	distance P	distance Q
A	decreases	increases
B	decreases	stays the same
C	increases	decreases
D	stays the same	increases

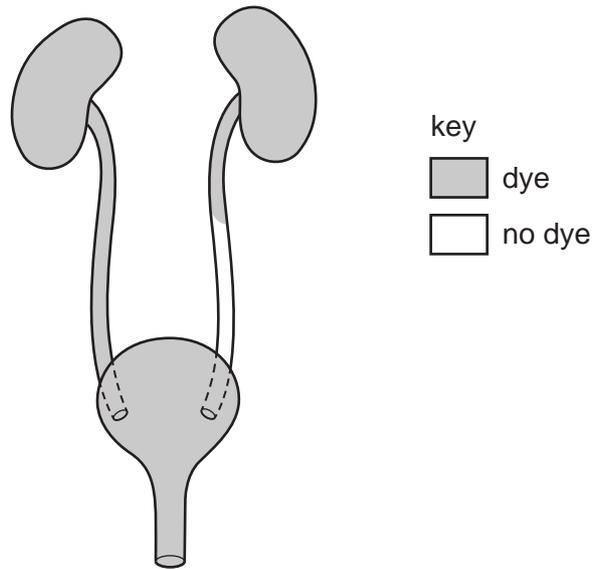
24 The diagram shows a leaf as seen in cross-section under the microscope.



What are tissues 1, 2 and 3?

	1	2	3
A	epidermis	palisade mesophyll	spongy mesophyll
B	epidermis	spongy mesophyll	palisade mesophyll
C	palisade mesophyll	epidermis	spongy mesophyll
D	spongy mesophyll	palisade mesophyll	epidermis

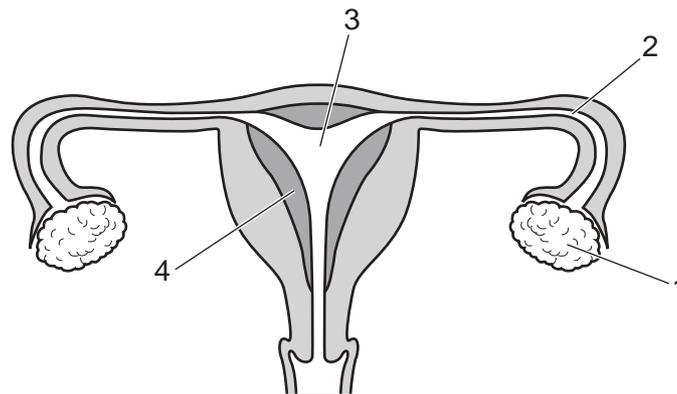
- 25 A patient has dye injected into the blood supply to his kidneys. The dye appears in his excretory system as shown.



Which part is blocked?

- A the kidney
 - B the ureter
 - C the bladder
 - D the urethra
- 26 Which organ secretes amylase?
- A colon
 - B liver
 - C pancreas
 - D stomach
- 27 What is essential for the germination of all seeds?
- A light
 - B nutrients
 - C water
 - D photosynthesis

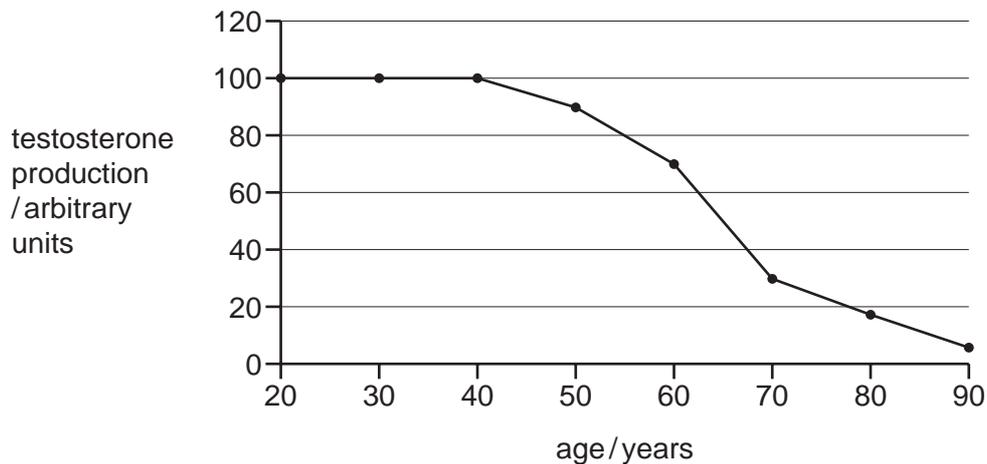
28 The diagram shows the female reproductive system.



Where does fertilisation normally occur?

- A** 1 and 2 **B** 2 only **C** 3 and 4 **D** 4 only

29 The graph shows the decline in testosterone production as men get older.



Which age range shows the greatest decline in testosterone production?

- A** 40 to 50 years
B 50 to 60 years
C 60 to 70 years
D 70 to 80 years

30 A man has three sons.

What is the chance of his next child being a daughter?

- A** 0% **B** 25% **C** 50% **D** 100%

31 Which statements about meiosis are correct?

	produces genetically identical cells	involved in the production of gametes	
A	✓	✓	key ✓ = yes X = no
B	✓	X	
C	X	✓	
D	X	X	

32 In a plant species, the allele for red flowers, R, is dominant to the allele for white flowers, r. Homozygous red-flowered plants, RR, are crossed with homozygous white-flowered plants, rr.

What is the colour of the flowers produced by the offspring of this cross?

- A** all red
- B** all white
- C** equal numbers of red and white
- D** three white to one red

33 Different organisms have different adaptive features. For example, the anthers of wind-pollinated flowering plants have long filaments.

What is true of this adaptive feature?

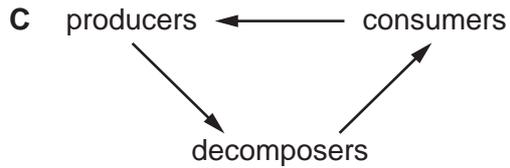
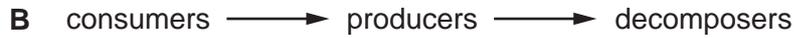
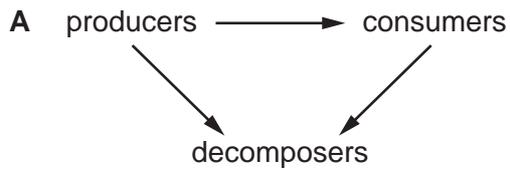
- A** Filament length is not affected by genes.
- B** It gives the plant an advantage in any environment.
- C** Longer filaments attract more insects.
- D** It makes the plant more likely to reproduce.

34 The statements describe aspects of selective breeding and natural selection.

Which statement applies **only** to selective breeding?

- A** Humans select individuals which have desirable features.
- B** Individuals pass their alleles to the next generation.
- C** There may be a large number of offspring produced.
- D** There is variation between individual offspring.

35 Which diagram correctly shows the flow of energy?



36 The diagram shows a food chain.

Which organism is the secondary consumer?



37 Which process is part of the carbon cycle?

- A** combustion
- B** evaporation
- C** precipitation
- D** transpiration

38 What is an example of genetic engineering?

- A** inserting genes into bacteria
- B** inserting insulin into bacteria
- C** spraying plants with herbicides
- D** using biological washing powders

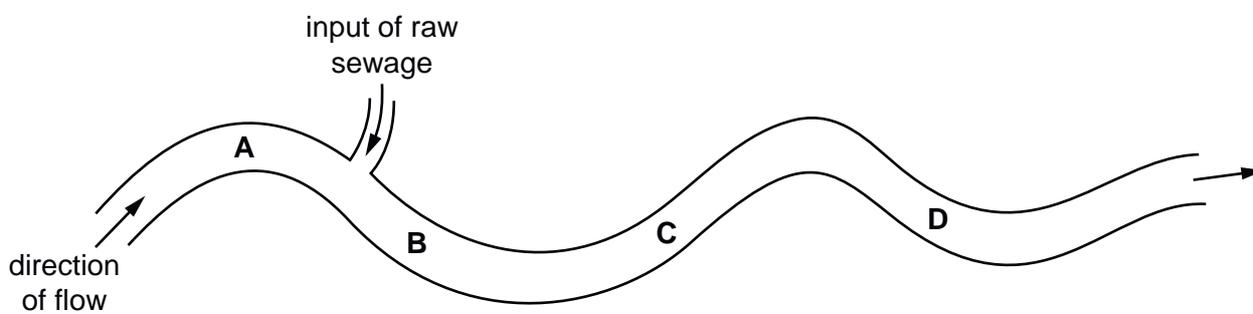
39 What are the possible effects of deforestation?

	loss of soil	flooding	decrease in atmospheric carbon dioxide
A	yes	yes	no
B	yes	no	yes
C	no	yes	no
D	no	no	yes

40 The bloodworm is an organism that is found in heavily polluted water.

The diagram shows where raw sewage flows into a river.

Where would there be fewest bloodworms?



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BIOLOGY

0610/13

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 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.

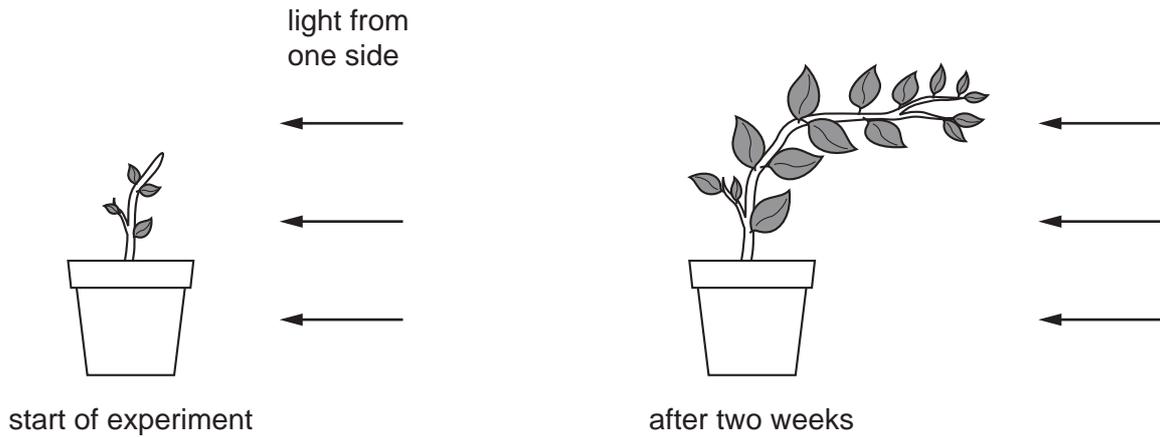
Electronic calculators may be used.

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.



- 1 The diagrams show a plant at the start of an experiment, and the same plant two weeks later.



Which characteristics of living organisms are demonstrated by this experiment?

- A excretion, growth, movement
 - B excretion, movement, reproduction
 - C growth, movement, sensitivity
 - D sensitivity, growth, respiration
- 2 Donkeys and zebras are different species. They can breed to produce an animal called a zedonk.

Zedonks are not fertile.

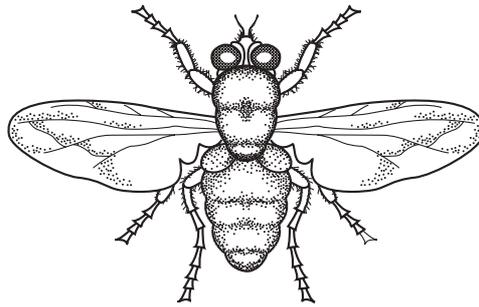
Which statement is correct?

- A Zedonks and donkeys are the same species.
 - B Zedonks and zebras are the same species.
 - C Zedonks are a species.
 - D Zedonks are not a species.
- 3 Which feature is characteristic only of birds?
- A hair and wings
 - B hard-shelled eggs and feathers
 - C scales and soft-shelled eggs
 - D wings and soft-shelled eggs

4 Which features do animal cells share with plant cells?

	chloroplast	cytoplasm	nucleus	
A	✓	✓	✓	key ✓ = yes X = no
B	✓	X	✓	
C	X	✓	✓	
D	X	X	X	

5 The diagram shows an animal.



Use the key to identify the animal.

- 1 wings present go to 2
 wings absent go to 3
- 2 one pair of wings visible **A**
 two pairs of wings visible **B**
- 3 three pairs of legs **C**
 four pairs of legs **D**

6 At which level of organisation is a root?

- A** organ
B organ system
C organism
D tissue

7 Which process requires energy from respiration?

- A** active transport
B diffusion
C osmosis
D transpiration

8 Which identifies the chemical elements found in proteins?

	carbon	hydrogen	oxygen	nitrogen
A	✓	✓	✓	✓
B	✓	✓	✓	x
C	✓	x	✓	x
D	x	✓	x	✓

key

✓ = present

x = absent

9 Enzyme X digests protein in the stomach.

Four test-tubes were set up, each contained the same amounts of protein and enzyme X. The test-tubes are kept at different levels of pH and temperature, as shown in the table.

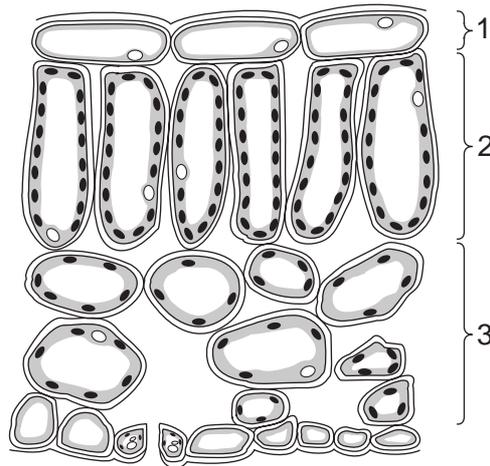
In which test-tube will protein digestion be quickest?

	pH	temperature/°C
A	2	20
B	2	35
C	7	20
D	7	35

10 Which substance is used up in photosynthesis?

- A** chlorophyll
- B** light
- C** oxygen
- D** water

11 The diagram shows a leaf as seen in cross-section under the microscope.

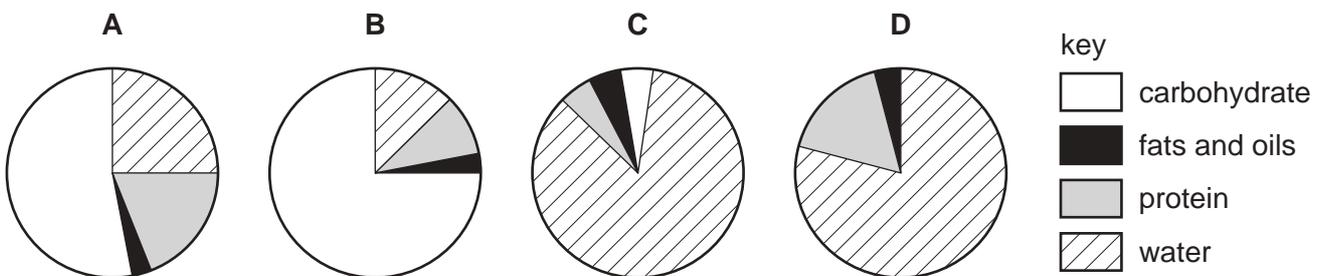


What are tissues 1, 2 and 3?

	1	2	3
A	epidermis	palisade mesophyll	spongy mesophyll
B	epidermis	spongy mesophyll	palisade mesophyll
C	palisade mesophyll	epidermis	spongy mesophyll
D	spongy mesophyll	palisade mesophyll	epidermis

12 The pie charts show the composition of 100 g of four different foods.

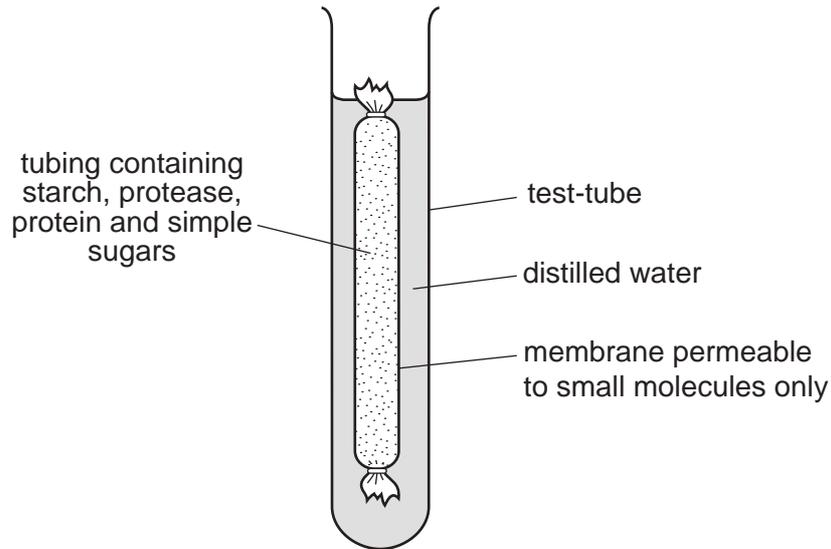
Which food provides the most energy?



13 In which part of the alimentary canal is most water absorbed?

- A** colon
- B** oesophagus
- C** small intestine
- D** stomach

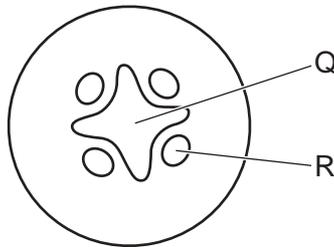
14 The diagram shows an experiment kept at room temperature.



What is present in the water surrounding the membrane after 45 minutes?

- A amino acids and simple sugars
- B protein and amino acids
- C protein and simple sugars
- D starch and simple sugars

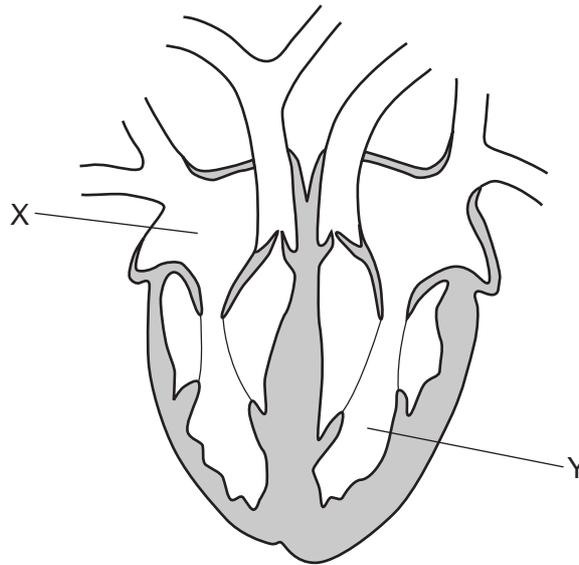
15 The diagram shows a cross-section through a plant root.



What is found at Q and R?

	Q	R
A	palisade mesophyll	spongy mesophyll
B	phloem	xylem
C	spongy mesophyll	palisade mesophyll
D	xylem	phloem

16 The diagram shows a vertical section through a human heart.



What are X and Y?

	X	Y
A	left atrium	right ventricle
B	left ventricle	right atrium
C	right atrium	left ventricle
D	right ventricle	left atrium

17 The table shows the concentration of red blood cells, white blood cells and platelets in the blood of four patients.

Which patient is most likely to have a deficiency of iron in their diet **and** will find it difficult to form a blood clot?

	red blood cells /cells per mm ³	white blood cells /cells per mm ³	platelets /cells per mm ³
A	2 525 000	643	296 000
B	2 275 000	756	27 500
C	7 250 000	650	275 000
D	7 325 000	405	25 000

18 *Campylobacter* is a bacterium that can cause food poisoning.

Which word describes *Campylobacter*?

- A antibody
- B disease
- C pathogen
- D symptom

19 What is the sequence of structures through which a molecule of oxygen passes from the air to the blood of a person?

- 1 bronchiole
- 2 capillary
- 3 alveolus wall
- 4 larynx

- A 1 → 4 → 2 → 3
- B 3 → 2 → 1 → 4
- C 4 → 1 → 3 → 2
- D 4 → 2 → 1 → 3

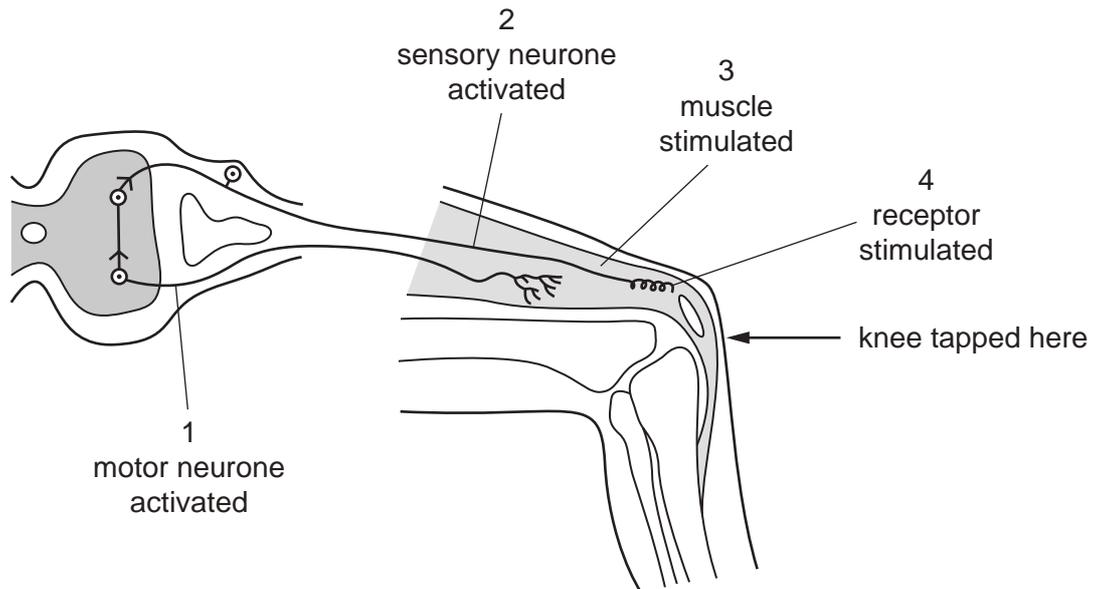
20 Which process releases heat to maintain a constant body temperature?

- A excretion
- B nutrition
- C reproduction
- D respiration

21 Which process releases the most energy from one molecule of glucose?

- A aerobic respiration
- B anaerobic respiration in muscle
- C anaerobic respiration in yeast
- D photosynthesis

22 The diagram shows a simple reflex arc.



What is the correct order of events after the knee is tapped?

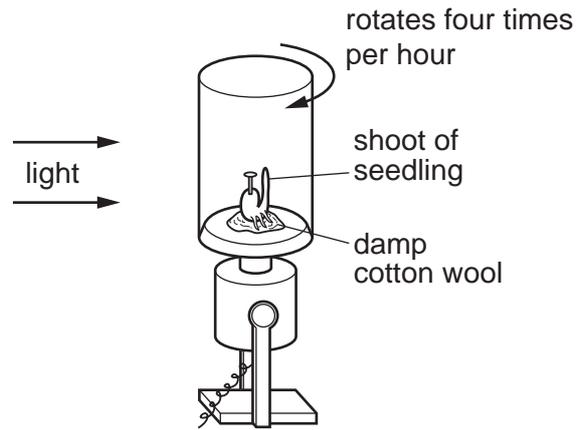
- A 1 → 2 → 3 → 4
- B 1 → 4 → 2 → 3
- C 4 → 2 → 1 → 3
- D 4 → 3 → 2 → 1

23 When a bright light is shone into the eye, the diameter of the pupil decreases.

What is this an example of?

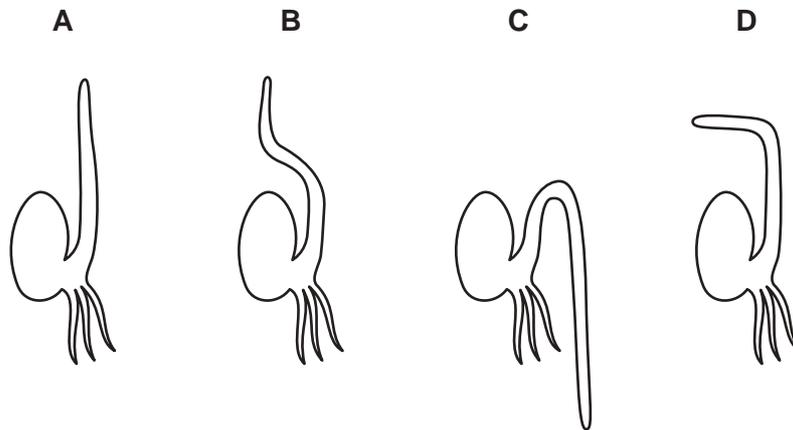
- A a simple reflex
- B 'fight or flight' response
- C a synapse
- D refraction

24 The diagram shows a seedling, fixed to a rotating platform. Light is directed from one side only.

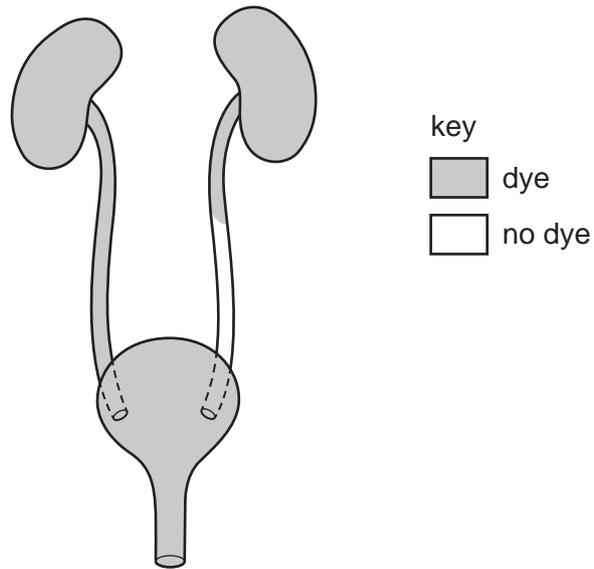


The platform was allowed to rotate for two days. It was left stationary for a further two days.

Which diagram shows the appearance of the seedling after this four-day period?



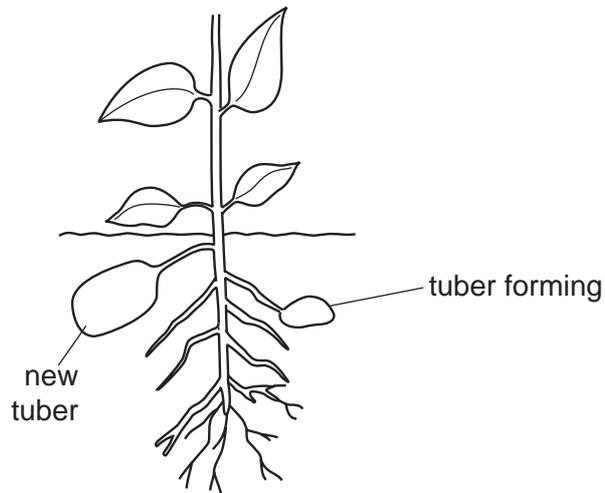
- 25 A patient has dye injected into the blood supply to his kidneys. The dye appears in his excretory system as shown.



Which part is blocked?

- A the kidney
 - B the ureter
 - C the bladder
 - D the urethra
- 26 Which organ breaks down alcohol?
- A bladder
 - B heart
 - C kidney
 - D liver

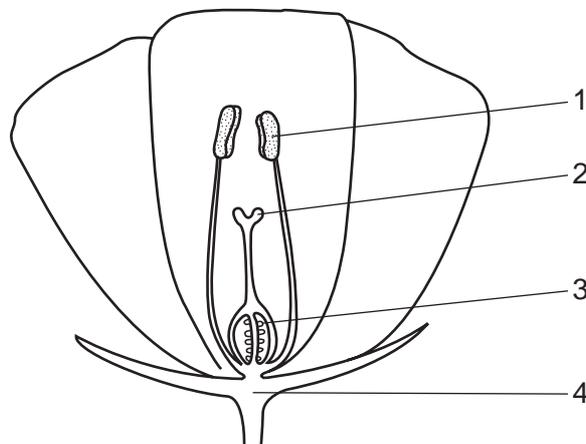
27 The diagram shows reproduction in a potato plant.



Which process is shown?

- A asexual reproduction
- B fertilisation
- C pollination
- D sexual reproduction

28 The diagram shows part of a flower.



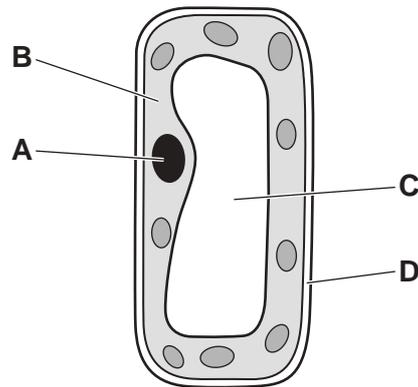
Where does fertilisation occur and where are the ovules and pollen grains found?

	fertilisation occurs here	ovules are found here	pollen grains are found here
A	1	2	4
B	2	3	4
C	3	3	1
D	4	1	2

- 29 Which method of birth control can be used as a barrier to sperm **and** sexually transmitted diseases during sexual intercourse?
- A condom
 - B IUD
 - C IUS
 - D surgical sterilisation

- 30 The diagram shows a plant cell.

Where are the chromosomes found?



- 31 Which statement describes human cells formed by meiosis?
- A They are genetically identical gametes.
 - B They are genetically identical body cells.
 - C They are genetically different gametes.
 - D They are genetically different body cells.

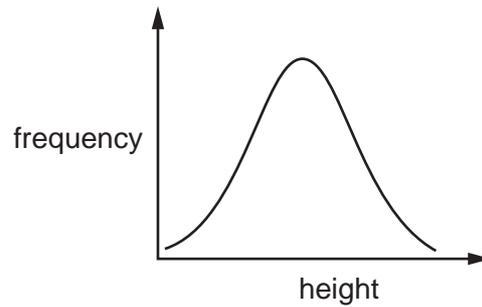
- 32 Pea plants have two alleles for height. T is tall, t is short.

Two heterozygous pea plants, Tt, are crossed.

What is the phenotypic ratio of the offspring for this cross?

- A all short plants
- B all tall plants
- C one tall plant to three short plants
- D three tall plants to one short plant

33 The graph shows the heights of humans.



Which statement is correct?

- A The individuals of this population all have the same genotype.
- B The individuals of this population all have the same phenotype.
- C This population shows continuous variation.
- D This population shows discontinuous variation.

34 What is a mutation?

- A a condition caused by a dominant allele
- B a genetic change
- C a process used in genetic engineering
- D an adaptive feature

35 Consumers take in carbon atoms from their food.

How do carbon atoms leave the consumers?

	egestion	excretion	decomposition	
A	✓	✓	✓	key ✓ = yes X = no
B	✓	X	✓	
C	✓	X	X	
D	X	✓	✓	

36 Which process is part of the water cycle?

- A combustion
- B fossilisation
- C respiration
- D transpiration

37 A gene for insulin is taken from a human cell and placed in a bacterium.

The bacterium can then make human insulin.

What is this process called?

- A** adaptation
- B** genetic engineering
- C** natural selection
- D** selective breeding

38 Some examples of how areas of land may be used are listed:

- 1 food crop production
- 2 grazing cattle
- 3 house building
- 4 tree planting.

Which uses of land will cause habitat destruction?

- A** 1, 2 and 3 **B** 1, 2 and 4 **C** 2 and 3 only **D** 3 and 4 only

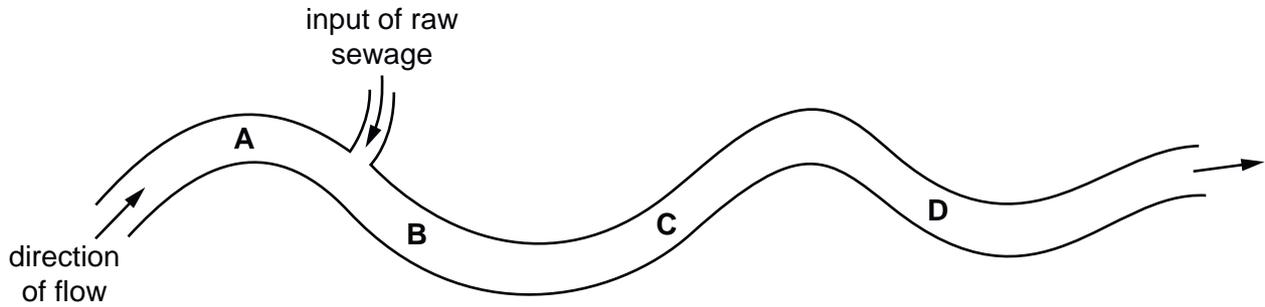
39 What are the possible effects of deforestation?

	loss of soil	flooding	decrease in atmospheric carbon dioxide
A	yes	yes	no
B	yes	no	yes
C	no	yes	no
D	no	no	yes

40 The bloodworm is an organism that is found in heavily polluted water.

The diagram shows where raw sewage flows into a river.

Where would there be fewest bloodworms?



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Cambridge International General Certificate of Secondary Education

BIOLOGY

0610/21

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 is recommended)

* 7 5 3 8 6 7 1 5 7 8 *

READ THESE INSTRUCTIONS FIRST

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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**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

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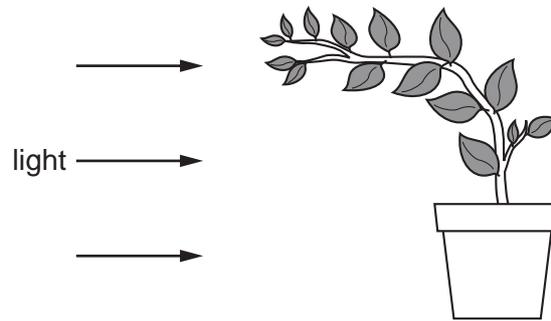
Electronic calculators may be used.

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This document consists of **15** printed pages and **1** blank page.



1 The diagram shows a plant.



Which characteristic of living organisms is shown by the plant in the diagram?

- A excretion
 - B reproduction
 - C respiration
 - D sensitivity
- 2 Using the binomial system of naming organisms, the name of the lion is *Panthera leo*.

Which statement is correct?

- A The lion belongs to the kingdom *Panthera*.
 - B The lion belongs to the genus *Panthera*.
 - C The lion belongs to the species *Panthera*.
 - D The lion belongs to the genus *leo*.
- 3 The table shows the number of animals collected in a sample from a woodland and the groups to which they belong.

animal group	number in sample
arachnids	10
crustaceans	8
insects	80
myriapods	7

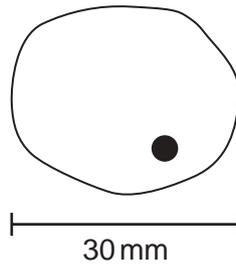
How many arthropods in total, in this sample, have six or eight legs?

- A 15
- B 88
- C 90
- D 98

4 Which features do animal cells share with plant cells?

	chloroplast	cytoplasm	nucleus	
A	✓	✓	✓	key ✓ = yes X = no
B	✓	X	✓	
C	X	✓	✓	
D	X	X	X	

5 The diagram shows a cell with an actual size of 30 μm .



What is the magnification of the diagram?

- A** $\times 10$ **B** $\times 100$ **C** $\times 1000$ **D** $\times 10000$

6 Red blood cells were placed in pure water.

Movement of water across the cell membrane caused a change in their appearance.

What caused this change in appearance?

	direction of water movement	from higher to lower water potential	from lower to higher water potential
A	into cells	yes	no
B	into cells	no	yes
C	out of cells	yes	no
D	out of cells	no	yes

7 Some examples of substances moving across membranes are listed.

- 1 glucose molecules into the epithelium that lines the small intestine
- 2 nitrate ions from a dilute solution in soil into a more concentrated solution in root hair cells
- 3 water molecules from mesophyll cells into the air spaces of a leaf

For which must oxygen be present?

- A** 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

8 Which identifies the chemical elements found in proteins?

	carbon	hydrogen	oxygen	nitrogen
A	✓	✓	✓	✓
B	✓	✓	✓	x
C	✓	x	✓	x
D	x	✓	x	✓

key

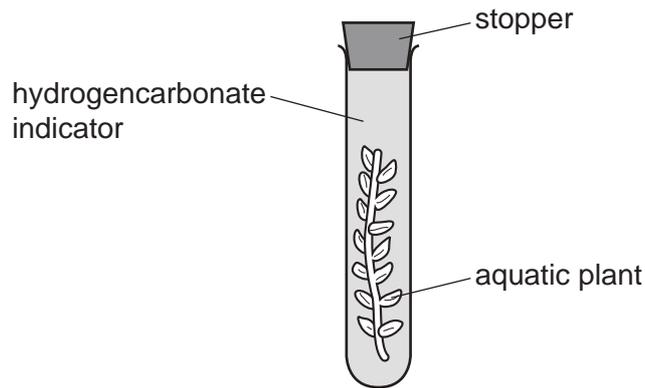
✓ = present

x = absent

9 What is the correct definition of the term *enzyme*?

- A** carbohydrates that act as biological catalysts
- B** carbohydrates that act as substrates
- C** proteins that act as biological catalysts
- D** proteins that act as substrates

10 Two sealed test-tubes containing aquatic plants and hydrogencarbonate indicator were set up.



The indicator in the sealed test-tubes shows the concentration of dissolved carbon dioxide present.

concentration of carbon dioxide	colour of indicator
low	red
medium	orange
high	yellow

One of the sealed test-tubes was kept in the light for 24 hours and one of the sealed test-tubes was kept in the dark for 24 hours.

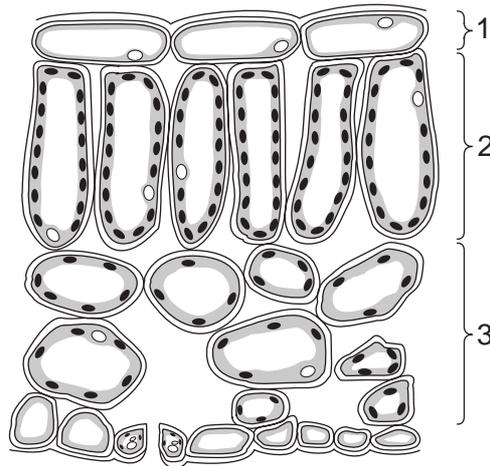
The results are shown in the table.

test-tube kept in	start colour	end colour
light	orange	red
dark	orange	yellow

What is the correct explanation of what has taken place?

- A Photosynthesis and respiration both occur in the light, but the rate of photosynthesis is higher.
- B Photosynthesis occurs in the light, but respiration does not.
- C Respiration can only occur when photosynthesis is not taking place.
- D The amount of carbon dioxide used and produced in the light is equal.

11 The diagram shows a leaf as seen in cross-section under the microscope.

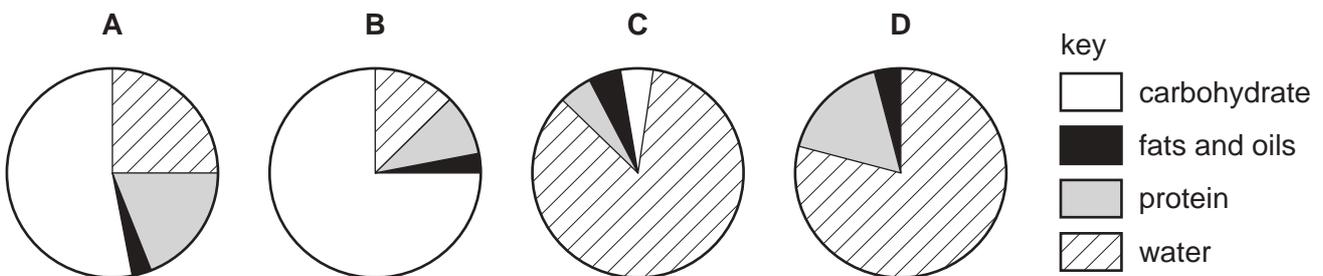


What are tissues 1, 2 and 3?

	1	2	3
A	epidermis	palisade mesophyll	spongy mesophyll
B	epidermis	spongy mesophyll	palisade mesophyll
C	palisade mesophyll	epidermis	spongy mesophyll
D	spongy mesophyll	palisade mesophyll	epidermis

12 The pie charts show the composition of 100 g of four different foods.

Which food provides the most energy?

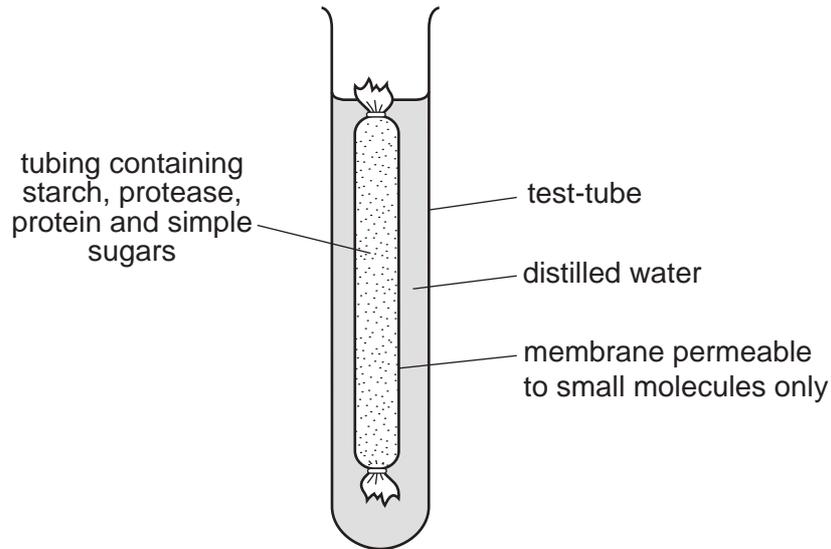


13 One of the symptoms of the disease cholera is diarrhoea. This is due to water loss by osmosis caused by the cholera toxin.

Cholera toxins result in

- A** secretion of chloride ions out of the small intestine lowering the water potential.
- B** secretion of chloride ions out of the small intestine raising the water potential.
- C** secretion of chloride ions into the small intestine lowering the water potential.
- D** secretion of chloride ions into the small intestine raising the water potential.

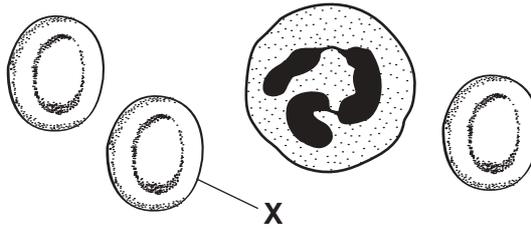
14 The diagram shows an experiment kept at room temperature.



What is present in the water surrounding the membrane after 45 minutes?

- A amino acids and simple sugars
 - B protein and amino acids
 - C protein and simple sugars
 - D starch and simple sugars
- 15 What is an example of diffusion?
- A dust particles being moved by ciliated cells in the trachea
 - B oxygen molecules moving into a red blood cell in the lungs
 - C pollen grains moving from anthers to stigmas in the wind
 - D red blood cells moving in a blood capillary in a muscle
- 16 In plants, what is transported by translocation?
- A glucagon
 - B glycogen
 - C starch
 - D sucrose

17 The diagram shows human blood cells, as seen under a microscope.



What is the function of cell X?

- A to carry glucose
- B to carry oxygen
- C to defend against disease
- D to make the blood clot

18 Which row describes the features of passive immunity?

	antibodies made	involves memory cells	effective period
A	no	no	short term
B	no	yes	short term
C	yes	no	long term
D	yes	yes	long term

19 Which row shows the approximate percentage of gases in expired air?

	percentage of carbon dioxide	percentage of oxygen
A	12	9
B	4	16
C	24	24
D	27	20

20 What is the correct equation for aerobic respiration?

- A $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$
- B $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{CO}_2 \rightarrow 6\text{O}_2 + 6\text{H}_2\text{O}$
- C $\text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
- D $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$

21 Lactic acid builds up in the muscles during vigorous exercise.

During recovery, how is this lactic acid removed?

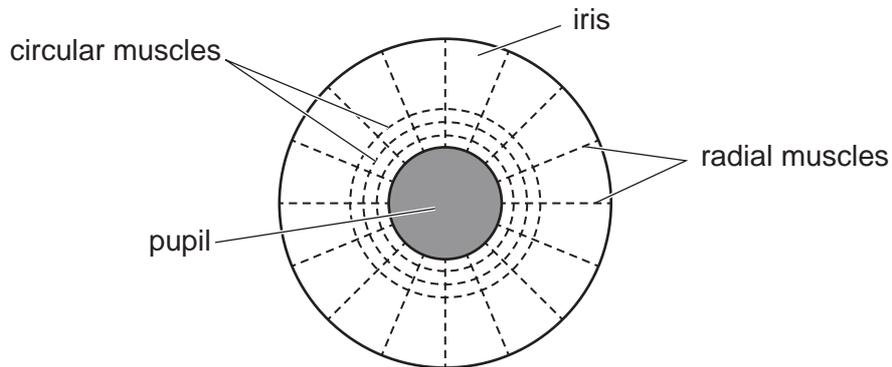
- A aerobic respiration of lactic acid in the liver
- B anaerobic respiration of lactic acid in the muscles
- C excretion of lactic acid by the lungs
- D removal of lactic acid by the alimentary canal

22 The neurones at synapses contain vesicles.

Which type of substance is found inside the vesicles?

- A enzyme
- B chromosomes
- C neurotransmitter
- D steroid

23 The diagram shows the muscles that control the size of the pupil in an eye.



How do the muscles make the pupil smaller?

	circular muscles	radial muscles
A	contract	contract
B	contract	relax
C	relax	contract
D	relax	relax

24 More adrenaline is produced by the adrenal glands when a person is frightened.

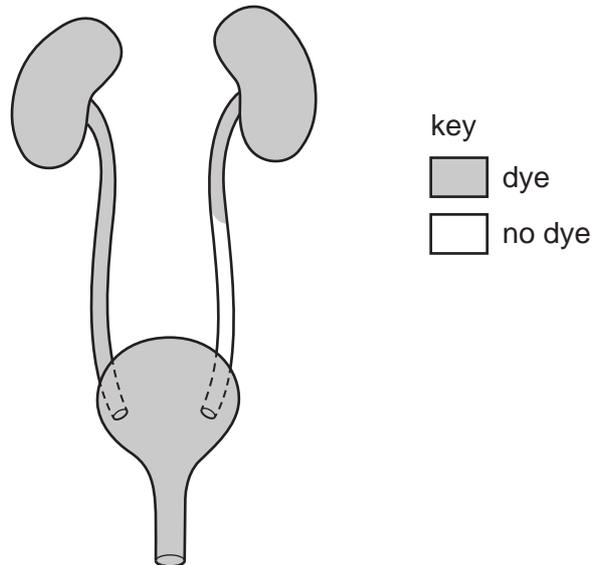
This increase affects several parts of the body.

	change	increases	decreases	
1	blood glucose concentration	X	✓	key
2	heart rate	✓	X	✓ = yes
3	breathing rate and depth	✓	X	X = no
4	dilation of pupil	X	✓	

Which rows are correct?

- A 1 and 3 B 1 and 4 C 2 and 3 D 2 and 4

25 A patient has dye injected into the blood supply to his kidneys. The dye appears in his excretory system as shown.



Which part is blocked?

- A the kidney
 B the ureter
 C the bladder
 D the urethra

26 Which statement is a reason why viruses are unharmed by antibiotics such as penicillin?

- A They are very small in size.
- B They do not have a cell wall.
- C They have genetic material.
- D They have a protein coat.

27 Several athletes have been banned from their sport for using the drug nandrolone. This drug helps the body to build up muscle tissue.

What sort of drug is nandrolone?

- A anabolic steroid
- B antibiotic
- C depressant
- D neurotransmitter

28 Which statement about the hormone FSH is correct?

- A It stimulates ovulation.
- B It stimulates ovulation and menstruation.
- C It stimulates the maturation of follicles.
- D It stimulates the maturation of follicles and menstruation.

29 HIV is transmitted by body fluids during sexual contact.

HIV affects the immune system.

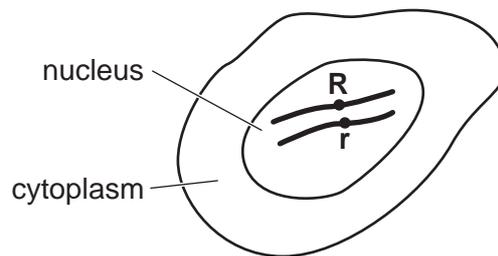
Which statement best describes the effect of HIV?

- A The body has increased immunity.
- B The body produces fewer antibodies.
- C The body produces more antibodies.
- D The number of lymphocytes increases.

30 How many chromosomes are there in each of the human cells shown in the table?

	goblet cell	motor neurone	mature red blood cell	sperm
A	0	23	0	0
B	23	23	23	0
C	46	46	0	23
D	46	46	46	23

31 The diagram shows a diploid cell and alleles **R** and **r** on one pair of chromosomes.



When this cell divides by mitosis, which daughter cells will be produced?

	chromosome number	genotype
A	diploid	heterozygous
B	diploid	homozygous
C	haploid	heterozygous
D	haploid	homozygous

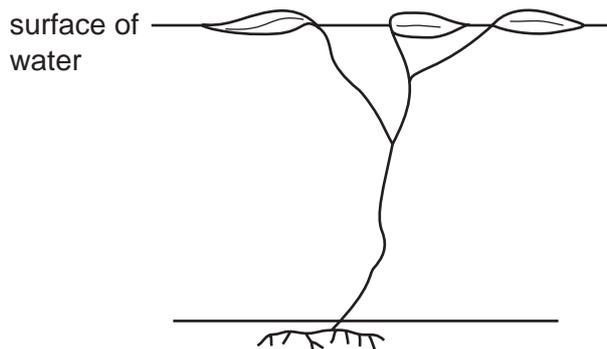
32 The diagram shows breeding rats where the allele for grey fur is dominant to white fur.



Which two individuals are definitely heterozygous for fur colour?

- A** 1 and 4 **B** 2 and 3 **C** 2 and 5 **D** 3 and 6

33 The diagram shows a hydrophyte in a lake.



Which statement about the leaves is correct?

- A They cannot photosynthesise.
- B They have a thick cuticle.
- C They have large air spaces in the spongy mesophyll.
- D They require many xylem vessels for support.

34 Some disease-causing bacteria survive treatment with an antibiotic.

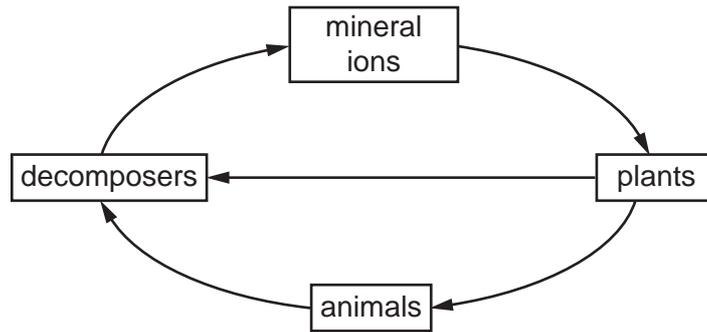
Which statement about the surviving bacteria is correct?

- A The antibiotic will work better on the next generation of bacteria.
- B The bacteria have undergone a process of natural selection.
- C The bacteria will now be resistant to all antibiotics.
- D The resistance of the bacteria is a result of selective breeding.

35 Which row describes the energy flow into and through a food chain that starts with a plant?

	energy entering a food chain	energy transferred between organisms in a food chain
A	chemical	chemical
B	chemical	heat
C	light	chemical
D	light	heat

36 The diagram shows part of the nitrogen cycle.



What is one of the mineral ions?

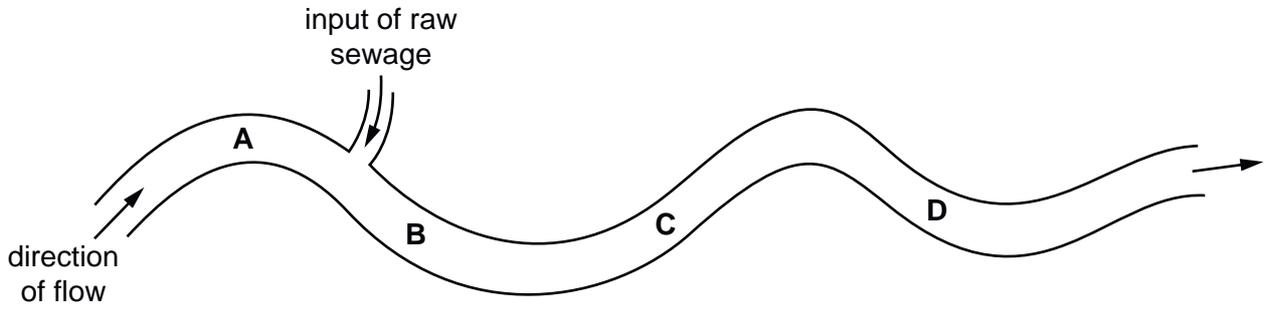
- A amino acids
 - B nitrate
 - C nitrogen
 - D protein
- 37 Which part of a bacterial cell makes it useful in genetic engineering?
- A cell wall
 - B cytoplasm
 - C flagellum
 - D plasmid
- 38 Which enzyme would be used in a biological washing powder?
- A DNA ligase
 - B lactase
 - C pectinase
 - D protease
- 39 What are the possible effects of deforestation?

	loss of soil	flooding	decrease in atmospheric carbon dioxide
A	yes	yes	no
B	yes	no	yes
C	no	yes	no
D	no	no	yes

40 The bloodworm is an organism that is found in heavily polluted water.

The diagram shows where raw sewage flows into a river.

Where would there be fewest bloodworms?



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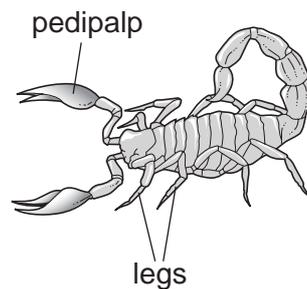


- 1 The diagrams show a test-tube containing pond water. The green colour is caused by microorganisms that have chloroplasts.



Which characteristics of living organisms are shown?

- A excretion, growth and movement
 - B movement, nutrition and sensitivity
 - C nutrition, reproduction and respiration
 - D reproduction, sensitivity and growth
- 2 Which shows an organism that has been named using the binomial system?
- A *Brown seaweed*
 - B *Polar bear*
 - C *Red fox*
 - D *Vulpes vulpes*
- 3 The diagram shows an arthropod.



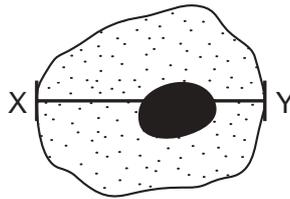
To which group does it belong?

- A arachnids
- B crustaceans
- C insects
- D myriapods

4 Which features do animal cells share with plant cells?

	chloroplast	cytoplasm	nucleus	
A	✓	✓	✓	key ✓ = yes X = no
B	✓	X	✓	
C	X	✓	✓	
D	X	X	X	

5 The diagram shows a drawing of a human cheek cell.



The distance between points X and Y on the diagram is 30 mm.

The actual length of the cell between X and Y was 60 μm .

What is the magnification of the cell?

- A** $\times 50$ **B** $\times 200$ **C** $\times 500$ **D** $\times 2000$

6 Red blood cells were placed in pure water.

Movement of water across the cell membrane caused a change in their appearance.

What caused this change in appearance?

	direction of water movement	from higher to lower water potential	from lower to higher water potential
A	into cells	yes	no
B	into cells	no	yes
C	out of cells	yes	no
D	out of cells	no	yes

7 Which process depends on active transport?

- A** absorption of carbon dioxide by plant leaves
B reabsorption of glucose by kidney tubules
C removal of carbon dioxide in the alveoli
D uptake of water by plant roots

8 Which identifies the chemical elements found in proteins?

	carbon	hydrogen	oxygen	nitrogen
A	✓	✓	✓	✓
B	✓	✓	✓	x
C	✓	x	✓	x
D	x	✓	x	✓

key

✓ = present

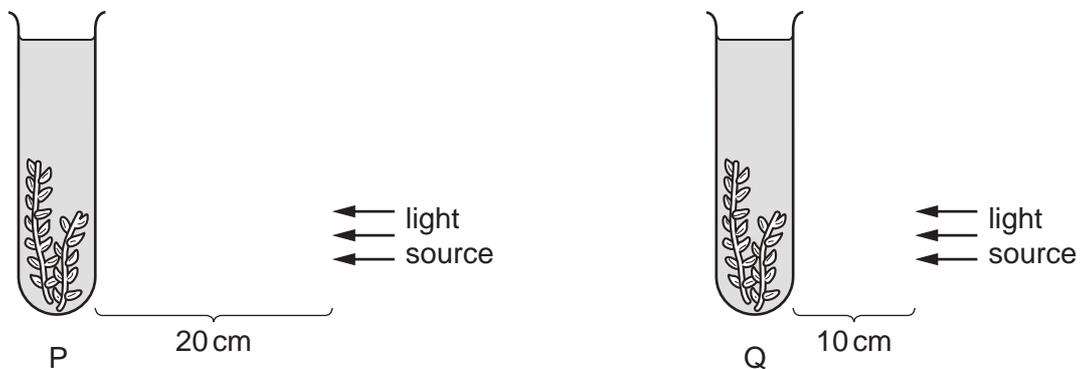
x = absent

9 A student carries out a test to see whether the solution in a test-tube contains protein.

Which row shows the correct food test and a positive result?

	name of test	colour seen with a positive result
A	Benedict's test	blue-black
B	Benedict's test	purple
C	biuret test	blue-black
D	biuret test	purple

10 The diagram shows an experiment investigating the effect of light intensity on an aquatic plant.

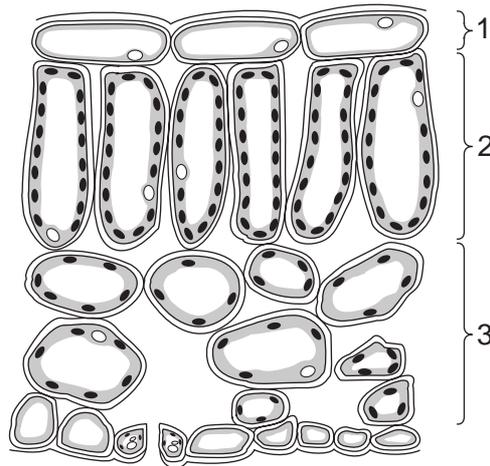


Photosynthesis occurred in both test-tube P and test-tube Q. Both test-tubes were kept at the same temperature. The number of bubbles produced in test-tube P was 12 bubbles per minute.

What is the most likely number of bubbles produced in one minute in test-tube Q?

- A** 0 **B** 3 **C** 12 **D** 48

11 The diagram shows a leaf as seen in cross-section under the microscope.

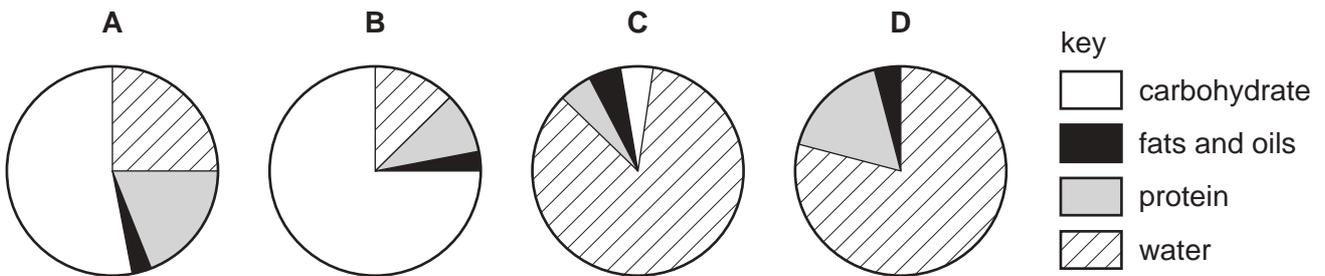


What are tissues 1, 2 and 3?

	1	2	3
A	epidermis	palisade mesophyll	spongy mesophyll
B	epidermis	spongy mesophyll	palisade mesophyll
C	palisade mesophyll	epidermis	spongy mesophyll
D	spongy mesophyll	palisade mesophyll	epidermis

12 The pie charts show the composition of 100 g of four different foods.

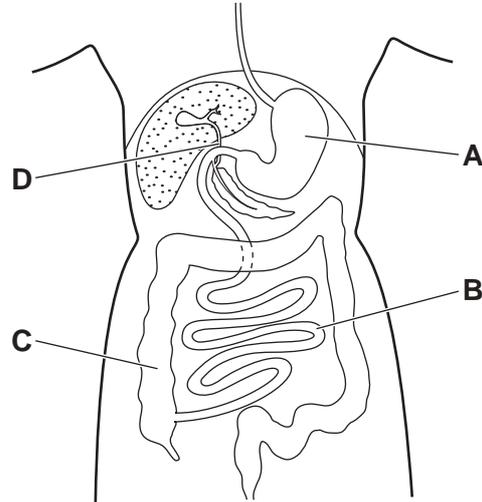
Which food provides the most energy?



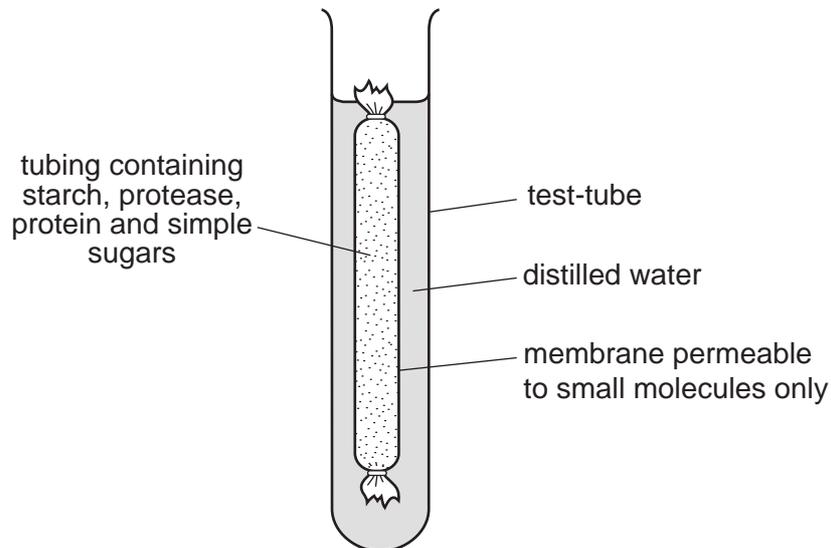
- 13** The cholera bacterium produces a toxin that results in water entering the alimentary canal and causing diarrhoea.

The diagram shows the human alimentary canal.

Into which region are chloride ions secreted as a result of the toxin?



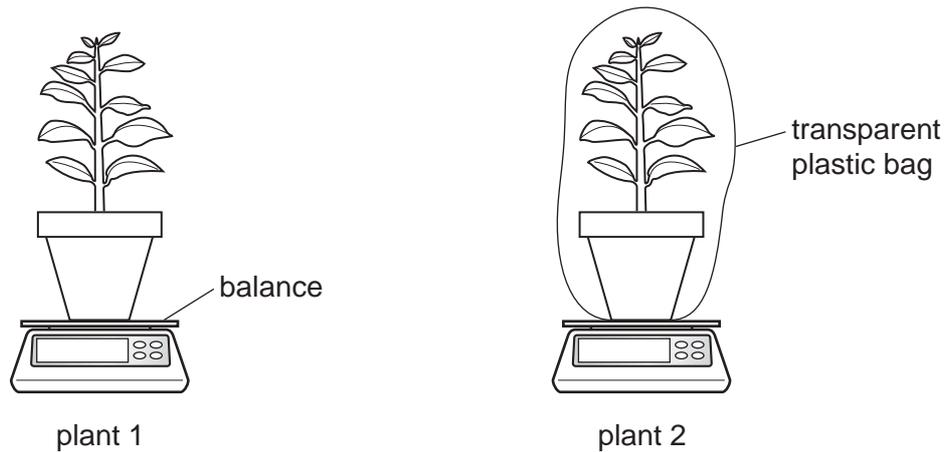
- 14** The diagram shows an experiment kept at room temperature.



What is present in the water surrounding the membrane after 45 minutes?

- A** amino acids and simple sugars
- B** protein and amino acids
- C** protein and simple sugars
- D** starch and simple sugars

15 The diagram shows an experiment to investigate transpiration.



Plant 1 is not covered. Plant 2 and its pot are covered by a transparent plastic bag.

The mass of each plant and its pot is measured. The masses are measured again after two hours.

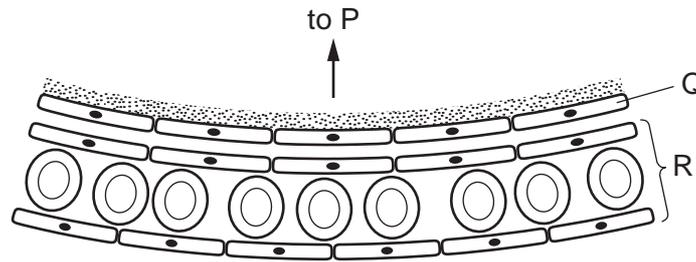
What is the result?

- A The mass of both plants decreases by the same percentage.
 - B The mass of both plants stays the same.
 - C The mass of plant 1 decreases more than the mass of plant 2.
 - D The mass of plant 2 decreases more than the mass of plant 1.
- 16 Which description of translocation is correct?
- A movement of glucose and amino acids from a sink to a source
 - B movement of glucose and amino acids from a source to a sink
 - C movement of sucrose and amino acids from a sink to a source
 - D movement of sucrose and amino acids from a source to a sink
- 17 Which factor increases the risk of developing coronary heart disease?
- A low fat diet
 - B regular exercise
 - C relaxation
 - D smoking

18 Which row describes the features of passive immunity?

	antibodies made	involves memory cells	effective period
A	no	no	short term
B	no	yes	short term
C	yes	no	long term
D	yes	yes	long term

19 The diagram shows part of the human gas exchange system.



Which row identifies P, Q and R?

	P	Q	R
A	alveolus wall	capillary wall	vein
B	bronchiole	alveolus wall	capillary
C	capillary	layer of moisture	bronchiole
D	alveolus wall	bronchiole	capillary

20 What is the effect on germinating seeds of increasing the temperature from 10 °C to 20 °C?

- A** a decrease in the production of oxygen
- B** a decrease in the respiration rate
- C** an increase in the respiration rate
- D** an increase in the transpiration rate

21 Lactic acid builds up in the muscles during vigorous exercise.

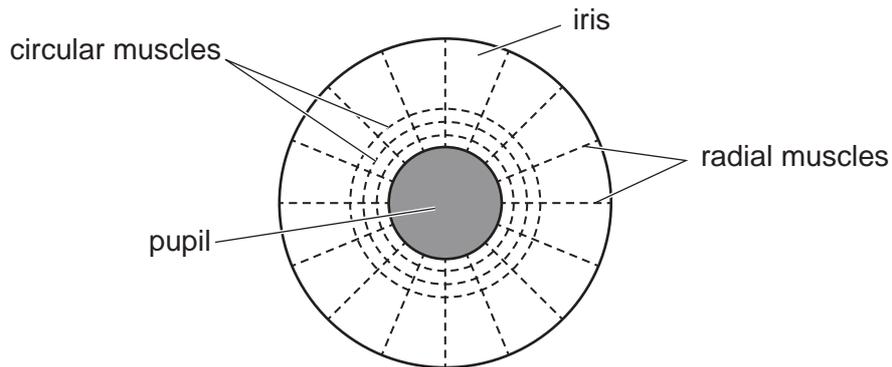
During recovery, how is this lactic acid removed?

- A aerobic respiration of lactic acid in the liver
- B anaerobic respiration of lactic acid in the muscles
- C excretion of lactic acid by the lungs
- D removal of lactic acid by the alimentary canal

22 Which process transmits an impulse across a synapse?

- A active transport
- B diffusion
- C gravity
- D osmosis

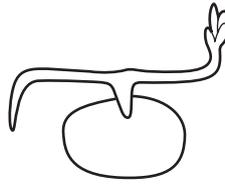
23 The diagram shows the muscles that control the size of the pupil in an eye.



How do the muscles make the pupil smaller?

	circular muscles	radial muscles
A	contract	contract
B	contract	relax
C	relax	contract
D	relax	relax

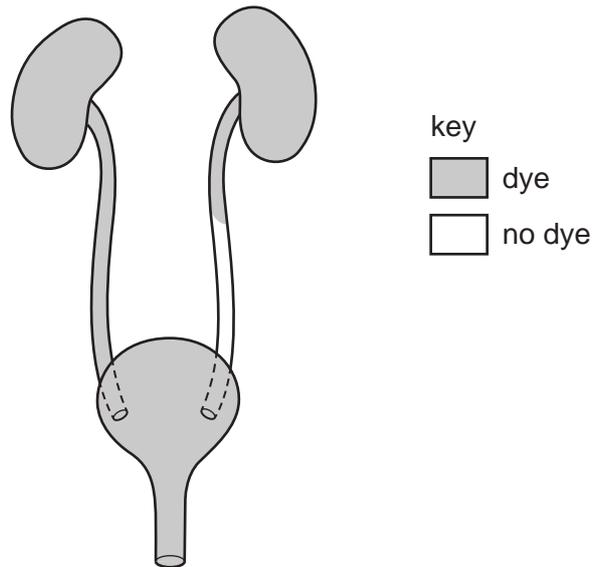
24 The diagram shows the shoot and root of a seedling responding to gravity.



Which row shows where the auxin accumulates and the effect of this in the shoot?

	accumulates	effect
A	lower surface	inhibits cell elongation
B	lower surface	promotes cell elongation
C	upper surface	inhibits cell division
D	upper surface	promotes cell division

25 A patient has dye injected into the blood supply to his kidneys. The dye appears in his excretory system as shown.



Which part is blocked?

- A** the kidney
- B** the ureter
- C** the bladder
- D** the urethra

26 Bacteria such as MRSA are resistant to antibiotics.

These processes can occur in bacteria.

- 1 artificial selection
- 2 genetic variation
- 3 mutation
- 4 natural selection

What would contribute to the development of antibiotic resistance?

- A 1, 2, 3 and 4
- B 1, 2 and 3 only
- C 2, 3 and 4 only
- D 2 and 4 only

27 Why do some athletes take anabolic steroids?

- A to decrease blood glucose concentration
- B to increase muscle mass
- C to kill bacteria
- D to reduce aggression

28 In humans, why are sperm cells produced in much greater numbers than egg cells?

- A Many sperm cells are needed to fertilise an egg cell.
- B Sperm cells are small in size.
- C Sperm cells are non-motile.
- D The chance of one sperm cell reaching an egg is very small.

29 There are many reasons why a woman does not become pregnant.

What can be treated by a drug that increases the secretion of FSH?

- A inactive sperm
- B follicles not developing
- C thin uterine lining
- D too few sperm

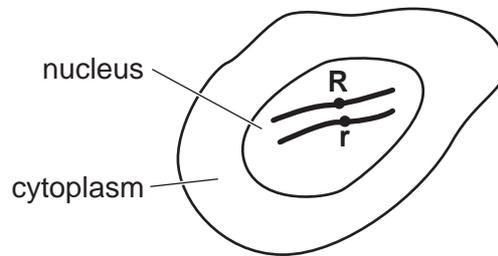
30 The diagram shows the cells of a mammalian embryo shortly after fertilisation.



Which is the correct description of these cells?

- A gametes undergoing meiosis
- B gametes undergoing mitosis
- C stem cells undergoing meiosis
- D stem cells undergoing mitosis

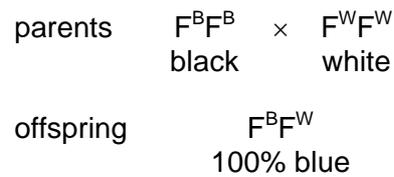
31 The diagram shows a diploid cell and alleles **R** and **r** on one pair of chromosomes.



When this cell divides by mitosis, which daughter cells will be produced?

	chromosome number	genotype
A	diploid	heterozygous
B	diploid	homozygous
C	haploid	heterozygous
D	haploid	homozygous

- 32 The diagram shows a genetic cross between a male bird with black feathers and a female bird with white feathers. All of the offspring have blue feathers.



Two of the blue offspring are crossed.

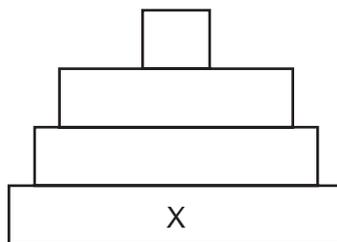
Which row shows the correct phenotype percentages for the cross?

	percentage black	percentage blue	percentage white
A	25	75	0
B	25	50	25
C	50	20	25
D	75	0	25

- 33 What is a feature of some xerophytes?

- A large air spaces in the tissues
- B leaves rolled up and covered with hairs
- C leaves with stomata on the upper surface
- D thin cuticle

- 34 The diagram shows a pyramid of biomass.



Which organisms are found in position X?

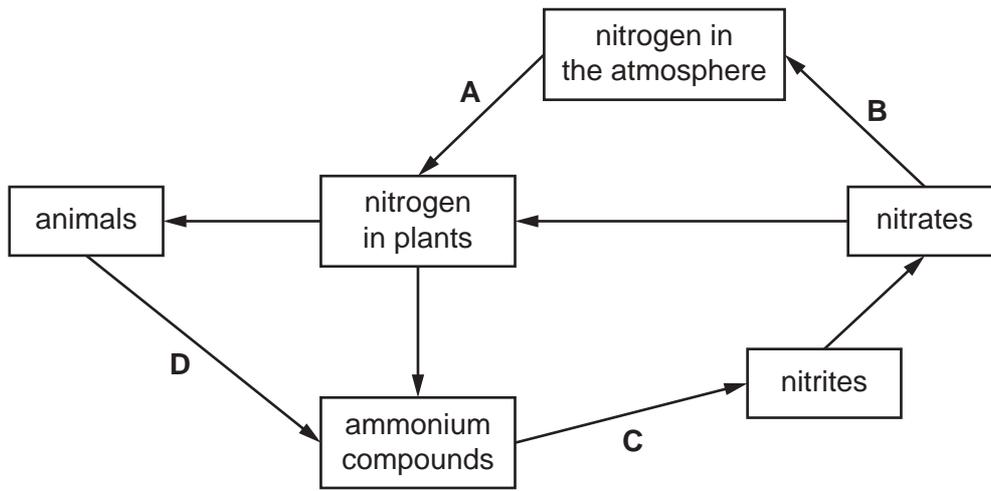
- A decomposers
- B herbivores
- C primary consumers
- D producers

35 What is a trophic level?

- A a group of interconnected food chains
- B all of the consumers in an ecosystem
- C an organism's position in a food web
- D the transfer of energy between organisms

36 The diagram shows part of the nitrogen cycle.

At which stage is denitrification occurring?



37 Which structures found in bacteria make bacteria useful in genetic engineering?

- A cell walls
- B membranes
- C nuclei
- D plasmids

38 Which chemical reaction is catalysed by maltase?

- A glycogen \rightarrow glucose + maltose
- B maltose \rightarrow glucose + glucose
- C maltose \rightarrow starch
- D starch \rightarrow glucose + maltose

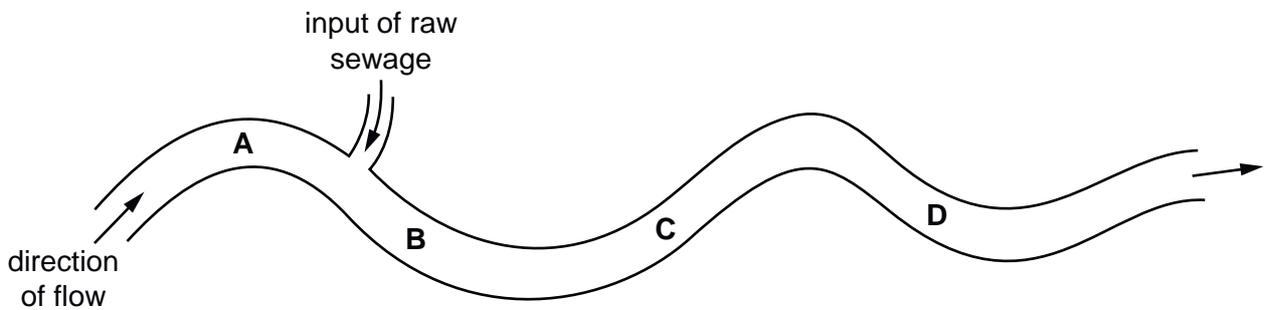
39 What are the possible effects of deforestation?

	loss of soil	flooding	decrease in atmospheric carbon dioxide
A	yes	yes	no
B	yes	no	yes
C	no	yes	no
D	no	no	yes

40 The bloodworm is an organism that is found in heavily polluted water.

The diagram shows where raw sewage flows into a river.

Where would there be fewest bloodworms?



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BIOLOGY

0610/23

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 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.

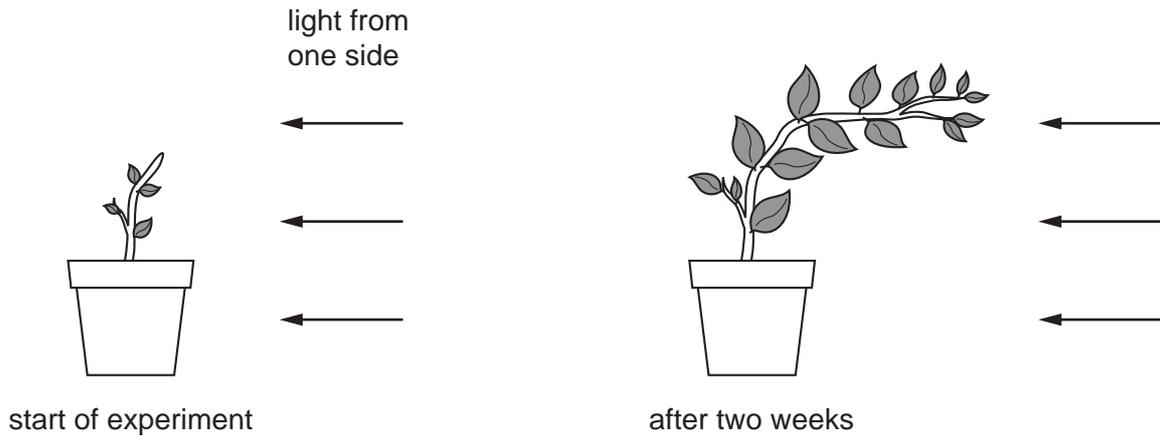
Electronic calculators may be used.

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This document consists of **16** printed pages.



- 1 The diagrams show a plant at the start of an experiment, and the same plant two weeks later.



Which characteristics of living organisms are demonstrated by this experiment?

- A excretion, growth, movement
 - B excretion, movement, reproduction
 - C growth, movement, sensitivity
 - D sensitivity, growth, respiration
- 2 Donkeys and zebras are different species. They can breed to produce an animal called a zedonk.

Zedonks are not fertile.

Which statement is correct?

- A Zedonks and donkeys are the same species.
 - B Zedonks and zebras are the same species.
 - C Zedonks are a species.
 - D Zedonks are not a species.
- 3 Which feature is characteristic only of birds?
- A hair and wings
 - B hard-shelled eggs and feathers
 - C scales and soft-shelled eggs
 - D wings and soft-shelled eggs

4 Which features do animal cells share with plant cells?

	chloroplast	cytoplasm	nucleus	
A	✓	✓	✓	key ✓ = yes X = no
B	✓	X	✓	
C	X	✓	✓	
D	X	X	X	

5 A bacterium is $0.5\ \mu\text{m}$ long.

A student makes a drawing of the bacterium. The student's drawing is 100 mm long.

What is the magnification of the student's drawing?

- A** $\times 0.005$ **B** $\times 50$ **C** $\times 200$ **D** $\times 200\ 000$

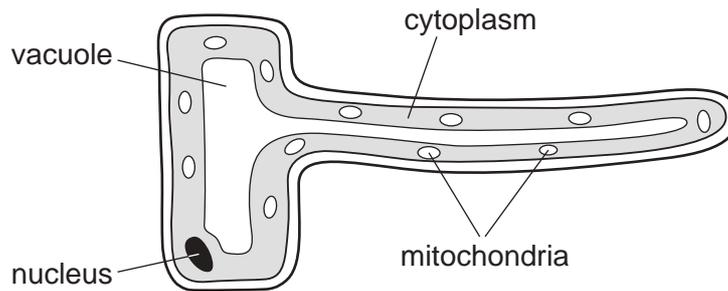
6 Red blood cells were placed in pure water.

Movement of water across the cell membrane caused a change in their appearance.

What caused this change in appearance?

	direction of water movement	from higher to lower water potential	from lower to higher water potential
A	into cells	yes	no
B	into cells	no	yes
C	out of cells	yes	no
D	out of cells	no	yes

7 The diagram shows a root hair cell.



Why does a root hair cell contain a large number of mitochondria?

- A to provide energy for the absorption of water from the soil
- B to provide energy for the diffusion of mineral ions from the soil
- C to provide energy for osmosis
- D to provide energy for the active transport of mineral ions from the soil

8 Which identifies the chemical elements found in proteins?

	carbon	hydrogen	oxygen	nitrogen
A	✓	✓	✓	✓
B	✓	✓	✓	x
C	✓	x	✓	x
D	x	✓	x	✓

key

✓ = present

x = absent

9 Enzyme X digests protein in the stomach.

Four test-tubes were set up, each contained the same amounts of protein and enzyme X. The test-tubes are kept at different levels of pH and temperature, as shown in the table.

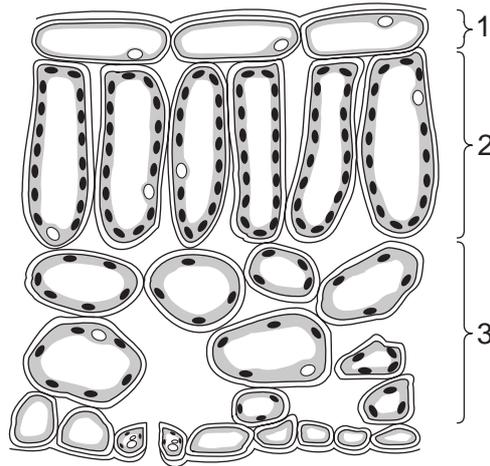
In which test-tube will protein digestion be quickest?

	pH	temperature/°C
A	2	20
B	2	35
C	7	20
D	7	35

10 Which substance is used up in photosynthesis?

- A chlorophyll
- B light
- C oxygen
- D water

11 The diagram shows a leaf as seen in cross-section under the microscope.

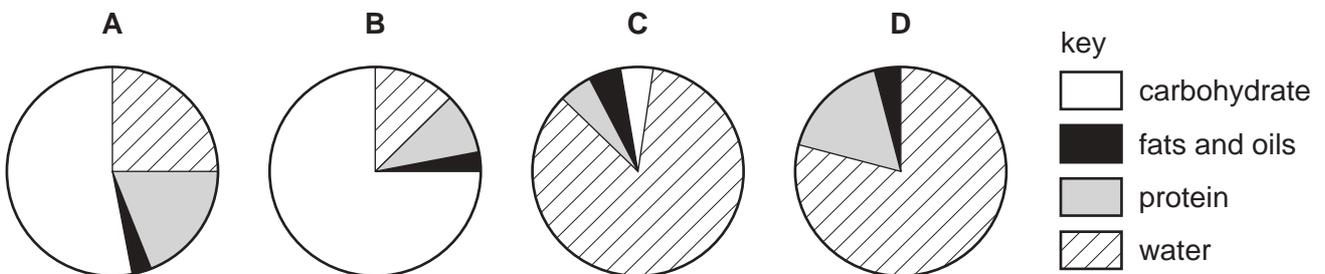


What are tissues 1, 2 and 3?

	1	2	3
A	epidermis	palisade mesophyll	spongy mesophyll
B	epidermis	spongy mesophyll	palisade mesophyll
C	palisade mesophyll	epidermis	spongy mesophyll
D	spongy mesophyll	palisade mesophyll	epidermis

12 The pie charts show the composition of 100 g of four different foods.

Which food provides the most energy?

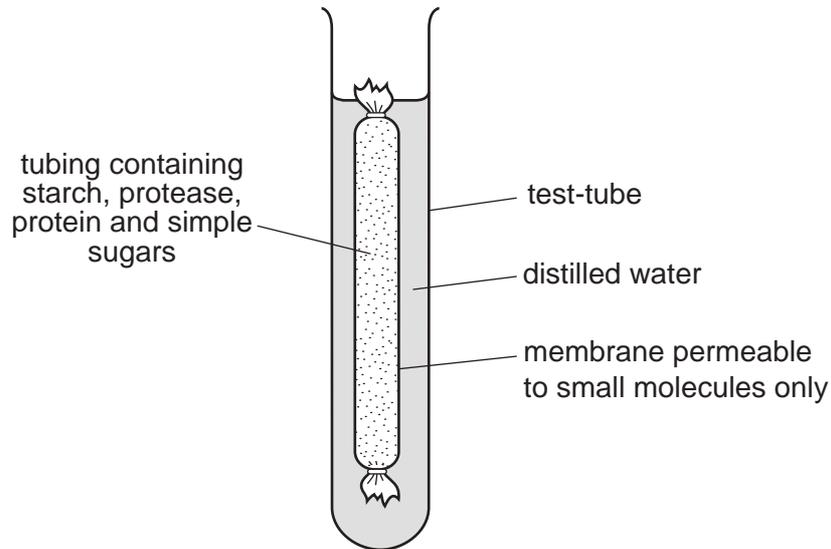


- 13 Cholera is a disease caused by a bacterium called *Vibrio cholerae* which produces a toxin in the infected person's gut.

What is the effect of this toxin?

- A It causes loss of water from the gut into the blood.
- B It causes loss of water from the gall bladder into the blood.
- C It causes water to enter the gut from the blood.
- D It causes water to enter the gall bladder from the blood.

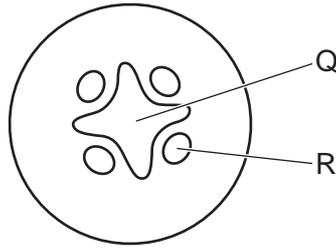
- 14 The diagram shows an experiment kept at room temperature.



What is present in the water surrounding the membrane after 45 minutes?

- A amino acids and simple sugars
- B protein and amino acids
- C protein and simple sugars
- D starch and simple sugars

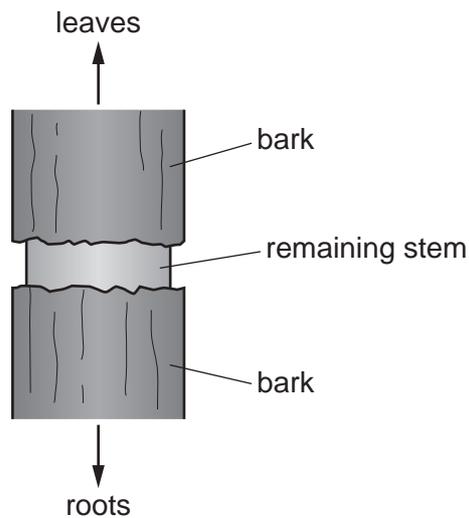
15 The diagram shows a cross-section through a plant root.



What is found at Q and R?

	Q	R
A	palisade mesophyll	spongy mesophyll
B	phloem	xylem
C	spongy mesophyll	palisade mesophyll
D	xylem	phloem

16 Rabbits can damage trees by eating the bark and phloem.



If the damage goes all the way around the stem, what will happen in the tree?

- A** Sugars cannot move from the leaves to the roots causing swelling above the ring.
- B** Sugars cannot move from the leaves to the roots causing swelling below the ring.
- C** Water cannot move from the leaves to the roots causing swelling above the ring.
- D** Water cannot move from the leaves to the roots causing swelling below the ring.

- 17 The table shows the concentration of red blood cells, white blood cells and platelets in the blood of four patients.

Which patient is most likely to have a deficiency of iron in their diet **and** will find it difficult to form a blood clot?

	red blood cells /cells per mm ³	white blood cells /cells per mm ³	platelets /cells per mm ³
A	2 525 000	643	296 000
B	2 275 000	756	27 500
C	7 250 000	650	275 000
D	7 325 000	405	25 000

- 18 Which row describes the features of passive immunity?

	antibodies made	involves memory cells	effective period
A	no	no	short term
B	no	yes	short term
C	yes	no	long term
D	yes	yes	long term

- 19 What is the sequence of structures through which a molecule of oxygen passes from the air to the blood of a person?

- 1 bronchiole
- 2 capillary
- 3 alveolus wall
- 4 larynx

- A** 1 → 4 → 2 → 3
B 3 → 2 → 1 → 4
C 4 → 1 → 3 → 2
D 4 → 2 → 1 → 3

20 How do green plants and mammals obtain their energy?

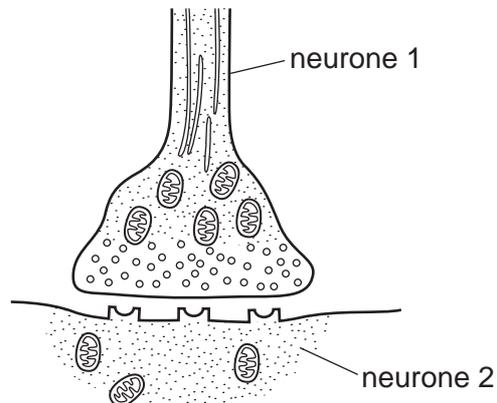
	green plants	mammals
A	from the soil	from sleeping and resting
B	from the air around the plant	from the air they breathe
C	from the Sun	from digested and absorbed food
D	from water and carbon dioxide	from water and oxygen

21 Lactic acid builds up in the muscles during vigorous exercise.

During recovery, how is this lactic acid removed?

- A** aerobic respiration of lactic acid in the liver
- B** anaerobic respiration of lactic acid in the muscles
- C** excretion of lactic acid by the lungs
- D** removal of lactic acid by the alimentary canal

22 The diagram shows a synapse.

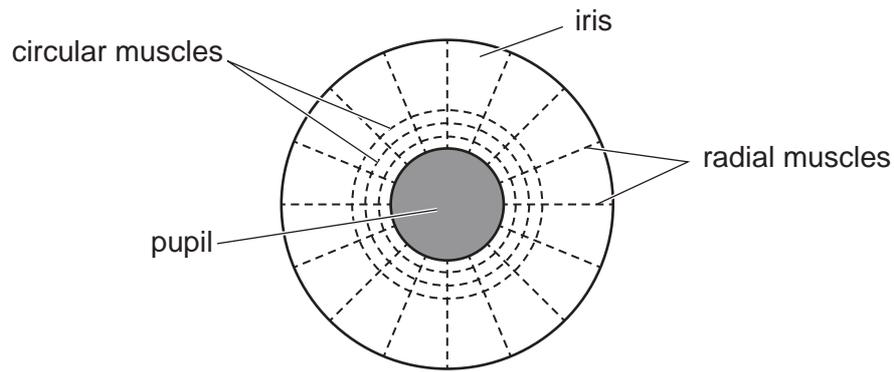


Heroin is a drug that can bind with receptors in a synapse.

What is the **most** likely effect heroin will have on the synapse?

- A** cause the impulse to travel back along neurone 1
- B** prevent neurotransmitter binding with receptors on neurone 2
- C** stop the impulse being generated in neurone 1
- D** transfer the impulse to a different neurone other than neurone 2

23 The diagram shows the muscles that control the size of the pupil in an eye.



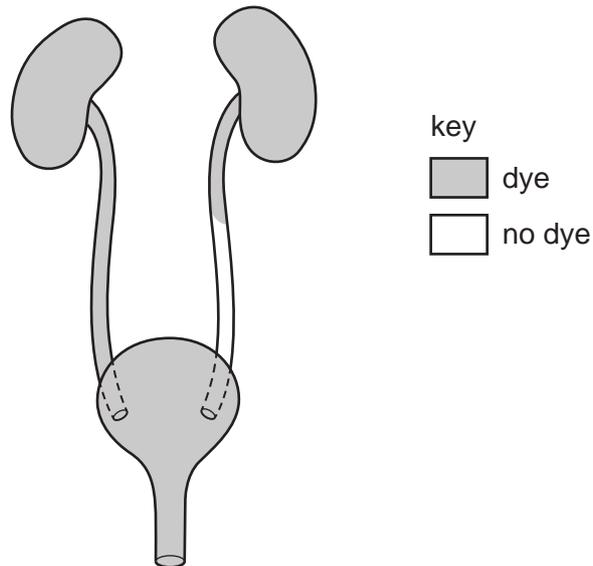
How do the muscles make the pupil smaller?

	circular muscles	radial muscles
A	contract	contract
B	contract	relax
C	relax	contract
D	relax	relax

24 In a plant shoot, where is auxin made and what is its effect?

	where made	effect
A	leaves	promotes cell division
B	leaves	promotes cell elongation
C	shoot tip	promotes cell division
D	shoot tip	promotes cell elongation

- 25 A patient has dye injected into the blood supply to his kidneys. The dye appears in his excretory system as shown.



Which part is blocked?

- A the kidney
 - B the ureter
 - C the bladder
 - D the urethra
- 26 Which statement about antibiotics is correct?
- A Antibiotics are used to treat all transmissible diseases.
 - B Antibiotics are used to treat diseases caused by viruses.
 - C Antibiotic resistance can be stopped by increasing their use.
 - D Antibiotics are used to treat diseases caused by bacteria.
- 27 Which substance in tobacco smoke directly reduces the oxygenation of blood?
- A carbon dioxide
 - B carbon monoxide
 - C nicotine
 - D tar

28 The concentrations of LH and oestrogen are measured during part of a menstrual cycle.

On which day does ovulation occur?

	day from start of menstrual cycle	concentration of LH /arbitrary units	concentration of oestrogen /arbitrary units
A	7	10	30
B	10	12	135
C	13	120	130
D	16	20	25

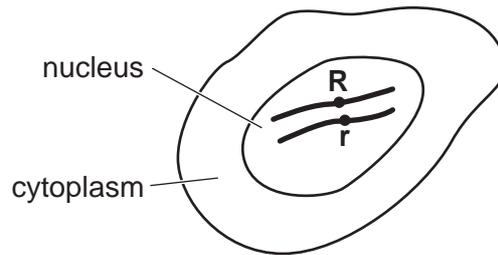
29 Where are oestrogen and progesterone produced during the menstrual cycle in a woman who is **not** pregnant?

	oestrogen	progesterone
A	adrenal gland	ovary
B	ovary	ovary
C	ovary	placenta
D	placenta	pancreas

30 A haploid nucleus is defined as one that contains

- A** one chromosome.
- B** one set of unpaired chromosomes.
- C** two chromosomes.
- D** two sets of chromosomes.

31 The diagram shows a diploid cell and alleles **R** and **r** on one pair of chromosomes.



When this cell divides by mitosis, which daughter cells will be produced?

	chromosome number	genotype
A	diploid	heterozygous
B	diploid	homozygous
C	haploid	heterozygous
D	haploid	homozygous

32 Sickle-cell anaemia is caused by a mutation in the haemoglobin gene.

The normal base sequence is shown in 1, and the sickle-cell base sequence is shown in 2.

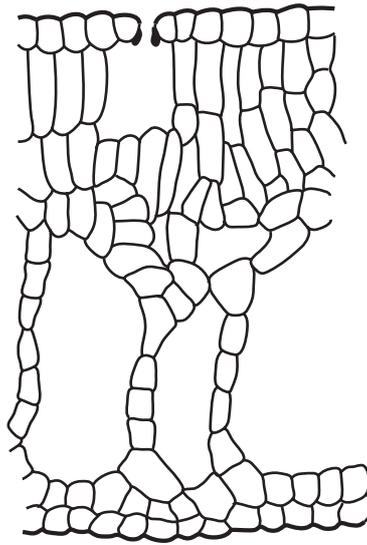
1 TGA GGA CTC CTC

2 TGA GGA CAC CTC

What causes the change in the DNA?

- A** the addition of one base
- B** the addition of two bases
- C** the change of one base for another
- D** the deletion of one base

33 The diagram shows part of a section through the leaf of a water lily.

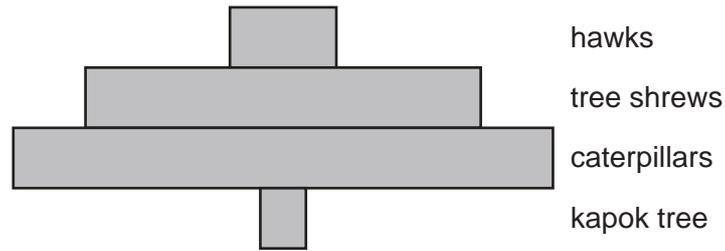


Their leaves are adapted to help them to live on the surface of the water.

How is the leaf of this plant adapted to being a hydrophyte?

- A It does not have a cuticle.
 - B It has a palisade layer.
 - C It has an epidermis.
 - D It has stomata on upper surface.
- 34 What could be responsible for the conversion of nitrogen in the atmosphere to nitrates in the soil?
- A decomposers
 - B denitrifying bacteria
 - C lightning
 - D nitrifying bacteria
- 35 Which statement describes the effect of a disease which kills members of a population?
- A It causes an exponential (log) increase in the population size.
 - B It decreases the rate of growth of the population.
 - C It decreases the food supply available to the population.
 - D It reduces the lag phase of the population.

36 The diagram shows a pyramid of numbers in a food chain.

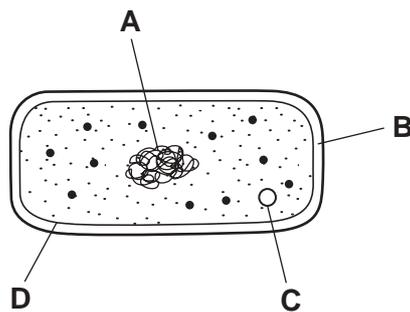


What type of organism is the tree shrew?

- A producer
- B primary consumer
- C secondary consumer
- D tertiary consumer

37 The diagram shows a bacterium.

Which structure is used in genetic engineering?



38 Penicillin is made in a fermenter by growing organisms.

Which type of organism is used in the production of penicillin?

- A bacterium
- B fungus
- C protocist
- D virus

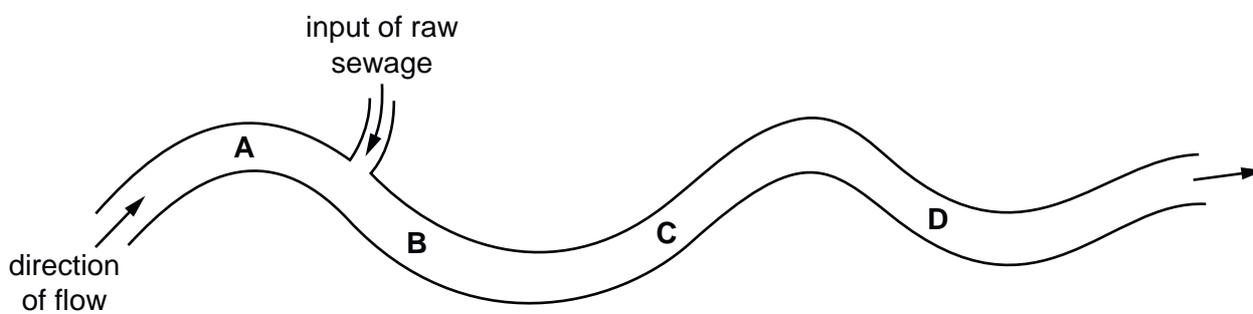
39 What are the possible effects of deforestation?

	loss of soil	flooding	decrease in atmospheric carbon dioxide
A	yes	yes	no
B	yes	no	yes
C	no	yes	no
D	no	no	yes

40 The bloodworm is an organism that is found in heavily polluted water.

The diagram shows where raw sewage flows into a river.

Where would there be fewest bloodworms?



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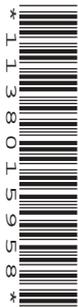


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Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER



BIOLOGY

0610/31

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.

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 **17** printed pages and **3** blank pages.

1 Fig. 1.1 is a diagram of a molecule of fat.

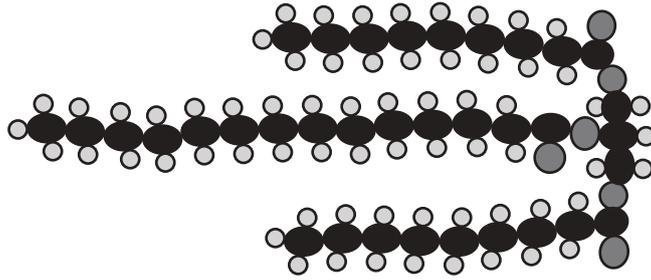


Fig. 1.1

(a) (i) List the chemical elements present in fat.

..... [1]

(ii) State the smaller units that fats are made from.

..... [2]

(b) Fats are an important part of a balanced diet.

State the name of **three** other components of a balanced diet.

1

2

3

[3]

(c) Marmots and lynx are mammals that can live in a variety of environments.

The percentage of fat in the bodies of these two species was measured. Measurements were taken from marmots and lynx living in Alaska and in Virginia. Alaska is a cold environment and Virginia is a warm environment.

The results are shown in Table 1.1.

Table 1.1

species	percentage of fat in the body		difference in the percentage of fat in the body
	in Alaska	in Virginia	
marmot	36	5	31
lynx	15	11	

(i) Complete Table 1.1 by calculating the difference in the percentage of fat in the body for the lynx.

Write your answer in Table 1.1. [1]

(ii) Describe the results shown in Table 1.1.

.....

.....

.....

.....

..... [2]

(iii) Explain the difference in the percentage of fat in the body between the mammals living in Alaska and Virginia.

.....

.....

.....

..... [2]

[Total: 11]

- 2 (a) Complete the definition of the term *adaptive feature* by filling in the gaps with the correct words.

An adaptive feature is an feature that helps an organism to and reproduce in its [3]

- (b) The flagellum is one of the adaptive features of a sperm.

A sample of sperm was taken and the length of each flagellum was recorded.

Fig. 2.1 shows a graph of the results.

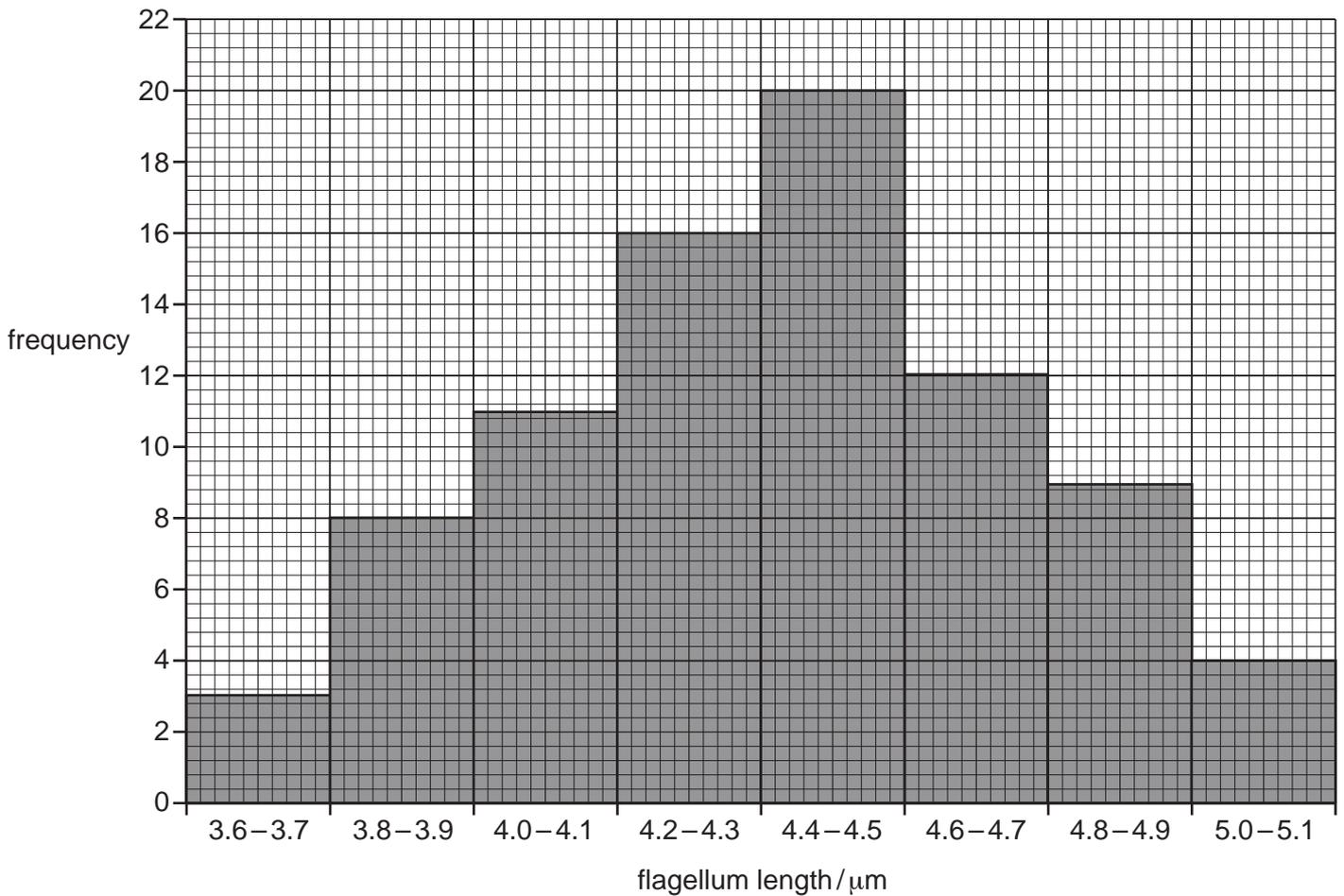


Fig. 2.1

- (i) State the most frequent range for flagellum length.

..... μm [1]

- (ii) State the frequency of sperm with flagellum length between $4.8\ \mu\text{m}$ to $4.9\ \mu\text{m}$.

..... [1]

- (iii) State the type of variation shown by flagellum length.

..... [1]

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- (c) Some scientists have suggested that the longer the flagellum the more likely the sperm is to fertilise the egg cell.

Suggest a reason why.

.....
.....
..... [1]

- (d) State the name of the organ that produces sperm.

..... [1]

[Total: 8]

3 (a) A student investigated the conditions required for germination.

Seeds were placed on cotton wool in Petri dishes and exposed to different conditions.

The conditions used are shown in Table 3.1.

Table 3.1

Petri dish	temperature /°C	condition of cotton wool	access to light
A	20	damp	yes
B	3	damp	yes
C	20	dry	yes
D	20	damp	no

Seeds in **two** of the Petri dishes did not germinate.

Predict in which Petri dishes the seeds did not germinate.

Give reasons for your answer.

Petri dishes

reasons

.....

.....

[3]

(b) In another investigation, the germination ratio of the seeds was calculated.

60 cress seeds were used in the investigation.

20 seeds germinated and 40 seeds did not germinate.

Calculate the ratio of the seeds that germinated to the seeds that did not germinate.

ratio : [1]

(c) Plants need mineral ions for healthy growth.

State why a plant needs magnesium ions and nitrate ions.

magnesium ions

.....

nitrate ions

.....

[2]

Need a home tutor? Visit smiletutor.sg [Total: 6]

- 4 (a) Fig. 4.1 is a graph showing the changes to the thickness of the lining of the uterus during the menstrual cycle.

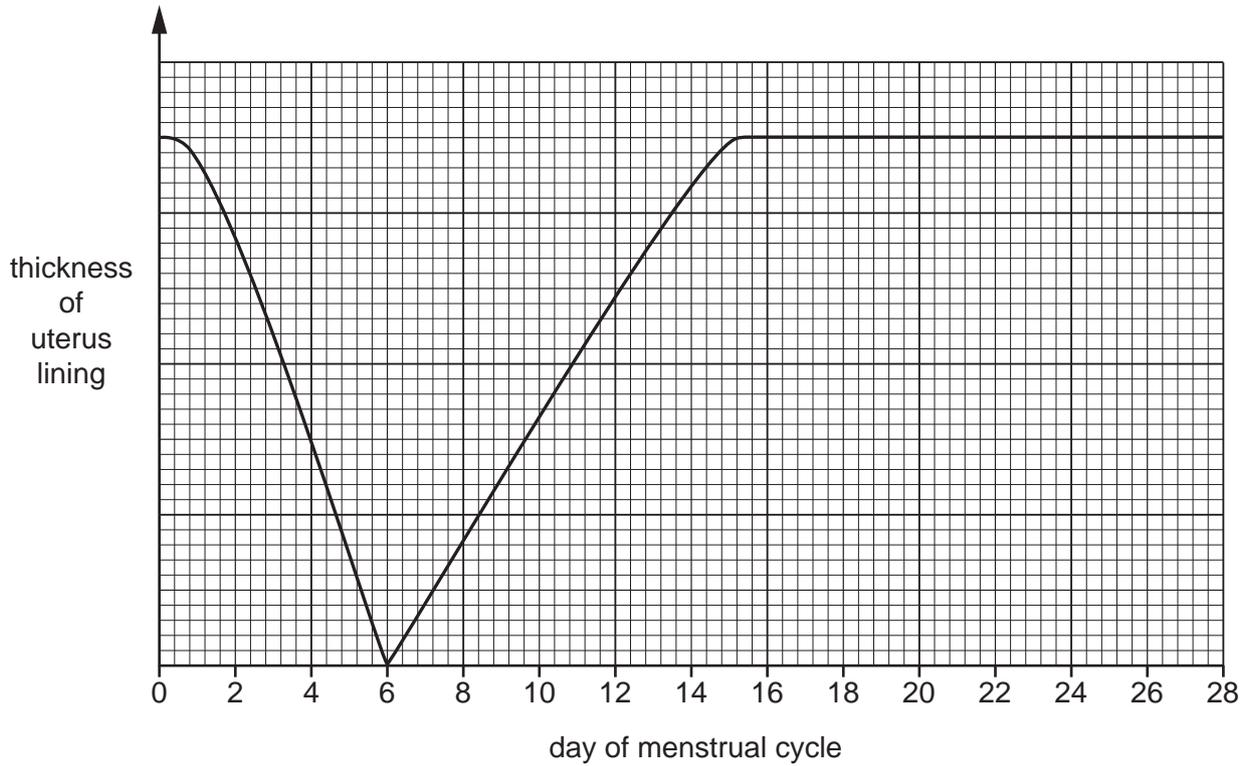


Fig. 4.1

- (i) Describe the changes to the thickness of the lining of the uterus during the menstrual cycle as shown in Fig. 4.1.

.....

.....

.....

.....

.....

.....

.....

..... [3]

- (ii) State the days, shown on Fig. 4.1, on which the lining of the uterus is broken down and lost.

..... [1]

- (iii) Draw an X on Fig. 4.1 to show when ovulation occurs. [1]

(b) The menstrual cycle is controlled by hormones.

(i) Complete the sentence to define the term *hormone*.

A substance produced by a ,
carried by the , which alters the activity of one or more
specific target organs. [3]

(ii) Adrenaline is a hormone involved in ‘fight or flight’ situations.

Describe **two** effects of adrenaline on the body.

1
.....
2
..... [2]

(iii) State the name of the organ that produces adrenaline.

..... [1]

[Total: 11]

(c) Anaerobic respiration in yeast produces alcohol.

The boxes on the right show some sentence endings.

Draw lines from the word alcohol to make **three** correct sentences.

Alcohol

abuse decreases instances of crime.

can be addictive.

causes lung cancer.

increases levels of self-control.

increases reaction times.

is a depressant.

[3]

(d) State the name of an organ damaged by long-term alcohol abuse.

..... [1]

[Total: 10]

6 (a) (i) State the names of **three** structures that are found in a mammalian heart.

1

2

3

[3]

(ii) Describe how the structure of a vein differs from the structure of an artery.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

[3]

(iii) State the function of arteries in the human circulatory system.

.....
.....
.....

[1]

(b) Fig. 6.1 is a photomicrograph of blood.

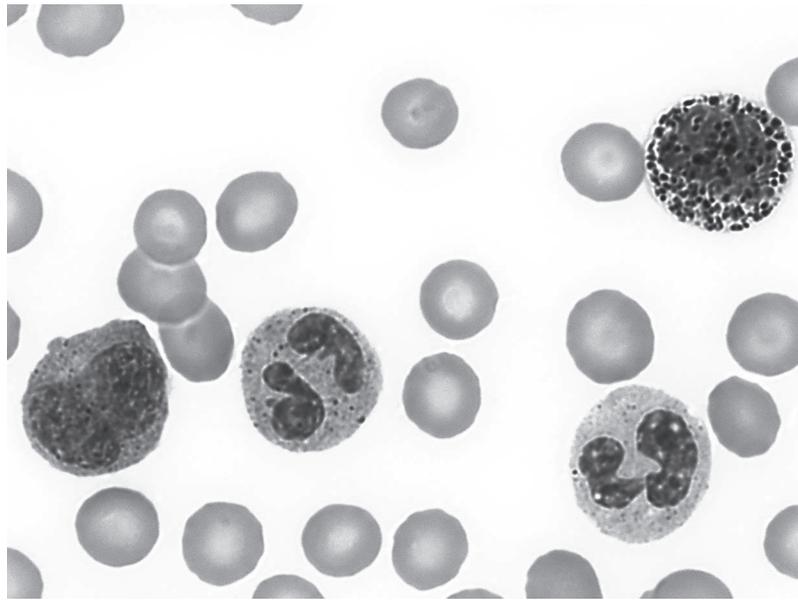


Fig. 6.1

(i) Label **one** red blood cell on Fig. 6.1 with a label line and the letter **X**. [1]

(ii) State the name of **one** other type of blood cell in Fig. 6.1.
 [1]

(iii) State the names of **two** other components of blood.
 1
 2 [2]

(c) Coronary heart disease (CHD) is a disease of the circulatory system.

(i) State **three** risk factors for developing CHD.
 1
 2
 3 [3]

(ii) State the name of the blood vessel that becomes blocked in CHD.
 [1]

[Total: 15]

7 Fig. 7.1 is a photograph of a large-scale monoculture of soybeans which are a crop plant.



Fig. 7.1

(a) Describe the disadvantages of large-scale monocultures.

.....

.....

.....

.....

.....

.....

.....

..... [3]

(b) Some crop plants have been selectively bred to be drought resistant.

The sentences show stages in the process of selective breeding.

They are not in the correct order.

- 1 A farmer identifies crop plants that survive in drought conditions.
- 2 Offspring that survive drought conditions are selected and bred again.
- 3 The drought resistant plants are bred together and seeds collected.
- 4 The farmer repeats the process over many generations.
- 5 The seeds are germinated and grown in drought conditions.

Write the statement numbers in the boxes to show the correct order of the stages in selective breeding.

--	--	--	--	--

[3]

[Total: 6]

- 8 (a) The government of a country introduced a law called the Endangered Species Act. It was hoped that the Act would help to conserve species that were at risk from extinction.

Table 8.1 shows the numbers of birds from different species before and after the Act was introduced.

Table 8.1

species	number of birds	
	before the Act	after the Act
bald eagle	416	9789
Kirtland's warbler	210	1415
nene goose	400	1275
peregrine falcon	324	1700
whooping crane	54	513

- (i) State which species was the most at risk from extinction in Table 8.1.

..... [1]

- (ii) Calculate the percentage increase in the number of Kirtland's warblers.

Give your answer to the nearest whole number.

..... %
[3]

- (b) (i) List **three** reasons why species become endangered or extinct.

1

2

3 [3]

- (ii) Describe **one** method of conserving endangered plant species.

.....

.....

..... [1]

9 Sewage contains water and other substances.

Sewage should be treated before it goes into a river.

(a) Describe **two** reasons why sewage should be treated before it goes into a river.

1

.....

2

.....

[2]

(b) Treatment of sewage has several stages.

One of the stages is filtration.

State the name of **one** other stage in the treatment of sewage.

..... [1]

(c) Fig. 9.1 shows a trickling filter in a sewage treatment plant.



Fig. 9.1

The untreated sewage trickles through gravel. There are organisms on the surface of the gravel.

(i) State the name of the type of organism on the surface of the gravel.

..... [1]

(ii) Describe the function of these organisms.

.....
.....
..... [1]

[Total: 5]

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BIOLOGY

0610/32

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.

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 **18** printed pages and **2** blank pages.

- 1 Complete the sentences about food and digestion using words from the list.

Each word may be used once, more than once, or not at all.

absorbed **antibodies** **bacteria** **duodenum**
egested **enzymes** **fat** **stomach** **water**

The secretes hydrochloric acid. One function of this acid in the body is to kill in the food. Most food that is eaten has to be digested before it can be by the body. Most chemical digestion is carried out by special proteins called One component of the diet that does not need to be digested is [5]

- 2 Table 2.1 lists some descriptions of meiosis and mitosis.

Complete Table 2.1 by placing a tick (✓) in each box that is correct.

Table 2.1

description of process	meiosis	mitosis
can result in growth		
is a nuclear division		
occurs in asexual reproduction		
produces egg cells		
replaces damaged cells		

[5]

3 (a) Fig. 3.1 shows a cross-section of a vein and Fig. 3.2 shows a longitudinal section of the vein.

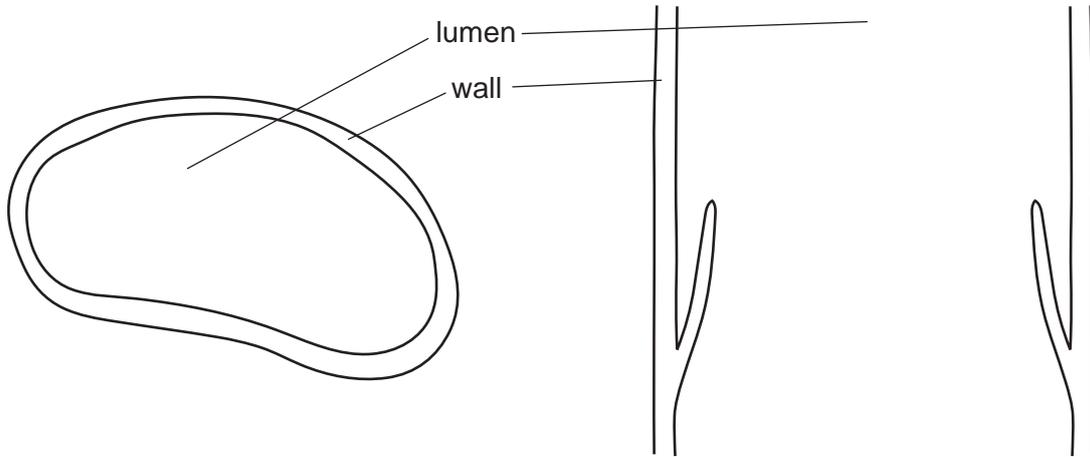


Fig. 3.1

Fig. 3.2

(i) Describe **two** features, visible in Fig. 3.1 and Fig. 3.2, which show that this blood vessel is a vein.

- 1
-
- 2
-

[2]

(ii) Draw an arrow on Fig. 3.2 to show the direction of blood flow in this vein.

[1]

(b) Two groups of students, **A** and **B**, investigated how running affected their pulse rates.

There were three students, **1**, **2** and **3**, in each group.

They measured their pulse rates when at rest, then all ran the same distance and immediately measured their pulse rates again.

The results are shown in Fig. 3.3.

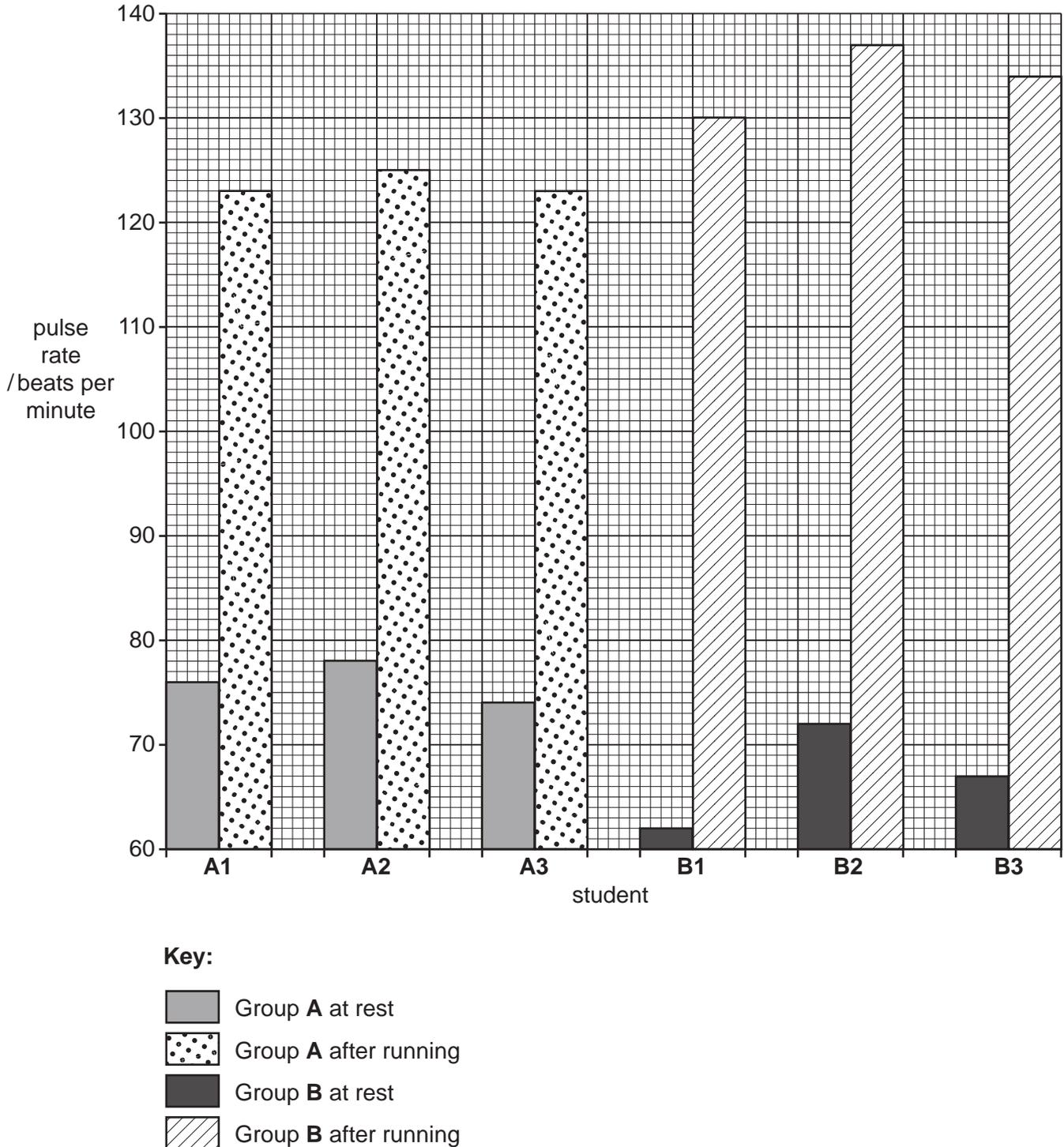


Fig. 3.3

(i) Suggest a method the students could use to measure their pulse rates.

.....
.....
..... [2]

(ii) Calculate the average pulse rate for the three students in group **A** when at rest.

..... beats per minute [1]

(iii) State the effect of running on the pulse rate using the information in Fig. 3.3.

.....
..... [1]

(iv) State which student had the greatest change in pulse rate after running.

..... [1]

(v) Describe **two** differences in the data between group **A** and group **B** in Fig. 3.3.

1
.....
2
..... [2]

(c) Predict and describe the changes that would occur in the students' breathing during the investigation.

.....
.....
.....
.....
..... [2]

[Total: 12]

4 The boxes on the left contain the functions of some plant cell structures.

The boxes on the right contain the names of structures found in plant cells.

Draw **one** straight line from each box on the left to a box on the right to link the plant cell function to the correct plant cell structure.

Draw **four** lines.

plant cell function

controls cell activities

controls movement of
chemicals into and out of cells

makes glucose

prevents cell from bursting

plant cell structure

cell membrane

cell wall

chloroplast

nucleus

vacuole

[4]

- 5 (a) Fig. 5.1 shows a seed that has germinated.

It is growing on damp cotton wool in the dark in a vertical position.

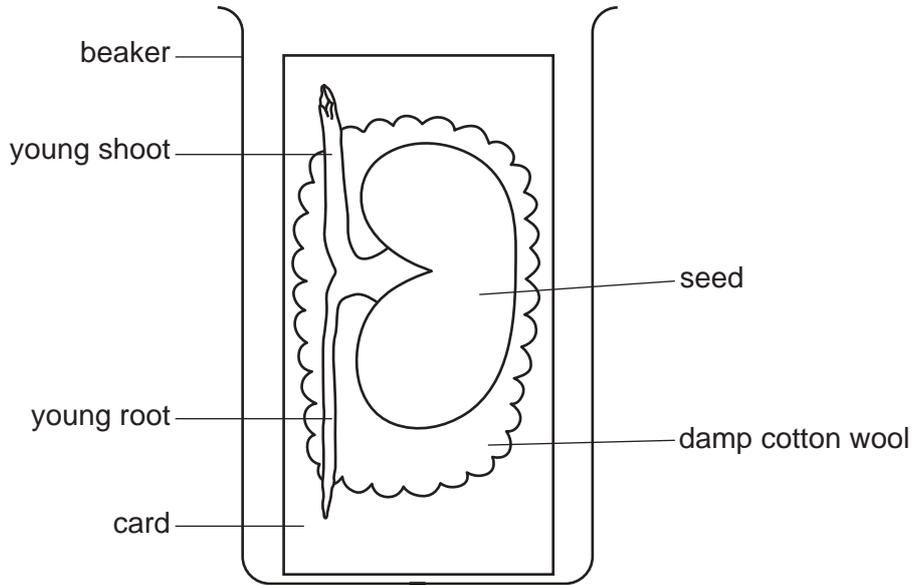


Fig. 5.1

The seedling was then rotated to a horizontal position and kept in the dark as shown in Fig. 5.2.

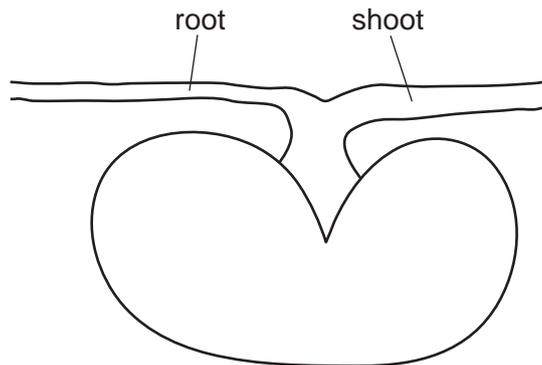


Fig. 5.2

- (i) Complete Fig. 5.2 by drawing the expected appearance of the root and the shoot after five days in the dark. [2]
- (ii) State the name of the response shown in Fig. 5.2.

..... [1]

(b) (i) The leaves of a seedling photosynthesise.

State the word equation for photosynthesis.

..... [2]

(ii) Chlorophyll has to be present for photosynthesis to take place.

State the name of the mineral ion that plants need to make chlorophyll.

..... [1]

(iii) State the name of **one** type of cell that carries out photosynthesis.

..... [1]

(c) The rate of photosynthesis can be measured using the apparatus shown in Fig. 5.3.

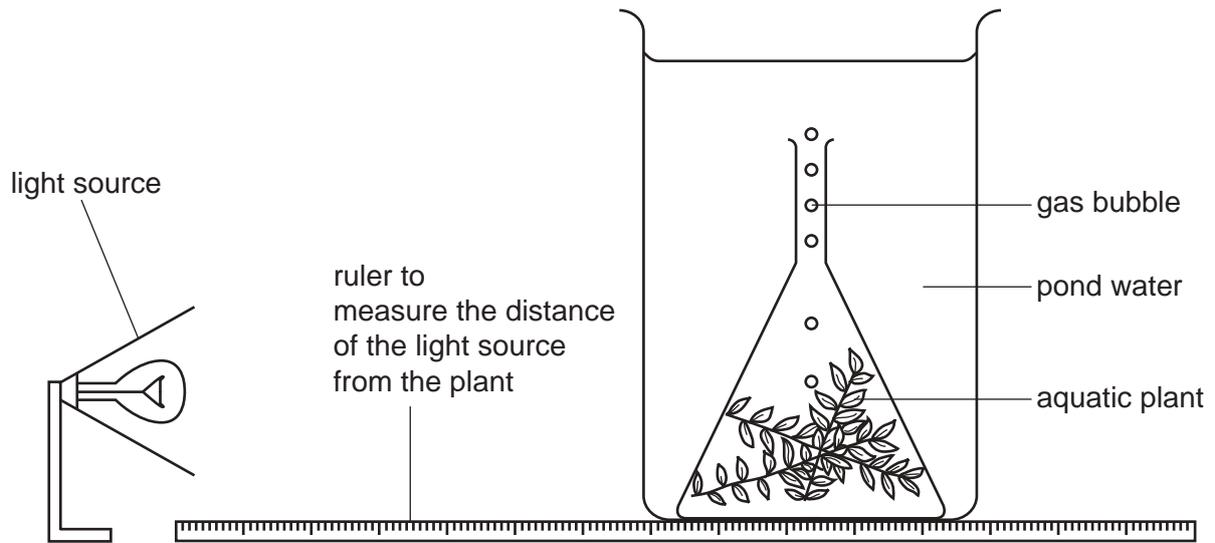


Fig. 5.3

The faster the rate of photosynthesis, the more gas bubbles are produced.

Table 5.1 shows the results from an investigation using this apparatus.

Table 5.1

distance of light source from plant/cm	number of bubbles produced in 5 minutes
5	74
10	75
20	35
30	15
40	5
50	1
60	0

(i) Describe the relationship between light and the rate of photosynthesis shown in Table 5.1.

.....

.....

.....

..... [2]

(ii) State **two** factors, other than light, that will affect the rate of photosynthesis in this investigation.

1

2

[2]

(d) Suggest **one** use of glucose in a plant.

.....

..... [1]

[Total: 12]

6 Fig. 6.1 shows part of the human gas exchange system.

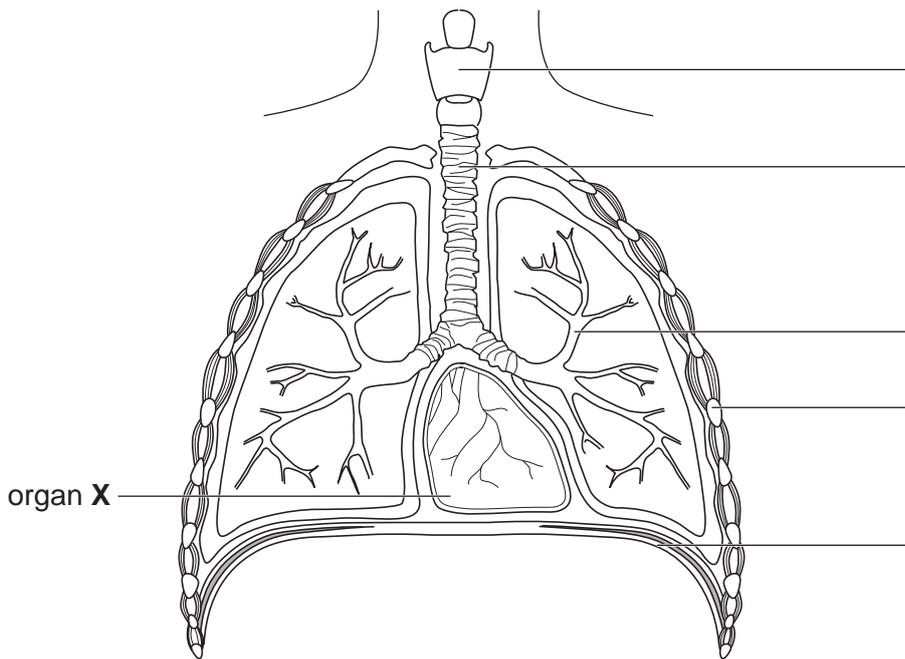


Fig. 6.1

(a) (i) Label the structures on Fig. 6.1 using words from the list:

- bronchiole
- diaphragm
- larynx
- rib
- trachea.

[5]

(ii) Organ X on Fig. 6.1 is not part of the gas exchange system.

State the name of the organ system to which organ X belongs.

..... [1]

(b) State **three** features of an efficient gas exchange surface.

1

.....

2

.....

3

.....

[3]

(c) Describe the harmful effects of tobacco smoke on the body.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 13]

7 (a) Table 7.1 contains the definitions of terms used in genetics.

Complete Table 7.1 by writing the term for each definition.

Table 7.1

definition	term
A thread-like structure of DNA, carrying genetic information in the form of genes.	
A length of DNA that codes for a protein.	
The observable features of an organism.	
The transmission of genetic information from generation to generation.	

[4]

(b) Fig. 7.1 shows a photomicrograph of the chromosomes present in the body cells of a human.

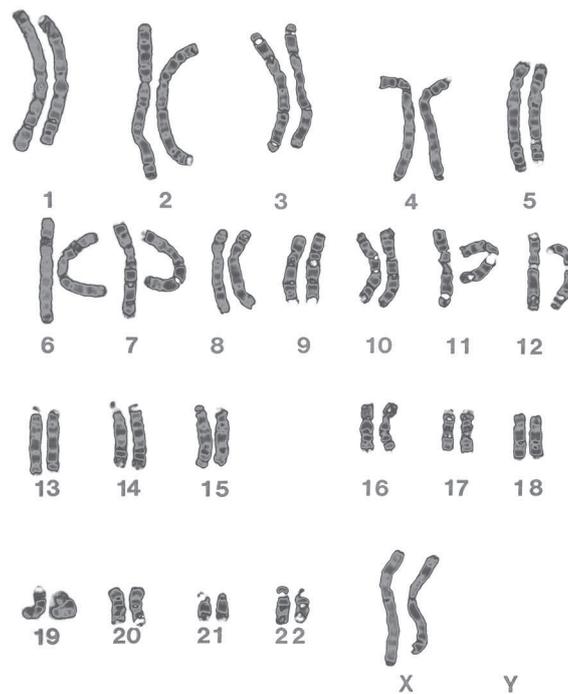


Fig. 7.1

(i) State the number of chromosomes present in human body cells.

..... [1]

(ii) The individual in Fig. 7.1 is female.

Describe the evidence from Fig. 7.1 that supports this statement.

.....

.....

..... [1]

(iii) Sometimes a genetic change occurs which results in a condition called Down's syndrome.

Fig. 7.2 shows the chromosomes from a body cell of a person with Down's syndrome.

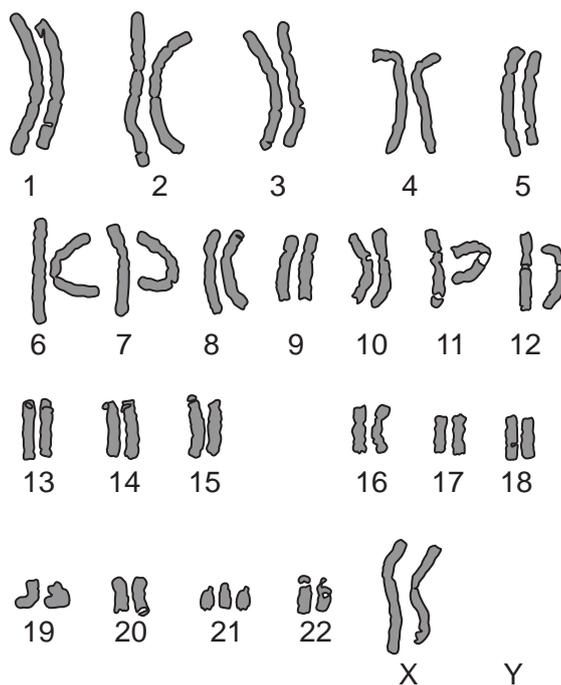


Fig. 7.2

Describe the genetic change that produces Down's syndrome using the information in Fig. 7.1 and Fig. 7.2.

.....

.....

..... [1]

[Total: 7]

9 All organisms must maintain a balance between water gain and water loss.

(a) (i) State the name of the type of cell which absorbs water into a plant.

..... [1]

(ii) State the name of the tissue in a plant that transports water.

..... [1]

(iii) State the name of the organ in a plant where most water loss occurs.

..... [1]

(b) State **three** ways in which the human body may lose water.

1

2

3

[3]

[Total: 6]

10 In an investigation, the uptake of water into a plant and the loss of water from the same plant were measured.

Measurements were taken over an 18-hour period.

The results are shown in Fig. 10.1.

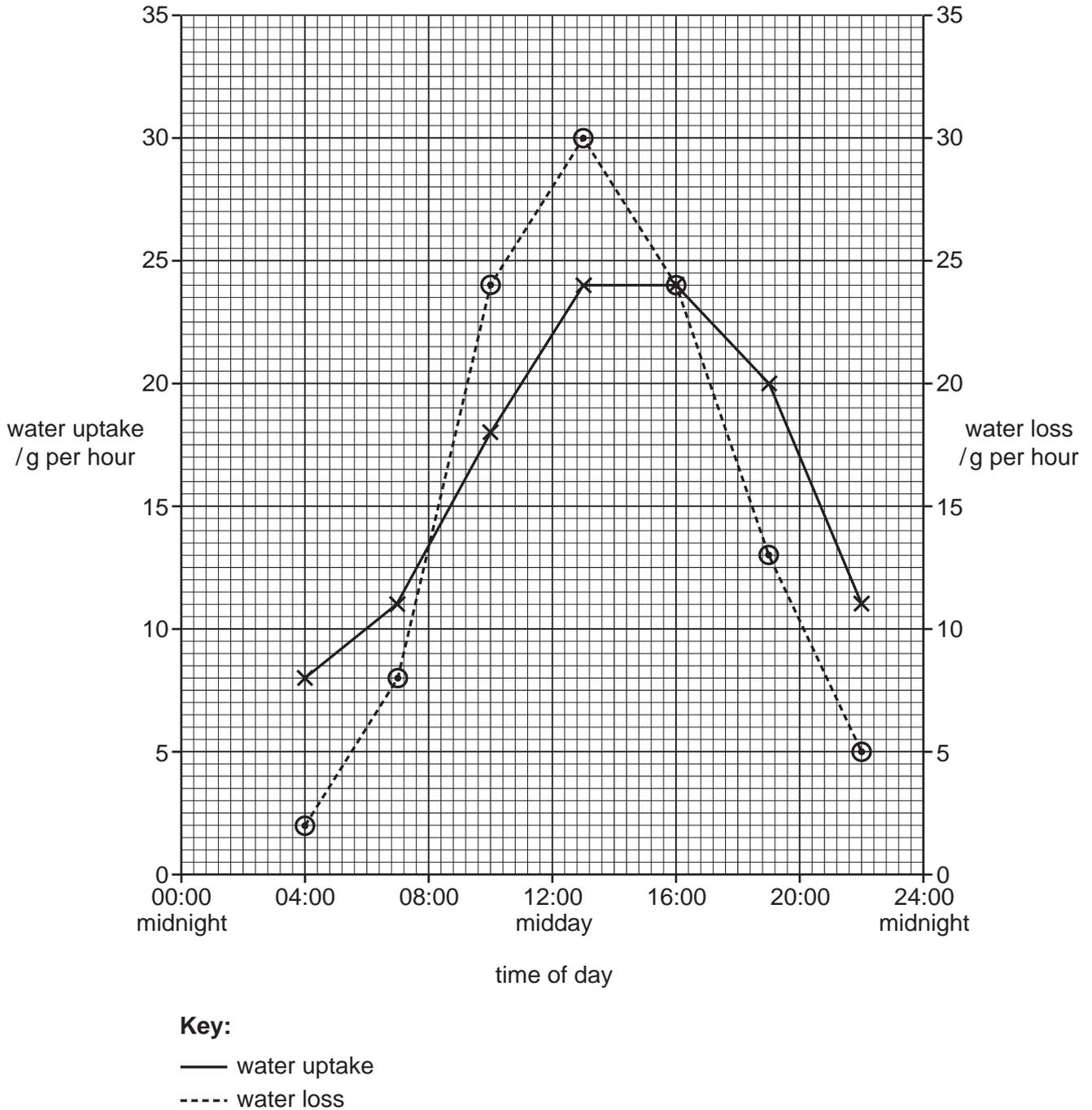


Fig. 10.1

(a) Use the information in Fig. 10.1 to answer these questions:

(i) State the rate of water uptake at 12:00 (midday).

..... g per hour [1]

(ii) State the time when the water uptake was 10 g per hour.

..... [1]

(iii) State **one** time during the day when the water uptake and the water loss were equal.

..... [1]

(b) Describe how changes in temperature and changes in humidity affect the rate of water loss in a plant.

.....
.....
.....
.....
..... [2]

(c) State the name of the process that results in water loss from plants.

..... [1]

[Total: 6]

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BIOLOGY

0610/33

Paper 3 Theory (Core)

October/November 2019

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

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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 **18** printed pages and **2** blank pages.

1 An adaptive feature is an inherited feature that helps an organism to survive and reproduce in its environment.

(a) (i) Egg cells have adaptive features linked to their structure.

Draw **two** lines from the phrase 'An egg cell' to two boxes on the right to complete **two** correct sentences.

An egg cell	has a jelly coating.
	has chloroplasts.
	has cilia.
	has energy stores.
	is very thin.

[2]

(ii) Fig. 1.1 is an incomplete drawing of a sperm cell.

Complete the drawing and label the main features of the sperm cell.

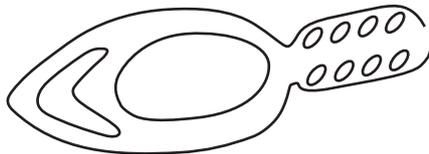


Fig. 1.1

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(b) (i) Egg cells and sperm cells each contain these structures:

chromosome **gene** **nucleus**

List the **three** structures in order of size starting with the largest.

..... largest
.....
..... smallest

[1]

(ii) Egg cells and sperm cells contain genetic material.

State the name of the molecule that genetic material is made from.

..... [1]

(c) Egg cells and sperm cells are specialised cells.

State the name of the specialised cell that is responsible for each of these functions:

- conduction and support in plants
- movement of mucus in the trachea
- photosynthesis
- transport of oxygen in mammals

[4]

[Total: 11]

2 Nervous coordination uses specialised cells called neurones.

Fig. 2.1 is a diagram showing three neurones.

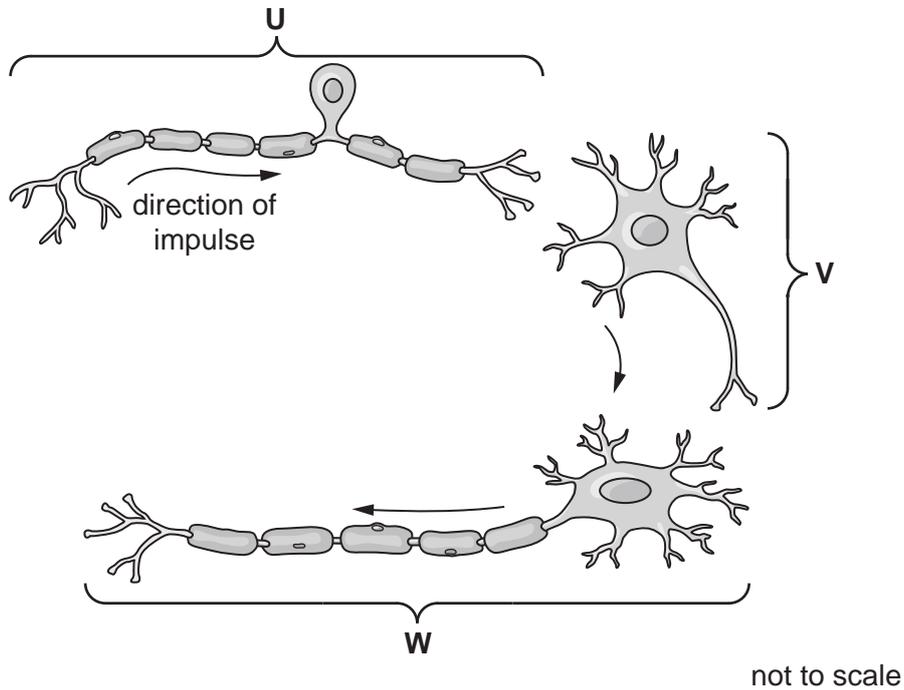


Fig. 2.1

(a) State the name of the type of neurone labelled U.

..... [1]

(b) The list of words and phrases can be used to describe nervous control.

- | | | |
|------------------------|-----------------|--------------------------|
| chemical signal | effector | electrical signal |
| receptor | reflex | stimulus |
| | | synapse |

(i) State the word or phrase from the list that describes a junction between two neurones.

..... [1]

(ii) State the word or phrase from the list that describes a nerve impulse.

..... [1]

(c) Place ticks (✓) in the boxes that describe the human nervous system.

includes the brain and spinal cord	<input type="checkbox"/>
is made up of the brain, heart and spinal cord	<input type="checkbox"/>
consists of the central nervous system only	<input type="checkbox"/>
consists of the central and peripheral nervous system	<input type="checkbox"/>
coordinated by hormones	<input type="checkbox"/>
coordinates and regulates body functions	<input type="checkbox"/>

[3]

(d) Some neurones are wrapped in a layer of fat and protein.

List **four** chemical elements that are found in all proteins.

1

2

3

4

[2]

(e) Proteins are large molecules.

The boxes on the left show the names of some large molecules.

The boxes on the right show the smaller molecules they are made from.

Draw **four** lines to match the large molecule with the smaller molecule it is made from.

large molecule

cellulose

fat

glycogen and starch

protein

smaller molecule

amino acids

fatty acids and glycerol

glucose

[4]

[Total: 12]

- 3 (a) Plant and animal cells contain many cell structures with important functions.

Complete the sentences using the words or phrases from the list.

Each word or phrase may be used once, more than once or not at all.

chloroplast	cytoplasm	membrane	microscope
nucleus	protein synthesis	photosynthesis	
respiration	test-tube	vacuole	wall

Cells are very small. To magnify cells a piece of laboratory equipment called a is used.

All cells have a cell that controls what goes into and out of the cell. The structure that contains the genetic information and controls all of a cell's activities is called the

In a plant cell, the cell maintains the cell shape and the is full of a solution of sugars, called cell sap.

Plant cells carry out the process of to release energy.

[6]

(b) Mitosis and meiosis are types of nuclear division.

(i) Table 3.1 shows some features of mitosis **and** meiosis.

Place ticks (✓) in the boxes to show which features occur in which type of nuclear division.

Table 3.1

feature	mitosis	meiosis
produces gametes		
produces genetically different cells		
produces genetically identical cells		
produces new cells during growth and repair to damaged tissues		
replaces cells		
used in asexual reproduction		

[4]

(ii) A human body cell has 46 chromosomes including a pair of sex chromosomes.

There are two types of sex chromosome, **X** and **Y**, as shown in Fig. 3.1.

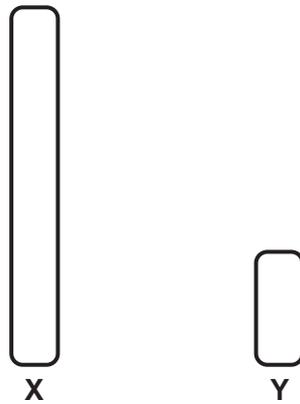


Fig. 3.1

Complete Table 3.2 to show the correct letters of the sex chromosomes in a female and a male.

Table 3.2

sex	chromosomes
female	
male	

[2]

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4 (a) Define the term *variation*.

.....

.....

..... [2]

(b) Hand span is the maximum distance between the tip of the thumb and the tip of the fifth finger as shown in Fig. 4.1.

Scientists investigated variation in the hand spans of adults.

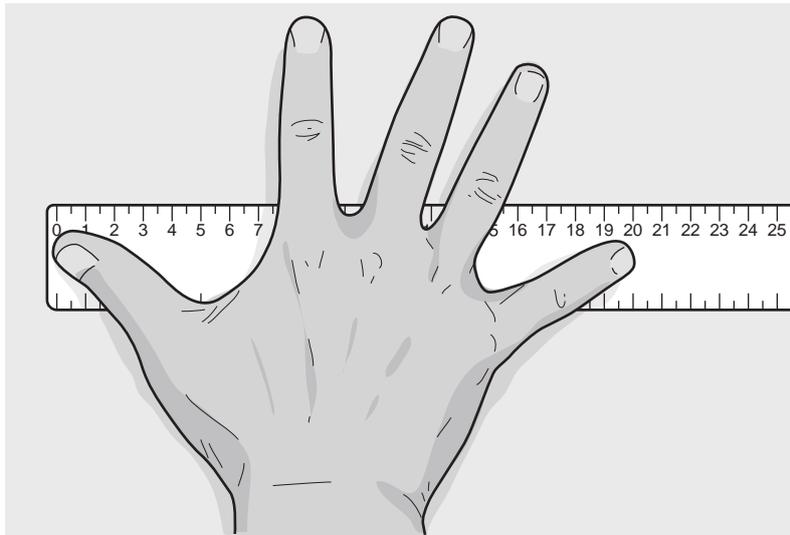


Fig. 4.1

The results are shown in Fig. 4.2.

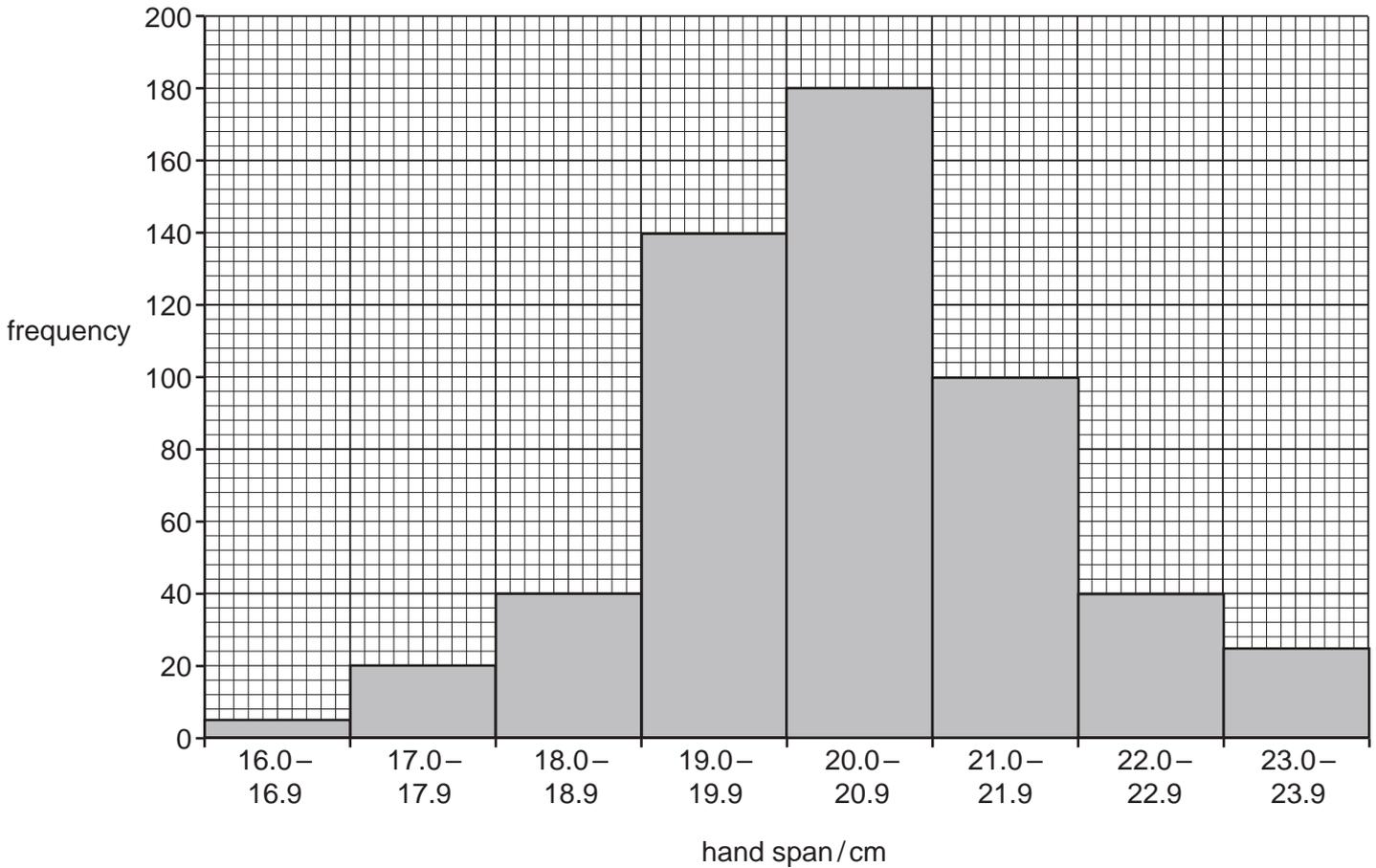


Fig. 4.2

(i) State the frequency of adults with a hand span of 19.0–19.9cm in Fig. 4.2.

..... [1]

(ii) State which hand span range is the most frequent.

..... cm [1]

(c) There are different types of variation.

State the type of variation shown in Fig. 4.2 **and** describe the evidence for your choice.

type of variation

evidence

.....

.....

[2]

[Total: 6]

- 5 (a) Puberty leads to the development of secondary sexual characteristics.

It is controlled by hormones released from endocrine glands.

Fig. 5.1 is a diagram of part of the human endocrine system.

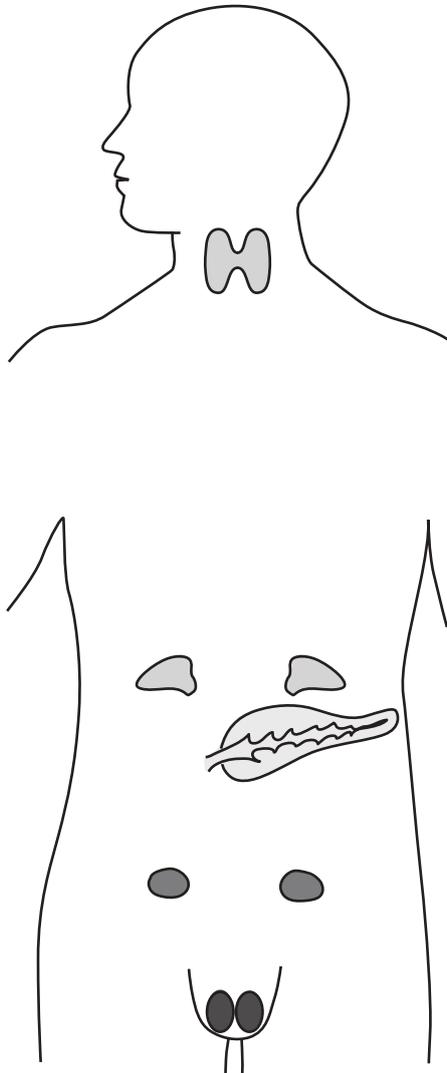


Fig. 5.1

- (i) One of the structures shown on Fig. 5.1 produces a hormone that controls puberty in boys.

Label this structure with a label line. Include the name of the structure in your label. [2]

- (ii) State the name of the hormone that leads to the development of secondary sexual characteristics in girls.

..... [1]

(iii) The list shows some secondary sexual characteristics that develop in puberty in humans.

- breasts grow
- growth of pubic hair
- growth of underarm hair
- menstruation begins
- pelvis widens

Complete Table 5.1 to show which characteristics develop in girls only and which develop in both boys and girls.

Table 5.1

girls only	both boys and girls

[3]

(b) State **two** effects on the body of the hormone adrenaline.

1

2

[2]

[Total: 8]

6 Muscle cells can carry out both aerobic and anaerobic respiration.

(a) (i) Define the term *anaerobic respiration*.

.....

 [2]

(ii) State the product of anaerobic respiration in a human muscle cell during vigorous exercise.

..... [1]

(iii) State **two** ways that anaerobic respiration in a yeast cell differs from that of a muscle cell.

1

2 [2]

(b) Fig. 6.1 shows an athlete taking part in a long distance race.



Fig. 6.1

Table 6.1 shows the energy released in muscle cells from 180 g of glucose.

Table 6.1

type of respiration	energy released/kJ
aerobic	2900
anaerobic	120

- (i) Calculate the ratio of energy released using the information in Table 6.1:

$$\text{ratio of energy released} = \frac{\text{energy released in aerobic respiration}}{\text{energy released in anaerobic respiration}}$$

Give your answer to the nearest whole number.

ratio : 1
[2]

- (ii) Suggest why it is beneficial for the long distance athlete to respire aerobically, rather than anaerobically.

.....

 [2]

- (c) A student went for a short run to investigate the effect of physical activity on his pulse rate.

The resting pulse rate for the student was 60 beats per minute and during exercise his pulse rate increased to 144 beats per minute.

Calculate the percentage increase in pulse rate.

.....%
[2]

- (d) A student wrote a sentence about the circulatory system:

“The circulatory system is a system of alveoli with a pump and valves to ensure two-way flow of blood.”

Identify **two** incorrect words or phrases in the sentence.

1
 2 [2]

7 A gardener investigated plant growth.

She used a tray of tomato seedlings. The tomato seedlings were all approximately 3 cm tall.

She placed the tray in a box with a source of light at the side.

Fig. 7.1 shows the apparatus.

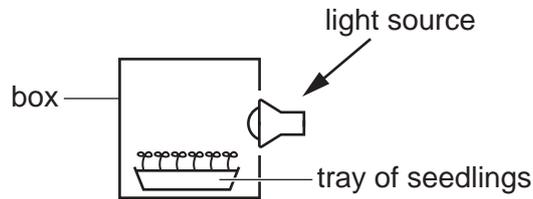


Fig. 7.1

(a) After 48 hours the gardener observed that the tomato seedlings had curved stems.

She rotated the tray so that the curved tomato seedlings were facing away from the source of light as shown in Fig. 7.2.

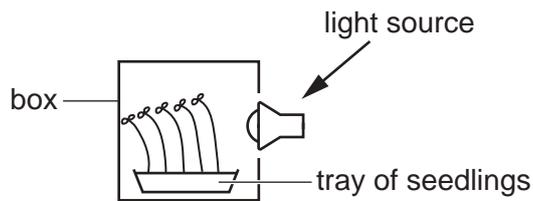


Fig. 7.2

(i) Predict what will happen to the tomato seedlings in Fig. 7.2.

.....

.....

..... [1]

(ii) State the name of the response to light shown by the tomato seedlings.

..... [1]

(iii) Explain why the tomato seedlings need light.

.....
.....
.....
.....
.....
.....
.....
.....
.....
..... [4]

(iv) Describe how the **roots** of the tomato seedlings would respond to light.

.....
..... [1]

(b) The gardener grew the tomato seedlings from tomato seeds.

State **three** conditions that are required for the germination of seeds.

1
2
3 [3]

(c) The cells of tomato seedlings that are regularly watered remain firm and well-supported.

State how water supports plant cells.

.....
.....
.....
.....
..... [2]

[Total: 12]

- 8 (a) The eye is a sense organ that contains receptor cells that respond to light.

Fig. 8.1 is a diagram of the human eye.

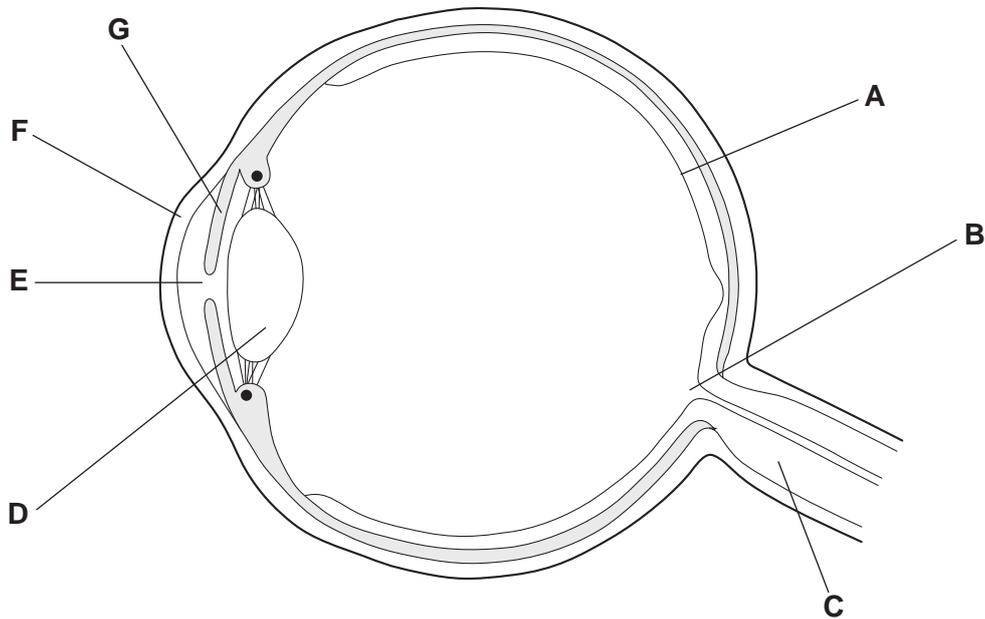


Fig. 8.1

Complete Table 8.1 using the information in Fig. 8.1.

Table 8.1

name	letter from Fig. 8.1	function
cornea		refracts light
iris	G	controls how much light enters the pupil
retina		contains light receptors
	D	focuses light on the retina
optic nerve		

[4]

(b) Fig. 8.2 is a photograph of a human eye.

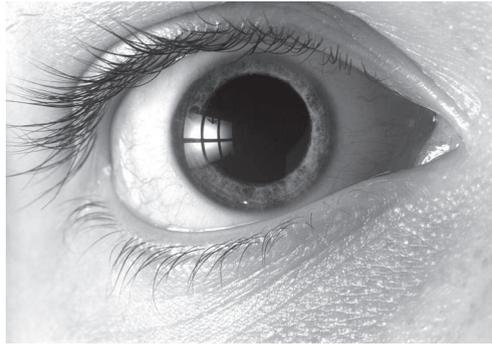


Fig. 8.2

The person has been in a dark room.

Explain the response of the pupil if the light is now switched on.

.....

.....

.....

.....

..... [2]

[Total: 6]

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BIOLOGY

0610/41

Paper 4 Theory (Extended)

October/November 2019

1 hour 15 minutes

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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.

At the end of the examination, fasten all your work securely together.

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1 All living organisms are placed into groups according to their features. Myriapods are one of the main groups of arthropods.

(a) State **two** features of myriapods that can be used to distinguish them from other arthropods.

1

2

[2]

Fig. 1.1 shows that there are four main groups of arthropods.

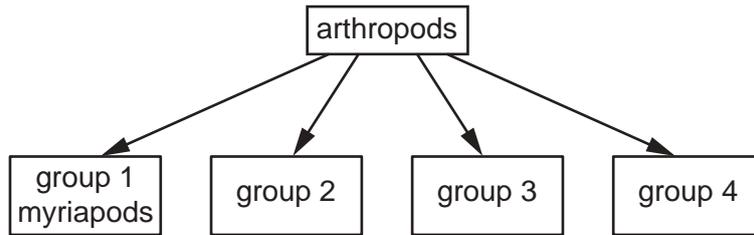


Fig. 1.1

(b) State the names of **two** of the other groups of arthropods in Fig. 1.1.

1

2

[2]

(c) Myriapods can be classified into four classes, **1, 2, 3** and **4**.

Fig. 1.2 is a dichotomous key that can be used to distinguish the four classes of myriapods.

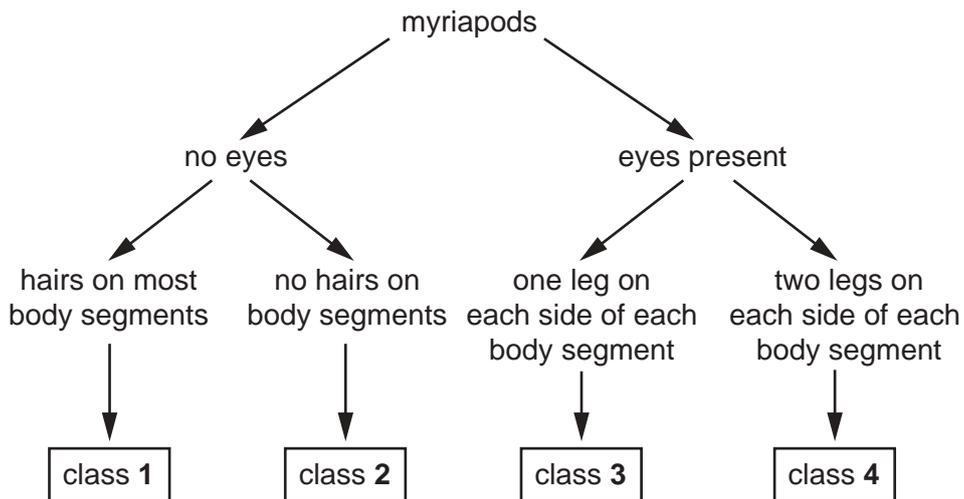


Fig. 1.2

3

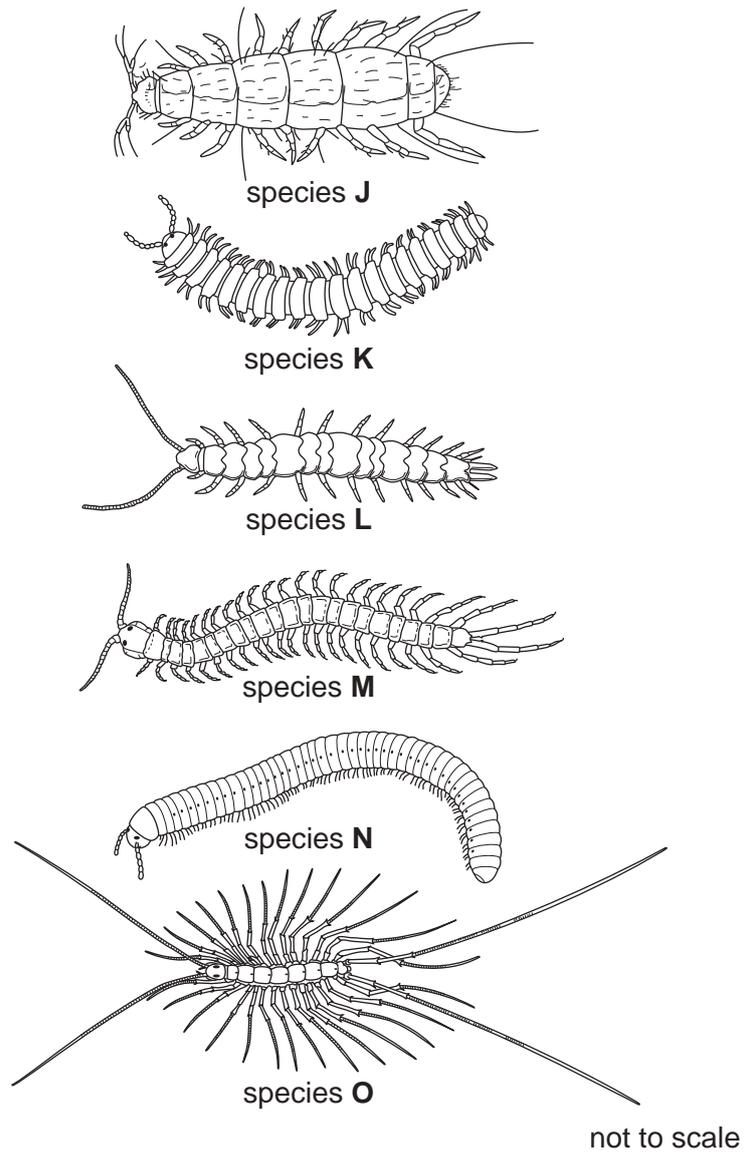


Fig. 1.3

Complete Table 1.1 by using the key in Fig. 1.2 to classify the six myriapods in Fig. 1.3 into the four classes.

Table 1.1

class	letter(s) of species from Fig. 1.3 in each class
1	
2	
3	
4	

[3]

(d) Fig. 1.4 is a photograph of the myriapod, *Apheloria virginiensis*.



Fig. 1.4

(i) State the genus name and kingdom name for the myriapod shown in Fig. 1.4.

genus

kingdom

[2]

(ii) *A. virginiensis* releases the poison cyanide when it is attacked by predators. Cyanide stops enzymes in the mitochondria from functioning.

Suggest why cells die if the mitochondria do not function.

.....
.....
..... [1]

[Total: 10]

2 Phloem is used to transport sucrose and amino acids in plants. Sucrose is a carbohydrate.

(a) Describe the uses of carbohydrates **and** amino acids in plants.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(b) Fig. 2.1 shows a diagram of a plant. The arrows point to circles containing magnified cross-sections of those parts of the plant.

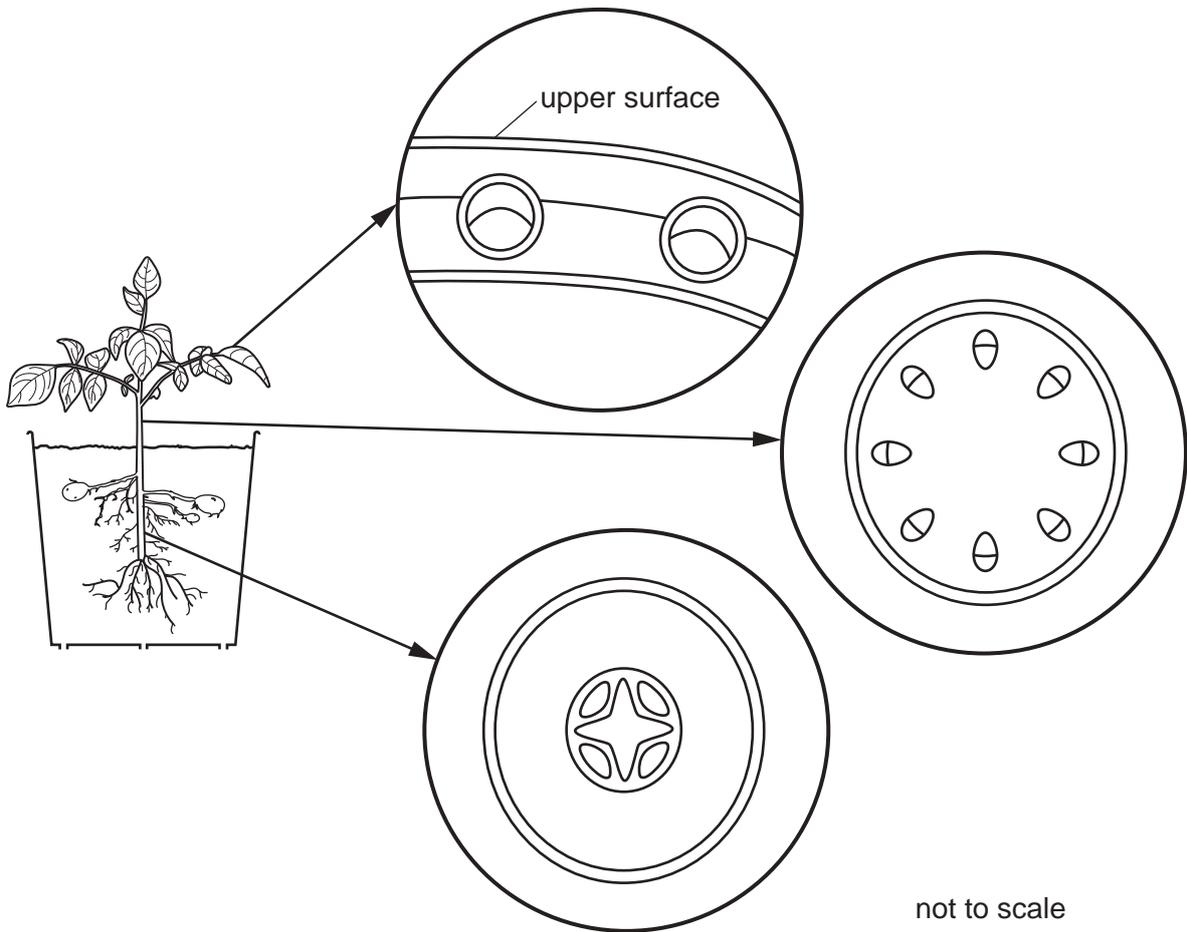


Fig. 2.1

Label the position of the phloem in each of the three magnified sections in Fig. 2.1.

Use a label line and the letter **P** for each section.

[3]

(c) Aphids are used by investigators to discover how plants transport sucrose.

Fig. 2.2 shows an aphid with its mouthparts inserted into a plant stem to feed on the liquid in the phloem.



Fig. 2.2

A plant was put in a dark cupboard for several days.

Four aphids, **A**, **B**, **C** and **D**, were then placed on the plant in the dark cupboard as shown in Fig. 2.3.

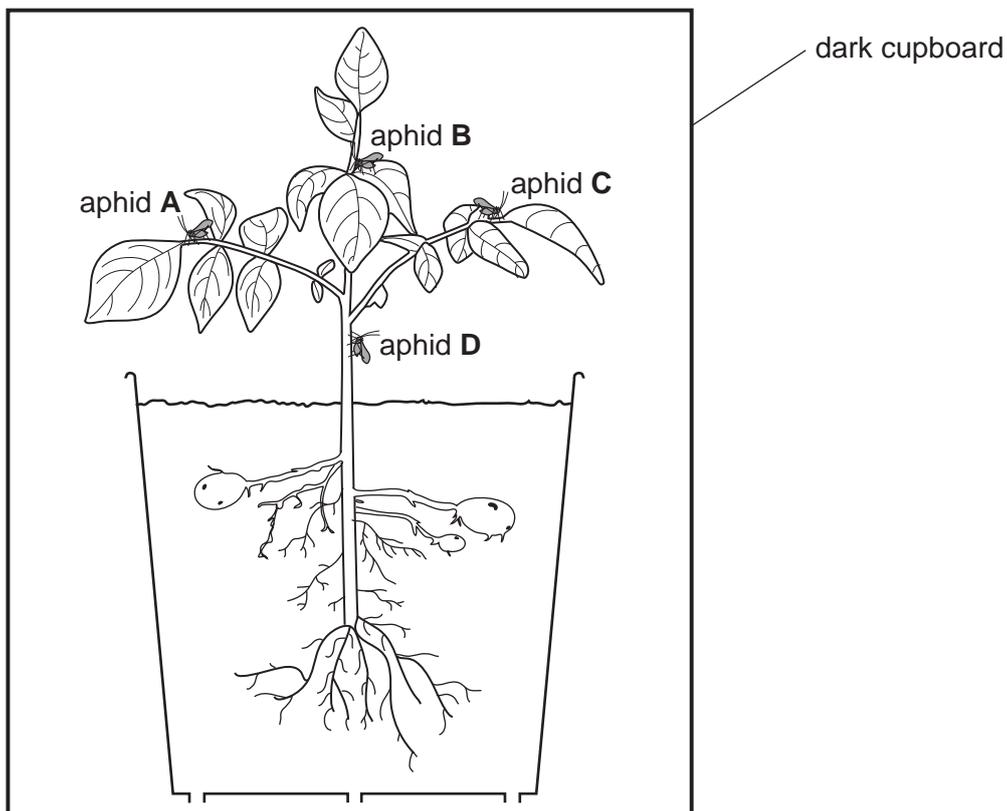


Fig. 2.3

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(i) Immediately after the aphids were placed on the plant it was observed that:

- all the aphids ingested the same volume of liquid from the phloem
- aphid **D** ingested the highest concentration of sucrose.

Explain why aphid **D** ingested the highest concentration of sucrose.

.....

.....

.....

.....

.....

.....

.....

..... [3]

(ii) Many crop farmers try to prevent insects such as aphids from damaging their plants.

Describe how modern technology is used to reduce damage to crop plants by insects.

.....

.....

.....

.....

.....

.....

.....

..... [3]

(iii) Other insects are useful to crop farmers.

Give **one** example of how insects are useful to farmers.

.....

..... [1]

[Total: 14]

3 Kidneys are important for excretion.

(a) Explain the purpose of excretion.

.....
.....
..... [2]

(b) Sketch a simple diagram of a human kidney and its ureter.

Label the cortex, medulla and ureter on your diagram.

[2]

(c) Fig. 3.1 is a photomicrograph of a glomerulus in a kidney.

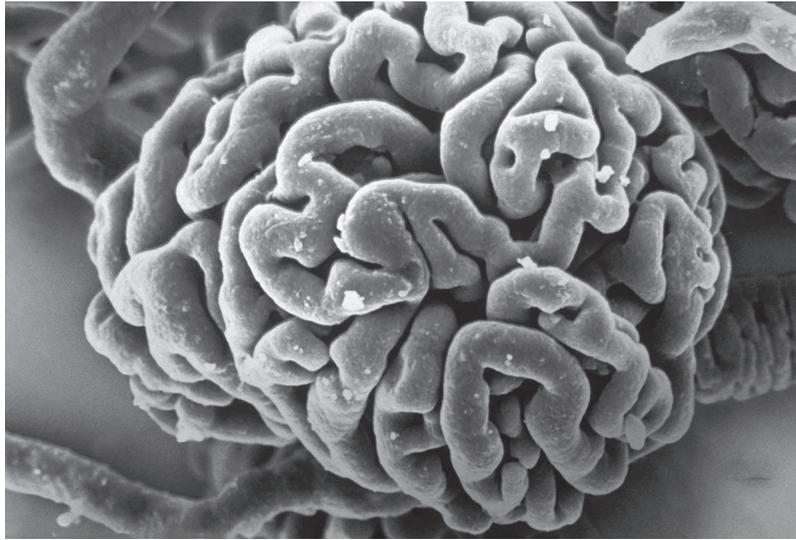


Fig. 3.1

(i) Describe the structure of a glomerulus.

You may refer to Fig. 3.1 in your answer.

.....

.....

.....

.....

..... [2]

(ii) Describe the role of the glomerulus.

.....

.....

.....

.....

..... [2]

(ii) Scientists stated a hypothesis:

“humans and mice reabsorb salt at almost the same rate in relation to the size of their kidneys”

Determine whether the data in Table 3.1 supports this hypothesis.

Show your working.

human	mouse

.....

 [4]

(iii) Table 3.1 also shows that water is reabsorbed in the kidneys of both humans and mice.

State the name of the process that mammals use to reabsorb water.

..... [1]

(iv) Water and salt are reabsorbed in the kidneys.

State the name of one **other** molecule that is also reabsorbed in kidney tubules.

..... [1]

[Total: 18]

- 5 Fig. 5.1 shows an angiogram of a heart before and after treatment for coronary heart disease (CHD). An angiogram is an image of the blood flow through the blood vessels of the heart.

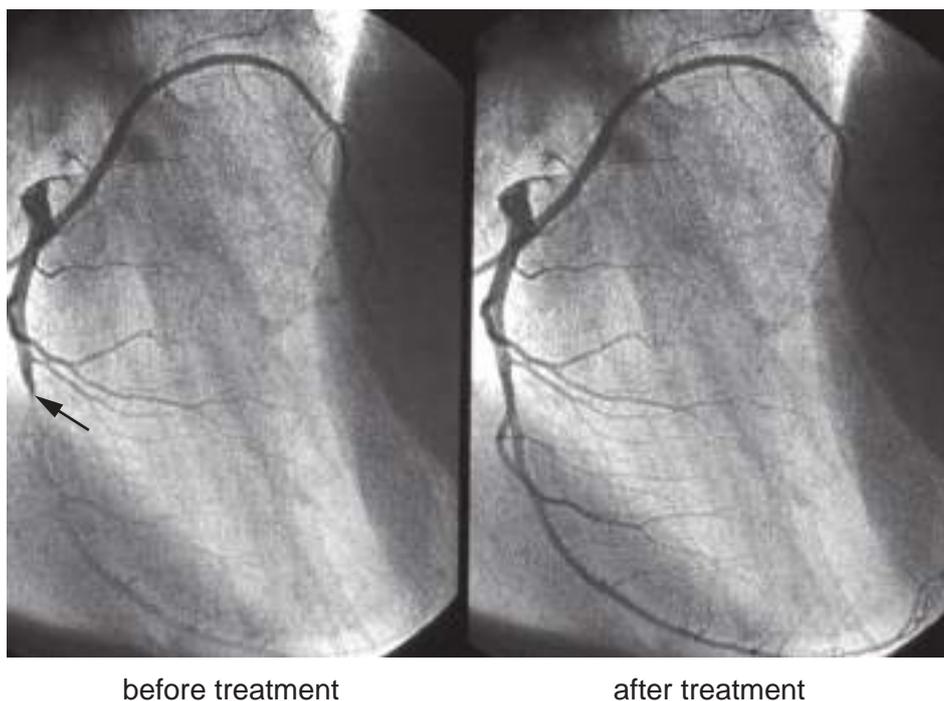


Fig. 5.1

- (a) The arrow on Fig. 5.1 shows the position of a blockage in a blood vessel.

(i) State the name of the blocked blood vessel.

..... [1]

(ii) The blockage is caused by a blood clot.

Describe how a blood clot forms.

.....

 [3]

(iii) State the name of a drug that can be used to treat coronary heart disease.

..... [1]

- (b) Many health specialists think that the risk of coronary heart disease can be reduced by doing regular exercise.

A long-term study of a large group of women was used to test this hypothesis.

The women were between 35 and 45 years old at the start of the study.

Every two years the same group of women were asked how much they were exercising.

After 28 years the researchers analysed their data:

- They calculated the average time spent exercising per week by each woman.
- They put the women into categories determined by how much exercise they had done.
- For each category, they calculated the number of women who died from coronary heart disease (CHD).

The results are shown in Fig. 5.2.

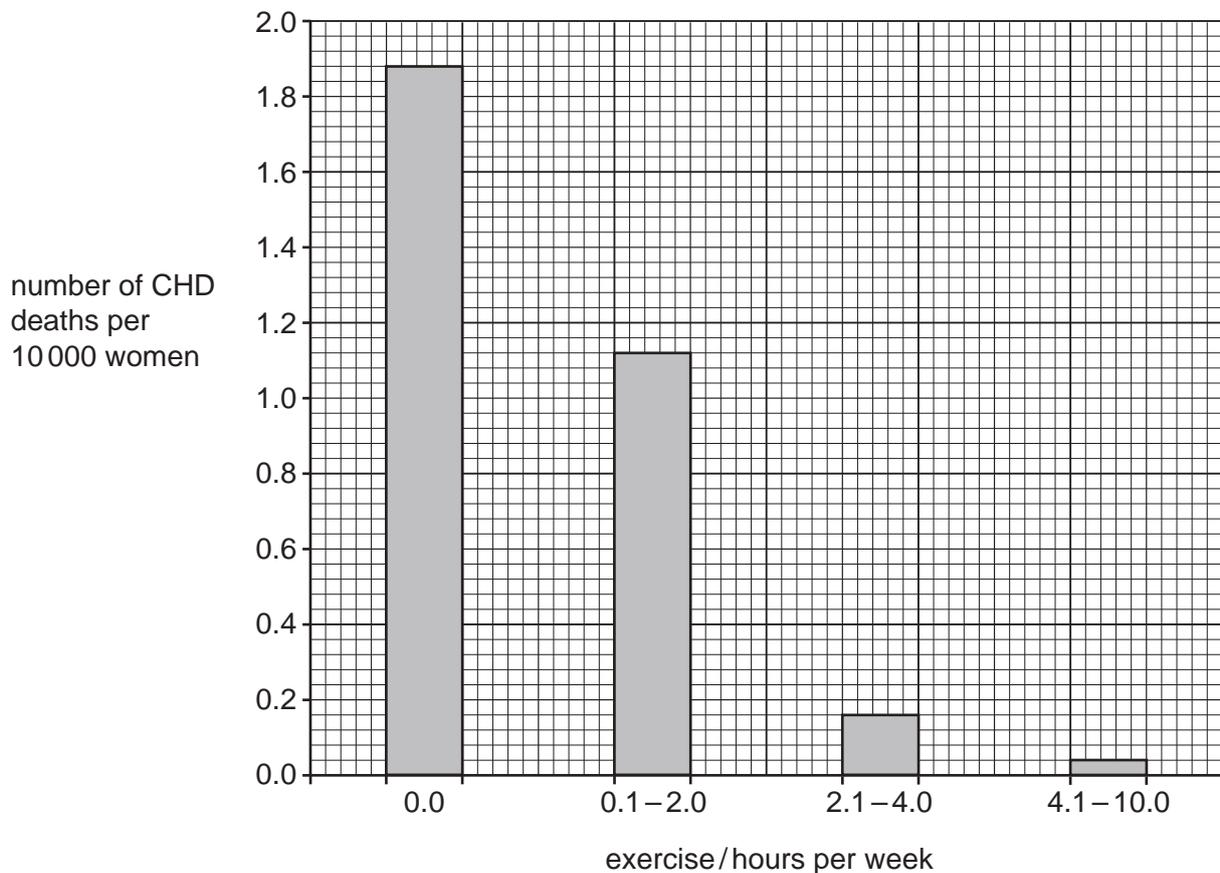


Fig. 5.2

- (i) Calculate the percentage **decrease** in the number of CHD deaths per 10000 women between those who did no exercise and those who exercised for 4.1 to 10.0 hours a week, using the data in Fig. 5.2.

number of CHD deaths per 10 000 women who did no exercise

number of CHD deaths per 10 000 women who did 4.1 to 10.0 hours per week of exercise
.....

Give your answer to the nearest whole number.

Space for working.

..... %
[3]

- (ii) Health professionals wanted to use the results of this study to encourage the whole population to take more exercise.

Discuss the arguments for and against health professionals using this study in this way.

Use the information about how the study was designed and the results in Fig. 5.2 in your arguments.

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
..... [5]

(c) Exercise causes heart rate to increase.

Explain why exercise causes an increase in heart rate.

.....

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 16]

6 Fish are an important part of a balanced diet for many people.

(a) Fish are a good source of vitamin D.

State **one** effect of a diet that is deficient in vitamin D.

.....

.....

..... [1]

(b) Many fish stocks have declined.

Marine ecologists considered the three topics shown in Fig. 6.1 when they discussed the decline of fish stocks.

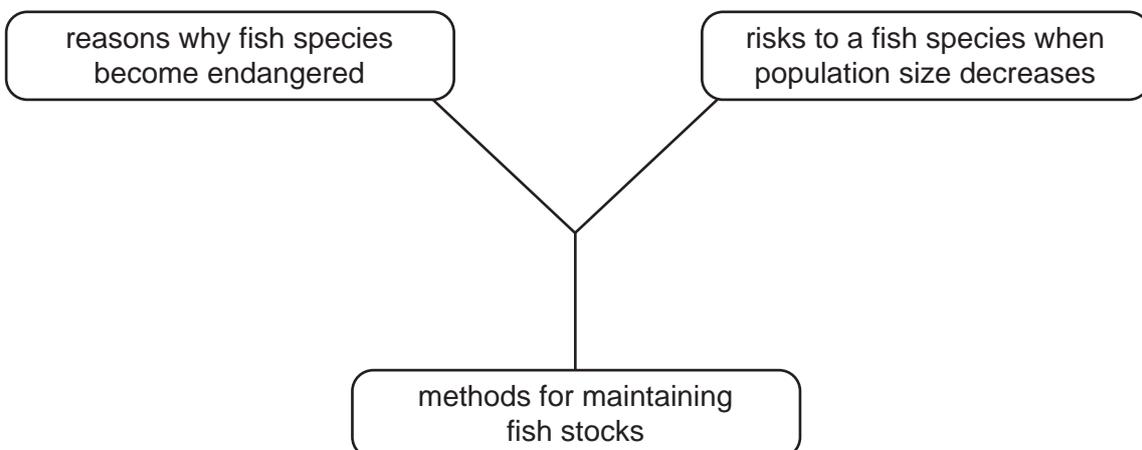


Fig. 6.1

7 Fig. 7.1 shows part of the nitrogen cycle.

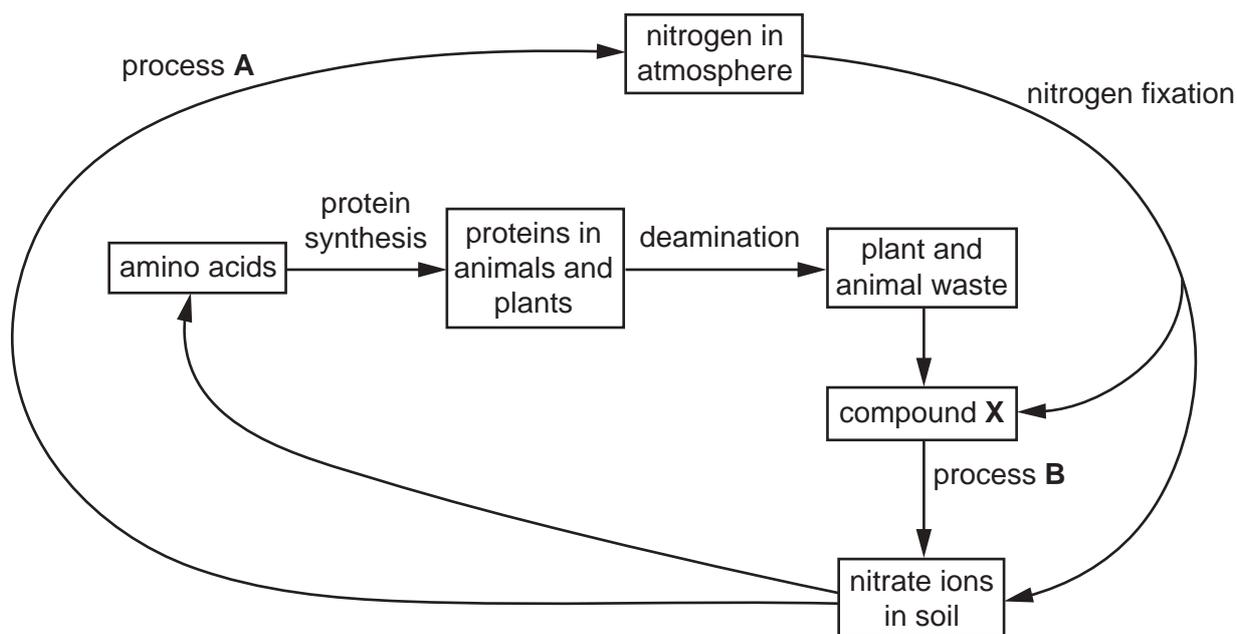


Fig. 7.1

(a) (i) State **two** ways that nitrogen fixation can occur.

- 1
 - 2
- [2]

(ii) State the names of processes **A** and **B** in Fig. 7.1.

- process **A**
 - process **B**
- [2]

(iii) State the name of compound **X** in Fig. 7.1.

..... [1]

(iv) Define the term *deamination*.

.....

.....

.....

.....

.....

.....

..... [2]

(b) State the name of the structure in a cell where protein synthesis occurs.

..... [1]

(c) State the name of an enzyme that digests proteins.

..... [1]

[Total: 9]

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0610/42

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October/November 2019

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Electronic calculators may be used.

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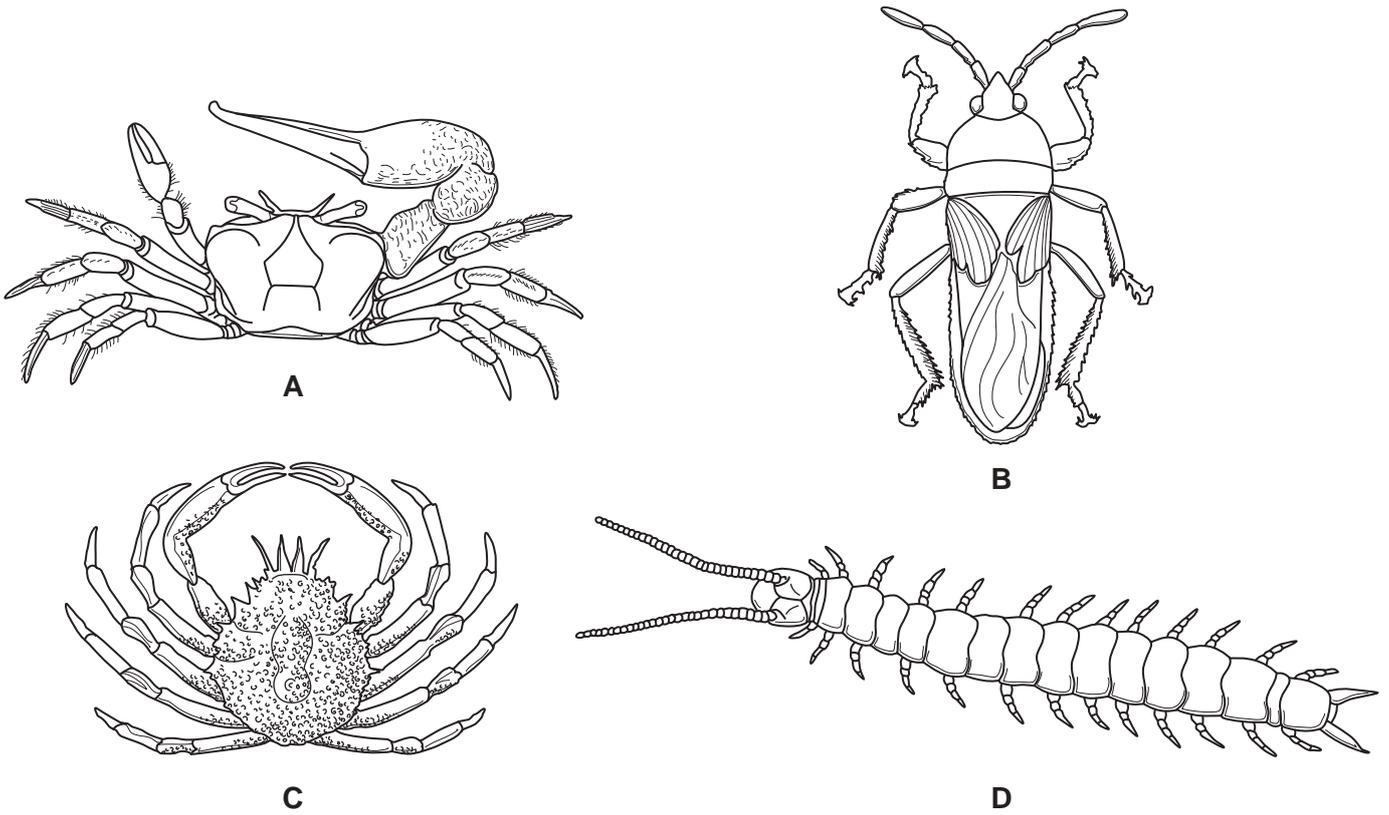
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1 (a) Fig. 1.1 shows four arthropods.



not to scale

Fig. 1.1

(i) State **two** features, visible in Fig. 1.1, that are common to all arthropods.

- 1
- 2

[2]

(ii) Fig. 1.2 is a dichotomous key for the arthropods shown in Fig. 1.1.

Complete Fig. 1.2 by writing suitable statements in:

- box 2 to identify species **B**
- box 3 to separate species **C** and **A**.

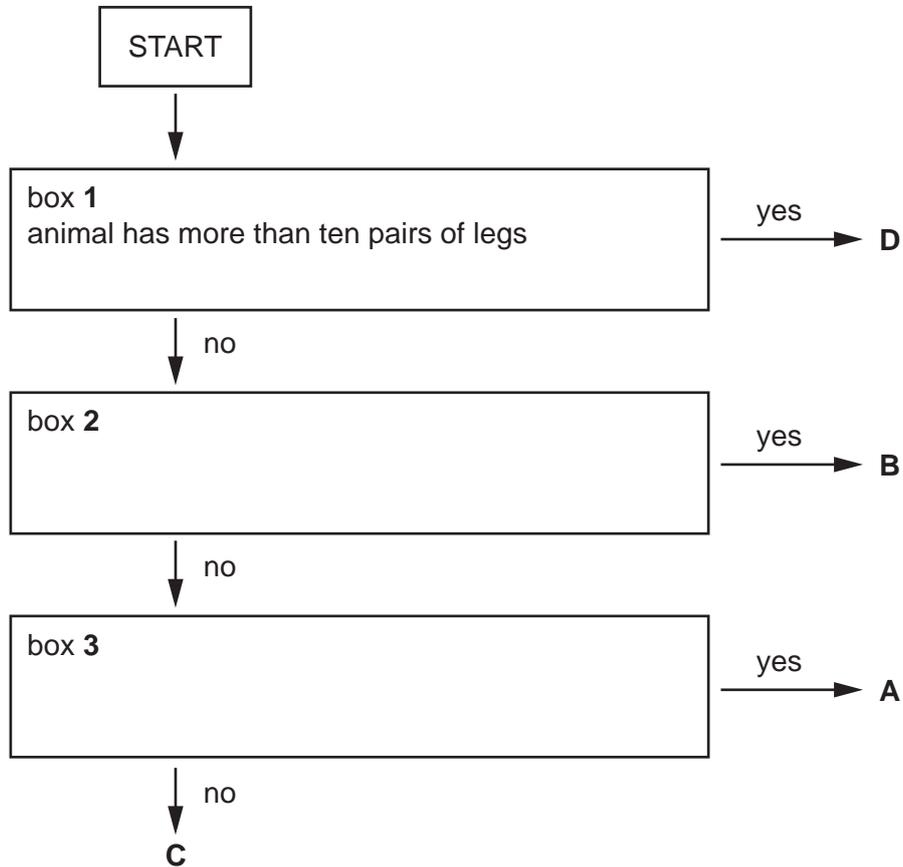


Fig. 1.2

[2]

- (b) The Hawaiian happy-face spider, *Theridion grallator*, is found on several of the Hawaiian islands. Some of the spiders have a very distinctive pattern on their bodies as shown in Fig. 1.3.



Fig. 1.3

- (i) State **one** feature, visible in Fig. 1.3, that identifies *T. grallator* as an arachnid.
..... [1]

- (ii) Scientists think that the pattern on the bodies of the spiders is an adaptive feature.
Explain the term *adaptive feature* with reference to this pattern.
.....
.....
.....
.....
.....
.....
.....
..... [3]

- (c) DNA can be extracted from the webs of spiders. This DNA can be used to identify the species of spider that made the web, and the species of prey caught in the web.

Explain how DNA extracted from spider webs can be used to identify different species.

.....
.....
.....
.....
..... [2]

- (d) Many species of spider are thought to be endangered.

State **three** reasons why animal species such as spiders become endangered.

1
.....
2
.....
3
..... [3]

[Total: 13]

2 Fig. 2.1 shows part of a cross-section of the stem of a young sunflower plant.

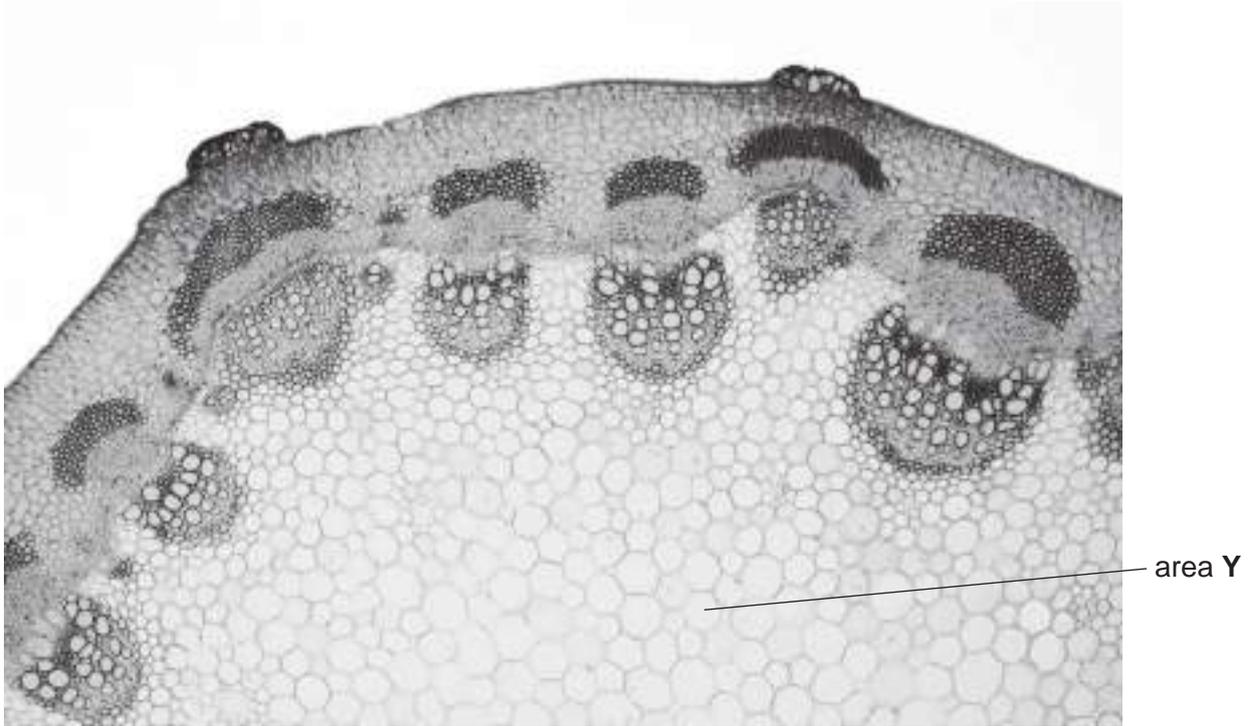


Fig. 2.1

(a) Draw a circle around **one** vascular bundle on Fig. 2.1.

Label the **xylem** in the vascular bundle with the letter **X**.

[2]

(b) Explain how the cells in **area Y** are able to support the stem so that it stays upright.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [3]

- (c) Researchers used carbon dioxide that contained a traceable source of carbon (^{13}C) to investigate translocation of sucrose from the leaves of bean plants, *Phaseolus vulgaris*.

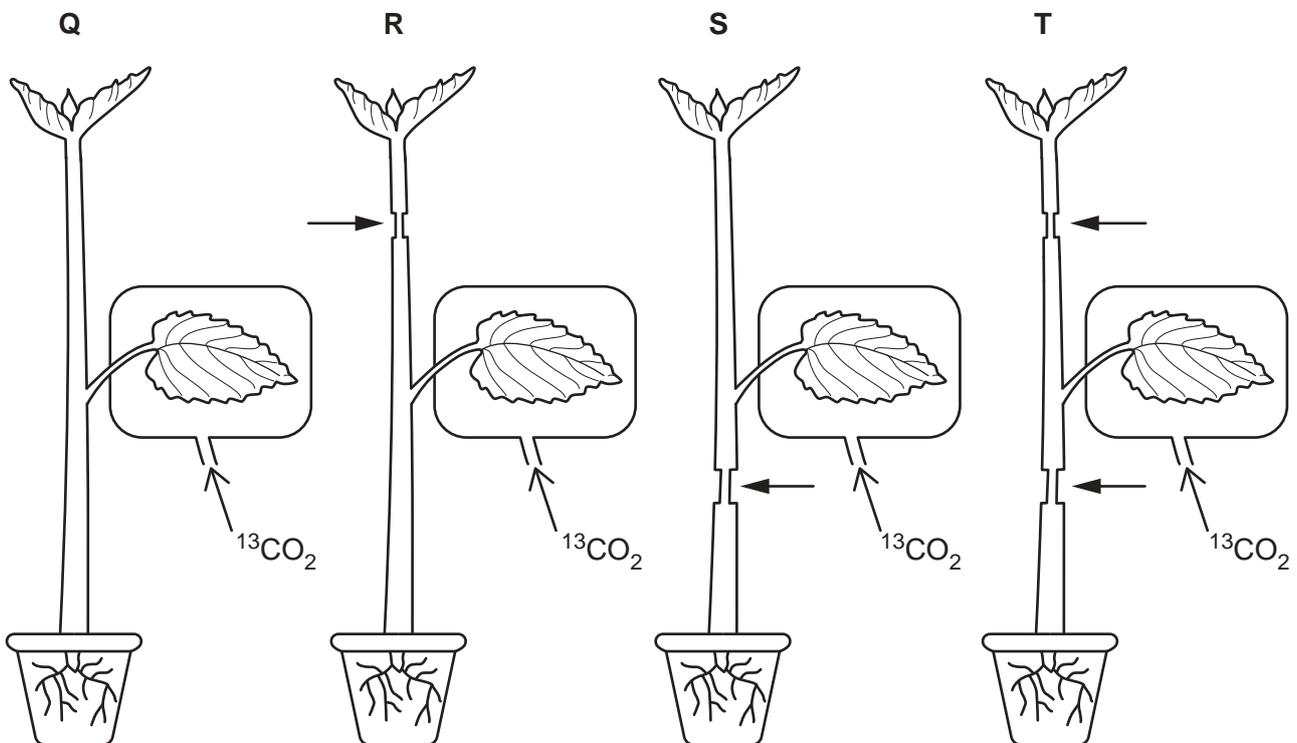
Fig. 2.2 shows that glucose produced in photosynthesis is converted to sucrose for translocation.



Fig. 2.2

Researchers selected four plants, **Q**, **R**, **S** and **T**, which had leaves that were of similar sizes. The leaves on the four plants were supplied with $^{13}\text{CO}_2$.

After the leaves had started to make sucrose, the researchers cut away a ring of tissue in different places as shown in Fig. 2.3. The rings of tissue that were removed from plants **R**, **S** and **T** contained the phloem.



Key: \longrightarrow the positions on the stems where rings of tissue containing phloem were removed.

Fig. 2.3

3 Cells in the lining of the stomach secrete gastric juice, which contains hydrochloric acid and pepsin.

(a) (i) State **two** roles of hydrochloric acid in the stomach.

1

2 [2]

(ii) Describe the function of pepsin.

.....

.....

.....

..... [2]

(b) Define the term *assimilation*.

.....

.....

.....

..... [2]

(c) There are stem cells in the epithelial tissue that forms the lining of the stomach.

Explain why these stem cells are necessary.

.....

.....

.....

.....

..... [2]

(d) The epithelial cells of the small intestine have many microvilli.

State the role of the microvilli.

.....

.....

.....

..... [2]

- (e) *Lactobacillus* is a type of bacterium. A study was carried out to investigate the ability of *Lactobacillus* to attach to the epithelial cells that form the lining of the small intestine.

Researchers added *Lactobacillus* bacteria to epithelial cells that had been grown in Petri dishes.

Every 15 minutes, the researchers estimated the average number of bacteria that were attached to the epithelial cells in the Petri dishes.

The results are shown in Fig. 3.1.

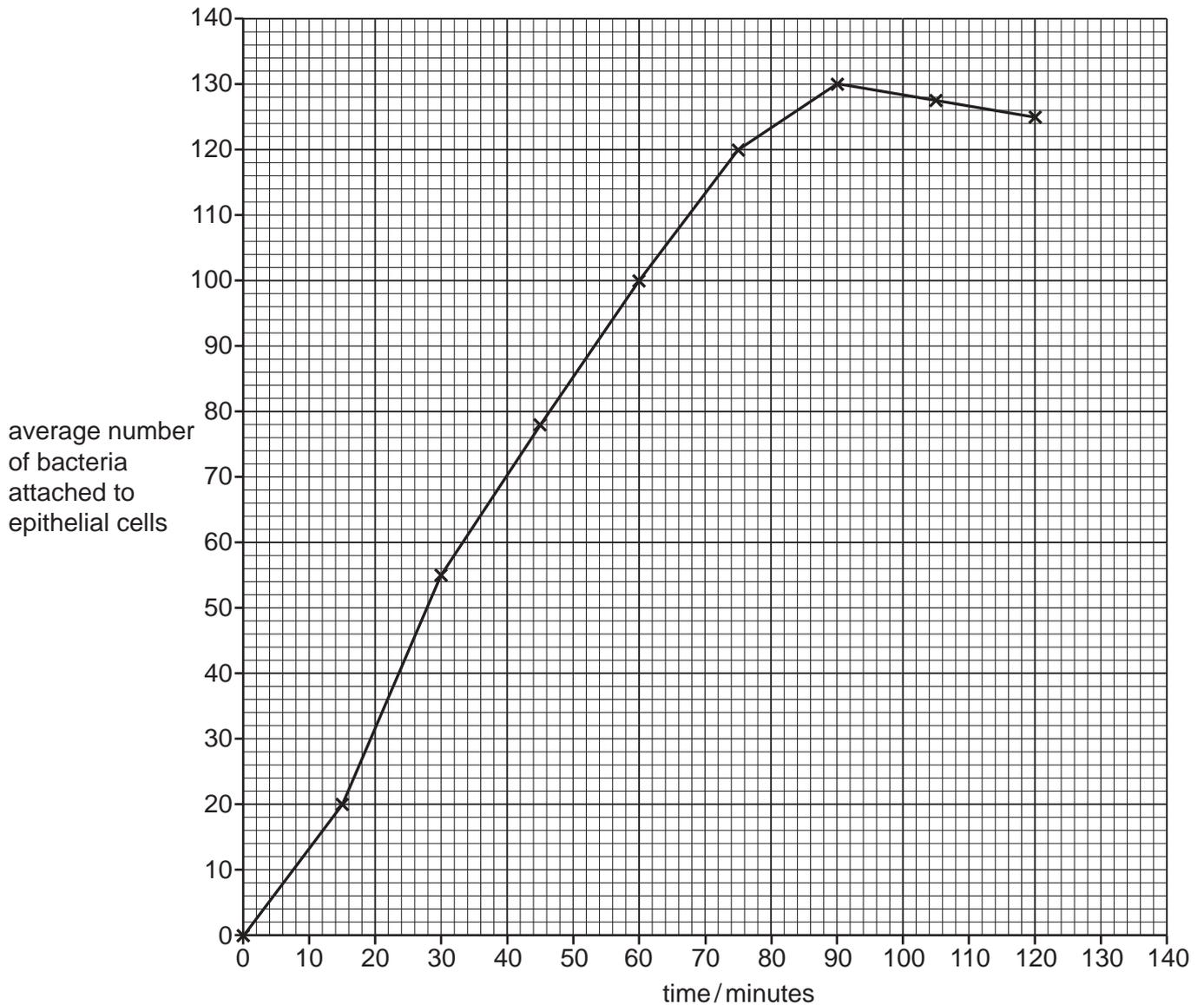


Fig. 3.1

13

Calculate the percentage increase in the average number of bacteria attached to epithelial cells from 45 minutes to 75 minutes.

average number of bacteria at 45 minutes

average number of bacteria at 75 minutes

Give your answer to the nearest whole number.

Space for working.

..... %
[3]

[Total: 13]

5 Grass plants are wind-pollinated. Fig. 5.1 shows a flower from a species of grass plant.



Fig. 5.1

(a) (i) Describe **and** explain how the features of the flower shown in Fig. 5.1 are adaptations for wind-pollination.

.....

.....

.....

.....

.....

.....

.....

.....

..... [3]

(ii) State **one** letter in Fig. 5.1 that identifies a structure where meiosis occurs.

..... [1]

(b) Wheat has flowers similar to those in Fig. 5.1, but reproduces by self-pollination.

Explain the consequences of self-pollination for a population of plants.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(c) Wheat is an important crop plant in many countries. Wheat can be infected by diseases leading to total loss of the crop which results in famine.

Outline factors, **other than** plant diseases, that can cause famines.

.....

.....

.....

.....

.....

.....

.....

.....

..... [3]

(d) Black stem rust is a disease of wheat that is caused by a fungus.

Plant breeders used two varieties of wheat to produce a variety of wheat that is both rust-resistant and has a high yield.

Fig. 5.2 shows the breeding programme that was used.

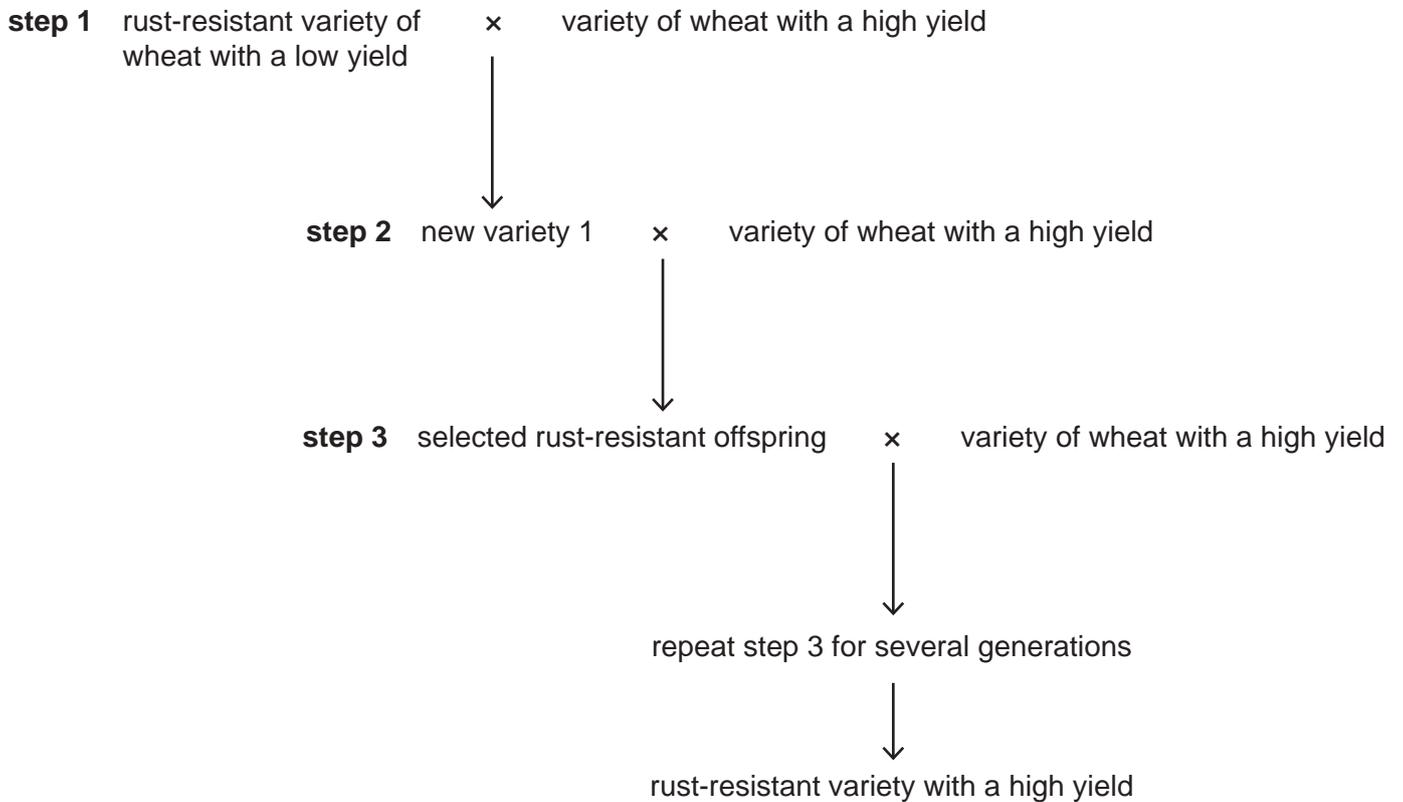


Fig. 5.2

(i) Suggest how plant breeders make sure that the plants that they use for step 3 are rust-resistant.

.....

.....

.....

.....

..... [2]

(ii) Suggest why step 3 is repeated for many generations before the new rust-resistant variety is made available for farmers to grow.

.....

.....

..... [1]

(e) Wheat plants are monocotyledons.

State **one** feature of monocotyledons that can be used to distinguish them from dicotyledons.

..... [1]

[Total: 15]

6 Carbon dioxide forms approximately 0.04% of the atmosphere.

Fig. 6.1 shows part of the carbon cycle.

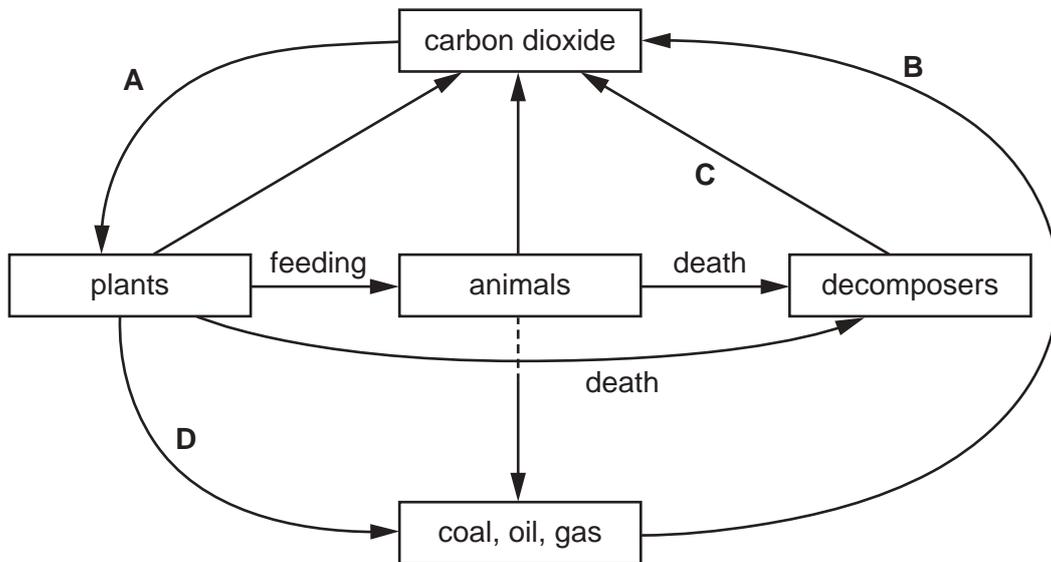


Fig. 6.1

(a) Complete Table 6.1 by naming the processes labelled **A** to **D** in Fig. 6.1.

Table 6.1

letter on Fig. 6.1	name of the process in the carbon cycle
A	
B	
C	
D	

[4]

(b) Complete the sentences by writing the missing words in the spaces.

Carbon dioxide is a greenhouse gas. Greenhouse gases trap
in the atmosphere. Water vapour is the most common greenhouse gas in the atmosphere.
Another greenhouse gas is methane which is released from
and Carbon dioxide and methane released from human
activities over the past 200 years have contributed to the
greenhouse effect.

Other atmospheric pollutants can cause acid rain. One of these is
..... which is a waste gas from some power stations.

One source of pollution in both aquatic and terrestrial ecosystems is
..... plastics.

[6]

[Total: 10]

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- 1 (a) The ant-mimic jumping spider, *Myrmarachne formicaria*, is shown in Fig. 1.1.

The common name of this species describes its behaviour. It is an arachnid that tricks its prey because it looks like the insects that it eats.



Fig. 1.1

- (i) Suggest which trophic level in a food chain *M. formicaria* could belong to.
 [1]
- (ii) State the genus of the spider shown in Fig. 1.1.
 [1]
- (iii) Some keys use paired choices of features to identify species such as the ant-mimic jumping spider.
 State the name of this type of key.
 [1]

(b) Spiders are classified as arachnids. Arachnids are one of the main groups of arthropods.

Fig. 1.2 shows diagrams of six arthropods, four of which are arachnids.

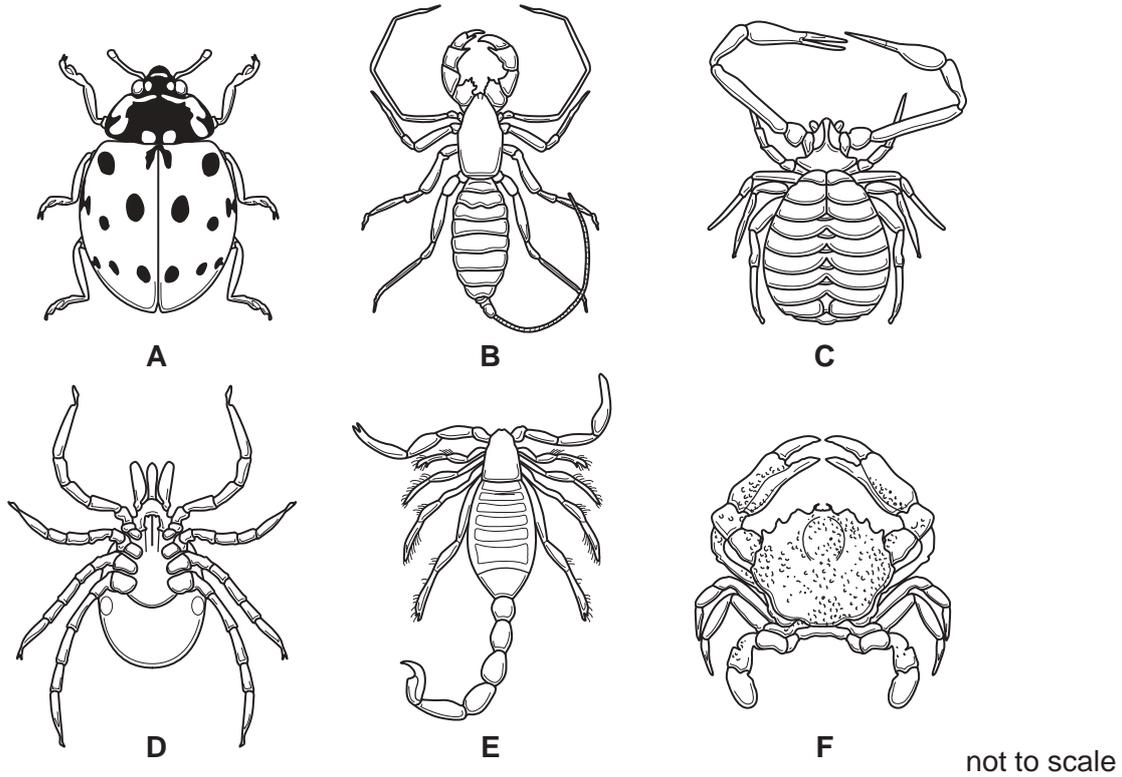


Fig. 1.2

(i) State **two** common features of all the arthropods, visible in Fig. 1.2.

- 1
- 2 [2]

(ii) State **two** common features of all arachnids that can be used to distinguish them from other arthropods.

- 1
- 2 [2]

(iii) State the letters of the **four** arachnids shown in Fig. 1.2.

..... [2]

(c) The features shown in Fig. 1.2 are morphological features. Many traditional methods of classification used morphology.

State the name of one **other** type of feature that can also be used in classification.

..... [1]

2 Plants produce glucose in leaves and convert some of it to sucrose.

(a) (i) Explain how glucose is produced in leaves.

.....
.....
.....
.....
.....
.....
..... [3]

(ii) State the name of the process that plants use to move sucrose from a source to a sink.

..... [1]

(iii) Roots can be an example of a sink.

Explain why sometimes roots act as a source rather than a sink.

.....
.....
.....
.....
..... [2]

(b) The movement of sucrose in plants can be modelled using laboratory apparatus.

Fig. 2.1 shows the apparatus used to model the movement of sucrose in a plant:

- Partially permeable bags were attached tightly to the ends of tube **Q**.
- The bag representing a **source** was filled with a coloured sucrose solution.
- The bag representing a **sink** was filled with water.
- The containers and tube **Q** and tube **S** were filled with water.

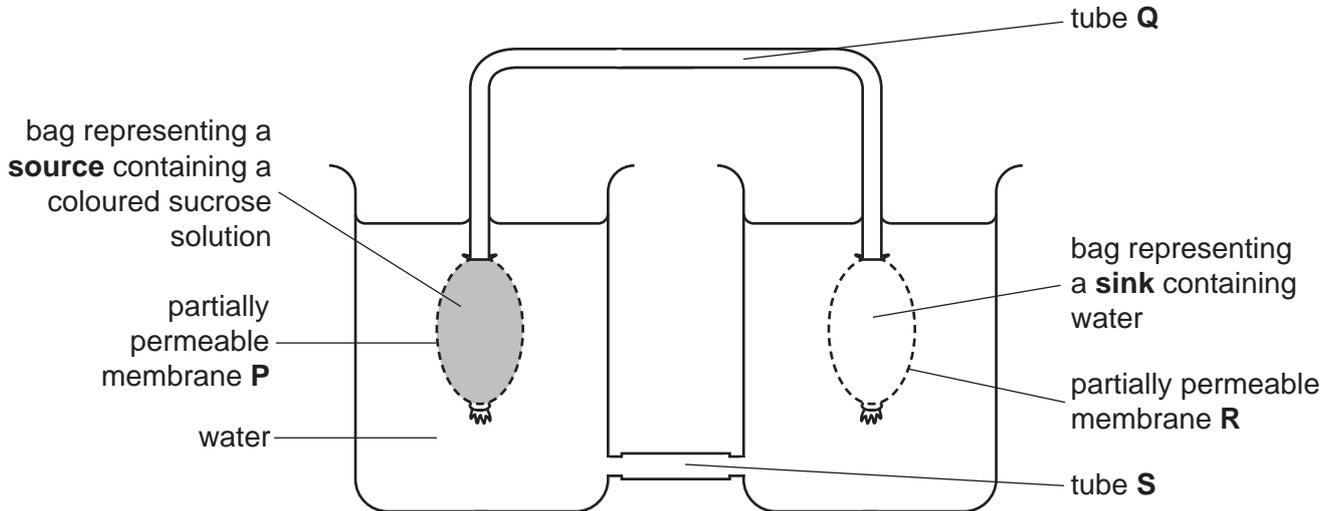


Fig. 2.1

Fig. 2.2 shows the position of the coloured sucrose solution 30 minutes after the apparatus was set up.

The arrows show the direction of the movement of the liquids.

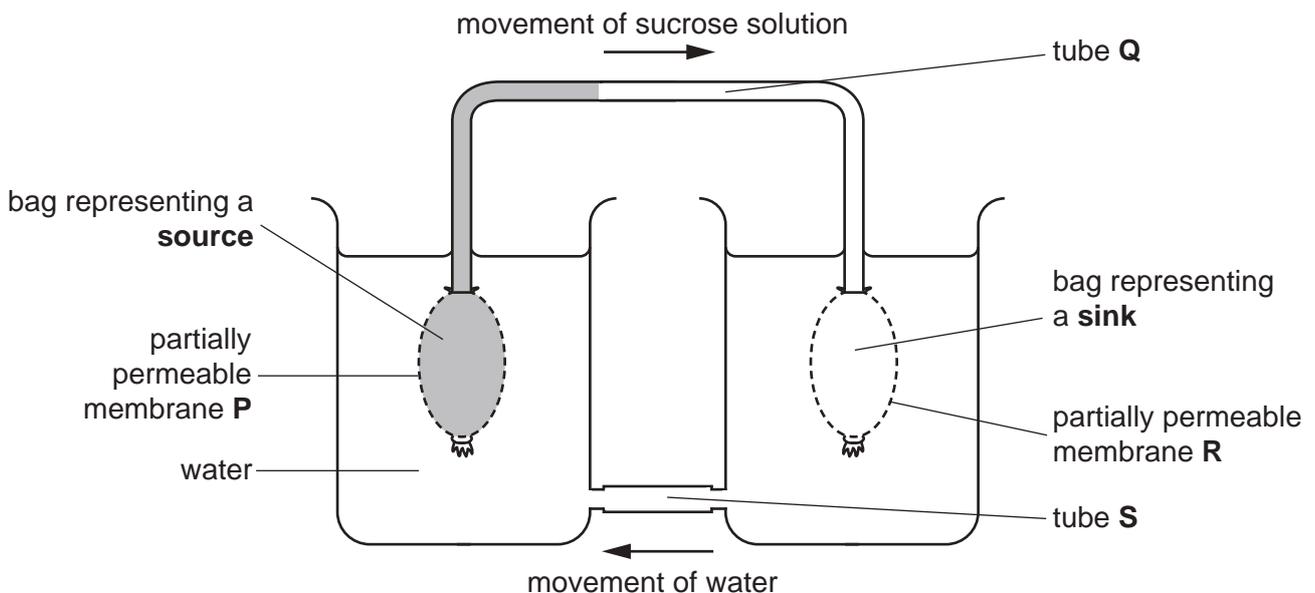


Fig. 2.2

3 Carbohydrates are an important component of a balanced diet.

The flow chart in Fig. 3.1 shows some of the processes that happen to carbohydrates in food that is eaten.

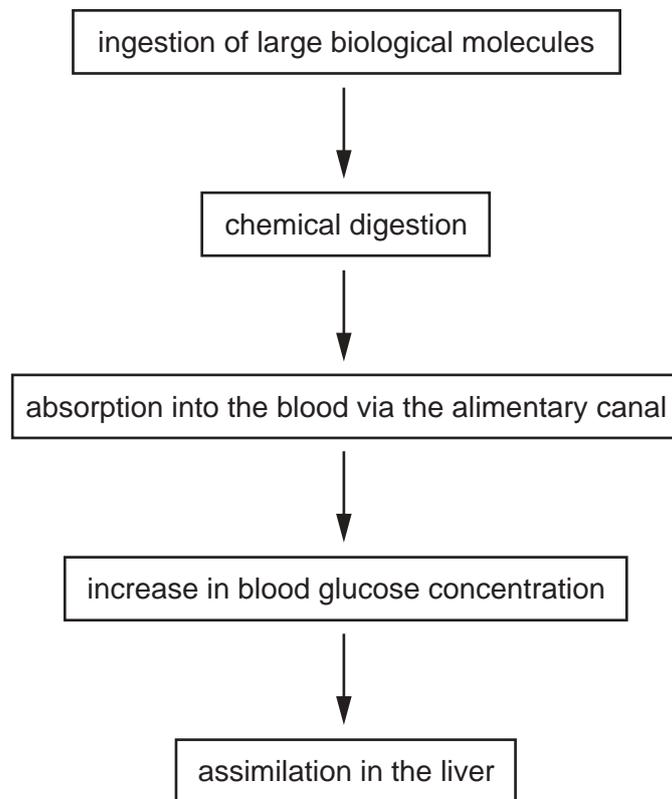


Fig. 3.1

(b) Mineral salts are another important component of a balanced diet.

State the importance of calcium ions and iron ions in a balanced diet.

calcium ions

.....

.....

iron ions

.....

.....

[4]

(c) Consuming too much of some mineral salts, such as sodium chloride, increases the risk of developing coronary heart disease (CHD).

Doctors studied the effect of diet on the risk of developing CHD.

The doctors first selected volunteers who had a high salt diet.

The doctors assessed the volunteers' overall risk of developing CHD and monitored their blood pressure.

(i) List **two** factors, **other than diet and blood pressure**, that the doctors considered when assessing the overall risk of the volunteers developing CHD.

1

2

[2]

(ii) The doctors used urine tests to identify volunteers who had a high salt diet.

Explain why urine tests are a good indicator of how much salt has been consumed.

.....

.....

.....

.....

.....

[2]

(d) The volunteers were divided into two groups.

The mass of salt consumed by **both** groups was changed every 4 weeks:

- low salt intake for 4 weeks
- medium salt intake for 4 weeks
- high salt intake for 4 weeks.

In addition, group 2 was given other changes to their diet but group 1 was not.

(i) Suggest **one** component of the diet of group 2, **other than salt**, that the doctors changed to further reduce the risk of developing CHD.

..... [1]

The systolic blood pressure of the volunteers was measured every 4 weeks. These results are shown in Fig. 3.2.

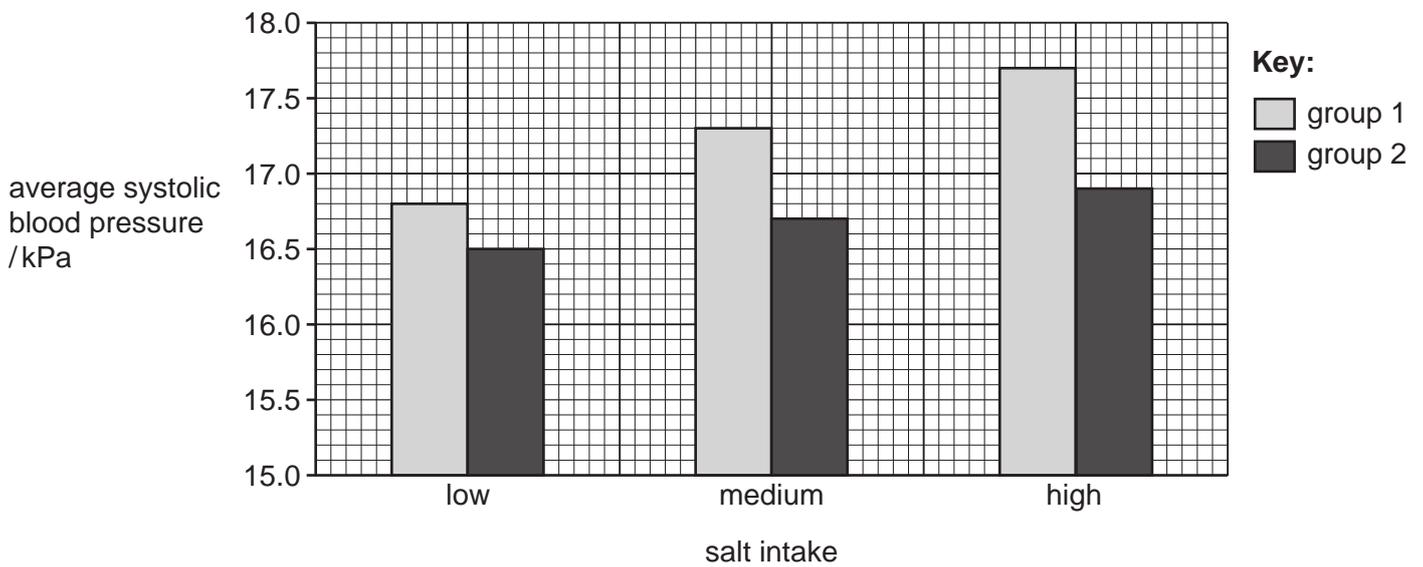


Fig. 3.2

(ii) Calculate the percentage increase in the average systolic blood pressure of the group 1 volunteers when they increased their salt intake from low to high.

low salt intake kPa

high salt intake kPa

Give your answer to the nearest whole number.

Space for working.

..... %
[3]

(iii) The doctors concluded that some diets reduce the risk of CHD.

Give evidence from Fig. 3.2 to support this conclusion.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 23]

4 Forest ecosystems are threatened by many human activities.

(a) (i) Describe reasons why people cut down forests.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [3]

(ii) Describe how forests can be conserved.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [3]

- (b) Ecologists in one country were concerned that some mammals had been affected by deforestation.

Fig. 4.1 is a diagram showing how deforestation affected one area of forest.

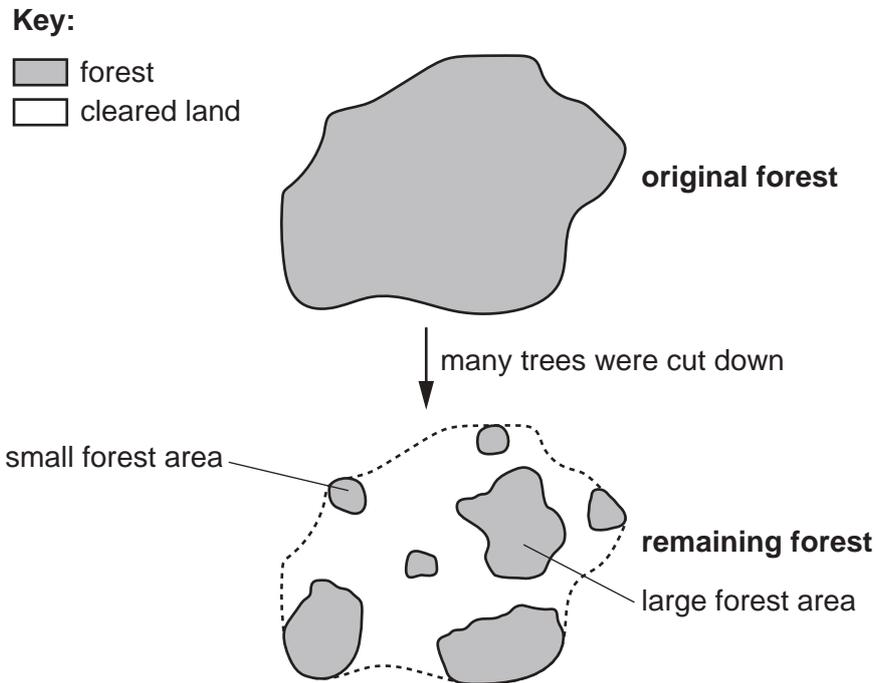


Fig. 4.1

The ecologists studied eight species of mammal. They recorded how many of the small and large areas of the remaining forest contained each of the eight species.

Two species, the black rat and the house mouse, are not usually found in this forest ecosystem. They were introduced to the area by humans many years ago before any trees were cut down.

The other six species are known to live in this forest ecosystem.

Table 4.1

species of mammal	average body mass/g	percentage of small forest areas containing the species	percentage of large forest areas containing the species
house mouse*	18	46	42
brown antechinus	40	62	83
swamp rat	130	15	25
bush rat	160	85	100
black rat*	200	15	0
southern brown bandicoot	850	31	92
long-nosed potoroo	1100	8	17
long-nosed bandicoot	1300	8	25

*introduced species

- (i) State which mammal in Table 4.1 showed almost no preference between small and large areas of forest.

..... [1]

- (ii) The ecologists made a hypothesis:

‘Larger areas of forest are better for the conservation of mammals.’

Discuss the evidence from Table 4.1 to support or reject this hypothesis.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 11]

5 Genetic engineering is an example of an important biotechnology.

(a) Complete the passage below by filling in each space with a suitable word.

DNA is a biological molecule found in the of an animal cell.
The sequence of the in mRNA determines the order of the
amino acids that will be assembled into a

When carrying out genetic engineering, sections of human DNA called
..... are cut using restriction enzymes. Next bacterial plasmids
are cut with the restriction enzymes to form complementary
..... ends.

The cut section of human DNA is inserted into the cut plasmid and they are joined together
to form a plasmid. These plasmids are inserted into
..... and replication occurs. This process is used to produce
human that is used to treat people with diabetes.

[9]

(b) In addition to genetic engineering, enzymes are also useful in other biotechnologies.

State **two** examples of how enzymes are used in another biotechnology.

1

2

[2]

[Total: 11]

(b) State the importance of blood clotting.

.....
.....
.....
.....
..... [2]

(c) There are four blood group phenotypes A, B, AB and O in humans.

(i) Define the term *phenotype*.

.....
.....
..... [1]

(ii) State the name of the type of inheritance that is shown by blood groups.

..... [1]

(iii) State the **two** possible genotypes for a person who has the phenotype blood group A.

1
2 [2]

[Total: 11]

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BIOLOGY **0610/51**
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 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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1	
2	
Total	

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This document consists of **14** printed pages and **2** blank pages.

- 1 The leaves of plants contain green chlorophyll and other coloured pigments that are used in photosynthesis to trap light.

You are going to investigate the pigments present in a green leaf using chromatography. The process of chromatography separates the pigments. The more soluble the pigment the further it moves.

In this experiment the pigments in green leaves dissolve in a solvent (**S1**). The solvent moves up the paper carrying the pigments different distances.

You should use the safety equipment provided while you are carrying out the practical work.

Step 1 Use a ruler to draw a **pencil** line across the strip of chromatography paper 3 cm from one end.

Step 2 Place a leaf on top of the pencil line and transfer the pigment from the leaf onto the pencil line by rolling a metal disc over the leaf as shown in Fig. 1.1. You should see a faint green line on the chromatography paper.

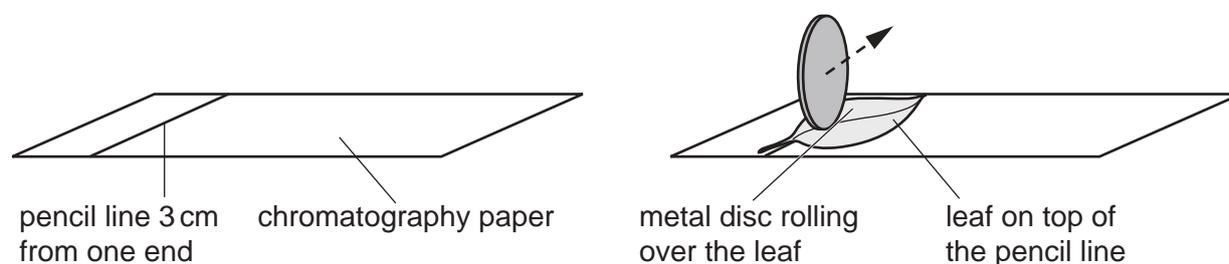


Fig. 1.1

Step 3 Move the leaf so that a different part of the leaf is over the line you have just made and repeat rolling the metal disc across the leaf along the pencil line. Repeat this step until you have a dark green line.

Step 4 Pour solvent **S1** into a test-tube to a depth of 2 cm. Put the lid back on the solvent container to prevent evaporation.

Step 5 Carefully lower the strip of chromatography paper into the test-tube with the green line at the bottom. Do **not** allow the green line to go below the level of solvent **S1** as shown in Fig. 1.2.

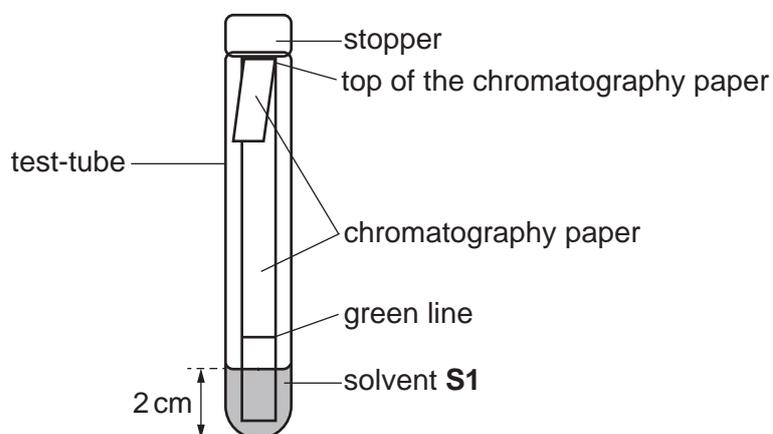


Fig. 1.2

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Step 6 Fold the free end of the chromatography paper over the edge of the outside of the test-tube and place a stopper in the test-tube.

Do not move the test-tube during steps 7 and 8.

Step 7 Start the stop-clock and observe the movement of solvent **S1** up the chromatography paper for one minute while it is inside the test-tube.

Step 8 Wait for five more minutes and then observe the movement of the solvent again while it is inside the test-tube. If the solvent is near the top of the chromatography paper move on to step 9. If it is not near the top of the chromatography paper wait for another five minutes and then move on to step 9.

Step 9 When the solvent is near the top of the chromatography paper (or you have waited for a total of 11 minutes) remove the stopper from the test-tube and lift out the strip of chromatography paper. Put the stopper back into the test-tube to prevent the solvent from evaporating.

Step 10 Place the chromatography paper on a paper towel and use the pencil to draw a line across the paper to mark how far up the chromatography paper solvent **S1** has reached. Leave the paper to dry for one minute.

(a) (i) Use the adhesive tape to stick your completed chromatogram in the space in Fig. 1.3.

Observe the different pigment colours visible on your chromatogram.

Complete Fig. 1.3 by drawing the shape of each pigment colour visible in your chromatogram onto the diagram. Label all the visible pigment colours and the position reached by solvent **S1**.

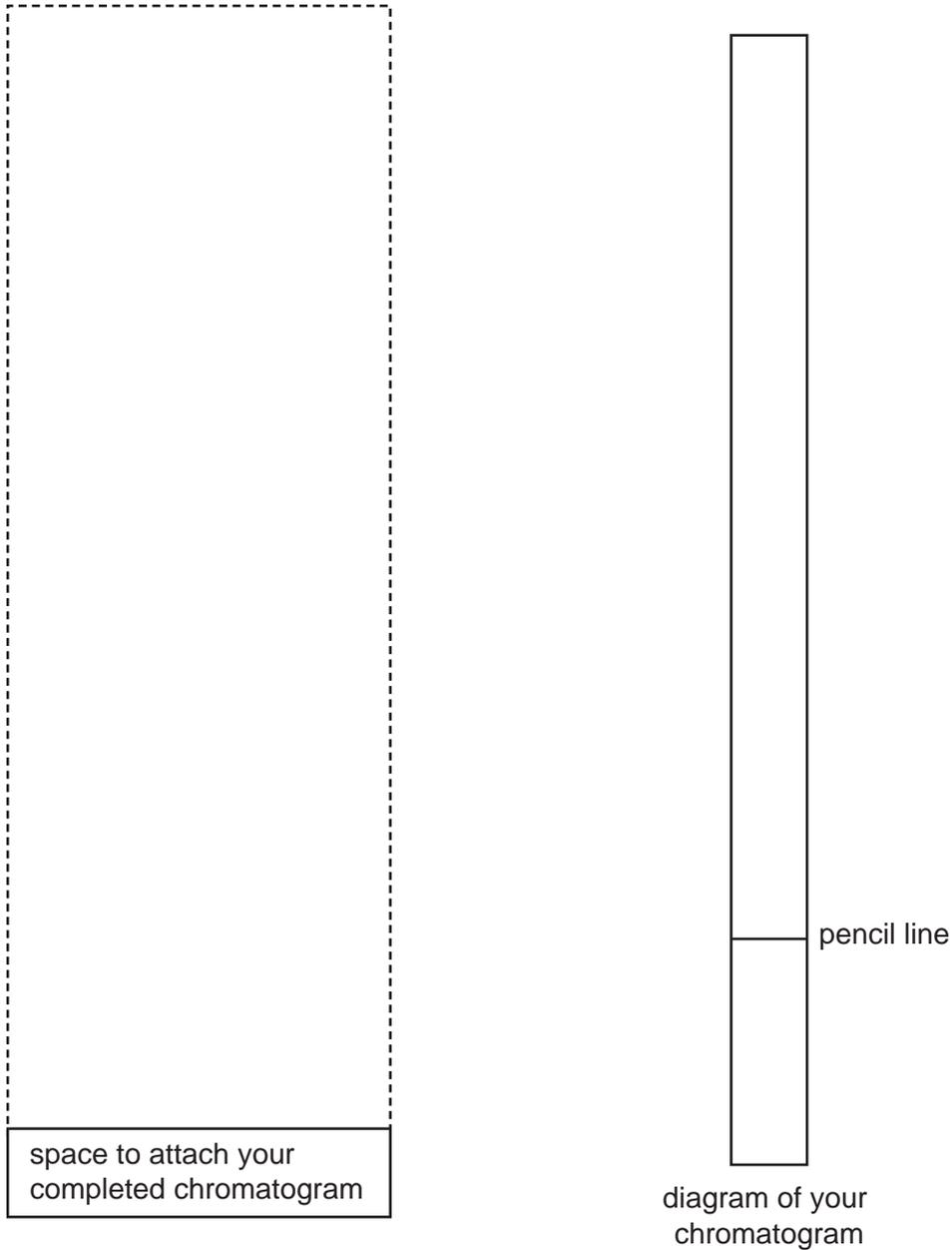


Fig. 1.3

[3]

(ii) Suggest why it is important that the green line was kept above solvent **S1**.

.....

.....

..... [1]

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(b) Some students used a different method to obtain the pigments from a leaf by cutting up the leaf and grinding it with ethanol. They filtered the mixture and obtained a chlorophyll extract which was then evaporated until only a small volume of extract remained. Ethanol is flammable.

(i) State **one** safety precaution that the students would take when evaporating substances containing ethanol.

.....
 [1]

(ii) A chromatography paper was prepared in the same way as in step 1. A small drop of the concentrated chlorophyll extract was placed on the pencil line and allowed to dry. The chromatography paper was then placed in a test-tube containing a different solvent (**S2**) and left for 10 minutes.

Fig. 1.4 shows the appearance of the chromatogram after it was removed from solvent **S2** and allowed to dry.

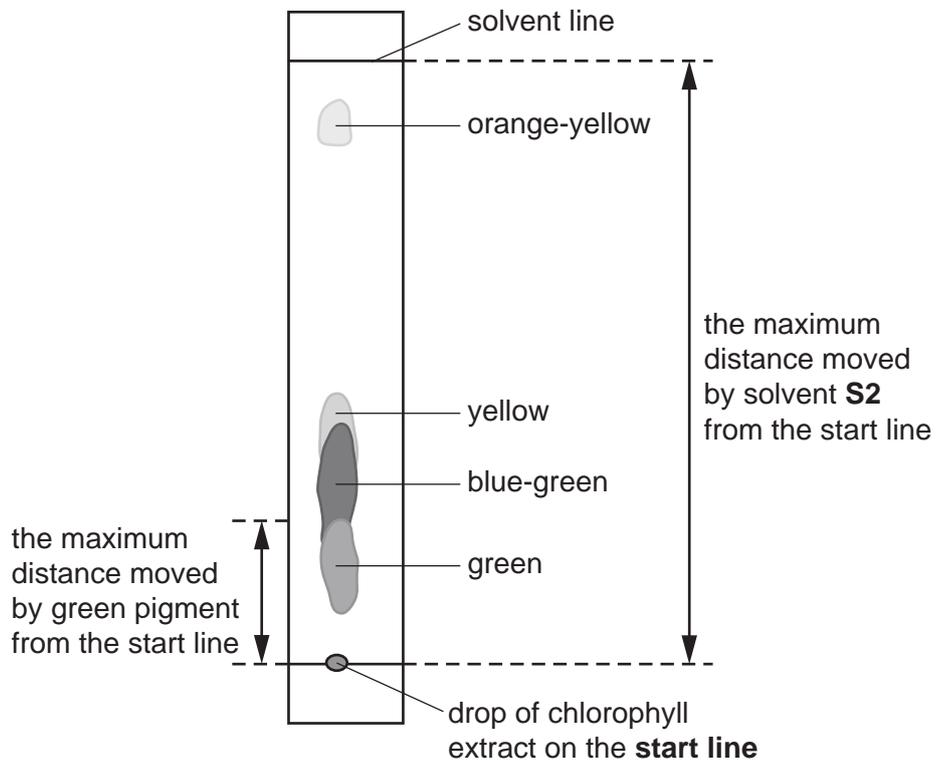


Fig. 1.4

The different pigments can be compared by calculating their Rf value.

$$\text{Rf value} = \frac{\text{the maximum distance moved by the pigment from the start line}}{\text{the maximum distance moved by the solvent from the start line}}$$

Fig. 1.4 shows where these distances were measured on the chromatogram for the green pigment.

The students calculated some of the Rf values. The results are shown in Fig. 1.5.



Fig. 1.5

Calculate the Rf values for the **orange-yellow** pigment in Fig. 1.4.

Give your answer to two decimal places.

the maximum distance moved by the orange-yellow pigment from the start line

..... mm

the maximum distance moved by the solvent from the start line

..... mm

orange-yellow Rf value [3]

(iii) Prepare a table and record the colours and Rf values of the four pigments.

[3]

(iv) Identify the pigment colour that is the least soluble and explain your choice.

pigment colour

explanation

.....

.....

[2]

(c) The method used to separate the leaf pigments in **1(b)** is different from the method you used in **1(a)**.

Describe **two** ways in which the method used in **1(b)** is an improvement to the method you used in **1(a)**.

1

.....

.....

2

.....

.....

[2]

(d) Chloroplasts can contain starch.

State the name of the substance that would be used to test for the presence of starch.

..... [1]

- (e) Chloroplasts contain coloured pigments. Fig. 1.6 shows some of the cells from a leaf that contains chloroplasts.

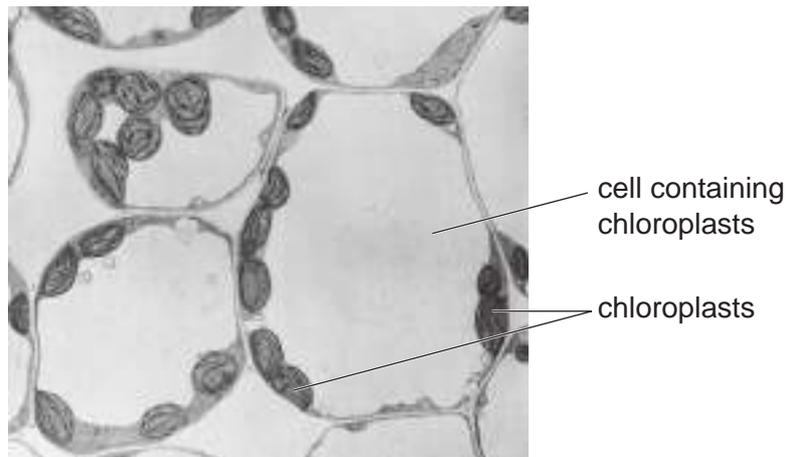


Fig. 1.6

Make a large drawing to show the three complete cells containing chloroplasts in Fig. 1.6.

Label **one** chloroplast on your drawing.

- (ii) The actual size of the counting grid in Fig. 2.1 is 0.20 mm × 0.20 mm. The depth of the counting grid is 0.10 mm.

Calculate the volume of the counting grid.

..... mm³ [1]

- (iii) A different sample of blood was also diluted 200 times.

The number of red blood cells inside the same size counting grid was 95.

Calculate the number of red blood cells per mm³ of undiluted blood.

Use the formula:

$$\text{number of red blood cells per mm}^3 = \frac{\text{red blood cells counted} \times \text{dilution}}{\text{volume of the counting grid}}$$

Space for working.

number of red blood cells per mm³ [1]

- (b) Table 2.1 describes the number of red blood cells and white blood cells in different blood samples.

Table 2.1

condition	number of red blood cells	number of white blood cells
healthy	normal	normal
anaemia	low	normal
leukaemia	low	high
infection	normal	high

Fig. 2.2 shows drawings of blood samples.

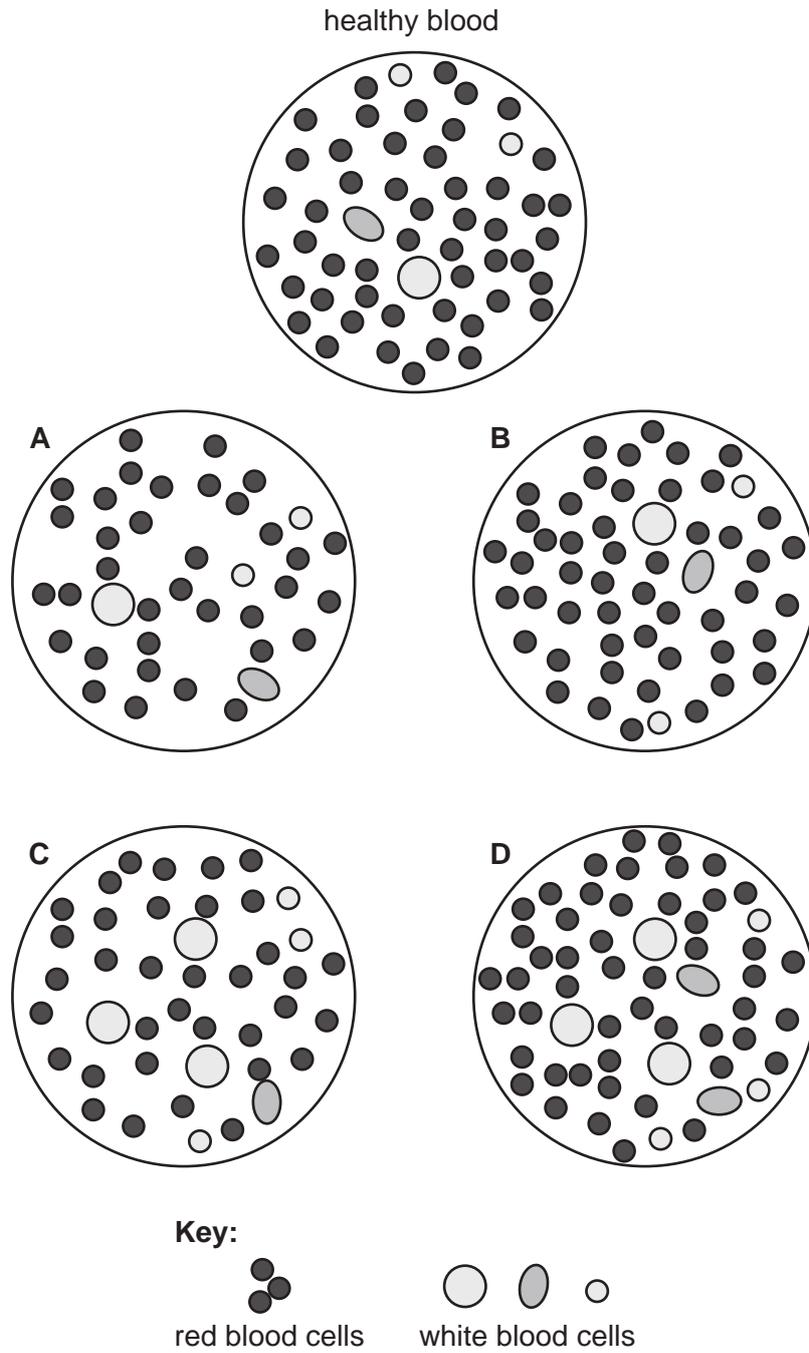


Fig. 2.2

State the letters in Fig. 2.2 which could represent these conditions:

infection

anaemia

[2]

- (c) Anaemia can also be diagnosed by measuring the haemoglobin content of the blood. Samples of blood were collected from 1800 men and 2400 women.

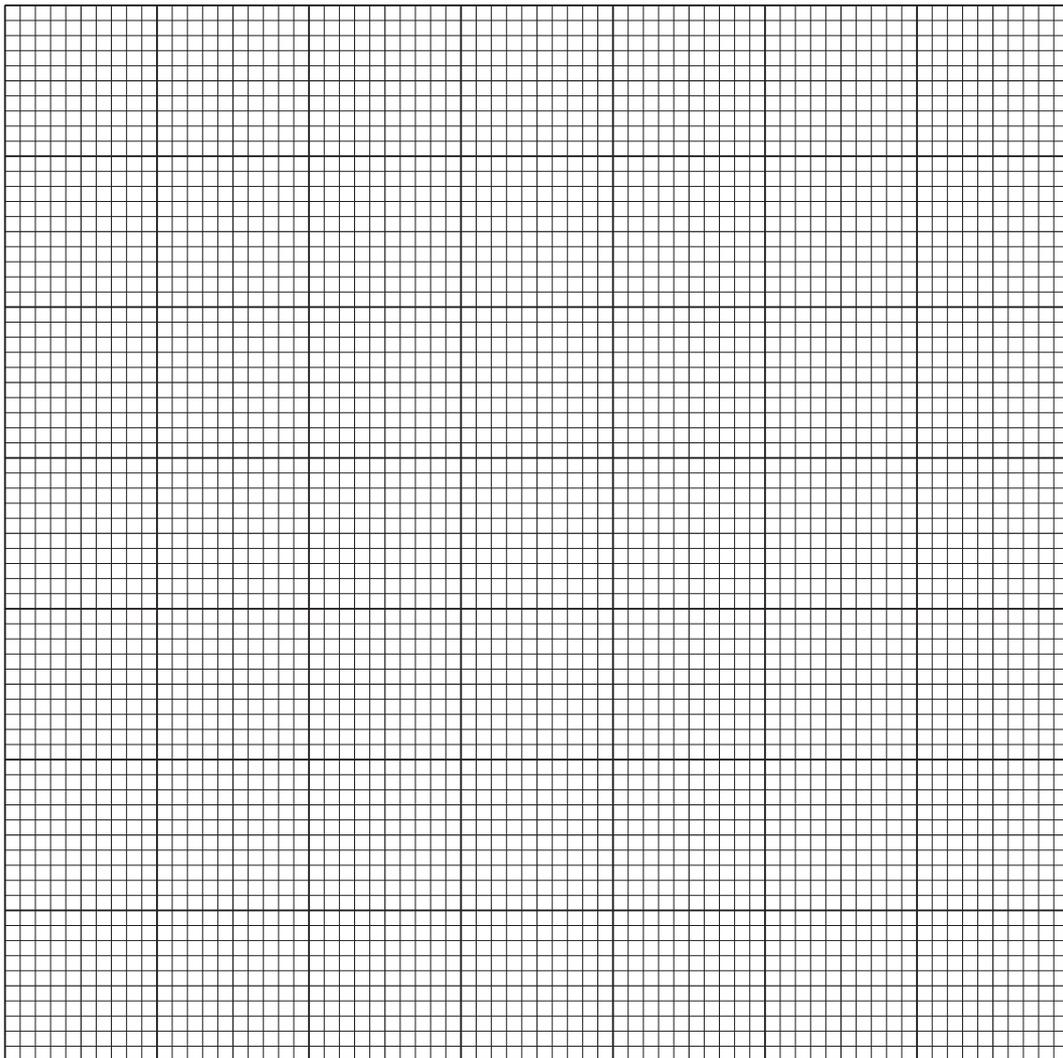
The haemoglobin content of their blood was measured and the percentage of people with anaemia was calculated.

Table 2.2 shows the percentage of men and women in the sample who have anaemia.

Table 2.2

age group	percentage with anaemia	
	men	women
65–74	7.0	8.5
75–84	16.5	11.0
85–94	26.0	20.5

- (i) Plot a histogram to show the percentage of men and women with anaemia in each age group.



(ii) Describe the trends shown by these data.

.....
.....
.....
.....
..... [2]

(iii) Suggest why the data was reported as percentages rather than the actual numbers of men and women with anaemia.

.....
.....
..... [1]

[Total: 13]

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BIOLOGY

0610/52

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 on all the work you hand in.
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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.

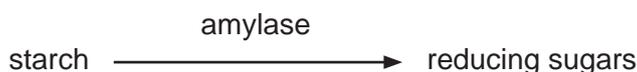
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The number of marks is given in brackets [] at the end of each question or part question.

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This document consists of **10** printed pages and **2** blank pages.

- 1 You will investigate the effect of the enzyme amylase (**A**) on the breakdown of starch (**S**). The starch suspension **S** will be placed inside a bag made from dialysis tubing.



Dialysis tubing is made from a type of membrane that is partially permeable. Only small molecules can pass through this membrane.

Read all the instructions but DO NOT CARRY THEM OUT until you have drawn a table for your results in the space provided in 1(a).

You should use the gloves and eye protection provided while you are carrying out the practical work.

You are supplied with two dialysis tubing bags, amylase solution **A** and starch suspension **S**.

- Step 1 Label two large test-tubes, **E** and **W**, and place them in a test-tube rack.
- Step 2 Use a syringe to put 20 cm³ of distilled water into each of the labelled test-tubes.
- Step 3 Use a syringe to draw up 3 cm³ of starch suspension **S**.
- Step 4 Use another syringe to draw up 3 cm³ of amylase solution **A**.
- Step 5 One end of each of the pieces of dialysis tubing has been knotted to form a bag. Open the **other** end of one of the dialysis tubing bags. You may need to rub the tubing between your fingers to open it.
- Step 6 Put starch suspension **S** and amylase solution **A** from steps 3 and 4 into the open dialysis tubing bag.
- Step 7 Rinse the outside of the dialysis tubing bag by dipping it into the **water for washing**. Keep the open end of the bag above the water.
- Step 8 Carefully lower the dialysis tubing bag into the large test-tube labelled **E**. Fold the top of the bag over the outside of the test-tube. Use an elastic band to hold the dialysis tubing in place as shown in Fig. 1.1.

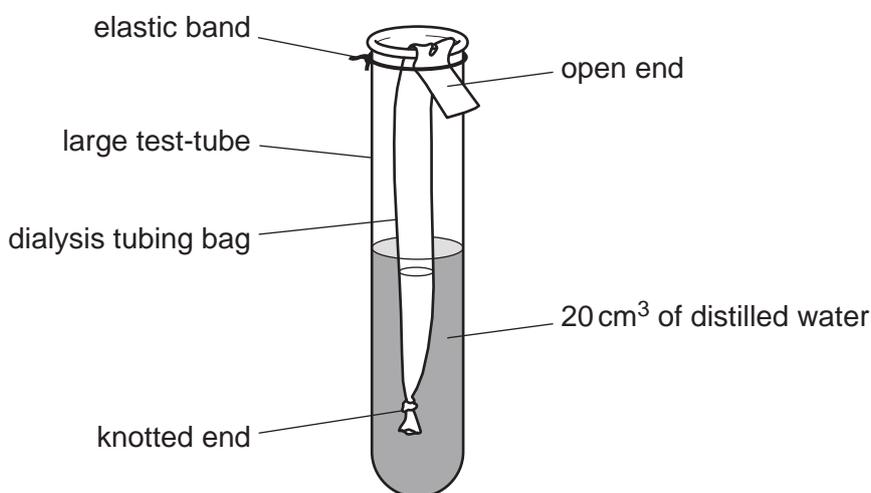


Fig. 1.1

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- Step 9 Repeat steps 3 to 7, using 3 cm³ of distilled water instead of amylase solution **A** in step 4.
- Step 10 Carefully lower the dialysis tubing bag into the large test-tube labelled **W**. Fold the top of the dialysis tubing bag over the outside of the test-tube. Use an elastic band to hold the dialysis tubing in place as shown in Fig. 1.1.
- Step 11 Prepare a water-bath by putting approximately 100 cm³ of hot water into the beaker labelled **water-bath**. Raise your hand when you are ready for a supply of hot water for your water-bath.
- Step 12 Put both large test-tubes into the water-bath and leave them for 10 minutes.

Continue with the other questions while you are waiting.

- Step 13 After 10 minutes carefully remove the dialysis tubing bag from large test-tube **E** and pour the contents of the dialysis tubing bag into the beaker labelled **E2**.
- Step 14 Carefully remove the dialysis tubing bag from large test-tube **W** and pour the contents of the dialysis tubing bag into the beaker labelled **W2**.

You are going to test the contents of the two large test-tubes (**E** and **W**) and the two beakers (**E2** and **W2**) for starch.

- Step 15 Use a clean pipette to place a drop of the solution from large test-tube **E** onto a white tile and add one drop of iodine solution.

Record the colour in the table you have prepared in **1(a)**.

- Step 16 Repeat step 15 using the solution from large test-tube **W**.
- Step 17 Repeat step 15 using the solution from beaker **E2**.
- Step 18 Repeat step 15 using the solution from beaker **W2**.

(a) Prepare a table to record the results of the tests for starch in the space provided.

(b) (i) Suggest why the dialysis tubing bag was rinsed in step 7.

.....
.....
..... [1]

(ii) Explain why distilled water was used instead of amylase solution **A** in the dialysis tubing bag in test-tube **W**.

.....
.....
.....
.....
..... [2]

(iii) State **two** variables that were kept constant during this investigation.

1
2 [2]

A student carried out the same investigation but also tested the solutions for reducing sugars.

(c) Describe how the student would find out if the solutions contained reducing sugars.

.....
.....
.....
.....
.....
.....
..... [3]

- 2 An investigation was performed to determine the effect of light intensity on leaf size in one species of plant.

Plants were grown in three different light intensities. The maximum width of each leaf was recorded. The results were recorded in Table 2.1 and an average value was calculated.

The results for three leaves grown in high light intensity are shown in Fig. 2.1. The horizontal line on each leaf indicates its maximum width.

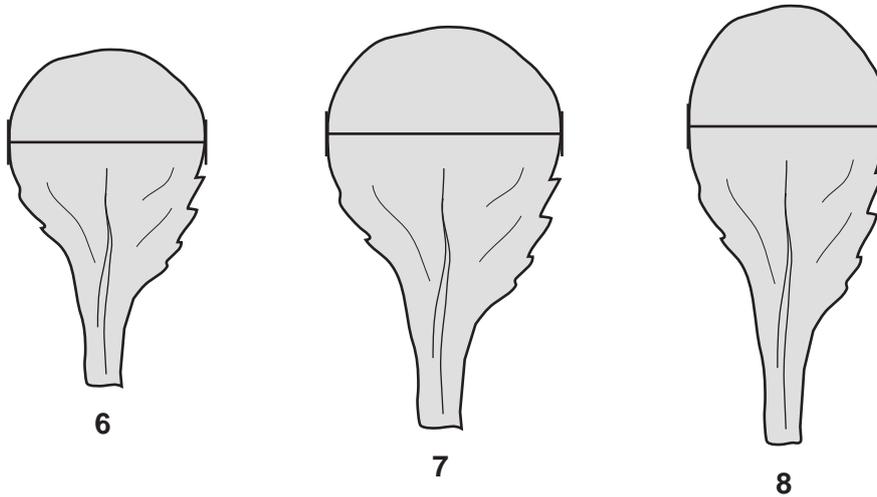


Fig. 2.1

- (a) (i) Measure the maximum widths of leaves 6, 7 and 8 in Fig. 2.1 and record these values in Table 2.1.

[1]

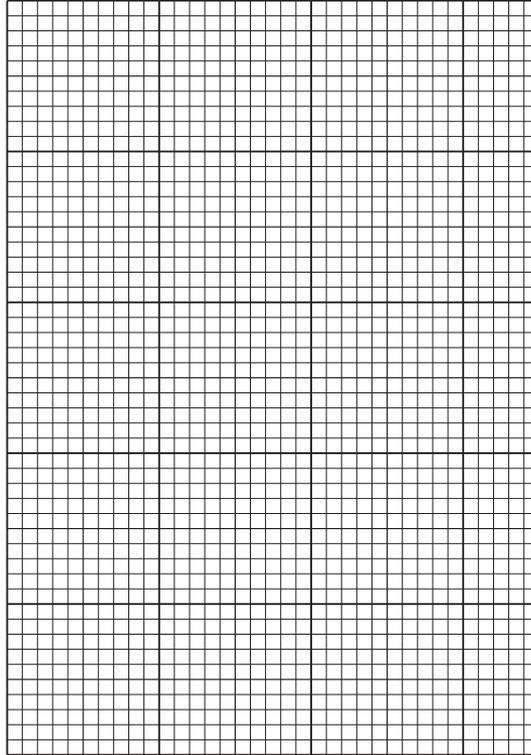
Table 2.1

leaf	maximum width of leaves/mm		
	low light intensity	medium light intensity	high light intensity
1	15	43	27
2	12	45	32
3	13	48	26
4	13	44	28
5	15	47	27
6	14	43	
7	12	12	
8	15	46	
average	14	41	

- (ii) Calculate the average width of the leaves grown in a high light intensity in Table 2.1. Record this value in Table 2.1.

[1]

- (iii) Plot a bar chart on the grid of the **average** leaf width for leaves grown in low, medium and high light intensity using the data in Table 2.1.



[3]

- (iv) Circle **one** measurement in Table 2.1 that could be considered to be anomalous. Give a reason for your choice.

reason

..... [2]

- (b) (i) State the variable that was changed in this investigation (the independent variable).
..... [1]

- (ii) State the variable that was measured in this investigation (the dependent variable).
..... [1]

(c) Fig. 2.2 is a photomicrograph of a cross-section of a root.

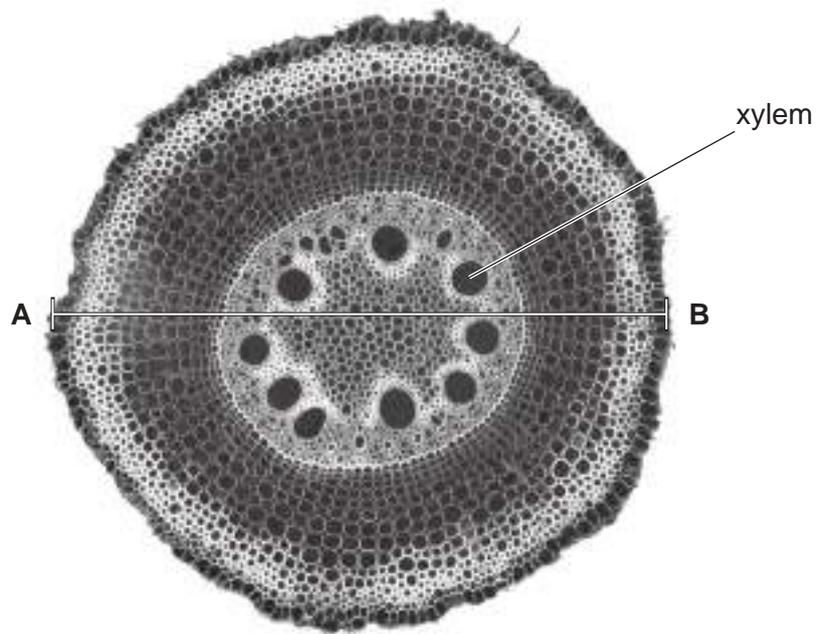


Fig. 2.2

- (i) Make a large drawing of the cross-section of the root in Fig. 2.2 to show the different areas of the root.

Do **not** draw individual cells.

(ii) Measure line **AB** on Fig. 2.2 in millimetres.

length of line **AB** mm

The actual diameter of the root shown in Fig. 2.2 is 2 mm.

Calculate the magnification of Fig. 2.2 using the equation.

$$\text{magnification} = \frac{\text{length of line AB on Fig. 2.2}}{\text{actual diameter of the root}}$$

.....
[2]

(iii) Fig. 2.3 is a photomicrograph of a cross-section of a stem.

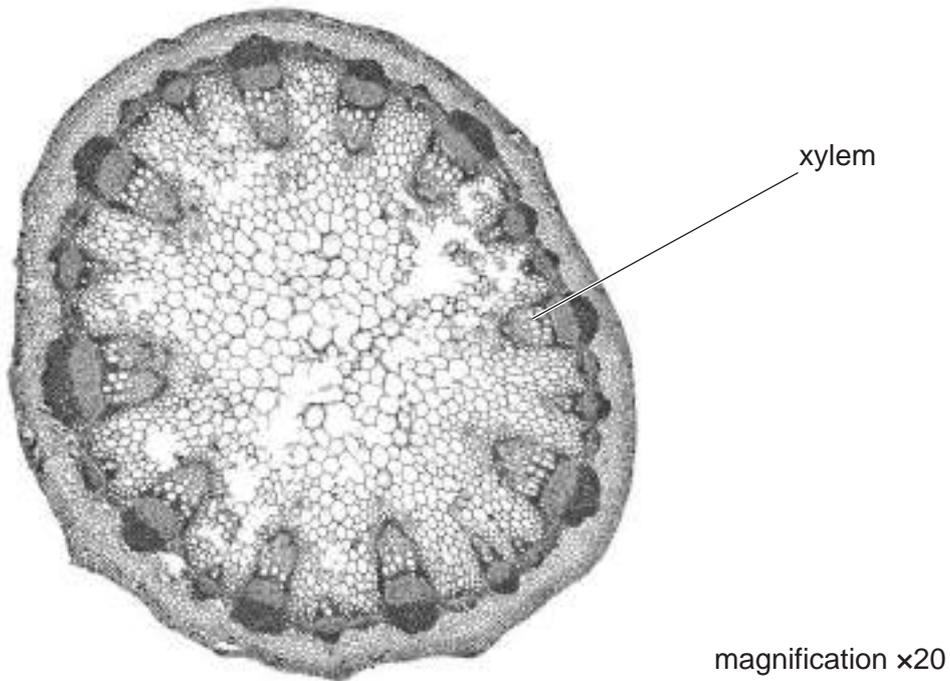


Fig. 2.3

State **two** differences between the root in Fig. 2.2 and the stem in Fig. 2.3.

- 1
-
- 2
-

[2]

(d) A student suggested that measuring leaf area is better than measuring leaf width.

(i) Describe how the area of a leaf could be measured.

.....
.....
.....
.....
..... [2]

(ii) Suggest why measuring leaf area is better than measuring leaf width.

.....
..... [1]

[Total: 20]

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BIOLOGY

0610/53

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 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.

For Examiner's Use	
1	
2	
Total	

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This document consists of **10** printed pages and **2** blank pages.

- 1 Photosynthesis occurs in chloroplasts. A chloroplast suspension can be made by extracting the chloroplasts from green leaves.

You are going to investigate the effect of light on photosynthesis in a chloroplast suspension.

The blue dye DCPIP can be used to investigate photosynthesis. During photosynthesis the dark blue colour of the DCPIP changes and eventually disappears so that it becomes colourless.

Read all the instructions but DO NOT CARRY THEM OUT until you have drawn a table for your results in the space provided in 1(a)(i).

You should wear the gloves and eye protection provided during the practical work in question 1.

- Step 1 You are provided with eight green leaves. Tear the leaves into small pieces and place them into the mortar (bowl).
- Step 2 Pour all of the ice-cold solution from the beaker labelled **isolation medium** into the mortar (bowl).
- Step 3 Use the pestle (or spoon) to grind the leaves in the isolation medium for three minutes.
- Step 4 Place three layers of muslin into the funnel. Put the funnel into the large test-tube labelled **C**.

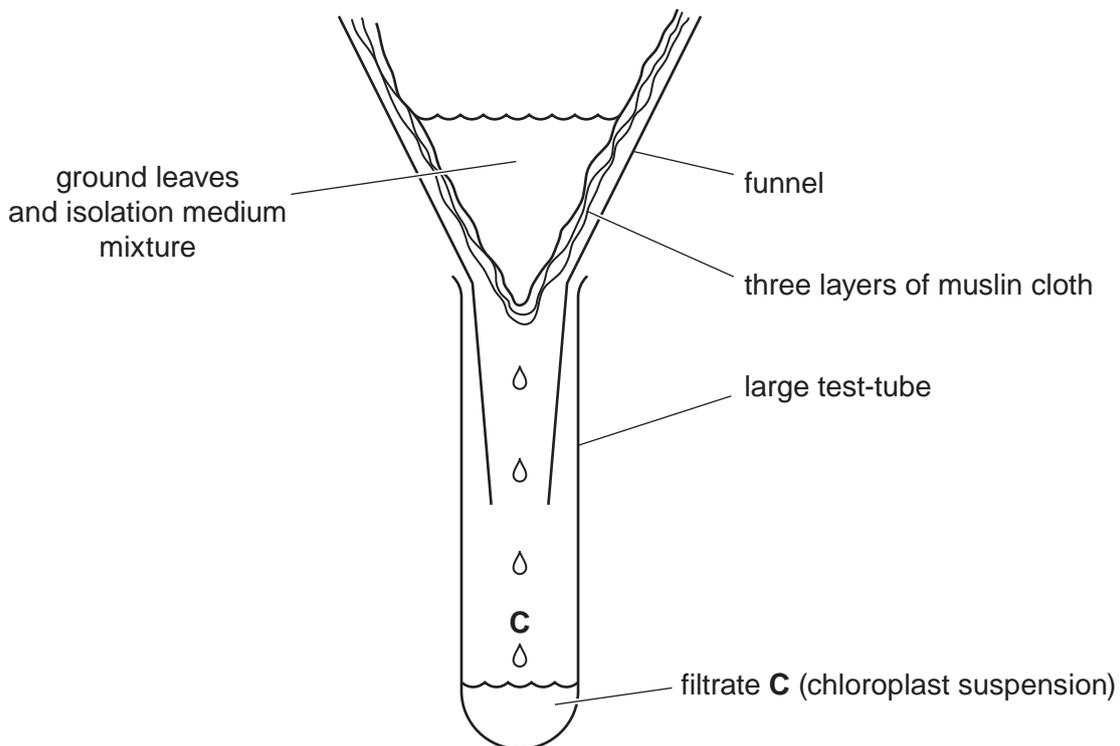


Fig. 1.1

- Step 5 Carefully hold the edges of the muslin and pour the ground leaves and isolation medium mixture from the mortar (bowl) into the muslin-lined funnel. When most of the liquid has filtered into the large test-tube, as shown in Fig. 1.1, place the muslin and funnel in the **waste** container.
- Step 6 Raise your hand when you are ready for ice-cold water to be added to the water-bath.

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- Step 7 Wrap aluminium foil around one empty test-tube to exclude light. Leave the opening at the top of the test-tube uncovered. Do **not** wrap the second test-tube. Place both test-tubes into the test-tube rack.
 - Step 8 Use the plastic pipette to add 2 cm³ of filtrate **C** to each of the empty test-tubes.
 - Step 9 Use a 5 cm³ syringe to add 5 cm³ of DCPIP solution to each of the two test-tubes. Place a stopper in both test-tubes. Stand both test-tubes in the water-bath and position the water-bath near a bright light source or lamp.
 - Step 10 Start the stop-clock and wait five minutes.
 - Step 11 After five minutes observe the colour in the uncovered test-tube and record it in your table in **1(a)(i)**.
 - Step 12 Remove the aluminium foil from the other test-tube. Immediately observe the colour of the liquid in the test-tube. Record this in your table in **1(a)(i)**.
- (a) (i)** Prepare a table to record your results.

[3]

- (ii)** Identify the variable that was changed (independent variable) and the variable that was measured (dependent variable) in this investigation.

independent variable

.....

dependent variable

.....

[2]

- (iii)** State **two** variables that have been kept constant in this investigation.

1

.....

2

.....

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(iv) State a conclusion for these results.

.....
.....
..... [1]

(b) The investigation was not repeated.

(i) Suggest why it would be advisable to repeat the investigation.

.....
.....
..... [1]

(ii) Identify **two** other sources of error in this investigation.

error 1

.....

error 2

..... [2]

(iii) Suggest an improvement for **one** of the errors you have identified in **1(b)(ii)**.

.....
.....
..... [1]

2 Fig. 2.1 is a photomicrograph of part of the lower epidermis of a leaf.

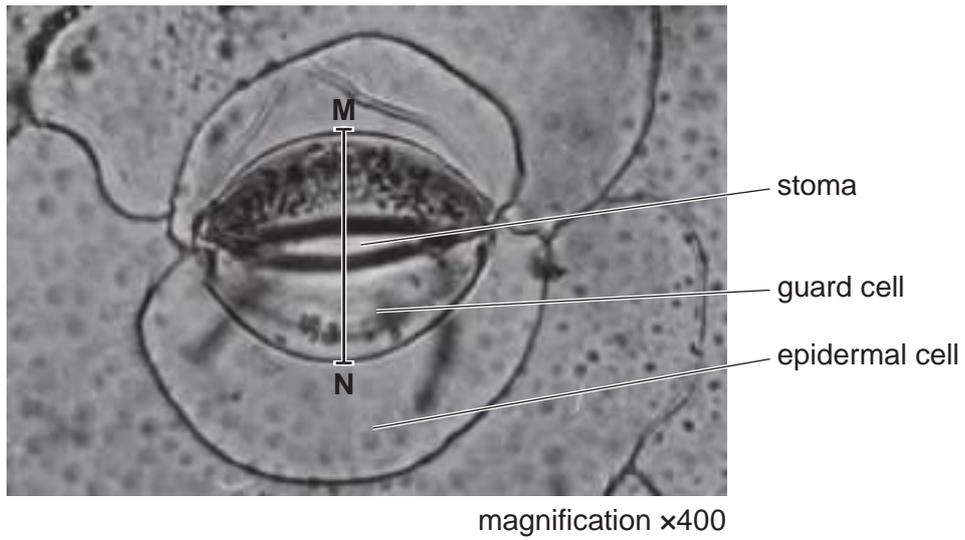


Fig. 2.1

(a) (i) Make a large drawing of Fig. 2.1. Do not label your drawing.

[4]

- (ii) Measure the length of the line **MN** on Fig. 2.1.

length of line **MN**mm

Calculate the actual width of the guard cells and the stoma indicated by line **MN** in Fig. 2.1. Use the equation and information in Fig. 2.1.

$$\text{magnification} = \frac{\text{length of line MN on Fig. 2.1}}{\text{actual width of the guard cells and the stoma}}$$

Give your answer to two decimal places.

.....mm
[3]

- (b) A student investigated the effect of sucrose concentration on stomatal opening.

Strips of epidermis from leaves were placed in different concentrations of sucrose solution for one hour.

The student measured the width of 10 stomatal openings from the epidermis in each sucrose solution.

The results are shown in Table 2.1.

Table 2.1

percentage concentration of sucrose	width of stomatal opening / μm										average
	1	2	3	4	5	6	7	8	9	10	
0	5	6	7	5	5	6	7	5	7	6	5.9
5	3	4	3	3	4	3	2	3	3	2	
20	1	2	1	2	1	1	5	1	2	1	1.7

- (i) Circle **one** measurement in Table 2.1 that could be anomalous. [1]

- (ii) Calculate the average width of stomatal opening in the 5% sucrose solution.

Include the unit.

.....
[2]

- (c) Pineapple plants are adapted to grow in hot dry conditions.

Scientists investigated the number of stomata open, in pineapple plants, at different times of day.

The data is shown in Table 2.2 (00:00 is midnight).

Table 2.2

time of day	average number of stomata open per mm ²
00:00	77
04:00	61
08:00	22
12:00	4
16:00	10
20:00	51

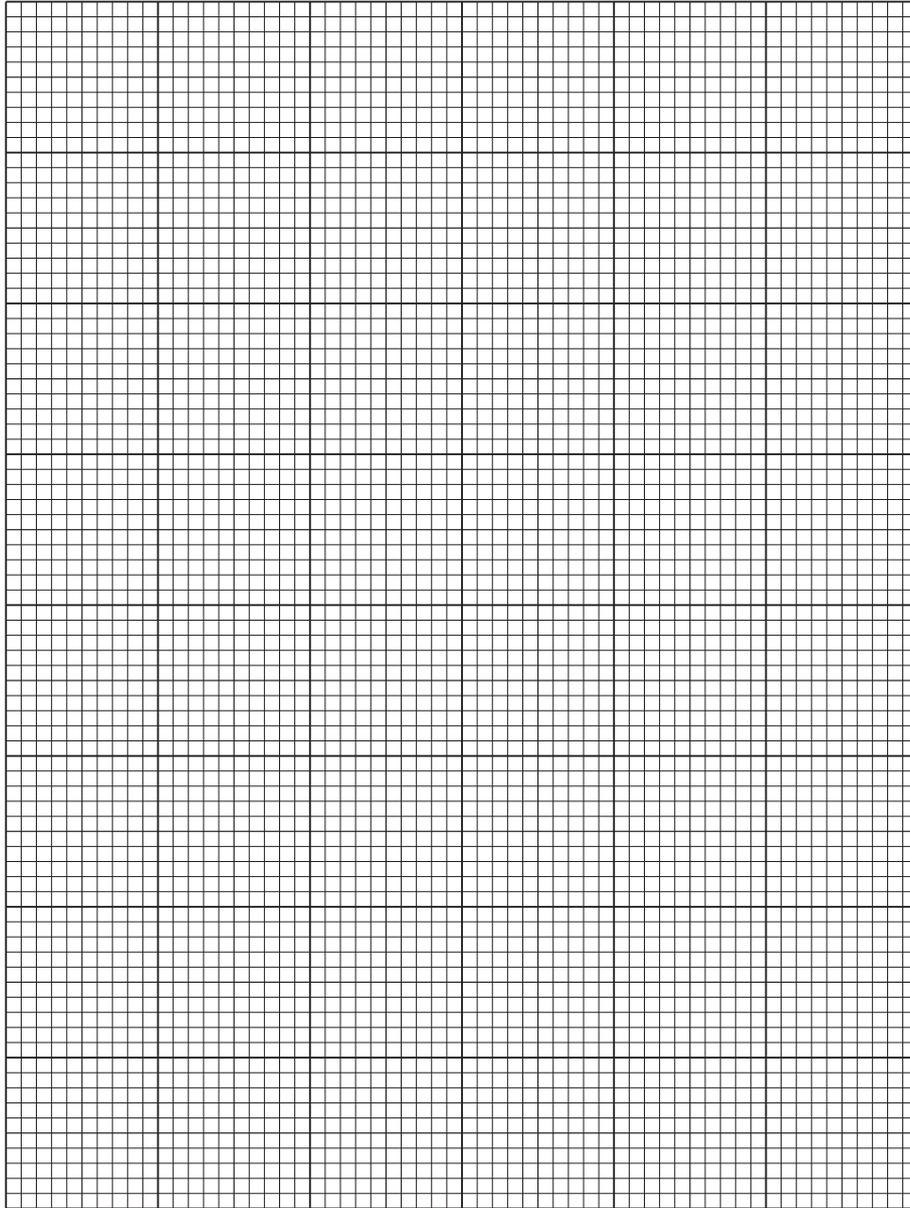
- (i) Calculate the percentage change in the average number of open stomata per mm² between 16:00 hours and 20:00 hours.

Space for working.

.....%

[2]

(ii) Plot a bar chart on the grid to show the data in Table 2.2.



[3]

(iii) Describe, using your graph, how the average number of open stomata per mm² changes throughout the day.

.....

.....

.....

.....

.....

[2]

(d) When fruit ripens the starch contained within it is converted into reducing sugars.

(i) State the name of the substance that is used to test for the presence of starch.

..... [1]

(ii) Describe how you could safely show a reducing sugar was present in a sample of pineapple fruit juice.

procedure

.....

.....

.....

.....

safety

..... [4]

[Total: 22]

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BIOLOGY

0610/61

Paper 6 Alternative to Practical

October/November 2019

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

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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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- 1 The leaves of plants contain chlorophyll and other coloured pigments that are used in photosynthesis to trap light.

Some students investigated the pigments present in a green leaf using chromatography. The process of chromatography separates the pigments. The more soluble the pigment the further it moves.

In this experiment the pigments in a green leaf were dissolved in a solvent (**S1**). The solvent moved up the paper carrying the dissolved pigments different distances.

- Step 1 The pigments from a green leaf were transferred to a strip of chromatography paper by pressing the leaf onto the paper using the edge of a metal disc. A green line was then visible on the paper as shown in Fig. 1.1.

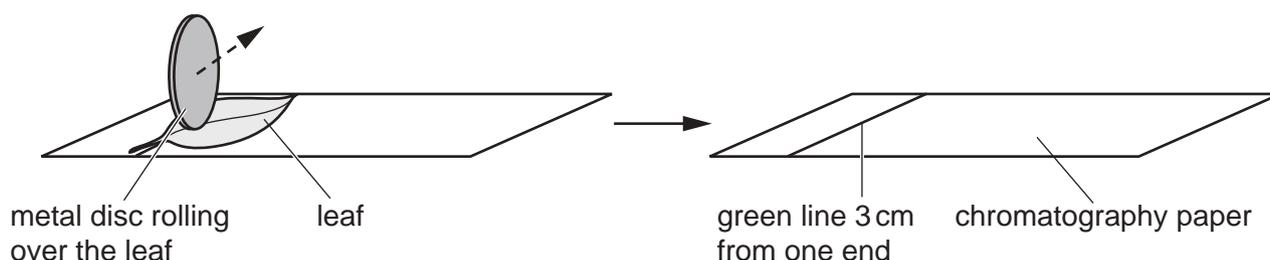


Fig. 1.1

- Step 2 Solvent **S1** was poured into a test-tube to a depth of 2 cm.

- Step 3 The strip of chromatography paper was lowered into the test-tube with the green line at the bottom so that part of the chromatography paper was in solvent **S1**. The green line remained above the level of solvent **S1** as shown in Fig. 1.2.

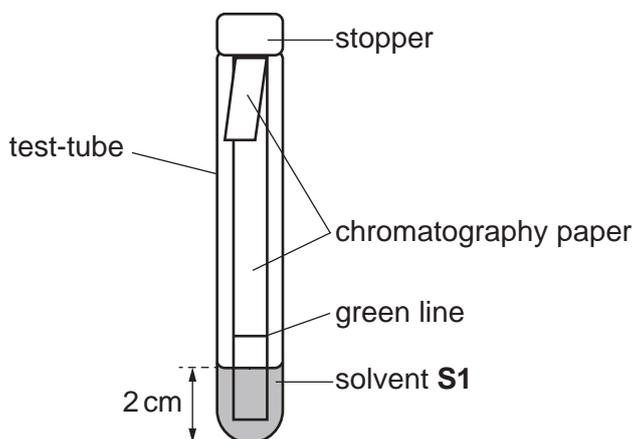


Fig. 1.2

- Step 4 The free end of the chromatography paper was folded over the edge of the test-tube and a stopper was placed into the test-tube. The movement of solvent **S1** up the chromatography paper was observed for 15 minutes.

- Step 5 After 15 minutes the strip of chromatography paper was removed from the test-tube.

Step 6 The chromatography paper was placed on a paper towel and a pencil line was drawn across the paper to mark how far up the chromatography paper solvent **S1** had moved.

(a) Fig. 1.3 shows a diagram of the chromatography paper after it was dry.

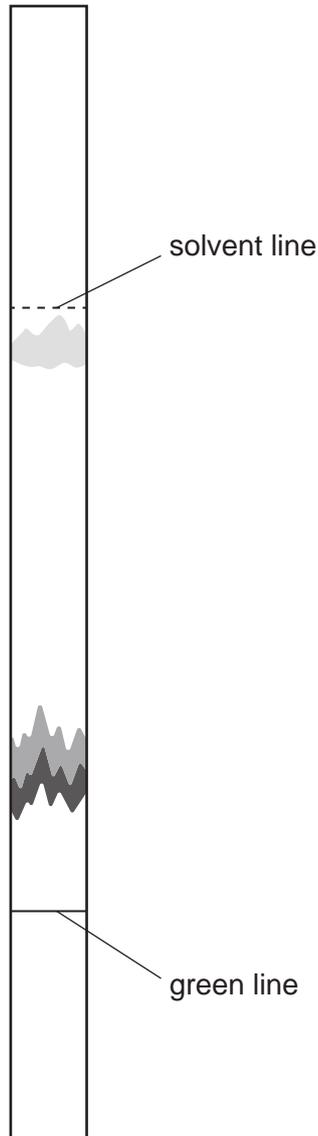


Fig. 1.3

(i) State how many different pigments are visible on the chromatography paper in Fig. 1.3.
..... [1]

(ii) Suggest why it was important that the green line was kept above solvent **S1** in the test-tube in Fig. 1.2.

.....
.....
..... [1]

- (iii) The students investigated the pigments in another type of green leaf using the same method.

State **two** variables that should be kept constant in this investigation.

1

2

[2]

- (b) Some students used a different method to obtain the pigments from a leaf by cutting up the leaf and grinding it with ethanol. They filtered the mixture and obtained a chlorophyll extract which was then evaporated until only a small volume of extract remained. Ethanol is flammable.

- (i) State **one** safety precaution that the students would take when evaporating substances containing ethanol.

.....

..... [1]

- (ii) A start line was drawn in pencil on a piece of chromatography paper. A small drop of the concentrated chlorophyll extract was placed on the start line and allowed to dry. The chromatography paper was then placed in a test-tube containing a different solvent (**S2**) and left for 10 minutes.

Fig. 1.4 shows the appearance of the chromatography paper after it was removed from solvent **S2** and allowed to dry.

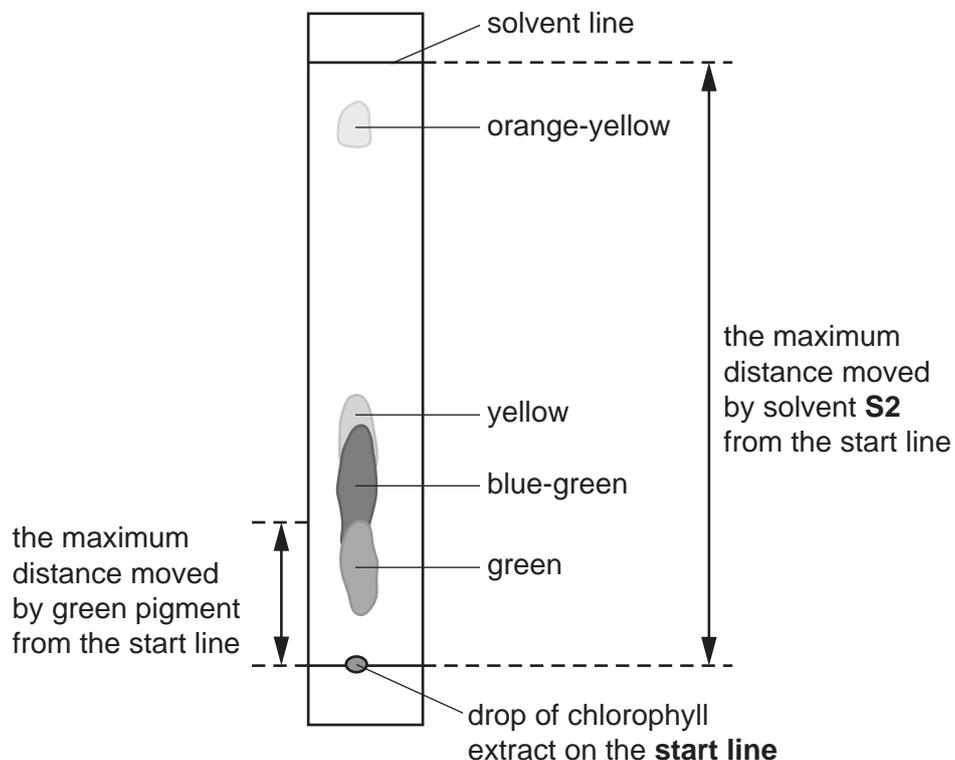


Fig. 1.4

The different pigments can be compared by calculating their Rf value.

$$\text{Rf value} = \frac{\text{the maximum distance moved by the pigment from the start line}}{\text{the maximum distance moved by the solvent from the start line}}$$

Fig. 1.4 shows where these distances were measured on the chromatography paper for the green pigment.

The students calculated some of the Rf values. The results are shown in Fig. 1.5.



Fig. 1.5

Calculate the Rf values for the **orange-yellow** pigment in Fig. 1.4.

Give your answer to two decimal places.

the maximum distance moved by the orange-yellow pigment from the start line

..... mm

the maximum distance moved by the solvent from the start line

..... mm

orange-yellow Rf value

[3]

(iii) Prepare a table and record the colours and Rf values of the four pigments.

[3]

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[Turn over

(iv) Identify the pigment colour that is the least soluble and explain your choice.

pigment colour

explanation

.....

.....

[2]

(c) The method used to separate the leaf pigments in **1(b)** is different from the method used in **1(a)**.

Describe **two** ways in which the method used in **1(b)** is an improvement to the method used in **1(a)**.

1

.....

.....

2

.....

.....

[2]

(d) Chloroplasts can contain starch.

State the name of the substance that would be used to test for the presence of starch.

..... [1]

- (e) Chloroplasts contain coloured pigments. Fig. 1.6 shows some of the cells from a leaf that contain chloroplasts.

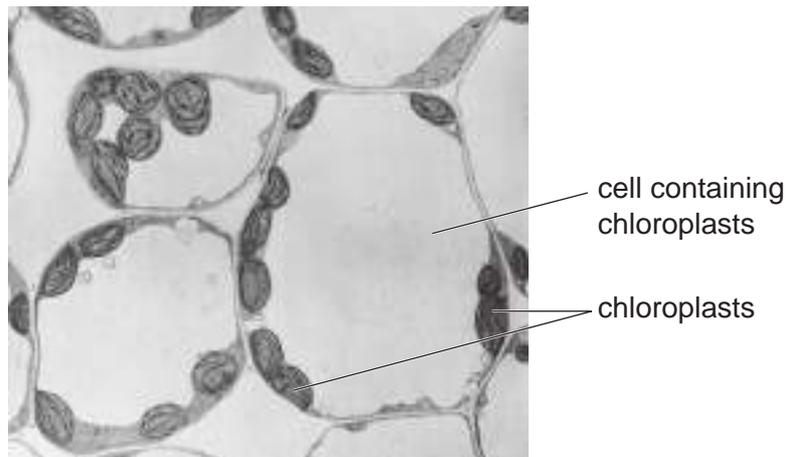


Fig. 1.6

Make a large drawing to show the three complete cells containing chloroplasts in Fig. 1.6.

Label **one** chloroplast on your drawing.

- 2 (a) Fig. 2.1 is a diagram of a sample of red blood cells on part of a counting grid. The blood has been diluted 200 times so that the cells can be counted more easily. A light microscope is used to view the counting grid.

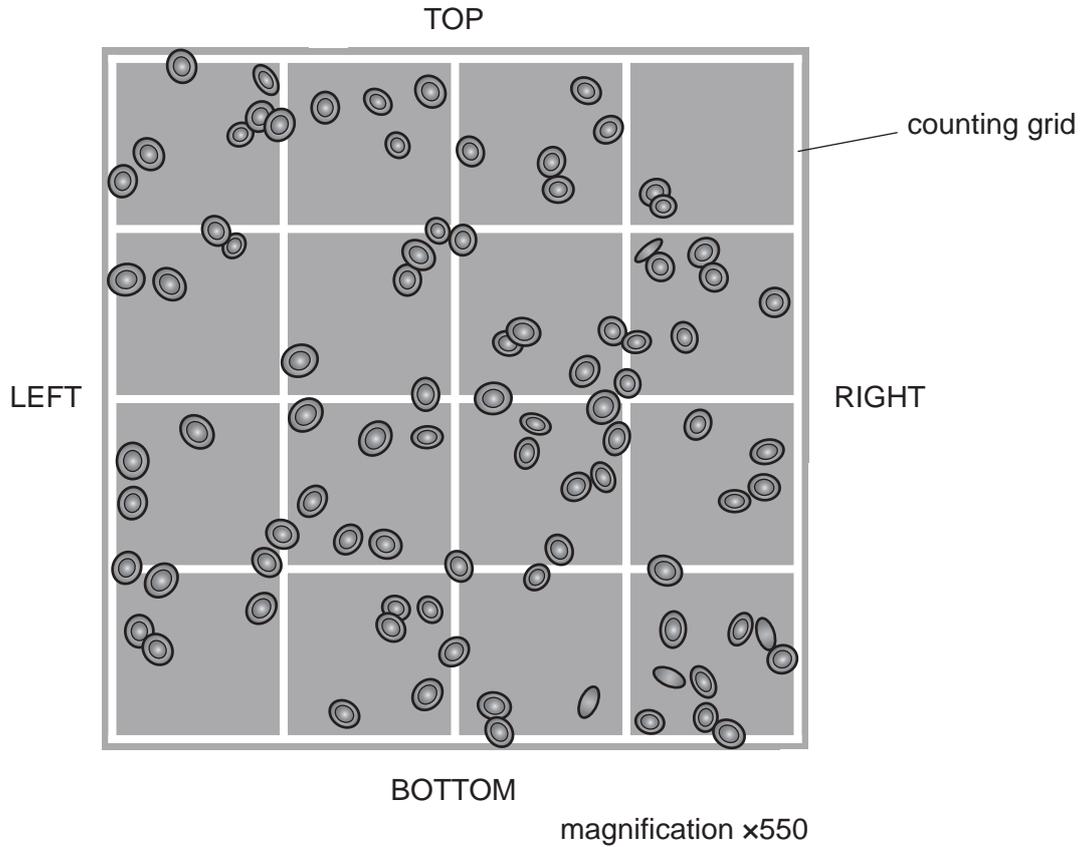


Fig. 2.1

- (i) Scientists count the number of red blood cells to estimate the total number of red blood cells in the blood.

Cells that are touching the top and left side of the grid are counted.

Cells touching the bottom and right side of the grid are **not** counted.

State how many cells would **not** be counted in the sample in Fig. 2.1.

..... [1]

- (ii) The actual size of the counting grid in Fig. 2.1 is 0.20 mm × 0.20 mm. The depth of the counting grid is 0.10 mm.

Calculate the volume of the counting grid.

..... mm³ [1]

- (iii) A different sample of blood was also diluted 200 times.

The number of red blood cells inside the same size counting grid was 95.

Calculate the number of red blood cells per mm³ of undiluted blood.

Use the formula:

$$\text{number of red blood cells per mm}^3 = \frac{\text{red blood cells counted} \times \text{dilution}}{\text{volume of the counting grid}}$$

Space for working.

number of red blood cells per mm³ [1]

- (b) Table 2.1 describes the number of red blood cells and white blood cells in different blood samples.

Table 2.1

condition	number of red blood cells	number of white blood cells
healthy	normal	normal
anaemia	low	normal
leukaemia	low	high
infection	normal	high

Fig. 2.2 shows drawings of blood samples.

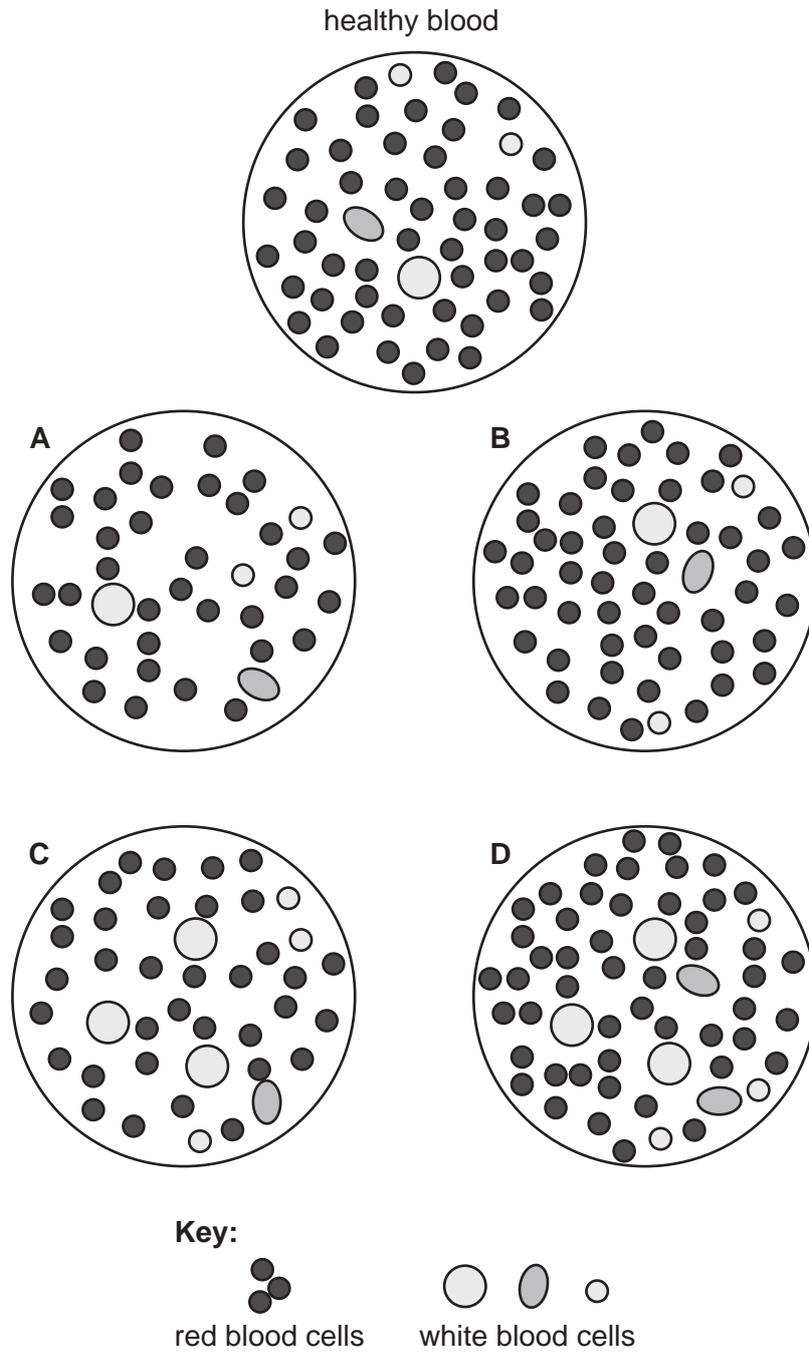


Fig. 2.2

State the letters in Fig. 2.2 which could represent these conditions:

infection

anaemia

[2]

- (c) Anaemia can also be diagnosed by measuring the haemoglobin content of the blood. Samples of blood were collected from 1800 men and 2400 women.

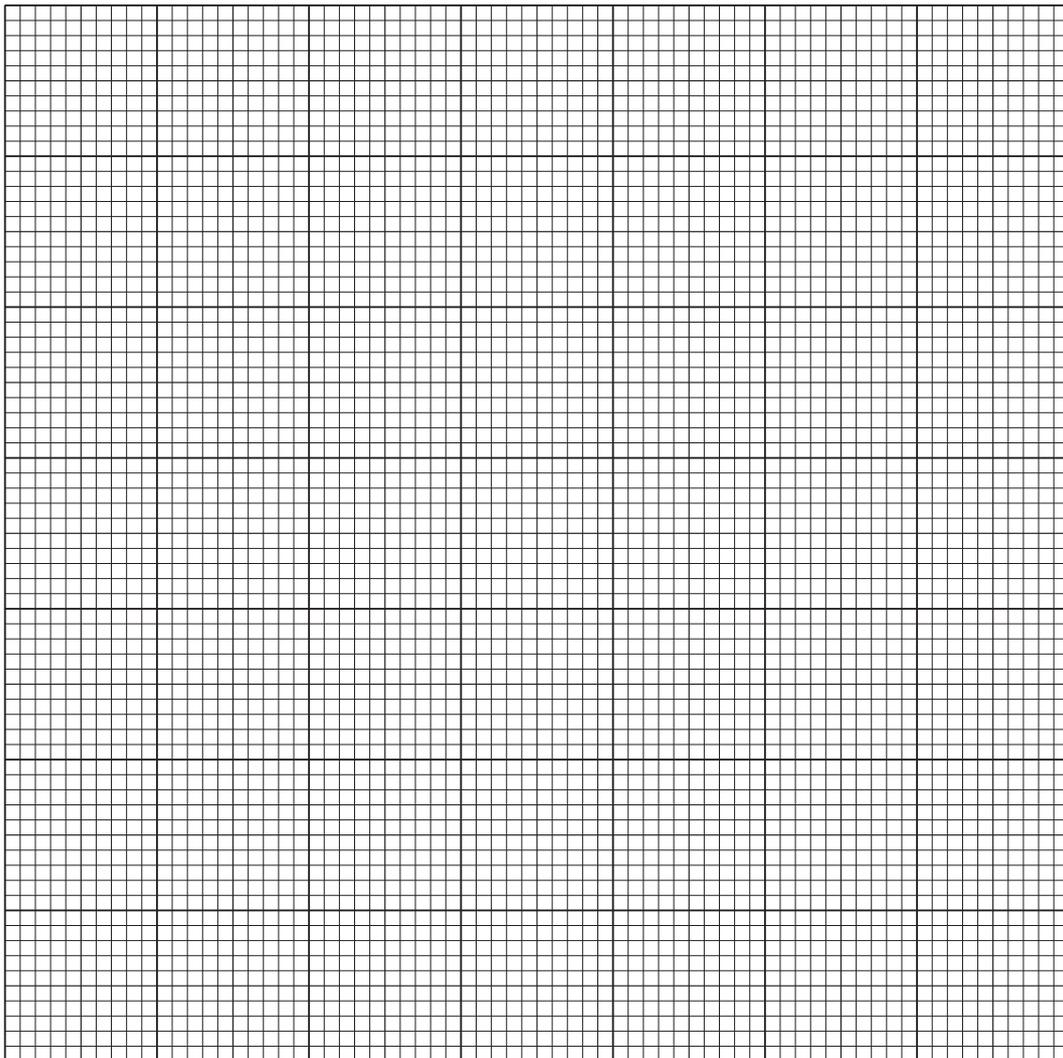
The haemoglobin content of their blood was measured and the percentage of people with anaemia was calculated.

Table 2.2 shows the percentage of men and women in the sample who have anaemia.

Table 2.2

age group	percentage with anaemia	
	men	women
65–74	7.0	8.5
75–84	16.5	11.0
85–94	26.0	20.5

- (i) Plot a histogram to show the percentage of men and women with anaemia in each age group.



(ii) Describe the trends shown by these data.

.....
.....
.....
.....
..... [2]

(iii) Suggest why the data was reported as percentages rather than the actual numbers of men and women with anaemia.

.....
.....
.....
..... [1]

[Total: 13]

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BIOLOGY **0610/62**
Paper 6 Alternative to Practical **October/November 2019**
1 hour

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Answer **all** questions.

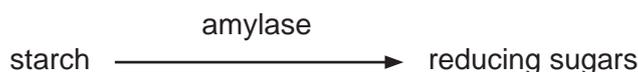
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- 1 A student investigated the effect of the enzyme amylase on the breakdown of a starch suspension. The starch suspension was placed inside a bag made from dialysis tubing.



Dialysis tubing is made from a type of membrane that is partially permeable. Only small molecules can pass through this membrane.

- Step 1 Two large test-tubes were put into a water-bath. Each large test-tube contained 20 cm³ of distilled water. The temperature of the water-bath was 40 °C.
- Step 2 A knot was tied at the end of one piece of dialysis tubing, to form a bag.
- Step 3 5 cm³ of the starch suspension was put into the dialysis tubing bag.
- Step 4 A clean syringe was used to put 5 cm³ of amylase solution into the dialysis tubing bag.
- Step 5 The contents of the dialysis tubing bag were mixed well and the outside of the bag was rinsed with distilled water.
- Step 6 The student repeated steps 2 to 5 using 5 cm³ of distilled water in step 4 instead of the amylase solution.
- Step 7 The dialysis tubing bags were placed into the large test-tubes as shown in Fig. 1.1.

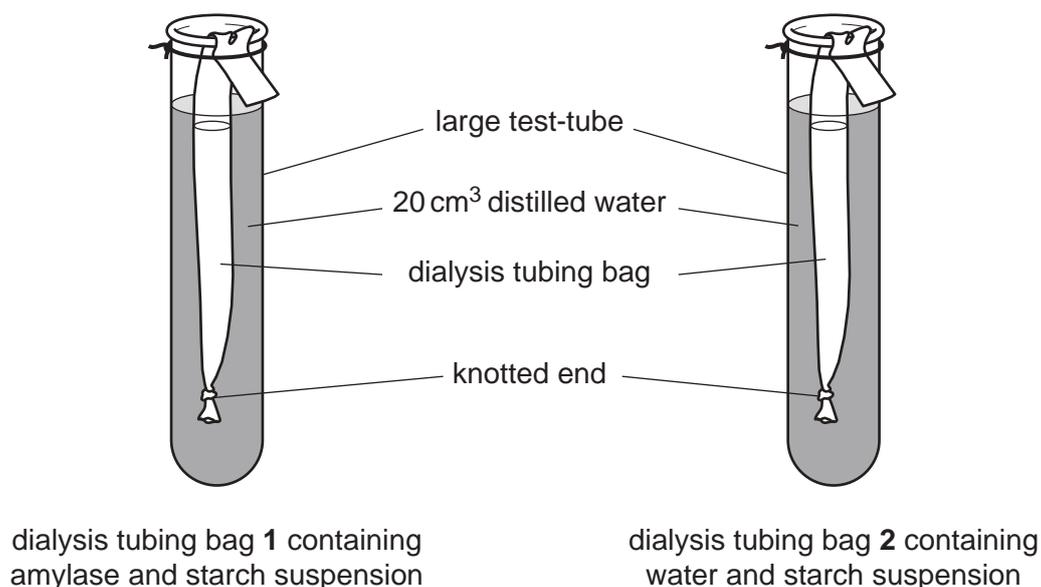


Fig. 1.1

- Step 8 Both large test-tubes were placed back into the water-bath and left for 10 minutes.
- Step 9 After 10 minutes the dialysis tubing bags were removed from the two large test-tubes.
- Step 10 The contents of the two large test-tubes and the two dialysis tubing bags were tested for reducing sugars and starch.

(a) State the name of the solution that the student would use to test substances for starch.

..... [1]

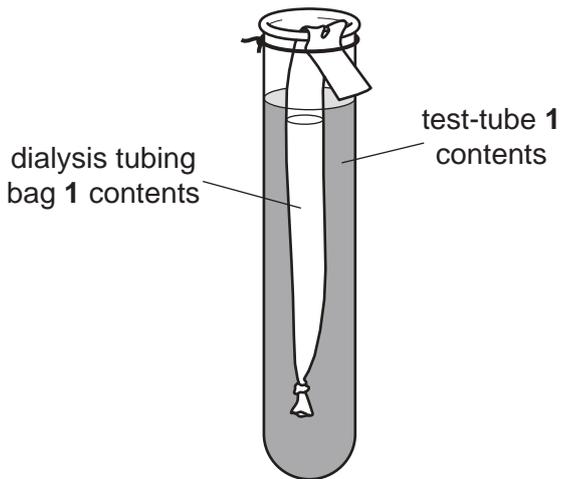
(b) Describe how the student would test substances for reducing sugars.

.....
.....
.....
.....
..... [2]

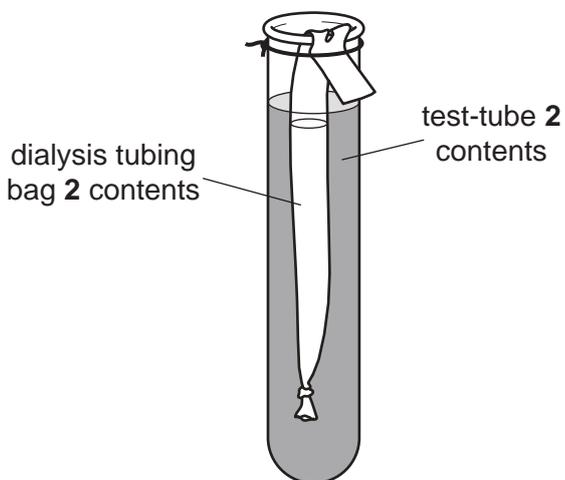
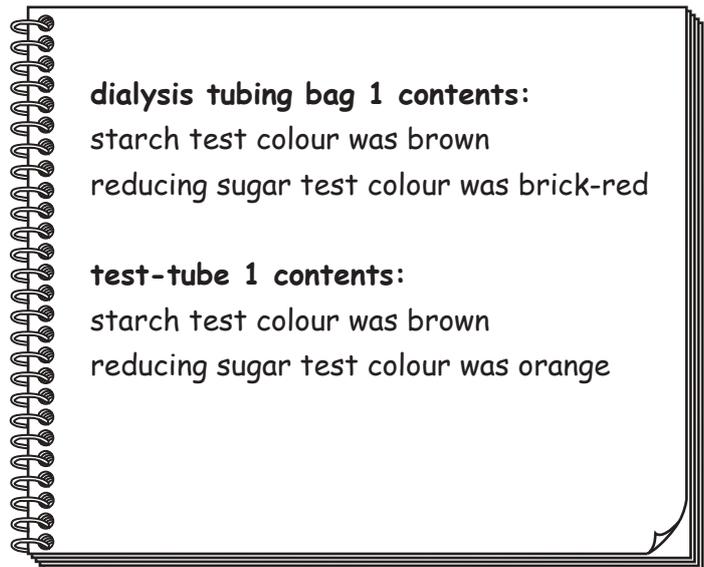
(c) Suggest why the outside of the dialysis tubing bag was rinsed in Step 5.

.....
..... [1]

The student's observations for the starch and reducing sugar tests in step 10 are shown in Fig. 1.2.



dialysis tubing bag 1 containing amylase and starch suspension at the start of the investigation



dialysis tubing bag 2 containing water and starch suspension at the start of the investigation

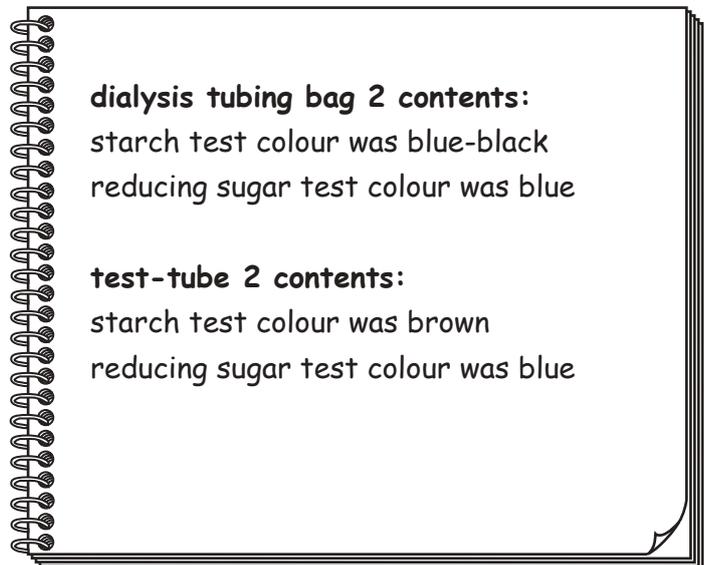


Fig. 1.2

(d) (i) Prepare a table and record the results of the starch and reducing sugar tests from Fig. 1.2 in the space provided.

[3]

(ii) State **three** conclusions for the results shown in Fig. 1.2.

.....

.....

.....

.....

.....

.....

.....

..... [3]

(e) State **two** variables that were kept constant during this investigation.

1

2

[2]

- 2 An investigation was performed to determine the effect of light intensity on leaf size in one species of plant.

Plants were grown in three different light intensities. The maximum width of each leaf was recorded. The results were recorded in Table 2.1 and an average value was calculated.

The results for three leaves grown in high light intensity are shown in Fig. 2.1. The horizontal line on each leaf indicates its maximum width.

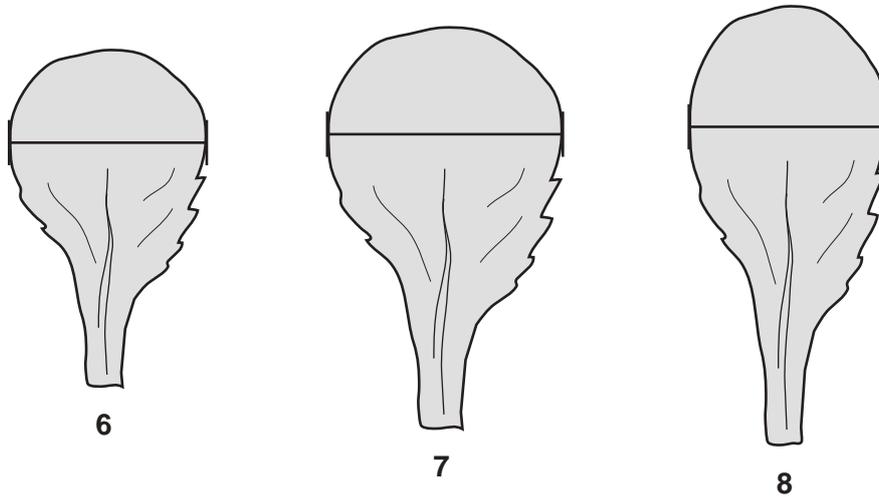


Fig. 2.1

- (a) (i) Measure the widths of leaves 6, 7 and 8 in Fig. 2.1 and record these values in Table 2.1. [1]

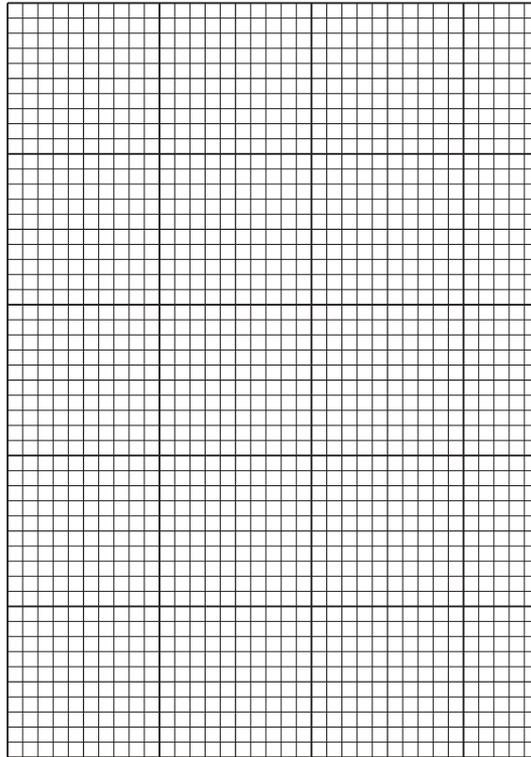
Table 2.1

leaf	maximum width of leaves / mm		
	low light intensity	medium light intensity	high light intensity
1	15	43	27
2	12	45	32
3	13	48	26
4	13	44	28
5	15	47	27
6	14	43	
7	12	12	
8	15	46	
average	14	41	

- (ii) Calculate the average width of the leaves grown in a high light intensity in Table 2.1. Record this value in Table 2.1.

[1]

- (iii) Plot a bar chart on the grid of the **average** leaf width for leaves grown in low, medium and high light intensity using the data in Table 2.1.



[3]

- (iv) Circle **one** measurement in Table 2.1 that could be considered to be anomalous.

Give a reason for your choice.

reason

..... [2]

- (b) (i) State the variable that was changed in this investigation (the independent variable).

..... [1]

- (ii) State the variable that was measured in this investigation (the dependent variable).

..... [1]

(c) Fig. 2.2 is a photomicrograph of a cross-section of a root.

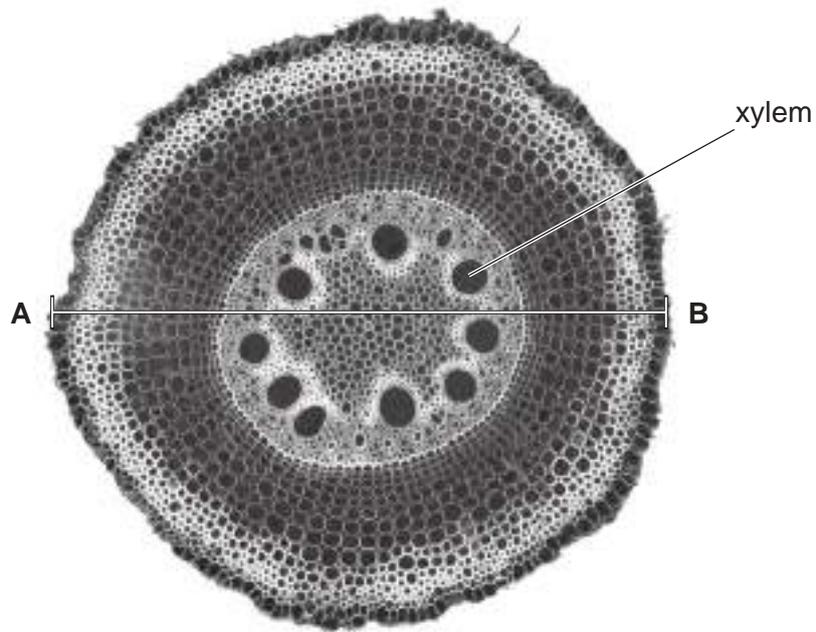


Fig. 2.2

- (i) Make a large drawing of the cross-section of the root in Fig. 2.2 to show the different areas of the root.

Do **not** draw individual cells.

(ii) Measure line **AB** on Fig. 2.2 in millimetres.

length of line **AB** mm

The actual diameter of the root shown in Fig. 2.2 is 2 mm.

Calculate the magnification of Fig. 2.2 using the equation.

$$\text{magnification} = \frac{\text{length of line AB on Fig. 2.2}}{\text{actual diameter of the root}}$$

..... [2]

(iii) Fig. 2.3 is a photomicrograph of a cross-section of a stem.

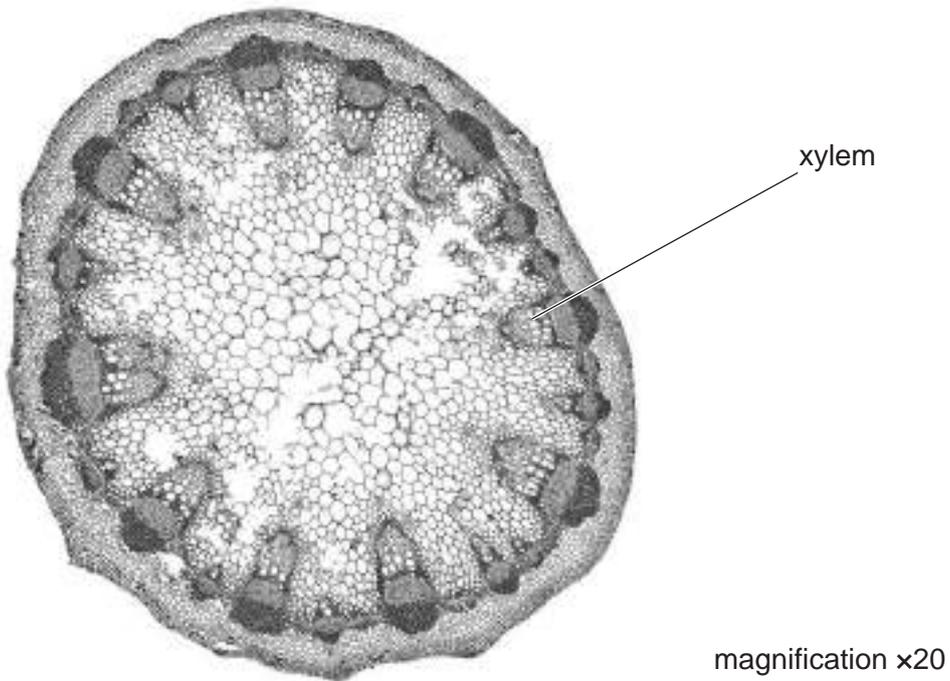


Fig. 2.3

State **two** differences between the root in Fig. 2.2 and the stem in Fig. 2.3.

- 1
-
- 2
-

[2]

(d) A student suggested that measuring leaf area is better than measuring leaf width.

(i) Describe how the area of a leaf could be measured.

.....
.....
.....
.....
..... [2]

(ii) Suggest why measuring leaf area is better than measuring leaf width.

.....
..... [1]

[Total: 20]

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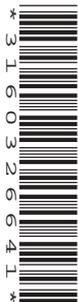
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CENTRE
NUMBER

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CANDIDATE
NUMBER

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BIOLOGY

0610/63

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 **10** printed pages and **2** blank pages.



- 1 Photosynthesis occurs in chloroplasts. A chloroplast suspension can be made by extracting the chloroplasts from green leaves.

The blue dye DCPIP can be used to investigate photosynthesis. During photosynthesis the blue colour of the DCPIP changes and eventually disappears so that it becomes colourless. The remaining mixture appears green due to the chloroplast suspension.

A student investigated the effect of light on photosynthesis in a chloroplast suspension.

- Step 1 The student crushed eight green leaves in an ice-cold buffer solution.
- Step 2 The mixture of crushed leaves and buffer solution was then filtered to form a chloroplast suspension.
- Step 3 The student was given two test-tubes. One test-tube was wrapped in aluminium foil to exclude light. The second test-tube was **not** covered in foil so that light could reach the contents of this test-tube.
- Step 4 A plastic pipette was used to add 2 cm^3 of the chloroplast suspension to each of the two test-tubes.
- Step 5 A syringe was used to add 5 cm^3 of DCPIP solution to both test-tubes. A stopper was placed in each test-tube.
- Step 6 Both test-tubes were placed in a water-bath containing ice-cold water. The water-bath was positioned near a bright light.
- Step 7 The test-tubes were left in the bright light for five minutes.
- Step 8 After five minutes the student observed and noted the colour of the liquid in the test-tube that was **not** wrapped in foil. They removed the foil from the covered test-tube and observed the colour in this test-tube.

The student's results are shown in Fig. 1.1.

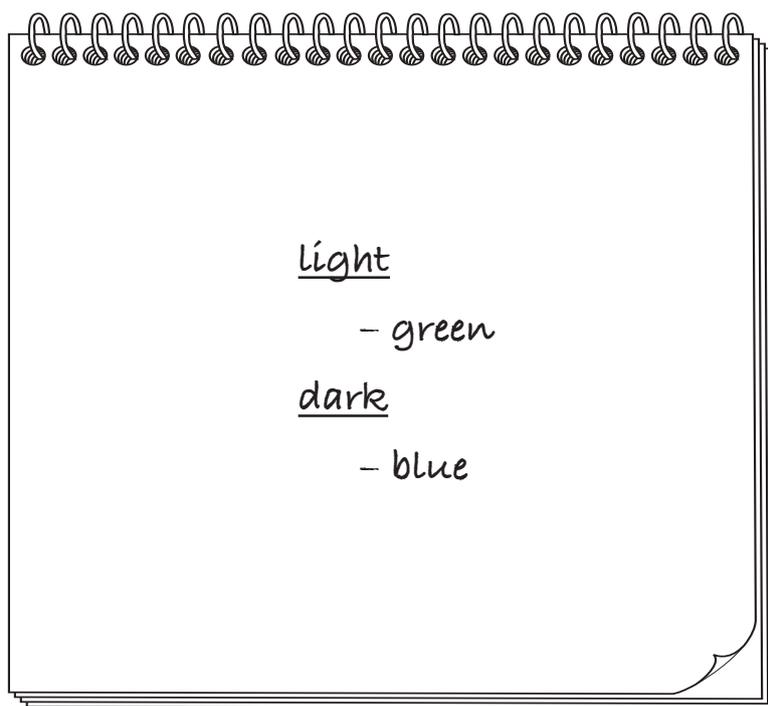


Fig. 1.1

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(a) (i) Prepare a table and record the results from Fig. 1.1.

[2]

(ii) Identify the variable that was changed (independent variable) and the variable that was measured (dependent variable) in this investigation.

independent variable.....
.....

dependent variable.....
.....

[2]

(iii) State **two** variables that were kept constant in this investigation.

1.....
.....

2.....
.....

[2]

(iv) State a conclusion for these results.

.....
.....
..... [1]

- (b) In step 6 both test-tubes were placed in a water-bath containing ice-cold water for five minutes. A thermometer was also placed in the water-bath.

Fig. 1.2 shows the thermometer at the start of the investigation and after five minutes.

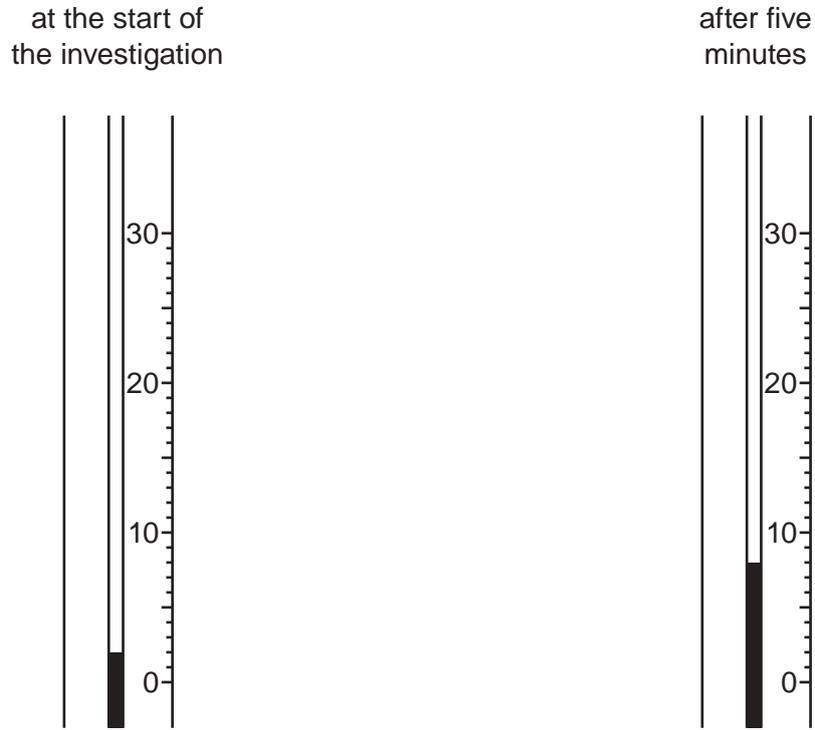


Fig. 1.2

Record the temperatures shown in Fig. 1.2. Include the units.

temperature at the start of the investigation

temperature after five minutes

[2]

- (c) The investigation was not repeated.

- (i) Suggest why it would be advisable to repeat the investigation.

.....
.....
..... [1]

- (ii) Identify **one** other source of error in this investigation and suggest an improvement for this error.

error.....

.....

improvement

.....

.....

[2]

- (d) A student wanted to investigate the effect of temperature on the rate of photosynthesis in a chloroplast suspension.

Describe how the student could carry out this investigation using DCPIP.

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..... [6]

[Total: 18]

2 Fig. 2.1 is a photomicrograph of part of the lower epidermis of a leaf.

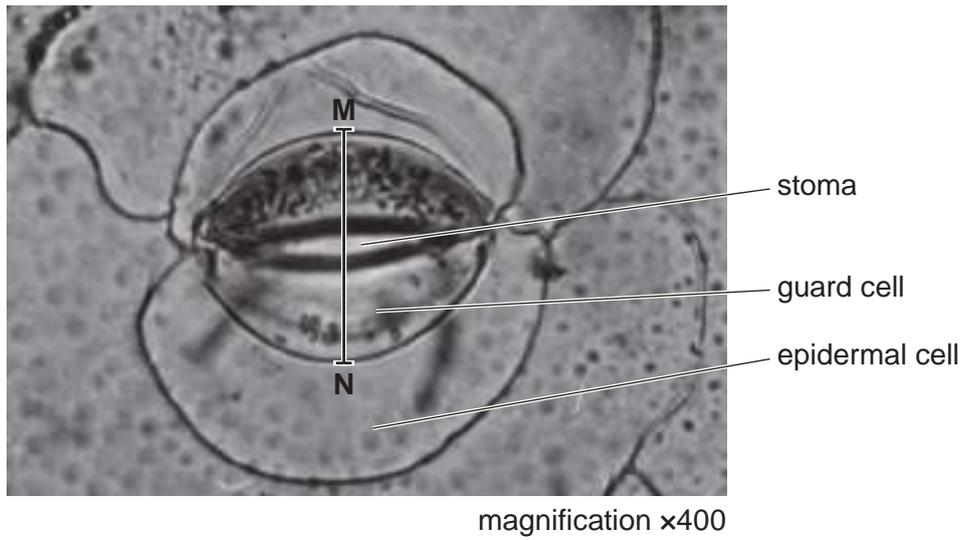


Fig. 2.1

(a) (i) Make a large drawing of Fig. 2.1. Do not label your drawing.

[4]

- (ii) Measure the length of the line **MN** on Fig. 2.1.

length of line **MN** mm

Calculate the actual width of the guard cells and the stoma indicated by line **MN** in Fig. 2.1. Use the equation and information in Fig. 2.1.

$$\text{magnification} = \frac{\text{length of line MN on Fig. 2.1}}{\text{actual width of the guard cells and the stoma}}$$

Give your answer to two decimal places.

..... mm
[3]

- (b) A student investigated the effect of sucrose concentration on stomatal opening.

Strips of epidermis from leaves were placed in different concentrations of sucrose solution for one hour.

The student measured the width of 10 stomatal openings from the epidermis in each sucrose solution.

The results are shown in Table 2.1.

Table 2.1

percentage concentration of sucrose	width of stomatal opening / μm										
	1	2	3	4	5	6	7	8	9	10	average
0	5	6	7	5	5	6	7	5	7	6	5.9
5	3	4	3	3	4	3	2	3	3	2	
20	1	2	1	2	1	1	5	1	2	1	1.7

- (i) Circle **one** measurement in Table 2.1 that could be anomalous. [1]

- (ii) Calculate the average width of stomatal opening in the 5% sucrose solution.

Include the unit.

.....
[2]

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[Turn over

- (c) Pineapple plants are adapted to grow in hot dry conditions.

Scientists investigated the number of stomata open, in pineapple plants, at different times of day.

The data is shown in Table 2.2 (00:00 is midnight).

Table 2.2

time of day	average number of stomata open per mm ²
00:00	77
04:00	61
08:00	22
12:00	4
16:00	10
20:00	51

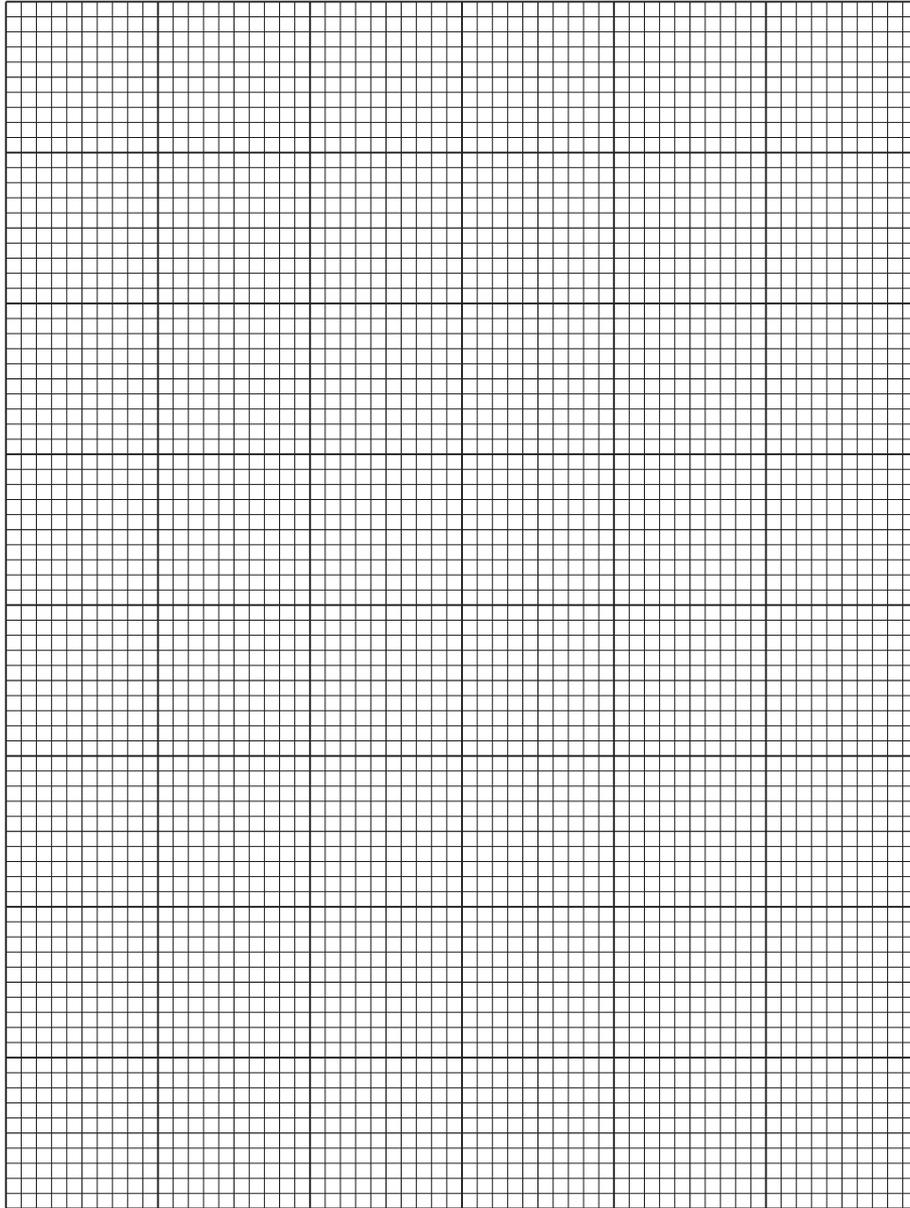
- (i) Calculate the percentage change in the average number of open stomata per mm² between 16:00 hours and 20:00 hours.

Space for working.

.....%

[2]

(ii) Plot a bar chart on the grid to show the data in Table 2.2.



[3]

(iii) Describe, using your graph, how the average number of open stomata per mm² changes throughout the day.

.....

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.....

.....

..... [2]

(d) When fruit ripens the starch contained within it is converted into reducing sugars.

(i) State the name of the substance that is used to test for the presence of starch.

..... [1]

(ii) Describe how you could safely show a reducing sugar was present in a sample of pineapple fruit juice.

procedure

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.....

.....

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safety

..... [4]

[Total: 22]

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