

Name: ()

Class:

**ASSUMPTION ENGLISH SCHOOL
END OF YEAR EXAMINATION 2014**

**LOWER SECONDARY SCIENCE
BOOKLET A**



ASSUMPTION ENGLISH SCHOOL ASSUMPTION ENGLISH SCHOOL ASSUMPTION ENGLISH SCHOOL ASSUMPTION ENGLISH SCHOOL
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LEVEL: Sec 2 Express

DATE: 2 October 2014

CLASSES: Sec 2/1, 2/2

DURATION: 2 hours
(For booklets **A** and **B**)

Additional Materials provided: 1 sheet of OAS paper

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your NAME, INDEX NUMBER and CLASS at the top of this page and on the OAS paper. **Shade your index number on the OAS paper.**

This paper consists of 3 sections.

Booklet A: Section A - Multiple-Choice Questions
Booklet B: Section B - Short Structured Questions
Section C - Long Structured Questions

SECTION A (30 marks)

Multiple-Choice Questions

There are 30 questions in this section. Answer **all** questions. For each question, there are four possible answers A, B, C and D. **Choose the correct answer and record your choice in soft or 2B pencil on the OAS paper provided. DO NOT fold or bend the OAS paper.**

At the end of the examination, hand in your OAS paper, Booklets **A** and **B** separately.
A copy of the Periodic Table is printed at the end of Booklet **B**.

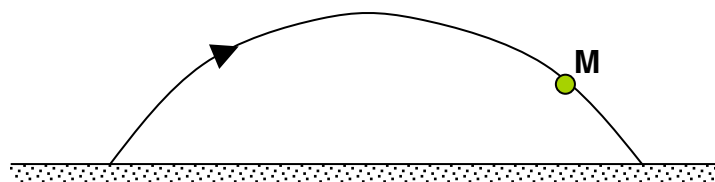
This Question Booklet consists of 12 printed pages including this page.

[Turn over

Section A: Multiple-Choice Questions (30 marks)

There are **thirty** questions in this section. 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 on the OAS paper in soft pencil.

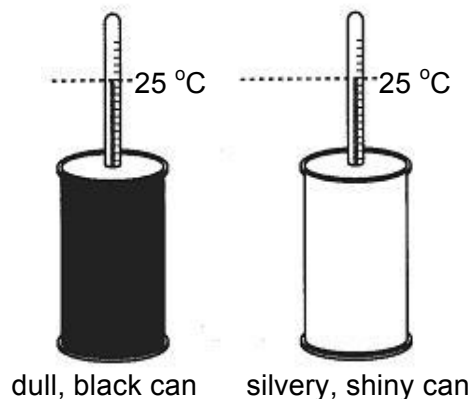
- 1 The diagram shows the path of a golf ball as it travels through the air. Which one correctly describes the gravitational potential energy and kinetic energy of the ball at point **M**?



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

- 2 Which is **not** a reason why we should conserve energy?
- A** Conserving energy increases the supply of fossil fuel.
 - B** Conserving energy results in less pollution.
 - C** Current energy sources may not be enough to meet the increasing demand for energy.
 - D** There is limited supply of oil and coal.
- 3 What causes the expansion of metals on heating?
- A** Increase of number of particles
 - B** Increase of size of particles
 - C** Increase of spaces between particles
 - D** Increase of volume of particles

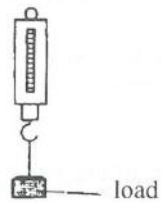
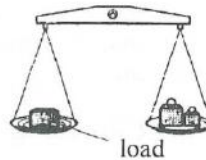
- 4 Which statement about convection is **true**?
- A A convection current does not require a medium for the transfer of heat energy.
 - B A convection current is caused by the difference in density between a hot liquid and a cold liquid.
 - C A convection current is caused by the movement of molecules in solids and gases.
 - D Convection in solids is slower than in liquids.
- 5 Two identically shaped cans are filled with equal amounts of water at 25 °C. One is a dull, black can while the other is a silvery, shiny can. They are placed under the sun for 10 minutes.



What can be observed after 10 minutes?

- A The drop in temperature of the dull, black can is higher than that of silvery, shiny can.
 - B The temperature of both cans will rise by the same amount.
 - C The temperature of the dull, black can will rise more than that of the silvery, shiny can.
 - D The temperature of the dull, black can will rise less than that of the silvery, shiny can.
- 6 What **cannot** be changed by a push or pull acting on an object?
- A mass of an object
 - B shape of an object
 - C size of an object
 - D speed of an object

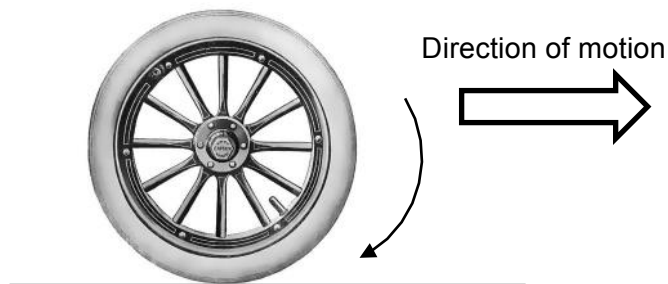
- 7 A load is placed on a balance **X** and then on a balance **Y**.

Balance **X**Balance **Y**

Which physical quantity is measured by each balance?

	Balance X	Balance Y
A	mass	force
B	mass	weight
C	weight	force
D	weight	mass

- 8 The diagram below shows a wheel rotating along the road, moving towards the right.



In which direction is the friction acting on the wheel?

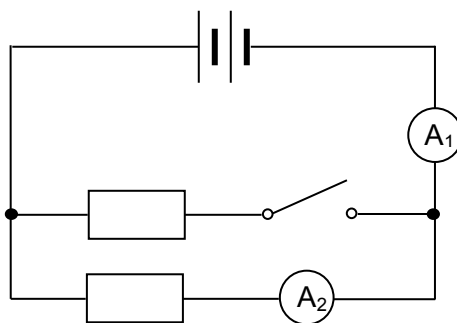
A	→
B	←
C	↓
D	↑

- 9 Brakes are used to stop a car.

What is most of the kinetic energy converted into?

- A heat energy
- B light energy
- C potential energy
- D sound energy

- 10 In the circuit shown, both resistors are identical.



If the switch is closed, how will the readings of ammeters A_1 and A_2 change?

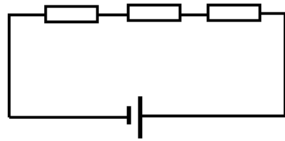
	reading of A_1	reading of A_2
A	increases	decreases
B	increases	no change
C	no change	decreases
D	no change	no change

- 11 An electric circuit contains four 3 V batteries and a $6\ \Omega$ resistor connected in series. What is the current produced in the circuit?

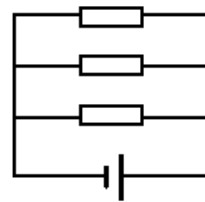
- A 0.5 A
- B 2 A
- C 3 A
- D 72 A

12 Which resistor combination has the lowest effective resistance?

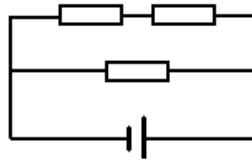
A



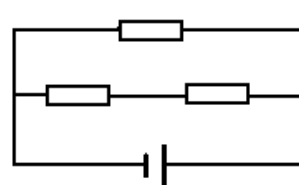
C



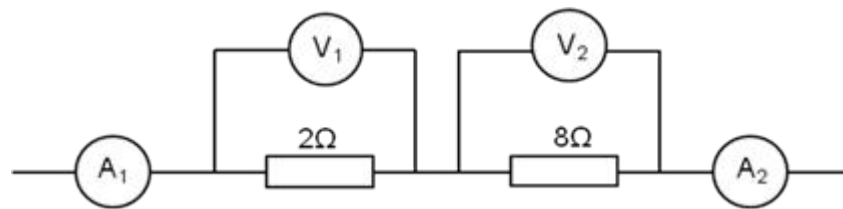
B



D



13 Current flows in two resistors connected in series as shown. A_1 and A_2 are the readings on the ammeters. V_1 and V_2 are the readings on the voltmeters.



Which of the following correctly describes the ammeter and voltmeter readings?

	ammeter readings	voltmeter readings
A	$A_1 < A_2$	$V_1 < V_2$
B	$A_1 < A_2$	$V_1 > V_2$
C	$A_1 = A_2$	$V_1 = V_2$
D	$A_1 = A_2$	$V_1 < V_2$

- 14** A coil of copper wire wrapped around a core could be used as an electromagnet.

Which combination would produce the strongest electromagnet?

	number of turns	core
A	few	soft iron
B	few	steel
C	many	copper
D	many	soft iron

- 15** Which of the following is a potential consequence when a multi-socket plug adapter is used to connect many appliances to the same socket?



- A** The appliances will be damaged due to the higher current that flows through each appliance.
- B** The current drawn from the mains gets higher and overheating may occur.
- C** The flow of the current will be slowed down and the power to each appliance will be reduced.
- D** The voltage across the live and neutral wires increases and overheating may occur.
- 16**I..... energy can be transmitted in vacuum butII..... energy cannot.

	I	II
A	Heat	light
B	Light	sound
C	Sound	heat
D	Sound	light

17 Which statement(s) about sound is correct?

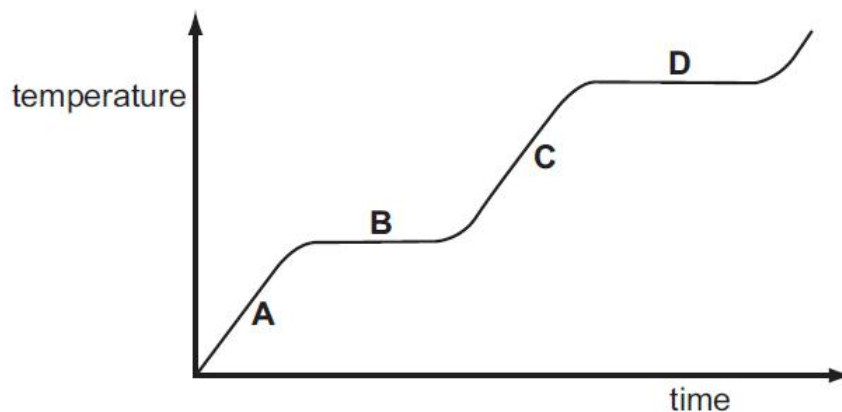
- I Human hearing range is from 10 Hz to 10,000 Hz
- II Sound travels in the form of wave
- III Speed of sound is higher in solid than liquid

- A I only
- B I and II only
- C II and III only
- D I, II and III only

18 Which parts of the ear vibrate when sound is heard?

- A ear bones and ear canal
- B ear bones and eardrum
- C eardrum and ear canal
- D external ear and ear canal

19 The graph shows the change in temperature of a material as it is heated. Which part of the graph shows that the material is boiling?



- 24** The table below shows a list of substances and their solubility in water.

substance	solubility in water
ammonium chloride	soluble
calcium chloride	soluble
silver nitrate	soluble
barium sulfate	insoluble
lead(II) sulfate	insoluble

Which mixture can be separated into its components by adding water, stirring and filtering?

- A** ammonium chloride and silver nitrate
- B** barium sulfate and calcium chloride
- C** calcium chloride and silver nitrate
- D** lead(II) sulfate and barium sulfate

- 25** The table shows some information about the solubilities of three solids.

solid	solubility in water	solubility in ethanol
P	insoluble	insoluble
Q	soluble	insoluble
R	insoluble	soluble

The following steps could be taken to obtain **R** from a mixture of **P**, **Q** and **R**.

- I** filter
- II** evaporate filtrate till dryness
- III** add ethanol
- IV** add water

In what order should the steps be taken to obtain **R** from a mixture of **P**, **Q** and **R**?

- A** III → I → II
- B** III → IV → I → II
- C** IV → I → II
- D** IV → III → I → II

26 Which pair of air pollutants is responsible for the formation of acid rain?

- A** carbon monoxide and nitrogen dioxide
- B** carbon monoxide and soot
- C** nitrogen dioxide and soot
- D** nitrogen dioxide and sulfur dioxide

27 Which situation are damages associated with acid rain?

- I** droughts
- II** erosion of stone statues and buildings
- III** melting of ice caps
- IV** threat to the life of aquatic beings

- A** I and III
- B** I and IV
- C** II and III
- D** II and IV

28 What is the colour of the resulting mixture if methyl orange, bromothymol blue and phenolphthalein are all added to a solution of pH 5?

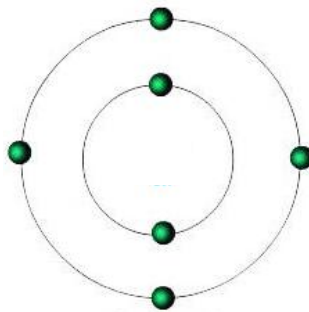
pH value	0	2	4	6	8	10	12	14
Methyl orange	red			yellow				
Bromothymol blue	yellow					blue		
Phenolphthalein	colourless						red	

- A** blue
- B** orange
- C** purple
- D** yellow

29 Which two particles have about the same relative mass?

- A** a neutron and an electron
- B** a proton and a neutron
- C** a proton and an atom
- D** a proton and an electron

- 30 If the relative atomic mass of the atom below is 12 times the relative atomic mass of a proton, how many neutrons are there in the atom?



A 4
B 6

C 8
D 12

– END OF SECTION A –

Name: ()

Class:

**ASSUMPTION ENGLISH SCHOOL
END OF YEAR EXAMINATION 2014**

**LOWER SECONDARY SCIENCE
BOOKLET B**



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LEVEL: Sec 2 Express

DATE: 2 October 2014

CLASSES: Sec 2/1, 2/2

DURATION: 2 hours
(For Booklets **A** and **B**)

Additional Materials provided: Nil

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your NAME, INDEX NUMBER and CLASS at the top of this page.

SECTION B (40 marks)

Short Structured Questions

Answer **all** questions. Write your answers in the spaces provided on the question paper.

SECTION C (30 marks)

Long Structured Questions

Answer all questions. Write your answers in the spaces provided on the question paper.

For Examiner's use:	
Section A	/ 30
Section B	/ 40
Section C	/ 30
Total	/ 100

At the end of the examination, hand in your OAS paper and Booklets **A** and **B** separately.
A copy of the Periodic Table is printed on page 15.

This Answer Booklet consists of 15 printed pages including this page.

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Section B: Short Structured Questions (40 marks)

Answer **all** questions in the spaces provided.

- 1 Two geologists are collecting rocks from the bottom of a cliff. The rocks are loaded into a basket and then pulled up the cliff on the end of a rope, as shown in Fig. 1. The basket of rocks is brought to rest at the top of the cliff.

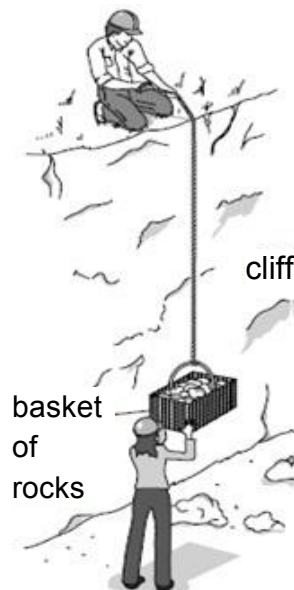


Fig. 1

- (a) Which form of energy that the basket possesses is significantly greater at the top of the cliff than when it is at the bottom of the cliff?

..... [1]

- (b) The man at the top of the cliff needs energy to pull the basket up. Name the energy that is in the man to pull the basket up.

..... [1]

- (c) State the law of conservation of energy.

.....
 [1]

- (d) Is work done by the geologist pulling the rope? Explain.

.....
 [2]

2 The following is a list of substances.

copper

sugar

steel

potassium oxide

seawater

hydrogen

Choose from the list above,

(a) a compound containing only two elements, [1]

(b) an element made up of molecules, [1]

(c) a mixture, [1]

(d) a substance that can go through a decomposition reaction.
..... [1]

3 (a) Complete the table below.

Compound	Elements present	Chemical formula	Total number of atoms
magnesium hydroxide		Mg(OH)_2	
ammonium sulfate		$(\text{NH}_4)_2\text{SO}_4$	

[4]

- (b) Oxygen is an element. Water is a compound. Air is a mixture.
Use these substances to illustrate the following:

- (i) One difference between the composition of an element and the composition of a compound.

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

- (ii) One difference between the composition of a mixture and the composition of a compound.

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

- (iii) One difference between the separation of a mixture and the separation of a compound.

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

- 4 A woman wants to buy a new television. She found the following information on the Internet. Use the data in the table to answer the following questions.

Type of television	Power rating in kW
LCD TV	0.17
LED TV	0.10
Plasma TV	0.30
Rear projection TV	0.19

- (a) Which television would be the cheapest to use? Explain.

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

- (b) The woman buys a plasma TV. In one month she watches 25 hours of television. Calculate how much electrical energy was used.

Energy transferred = kWh [2]

- (c) The woman is charged at \$0.30 per kWh of electricity she uses. Calculate the total cost of using the plasma television for one month.

Total cost = \$..... [1]

- (d) Suggest two reasons why energy labels are put on appliances.

1

 2
 [2]

- 5 (a) State if each of the following is a physical or chemical change.

(i) Rusting of iron nail
 (ii) Toasting a slice of bread
 (iii) Boiling a kettle of water
 (iv) Decay of food [2]

- (b) Give two reasons to explain your answer for part (a)(i).

.....
 [2]

example	sublimation $\xrightarrow{\hspace{1.5cm}}$ dry ice carbon dioxide gas
(a)	 $\xrightarrow{\hspace{1.5cm}}$ acid + alkali salt + water
(b)	 $\xrightarrow{\hspace{1.5cm}}$ carbon carbon dioxide formation
(c)	 $\xrightarrow{\hspace{1.5cm}}$ limestone calcium oxide + carbon dioxide CaCO_3 CaO + CO_2
(d)	 $\xrightarrow{\hspace{1.5cm}}$ water + carbon glucose + oxygen + water dioxide

LSS/S2E/EOY/14

- 7 Hydrochloric acid is a strong acid. Sodium hydroxide is a strong alkali. A student put some dilute sodium hydroxide solution in a beaker with some universal indicator solution. She added the dilute hydrochloric acid very slowly until the colour of the universal indicator stopped changing. The table shows the colour of universal indicator at different pH values.

Indicator colour	red	orange	green	blue	purple
pH	0 – 3	3 – 6	7	8 – 11	11–14

- (a) Describe the colour changes the student saw during the experiment. Start from the time she added the indicator to the sodium hydroxide.

.....

 [2]

- (b) How would the student know when the mixture in the beaker was neutral?

..... [1]

- (c) Complete the word equation for the above reaction.

Hydrochloric acid + Sodium hydroxide → + [2]

- (d) What is the term used to describe the reaction?

..... [1]

- 8 The gas in a can of hairspray is made up mainly of a hydrocarbon **X**. The boiling point of the hydrocarbon **X** is $-5\text{ }^{\circ}\text{C}$ and its melting point is $-120\text{ }^{\circ}\text{C}$.

(a) Complete the table below by making use of the above information.

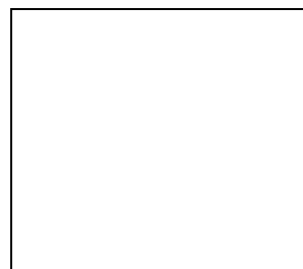
temperature ($^{\circ}\text{C}$)	state of hydrocarbon X
30	
-25	liquid
-60	

[1]

- (b) If 'O' represents a molecule of hydrocarbon **X**, show the arrangement of the molecules at $-25\text{ }^{\circ}\text{C}$ and at $30\text{ }^{\circ}\text{C}$, in the boxes below.



$-25\text{ }^{\circ}\text{C}$



$30\text{ }^{\circ}\text{C}$

[2]

- (c) Hydrocarbon **X** is usually kept as a liquid in aerosol sprays by pressurizing it. When the seal on the aerosol can is opened, the pressure is reduced. This allows the liquid to turn into a gas.

What is the advantage of carrying hydrocarbon **X** as a liquid rather than a gas?

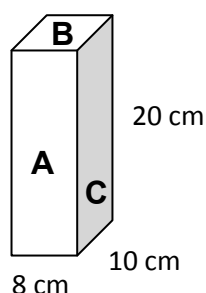
.....

..... [1]

Section C – Long Structured Questions (30 marks)

Answer **ALL** questions in the spaces provided.

- 1 (a) Caleb is conducting an experiment on pressure. He places a heavy rectangle brick on mud by standing the brick on face **A**. He then measures the depth of the depression in the mud. He repeats the steps with the other faces, **B** and **C**.



- (i) On which face does the brick exert the greatest pressure on the mud?

..... [1]

- (ii) The brick presses least deeply into the mud when it stands on one of its faces. Predict the face that the brick stands on when this happens. Explain your prediction.

.....

.....

..... [2]

- (iii) If the brick weighs 40N, calculate the greatest pressure exerted by the brick on the mud.

Pressure =N/cm² [2]

- (b) (i) State with reasons whether solids **P**, **Q** and **R** are elements, compound or mixture.

Solid	Information
P	P is a white solid. It is formed by burning magnesium in oxygen gas.
Q	Q is attracted to a magnet. It cannot decompose into anything simpler.
R	R contains green and white powder. The green powder dissolves in water but the white powder does not.

.....

 [3]

- (ii) State which of the solids in (b)(i) can be physically separated and what technique can be used to separate it.

.....

 [2]

- 2 (a) Alfred has two liquids of different substances, **R** and **S**.

Alfred poured two quantities of liquid **R**, each measuring 40 cm^3 , into a measuring cylinder. The total volume of the mixture was found to be 80 cm^3 . Alfred then poured 40 cm^3 of liquid **R** and 40 cm^3 of liquid **S** into another measuring cylinder. The total volume of the mixture of liquid **R** and **S** was also measured.

What do you think is the total volume of Alfred's mixture? Using your knowledge of particulate model of matter, explain your answer. You should use a relevant diagram to help you in your explanation.

.....

.....

.....

.....

.....

.....

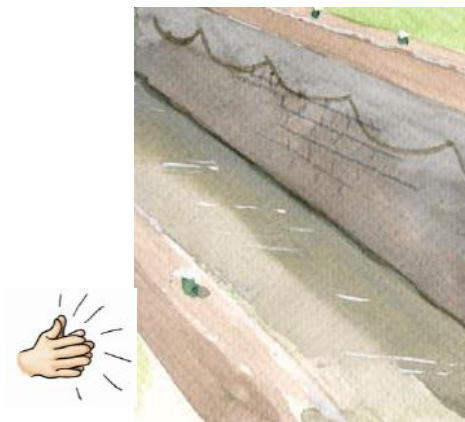
..... [5]

- (b) Using the particulate nature of matter, explain why sound travels slower in liquids than in solids.

.....

 [2]

- (c) James stands on the bank of a river. He sees a wall on the opposite bank of the river. He gives a single clap. Using a stopwatch he measures the time taken for him to hear the echo from the clap.



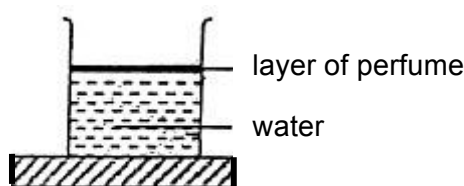
- (i) What is James trying to find out?

..... [1]

- (ii) The echo is heard 4 seconds later. Calculate the distance between James and the wall. (Take the speed of sound in air as 330 m/s on that particular day)

[2]

- 3 (a) Alice had some perfume which was immiscible (do not mix) with water. She poured some of the perfume into a beaker filled with hot water and left it in the laboratory. As the perfume was less dense than water, it floated on the surface of the water as shown in the diagram below.



- (i) Explain why the smell of the perfume becomes stronger when it is added to the beaker filled with hot water.

.....

 [2]

- (ii) Using your answer from (a)(i), explain why when Alice uses perfume, she sprays it on her wrist or behind her ears.

.....
 [2]

- (b) When the cover of a pot of hot soup is lifted off the pot, it takes some time before droplets of water form on the underside of the cover. In contrast, droplets of water form, almost immediately, on the cover of a pot taken from the refrigerator.



Explain the above observations.

.....

 [3]

- (c) A pair of cotton kitchen gloves is used to carry hot pots and pans.



Explain why cotton kitchen gloves are used when carrying hot objects.

.....

.....

..... [3]

– END OF PAPER –

The Periodic Table of Elements

I	II											III	IV	V	VI	VII	0																
1HHydrogen1																	4HeHelium2																
																	11B Boron 5	12C Carbon 6	14N Nitrogen 7	16O Oxygen 8	19F Fluorine 9	20Ne Neon 10											
																	27Al Aluminium 13	28Si Silicon 14	31P Phosphorus 15	32S Sulfur 16	35.5Cl Chlorine 17	40Ar Argon 18											
																	70Ga Gallium 31	73Ge Germanium 32	75As Arsenic 33	79Se Selenium 34	80Br Bromine 35	84Kr Krypton 36											
																	115In Indium 49	119Sn Tin 50	122Sb Antimony 51	128Te Tellurium 52	127I Iodine 53	131Xe Xenon 54											
																	204Tl Thallium 81	207Pb Lead 82	209Bi Bismuth 83	Po Polonium 84		At Astatine 85		Rn Radon 86									

*58-71 Lanthanoid series
†90-103 Actinoid series

a	a = relative atomic mass
X	X = atomic symbol
b	b = proton (atomic) number

The volume of one mole of any gas is 24 dm³ at room temperature and pressure.

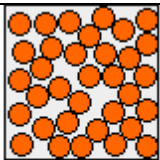
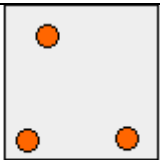
Mark Scheme

Section A [30M]

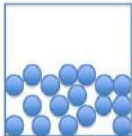
1	2	3	4	5	6	7	8	9	10
B	A	C	B	C	A	D	A	A	C
11	12	13	14	15	16	17	18	19	20
B	C	D	D	B	B	C	B	D	C
21	22	23	24	25	26	27	28	29	30
B	D	B	B	A	D	D	D	B	B

Section B [40M]

Qxn	Answer	Marks												
1(a)	Gravitational potential energy	1												
(b)	Chemical potential energy	1												
(c)	Energy cannot be lost or created, it can only be transferred from one form to another	1												
(d)	Yes Force is applied and object moved	1 1												
2(a)	potassium oxide	1												
(b)	hydrogen	1												
(c)	seawater / steel	1												
(d)	sugar	1												
3(a)	<table><tr><th>Compound</th><th>Elements present</th><th>Chemical formula</th><th>Total number of atoms</th></tr><tr><td>magnesium hydroxide</td><td>magnesium, hydrogen, oxygen [1]</td><td>Mg(OH)₂</td><td>5 [1]</td></tr><tr><td>ammonium sulfate</td><td>nitrogen, hydrogen, sulfur, oxygen [1]</td><td>(NH₄)₂SO₄</td><td>15 [1]</td></tr></table>	Compound	Elements present	Chemical formula	Total number of atoms	magnesium hydroxide	magnesium, hydrogen, oxygen [1]	Mg(OH) ₂	5 [1]	ammonium sulfate	nitrogen, hydrogen, sulfur, oxygen [1]	(NH ₄) ₂ SO ₄	15 [1]	4
Compound	Elements present	Chemical formula	Total number of atoms											
magnesium hydroxide	magnesium, hydrogen, oxygen [1]	Mg(OH) ₂	5 [1]											
ammonium sulfate	nitrogen, hydrogen, sulfur, oxygen [1]	(NH ₄) ₂ SO ₄	15 [1]											
(b)(i)	Oxygen contains only one type of atom(s) whereas water contains two types of atoms.	1												
(ii)	Air contains different substances (elements and compounds) with no fixed mass of percentage whereas water contains hydrogen and oxygen with fixed mass by percentage.	1												

(iii)	Air can be separated into its components by physical means/methods whereas water can only be separated into its constituent elements by chemical means.	1
4(a)	LED It has the lowest power rating, least energy consumed per second	1
(b)	0.30×25 $= 7.5 \text{ kWh}$	1 1
(c)	7.5×0.30 $= \$2.25$	1
(d)	- so people can compare energy efficiency of different machines - so people can choose the cheapest to run - to encourage people to save energy <i>Any two</i>	2
5(a)(i) (ii) (iii) (iv)	Chemical Chemical Physical Chemical <i>Any 2 correct 1 mark</i>	2
(b)	Rusting is a chemical change as rust is a new substance formed, different in properties from iron, And the reaction is irreversible	1 1
6(a) (b) (c) (d)	Neutralisation Combustion/oxidation Decomposition Photosynthesis	1 1 1 1
7(a)	starts purple and ends as red goes through blue–green–orange	1 1
(b)	The mixture would go green	1
(c) (d)	Sodium chloride + water neutralisation	1, 1 1
8(a)	30°C - Gas -60°C - Liquid <i>2 correct 1 mark</i>	1
(b)	 -25 °C  30 °C	2
(c)	As a liquid, more X can be stored in a given space than as a gas	1

Section C [30M]

Qxn	Answer	Marks
1a(i)	B	1
(ii)	C The same force acts on the largest area, hence the pressure exerted least on face C	1 1
(iii)	Pressure = F / area = $40\text{N} / 8 \times 10 \text{ cm}^2$ $= 0.5 \text{ N} / \text{cm}^2$	1 1
1b(i)	P - compound, it is made up of magnesium and oxygen. Q - element, does not decompose into anything simpler. R - mixture, the two particles retain their physical properties (colour, solubility) <i>Accept answer only with suitable reason. Don't accept quoting information wholesale as reason except for Q.</i>	1 1 1
(ii)	Solid R. Filtration.	1 1
2a	 Two liquid particles of different sizes [1] Smaller particles fill up the empty spaces of the larger particles [1] R and S The total volume should be less than 80cm^3. Liquid R and liquid S are made up of particles of different sizes. These particles have empty spaces in between them. On mixing, smaller particles filled up the spaces in between the larger particles. Therefore, volume of the mixture is less than the separate volumes added together.	2 1 1 1
2b	Molecules of solids are packed closely together while molecules of liquid are packed less closely together, hence the distance between the molecules of solids is smaller than liquids As a result transfer of sound energy is faster in solids than in liquids	1 1
2c(i)	Width of the river / his distance from the wall / time taken for sound to travel from him to the wall and back to him	1

2c(ii)	Speed = $2D / \text{time taken}$ $2D = \text{speed} \times \text{time}$ $= 320\text{m/s} \times 4\text{s}$ $= 1280$ $D = 640\text{m}$	1 (formula) 1 (answer)
3(a)(i)	Perfume particles absorb heat energy from the hot water so more perfume evaporate into the air	1 1
(ii)	There are blood vessels close to the skin on the wrist and behind the ears. These warm up the perfume and makes it evaporate faster into the air	1 1
(b)	The cover of the pot of hot soup is hot, so it needs to cool down before there is condensation of water vapour The cover of the pot from the fridge is cold so water vapour from the air condenses immediately on it.	1 1 1
(c)	Cotton kitchen gloves consist of <u>air pockets</u> which are <u>good insulators</u>. It prevents us from getting burned.	1, 1 1

Name	Index Number	Class	Parent's Signature



BALESTIER HILL SECONDARY SCHOOL
END OF YEAR EXAMINATION (2014)
SECONDARY TWO EXPRESS
SCIENCE (BIOLOGY AND CHEMISTRY)

Wednesday, 8 October 2014

1 hour

Candidates answer on the Question Paper.
Additional materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class in the spaces provided at the top of this page.
Write in dark blue or black pen in the spaces provided on the Question Paper.
You may use a pencil for any diagrams, graphs or rough working.
You may use a calculator.
Do not use staples, paper clips, glue or correction fluid.

Section A

There are **ten** questions in this section. 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 the optical answer sheet provided.
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Section B

Answer **all** questions in the spaces provided.
The number of marks is given in brackets [] at the end of each question or part-question.

Section C

Answer **any two** questions in the spaces provided.
The number of marks is given in brackets [] at the end of each question or part-question.

A copy of the Periodic Table could be found in Page 13.

For Examiner's Use	
Section A	/10
Section B	/20
Section C	/20
TOTAL	/50

Setter: Mdm Stella Soh
Vetter: Mr Justin Lee

This document consists of 13 printed pages.

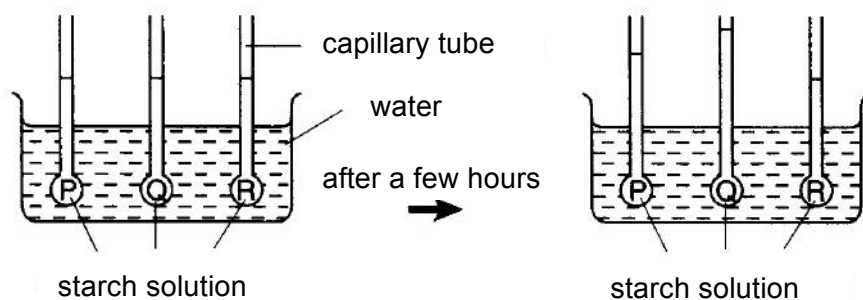
Section A

Answer **all** the questions in this section.
Shade your answers on the OMR sheet provided.

- 1 This substance is stored in seeds. It is broken down by enzyme amylase during seed germination. What could this substance be?
 - A Fats
 - B Proteins
 - C Starch
 - D Sucrose

- 2 Why is digestion important in animals?
 - A It allows energy from food to get into their blood.
 - B Large food molecules have to be made small enough for absorption into the bloodstream.
 - C Large pieces of food need to be broken down into smaller pieces.
 - D Waste materials have to be eliminated from food.

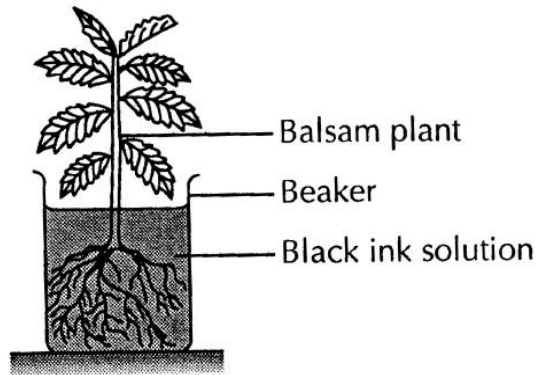
- 3 The experiment below shows what happen to three different concentrations of starch solution after a few hours.



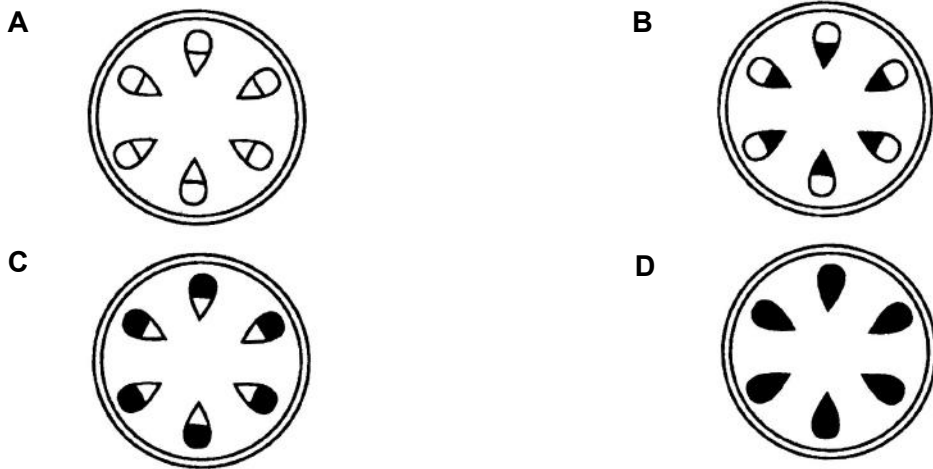
Which row lists the starch solutions in increasing concentrations?

	Lowest		Highest
A	P	Q	R
B	P	R	Q
C	R	P	Q
D	Q	P	R

- 4 Emma put a balsam plant in a beaker of black ink as shown below.



After 3 days, she cut open a section of the stem and observed it. Which diagram would she expect to observe?



- 5 Which pathogens cause AIDS, gonorrhoea and syphilis?

	AIDS	Gonorrhoea	Syphilis
A	Bacterium	Bacterium	Virus
B	Bacterium	Virus	Bacterium
C	Virus	Bacterium	Bacterium
D	Virus	Virus	Bacterium

- 6 A woman has a 28-day menstrual cycle. Her period starts on the 17th July. On which day is she likely to start ovulation?
- A** 24th July
B 30th July
C 7th August
D 14th August

- 7 Which of the following shows the correct gases given off for the reactions of acids with metals and acids with carbonates?

	Acids and metals	Acids and carbonates
A	Carbon dioxide	Hydrogen
B	Carbon dioxide	Water
C	Hydrogen	Carbon dioxide
D	Hydrogen	Water

- 8 Which of the following involves only physical changes?

- I Drying cement on a brick wall
- II Drying clothes on a clothing line
- III Switching on an electric cooking stove

- A** I and II only
- B** I and III only
- C** II and III only
- D** I, II and III

- 9 Which statement is true about a food chain?

- A** A food chain must always start with a producer.
- B** Food chains usually have five links.
- C** The number of consumers always increases along a food chain.
- D** The size of the consumers decreases along a food chain.

- 10 Which processes release carbon dioxide to the atmosphere?

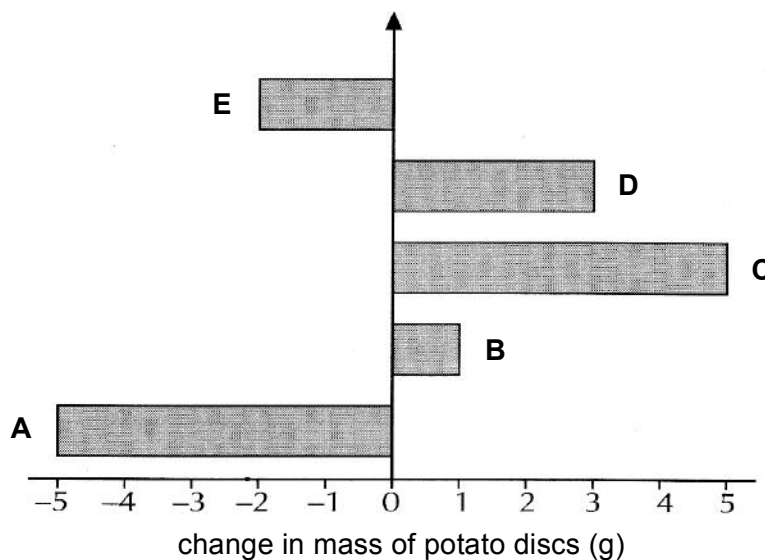
- I Combustion
- II Decomposition
- III Photosynthesis
- IV Respiration

- A** III only
- B** I, II and III only
- C** I, II and IV only
- D** I, II, III and IV

Section B

Answer **all** questions in the spaces provided.

- 1 Five discs of fresh potato (**A – E**), each weighing 10 grams were immersed in sugar solutions of different concentration for two hours, and then dried and reweighed. The change in the mass of each potato disc was recorded in a bar chart as shown in diagram below.



- (a) Name the process that caused the change in mass of the potato discs.

[1]

- (b) Arrange the potato discs (**A – E**) in ascending order of the concentration of the sugar solution that each was immersed in.

Sugar solution	Potato discs
Lowest concentration	
Highest concentration	

[1]

- (c) Describe and explain what caused the changes in potato disc **C**.

[3]

[Total: 5]

- 2 The table below shows the statistics of HIV infected Singaporean by age from year 1985 to year 2007.

HIV Infected Singaporeans by Age (1985 – Jun 2007)								
Age Group	1985 – 2000	2001	2002	2003	2004	2005	2006	2007 Jan-Jun
0-9	13	2	2	1	3	3	3	0
10-19	11	1	1	1	4	4	2	2
20-29	304	27	32	29	47	44	57	19
30-39	543	67	56	83	89	95	99	41
40-49	294	68	73	74	89	84	97	47
50-59	108	38	45	32	44	56	66	40
60 & above	89	34	25	22	35	31	33	15

- (a) What does HIV stand for?

[1]

- (b) Name the sexually transmitted disease that is caused by HIV.

[1]

- (c) The table above shows that Singaporeans in the age group of 0-9 can also be infected by HIV despite not being sexually active. Suggest how they maybe infected by HIV.

[1]

- (d) Suggest **two** ways to reduce HIV infection among Singaporeans.

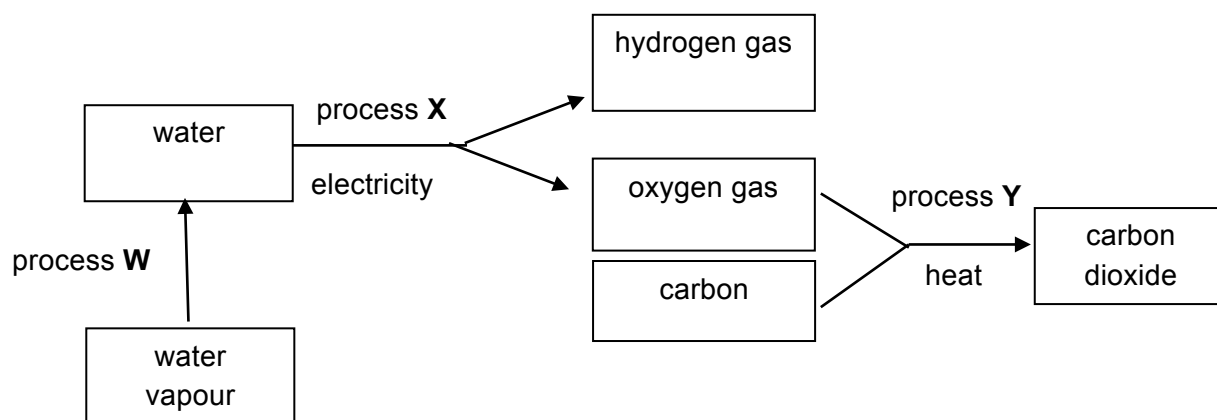
1.

2.

[2]

[Total: 5]

3 The diagram shows how some substances undergo a series of changes.



(a) Identify the processes that have taken place.

	Process	Name of process
(i)	W	
(ii)	Y	
(iii)	Z	

[3]

(b) (i) Write a word equation to represent the reaction that has taken place in process Y.

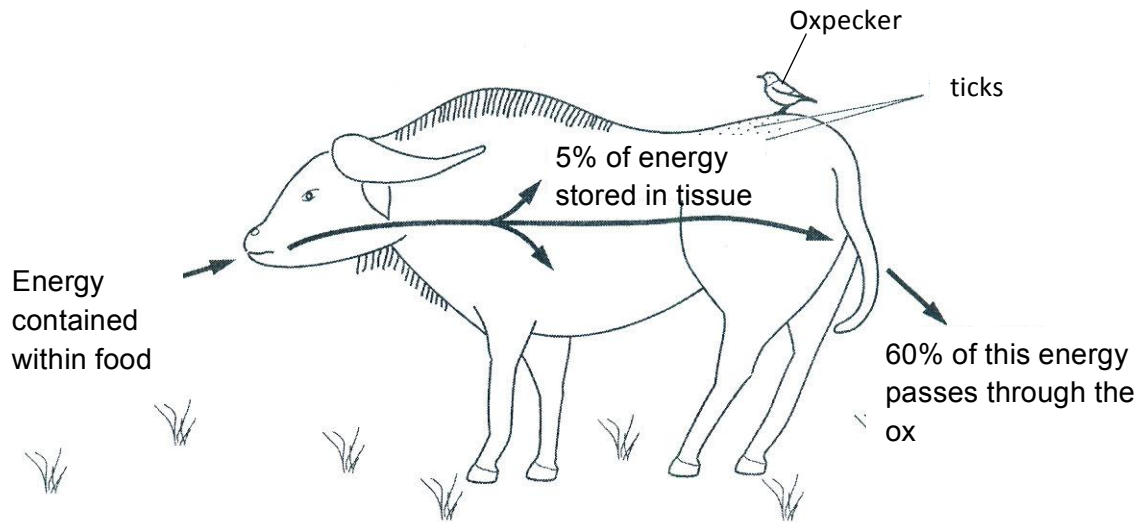
[1]

(ii) Suggest **one** reason why process Y is considered as a chemical change.

[1]

[Total: 5]

- 4 The diagram below shows what happens to energy as it passes through an ox.



- (a) State the source of the energy in the food eaten by the ox.

[1]

- (b) Name the process that uses up the remaining 35% of the energy in the food available to the ox.

[1]

- (c) What kind of feeding relationship is formed by the ticks with the ox? Explain your answer.

[2]

- (d) The oxpecker found on the back of the ox feeds on both the ticks as well as the blood from the ox's wounds. In the space below, draw a food web to show the feeding relationships of the organisms.

[1]
[Total: 5]

Section C

Answer any **two** questions in the spaces provided.

1 Alice ate a curry puff with chicken meat and potato filling.

- (a)** Describe how the curry puff with chicken meat and potato filling can be digested in the mouth, stomach and small intestine.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[5]

- (b)** Due to stomach cancer, Alice has to remove part of her stomach. Describe **two** ways in which her diet needs to be modified.
- 1.**

.....

2.

.....

[2]

- (c)** Explain why Alice needs to ensure she has included the three main nutrients (carbohydrates, fats and proteins) in her diet.

.....

.....

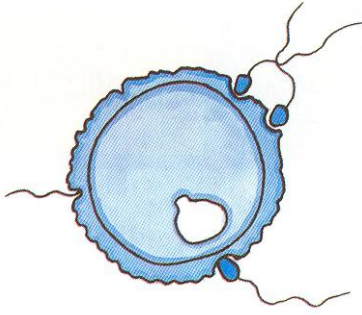
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[3]

[Total:10]

- 2 (a) The diagram below shows a few sperms surrounding an egg. One of the sperms has successfully fertilized the egg.



- (i) Where in the female reproductive system does this process take place?

[1]

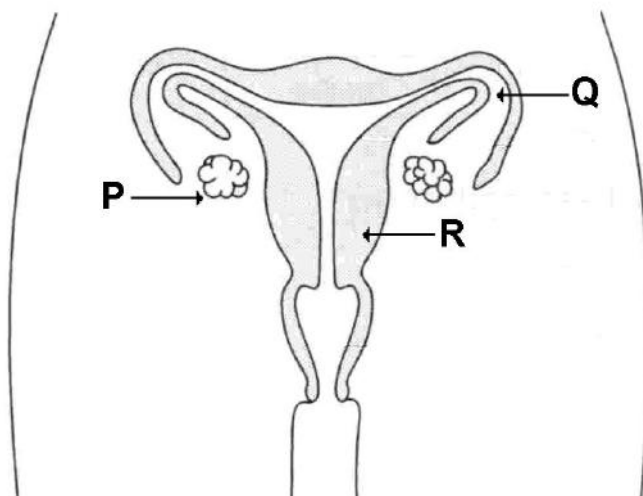
- (ii) Describe the events after sexual intercourse that will lead to fertilization of an egg.

[2]

- (iii) Upon fertilisation, the fertilised egg will move to the uterus. How does the fertilised egg move to the uterus?

[2]

- (b) The diagram below shows the female reproductive system.



- (i) Name the parts labelled **P**, **Q** and **R**.

P:

Q:

R:

[1]

- (ii) Ligation is a permanent method of contraception. Mark with the letter "**X**" on the diagram above the site where ligation would be carried out.

[1]

- (iii) How does ligation prevent pregnancy in a female?

[1]

- (iv) Intra-uterine device is another type of contraception method that a female can use. Mark with letter "**Y**" on the diagram where an intra-uterine device can be placed.

[1]

- (v) How does the Intra-uterine device help prevent pregnancy in a female?

[1]

[Total: 10]

- 3 (a) The followings are chemical changes that can be brought about by interactions with heat, light and electric current or other matter. Write them in the correct group to show what causes these changes.

- Combination of iron and sulfur to form iron sulfide
- Production of carbon dioxide from coal
- Splitting of water into oxygen and hydrogen
- Formation of glucose from carbon dioxide and water
- Formation of salt and water from a dilute acid and an alkali
- Copper-plating using copper sulphate solution

Interaction with heat	
Interaction with light	
Interaction with electric current	
Interaction with other matter	

[6]

- (b) A flask contains the juice of several oranges. Would you expect the pH of the orange juice to be between 1 and 6 or between 8 and 14?

[1]

- (c) Some pieces of magnesium were added to some of the orange juice. Effervescence of a colourless and odourless gas was seen.

(i) Name the gas produced.

[1]

(ii) How would you test the presence of the gas you named in (i)?

[2]

[Total: 10]

End of Paper

The Periodic Table of the Elements

Group																	
I	II	1 H hydrogen 1										III	IV	V	VI	VII	0
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	64 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	127 I iodine 53	128 Te tellurium 52	131 Xe xenon 54	
133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	210 Po polonium 84	210 At astatine 85	210 Rn radon 86
87 Fr francium	88 Ra radium	89 Ac actinium															

*58-71 Lanthanoid series

†90-103 Actinoid series

140 Ce cerium 58	141 Pr praseodymium 59	144 Nd neodymium 60	150 Sm samarium 62	152 Eu europium 63	157 Gd gadolinium 64	159 Tb terbium 65	162 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71
232 Th thorium 90	238 Pa protactinium 91	238 U uranium 92	238 Pu plutonium 94	238 Am americium 95	238 Cm curium 96	238 Bk berkelium 97	238 Cf californium 98	238 Es einsteinium 99	238 Fm fermium 100	238 Md mendelevium 101	238 No nobelium 102	238 Lr lawrencium 103

a = relative atomic mass

X = atomic symbol

b = proton (atomic) number

Key	a	X	b
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*58-71 Lanthanoid series

+90-103 Actinoid series

Key

a	X	a = relative atomic mass
X		X = atomic symbol
b		b = proton (atomic) number

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

Section A-MCQ

No	Answer
1	C
2	B
3	C
4	B
5	C
6	B
7	C
8	C
9	A
10	C

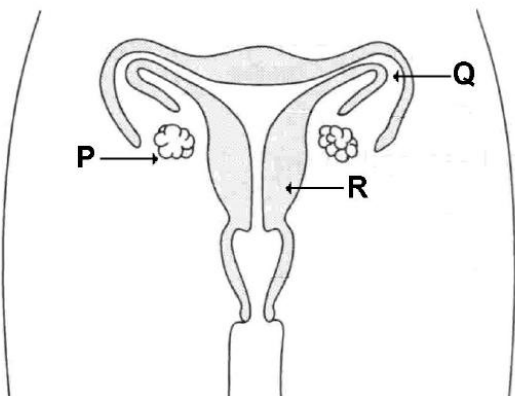
Section B

No		Answers	Marks
1	(a)	osmosis	1
	(b)	Lowest concentration : C D B E Highest concentration: A	1 * all must be correct to get 1 mark
	(c)	The <u>water potential</u> of cell sap of potato disc C is lower than the sugar solution in the surrounding. Hence <u>water molecules</u> move from the sugar solution to the cell sap of potato disc C to the sugar solution <u>by osmosis</u> . The potato disc C <u>becomes greater in mass</u> due to <u>water gain</u>	1 1 1
2	(a)	Human Immunodeficiency Virus	1
	(b)	Acquired Immune Deficiency Syndrome (AIDS) HIV passed from their mother during pregnancy.	1 * Accept if students write acronyms
	(c)	They were infected by their HIV positive/ infected parents.	1
	(d)	Any one of the followings (max 2 mark): 1. Be <u>faithful/ loyal</u> to your <u>spouse</u> . 2. Educate the public to have <u>only one sexual partner</u> . 2. Use <u>protection sheath</u> such as <u>condom</u> . 3. Avoid <u>sharing intravenous needles</u> , syringes or any personal items that may leads to the sharing of body fluid.	2
3	(a)	(i) process w : condensation process X : electrolysis/decomposition process Y:combustion/burning	1 1 1
	(b)	(i) carbon + oxygen $\rightarrow$ carbon dioxide	1
	(b)	(ii) The change is irreversible/ new substance is formed/ heat is given out/ properties of product is different from the reagents.	1 (Any 1 answer)

4	(a)	Sunlight/light	1
	(b)	Respiration	1
	(c)	Parasitism. Ticks benefit but ox is harmed.	1 1
	(d)	<pre> graph LR A[Grass plant Producer] --> B[ox] B --> C[tick] B --> D[oxpecker] C --> D </pre>	1

Section C

No		Answers	Marks
1	(a)	In the mouth, starch (potato) digested by salivary amylase to become simple sugar. In the stomach, protein (meat) is broken down into shorter chains by protease In small intestine, carbohydrates broken down by carbohydrases to form glucose Shorter protein chains further digested into amino acids with the help of protease. Fats broken down into small fat molecules by bile. Further digested to glycerol and fatty acids with help of lipase	1 1 1 1 1
	(b)	Small meals Frequent meals Softer and more fluid based food Cleaner food Chew food properly	1 1 (Any of the 2 answer)
	(c)	Fats supply energy to the body and they are used mainly to store food/ protect the body against cold. Carbohydrates are an intermediate form of energy to the body. Proteins are needed by the body for growth and repair of worn-out tissues.	1 1 1
2	(a)	(i) oviduct/fallopian tube	1
		(ii) sperm deposited in the vagina swim up through the cervix, uterus and into the fallopian tube.	1 1
		(iii) Muscular contractions of the wall of the oviduct sweeping motions of the cilia continue to move zygote towards the uterus.	1 1

	(b)	(i) P- ovary Q- fallopian tube/oviduct R- womb/uterus	1 (All 3 for 1 mark)								
	(b)										
		(ii) Stops eggs from the ovaries from passing along the fallopian tubes into the uterus	1								
		(iv) Prevents fertilized egg from implanting in the uterus									
3	(a)	<table><tr><td>Interaction with heat</td><td> • Combination of iron and sulphur to form iron sulphide • Production of carbon dioxide from coal </td></tr><tr><td>Interaction with light</td><td> • Formation of glucose from carbon dioxide and water </td></tr><tr><td>Interaction with electric current</td><td> • Splitting of water into oxygen and hydrogen • Copper-plating using copper sulphate solution </td></tr><tr><td>Interaction with other matter</td><td> • Formation of salt and water from a dilute acid and an alkali </td></tr></table>	Interaction with heat	• Combination of iron and sulphur to form iron sulphide • Production of carbon dioxide from coal	Interaction with light	• Formation of glucose from carbon dioxide and water	Interaction with electric current	• Splitting of water into oxygen and hydrogen • Copper-plating using copper sulphate solution	Interaction with other matter	• Formation of salt and water from a dilute acid and an alkali	[6]
Interaction with heat	• Combination of iron and sulphur to form iron sulphide • Production of carbon dioxide from coal										
Interaction with light	• Formation of glucose from carbon dioxide and water										
Interaction with electric current	• Splitting of water into oxygen and hydrogen • Copper-plating using copper sulphate solution										
Interaction with other matter	• Formation of salt and water from a dilute acid and an alkali										
	(b)	pH between 1 and 6	1								
	(c)	(i) Hydrogen gas	1								
		(ii) Use lighted splint. If hydrogen is present, lighted splint extinguished with a “pop” sound.	1 1								

Name	Index Number	Class	Parent's Signature



BALESTIER HILL SECONDARY SCHOOL
END OF YEAR EXAMINATION 2014
SECONDARY TWO EXPRESS
SCIENCE (PHYSICS)

Wednesday, 8 October 2014

1 hour

Candidates answer on the Question Paper.
Additional materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on all the work you hand in.
Write in dark blue or black pen in the spaces provided on the Question Paper.
You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A

There are **ten** questions in this section. Answer **all** questions.
For each question, there are four possible answers **A, B, C** or **D**. Choose the **one** you consider correct and record your choice in soft pencil on the separate answer sheet.
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Section B

Answer **all** questions in the spaces provided.

Section C

Answer any **two** questions in the spaces provided.

At the end of the examination, answers to Section A must be handed in separately.
For Sections B and C, the number of marks is given in brackets [] at the end of each question or part-question.
The use of an approved scientific calculator is expected, where appropriate.

For Examiner's Use	
Section A	/10
Section B	/20
Section C	/20
TOTAL	/50

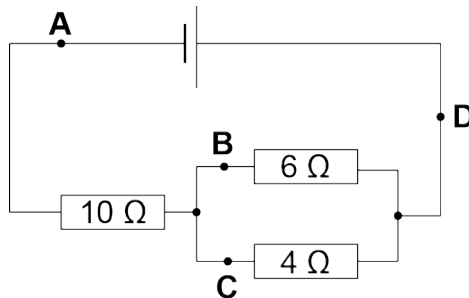
Setter: Mr Kenny Sng
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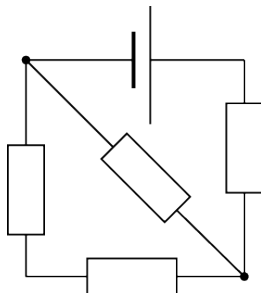
Section A [10 marks]

Answer **all** questions on the **Multiple Choice Answer Sheet** provided.

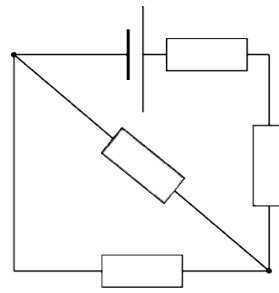
- A1** In the circuit shown below, resistors of varying resistances are connected. At which point is the current the **smallest**?



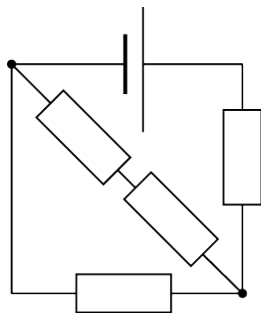
- A2** In the circuits below, all the resistors are identical. Which of the circuits have the same total resistance?



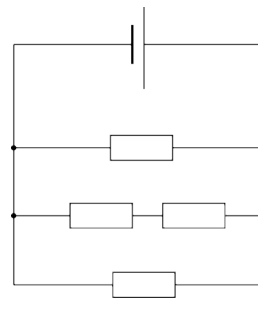
I



II



III



IV

- | | | | |
|----------|--------------------------|----------|----------------------|
| A | I and II | B | I, II and III |
| C | I, II, III and IV | D | I and III |

A3 Friction can be reduced by _____.

- I** making the surface of contact smoother
- II** using ball bearings
- III** using lubricants
- IV** using rollers and wheels

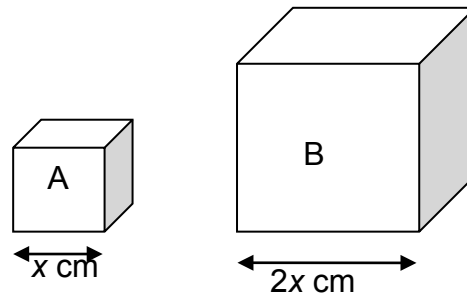
A I and II only

B I, II and IV only

C I, III and IV only

D I, II, III and IV

A4 Two cubic boxes are resting on the floor. Box B has sides which are twice as long as those of Box A.



Which statement is true?

A No conclusion can be made based on the information given.

B The pressure exerted by A on the floor is equal to the pressure exerted by B on the floor.

C The pressure exerted by A on the floor is 2 times the pressure exerted by B on the floor

D The pressure exerted by A on the floor is 4 times the pressure exerted by B on the floor.

A5 Jeremy threw a basketball upwards. Which of the following statements correctly describes what happens to the kinetic energy and gravitational potential energy of the ball just **before** it reaches the highest point?

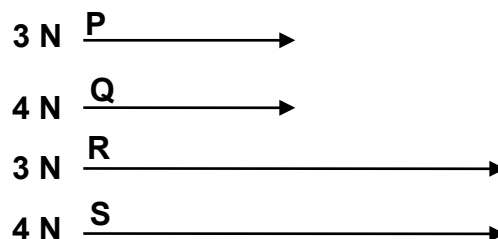
A It gains both kinetic and gravitational potential energy.

B It gains gravitational potential energy but loses kinetic energy.

C It gains kinetic energy but loses gravitational potential energy.

D It loses both kinetic and gravitational potential energy.

- A6** Forces of 3 N and 4 N are used to move objects **P**, **Q**, **R** and **S** over the distances shown in the diagrams below.



Which statement correctly describes the work done by the forces?

- A** The most work is done to move **Q**.
- B** The most work is done to move **S**.
- C** The same amount of work is done to move **P** and **Q**.
- D** The same amount of work is done to move **R** and **S**.

- A7** As sound travels through the air, it eventually fades away. The reason for this is _____.

- A** sound does not need a medium to travel
- B** sound travels in a straight line
- C** sound loses energy as it travels
- D** sound travels slower than light

- A8** If the string of a guitar vibrates 225 times in 3 minutes, what is the frequency of the sound produced?

- | | |
|------------------|------------------|
| A 0.75 Hz | B 1.25 Hz |
| C 12.5 Hz | D 75 Hz |

A9 Anthony finds it hard to unscrew the cap of a bottle of jam. What should he do?

- A** Cool both the cap and the bottle.
- B** Cool the bottle.
- C** Heat both the cap and the bottle.
- D** Heat the bottle.

A10 For the same decrease in temperature, _____.

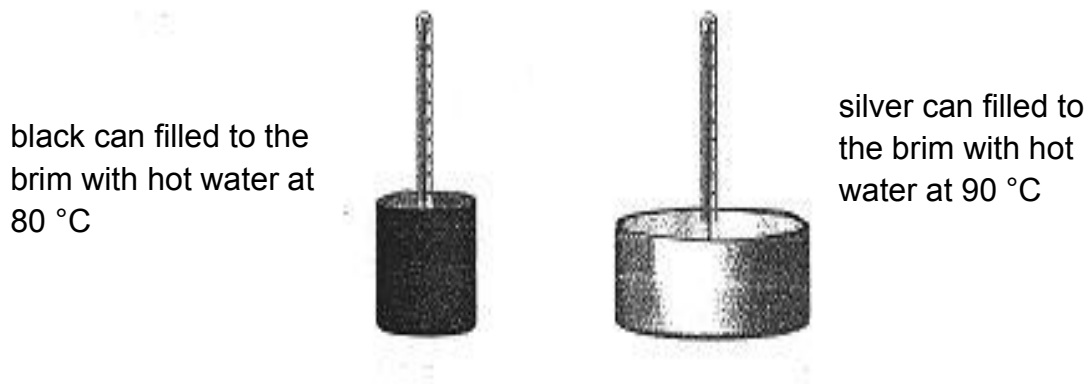
- A** liquids contract less than solids but more than gases
- B** liquids contract more than solids but less than gases
- C** liquids expand less than solids but more than gases
- D** liquids expand more than solids but less than gases

----- End of Section A -----

Section B [20 marks]

Answer **all** questions in the spaces provided.

- B1** An experiment was carried out to find out how the nature of the surface affects heat lost by radiation. The set up of the experiment is shown in the figure below.



- (a) Define *radiation*.

_____ [1]

- (b) State **two** mistakes made in the setup above that made the experiment unfair.

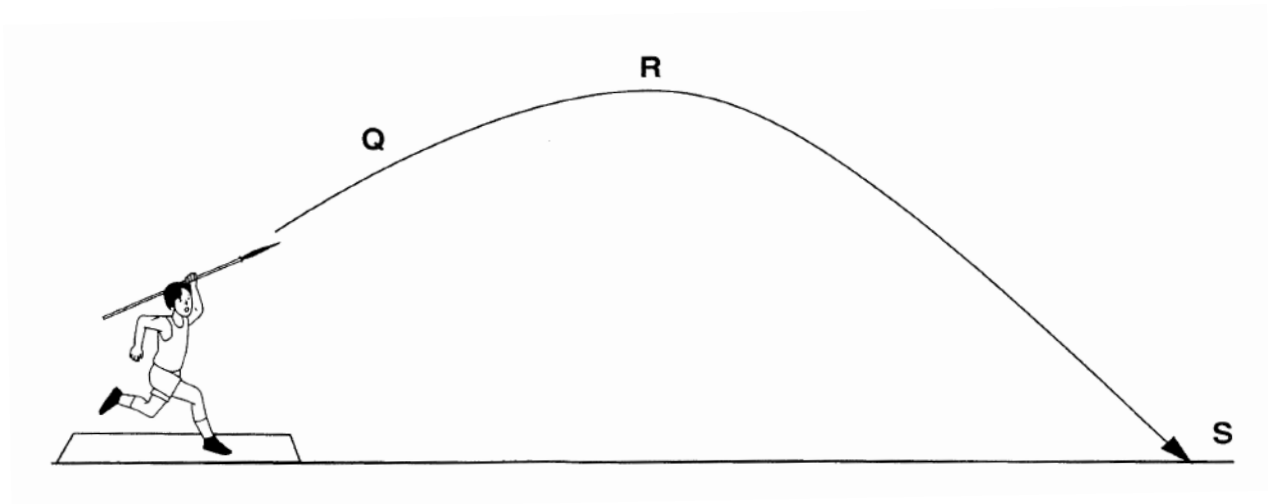
1. _____

2. _____ [2]

- (c) After making the necessary corrections to the experiment, the water is left to cool. State and explain in which can will the water cool down faster.

_____ [2]

- B2** At the recent Youth Olympic Games, a javelin thrower used 250 J of energy to throw his javelin from a stationary position. The path taken by the javelin is shown in the figure below.



- (a) State the point (**Q**, **R** or **S**) in the above figure where the javelin has

(i) the highest gravitational potential energy,

_____ [1]

(ii) the highest kinetic energy.

_____ [1]

- (b) State and explain whether the kinetic energy at point **S** is equal to 250 J.

 _____ [2]

- B3** A hammer strikes one end of a 600 m long metal pipe. A sensitive sound detector at the other end detects two sounds at an interval of 1.9 s between them.

- (a) Explain why two sounds are detected by the sound detector.

 _____ [2]

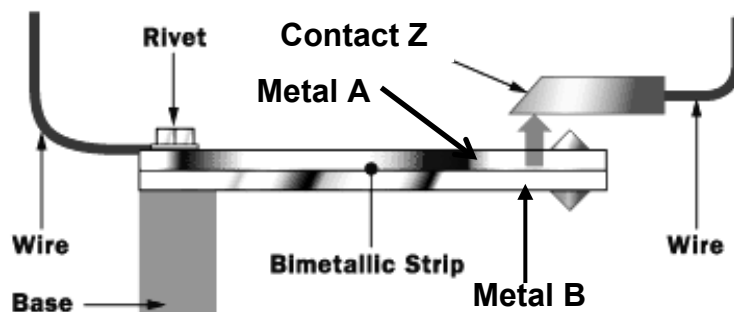
- (b) The speed of sound in air is 300 m/s. Calculate
- (i) the time taken for the sound to reach the detector by air,

Time taken = _____ s [2]

- (ii) the speed of sound in the metal pipe.

Speed of sound in metal pipe = _____ m/s [2]

- B4** The diagram below shows a bimetallic strip thermostat used to turn on and off an oven. The contacts are now open as the interior of the oven is now at 350 °C.



- (a) State which metal, A or B, contracts more when cooled.

[1]

- (b) If a higher temperature in the oven is desired, state and explain briefly whether contact Z should be moved nearer or further away from the bimetallic strip.

_____ [2]

- (c) Suggest **two** possible modifications to this thermostat to enable it to work in an air conditioner.

1. _____
2. _____ [2]

----- End of Section B -----

Section C [20 marks]

Answer any **two** questions in the spaces provided.

- C1 (a)** **Figure 1** shows an experiment to measure the friction between the object and the surface of a floor.

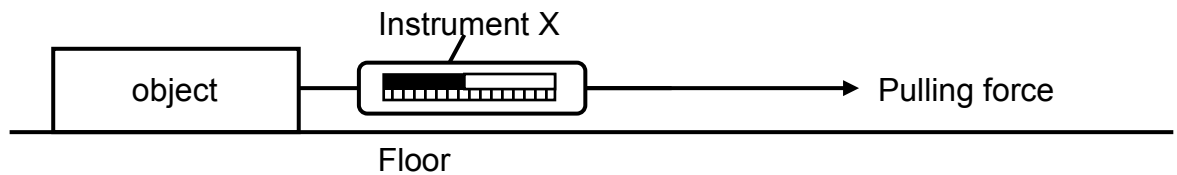


Figure 1

- (i) State the name of Instrument X.

_____ [1]

- (ii) On the diagram, indicate the direction of the frictional force acting on the object. [1]

- (b)** **Figure 2** below shows a stool. Each leg of the stool has a square base of side 5 cm.

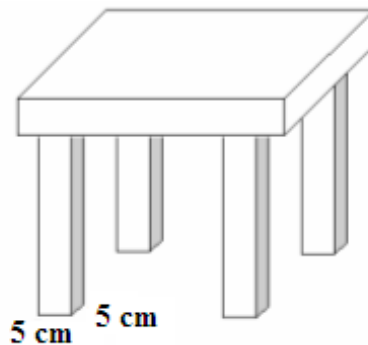


Figure 2

- (i) Define *pressure*.

_____ [1]

- (ii) Find the pressure exerted on the floor if the weight of the stool is 6 N.

Pressure = _____ N/cm² [2]

- (iii) Find the pressure exerted on the floor when a lady of weight 50 N sat on the stool.

Pressure = _____ N/cm² [2]

- (iv) The stool is now replaced by another stool of the same weight which has only three legs, each of which has a square base of side 5 cm. State and explain how this would affect your answer in (iii) if the lady now sits on this stool.

[3]

- C2 (a)** **Figure 3** below shows an experimental setup using a glass flask containing air. The tube of the flask is immersed in water.

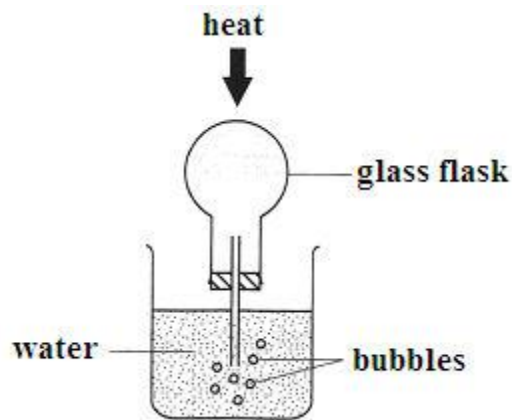


Figure 3

- (i)** When the flask is heated, bubbles are observed in the water. Explain this observation.

[2]

- (ii)** The flask is then cooled. Predict and explain what would be observed.

[3]

- (b)** Explain how a sea breeze is formed by convection.

[3]

- (c) Paper steamboat is a very popular Japanese cuisine where the food is placed in paper and cooked over the flame. Explain, using knowledge of the process of thermal energy transfer, why the paper will **not** catch fire easily.



Figure 4

[2]

- C3 (a)** In the experiment shown in **Figure 5**, one hand is pressed onto an end of a flexible plastic ruler against a table top. The other hand pushes the free end of the ruler and releases. A sound is heard.



Figure 5

- (i) State what produces the sound that is heard.

[1]

- (ii) As the plastic ruler moves up and down, the ruler is moved in the direction of the arrow shown in **Figure 5** so that less of it extends over the table's edge. State and explain what happens to the pitch of the sound produced.

[3]

- (iii) The experiment is repeated again by striking the ruler with a larger force. State and explain the difference in the sound obtained.

[2]

- (b) **Figure 6** below shows a man firing a gun. He stands 150 m away from a cliff and 300 m away from a second man. The speed of sound is approximately 300 m/s.

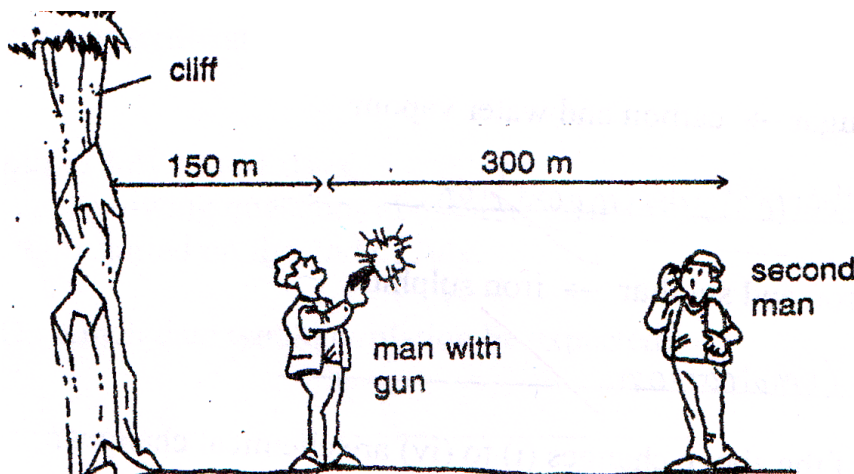


Figure 6

- (i) Calculate the time taken for the second man to hear the gun shot after it was fired.

Time taken = _____ s [1]

- (ii) Calculate the time taken for the second man to hear the echo from the cliff after the firing.

Time taken = _____ s [2]

(iii) Describe one useful application of echo.

[1]

----- End of Paper -----

**Balestier Hill Secondary School
End Of Year Examination (2014)
Secondary Two Express
Science (Physics)
Marking Scheme**

Section A (10 marks)

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
B	D	D	A	B	B	C	B	B	B

Section B (20 marks)

Question			Answer	Mark	Remarks
B1	a		Transfer of heat/gain or loss of heat without the need for a medium	1	
	b		Starting temperature of the water is different for both cans	1	
			Surface area is different for the water for both cans	1	
	c		Water in black can will cool faster	1	
			Black/Darker surfaces loses more heat per second /loses heat faster /are better emitters of heat/better radiator of heat	1	
B2	a	i	R	1	
		ii	S	1	
	b		The kinetic energy would not not be equal to 250J	1	
			Energy is lost to the surrounding due to friction/air resistance OR energy is converted into other forms of energy throughout its motion	1	
B3	a		Sound travels faster in the metal pipe than in air	1	
			Hence, the sound travelling through the pipe reaches the detector first	1	
	b	i	Time taken = $\frac{600}{300}$ = 2 s	1	
				1	
		ii	Time taken for the sound to travel through the pipe = 2 – 1.9 = 0.1 s	1	

			Speed of sound in metal pipe = $\frac{600}{0.1}$ = 6000 m/s	1	
B4	a		Metal A	1	
	b		Contact Z should be moved nearer to the bimetallic strip. When the temperature cools, it will need to move a shorter distance to close the contact	1 1	
	c		Swap the position of Metal A and B/Change Metal B to another metal that contracts more than A/Move position of Z to side of Metal B instead of A	Any 2 of the points – 1 mark each	

Section C (20 marks, 3 Questions Choose 2)

Question			Answer	Mark	Remarks
C1	a	i	Force meter/Spring Balance/Newton Meter	1	Weighing scale: Not accepted
		ii	Arrow drawn correctly in the opposite direction of the pulling force and close to the object and surface	1	
	b	i	Measure of the amount of force acting on a <u>unit</u> area	1	No marks to be awarded if the idea of unit area is not present
		ii	$\text{Pressure} = \frac{6}{4 \times 5 \times 5}$ $= 0.06 \text{ N/cm}^2$	1 1	No fractions allowed
		iii	$\text{Pressure} = \frac{6 + 50}{4 \times 5 \times 5}$ $= 0.56 \text{ N/cm}^2$	1 1	Allow ECF from (ii) No fractions allowed
		iv	Pressure will increase	1	Surface area of the stool- not accepted
			Area of contact has decreased/lesser unit area in contact with the ground	1	
			Total weight of stool and lady remains the same	1	
C2	a	i	The air in the flask expands when heated	1	No credit if students write

			The expanded air escapes into the water	1	air particles expanded
		ii	The air in the flask contracts when cooled It occupies less space in the flask/empty spaces in the flask/lower air pressure inside/more air pressure outside The water flows into the flask to take up the space/water level in the tube rises to take up the space/water level in the beaker falls	1 1 1	
	b		On a hot day, the land heats up faster than the sea. Hot air over the land rises. Cold, denser air over the sea replaces this hot air. This results in a breeze from the sea to the land.	1 1 1	Do not accept if students simply write “hot air rises, cold air sinks” If students explain land breeze correctly instead of sea breeze, minus 1m
	c		Heat is transferred away from the paper by the water by convection The temperature of the paper rises at a slower rate/speed OR paper did not gain/absorb enough heat to burn OR paper remains cool enough	1 1	
C3	a	i	Vibration of the ruler	1	Do not accept “movement of

					ruler”
		ii	The speed of the ruler’s vibration increases/vibrate faster Hence, frequency of the sound increases/number of vibrations per second increases Results in an increase in the pitch of the sound	1 1 1	
		iii	Volume of the sound will increase The size of the ruler’s vibration increases	1 1	
	b	i	Time taken = $\frac{300}{300}$ = 1 s	1	No marks awarded if no working is shown
		ii	Time taken = $\frac{600}{300}$ = 2 s	1 1	
		iii	Measure the depth of the ocean/determine location of shoals of fishes	1	No marks awarded if students simply wrote “echolocation”

Name: _____

Class: Sec _____

Index No.: _____



CORAL SECONDARY SCHOOL END-OF-YEAR EXAMINATION 2014

LOWER SECONDARY SCIENCE (CHEMISTRY)

10 October 2014

SECONDARY 2 EXPRESS

Duration: 45 minutes

Candidates must answer ALL questions in the spaces provided in the Question Paper.

READ THESE INSTRUCTIONS FIRST

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

Write your name, class and index number on all the work you hand in.

Write in dark blue or black pen. You may use a pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A: Multiple Choice Questions [10 marks]

Answer **all** questions in the table provided at the end of the section on page 5.

Section B: Structured Questions [18 marks]

Section C: Free Response Questions [12 marks]

Answer **all** questions. Write your answers in the spaces provided.

The number of marks is given in brackets [] at the end of each question or part question.

A copy of the Periodic Table is printed on page 12.

ELECTRONIC CALCULATORS MAY BE USED IN THIS PAPER.

For Examiner's Use		
Section	Question(s)	Marks
A	1 – 10	
B	11 – 13	
C	14	
Total Marks		

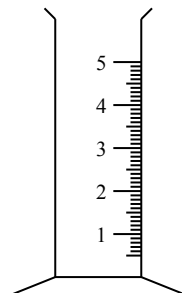
This question paper consists of **12** printed pages, including this page.**[Turn over**

Section A [10 Marks]

Answer **all** questions in the table provided at the end of the section.

- 1 Four pieces of apparatus are shown.

Which apparatus is **not** used to measure the volume of a liquid?

A**B****C****D**

- 2 A liquid boils at a temperature of 100 °C.

Which other property of the liquid proves that it is pure water?

- A** It freezes at 0 °C.
- B** It is neither acidic nor alkaline.
- C** It does not leave a residue when boiled.
- D** It has a pH of 7 when tested with Universal Indicator.
- 3 Which of the following shows the correct number of elements and atoms in sodium sulfate, Na₂SO₄?

	number of elements	number of atoms
A	3	3
B	3	7
C	7	3
D	7	7

- 4 The table below shows the melting and boiling points of four metals.

metal	melting point / °C	boiling point / °C
caesium	29	685
potassium	63	766
rubidium	39	701
sodium	98	890

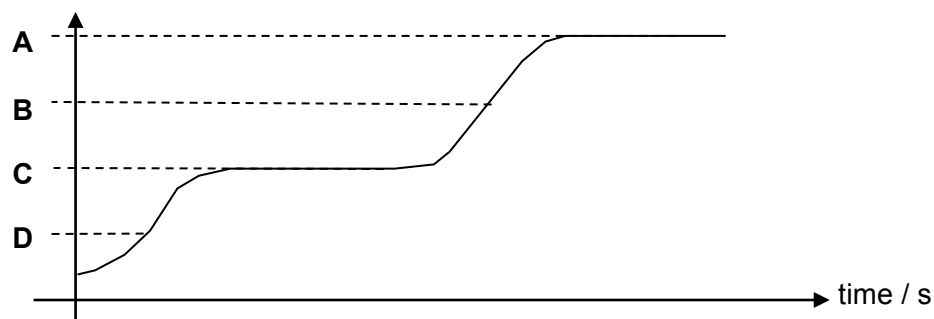
When the metals are cooled to 50 °C, some of these metals will solidify.

Which metals will solidify?

- A** caesium and rubidium only
B potassium and sodium only
C rubidium and sodium only
D all metals
- 5 A sample of a pure substance was heated. The graph below shows the change in temperature with time.

Which letter shows the melting point of the substance?

temperature / °C



[Turn over

- 6 The table below gives the structure of four atoms.

Which atom has the largest mass number?

	number of electrons	number of neutrons	number of protons
A	5	6	5
B	5	7	5
C	6	4	6
D	6	5	6

- 7 Which statement explains why noble gases are unreactive?

- A** They all have completely filled valence shells.
- B** They all have eight electrons in their valence shells.
- C** They all have an even number of electrons.
- D** They all have the same number of electrons and protons.

- 8 The table shows the number of protons in five elements.

atom of element	number of protons
U	18
V	9
W	17
X	11
Y	4

Which pair of atoms forms a covalent molecule?

- A** two atoms of **U**
- B** two atoms of **V**
- C** an atom of **W** and an atom of **X**
- D** an atom of **X** and an atom of **Y**

- 9 What was observed when a piece of damp litmus paper was dipped into hydrochloric acid?
- A The blue litmus paper turns red.
- B The red litmus paper turns blue.
- C No change was observed.
- D The blue litmus paper turns red then blue.
- 10 Ammonium chloride is heated with substance X. Ammonia gas is given off.
- What type of substance is X?
- A acid
- B alkali
- C salt
- D metal

ANSWERS FOR SECTION A

No.	Answer	No.	Answer
1		6	
2		7	
3		8	
4		9	
5		10	

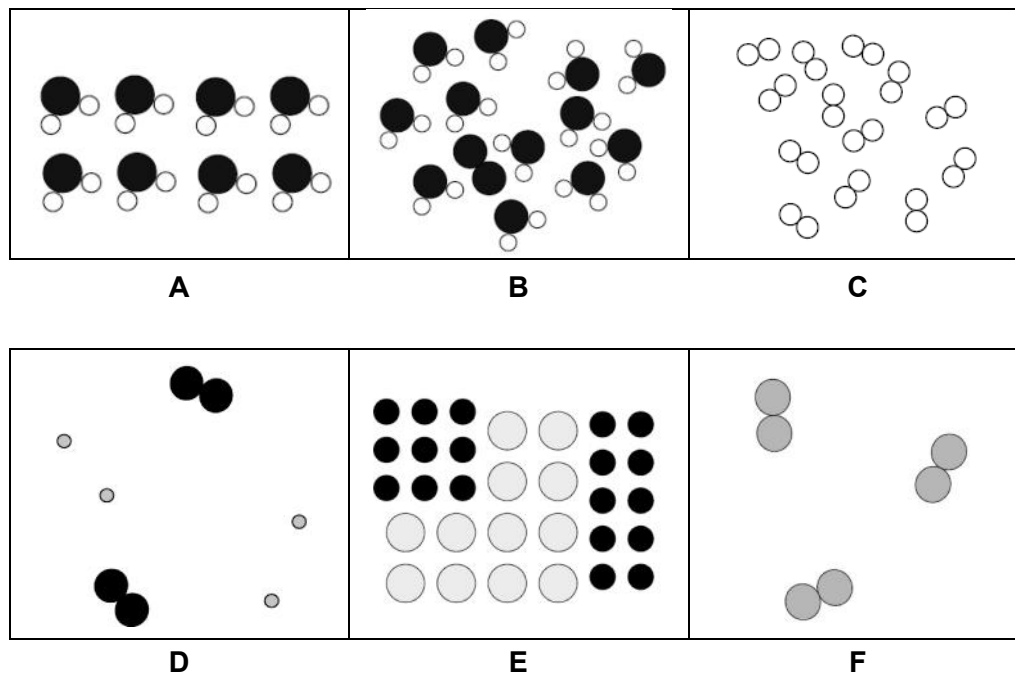
[10]

[Turn over

SECTION B [18 Marks]

Answer **all** questions. Write your answers in the spaces provided.

- 11** In the boxes, each circle represents an atom. Circles of different sizes and colour show different elements.



Use the letters **A** to **F** to identify a

- | | | |
|--|--|-----|
| (a) solid compound; | | [1] |
| (b) liquid element; | | [1] |
| (c) solid mixture; | | [1] |
| (d) gaseous mixture of elements; | | [1] |
| (e) liquid mixture of elements and compounds. | | [1] |

12 An atom of fluorine has nine electrons.

(a) Draw a diagram to show the arrangement of electrons in a fluorine atom.

[1]

(b) Fluorine reacts with magnesium metal to form magnesium fluoride.

Draw a dot-and-cross diagram of magnesium fluoride.

[2]

(c) Fluorine also reacts with hydrogen to form hydrogen fluoride.

Draw a dot-and-cross diagram of hydrogen fluoride. Show only the outer shell electrons.

[2]

[Turn over

- (d) Magnesium fluoride and hydrogen fluoride have very different boiling points.

Use your knowledge of the bonding in magnesium fluoride and hydrogen fluoride to explain the difference in boiling points.

.....

.....

.....

.....

.....

[3]

- 13 Complete the following table by writing the missing formula and electrical conductivity.

substance	chemical formula	electrical conductivity	
		solid state	molten state
oxygen gas		poor	
sulfur trioxide		poor	
potassium carbonate		poor	
calcium oxide		poor	
iron		good	

[5]

SECTION C [12 Marks]

Answer **all** questions. Write your answers in the spaces provided.

- 14 (a)** Complete the table to indicate if there is a chemical reaction when the following substances are added in a test-tube.

State 'yes' if there is a chemical reaction and name the products formed.

State 'no' if there is no chemical reaction.

substances added	is there a chemical reaction?	names of products formed
calcium + sodium nitrate		
zinc oxide + hydrochloric acid		
sodium carbonate + nitric acid		

[3]

- (b)** When nitric acid reacts with magnesium metal, magnesium nitrate and a gas is formed.

- (i)** Describe a test to confirm the identity of this gas.

test.....

observation.....

.....

[2]

- (ii)** When magnesium metal was replaced with another metal, no reaction was observed.

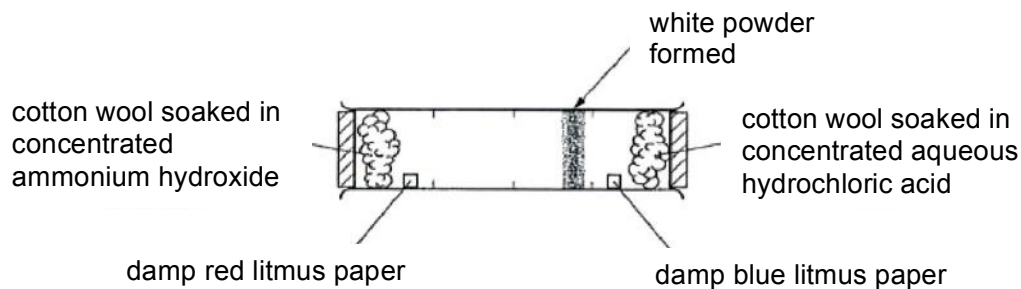
Suggest the identity of the metal.

.....

[1]

[Turn over

- (c) The following experiment was set up to investigate the movement of gases.



The white powder forms on the tube due to the reaction between ammonium hydroxide and hydrochloric acid.

- (i) Complete the following word equation.

ammonium hydroxide + hydrochloric acid →

..... [1]

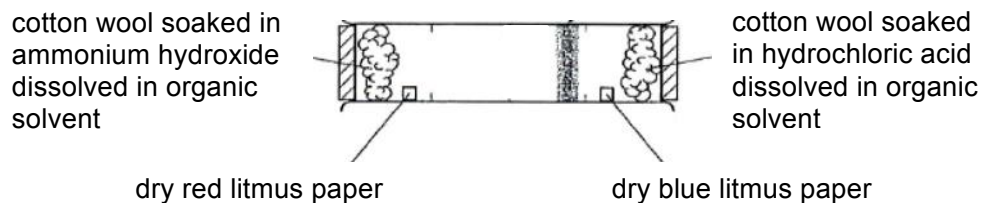
- (ii) What is the name given to this reaction?

..... [1]

- (iii) Explain why the white powder does not form in the centre of the tube.

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

- (iv) The experiment was repeated using cotton wool soaked in ammonium hydroxide and hydrochloric acid dissolved in an organic solvent and dry litmus papers.



At the end of the experiment, it was observed that the colour of the two litmus papers were different from that of those observed at the end of the first experiment.

Describe and explain the difference in observations.

.....

.....

.....

.....

.....

.....

.....

.....

.....

[2]

~ END OF PAPER ~

[Turn over

The Periodic Table of the Elements

Group																	
I	II											III	IV	V	VI	VII	0
1 H hydrogen 1																	
7 Li lithium 3	9 Be beryllium 4																
23 Na sodium 11	24 Mg magnesium 12																
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	64 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	101 Ru ruthenium 44	101 Rh rhodium 45	103 Pd palladium 46	106 Ag silver 47	108 Cd cadmium 48	112 In indium 49	115 Sn tin 50	119 Sb antimony 51	122 Te tellurium 52	128 I iodine 53	131 Xe xenon 54	
133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	210 Po polonium 84	210 At astatine 85	222 Rn radon 86
87 Fr francium	88 Ra radium	89 Ac actinium															
*58-71 Lanthanoid series																	
†90-103 Actinoid series																	
140 Ce cerium 58	141 Pr praseodymium 59	144 Nd neodymium 60	147 Pm promethium 61	150 Sm samarium 62	152 Eu europium 63	157 Gd gadolinium 64	159 Tb terbium 65	162 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71	101 Fm fermium 100	101 Md mendelevium 101	102 No nobelium 102	103 Lr lawrencium 103
232 Th thorium 90	232 Pa protactinium 91	238 U uranium 92	238 Np neptunium 93	238 Pu plutonium 94	238 Am americium 95	238 Cm curium 96	238 Bk berkelium 97	238 Cf californium 98	238 Es einsteinium 99	238 Fm fermium 100	238 Md mendelevium 101	238 No nobelium 102	238 Lr lawrencium 103				

Key

a

X

b

a = relative atomic mass

X = atomic symbol

b = proton (atomic) number

Key

a	X	b
---	---	---

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

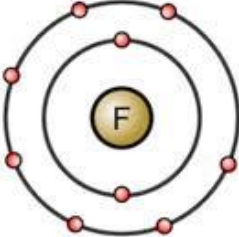
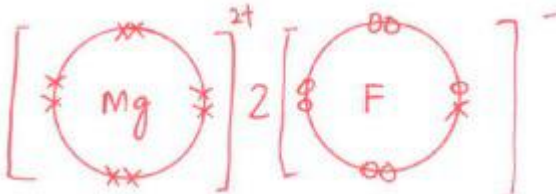
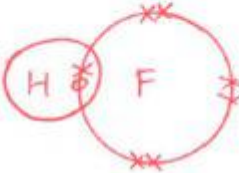
The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

**Coral Secondary School
EOY 2014
Sec 2E Lower Sec Science (Chemistry)**

Section A: Multiple Choice Questions (Total Marks: 10)

Question No.	Answer	Question No.	Answer
1	D	6	B
2	A	7	A
3	B	8	B
4	B	9	A
5	C	10	B

Section B: Structured Questions (Total Marks: 18)

Qn No.	Answer	
11a 11b 11c 11d 11e	A C E D B	1 1 1 1 1
12 (a)		1
12 (b)		1 – correct charges + electrons 1 – correct ratio of 1:2
12 (c)		1 – correct number of atoms 1 – correct number of bonding electrons

12 (d)	Magnesium fluoride is an <u>ionic compound</u> with a high boiling point while hydrogen fluoride is a <u>covalent compound</u> with low boiling point . Magnesium fluoride has <u>strong force of attraction between ions</u> hence its melting point is high. Hydrogen fluoride <u>has weak van der Waals forces of attraction between molecules/intermolecular force</u> which require less energy to break, hence it's melting point is low.			1- difference in melting points/difference in <u>heat</u> energy required 1- naming the type of compound 1- description of bonding																									
13	<table><tr><th rowspan="2">substance</th><th rowspan="2">chemical formula</th><th colspan="2">Electrical conductivity</th></tr><tr><th>solid state</th><th>molten state</th></tr><tr><td>oxygen gas (element, non-metal)</td><td><u>O₂</u></td><td>poor</td><td><u>Poor</u></td></tr><tr><td>sulfur trioxide (covalent compound)</td><td><u>SO₃</u></td><td>poor</td><td><u>Poor</u></td></tr><tr><td>potassium carbonate (ionic compounds)</td><td><u>K₂CO₃</u></td><td>poor</td><td><u>Good</u></td></tr><tr><td>calcium oxide (Ionic compound)</td><td><u>CaO</u></td><td>poor</td><td><u>Good</u></td></tr><tr><td>iron</td><td><u>Fe</u></td><td>good</td><td><u>Good</u></td></tr></table>	substance	chemical formula	Electrical conductivity		solid state	molten state	oxygen gas (element, non-metal)	<u>O₂</u>	poor	<u>Poor</u>	sulfur trioxide (covalent compound)	<u>SO₃</u>	poor	<u>Poor</u>	potassium carbonate (ionic compounds)	<u>K₂CO₃</u>	poor	<u>Good</u>	calcium oxide (Ionic compound)	<u>CaO</u>	poor	<u>Good</u>	iron	<u>Fe</u>	good	<u>Good</u>	Every 2 correct - 1M	
substance	chemical formula			Electrical conductivity																									
		solid state	molten state																										
oxygen gas (element, non-metal)	<u>O₂</u>	poor	<u>Poor</u>																										
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calcium oxide (Ionic compound)	<u>CaO</u>	poor	<u>Good</u>																										
iron	<u>Fe</u>	good	<u>Good</u>																										

Section C: Free-Response Questions (Total Marks: 12)

14 (a)	substances added	is there a chemical reaction?	name of products formed	
	calcium + sodium nitrate	No	Nil	1
	zinc oxide + hydrochloric acid	Yes	Zinc chloride + water	1
	sodium carbonate + nitric acid	Yes	Sodium nitrate + water + carbon dioxide	1
14 (b) i	Introduce a lighted splint. The gas will <u>extinguish</u> a <u>lighted splint</u> with a 'pop' sound.			1 1
14 (b) ii	Copper/Silver			1
14 (c) i	ammonium chloride + water / ammonium chloride			1
14 (c) ii	Neutralisation			1

14 (c) iii	Ammonia has a lower molecular mass than hydrogen chloride. Hence it <u>diffuses/travels faster</u> than hydrogen chloride. Hence the white powder is formed nearer to hydrogen chloride.	1 1
16 (c) iv	For the first experiment, at the end, the red litmus paper turns blue while the blue litmus paper turns red. However in the second experiment, <u>both litmus paper remains unchanged</u>. In the first experiment, due to the presence of water, both hydrogen chloride and ammonia dissociated to form hydrogen ions & hydroxide ions respectively. However in the second experiment, as there was no water, the hydrogen chloride and ammonia <u>were not able to dissociate into its ions</u>, hence no colour change was observed.	1 1

Name:	Class: Sec _____	Index No.: _____
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CORAL SECONDARY SCHOOL END-OF-YEAR EXAMINATION 2014

LOWER SECONDARY SCIENCE PHYSICS

Paper 1

9 October 2014

SECONDARY 2 EXPRESS

Duration: 45 minutes

Candidates must answer ALL questions in the spaces provided in the Question Paper.

READ THESE INSTRUCTIONS FIRST

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

Write your name, class and index number on all the work you hand in.

Write in dark blue or black pen. You may use a pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A: Multiple Choice Questions [10 marks]

Answer **all** questions in the table provided at the end of the section on **page 4**.

Section B: Structured Questions [20 marks]

Section C: Free Response Questions [10 marks]

Answer **all** questions. Write your answers in the spaces provided.

The number of marks is given in brackets [] at the end of each question or part question.

Unless otherwise stated, use $g = 10 \text{ m s}^{-2}$ for all your calculations.

ELECTRONIC CALCULATORS MAY BE USED IN THIS PAPER.

For Examiner's Use		
Section	Question(s)	Marks
A	1 – 10	
B	11 – 15	
C	16	
Total Marks		

This question paper consists of **9** printed pages, including this page.

[Turn over

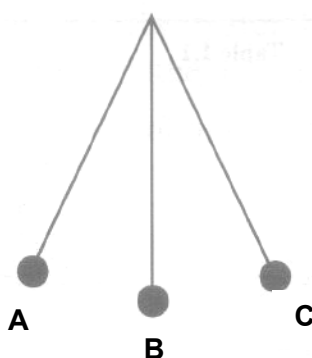
SECTION A [10 MARKS]

Answer **ALL** questions by writing the correct option in the table found on page 4.

- 1 Which of the following is a vector quantity?

A time
B speed
C distance
D acceleration

- 2 The diagram shows a simple pendulum that oscillates between **A** and **C**. The pendulum takes 0.3 s to move from **A** to **B**.



What is the period of the pendulum?

- A** 0.3 s **B** 0.6 s **C** 1.2 s **D** 2.4 s
- 3 Mary is measuring the period of 4 different pendulums – **A**, **B**, **C** and **D**. The table shows the length and mass of each pendulum.

Which pendulum will have the **shortest** period?

	length / cm	mass / g
A	20	50
B	40	40
C	60	30
D	80	20

- 4 According to Newton's First Law of Motion, when there is no resultant force acting on a moving object, the object will
- A slow down and stop moving.
 - B continue moving at the same speed in the same direction.
 - C continue moving at the same speed but direction might change.
 - D continue moving at the same acceleration in the same direction.
- 5 Which of the following is **not** possible when a force acts on an object?
- A The object slows down.
 - B The object moves faster.
 - C The object changes its mass.
 - D The object changes its shape.
- 6 Two forces of magnitudes 10 N and 15 N are acting on an object.
Which of the following is **not** a possible value for the resultant force?
- A 5 N B 12 N C 25 N D 30 N
- 7 A pressure of 100 Pa is equal to
- A 100 N m^{-2} B 1000 N m^{-2} C 1000 N cm^{-2} D 10000 N cm^{-2}
- 8 Which of the following properties of light explains why shadows are formed?
- A Light is a form of energy.
 - B Light can be reflected.
 - C Light travels in straight lines.
 - D The speed of light changes when it passes into a different medium.
- 9 The human eye is able to see a non-luminous object because
- A the human eye gives out light.
 - B the non-luminous object gives out light.
 - C light is reflected from the non-luminous object into the human eye.
 - D light is reflected from the human eye onto the non-luminous object.

10 When you look at a convex mirror, the image of your face is

- A** upright and bigger than your face.
- B** inverted and bigger than your face.
- C** upright and smaller than your face.
- D** inverted and smaller than your face.

ANSWERS FOR SECTION A

No.	Answer	No.	Answer
1		6	
2		7	
3		8	
4		9	
5		10	

[10]

SECTION B [20 MARKS]

Answer **ALL** questions. Write your answers in the spaces provided.

- 11** Peter is running along a circular path in the park. The distance of one complete round around the circular path is 800 m. Peter takes 12 min to run three complete rounds.

- (a) Calculate the distance travelled and average speed of Peter in running three complete rounds.

distance travelled = m

average speed = m s^{-1} [2]

- (b) (i) State the displacement of Peter after 3 complete rounds.

displacement = m [1]

- (ii) Explain why the distance travelled by Peter is different from his displacement after running three complete rounds.

.....

.....

..... [1]

- 12** A man took 30 min to drive from town **X** to town **Y** at an average speed of 70 km h^{-1} . He took a break for 1 h before driving from town **Y** to town **Z** in 40 min at an average speed of 60 km h^{-1} .

- (a) Calculate the total distance travelled by the man from town **X** to town **Z**.

distance = km [2]

- (b) Calculate the average speed of the man from town **X** to town **Z**.

average speed = km h^{-1} [2]

- 13 (a) Define *acceleration*.

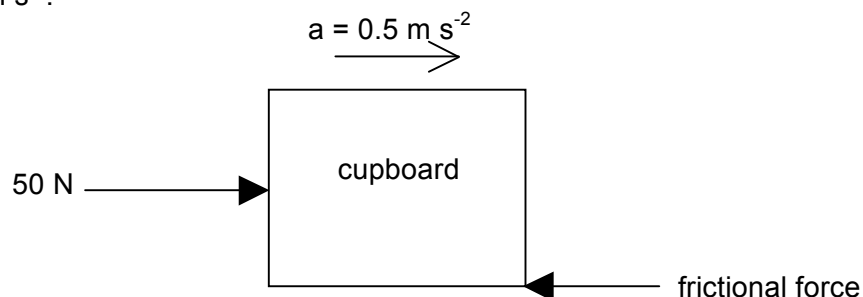
..... [1]

- (b) A car travelling at an initial speed of 15 m s^{-1} slows down to a stop before a traffic junction with a deceleration of 3 m s^{-2} .

Calculate the time taken for the car to come to a stop.

time = s [2]

- 14 The diagram below shows the forces acting on a cupboard as it is being pushed along the floor. The mass of the cupboard is 20 kg , and it is moving with an acceleration of 0.5 m s^{-2} .



- (a) Calculate the resultant force acting on the cupboard.

resultant force = N [2]

- (b) Calculate the frictional force.

frictional force = N [2]

- (c) State **one** way to reduce the friction between the cupboard and the floor.

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

- 15** A man of weight 800 N is standing on two feet. He is carrying a box that has a weight of 100 N. The total area of his two feet in contact with the floor is 400 cm^2 .

- (a) Calculate the pressure exerted by the man's feet on the floor, in N cm^{-2} .

pressure = N cm^{-2} [2]

- (b) The man is standing on soft sand and he starts to sink into it as a result of the pressure he exerts on the sand.

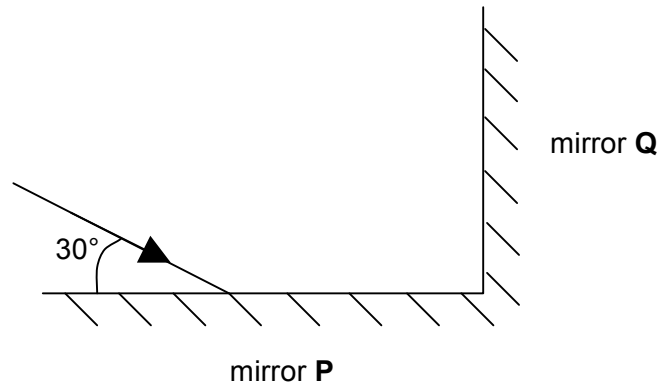
Suggest and explain how he can reduce the sinking effect.

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

SECTION C [10 MARKS]

Answer **ALL** questions. Write your answers in the spaces provided.

- 16 (a)** Two mirrors, **P** and **Q**, are arranged at 90° to each other as shown in the diagram below (not to scale). A ray of light strikes mirror **P** at an angle of 30° .



- (i) Complete the diagram to show how the ray of light reflects from mirrors **P** and **Q**. [1]
- (ii) State the incident angle of the light ray on mirror **P**.

incident angle =° [1]

- (iii) State the Law of Reflection of light.

..... [1]

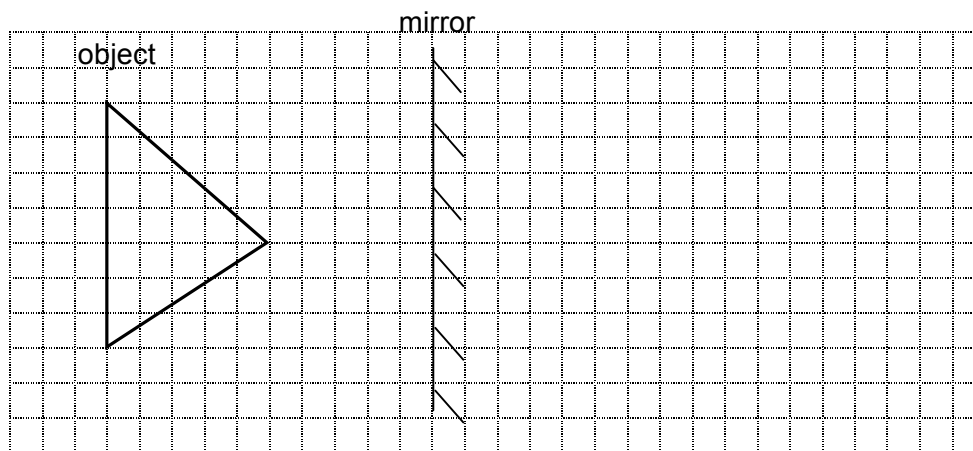
- (iv) By using relevant angle properties, determine the angle of reflection of the light ray from mirror **Q**.

angle of reflection =° [2]

- (b) The diagram below shows a triangular object in front of a plane mirror.

In the diagram, draw the image of the object behind the mirror.

[3]



- (c) The word **CORAL** has five letters.

- (i) Write down how the image of the word **CORAL** will look like in a plane mirror.

..... [1]

- (ii) How many letters in the word will appear to be the same in the mirror?

..... [1]

~ END OF PAPER ~

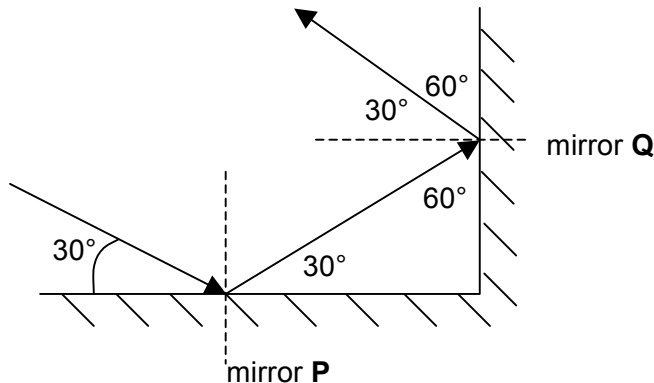
Section A

1	D	6	D
2	C	7	A
3	A	8	C
4	B	9	C
5	C	10	C

[10 m]

Section B

11	(a)	distance travelled = $3 \times 800 = 2400 \text{ m}$ average speed = $2400 / (12 \times 60) = 3.33 \text{ m s}^{-1}$ <i>allow e.c.f.</i>	B1 A1
	b(i)	displacement = 0 m	B1
	b(ii)	Distance is total length regardless of path taken, while displacement is final distance in a straight line from starting point. OR Distance is a scalar, displacement is a vector / distance does not depend on direction while displacement depends on direction	B1
12	(a)	distance = speed x time $= (70)(30/60) + (60)(40/60)$ $= 75 \text{ km}$	C1 A1
	(b)	average speed = total distance / total time $= 75 / [(30+40+60)/60]$ <i>allow e.c.f. from part (a)</i> $= 34.6 \text{ km h}^{-1}$	C1 A1
13	(a)	rate of change of velocity	B1
	(b)	$a = (v - u)/t$ $t = (v - u)/a$ $= (0 - 15) / (-3)$ $= 5 \text{ s}$	C1 A1
14	(a)	$F = ma$ $= (20)(0.5)$ $= 10 \text{ N}$	C1 A1
	(b)	resultant force = 50 N – frictional force frictional force = 50 N – resultant force $= 50 \text{ N} - 10 \text{ N}$ <i>allow e.c.f. from part (a)</i> $= 40 \text{ N}$	C1 A1

	(c)	Possible answers: lubricate the floor with oil, put wheels under the cupboard, use a trolley, empty the cupboard	B1
15	(a)	pressure = force/area = 900/400 = 2.25 N cm ⁻²	C1 A1
	(b)	Increase the contact area between his feet and the sand, so that he exerts less pressure on the sand.	B1 B1
16	a(i)	Diagram shows light ray reflecting from P onto Q and away from Q, with correct arrow direction.	B1
	a(ii)	incident angle = 60°	B1
	a(iii)	Angle of reflection is equal to angle of incidence.	B1
	a(iv)	 angle of reflection = 30° <i>Give 2 marks if final answer is correct, even without working. Give 1 mark if final answer is wrong but there is evidence of working that shows the angles are correct, but student mistakes 60° to be angle of reflection.</i>	B2
	(b)	image drawn is - laterally inverted - same distance behind mirror as object is in front - drawn with dotted lines to show it's a virtual image	B1 B1 B1
	c(i)	the word CORAL is laterally inverted with L as first letter and C as last letter, with C, R and L laterally inverted.	A1
	c(ii)	2 letters	A1



**DAMAI SECONDARY SCHOOL
END OF YEAR EXAMINATION 2014**

Secondary Two Express Level

Lower Secondary Science

Thursday 2nd October 2014

0815am – 1015am

2 hour

INSTRUCTIONS TO CANDIDATES

Write your full name, register number and class in the spaces provided on the cover of this question paper and on the answer booklet.

This paper consists of three sections:

- Section A: Multiple choice questions
Answer **ALL** questions. Shade all answers on the OMR sheet provided.
- Section B: Short answer questions
Answer **ALL** questions. Write all answers in the answer booklet provided.
- Section C: Long structured questions
Answer **only 4 out of 5** questions. **Circle the questions** which you have attempted and write all answers in the answer booklet provided.

Hand in the OMR sheet, question paper and answer booklet separately at the end of the examination.

INFORMATION FOR CANDIDATES

The number of marks is given in the brackets [] at the end of each question.

Mistakes in spelling may be penalised in any part of the paper.

Electronic calculators may be used for this paper.

This question paper consists of 8 printed pages.

[Turn Over]

Section A

(30 marks)

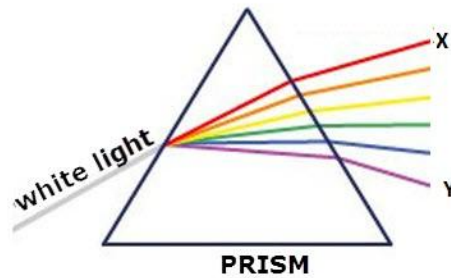
Answer all questions on the OMR sheet

A1 In Japan, the colours green and blue are considered to be different shades of the same colour "ao". A Japanese student mixed "ao" light with red light. How many resultant colours are possible?

- A** Two
- C** Four

- B** Three
- D** Five

A2 The diagram shows a ray of light entering a glass prism.



What is the colour of the light at **X** and **Y** respectively?

	Colour at X	Colour at Y
A	Red	Red
B	Red	Violet
C	Violet	Red
D	Violet	Violet

A3 Divergent lens are used in _____.

- A** magnifying glasses
- B** photocopying machines
- C** spectacles to correct myopia
- D** overhead projectors of the classroom

A4 What type of image is formed through the lens of a photocopy machine?

- A** real and upright
- B** real and inverted
- C** virtual and upright
- D** virtual and inverted

- A5** Which of the following explains why coffee powder **cannot** be obtained from coffee by filtration?
- A** The heat of the coffee causes the filter paper to be unstable.
 - B** The coffee powder had reacted to form a new liquid substance.
 - C** The filter paper is not strong enough to hold the coffee powder.
 - D** The coffee powder is small enough to enter through the pores of the filter paper.
- A6** What is distillation most suitable for?
- A** To obtain sugar from soda.
 - B** To obtain salt from sea water.
 - C** To obtain milk powder from milk.
 - D** To obtain water from salt solution.
- A7** What can be deduced from the symbol ${}^7_3\text{Li}$?
- A** The lithium atom has 3 electrons.
 - B** The lithium atom has 7 neutrons.
 - C** The lithium atom has 10 protons.
 - D** The lithium atom is electronically stable.
- A8** How many types of elements are there in butanoic acid, $\text{C}_3\text{H}_7\text{COOH}$?
- A** Three
 - B** Four
 - C** Five
 - D** Six
- A9** Moving from the left to the right of the periodic table, the elements become more _____.
- A** acidic
 - B** metallic
 - C** non-metallic
 - D** reactive
- A10** Hydrogen peroxide has the chemical formula H_2O_2 . Which of the following statements about hydrogen peroxide is correct?
- A** Hydrogen peroxide is an element.
 - B** Hydrogen peroxide is a compound.
 - C** Hydrogen peroxide is a mixture of elements.
 - D** Hydrogen peroxide is a mixture of compounds.

A11 Which of the following statements is true of isotopes?

- A** They have the same boiling points.
- B** They differ in the number of protons.
- C** They differ in the number of electrons.
- D** They have the similar chemical properties.

A12 Which of the following best describes ionic bonds?

- A** The sharing of electrons between non-metals.
- B** The transfer of electrons between non-metals.
- C** The sharing of electrons between metals and non-metals.
- D** The transfer of electrons between metals and non-metals.

A13 Four aqueous solutions has the following pH values

Solution	P	Q	R	S
pH	4	7	8	10

Which pair of solutions will always give an acidic solution when mixed?

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

A14 An alkali will change the colour of a litmus paper from _____.

- A** blue to green
- B** blue to red
- C** red to blue
- D** red to green

A15 Which of the following substance(s) is/are alkaline?

I: Chicken curry
III: Soft drinks

II: Distilled water
IV: Toothpaste

- A** I and II
- B** I and III
- C** II only
- D** IV only

A16 Which of the following involves a chemical change?

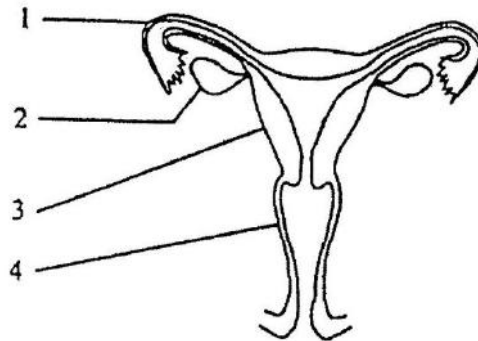
- A** Smashing of bricks into tiny pieces.
- B** Freezing of carbon dioxide into dry ice.
- C** Melting of ice cream under the hot sun.
- D** Burning of charcoal during a barbeque.

A17 Which of the following is **not** unicellular?

- A** embryo
- C** sperm

- B** ovum
- D** zygote

A18 The diagram below shows the reproductive system of a human female.

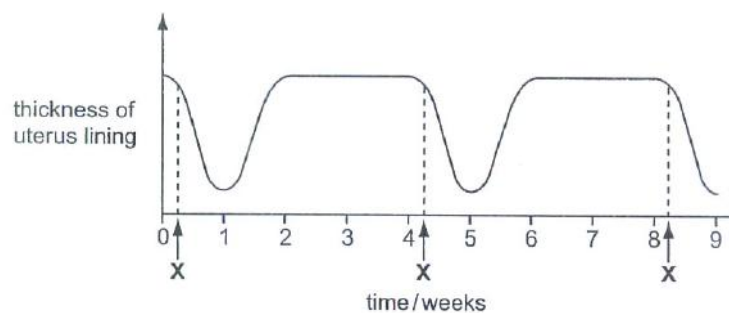


Where does fertilisation take place?

- A** 1 only
- C** 2 only

- B** 1 and 3
- D** 3 and 4

A19 The following graph shows changes in the thickness of the uterus lining of a lady over a period of 9 weeks.



What happens at **X**?

- A** Fertilisation
- C** Menstruation

- B** Implantation
- D** Ovulation

A20 Which of the following is a symptom of gonorrhoea?

- A** brain infection
- B** painless sores
- C** intestinal bleeding
- D** pus present in urine

A21 How can AIDS be spread?

- A** Sharing of food with an infected person.
- B** Being sneezed on by an infected person.
- C** Sharing of medical needles with an infected person.
- D** Resting on the same bed previously used by an infected person.

A22 Electrical current is due to the movement of _____.

- | | |
|--------------------|--------------------|
| A batteries | B electrons |
| C lightning | D protons |

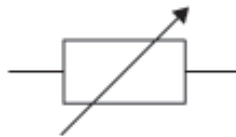
A23 Why should overloading of power sockets be avoided?

- A** It might break the circuit.
- B** It might overheat the circuit.
- C** It might expose faulty wires.
- D** It might cause the circuit to get wet.

A24 Which of the following is true of wires in a three-pin plug?

- A** The live wire is kept at zero voltage.
- B** All the wires are kept at high voltage.
- C** The earth wire is kept at high voltage.
- D** The neutral wire is kept at zero voltage.

A25 The following symbol shows an electrical component.



What does the symbol represent?

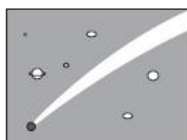
- | | |
|-------------------|-------------------|
| A Fuse | B Resistor |
| C Rheostat | D Switch |

A26 The diagram below shows three different events.

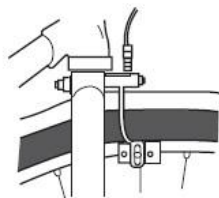
a parachutist
reaching terminal velocity



a meteor glowing as it
falls through the
atmosphere



brakes slowing down
a bicycle



What is the similar cause for all the three events?

- A** Heat
- C** Gravity

- B** Friction
- D** Radiation

A27 Which of the following is a contact force?

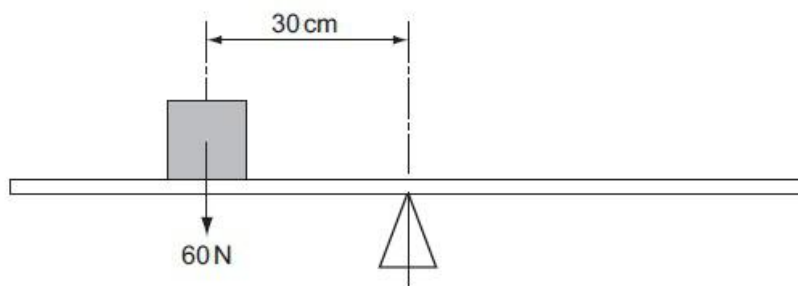
- A** Electrostatic force
- C** Magnetic force

- B** Gravitational force
- D** Tension

A28 The reason why an astronaut can jump higher on the moon than on earth is because _____.

- A** his mass is lower moon on than on the earth.
- B** his mass is higher moonon than on the earth.
- C** his weight is lower on the moonthan on the earth.
- D** his weight is higher on the moonthan on the earth.

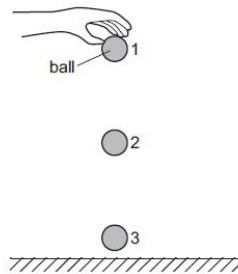
A29 A uniform beam is balanced at its midpoint. An object is placed on the beam as shown in the diagram.



Which of the following forces will rebalance the system?

- A** 15 N acting upwards, 120 cm to the left of the pivot.
- B** 30 N acting upwards, 60 cm to the right of the pivot.
- C** 45 N acting downwards, 40 cm to the left of the pivot.
- D** 90 N acting downwards, 10 cm to the right of the pivot.

A30 A ball drops from a height as shown in the diagram below.



Ignoring air resistance, the total energy of the ball is _____.

- A** greatest at point 1
- B** greatest at point 2
- C** greatest at point 3
- D** the same at all points

END OF SECTION A

Name : _____()

Class: _____

Parent's Signature



**DAMAI SECONDARY SCHOOL
END OF YEAR EXAMINATION 2014**

Secondary Two Express

Thursday 2nd October 2014

0815am – 1015am

2 hour

ANSWER BOOKLET

For Teacher's Use only:

Section	Question No.	Marks
A	A1 – A30	
B	B1 – B6	
C Choose <u>4</u> Questions ONLY	C7	
	C8	
	C9	
	C10	
	C11	
TOTAL		

This question paper consists of 14 printed pages including this page

[Turn over]

Section B
(30 marks)
Answer all questions

- B1** A driver sees the image of the car behind him in a mirror as shown in **Fig 1.1**.

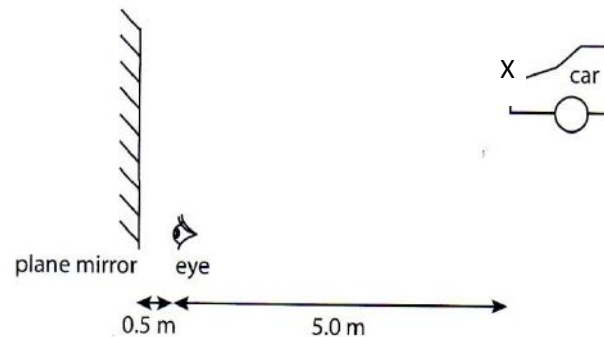


Fig 1.1

- (a) (i) Complete the ray diagram in **Fig 1.1** to locate the image of the car at point X. Label the point Y. [2]

- (ii) Calculate the horizontal distance between the eye and the image.

[1]

- (iii) On **Fig 1.1**, complete the ray to show the path taken by light rays travelling from X to the driver's eye. [2]

- (b) (i) **Fig 1.2** shows a ray of light entering a glass block. Complete the ray diagram by drawing the refracted ray and the emergent ray. You should show all the normals clearly. [2]

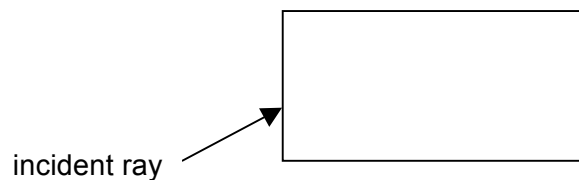


Fig 1.2

- (ii) Explain your answer in **part (i)** for the direction of the refracted and emergent ray.

.....

.....

.....

[2]

B2 Fig 2 below shows five diagrams, **A** to **E**, of some students' drawings of gas particles.

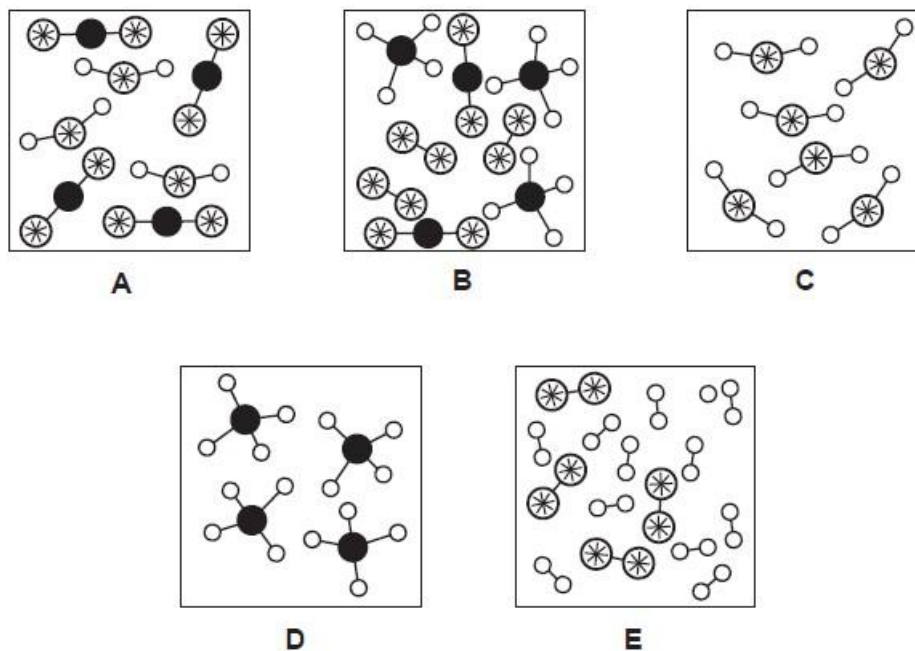


Fig 2

- (a) Which of the following drawings (**A**, **B**, **C**, **D** or **E**) best represent
- (i) molecules of methane (CH_4)?
- (ii) molecules of water?
- (iii) a mixture of elements? [3]
- (b) (i) State the type of bonding present in methane.
- [1]
- (ii) Give an example of a mixture shown in **A**.
- [1]

- B3** Paper chromatography can be used to identify food dyes. The results of a chromatogram done on different food samples is shown in **Fig 3**.

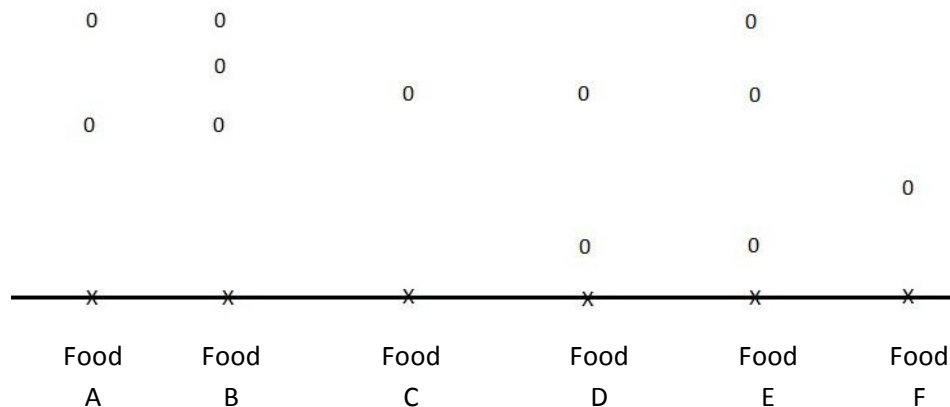


Fig 3

- (a) Which samples of food contain a single dye?
 [1]
- (b) How many types of dyes were identified in Food B?
 [1]
- (c) A toxic dye was identified in Food E, but not in Food D. Suggest which other food sample(s) is/are toxic.
 [1]

- B4** Balance the following chemical equations.

- (a) $\text{___Na} + \text{___O}_2 \rightarrow \text{___Na}_2\text{O}$
- (b) $\text{___NaOH} + \text{___H}_2\text{SO}_4 \rightarrow \text{___Na}_2\text{SO}_4 + \text{___H}_2\text{O}$
- (c) $\text{___Li} + \text{___H}_2\text{O} \rightarrow \text{___LiOH} + \text{___H}_2$ [3]

B5 HIV is one of the more deadly STIs known.

(i) What does HIV stand for?

..... [1]

(ii) Explain why HIV is one of the more severe STIs.

.....

 [3]

B6 (a) **Fig 6.1** shows an incandescent light bulb.

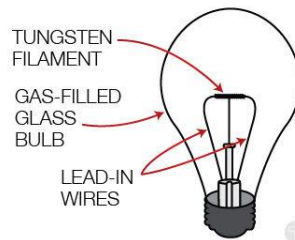


Fig 6.1

(i) Suggest why tungsten is used instead of copper.

.....
 [2]

(ii) Recommend a gas to fill the light bulb with, and explain your choice.

.....

 [2]

- (b) A student sets up a circuit as shown in **Fig 6.2** to measure potential difference and current across a light bulb.

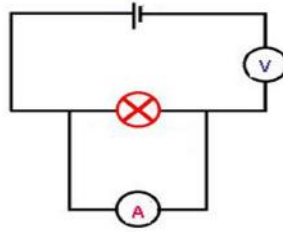


Fig 6.2

Identify **two** mistakes the student made in setting up the experiment.

.....

..... [2]

END OF SECTION B

Section C
(40 marks)

Answer four out of five questions
Cancel out the question not answered

- C7** Fig 7.1 shows a claw hammer being used to pull a nail out of a piece of wood.

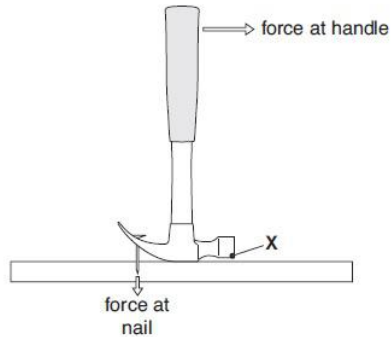


Fig 7.1

- (a) (i)** Describe how moments can be calculated.

.....

..... [2]

- (ii)** Explain why the force at the nail is greater than the force exerted at the handle of the hammer.

.....

..... [2]

- (b)** For his 16th birthday, Klose's parents bought him a new pair of football shoes. He noted that there were protrusions (called "studs") at the sole of his shoes as shown in Fig 7.2.



Fig 7.2

- (i) Klose has a mass of 45 kg. The total surface area of the studs in contact with the football pitch is 30 cm^2 , calculate the pressure (in terms of Pa) exerted by Klose on the pitch when he wears his football shoes. (Assume $g = 10 \text{ m/s}^2$)

Pressure = [2]

- (ii) Feeling uncomfortable in his new shoes, Klose decided to manually unscrew the studs from his shoes. Assuming the studs occupied 10% of the shoes' total surface area, calculate the new pressure (in terms of Pa) exerted by Klose on the pitch with his unstudded shoes.

Pressure = [2]

- (iii) Without the studs, Klose frequently found himself slipping and falling while participating in football matches. Explain why playing with studs would be a better option for Klose.

.....

.....

..... [2]

C8 The flowchart in **Figure 8** shows a series of chemical reactions involving acid **X**.

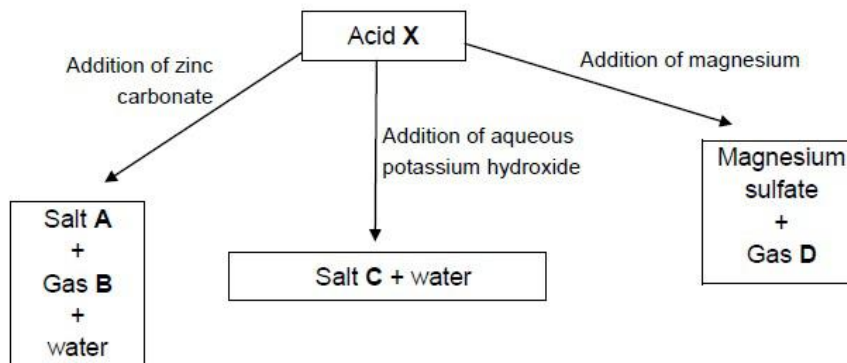


Figure 8

(a) (i) Identify **A**, **B**, **C** and **D**.

A		B		
C		D		[4]

(ii) Describe a test to confirm the identity of Gas **D**.

.....

..... [2]

(b) (i) Identify Acid **X** and explain how you arrived at that conclusion.

.....

..... [2]

(ii) Explain why the reaction between acids and carbonates is considered a chemical reaction.

.....

..... [2]

- C9 (a)** **Table 9** is a calendar that shows some events in Joan's menstrual cycle in January 2012. Menstruation starts on 5th of January, and she has a 28-day cycle.

January 2012						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Table 9

- (i) What substance(s) is/are being discharged from Joan's body together with blood during the start of her menstrual cycle?

.....

..... [2]

- (ii) What would happen to the uterus wall lining in the days leading to ovulation?

.....

..... [1]

- (iii) Predict the **date** which Joan's next menstrual cycle is expected to start.

..... [1]

- (iv) Between which dates would it be most likely for sexual intercourse to result in fertilization?

..... [1]

- (b) One of the ways to treat a female patient suffering from ovarian cancer is to remove the womb (uterus). Can this female patient have children after the removal of her uterus? Give a reason.

.....

.....

.....

..... [3]

- (c) List **two** physical changes a male will experience when he goes through puberty.

.....
 [2]

C10 Fig 10 shows a lady holding a basket that weighs 30 N.



Fig 10

- (a) Draw, on **Figure 10**, the force that the girl acts on the basket. Label this force **F**. [1]

- (b) The lady moves 10 m to the left. Calculate the work done by force **F**.

Work done = [1]

- (c) (i) State the principle of conservation of energy.

.....
 [3]

- (ii) Starting at the first floor, the lady climbed four flights of stairs to reach the fifth floor. Assuming each floor has a height of 3 m, calculate the work done by force **F**.

Work done = [2]

(iii) State the gain in gravitational potential energy of the basket.

..... [1]

(iv) The lady accidentally drops the basket onto the floor and a loud 'thud' is heard. List the changes in energy in this event.

.....

..... [1]

(d) List two renewable sources of energy.

..... [1]

C11 Two dry cells of 5V each was connected to a circuit with three identical resistors of 1Ω resistance each and a bulb of 2Ω resistance. **Fig 11** shows a circuit set up.

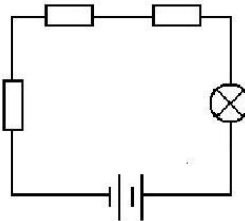


Fig 11

(a) (i) Calculate the voltage across the two dry cells.

Voltage = [1]

(ii) Calculate the total resistance of the circuit.

Resistance = [1]

(iii) Calculate the current flowing through the bulb.

Current = [1]

- (b) **Without adding or removing** any electrical components from the circuit, redraw the circuit diagram such that the total resistance of the circuit is **3.5Ω** .

[2]

- (c) A 1400W oven was used for 150 mins to thaw a Christmas turkey.
 (i) Calculate the electrical energy used in kWh.

Electrical energy used = [2]

- (ii) Given 1 unit of energy costs \$0.30, calculate the cost of energy used in thawing the Christmas turkey.

Costs = [1]

- (d) Mr Wong buys a refrigerator that is rated 1.0 kW for \$750, instead of one that is rated 0.8 kW for \$800. Suggest why Mr Wong's decision is more expensive in the long run.

.....

.....

..... [2]

END OF SECTION C

The Periodic Table of the Elements

Group																	
I	II											III	IV	V	VI	VII	0
		1 H hydrogen 1															
7 Li lithium 3	9 Be beryllium 4																
23 Na sodium 11	24 Mg magnesium 12																
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	64 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	84 Kr krypton 36	
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	99 Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	131 Xe xenon 54	
133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	210 Po polonium 84	210 At astatine 85	222 Rn radon 86
87 Fr francium	88 Ra radium	89 Ac actinium															
*58-71 Lanthanoid series																	
†90-103 Actinoid series																	

140 Ce cerium 58	141 Pr praseodymium 59	144 Nd neodymium 60	150 Pm promethium 61	152 Eu europium 63	157 Gd gadolinium 64	159 Tb terbium 65	162 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71
232 Th thorium 90	238 Pa protactinium 91	238 U uranium 92	238 Pu plutonium 94	238 Am americium 95	238 Cm curium 96	238 Bk berkelium 97	238 Cf californium 98	238 Es einsteinium 99	238 Fm fermium 100	238 Md mendelevium 101	238 No nobelium 102	238 Lr lawrencium 103

Key

a

X

b

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

A1 In Japan, the colours green and blue are considered to be different shades of the same colour "ao". A Japanese student mixed "ao" light with red light. How many resultant colours are possible?

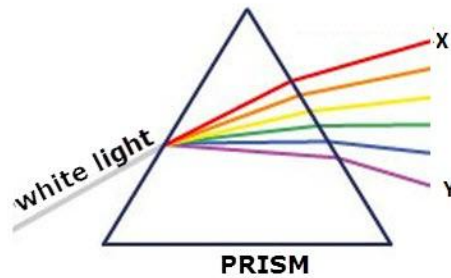
A Two

B Three

C Four

D Five

A2 The diagram shows a ray of light entering a glass prism.



What is the colour of the light at **X** and **Y** respectively?

	Colour at X	Colour at Y
A	Red	Red
B	Red	Violet
C	Violet	Red
D	Violet	Violet

A3 Divergent lens are used in _____.

A magnifying glasses

B photocopying machines

C spectacles to correct myopia

D overhead projectors of the classroom

A4 What type of image is formed through the lens of a photocopy machine?

A real and upright

B real and inverted

C virtual and upright

D virtual and inverted

A5 Which of the following explains why coffee powder cannot be obtained from coffee by filtration?

- A** The heat of the coffee causes the filter paper to be unstable.
- B** The coffee powder had reacted to form a new liquid substance.
- C** The filter paper is not strong enough to hold the coffee powder.
- D** The coffee powder is small enough to enter through the pores of the filter paper.

A6 What is distillation most suitable for?

- A** To obtain sugar from soda.
- B** To obtain salt from sea water.
- C** To obtain milk powder from milk.
- D** To obtain water from salt solution.

A7 What can be deduced from the symbol ${}^7_3\text{Li}$?

- A** The lithium atom has 3 electrons.
- B** The lithium atom has 7 neutrons.
- C** The lithium atom has 10 protons.
- D** The lithium atom is electronically stable.

A8 How many types of elements are there in butanoic acid, $\text{C}_3\text{H}_7\text{COOH}$?

- | | |
|----------------|---------------|
| A Three | B Four |
| C Five | D Six |

A9 Moving from the left to the right of the periodic table, the elements become more _____.

- | | |
|-----------------------|-------------------|
| A acidic | B metallic |
| C non-metallic | D reactive |

A10 Hydrogen peroxide has the chemical formula H_2O_2 . Which of the following statements about hydrogen peroxide is correct?

- A** Hydrogen peroxide is an element.
- B** Hydrogen peroxide is a compound.
- C** Hydrogen peroxide is a mixture of elements.
- D** Hydrogen peroxide is a mixture of compounds.

A11 Which of the following statements is true of isotopes?

- A** They have the same boiling points.
- B** They differ in the number of protons.
- C** They differ in the number of electrons.
- D** They have the similar chemical properties.

A12 Which of the following best describes ionic bonds?

- A** The sharing of electrons between non-metals.
- B** The transfer of electrons between non-metals.
- C** The sharing of electrons between metals and non-metals.
- D** The transfer of electrons between metals and non-metals.

A13 Four aqueous solutions has the following pH values

Solution	P	Q	R	S
pH	4	7	8	10

Which pair of solutions will always give an acidic solution when mixed?

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

A14 An alkali will change the colour of a litmus paper from _____.

- A** blue to green
- B** blue to red
- C** red to blue
- D** red to green

A15 Which of the following substance(s) is/are alkaline?

I: Chicken curry

II: Distilled water

III: Soft drinks

IV: Toothpaste

A I and II

B I and III

C II only

D IV only

A16 Which of the following involves a chemical change?

A Smashing of bricks into tiny pieces.

B Freezing of carbon dioxide into dry ice.

C Melting of ice cream under the hot sun.

D Burning of charcoal during a barbeque.

A17 Which of the following is not unicellular?

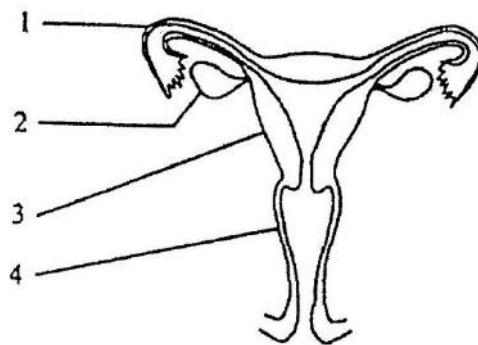
A embryo

B ovum

C sperm

D zygote

A18 The diagram below shows the reproductive system of a human female.



Where does fertilisation take place?

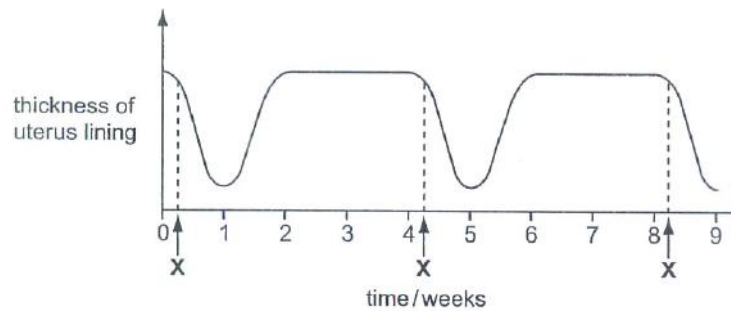
A 1 only

B 1 and 3

C 2 only

D 3 and 4

- A19** The following graph shows changes in the thickness of the uterus lining of a lady over a period of 9 weeks.



What happens at **X**?

- A** Fertilisation
C Menstruation
B Implantation
D Ovulation
- A20** Which of the following is a symptom of gonorrhoea?
- A** brain infection
B painless sores
C intestinal bleeding
D pus present in urine
- A21** How can AIDS be spread?
- A** Sharing of food with an infected person.
B Being sneezed on by an infected person.
C Sharing of medical needles with an infected person.
D Resting on the same bed previously used by an infected person.
- A22** Electrical current is due to the movement of _____.
- A** batteries
C lightning
B electrons
D protons

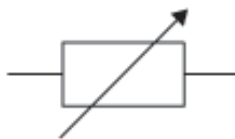
A23 Why should overloading of power sockets be avoided?

- A** It might break the circuit.
- B** It might overheat the circuit.
- C** It might expose faulty wires.
- D** It might cause the circuit to get wet.

A24 Which of the following is **TRUE** of wires in a three-pin plug?

- A** The live wire is kept at zero voltage.
- B** All the wires are kept at high voltage.
- C** The earth wire is kept at high voltage.
- D** The neutral wire is kept at zero voltage.

A25 The following symbol shows an electrical component.



What does the symbol represent?

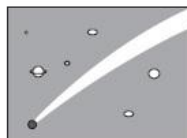
- | | |
|-------------------|-------------------|
| A Fuse | B Resistor |
| C Rheostat | D Switch |

A26 The diagram below shows three different events.

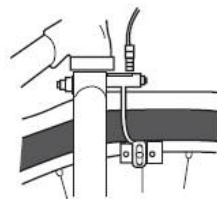
a parachutist
reaching terminal velocity



a meteor glowing as it
falls through the
atmosphere



brakes slowing down
a bicycle



What is the similar cause for all the three events?

- | | |
|------------------|--------------------|
| A Heat | B Friction |
| C Gravity | D Radiation |

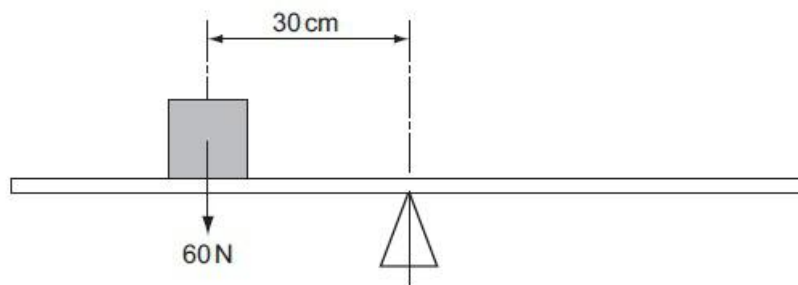
A27 Which of the following is a contact force?

- A** Electrostatic force
- B** Gravitational force
- C** Magnetic force
- D** Tension

A28 The reason why an astronaut can jump higher on the moon than on earth is because _____.

- A** his mass is lower moon on than on the earth.
- B** his mass is higher moon on than on the earth.
- C** his weight is lower on the moon than on the earth.
- D** his weight is higher on the moon than on the earth.

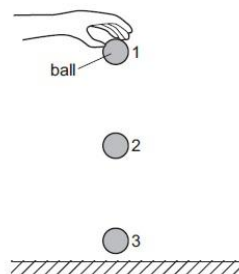
A29 A uniform beam is balanced at its midpoint. An object is placed on the beam as shown in the diagram.



Which of the following forces will rebalance the system?

- A** 15 N acting upwards, 120 cm to the left of the pivot.
- B** 30 N acting upwards, 60 cm to the right of the pivot.
- C** 45 N acting downwards, 40 cm to the left of the pivot.
- D** 90 N acting downwards, 10 cm to the right of the pivot.

A30 A ball drops from a height as shown in the diagram below.



Ignoring air resistance, the total energy of the ball is _____.

- A** greatest at point 1
- B** greatest at point 2
- C** greatest at point 3
- D** the same at all points

END OF SECTION A

Section B – Structured questions (30 marks)

Answer all questions

- B1** A driver sees the image of the car behind him in a mirror as shown in the diagram below

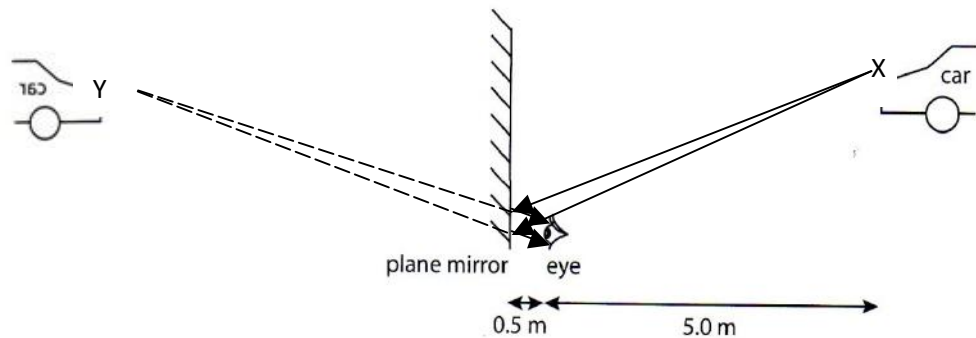


Figure 1.1

- (a) (i) Complete the ray diagram in **Figure 1.1** to locate the image of the car at X. Label the image Y.
Right distance [1]
Label Y [1]
- (ii) Calculate the horizontal distance between the eye and the image.
 Distance = $5.0 + 0.5 + 0.5 = 6.0\text{m}$ [1]
- (iii) Complete the ray diagram above to show the path taken by light rays travelling from X to the driver's eye.
Proper light rays from mirror to eye and car to mirror with arrows [1]
Correct virtual lines [1]
- (b) (i) **Figure 1.2** shows a ray of light entering a glass block. Complete the ray diagram by drawing the refracted ray and the emergent ray.

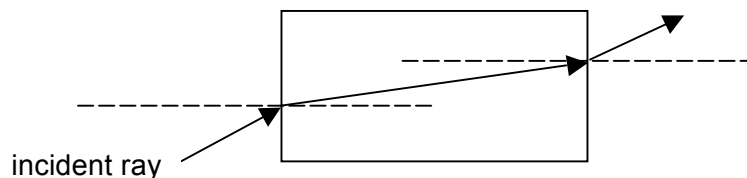


Figure 1.2

correct refracted ray [1]
correct emergent ray [1]

- (ii) Explain your answer in **part (i)** for the direction of the refracted ray.

The light rays bend towards the normal as it enters the glass as it is **optically denser**. [1]

The light rays bend away from the normal as it re-enters air as it is **optically less dense**. [1]

OR

The light rays bend towards the normal as **it slows down** after entering the glass [1]

The light rays bend away from normal as **its speed is increased** after leaving the glass. [1]

B2 Figure 2 below shows five diagrams, **A** to **E**, of some students' drawings of gas particles.

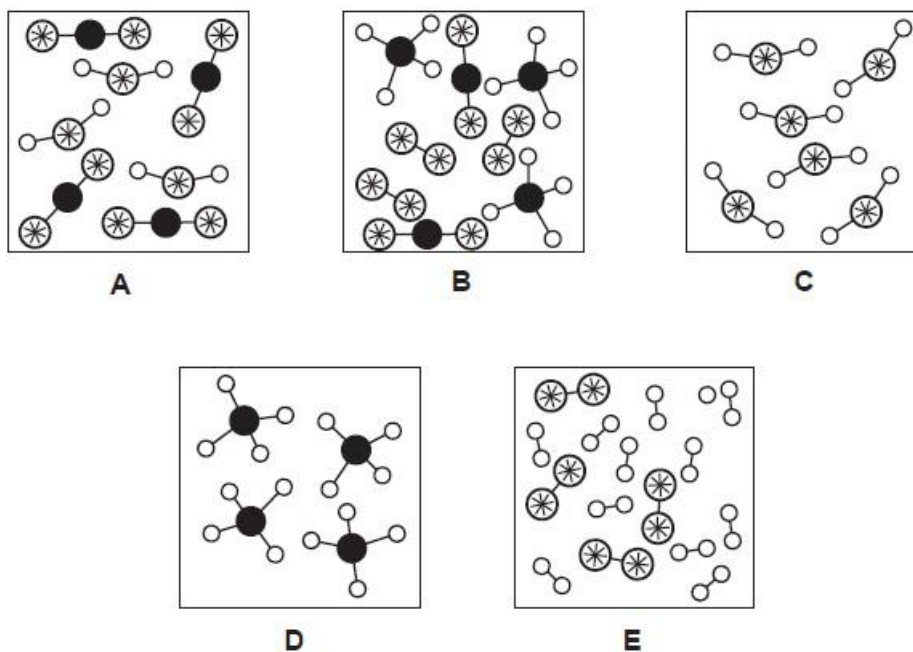


Figure 2

(a) Which of the following drawings (**A**, **B**, **C**, **D** or **E**) best represent

(i) molecules of methane (CH_4)? **D** [1]

(ii) molecules of water? **C** [1]

(iii) a mixture of elements? **E** [1]

(b) (i) State the type of bonding present in methane.

Covalent bonds [1]

(ii) Give an example of a mixture shown in A.

Carbon dioxide and water [1] (accept other possible answers)

B3 Paper chromatography can be used to identify food dyes. The results of an experiment is shown in **Figure 3**.

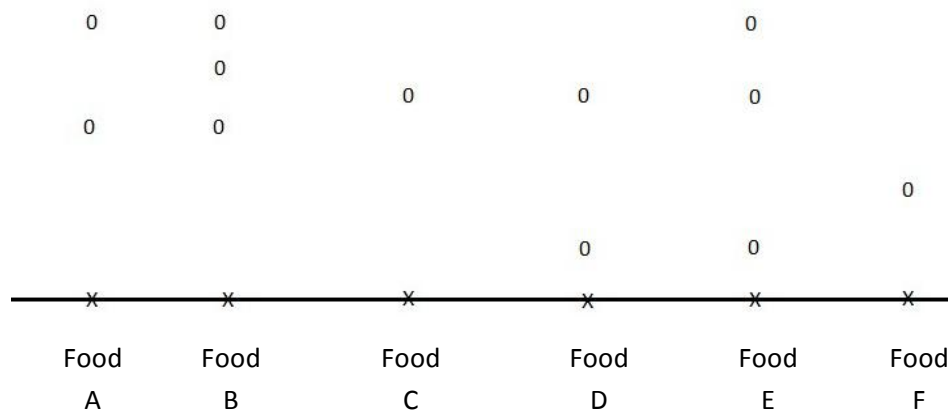


Figure 3

(a) Which samples of food contain a single dye?

C and F [1]

(b) How many types of dyes were identified in Food B?

3 [1]

(c) A toxic dye was identified in Food E, but not in Food D. Suggest which other food sample(s) is/are toxic.

A and B [1]

B4 Balance the following chemical equations.



[3]

B5 HIV is one of the more deadly STIs known.

(i) What does HIV stand for?

Human Immunodeficiency Virus [1]

(ii) Explain why HIV is one of the more severe STIs.

HIV causes AIDS which **incurable** and **fatal** [1]

(one mark for either **incurable** or **fatal**)

AIDS attack **white blood cells and the immune system** [1]

Patient will lose immunity and will be **open to other infections** [1]

B6 Figure 6.1 shows an incandescent light bulb.

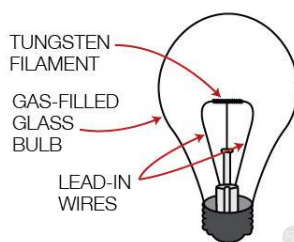


Figure 6.1

(a) (i) Suggest why tungsten is used instead of copper.

Tungsten has a **higher resistance** than copper [1]

More energy will be converted into light energy with tungsten [1]

(ii) Recommend a gas to fill the light bulb with, and explain your choice.

Any noble gas [1]

The gas is **unreactive** and will not react with the heated tungsten [1]

A student sets up a circuit as shown in **Figure 6.2** to measure potential difference and current across a light bulb.

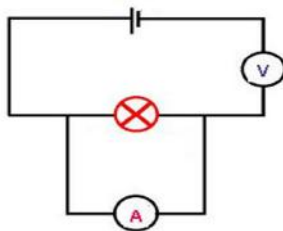


Figure 6.2

(b) Identify **two** mistakes the student made in setting up the experiment.

The ammeter is connected in parallel/should be connected in series [1]

The voltmeter is connected in series/should be connected in parallel [1]

END OF SECTION B

Section C - Free-response questions (40 marks)

Answer four out of five questions

- C7 Figure 7.1 shows a claw hammer being used to pull a nail out of a piece of wood.

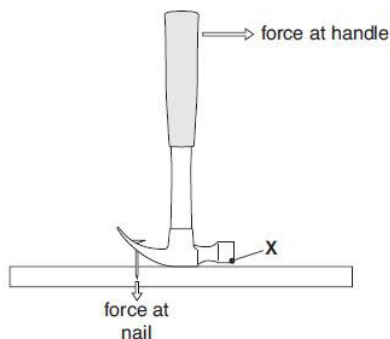


Figure 7.1

- (a) (i) Define moments.

It is the **product** [1] of the **force and its perpendicular distance from the force to the pivot** [1].

- (ii) Explain why the force at the nail is greater than the force exerted at the handle of the hammer.

The distance from the effort to the pivot is **larger** than the distance from the force to the pivot [1]

Hence a small force at the handle would provide a **large moment clockwise**. [1]

- (b) For his 16th birthday, Klose's parents bought him a new pair of football shoes. He noted that there were protrusions (called "studs") at the sole of his shoes as shown in **Figure 7.2**.

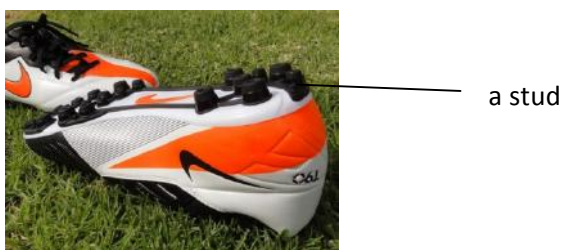


Figure 7.2

- (i) Klose has a mass of 45 kg. The total surface area of the studs in contact with the football pitch is 30 cm², calculate the pressure (in terms of Pa) exerted by Klose on the pitch when he wears his football shoes. (Assume $g = 10 \text{ m/s}^2$)

Weight of Klose = $45 \times 10 = 450 \text{ N}$

Surface area of shoe = $30 \times 1/10000 = 0.003 \text{ m}^2$ [1]

Pressure = $450 / 0.003 = 150\,000 \text{ Pa}$ [1]

Pressure = **15000Pa**

- (ii) Feeling uncomfortable in his new shoes, Klose decided to manually unscrew the studs from his shoes. Assuming studs occupied 10% of the shoes total surface area, calculate the new pressure (in terms of Pa) exerted by Klose on the pitch with his unstudded shoes.

$$\text{Surface area} = 100/10 \times 0.003 = 0.03 \text{ m}^2 \text{ [1]}$$

$$\text{Pressure} = 450/0.03 = 15\,000 \text{ Pa [1]}$$

$$\text{Pressure} = 1500 \text{ Pa}$$

- (iii) Without the studs, Klose frequently found himself slipping and falling while participating in football matches. Explain why playing with studs would be a better option for Klose.

The studs would allow him to **exert higher pressure** on the field. [1]

AND

This allows his studs to **sink into to ground** [1]

OR

Providing a **firm grip** on the ground[1]

(**Pressure** must be mentioned)

C8 The flowchart in **Figure 8** shows a series of chemical reactions involving acid **X**.

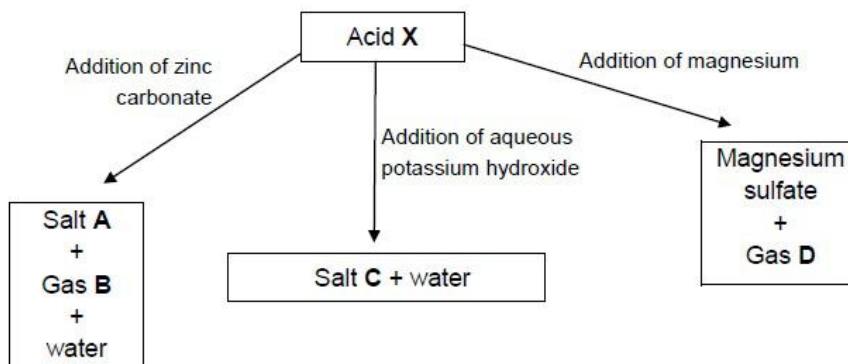


Figure 8

- (a) (i) Identify **A**, **B**, **C** and **D**.

A	zinc sulfate	B	Carbon dioxide	
C	potassium sulfate	D	Hydrogen gas	[4]

- (ii) Describe a test to confirm the identity of Gas **D**.

Place a **lighted splint** at the gas. [1]

If splint is **extinguished with a pop sound**, hydrogen is present. [1]

- (b) (i) Identify Acid **X** and explain how you arrived at that conclusion.

Sulfuric acid [1]

Magnesium sulfate is produced when magnesium is added to X, showing that the **sulfate ion had to come from X**. [1]

- (ii) Explain why the reaction between acids and carbonates is considered a chemical reaction.

A **new substance (new substance must be named)** is formed. [1]

The **properties of the products differ from the reactants**. [1]

(accept other possible answers)

- C9** **Table 9** is a calendar that shows some events in Joan's menstrual cycle in January 2012. Menstruation starts on 5th of January.

January 2012						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Table 9

- (a) (i) What substance(s) is/are being discharged from Joan's body together with blood during the start of her menstrual cycle?

The **unfertilised egg/ovum/dead ovum**. [1]

Blood and tissue from the uterine lining [1]

- (ii) What would happen to the uterus wall lining in the days leading to ovulation?

It will **be maintained/ not be broken down/thickened** [1]

- (iii) Predict the date on which Joan's next menstrual cycle is expected to start.

2nd February [1]

- (iv) Between which dates would it be most likely for sexual intercourse to result in fertilization?

15th January to 22nd January [1]

- (b) One of the ways to treat a female patient suffering from ovarian cancer is to remove the womb (uterus). Can this female patient have children? Give a reason.

No [1]

Even though fertilisation may take place, there is no **uterine lining** [1] for the zygote to be **implanted** in. [1]

- (c) List two physical changes a male will experience when he goes through puberty.

Breaking of voice/ body becoming more muscular/ growing of hair on pubic areas/ enlargement of sexual organs. [2]

C10 Figure 10 shows a lady holding a basket that weighs 30 N.



Figure 10

- (a) Draw, on **Figure 10**, the force that the girl acts on the basket. Label this force **F**. (see diagram) [1]
- (b) The lady moves 10 m to the left. Calculate the work done by force **F**.

Work done = 0 X 10 = 0J [1]

Work done = 0 J

- (c) (i) State the principle of conservation of energy.

Energy **cannot be created or destroyed** [1]

It can be **converted** from one form to another [1]

The **total sum of energy remains the same** [1]

- (ii) Starting at the first floor, the lady climbed four flights of stairs to reach the fifth floor. Assuming each floor has a height of 3 m, calculate the work done by force **F**.

Total distance = 3 X 4 = 12 m [1]

Work done = 30 X 12 = 360 J [1]

Work done = 360 J [1]

- (iii) State the gain in gravitational potential energy of the basket.

360 J [1]

- (iv) The lady accidentally drops the basket onto the floor and a loud 'thud' is heard. List the changes in energy in this event.

Gravitational potential energy to **kinetic** energy to **sound and heat** energy [1]

- (d) List two renewable sources of energy.

Geothermal/hydroelectric/wind/biofuels [1; both answers needed]

- C11** Two dry cells of 5V each was connected to a circuit with three identical resistors of 1Ω resistance each and a bulb of 2Ω resistance. **Fig 11** shows a circuit set up.

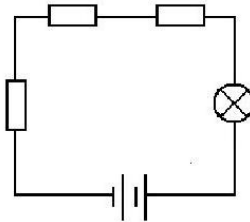


Figure 11

- (a) (i) Calculate the voltage across the two dry cells.

$$\text{Total voltage} = 5 \times 2 = 10\text{V}$$

$$\text{Voltage} = 10\text{V} [1]$$

- (ii) Calculate the total resistance of the circuit.

$$\text{Total resistance} = 3 \times 1 + 2 = 5\Omega [1]$$

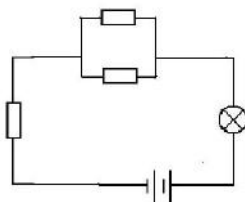
$$\text{Resistance} = 5\Omega [1]$$

- (iii) Calculate the current flowing through the bulb.

$$\text{Current} = 10/5 = 2\text{ A}$$

$$\text{Current} = 2\text{ A} [1]$$

- (b) **Without adding or removing** any electrical components from the circuit, redraw the circuit diagram such that the total resistance of the circuit is **3.5Ω** .



Correct combination of resistors [1]
All electrical components [1]

- (c) A 1400W oven was used for 150 mins to thaw a Christmas turkey.
(i) Calculate the electrical energy used in kWh.

Time used = $150 / 60 = 2.5\text{h}$ [1]

Energy = $1400 \times 2.5 = 3.5 \text{ kWh}$ [1]

Electrical energy used = **3.5kWh**

- (ii) Given 1 unit of energy costs \$0.30, calculate the cost if energy used in thawing the Christmas turkey.

Costs = $3.5 \times 0.30 = \$1.05$ [1]

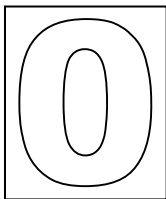
Costs = **\$1.05**

- (d) Mr Wong buys a refrigerator that is rated 1.0 kW for \$750, instead of one that is rated 0.8 kW for \$800. Suggest why Mr Wong's decision is more expensive in the long run.

The 1.0 kW refrigerator uses **more energy** than the other one. [1]

Refrigerators are **switched on all the time/ for long periods of time** [1]

END OF SECTION C



FAJAR SECONDARY SCHOOL
2014 END-OF-YEAR EXAMINATIONS
SECONDARY 2 EXPRESS

CANDIDATE
NAME

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SCIENCE

2 October 2014

Paper 1 Multiple Choice

Paper 1 and 2: 2 hours

Additional Materials: OTAS Sheet

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.

Write in dark blue or black pen.

You may use pencil for any diagrams, graphs, tables or rough working.

Do not use staples, paper clips, highlighters, glue or correction fluid.

There are **thirty** questions on this paper.

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 OTAS sheet.

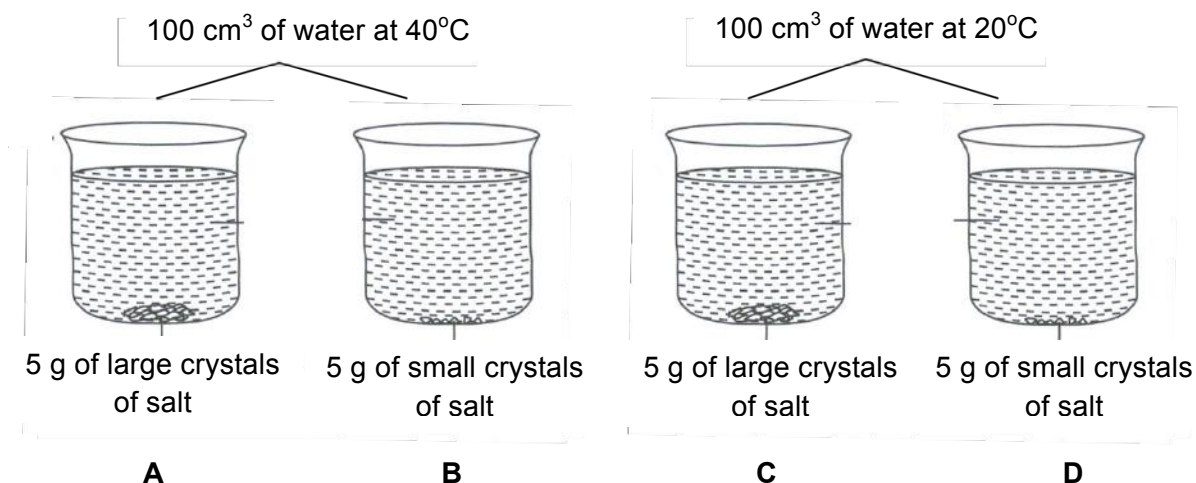
Electronic calculators can be used in this paper.

A copy of the Periodic Table is attached on page 15 of Paper 2.

The total of the marks for this paper is 30.

The total duration for both Science Paper 1 and 2 is 2 hours.

- 1 Which of the following shows that substance **Z** is a compound?
- A When heated, **Z** changes from a solid to a liquid.
 - B When heated, **Z** produces black residue and a colourless gas.
 - C **Z** has a fixed melting point and boiling point.
 - D **Z** is a colourless and odourless gas.
- 2 Which of the following shows the chemical formula of a compound containing three different elements?
- A BaCl_2
 - B CaO
 - C $\text{CH}_3\text{CO}_2\text{Na}$
 - D $\text{Mg}(\text{OH})_2$
- 3 Four beakers with salt at the bottom are shown below. The beakers are left undisturbed for 2 hours.
- In which beaker would the salt dissolve the slowest?



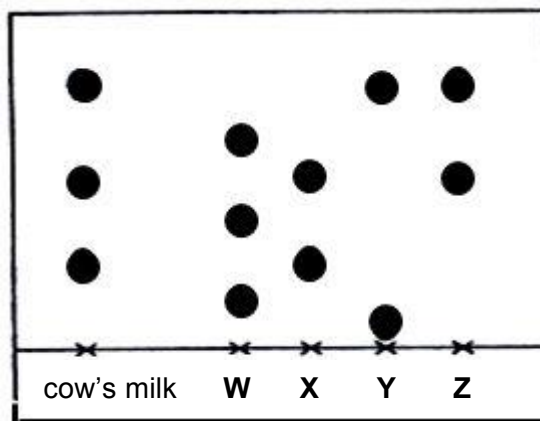
4 Which of the following are suspensions?

- I muddy water
- II orange juice
- III powdered chalk in water
- IV sports drink

- A I and II
- B I and III
- C I, II and III
- D I, III and IV

5 A sample of cows's milk from a nearby animal farm was tested for its sugar content and compared with four different types of sugars. The chromatogram is shown below.

Which sugar(s) does the cow's milk probably contain?

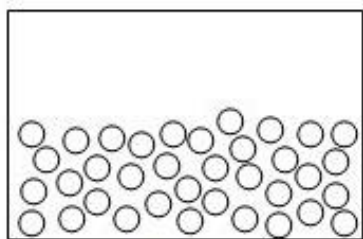


- A W only
- B X and Y
- C X and Z
- D W, Y and Z

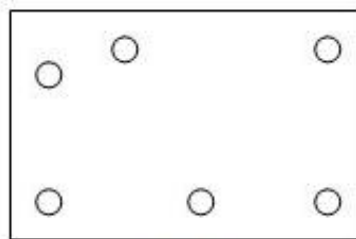
- 6 Which of the following **cannot** be separated from a mixture by magnetic attraction?
- A aluminium bottle caps from paper rubbish
 - B nickel nails from a mixture of nickel nails and chalk
 - C scrap cobalt parts from vehicles
 - D steel paper clips from a mixture of paper clips and plastic buttons
- 7 Which of the following substance(s) can pass through the partially permeable membrane in reverse osmosis during water treatment?
- A salt
 - B water
 - C waste particles
 - D salt and waste particles
- 8 40 cm³ of liquid **X** is poured into 35 cm³ of liquid **Y**.
- If there is no loss of either liquid, why is the total volume less than 75 cm³?
- A The liquid particles attract each other, therefore reducing the volume.
 - B The particles in the liquid move slower and arrange themselves in fixed positions, so reducing the volume.
 - C The size of the particles in the two liquids differ, so the smaller particles fill in the spaces between the larger particles.
 - D The total mass of the mixture increases which compresses the liquids into a smaller volume.

- 9 The diagrams below show the particles of a substance at the various temperatures.

What are the melting point and boiling point of this substance?



at -125°C



at -54°C

	melting point / $^{\circ}\text{C}$	boiling point / $^{\circ}\text{C}$
A	-187	-100
B	-180	0
C	-120	-56
D	150	238

- 10 A substance was described to change from “a state in which its particles are very closely packed and able to vibrate” to “a state in which its particles are widely spaced and able to move freely”.

What is the name of this process?

- A** condensation
 - B** evaporation
 - C** freezing
 - D** sublimation
- 11 A caffeine molecule is represented by $\text{C}_8\text{H}_{10}\text{O}_2\text{N}_4$.

Which of the following statements is **not** true?

- A** It consists of 4 different types of atoms.
- B** It consists of hydrogen, carbon, oxygen and nitrogen.
- C** There are 24 atoms in one caffeine molecule.
- D** There are 24 atoms of carbon in two molecules of caffeine.

- 12** During a chemical reaction, an atom becomes a negative ion.

What happens to the number of each sub-atomic particle?

	number of protons	number of neutrons	number of electrons
A	decreases	remains unchanged	increases
B	remains unchanged	increases	decreases
C	remains unchanged	remains unchanged	decreases
D	remains unchanged	remains unchanged	increases

- 13** Which of the following does electricity **not** have an effect on?

- A** contraction of a bimetallic strip
- B** decomposing water
- C** heating up a stove
- D** operating an electromagnet

- 14** When sulfur burns in air, it forms sulfur dioxide.

Which of the following terms can be used to describe this reaction?

- I** combustion
- II** neutralisation
- III** oxidation
- IV** thermal decomposition

- A** I and III
- B** I, III and IV
- C** II and III
- D** II and IV

- 15** Excess acid in the stomach can cause indigestion that can be cured by an indigestion tablet.

What could the tablet contain to reduce the acidity?

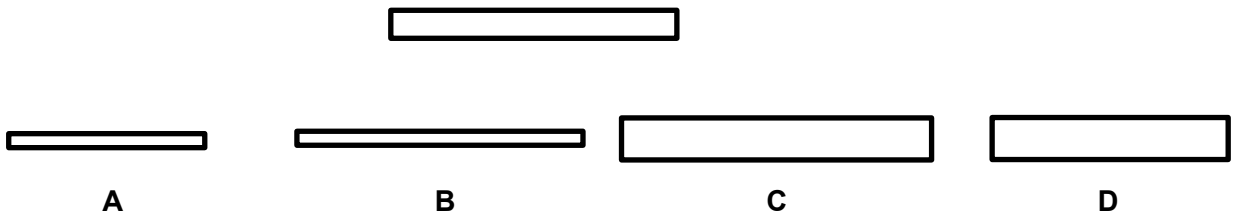
- A** acidic substance
- B** alkaline substance
- C** neutral substance
- D** Universal Indicator

- 16** Which of the following is a function of the heart?

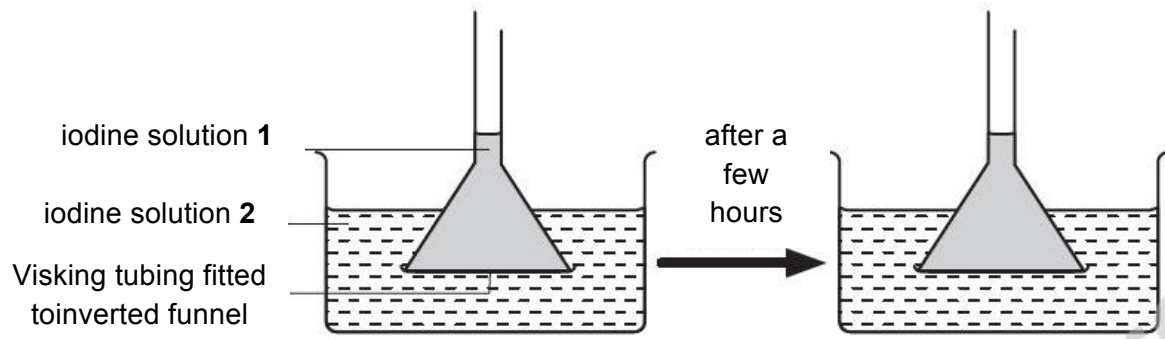
- A** to obtain oxygen for the body
- B** to pump blood around the body
- C** to remove carbon dioxide from the body
- D** to store oxygen and carbon dioxide

- 17** The potato strip in the diagram below is placed in a beaker of water.

Which of the following diagrams best shows the appearance of this potato strip after some time?



- 18** Rachel carried out an experiment on diffusion using the apparatus shown in the diagram below.



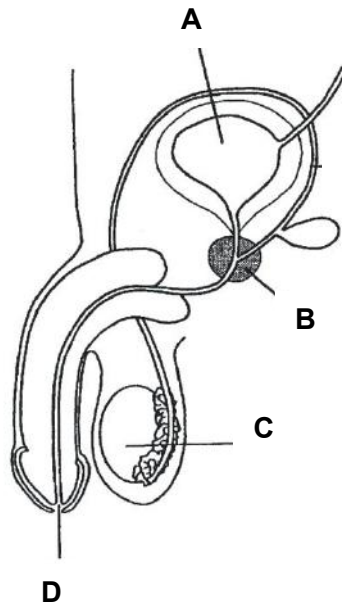
Why was there no change in the level of iodine solution 1?

- A** Iodine molecules are too large to move through the Visking tubing.
 - B** The concentrations of the two iodine solutions are different.
 - C** The concentrations of the two iodine solutions are the same.
 - D** The Visking tubing is not a partially permeable membrane.
- 19** Which of the following statements is true?
- A** All arteries carry blood towards the heart.
 - B** Blood vessels consist of arteries, veins and capillaries.
 - C** The circulatory system only carries food around the body.
 - D** The left side of the heart carries deoxygenated blood.
- 20** In human reproduction, where is the site of fertilisation?

- A** cervix
- B** oviduct
- C** uterus
- D** vagina

- 21** The diagram below shows the male reproductive system.

Which part produces a fluid that provides nutrients for sperms?



- 22** When a piece of metal is heated, which physical quantity increases?

- A** density
- B** mass
- C** volume
- D** weight

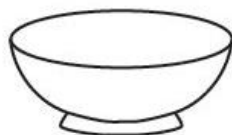
- 23** The four bowls below contain hot soup. The size and shape of the bowls are identical and each contains the same volume of soup at the same initial temperature.

After some time, which bowl of soup will be the coolest?



black plastic bowl

A



white plastic bowl

B



black plastic bowl
with cover

C



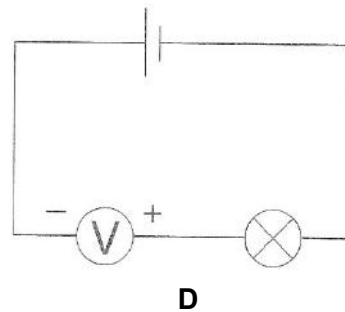
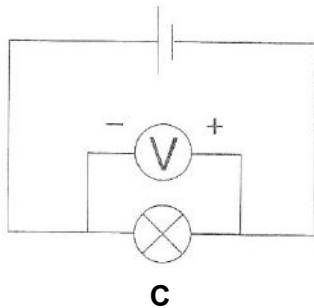
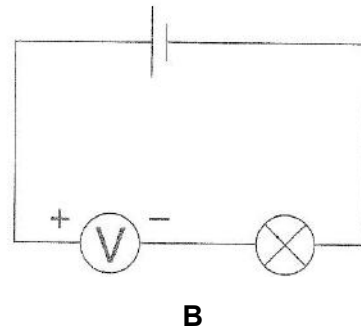
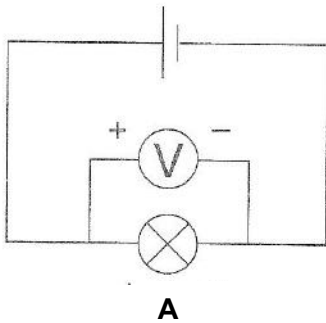
white plastic bowl
with cover

D

24 What is the best explanation of why a metal door knob feels cold to touch?

- A** It conducts heat energy from the hand quickly.
- B** It loses heat to the hand quickly.
- C** It has a shiny surface.
- D** It is a good absorber of heat energy.

25 In which of the following circuits will the voltmeter show a correct reading of the potential difference across the lamp?



26 Which of the following is an example of using electricity in a safe manner?

- A** Charging a hairdryer in the bathroom.
- B** Overloading a power socket.
- C** Touching an electrical appliance with wet hands.
- D** Unplugging an electrical appliance from a socket before cleaning it.

27 Which of the following statements about a series circuit is correct?

- I** As the number of components in the circuit increases, the current stays the same.
- II** If one component in the circuit is damaged, the others stop working.
- III** The current is the same at all points in the circuit.
- IV** The maximum number of components that can be joined in the circuit is three.

- A** I and III
- B** I and IV
- C** I, II and IV
- D** II and III

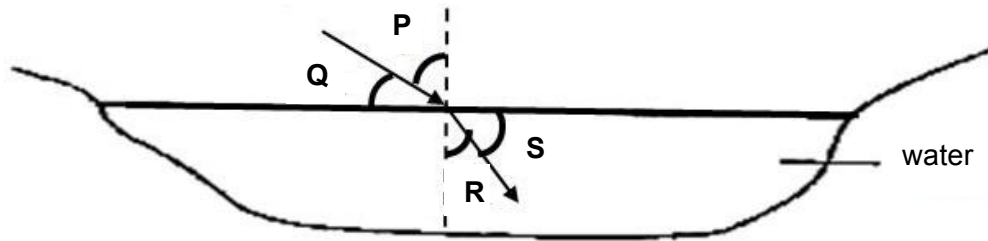
28 Security mirrors in shops are usually convex rather than plane.

What is the reason for this?

- A** Convex mirrors allow a wider area to be seen.
- B** Images in convex mirrors are not laterally inverted.
- C** The images in convex mirrors are inverted.
- D** The images in convex mirrors are smaller than in plane mirrors.

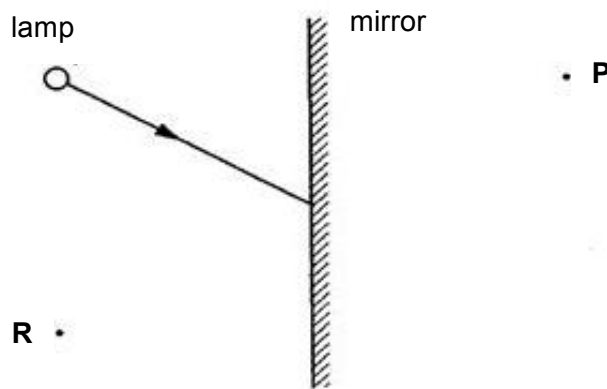
- 29** The diagram shows the path of a ray of light travelling towards and into a pool of water. Four angles, **P**, **Q**, **R** and **S** are labelled.

What are the angles of incidence and refraction?



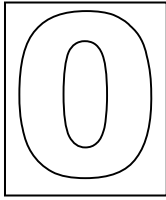
	angle of incidence	angle of refraction
A	P	R
B	Q	R
C	P	S
D	Q	S

- 30** The figure below shows a ray of light from a small lamp striking a plane mirror.



Which statement about the image formed by the mirror is correct?

- A** The image is at **P** and it is real.
- B** The image is at **P** and is virtual.
- C** The image is at **R** and is real.
- D** The image is at **R** and is virtual.



FAJAR SECONDARY SCHOOL
2014 END-OF-YEAR EXAMINATIONS
SECONDARY 2 EXPRESS

CANDIDATE
NAME

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CLASS

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INDEX
NUMBER

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SCIENCE

2 October 2014

Paper 2

Paper 1 and 2: 2 hours

Candidates answer on the Question Paper

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.

Write in dark blue or black pen.

You may use pencil for any diagrams, graphs, tables or rough working.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A and B

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

In calculations, you should show all steps in your working, giving you answer at each stage.

Electronic calculators can be used in this paper.

A copy of the Periodic Table is attached on page 15.

The number of marks is given in brackets [] at the end of each question or part question.

The total of the marks for this paper is 70.

The total duration for both Science Paper 1 and 2 is 2 hours.

For Examiner's Use	
Paper 1	30
Paper 2 Section A	40
Paper 2 Section B	30
Total	100

Section A [40 marks]

For
Examiner's
UseAnswer **all** questions in the spaces provided.

- 1 (a) What is the chemical symbol of the element in Group II and period 3 of the Periodic Table?

..... [1]

- (b) Name another element that has the same chemical properties as the element in (a).

..... [1]

- (c) Briefly describe the properties of a metalloid.

.....
 [1]

[Total: 3]

- 2 (a) The table below contains information about solids **X** and **Y**.

solid	information
X	X is speckled green and white. The green particles dissolves in water, but the white particles do not.
Y	Y is coloured grey. It is not attracted to a magnet. It cannot be decomposed into anything smaller.

Classify each of the solids as either an element, compound or a mixture.

- (i) Solid **X** is a/an [1]

- (ii) Solid **Y** is a/an [1]

- (b) State two differences between the properties of solutions and suspensions.

.....

 [2]

[Total: 4]

3 Study the experimental setup shown in Fig. 3.1.

For
Examiner's
Use

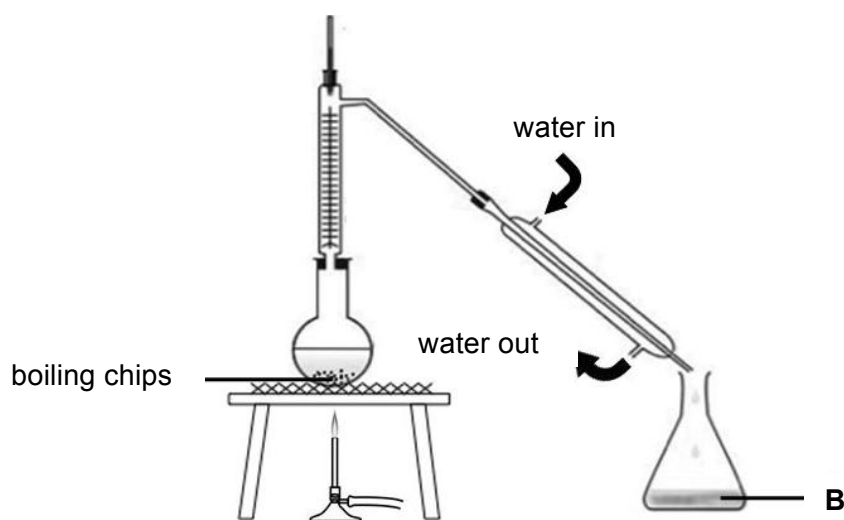


Fig. 3.1

(a) What kind of mixture can the setup above be used to separate?

..... [1]

(b) State an error in the setup.

..... [1]

(c) State the purpose of the boiling chips.

..... [1]

(d) What is the general name for the liquid collected in **B**?

..... [1]

[Total: 4]

[Turn over

4 Using particle arrangement and/or movement, explain why

(a) a hot air balloon rises,

.....

.....

..... [2]

(b) an iron nail cannot be compressed.

.....

.....

..... [2]

[Total: 4]

5 Fig. 5.1 represents an atom.

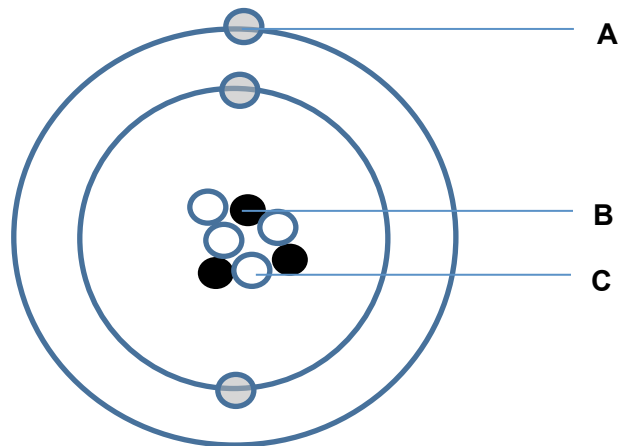


Fig. 5.1

(a) Name the sub-atomic particles of the atom.

A:

B:

C: [3]

(b) Identify the element.

..... [1]

[Total: 4]

- 6 A molecule of a substance is made up of calcium, carbon and element **X**. Its chemical formula is shown in the figure below.



One molecule of this substance has a total number of 50 protons.

- (a) What is the number of protons in one atom of element **X**?

..... protons [2]

- (b) By referring to the Periodic Table, what is the nucleon number of element **X**?

..... [1]

[Total: 3]

- 7 For each of the following, decide whether a physical change or chemical change has taken place.

- (a) boiling of water

..... [1]

- (b) electrolysis of water

..... [1]

- (c) mixing of sand and salt

..... [1]

- (d) rusting of iron

..... [1]

[Total: 4]

- 8 (a) Some liquid **A** is added to a test tube containing some magnesium filings. The reaction produces a salt solution and a gas that extinguishes a lighted splint with a "pop" sound.

(i) Identify the gas produced.

..... [1]

(ii) Suggest a possible name of the liquid **A** added to the magnesium filings.

..... [1]

(iii) Write down the word equation for the reaction above, using answers from (i) and (ii).

..... [1]

- (b) Liquid **A** was then added to some eggshells which contain calcium carbonate. A gas is produced. How would you test the presence of this gas?

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

[Total: 4]

- 9 Name two processes that allow water and dissolved mineral salts to be absorbed by the root hair cells.

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

[Total: 2]

10 (a) How is heat transferred from the sun to vehicles?

..... [1]

(b) Fig. 10.1 shows an engine of a motorcycle.

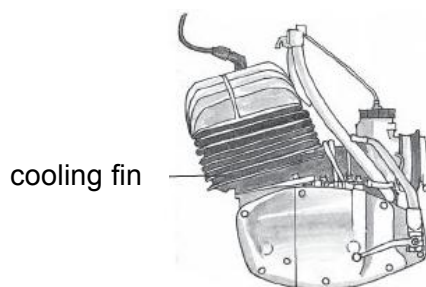


Fig. 10.1

(i) Why is the engine black?

..... [1]

(ii) Explain how the cooling fins help the engine to cool more quickly than an engine without fins.

..... [1]

[Total: 3]

11 (a) Fig. 11.1 shows a man trying to catch a fish.

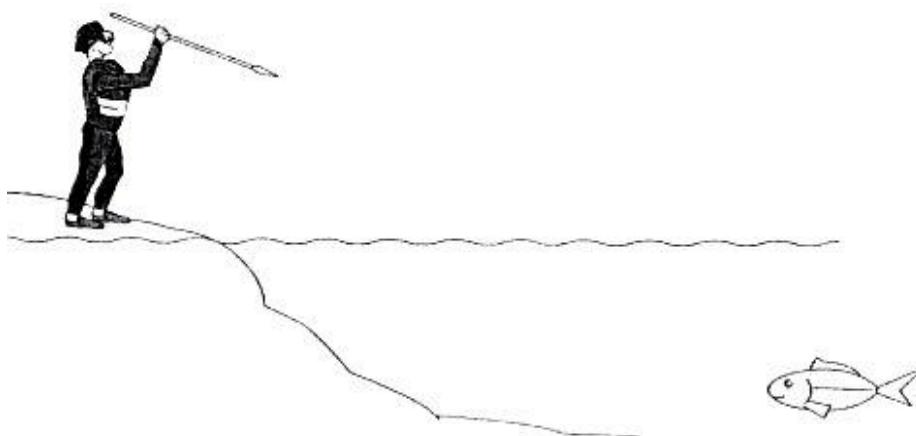


Fig. 11.1

In Fig. 11.1,

(i) draw the position of the image of the fish. [1]

(ii) draw a single ray diagram to show how the boy views the fish from his position. [2]

[Turn over]

- (b) Write down how "POLICE" would be printed on police vehicles so that other motorists would be able to read it correctly.

..... [1]

- (c) How are shadows formed?

..... [1]

[Total: 5]

Section B [30 marks]For
Examiner's
UseAnswer **all** questions in the spaces provided.

- 12 (a)** Xue Li had stained her clothes during lunchtime. Her friends recommended three different brands of detergent to remove her stains. She found out that the effectiveness of a detergent in removing stains is related to its solubility in water. She decided to carry out an investigation. The results of her investigation are found in Table 12.1.

brand of detergent	brand A		brand B		brand C	
temperature of water / °C	20	50	20	50	20	50
mass of detergent dissolved in water / g	1.7	30.2	1.2	3.0	5	17.6

Table 12.1

From the information in Table 12.1,

- (i)** give an example to show how the temperature of water affects the solubility of the detergents.

.....

.....

.....

.....

[2]

- (ii)** which brand of detergent should Xue Li use to remove her stain and at which temperature should she wash her clothes in?

.....

[2]

- (b)** People with sensitive skin may develop rashes from undissolved detergent on their clothes. Which detergent should Xue Li avoid to wash her baby brother's clothes if he has sensitive skin?

.....

[1]

[Turn over

(c) How is solubility different from rate of dissolving?

.....

.....

.....

..... [2]

(d) Gopal wants to separate a mixture of iron filings, chalk and salt. List the step he should take.

.....

.....

.....

.....

..... [3]

[Total: 10]

13 (a) (i) Name one sexually transmitted infection.

..... [1]

(ii) State one way to prevent the spread of STIs.

..... [1]

(b) Fig. 13.1 below gives information about the 28-day menstrual cycle.

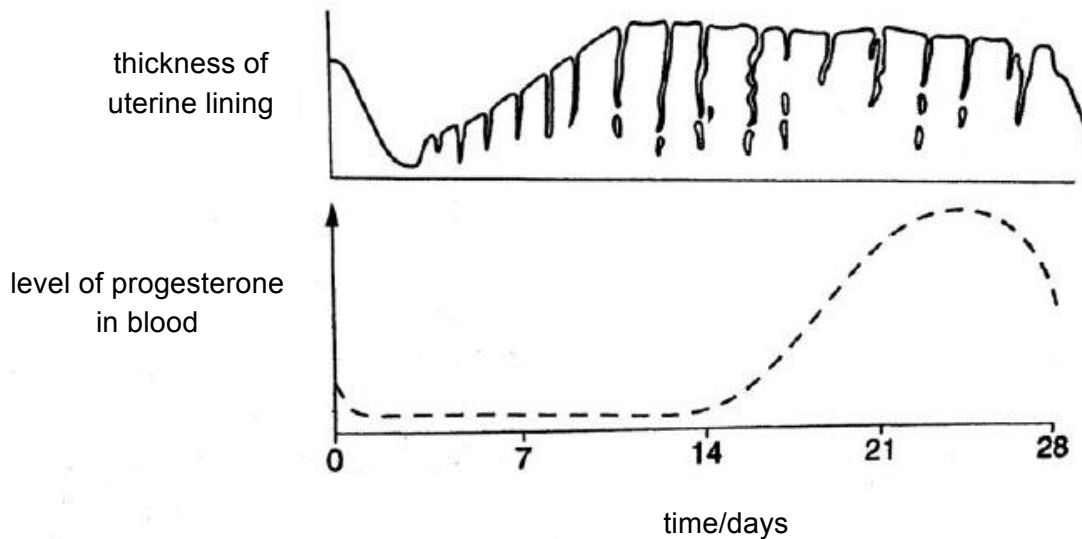


Fig. 13.1

(i) Name another female sex hormone **not** shown in Fig. 13.1.

..... [1]

(ii) Using Fig. 13.1 and your answer in (b)(i), explain the changes in the uterine lining from day 1 to 28 if fertilisation occurs.

..... [3]

(c) If a woman's first day of menstruation was 10 September, which date would ovulation most likely occur?

..... [1]

(d) State one structural adaptation of each of the following that allows it to perform its function.

(i) red blood cell

.....

..... [1]

(ii) artery

.....

..... [1]

(iii) capillary

.....

..... [1]

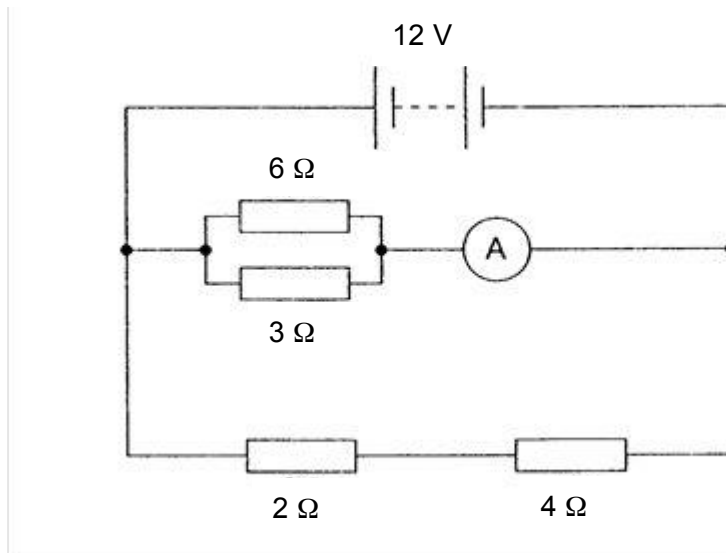
[Total: 10]

14 (a) Name the SI unit for resistance.

..... [1]

For
Examiner's
Use

(b) The following circuit shows two resistors connected to a 12 V power supply and some resistors.



(i) Calculate the combined resistance of the 2 Ω and 4 Ω resistors in series.

resistance = Ω [1]

(ii) Calculate the combined resistance of 3 Ω and 6 Ω resistors in parallel.

resistance = Ω [2]

[Turn over

(iii) Calculate the effective resistance of the circuit.

resistance = Ω [2]

(iv) Calculate the current passing through the ammeter.

current = A [2]

(c) An air conditioner has a power rating of 1.2 kW. If each unit costs \$0.24, how much would it cost to switch it on for 8 hours?

cost = \$..... [2]

[Total: 10]

- End of Paper 2 -

Group																			
I	II											III	IV	V	VI	VII	0		
7 Li lithium 3	9 Be beryllium 4	1 H hydrogen 1										11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10		
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18		
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	64 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36		
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	- Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54		
133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	- Po polonium 84	- At astatine 85	- Rn radon 86		
- Fr francium 87	- Ra radium 88	- Ac actinium 89																	

*58-71 Lanthanoid series

†90-103 Actinoid series

140 Ce cerium 58	141 Pr praseodymium 59	144 Nd neodymium 60	- Pm promethium 61	150 Sm samarium 62	152 Eu europium 63	157 Gd gadolinium 64	159 Tb terbium 65	162 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71
232 Th thorium 90	- Pa protactinium 91	238 U uranium 92	- Np neptunium 93	- Pu plutonium 94	- Am americium 95	- Cm curium 96	- Bk berkelium 97	- Cf californium 98	- Es einsteinium 99	- Fm fermium 100	- Md mendelevium 101	- No nobelium 102	- Lr lawrencium 103

a = relative atomic mass

X = atomic symbol

b = proton (atomic) number

Key

a

X

b

*58-71 Lanthanoid series
†90-103 Actinoid series

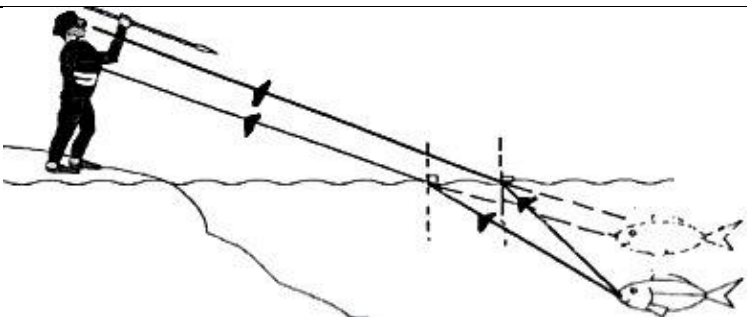
2E Science SA2 2014 Marking Scheme

Paper 1 (30 marks)

Question No	1	2	3	4	5	6	7	8	9	10
Answer	B	D	C	C	C	A	B	C	A	D
Question No	11	12	13	14	15	16	17	18	19	20
Answer	D	D	A	A	B	B	C	C	B	B
Question No	21	22	23	24	25	26	27	28	29	30
Answer	B	C	A	A	A	D	D	A	A	B

Paper 2 Section A (40 marks)

1	(a)	Mg	[1]										
	(b)	beryllium/calcium/strontium/barium/radium <i>Do not accept if chemical symbol given.</i>	[1]										
	(c)	It has properties of both metals and non-metals.	[1]										
[Total: 3]													
2	(a)(i)	Mixture	[1]										
	(ii)	Element	[1]										
	(b)	<table><tr><th>Solutions</th><th>Suspensions</th></tr><tr><td>Homogenous</td><td>Non-homogenous</td></tr><tr><td>Light can pass through</td><td>Light cannot pass through</td></tr><tr><td>No residue after filtration</td><td>Residue after filtration</td></tr><tr><td>No particles setting at the bottom when left to stand</td><td>Particles settle at the bottom when left to stand</td></tr></table> 1 mark for each correct difference. <i>Any 2 differences.</i>	Solutions	Suspensions	Homogenous	Non-homogenous	Light can pass through	Light cannot pass through	No residue after filtration	Residue after filtration	No particles setting at the bottom when left to stand	Particles settle at the bottom when left to stand	[2]
Solutions	Suspensions												
Homogenous	Non-homogenous												
Light can pass through	Light cannot pass through												
No residue after filtration	Residue after filtration												
No particles setting at the bottom when left to stand	Particles settle at the bottom when left to stand												
[Total: 4]													
3	(a)	Mixture of liquids with different boiling points.	[1]										
	(b)	Water flowing in and out are in wrong directions.	[1]										
	(c)	To ensure smooth boiling.	[1]										
	(d)	Distillate	[1]										
[Total: 4]													
4	(a)	Spaces between the particles increases/Particles move further apart causing the volume to increase Density decreases causing the balloon to rise	[1] [1]										

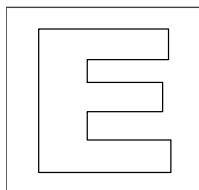
	(b)	Particles are <u>orderly/regularly arranged</u> OR <u>closely packed</u> Particles can only <u>vibrate</u> about its fixed position	[1] [1]
			[Total: 4]
5	(a)	A: electron B: proton C: neutron	[1] [1] [1]
	(b)	Li or lithium	[1]
			[Total: 4]
6	(a)	$50 - 20 - 6 = 24$ $24/3 = 8$	[1] [1]
	(b)	16	[1]
			[Total: 3]
7	(a)	Physical	[1]
	(b)	Chemical	[1]
	(c)	Physical	[1]
	(d)	Chemical	[1]
			[Total: 4]
8	(a)(i)	Hydrogen	[1]
	(ii)	Nitric acid/sulfuric acid/hydrochloric acid/ethanoic acid <i>Any other acid.</i>	[1]
	(iii)	<i>Nitric acid + magnesium → magnesium nitrate + hydrogen</i> <i>Word equation depends on acid in (b).</i>	[1]
	(b)	Pass it through <u>limewater</u> . There will be a <u>white precipitate/limewater turns chalky</u> in the presence of carbon dioxide. <i>Need both points to get the mark.</i>	[1]
			[Total: 4]
9	Active transport/osmosis/diffusion <i>Any 2. 1 mark each.</i>		[2]
			[Total: 2]
10	(a)	Radiation	[1]
	(b)(i)	Black is a good emitter of heat.	[1]
	(ii)	The fins provide a <u>large surface area</u> for heat to emit from.	[1]
			[Total: 3]
11			
	(a)(i)	Image of fish in correct position	[1]
	(ii)	Rays from fish to boy (solid lines)	[1]
			[1]

		Rays from image of fish (dotted lines)	
	(b)		[1]
	(c)	Shadows are formed when the path of light is blocked.	[1]
			[Total: 5]

Paper 2 Section B (30 marks)

12	(a)(i)	A higher temperature, the <u>greater the solubility</u> of the solvent/the more soluble the solvent is. e.g. brand A, only 17g dissolve in 20 °C but 30.2g dissolve in 50 °C. <i>Accept similar examples for brand B and C.</i>	[1] [1]
	(iii)	Brand A 50°C	[1] [1]
	(b)	Brand B	[1]
	(c)	Solubility the <u>maximum amount of solute dissolving</u> in a solvent while rate of dissolving is a measure of how fast/the time taken to completely dissolve in 100 g of solvent/fixed amount of solvent at fixed temperature	[1] [1]
	(d)	Use a magnet to separate the iron filings from the mixture. <u>Dissolve</u> the salt in water and <u>filter</u> the mixture of salt solution and chalk. <u>Evaporate</u> the salt solution to obtain the salt.	[1] [1] [1]
			[Total: 10]
13	(a)(i)	AIDS/gonorrhoea/syphilis	[1]
	(ii)	Avoid having many sexual partners. Males wear condom during sexual intercourse. Avoid sharing of needles. Sterilise instruments for acupuncture/tattooing/ear piercing etc Use disposable instruments. <i>Any 1. Accept other correct answers.</i>	[1]
	(b)(i)	Oestrogen	[1]
	(ii)	From day 1 to 4, <u>menstruation</u> occurs so <u>uterine lining decreases/breaks down</u> . From day 5 to 11, oestrogen repairs <u>uterine lining</u> /makes the lining thicken/more vascularised From day 14 to 28 <u>progesterone</u> helps to <u>maintain the thickness of uterine lining</u> to prepare for implantation.	[1] [1] [1]

	(c)	23 September (+/- 1 day)	[1]
	(d)(i)	<u>Biconcave shape</u> to <u>increase surface area</u> to volume ratio for oxygen transport OR <u>No nucleus</u> to <u>store more haemoglobin</u> /transport more oxygen	[1]
	(ii)	<u>Thick muscle wall</u> to <u>withstand high pressure</u> of blood	[1]
	(iii)	<u>One cell thick</u> for <u>efficient diffusion/exchange</u> of materials	[1]
			[Total: 10]
14	(a)	Ohm OR Ohm (Ω) <i>Do not accept just Ω.</i>	[1]
	(b)(i)	$2 + 4 = 6 \Omega$	[1]
	(ii)	$1/R = 1/6 + 1/3$ $= 1/2$ $R = 2 \Omega$	[1] [1]
	(iii)	$1/R = 1/6 + 1/2$ $= 2/3$ $R = 3/2 = 1.5 \Omega$	[1] [1]
	(iv)	$I = V/R$ $= 12/2$ $= 6 \text{ A}$	[1] [1]
	(c)	$1.2 \text{ kW} \times 8 \text{ h} = 9.6 \text{ kWh}$ $9.6 \text{ kWh} \times \$0.24 = \2.30	[1] [1]
			[Total: 10]



GAN ENG SENG SCHOOL

End-of-Year Examination 2014



CANDIDATE
NAME

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CLASS

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INDEX
NUMBER

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SCIENCE

Paper 1 Multiple Choice

7 Oct 2014
Papers 1 & 2: 2 hours

Sec 2 Express

Additional Materials: OTAS

Calculators are allowed in the examination

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, class and index number on the OTAS.

There are **thirty** questions in Section A. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.

Choose the answer you consider correct and record your choice in soft pencil on the separate OTAS.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Read the instructions on the OTAS very carefully.

You may proceed to answer Paper 2 as soon as you have completed Paper 1.

Any rough working should be done in this booklet.

A copy of the Periodic Table is inserted on page 14.

Total marks
30

Answer **all** the questions with the most suitable option **A, B, C** or **D**.

- 1 The table shows the physical states of a substance **X** at 20 °C, 110 °C and 200 °C.

Temperature (°C)	Physical State
20	Solid
200	Gas
110	Liquid

Which set of readings shows the possible melting point and boiling point of substance **X**?

	Melting Point (°C)	Boiling Point (°C)
A	15	112
B	108	150
C	112	145
D	110	210

- 2 There are four balloons, each containing 200 cm³ of one of the following gases:

- carbon dioxide
- neon
- nitrogen
- oxygen

The boiling points of four gases are given in the table below.

Gas	carbon dioxide	neon	nitrogen	oxygen
Boiling point / °C	-57	-246	-196	-183

Which of the balloons will **not** show a significant decrease in size when it is cooled to -200 °C?

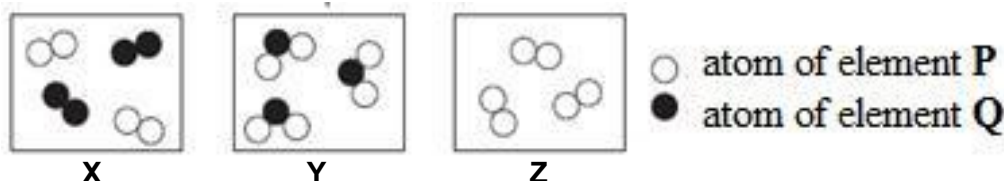
- A** The balloon containing carbon dioxide.
B The balloon containing neon.
C The balloon containing nitrogen.
D The balloon containing oxygen.

- 3 A small balloon will expand if placed in a large beaker of warm water. This is because the higher temperature causes the gas particles in the balloon to

I increase in number.
 II expand in size.
 III become further apart.

- A III only.
 B I and II only.
 C II and III only.
 D All of the above.

- 4 Diagrams X, Y and Z represent three different substances.



Which row in the table correctly describes X, Y and Z?

	X	Y	Z
A	compound	element	mixture
B	compound	mixture	element
C	mixture	element	compound
D	mixture	compound	element

- 5 The ion X^{3+} contains 52 particles in the nucleus and 21 electrons. How many protons and neutrons are there in the nucleus of X^{3+} ?

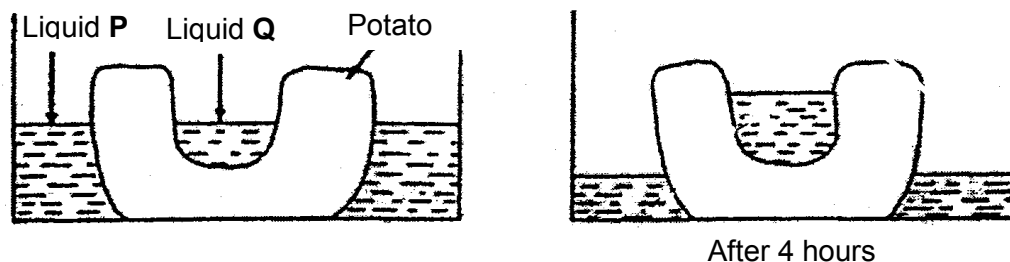
	Number of protons	Number of neutrons
A	18	34
B	21	31
C	24	28
D	52	73

- 6 One subatomic particle is added to an atom of an element Y. Which particle is responsible for the corresponding change?

	Particle	Corresponding change
A	electron	an isotope of element Y is formed
B	proton	the element on the left of Y in the Periodic Table is formed
C	neutron	an isotope of element Y is formed
D	neutron	the element on the left of Y in the Periodic Table is formed

- 7 Which of the following consists of the most number of occupied electron shells?
- A** I^-
B Li^+
C Mg^{2+}
D S^{2-}
- 8 When a white solid, **X**, was heated, it turned black and at the same time produced a brown gas of nitrogen dioxide (NO_2). What can you deduce from the observations?
- A** The composition of solid **X** is 1 part of nitrogen to 2 parts of oxygen.
B Solid **X** is a mixture of black and brown substances.
C Solid **X** is a compound containing nitrogen and oxygen elements.
D Solid **X** is an element but changes into a compound upon heating.
- 9 Which of the following reactions involves an exothermic reaction?
- (1) Photosynthesis
 (2) Respiration
 (3) Combustion
 (4) Thermal decomposition
 (5) Electrolysis
- A** (1) and (4)
B (2) and (3)
C (1), (4) and (5)
D (2), (3) and (4)
- 10 Consider the following reactions.
- I** calcium carbonate $\rightarrow$ calcium oxide + carbon dioxide
II carbon + water $\rightarrow$ carbon dioxide
III sugar $\rightarrow$ carbon + water
IV carbon + oxygen $\rightarrow$ carbon dioxide
- Which of the above are examples of decomposition?
- A** **I** and **II** only
B **I** and **III** only
C **II** and **III** only
D **II** and **IV** only

- 11 An experiment was set up as shown below using a peeled potato shaped into a cup.



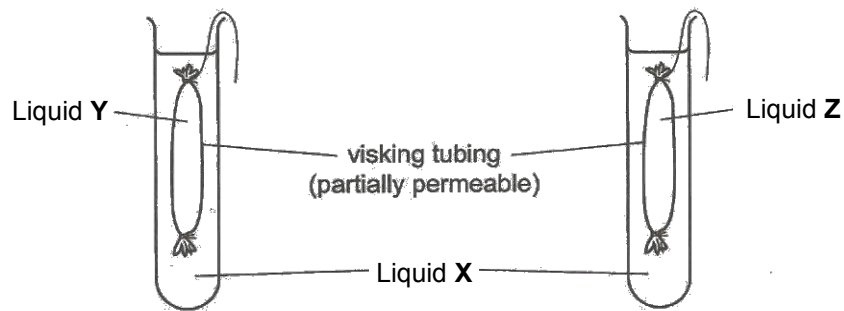
Which of the following can be deduced based on the results after four hours?

- A** Liquid **P** is a dilute sucrose solution and **Q** is a concentrated sucrose solution.
B Liquid **P** is a dilute sucrose solution and **Q** is distilled water.
C Liquid **P** is a concentrated sucrose solution and **Q** is distilled water.
D Liquid **P** is a concentrated sucrose solution and **Q** is a dilute sucrose solution.
- 12 Two tubes, **X** and **Y**, contain 2 cm^3 of sheep's blood. Tube **X** had 12 cm^3 of distilled water added to it, while tube **Y** had 12 cm^3 of concentrated salt solution added to it. An anti-clotting agent was added to both tubes. The two tubes are then spun at high speed to make the blood cells sink to the bottom of the tube.

Which of the following shows the results correctly?

	Tube X	Tube Y
A	A homogeneous solution with no solids at the bottom	A homogeneous solution with no solids at the bottom
B	Blood cells have collected at the bottom of the tube	A homogeneous solution with no solids at the bottom
C	A homogeneous solution with no solids at the bottom	Blood cells have collected at the bottom of the tube
D	Blood cells have collected at the bottom of the tube	Blood cells have collected at the bottom of the tube

- 13 The apparatus was set up as shown in the diagram.

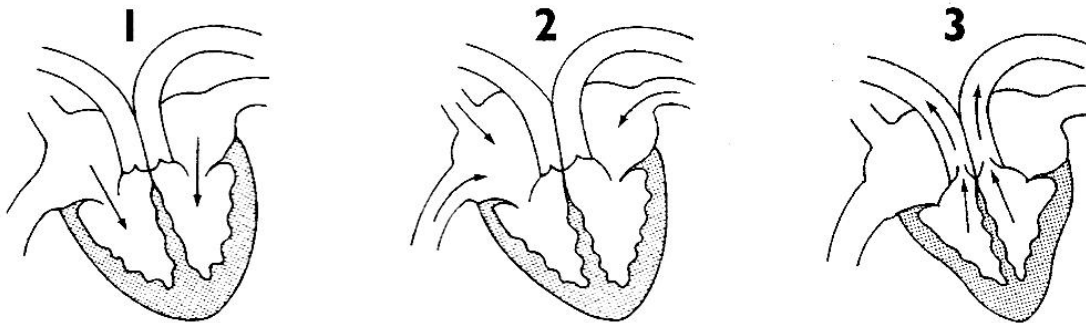


After 30 minutes had elapsed, the partially permeable tubing containing Liquid Y had collapsed while the tubing containing Liquid Z was firm.

Which could be a correct description of the liquids at the **start** of the experiment?

	Liquid X	Liquid Y	Liquid Z
A	10 % sucrose solution	Water	25 % sucrose solution
B	25 % sucrose solution	10 % sucrose solution	Water
C	Water	25 % sucrose solution	10 % sucrose solution
D	10 % sucrose solution	25 % sucrose solution	Water

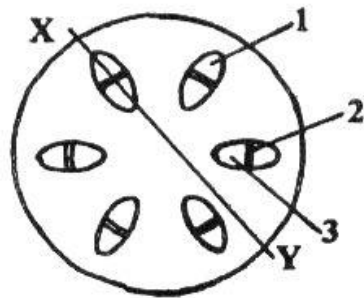
- 14 The diagram below shows three stages in the cardiac cycle.



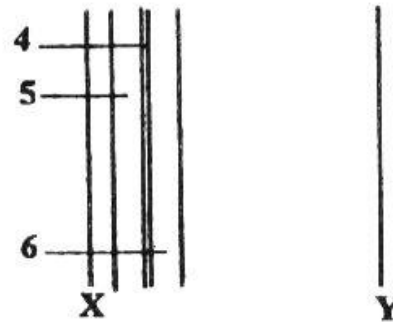
Which of the following sequences is correct?

- A** 2, 3, 1
- B** 1, 2, 3
- C** 2, 1, 3
- D** 3, 1, 2

- 15 The diagrams below show sections through the stem of a dicotyledonous plant.



Transverse section

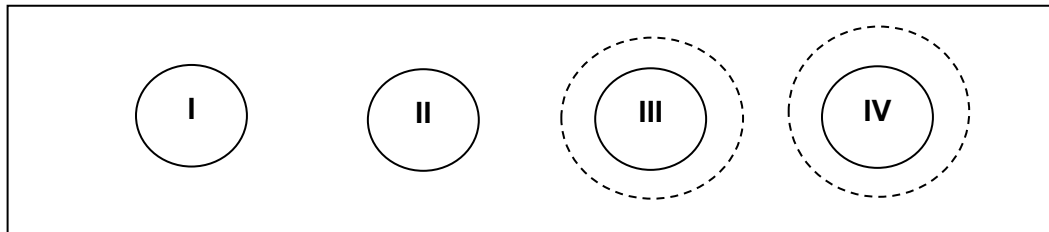


Longitudinal section taken through line XY

Which parts transport water and mineral salts?

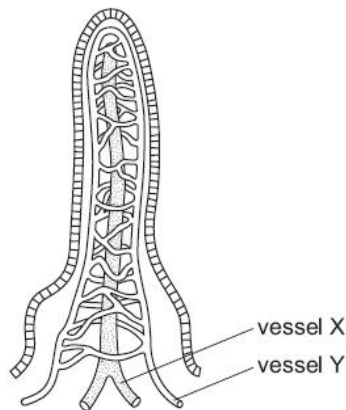
- A 1 and 5
B 2 and 4
C 3 and 5
D 3 and 6
- 16 A cloudy white jelly was prepared by mixing milk proteins with agar powder. The mixture was poured into a petri dish and allowed to set. Four cavities were dug and filled with different solutions: gastric juice, saliva, biological detergent, bile.

After 24 hours, clear zones were found in cavities III and IV. What are the solutions that were found in the cavities?



	Cavity 1	Cavity 2	Cavity 3	Cavity 4
A	saliva	biological detergent	gastric juice	bile
B	bile	saliva	gastric juice	biological detergent
C	gastric juice	saliva	biological detergent	bile
D	biological detergent	bile	saliva	gastric juice

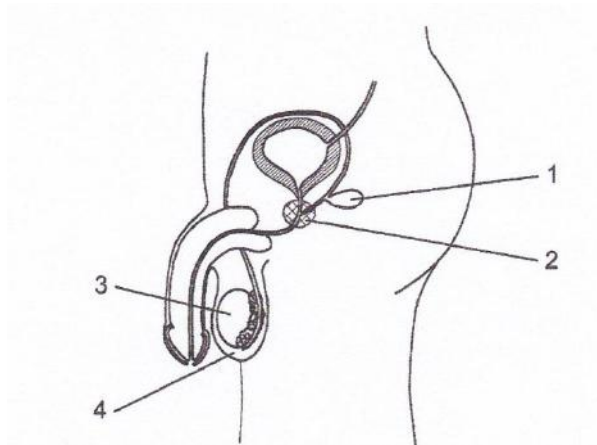
- 17 The diagram shows a villus.



After a meal containing starch and oil, which substance is absorbed mainly into vessel X and which substance is absorbed mainly into vessel Y?

	vessel X	vessel Y
A	glucose	amino acids
B	fats	glucose
C	glucose	fats
D	amino acids	glucose

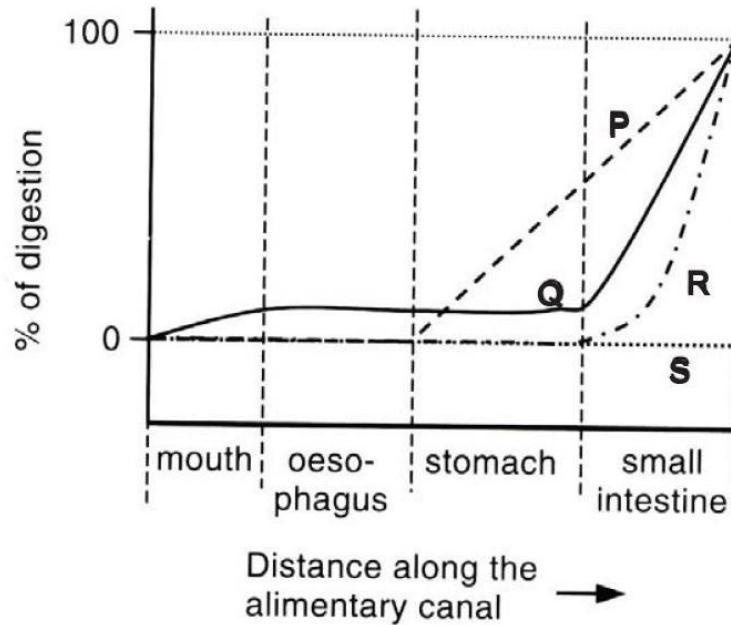
- 18 The diagram shows the side view of the male reproductive system.



What are the functions of the labelled parts?

	Hormone production	Seminal fluid production	Sperm production
A	1 and 3	2 and 3	3 and 4
B	2 and 3	1 and 2	3 and 4
C	3 only	1 and 2	3 only
D	4 only	1 and 3	3 only

- 19 The graph shows the percentage of digestion of four types of nutrients as they move along the human alimentary canal. What type of nutrients are **P**, **Q**, **R** and **S**?



	P	Q	R	S
A	starch	cellulose	protein	fat
B	fat	starch	cellulose	protein
C	protein	fat	starch	cellulose
D	protein	starch	fat	cellulose

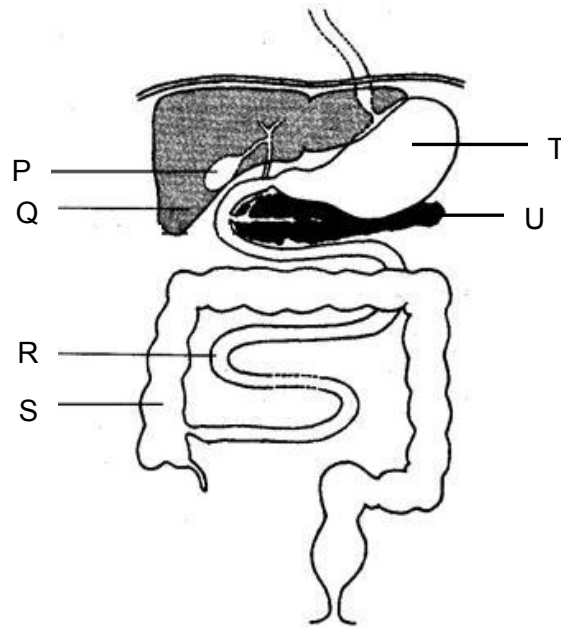
- 20 Which of the following shows the correct match between the sexually transmitted infection and one of its harmful effects?

	Sexually transmitted infection	Harmful effect
A	Gonorrhoea	Insanity
B	Syphilis	Sterility
C	Syphilis	Paralysis
D	AIDS	Baby of the infected mother is born blind

- 21 Which of the following statements about AIDS is incorrect?

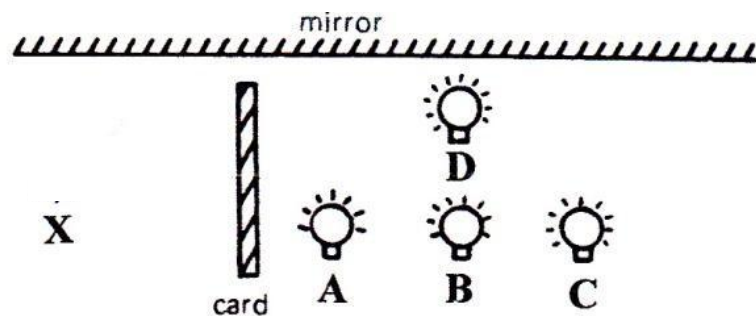
- A** It can be spread through blood transfusion.
- B** It can be transmitted from infected mother to the foetus.
- C** The infected person will have a lowered resistance to disease.
- D** It is curable by antibiotics if detected early enough.

- 22** The diagram below shows part of the human digestive system.

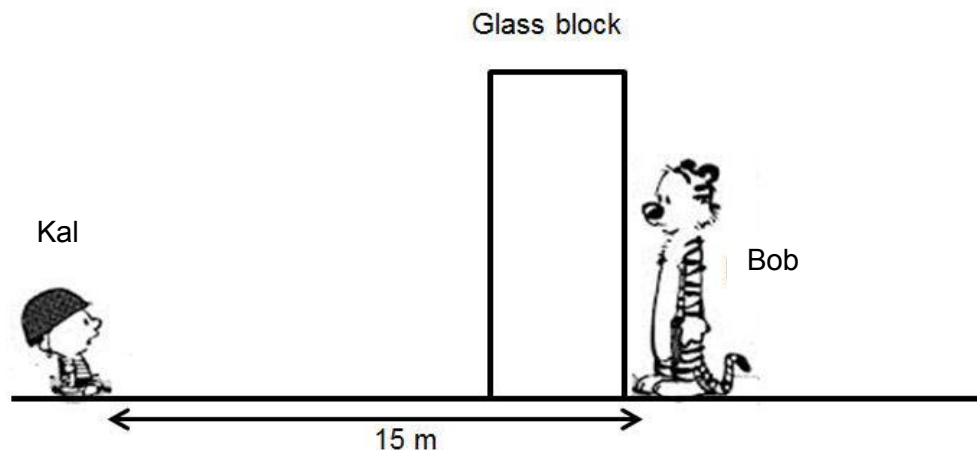


Which of the organs produce alkaline digestive juices?

- A** Q, R and U
 - B** P, Q, R, and U
 - C** Q, R, S and T
 - D** Q, R, S U and T
- 23** Four light bulbs are placed in front of a mirror, as shown in the diagram below. An observer is prevented from seeing the light bulbs directly by a card. Which of the bulb's image can the observer (X) see?



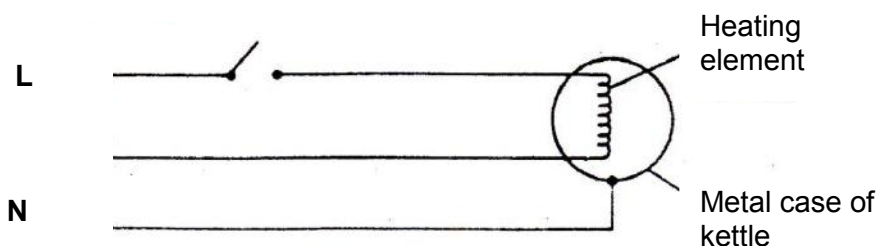
- 24 Kal saw Bob through a thick glass block as shown in the figure below. The actual distance between them is 15 m.



Which of the following distances below is a possible distance which Bob will **appear to be** to Kal?

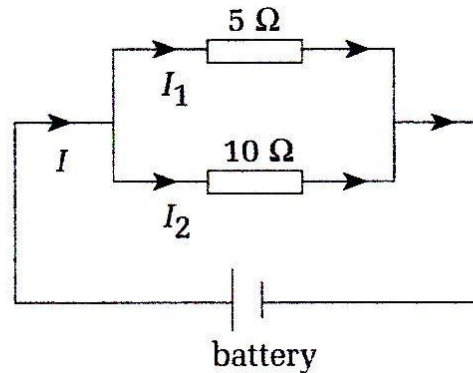
- A** 10 m **B** 15 m **C** 20 m **D** 25 m

- 25 The diagram below shows a 240 V mains supply socket with a 750 W electric kettle attached to it by a three-pin plug. If two fuses, a 5 A fuse and a 13 A fuse are available, which fuse should be used and where should it be connected?



- A** 5 A, connected in the live wire
B 5 A, connected in the earth wire
C 5 A, connected in the neutral wire
D 13 A, connected in the live wire

- 26** The figure below shows two resistors connected to a battery. The currents in the circuit are indicated on the figure.



Which of the following statement(s) is/are **not** correct?

- (1) The potential difference across the $5\ \Omega$ resistor is equal to the potential difference across the $10\ \Omega$ resistor.
- (2) The effective resistance of the circuit is more than $10\ \Omega$.
- (3) $I_2 = 2I_1$
- (4) $I = I_1 + I_2$

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

- 27** A $400\ \text{W}$ electric iron is switched on for 30 minutes. How long does a $2\ \text{kW}$ heater take to use the same amount of energy as the electric iron?

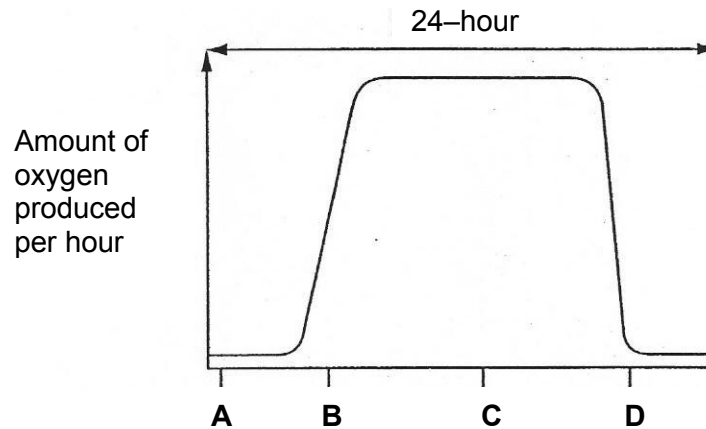
- A** 6 minutes
- B** 60 minutes
- C** 100 minutes
- D** 360 minutes

- 28** The cable to an electric fan becomes so worn out that the live wire makes electrical contact with the metal case. The metal case is earthed. The plug to the fan contains a 5 A fuse. There is a current of 4 A when the fan works normally.

What will happen?

- A** The current will run to the earth and the fuse will not be affected.
- B** The fuse will melt and switch off the circuit.
- C** The metal case will become live and dangerous.
- D** The metal case will become very hot.

- 29** The graph below shows the amount of oxygen produced by a green plant during a 24-hour period. Which letter represents midnight?



- 30** Why does blowing into a trumpet make sound?

- A** The trumpet heats the air.
- B** The trumpet reflects the air.
- C** The air in the trumpet is cooled.
- D** The trumpet causes the air to vibrate.

END OF PAPER

The Periodic Table of the Elements

Group																	
I	II											III	IV	V	VI	VII	0
1 H Hydrogen																	
7 Li Lithium	9 Be Beryllium											11 B Boron	12 C Carbon	14 N Nitrogen	16 O Oxygen	19 F Fluorine	20 Ne Neon
23 Na Sodium	24 Mg Magnesium											27 Al Aluminium	28 Si Silicon	31 P Phosphorus	32 S Sulfur	35.5 Cl Chlorine	40 Ar Argon
39 K Potassium	40 Ca Calcium	45 Sc Scandium	48 Ti Titanium	51 V Vanadium	52 Cr Chromium	55 Mn Manganese	56 Fe Iron	59 Co Cobalt	59 Ni Nickel	64 Cu Copper	65 Zn Zinc	70 Ga Gallium	73 Ge Germanium	75 As Arsenic	79 Se Selenium	80 Br Bromine	84 Kr Krypton
85 Rb Rubidium	88 Sr Strontium	89 Y Yttrium	91 Zr Zirconium	93 Nb Niobium	96 Mo Molybdenum	96 Tc Technetium	101 Ru Ruthenium	103 Rh Rhodium	106 Pd Palladium	108 Ag Silver	112 Cd Cadmium	115 In Indium	119 Sn Tin	122 Sb Antimony	128 Te Tellurium	127 I Iodine	131 Xe Xenon
133 Cs Caesium	137 Ba Barium	139 La Lanthanum	178 Hf Hafnium	181 Ta Tantalum	184 W Tungsten	186 Re Rhenium	190 Os Osmium	192 Ir Iridium	195 Pt Platinum	197 Au Gold	201 Hg Mercury	204 Tl Thallium	207 Pb Lead	209 Bi Bismuth	209 Po Polonium	209 At Astatine	209 Rn Radon
Fr Francium	Ra Radium	Ac actinium															

*58-71 Lanthanoid series

†90-103 Actinoid series

140 Ce Cerium	141 Pr Praseodymium	144 Nd Neodymium	150 Sm Samarium	152 Eu Europium	157 Gd Gadolinium	159 Tb Terbium	162 Dy Dysprosium	165 Ho Holmium	167 Er Erbium	169 Tm Thulium	173 Yb Ytterbium	175 Lu Lutetium
232 Th Thorium	238 Pa Protactinium	238 U Uranium	238 Pu Plutonium	238 Am Americium	238 Cm Curium	238 Bk Berkelium	238 Cf Californium	238 Es Einsteinium	238 Fm Fermium	238 Md Mendelevium	238 No Nobelium	238 Lr Lawrencium

a

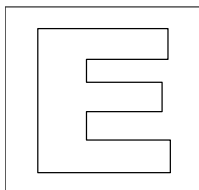
X

b

a = relative atomic mass

X = atomic symbol

b = proton (atomic) number



GAN ENG SENG SCHOOL

End-of-Year Examination 2014



CANDIDATE
NAME

CLASS

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INDEX
NUMBER

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SCIENCE

Paper 2

7 Oct 2014

Papers 1 & 2: 2 hours

Sec 2 Express

Candidates answer on the Question Paper.

Calculators are allowed in the examination

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid/tape.

Section A

Answer **all** questions.

Section B

Answer question **8** and **three other** questions.

In calculations, you should show all the steps in your working, giving your answer at each stage.

Enter the numbers of the Section B questions you have answered on the dotted lines in the grid below.

At the end of the examination, hand in your answers to Paper 1 and Paper 2 separately.

The number of marks is given in brackets [] at the end of each question or part question.

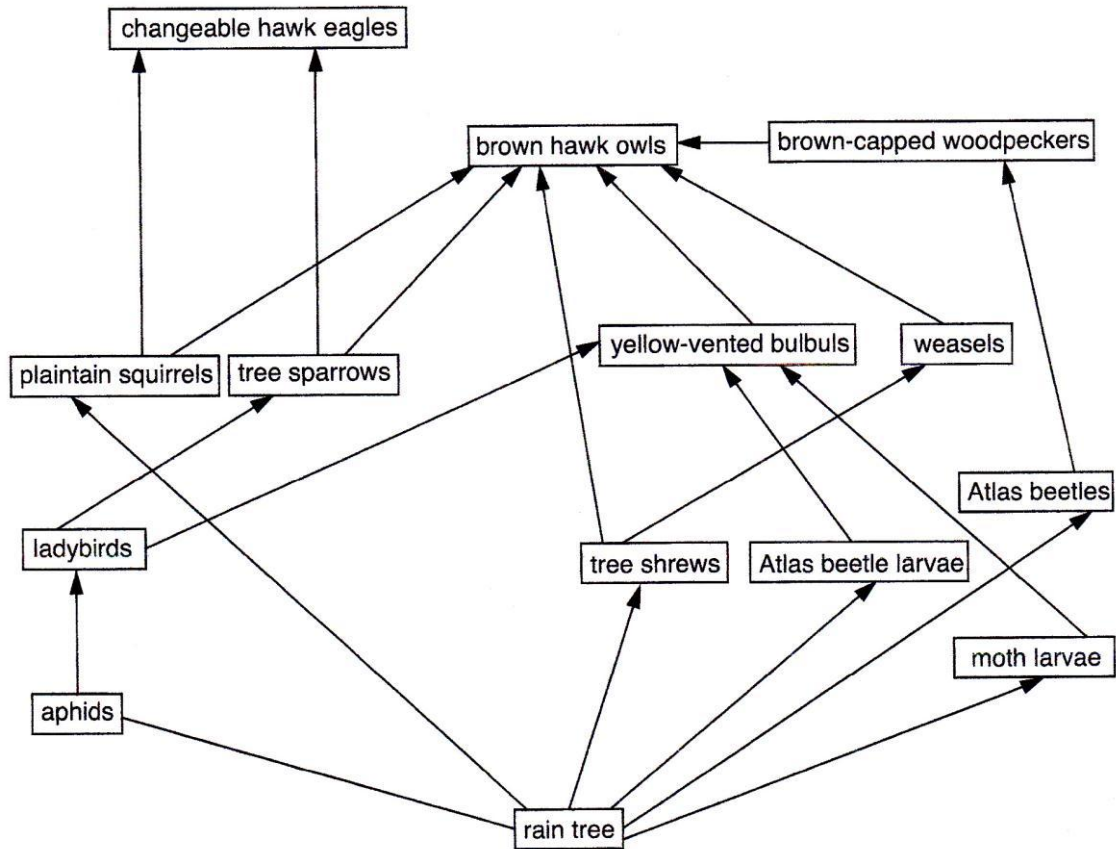
A copy of the Periodic table is inserted on page **18**.

For Examiner's Use	
Section A	30
Section B	40
Q8	
.....	
.....	
.....	
Total	70

SECTION A (30 marks)

Answer **all** the questions in this section.

- 1 The diagram below shows part of a food web in a forest.



- (a) Caterpillars are primary consumers and are preyed on by spiders. Spiders are a source of energy for the tree sparrows. [1]

Add this information on the food web above.

- (b) During one particular year, most of the Atlas beetle larvae are killed by a disease. [2]

Explain how this could affect the brown-capped woodpecker population.

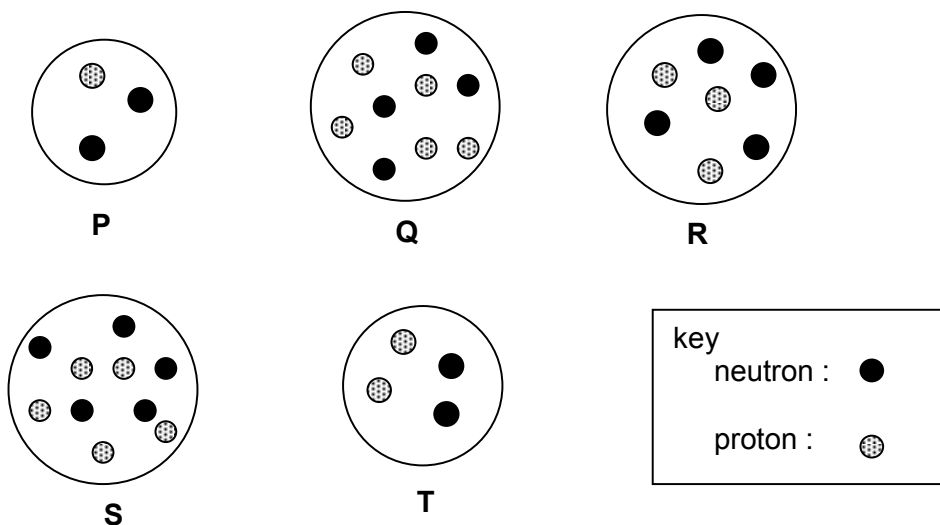
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2 The diagrams below show the nuclei of five different atoms, **P**, **Q**, **R**, **S** and **T**.



(a) Which of the atoms, **P**, **Q**, **R**, **S** and **T** [2]

(i) has a nucleon number of 4,

(ii) are isotopes of the same element?

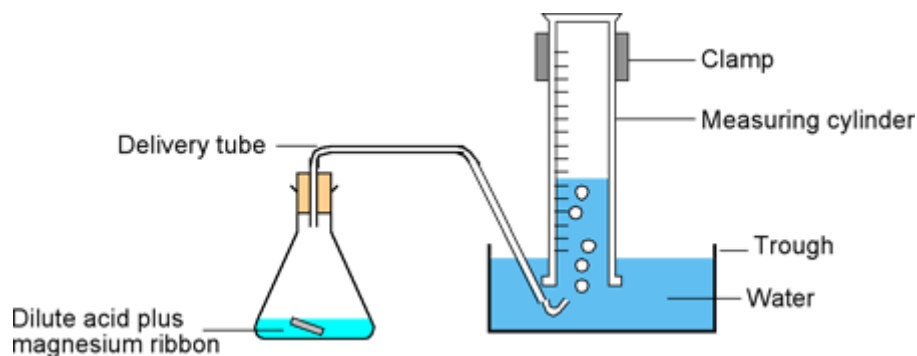
(b) (i) A compound is formed between the element of proton number 20 and [2]
 another of proton number 9.

Give the chemical formulae of the two different types of ions formed.

.....

(ii) Draw the “dot and cross” diagram of the compound formed between them. [2]

- 3 A student set up the following apparatus as he reacted some magnesium ribbons with dilute nitric acid.



- (a) Describe a test for the gas that is collected in the measuring cylinder. [2]

.....

.....

- (b) Write a balanced chemical equation for the reaction in the conical flask. [2]

.....

- 4 Fig. 4.1 shows the absorption of potassium ions by young cereal plant root hairs which were kept in aerated solutions maintained at two different temperatures. After 70 minutes, potassium cyanide, a poison which inhibits enzymes involved in respiration, was added to the solutions at each temperature.

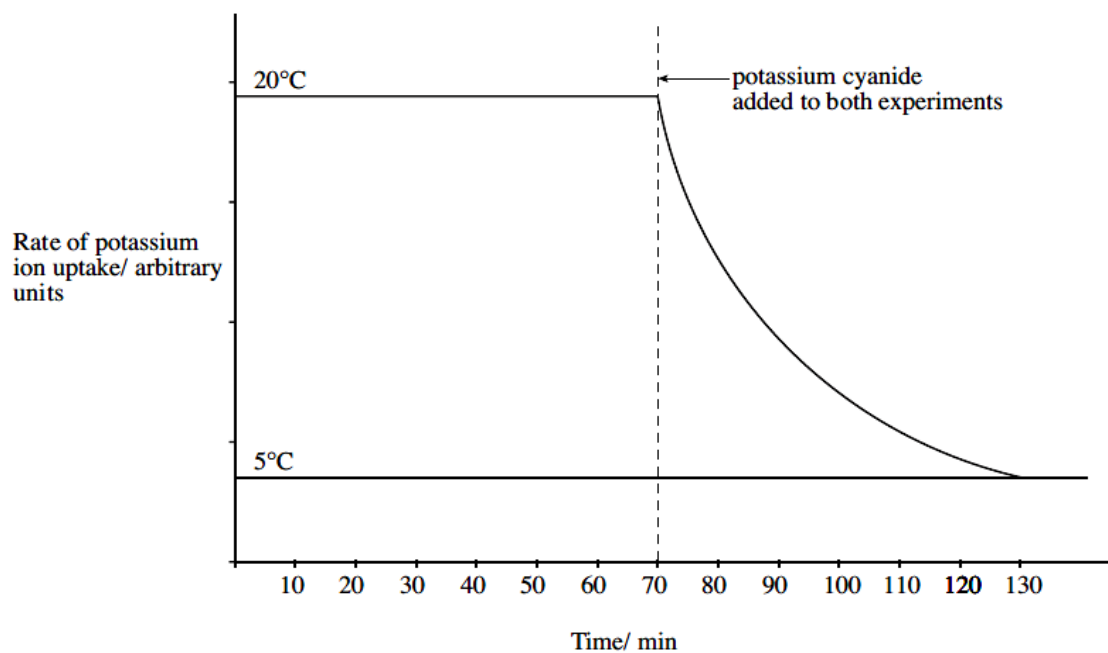


Fig. 4.1

- (a) How does the information given show that the root hairs take up the ions by active transport? [2]

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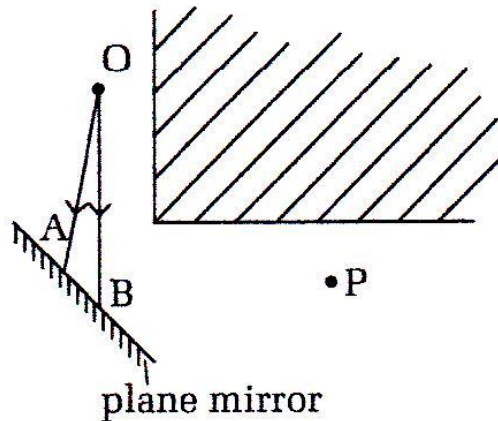
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- (b) It has been proven that enzymes are denatured at low temperatures. Explain why, at low temperatures, potassium uptake continues after the addition of potassium cyanide. [1]

.....

.....

- 5 The diagram below shows a plane mirror placed at a street corner. It enables a driver at position 'P' to see an on-coming vehicle approaching from 'O'.



- The rays **OA** and **OB** from the vehicle are incident on the plane mirror. [3]
Complete the ray diagram to show how the driver at **P** is able to see the image of the on-coming vehicle in the mirror. Indicate the position of the image with the letter '**I**'.

- 6 The melting and boiling points of three substances, **A**, **B** and **C**, are shown in

substance	melting point/ °C	boiling point/ °C
A	17	118
B	1083	2595
C	-138	-0.5

The three substances are placed at room temperature of 28°C.

- (a) Name the process that takes place when substance **A** is cooled from 120°C to room temperature. [1]

.....

- (b) Use the kinetic particle theory to explain what happens to the particles if **B** is heated from 1082°C to 1084°C. [3]

.....

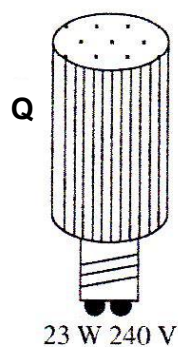
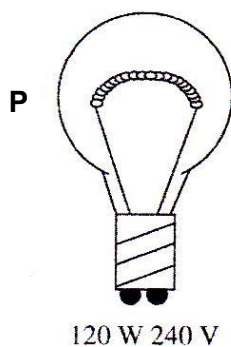
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- 7 The figure below shows a tungsten filament lamp, **P**, and an energy-saving lamp, **Q**. The manufacturers of the energy-saving lamp claim that it is as bright as a 120 W filament lamp.

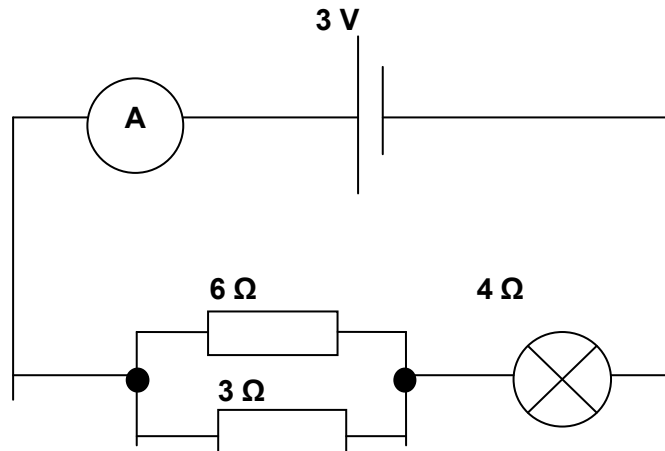


- (a) Calculate the resistance of the filament lamp, **P**. [2]
- (b) If 60% of the power consumed by lamp **Q** is given out as light, calculate the power given out as light. [1]
- (c) The power produced as light from lamp **P** is the same as that of lamp **Q**. [1]
What is the other form of energy emitted from lamp **P**?
.....
- (d) Calculate the amount of money a consumer will save if she uses bulb **Q** instead of bulb **P**, if on average, the bulb is used for 10 hours every day for the whole month of September. [3]
(September has 30 days and the cost of electricity is \$0.20 per kWh).

SECTION B (40 marks)

Answer **Q8** and any 3 other questions in this section.

- 8** An electric circuit is set up as shown below.



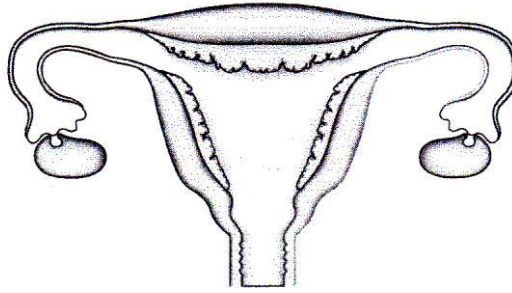
- (a)** Calculate the effective resistance of the whole circuit. [2]
- (b)** Find the reading of the ammeter. [2]
- (c)** Calculate the potential difference across
- (i)** the light bulb [1]
- (ii)** the 6 Ω resistor [1]
- (iii)** the 3 Ω resistor [1]

- (d) (i) If the 3 ohm resistor is replaced with a piece of copper wire, what will the new reading of the ammeter be? [2]

- (ii) How will this affect the brightness of the bulb? [1]

.....

- 9 (a) The figure below shows part of the female reproductive system.



- (i) On the figure, indicate with the letter 'D' the site where a diaphragm could be inserted. [1]

- (ii) Explain how the placement of a diaphragm can prevent the formation of an embryo, but does not prevent the spread of sexually transmitted infections. [2]

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- (iii) State one advantage for a woman to use tubal ligation as a form of contraception as compared to using a diaphragm. [1]

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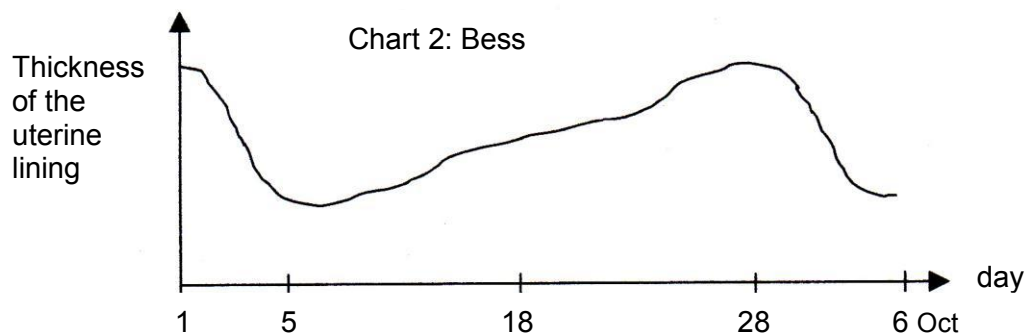
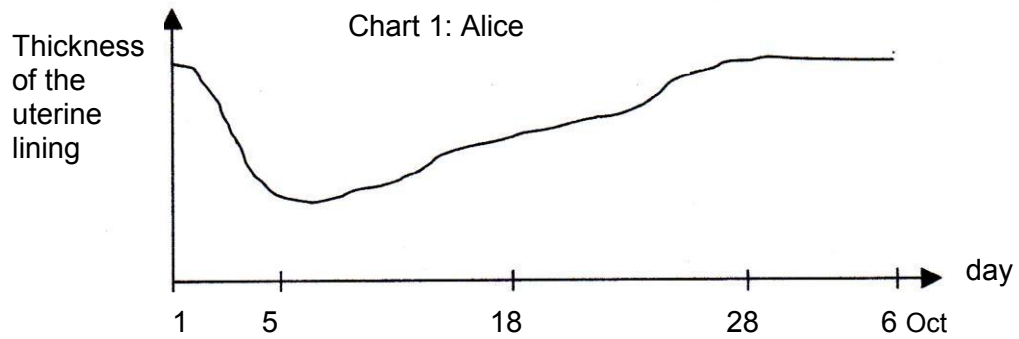
- (iv) Suggest reasons why a woman will not likely to get pregnant if she has sexual intercourse three days after her menstruation. [2]

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- (b) The charts below show how the thickness of the uterine lining of two women change from day to day during the months of September and October.



- (i) One of the charts shows that fertilisation has taken place. [2]
Identify the woman who has conceived and explain your answer.

.....
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Both Alice and Bess have a 28-day menstrual cycle and ovulated on 14 September.

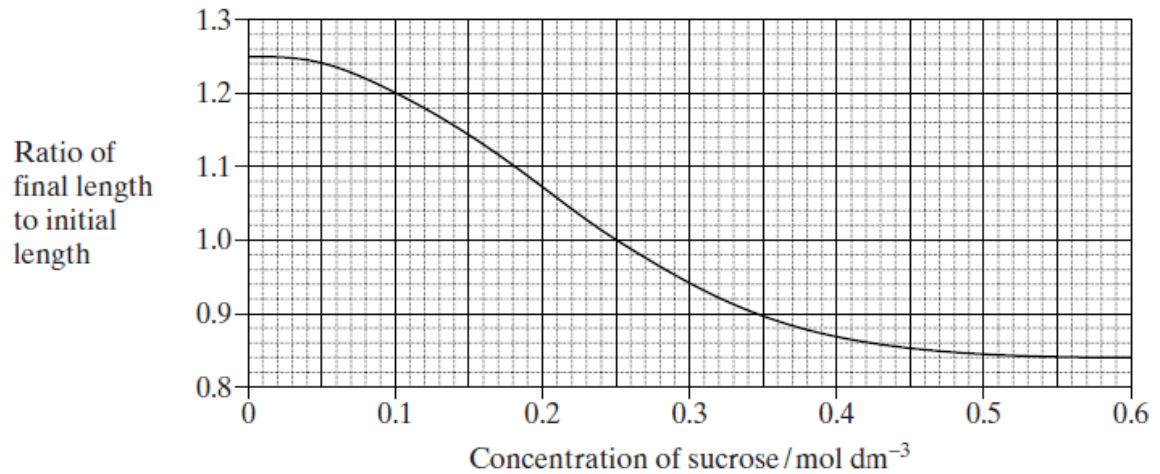
- (ii) When will the first day of the **next** menstrual cycle be for the woman who did not conceive? [1]

.....

- (iii) If the woman in **b(ii)** also wants to conceive, she needs be aware of her fertile period. Calculate the fertile period in October of this woman using the charts above. [1]

.....

- 10 (a)** Cylinders of potato were cut. Their initial lengths were measured. Each cylinder was then placed in a different concentration of sucrose solution for 2 hours. The graph below shows the changes in length of the potato cylinders in the different sugar solutions.



- (i) State the concentration of the cell sap of potato. [1]

.....

- (ii) The initial length of the potato cylinder immersed in 0.6 mol dm⁻³ was 7.5 cm. Calculate the final length of the potato cylinder. Show your workings clearly. [1]

- (iii) Explain how the length of the potato cylinder that was placed in 0.1 mol dm⁻³ sucrose solution changes. [3]

.....

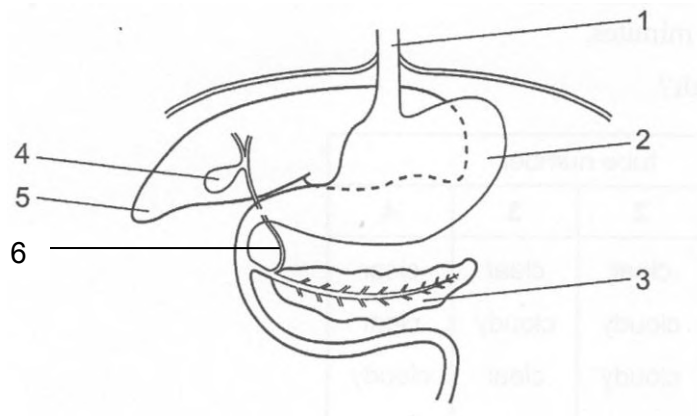
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(b) The diagram shows a section of the digestion system in man.



(i) Give the label of the organ in which bile is produced. [1]

.....

(ii) Explain clearly how bile helps in digestion. [2]

.....

.....

(iii) Some people develop a condition in which the part labelled **6** becomes gradually blocked by deposits. Describe the effect of this condition on digestive function and suggest how the patient's lifestyle has to change. [2]

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- 11 (a) Fig 11.1 shows an experiment set up to investigate any change in the mass of plants potted in damp soil over a period of time.

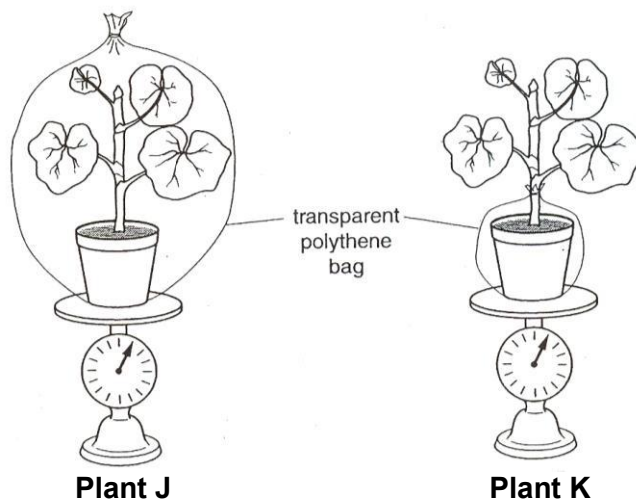


Fig 11.1

Fig 11.2 is a graph showing the loss in mass of the plants over the next five days.

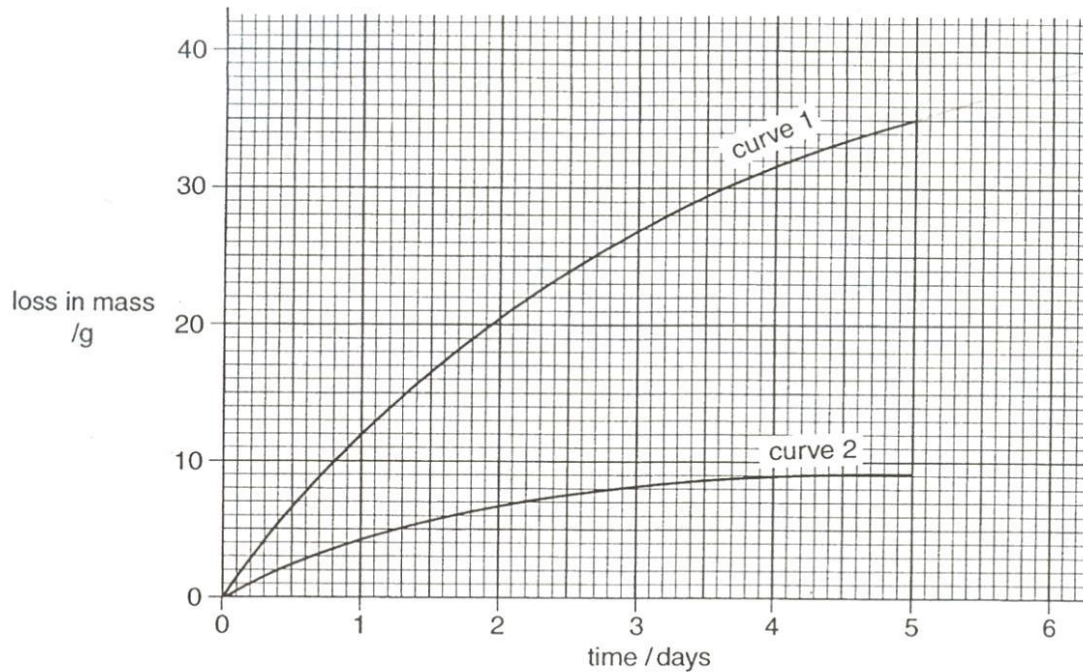


Fig 11.2

- (i) Which plant gives the result shown by curve 1? [1]

.....

- (ii) Name the process responsible for this loss in mass. [1]

.....

- (iii) Explain how this process is affected by the polythene bag around plant J. [2]

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- (b) Fig 11.3 below shows a cross section of a healthy human heart.

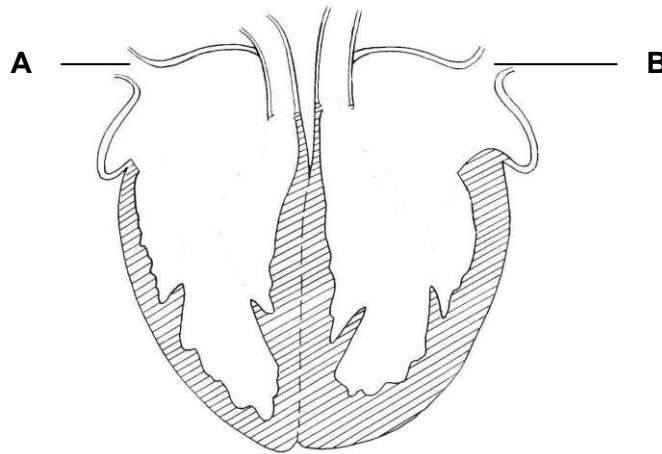


Fig 11.3

- (i) Name the blood vessels labelled **A** and **B**. [2]

A: **B:**

- (ii) Using arrows, draw on Fig 11.3, the flow of deoxygenated blood into and out of the heart. [1]

- (iii) Hypertrophic cardiomyopathy is a genetic disease of the heart muscles. a condition in which the heart muscle becomes thick. Often, only one part of the heart is thicker than the other parts. Most people with this condition have few, if any symptoms. It is one of the leading causes of sudden death in young athletes as the condition often goes undiagnosed. [3]

Predict and explain the consequences of hypertrophic cardiomyopathy.

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- 12 (a)** Ariel, standing at point **A** in Fig 12.1, sees the reflection of Ben on a shop window. Ben is standing at point **B**.

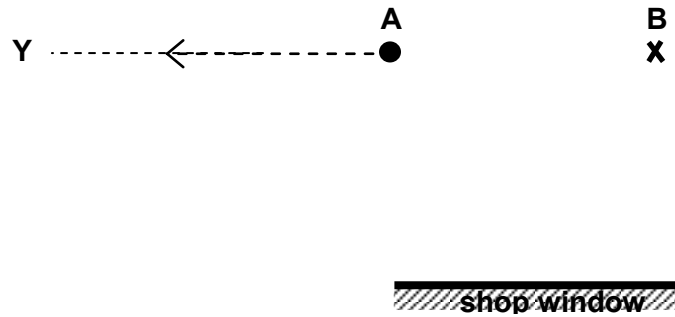


Fig 12.1

- (i) On Fig 12.1, draw a one-ray diagram to show how Ariel at **A** sees Ben at **B**. Consider the shop window to be a thin piece of glass acting as a mirror. [1]
- (ii) Ariel then moves further away from Ben towards Y in the direction of the arrow shown in Fig 12.1. Mark with a letter **X** the furthest position along **AY** to which Ariel can move so that Ariel and Ben will still be able to see each other by reflection through the shop window. You are to show your working by drawing a ray of light clearly on Fig 12.1. [2]
- (b) In white light, a skirt appears white with blue spots. Explain how the skirt would appear under cyan light. [4]

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- (c) Fig 12.2 shows a semi-circular glass block. The refractive index of the glass block is 1.5.

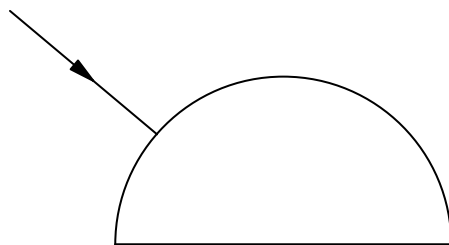


Fig 12.2

- (i) Calculate the critical angle of the glass block. [1]

- (ii) Complete the light ray till it emerges out of the glass block. [2]

END OF PAPER

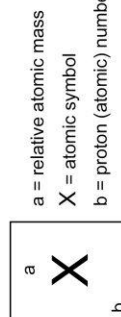
The Periodic Table of the Elements

Group																	
I	II											III	IV	V	VI	VII	0
1 H Hydrogen 1																	
7 Li Lithium 3	9 Be Beryllium 4											11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
23 Na Sodium 11	24 Mg Magnesium 12											27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	101 Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	210 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86
Fr Francium 87	226 Ra Radium 88	227 Ac actinium 89															

*58-71 Lanthanoid series

†90-103 Actinoid series

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71	
232 Th Thorium 90	238 Pa Protactinium 91	238 U Uranium 92	238 Np Neptunium 93	238 Pu Plutonium 94	238 Am Americium 95	238 Cm Curium 96	238 Bk Berkelium 97	238 Cf Californium 98	238 Es Einsteinium 99	238 Fm Fermium 100	238 Md Mendelevium 101	238 No Nobelium 102	238 Lr Lawrencium 103

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

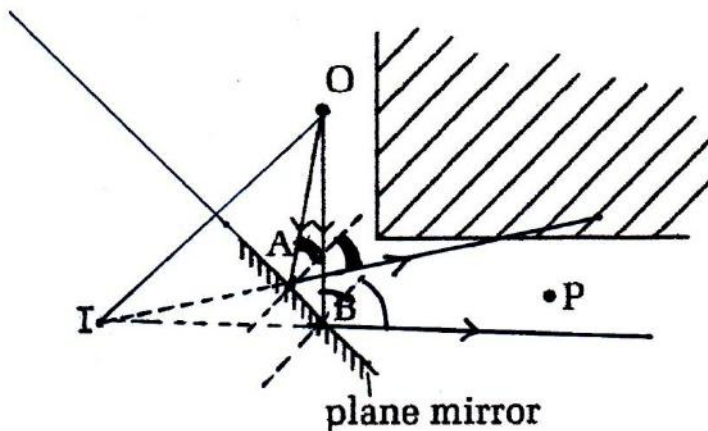
2Exp Science EOY Answers 2014

1	B	11	A	21	D
2	B	12	C	22	A
3	A	13	A	23	B
4	D	14	C	24	A
5	C	15	D	25	A
6	C	16	B	26	D
7	A	17	B	27	A
8	C	18	C	28	B
9	B	19	D	29	A
10	B	20	C	30	D

- 1 **a** shows the following food chain added to given food web: 1
rain tree → caterpillar → spider → tree sparrow
- b** If most of the Atlas beetle larvae are killed by a disease, there 2
will be a **decrease in the population of Atlas beetle**.(1) This
will lead to a **decrease in the brown capped woodpecker**
population (0.5) as they have **lost their only source of**
food.(0.5)
- 2 **ai** T 1
- aii** Q and S 1
- bi** Ca^{2+} , 1
 F^- 1
- bii** 1- One correct Ca^{2+} ions drawn 2
 1- Two correct F^- ion drawn
- 3 **a** Insert a lighted splint into gas; 1
 flame extinguished with a 'pop' sound; 1
- b** $\text{Mg} + 2\text{HNO}_3 \rightarrow \text{Mg}(\text{NO}_3)_2 + \text{H}_2$ 2
 1 – correct formula; 1 – correct balancing

- 4 a When potassium cyanide is added, respiration ceases, no energy released for active transport to take place; 1
Hence rate of absorption of ions decreases steeply. 1
- b Potassium ions also move by diffusion without the expense of energy from respiration; 1

5



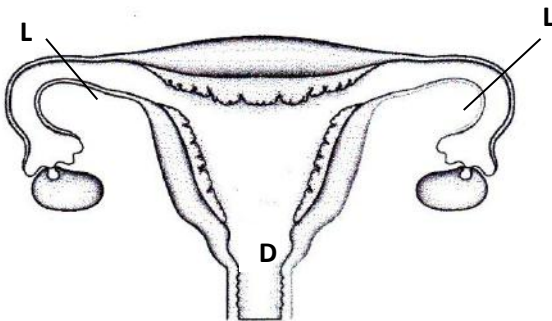
- 1- Correct position of I [1]
2-Correct direction of reflected rays from A & B with rays extended backwards to the image [2]

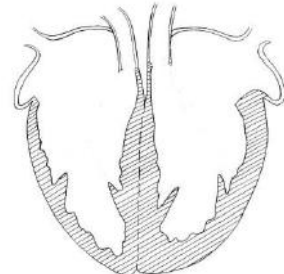
- 6 a Condensation 1
- b The particles gain heat/ kinetic energy; [1]
particles move faster; [1]
and further apart; [1]
the forces of attraction between the particles weaken; [1]
the particles slide over one another in a liquid; [1]
the spaces between particles are quite closely packed; [1]
{any three} 3

- 7 a $P = VI$ No unit or wrong unit: minus 1;
 $I = P/V$
 $= 120 \text{ W} / 240 \text{ V}$
 $= 0.5 \text{ A}$ 1 working must be shown

Resistance, $R = V/I$
 $= 240 \text{ V} / 0.5 \text{ A}$
 $= \underline{480 \Omega}$ 1
- b Power of light energy given out by lamp Q 1
 $= 60/100 \times 23 \text{ W}$
 $= \underline{13.8 \text{ W}}$ No unit or wrong unit: minus 1;
working must be shown

c	Thermal energy / Heat energy	1	
d	Cost saved = (120 – 23)/ 1000 kW x 10 h x 30 days x \$0.20 = <u>\$5.82</u>	2 1	No unit or wrong unit: minus 1;
	Alternative method Cost of using lamp P = 120/1000 kW x 10 h x 30 days x \$0.20 = \$7.20	1	working must be shown
	Cost of using lamp Q = 23/1000 kW x 10 h x 30 days x \$0.20 = \$1.38	1	
	Cost save by using lamp Q = \$(7.20 – 1.38) = \$5.82	1	
8	a For the resistors connected in parallel $1/R_p = 1/6 + 1/3$ = 1/2 $R_p = 2 \Omega$	1	No unit or wrong unit: minus 1
	Effective resistance $R_t = 2 + 4$ = <u>6 \Omega</u>	1 1	
	b Reading on the ammeter $I = V/R$ = 3V/ 6Ω = <u>0.5 A</u>	1 1	No unit or wrong unit: minus 1
	ci p.d across the light bulb, $V_{bulb} = IR$ = 0.5 A x 4 Ω = <u>2 V</u>	1	No unit or wrong unit: minus 1 (deduct once for 8c)
	cii p.d across the 6Ω resistor = p.d of 3 Ω resistor p.d across 6Ω resistor = (3 – 2) V = <u>1 V</u>	1	
	ciii p.d across 3Ω resistor = <u>1 V</u>	1	

	di If the $3\ \Omega$ resistor is replaced by a piece of copper wire, there will be a short circuit. Resistance of the circuit, $R_t = 4\ \Omega$ Current in circuit, $I_t = V/R_t$ $= 3V / 4\ \Omega$ $= \underline{\underline{0.75\ A}}$	1	No unit or wrong unit: minus 1 (deduct once for 8(b) and (d))
	dii The bulb will be <u>brighter</u>.	1	
9	ai 	1	Correct site of D
	a ii The diaphragm blocks the cervix and prevents sperms from entering the uterus (1); However, the diaphragm does not prevent contact between the penis and vagina/ sexual fluid can still be exchanged (1)	2	
	a iii Tubal ligation is more reliable / more effective than using a diaphragm in preventing pregnancy.	1	
	a iv The egg will only be released during ovulation on day 14 [1]. There will not be any mature egg released before this day [1]. The time of sexual intercourse falls outside of fertile period (day 11-17) [1] {any 2}	2	
	bi This means that Alice has conceived. (1) The chart shows that the thickness of the uterine lining remained constant after 28 September (1)	2	
	b ii 29 Sep	1	
	b iii 9 Oct to 15 Oct	1	
10	ai $0.25\ \text{mol dm}^{-3}$	1	
	a ii Final/ 7.5 = 0.84 Final = 6.3 cm {no mark if working not shown}	1	

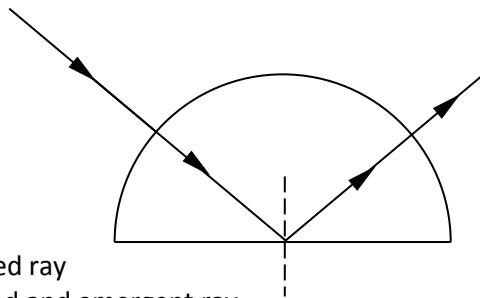
a	Cell sap has lower water potential than surrounding sucrose solution[1] Water moves into the cells by osmosis through the partially permeable cell membrane [1] Cells become turgid/ increase in size/ length of potato cylinder increases [1]	3	R: break down fat molecules
b	5	1	
bii	Bile is required to <u>emulsify fats</u>/ break down large fat droplets into smaller fat droplets. Hence increases the <u>surface area to volume ratio of fat droplets exposed to lipase</u> and speeds up digestion of fats	1	
biii	The <u>rate of digestion of fats</u> will decrease. So the diet of such a patient needs to <u>contain less fats</u> otherwise the patient will suffer from indigestion.	1	1
11	a	Plant K	1
	a	Transpiration	1
	a	Polythene bag traps the water vapour lost through the leaves [0.5] which create an environment of air that is saturated with water vapour/ high humidity [0.5];	1
		less water vapour moves out of the leaves through diffusion [0.5] since there is a reduced concentration gradient of water vapour between inside the leaf and the surrounding air [0.5]	1
	b	A: vena cava B: pulmonary vein	1
			1
	b		1
	biii	Ventricular <u>volume decreases</u> [0.5], hence <u>less blood</u>/ less oxygenated blood sent out of the heart/ harder for blood to leave the heart [0.5]; <u>less oxygen delivered to body cells</u>, [0.5] forcing the <u>heart to work harder</u> to pump blood/ heart pumps faster [0.5]; so person may experience fatigue [1] OR shortness of breath [1]	3
12	a	correct diagram (no need normal)	1

- aii** Mark **X** on **AY**. 1
 Use one reflected light ray to prove answer 1

- b** the skirt will appear cyan with blue spots; 1
 Cyan is made up of blue and green light; 1
 The white portion reflects blue and green light, hence appears 1
 cyan;
 The blue spots reflect blue light and absorbs green light, hence 1
 appears blue;

- ci** $n = \frac{1}{\sin c}$ 1 correct
 $1.5 = \frac{1}{\sin c}$ working must
 $c = \sin^{-1}\left(\frac{1}{1.5}\right)$ be shown
 $c = 41.8^\circ$

- cii** 2



- [1] – Correct refracted ray
 [1] – Correct reflected and emergent ray



Geylang Methodist School (Secondary)

End-of-Year Examination 2014

Candidate
Name

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Class

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Index Number

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LOWER SECONDARY SCIENCE

Sec 2 Express

Additional materials : Optical Answer Sheet
Writing Paper

2 hour

Setter : Miss Cheryl Dorothy Nonis
Miss Ng Huey Shin

7 October 2014

READ THESE INSTRUCTIONS FIRST

Do not open this booklet until you are told to do so.

Write in dark blue or black pen.

Write your name, class and register number on the answer sheet in the spaces provided.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A

There are **20** questions in this section. Answer **all** questions. For each question, there are four possible answers, **A, B, C** or **D**. Choose the one you consider to be correct and record your choice in **soft pencil** on the Optical Answer Sheet provided.

Section B

Answer **all** questions in the spaces provided.

Section C

Answer all **three** questions. The first question is in the form either/or.

Write your answers on the writing papers provided.

Start each question on a **new** page of writing paper.

At the end of the examination, hand in your answer sheet to Section **A** separately.

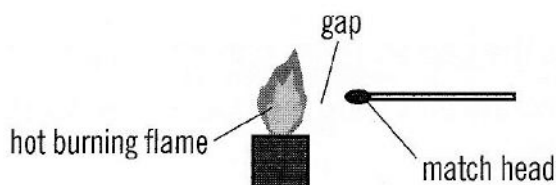
Tie the writing papers to Section **C** separately from the question paper.

Sections **B** and **C** will be handed in separately.

For Examiner's Use	
Section A	/20
Section B	/50
Section C	/30
Total	/100

Section A

- 1 Which of the following statements is **incorrect** about heat transfer?
- A Heat transfer cannot take place in a vacuum.
 - B Convection cannot take place in solids.
 - C Solids are better conductors of heat compared to liquids and gases.
 - D Convection involves the movement of the medium itself during the process of heat transfer.
- 2 A match stick is brought close to an extremely hot flame in open air as shown in the diagram below. The match is not lit up because it does not get hot enough.



- Which of the following is the best conclusion made from the observation?
- A The match reflects heat away.
 - B The air does not conduct heat well to light up the match head.
 - C The flame is still not hot enough to cause the match to light up.
 - D There is no convection in the air to light up the match.
- 3 The table below shows how the speed of sound varies with substances of different densities.

substance	speed of sound in substance / ms ⁻¹	density of substance / kgm ⁻³
air	330	1.29
oxygen	320	1.43
aluminium	5100	2710
iron	5000	7870
lead	1200	11300

From this information, what conclusion can you draw about the speed of sound?

- A The speed increases as the density of the substance increases.
- B The speed is greater in less dense substances.
- C The speed is greater in metals than in gases.
- D The speed is greatest in the densest metal.

- 4 A force is applied to a rolling ball in the same direction as its motion.

What is a possible effect of the force?

- I slows down the rolling ball
- II speeds up the rolling ball
- III stops the rolling ball
- IV changes the direction of the rolling ball

- A II only
- B II and IV only
- C I and III only
- D All of the above

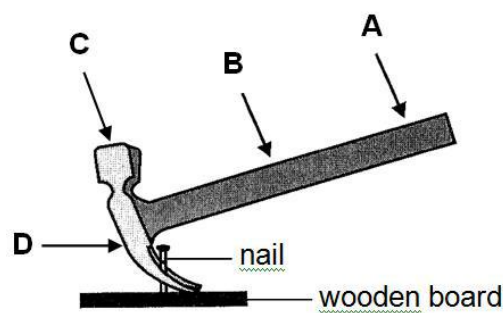
- 5 An object is taken into the outer space in a rocket.

As the rocket moves from Earth into outer space, which changes take place to the object?

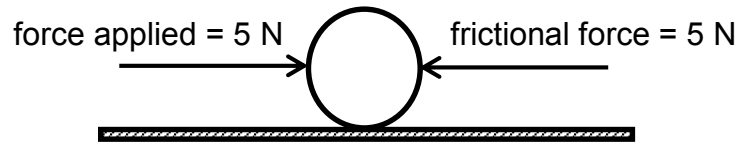
	change in mass	change in height
A	no	no
B	no	yes
C	yes	no
D	yes	yes

- 6 The diagram below shows a hammer being used to remove a nail from a wooden board.

At which position would you apply a force to pull the nail out of the board with the least possible effort?



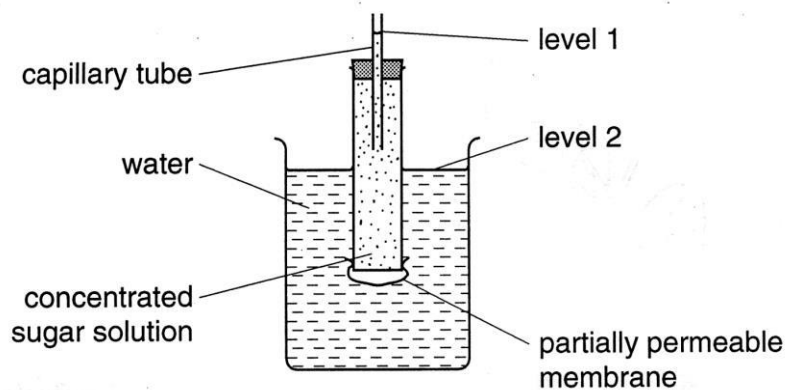
- 7 The diagram below shows two forces acting on a ball that is stationary at the same time, in opposite directions.



Which of the following statements about work done on the ball is correct?

- A** Work is done on the ball whenever there is a force applied on it.
 - B** Work is done as the ball moves in the direction of the frictional force.
 - C** There is no work done because the ball remains at rest.
 - D** Work is done as the ball will move in the direction of the force applied.
- 8 In some power stations, water is stored in a reservoir behind a dam.
- What type of energy is obtained from using water stored behind a dam?
- A** Tidal energy
 - B** Geothermal energy
 - C** Wave Energy
 - D** Hydroelectric energy
- 9 In which of the following is a kilowatt-hour of electrical energy used?
- A** A 50 W electric fan used for 2 hours.
 - B** A 500 W computer used for 1 hour.
 - C** A 3000 W heater is used for 20 minutes.
 - D** Two 100 W lamps used for 30 minutes.
- 10 What is the possible result of replacing the fuse in an electrical appliance with one of a lower rating?
- A** The fuse will melt.
 - B** Lesser current will flow through the appliance and will not cause overheating.
 - C** More current will flow through the appliance and cause overheating.
 - D** More protection is provided against a short circuit occurring.

- 11 The diagram below shows the apparatus used to investigate osmosis.

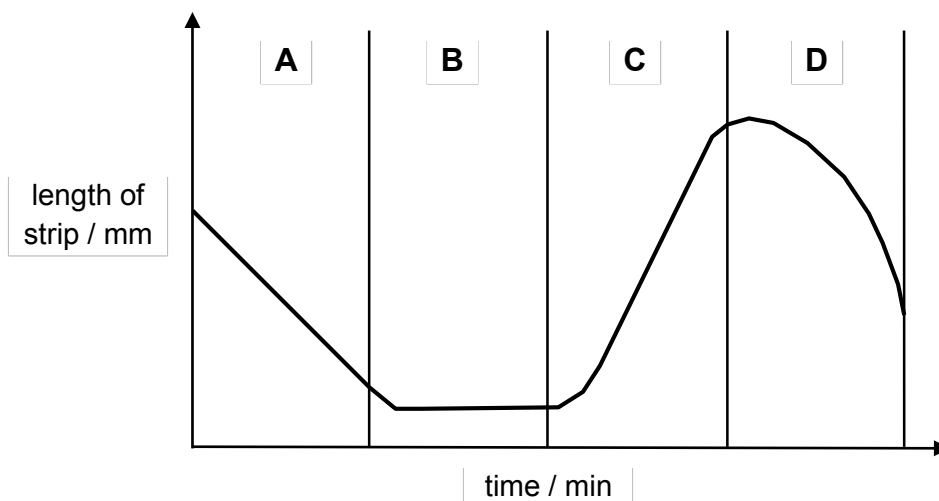


After four hours, which changes in levels will occur and which molecules will move across the membrane?

	level 1	level 2	molecules
A	fall	rise	sugar
B	fall	rise	water
C	rise	fall	sugar
D	rise	fall	water

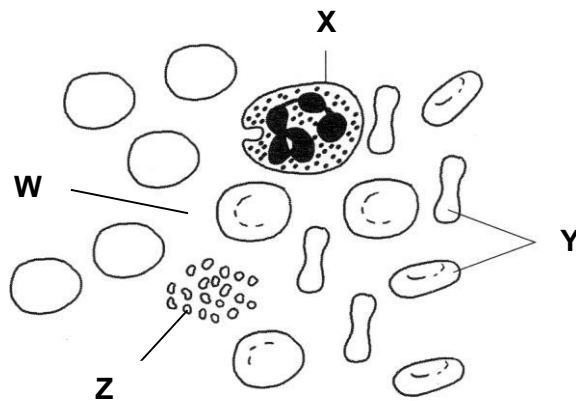
- 12 A raw cucumber strip was placed in solutions of different concentrations. The length of the strip was measured regularly.

The graph below shows the length of the cucumber strip in solutions of different concentrations.



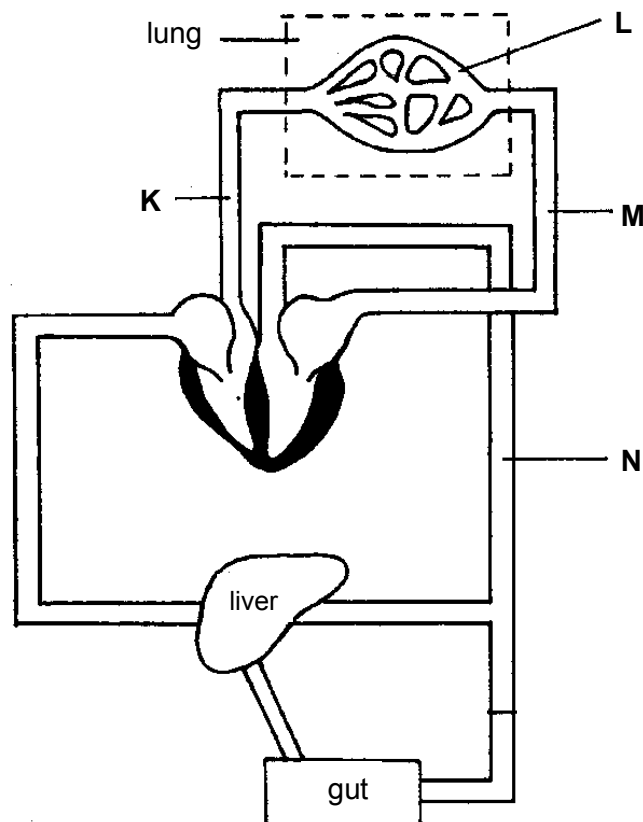
In which period of time was the cucumber strip in distilled water?

- 13 The photomicrograph below shows a blood smear.



Which labelled part(s) is/are involved in the transport of carbon dioxide towards the lungs?

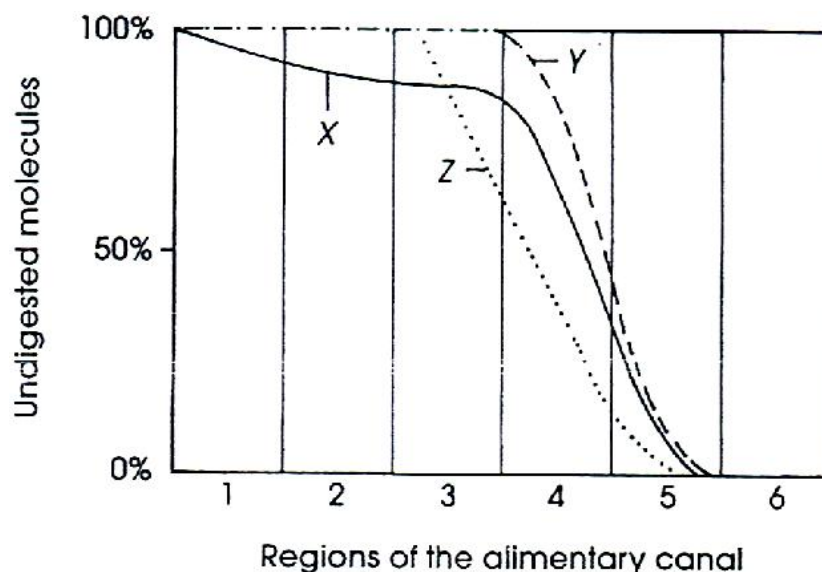
- | | | | |
|----------|--------------|----------|--------------|
| A | W only | C | W and Y only |
| B | Y and Z only | D | X and Z only |
- 14 The diagram below shows the blood circulatory system in a human body.



Arrange the blood vessels **K – N** in order of descending blood pressure.

- | | | | |
|----------|------------|----------|------------|
| A | K, L, M, N | C | M, K, N, L |
| B | L, N, M, K | D | N, K, L, M |

For Questions **15** and **16**, refer to the following graph which shows the extent to which starch, proteins and fats are digested chemically as food passes through the alimentary canal.



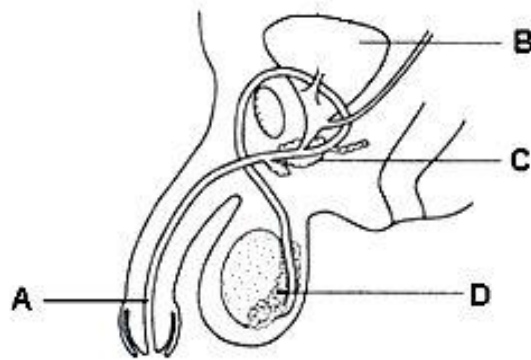
- 15** Which of the following shows the correct identities of regions 2 to 6 ?

	region 2	region 3	region 4 and 5	region 6
A	oesophagus	stomach	large intestine	rectum
B	stomach	small intestine	colon	rectum
C	oesophagus	stomach	small intestine	colon
D	stomach	small intestine	large intestine	liver

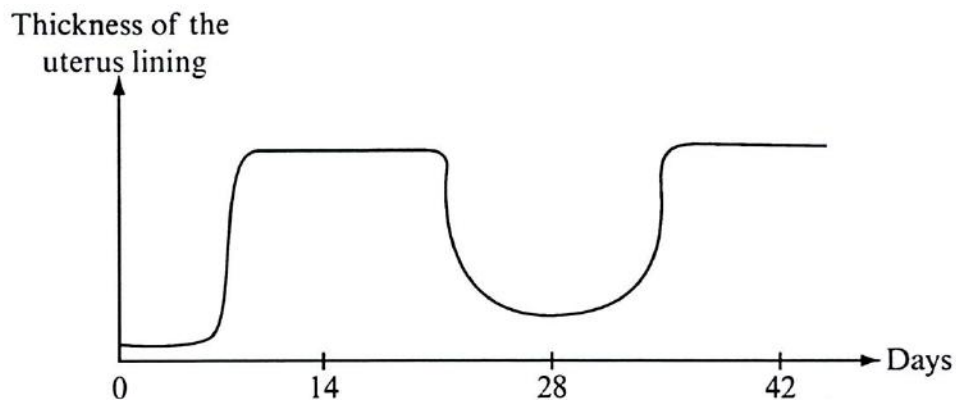
- 16** What are the possible uses of the digested products of X, Y and Z?

	X	Y	Z
A	for cellular respiration	production of insulating materials	production of new protoplasm
B	production of insulating materials	production of new protoplasm	for cellular respiration
C	for cellular respiration	production of enzymes	production of insulating material
D	production of insulating materials	production of enzymes	production of new protoplasm

- 17 Which part of the male reproductive system provides the fluids that contain nutrients and enzymes to nourish and activate the sperms?



- 18 The graph below shows the change in thickness of the uterus lining of a female over a period of time.



On which day is she most likely to be able to produce a zygote?

- A 6th day
B 16th day
C 24th day
D 29th day
- 19 Which of the following statements about abortion is **incorrect**?
- A It is considered a surgical method.
B It is a method of preventing pregnancy.
C It may cause a lot of harmful effects to the female.
D It is the deliberate removal of the fetus from the uterus.
- 20 Which of the following is the best way to prevent the spread of the human immunodeficiency virus?

- A not donating blood
B taking oral contraceptive pills
C taking a shower immediately after sexual intercourse
D using condoms during sexual intercourse

End of Section A

Section B

Write all your answers in the spaces provided.

- 21 Fig. 21.1 shows the structure of the human ear.

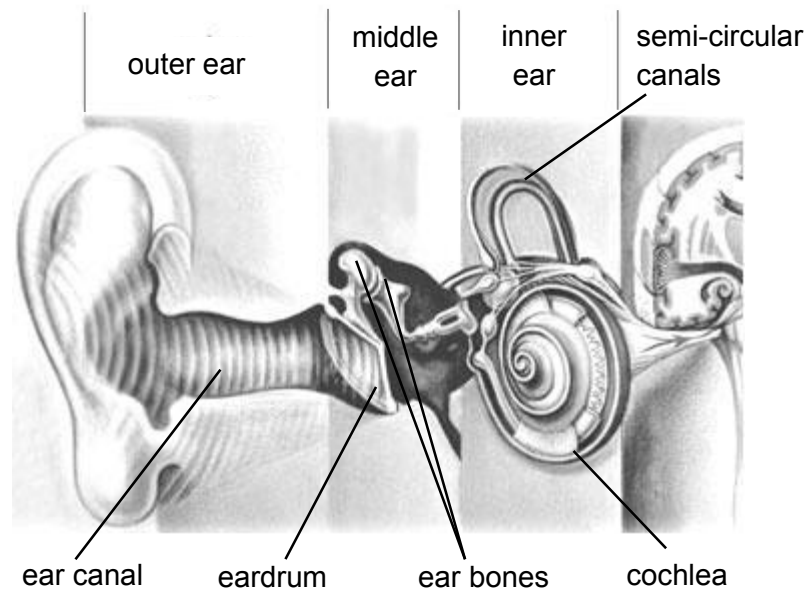


Fig. 21.1

- (a) State which part of the ear takes sound waves and turns them into vibrations.

_____ [1]

- (b) An acoustic trauma caused by a sudden loud noise such as an explosion or a sudden blast of loud music, can cause the eardrum to rupture.

- (i) What determines the loudness of sound?

_____ [1]

- (ii) Explain what causes a sudden loud noise to rupture the eardrum.

_____ [1]

[Total: 3 marks]

- 22** An engineer is tasked to design a car park on the top floor of a building that can accommodate 10 cars.

(a) If each car has a mass of 1500 kg, calculate the weight of these 10 cars.

weight = _____ [2]

(b) If the material that the engineer uses to construct the car park can withstand a pressure of 500 Pa, calculate the minimum floor area of the car park be in order to withstand the weight of the 10 cars.

minimum area = _____ [2]

[Total: 4 marks]

- 23** Edmund found an old metal lamp in his storeroom and decided to check the wiring before plugging it into the power socket. He opened the plug and what he saw is shown in Fig. 23.1.

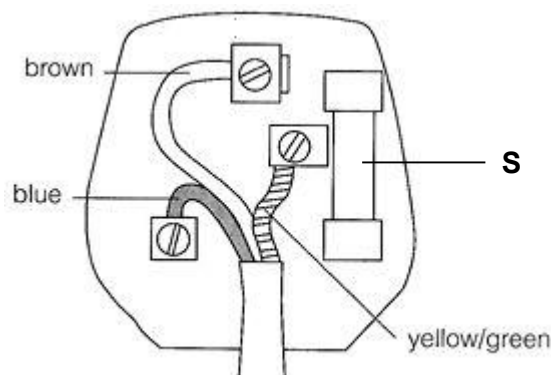


Fig. 23.1

(a) Identify component S.

_____ [1]

(b) State two mistakes in the wiring of the plug in Fig. 23.1.

[2]

(c) Explain what danger the wiring mentioned in (b) will pose to Edmund if he plugs the lamp into the power socket.

[1]

[Total: 4 marks]

24 Fig. 24.1 shows a transverse section of two blood vessels X and Y.

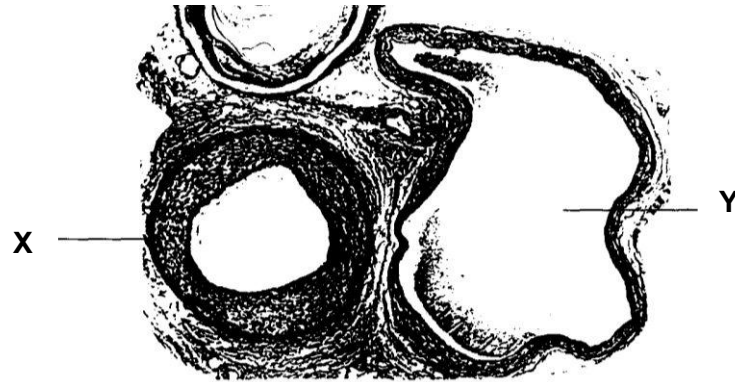


Fig. 24.1

(a) Identify the blood vessels labelled X and Y. Give a reason to support your answer.

Blood vessel X:

Blood vessel Y:

Reason:

[2]

(b) Compare one difference in the blood transported by blood vessels labelled X and Y.

[1]

[Total: 3 marks]

- 25** An experiment was carried out to investigate the effect of different concentrations of sugar solution on potato tissue. Fifty cubes of potato tissue of the same dimensions were cut and weighed. Ten cubes were placed in pure water and ten placed in each of four different concentrations of sugar solutions. The cubes were left for one hour, then removed from the solutions, dried carefully with blotting paper and reweighed.

Table 25.1 shows the results.

concentration of sugar solution g/100 cm ³	mean initial mass/g	mean final mass/g	mean change in mass/g	mean percentage change in mass/ % (2 s.f.)
0	2.23	2.42	+ 0.19	+ 8.5
5	2.31	2.41	+ 0.10	+ 4.4
10	2.18	2.20	+ 0.02	+ 0.8
20	2.27	2.18	- 0.09	- 4.1
40	2.39	2.20	- 0.19	- 7.9

Table 25.1

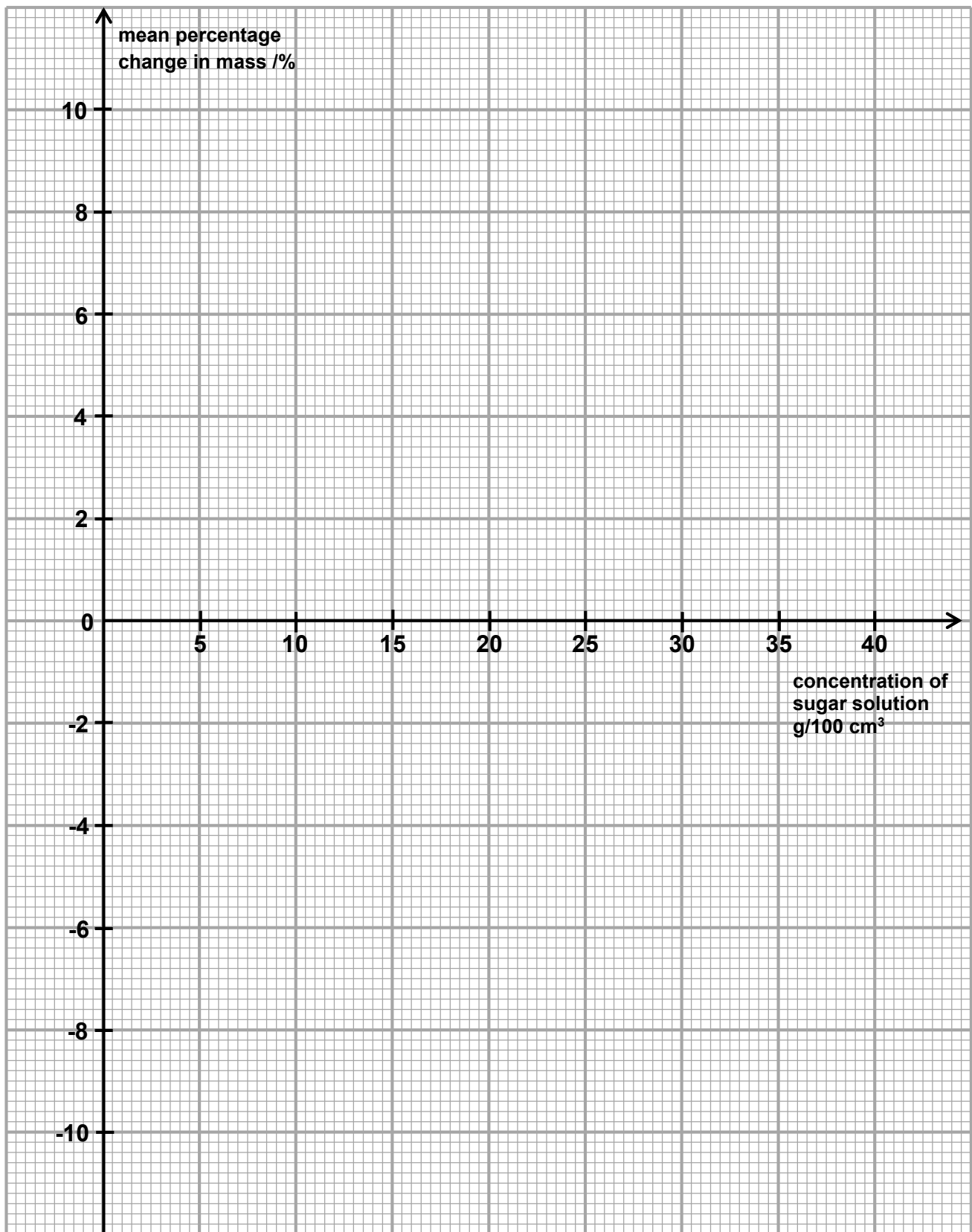
- (a) (i) Using the graph paper given on page 13, plot a graph of the mean percentage change in mass against the concentration of sugar solution. [2]
- (ii) Calculate the rate of change in mass by finding the gradient of the graph plotted. Show the working on the graph. [3]
- (iii) Using the graph plotted, find the concentration of sugar solution at which there was no change in mass. Indicate this concentration on your graph. [1]
- (b) From the results of the experiment, state what can be deduced about the cell membrane of the potato cells.

[1]

- (c) Explain why the potato cubes in 5 g/100cm³ sugar solution gained mass.

[3]

[Total: 10 marks]



rate of change in mass = gradient =

26

Fig. 26.1 shows the McSpicy chicken burger that John had at McDonald for lunch.

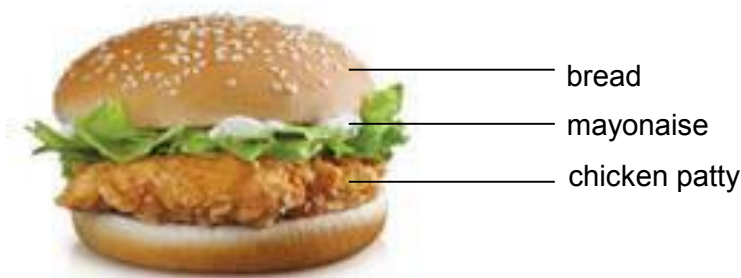


Fig. 26.1

Fill in Table 26.2 below to show how the chicken burger is chemically digested.

food	main nutrients in the food	location(s) of digestion	enzyme needed for digestion	end products of digestion
bread				maltose
	maltose			
chicken patty		stomach and small intestine		
Mayonnaise	fats			

Table 26.2

[6]

[Total: 6 marks]

27 Fig. 27.1 below shows the female reproductive system.

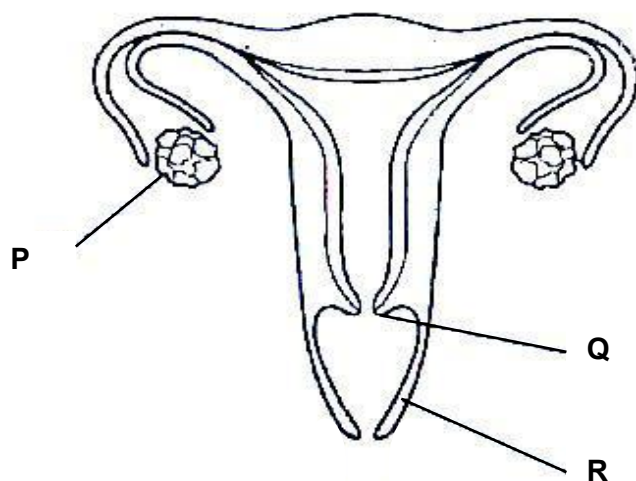


Fig. 27.1

(a) Label structures P, Q and R.

P: _____

Q: _____

R: _____

[3]

(b) State one function of structure R.

_____ [1]

(c) The woman is infertile due to the blockage of her oviduct. Doctor recommends her to carry out in vitro fertilization. The medical team will extract her ovum out from her body and fertilise it with a sperm in a test tube.

On Fig. 27.1, label 'X' to show the place where the fertilized ovum should be implanted back into the woman.

[1]

[Total: 5 marks]

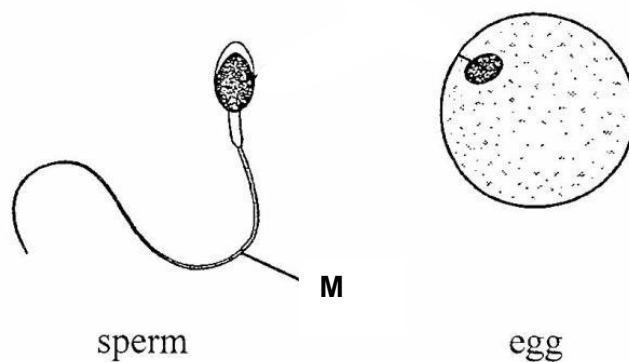


Fig. 28.1

- (a) How does part M allow the male sex cell to behave differently from the female sex cell?

[1]

- (b) State one similarity and one difference between the male and female sex cells **not** shown in the Fig. 28.1.

Similarity:

Difference:

[2]

[Total: 3 marks]

- 29** Fig. 29.1 shows the calendar of 30 days in November. On 3rd November, a woman who has a 28-days menstrual cycle, starts to menstruate as marked by * on the calendar.

November						
Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
	1	2	3 *	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

Fig. 29.1

- (a)** Describe what happens to the uterine lining between

- (i)** 3rd November and 7th November.

[1]

- (ii)** 8th November and 16th November.

[1]

- (b)** Explain why the change takes place in the uterine lining between 8th November and 16th November as mentioned in **(a) (ii)**.

[1]

- (c)** If fertilisation does not occur during this menstrual cycle, on which date would she expect to start menstruating again?

[1]

[Total: 4 marks]

- 30** John and Alice were married last month. As they are not ready for a child, they want to seek an effective birth control method for 3 years. They are considering the following methods:

- rhythm method
- intra-uterine device
- contraceptive pills
- tubal ligation

Some information about John and Alice are provided:

- John is running his own business.
- Alice is a manager of a big company.
- Both of them are extremely busy with their work.
- Both of them tend to be absent-minded.
- She is always under a lot of stress.

- (a)** Based on the information given above, which birth control method among the four methods would you recommend to them?

_____ [1]

- (b)** Explain why you recommend the method mentioned in **(a)**.

_____ [1]

- (c)** Explain why the other methods were not recommended.

_____ [3]

[Total: 5 marks]

- 31 Fig. 31.1 shows the number of cases of the sexually transmitted disease, AIDS, affecting people of different ages in a country in one year.

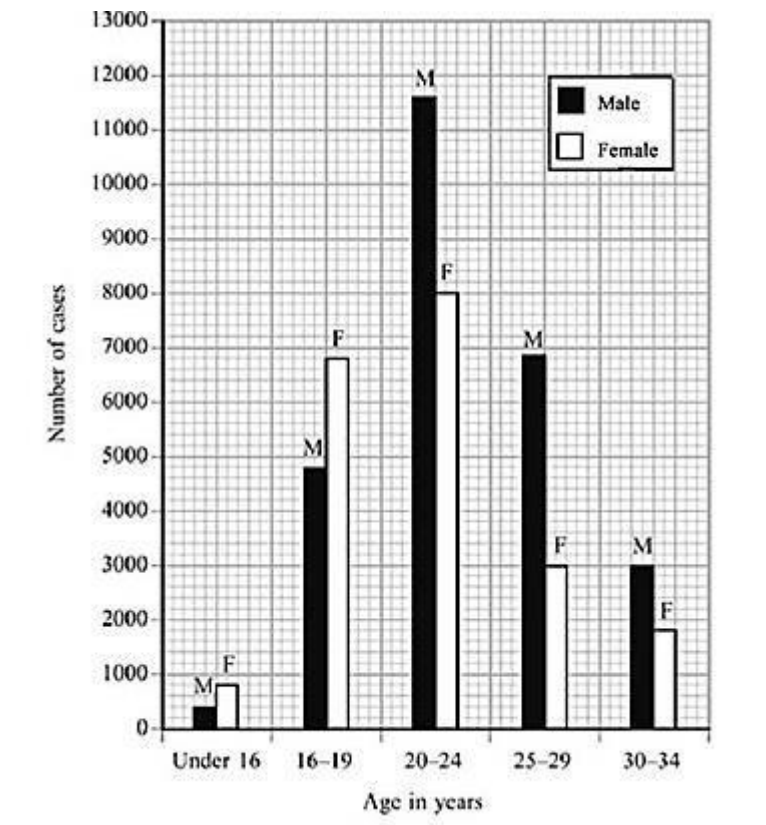


Fig. 31.1

- (a) What do the letters AIDS stand for?

_____ [1]

- (b) How many cases of the disease were there during the year in the 30 – 34 age group?

_____ [1]

- (c) Which age group has the greatest number of cases of the disease in males and females? Suggest a reason for this.

 _____ [1]

[Total: 3 marks]

Section C

Answer all **three** questions on the writing papers provided.

The first question is in the form of either/or and only **one** of the alternatives should be attempted.

EITHER

32 (a) Table 32.1 gives information about four different indicators.

indicator	colour at pH 1	pH at which colour changes	colour at pH 12
P	colourless	10	red
Q	red	3	yellow
R	blue	4	red
S	blue	6	colourless

Table 32.1

- (i) Which indicators will give the same colour in soap which has a pH of 8.5? [1]
- (ii) Nelson used a red litmus paper to test another substance X. The red litmus paper remained red. What can Nelson best conclude from this observation? [1]
- (iii) Using only one of the indicators in the table, advise Nelson how he may be able to carry out another test to confirm the nature of substance X. [2]
- (iv) Suggest the most accurate method to confirm the nature of substance X. Explain your answer. [2]
- (b) An experiment was carried out as shown in Fig. 32.1 below.

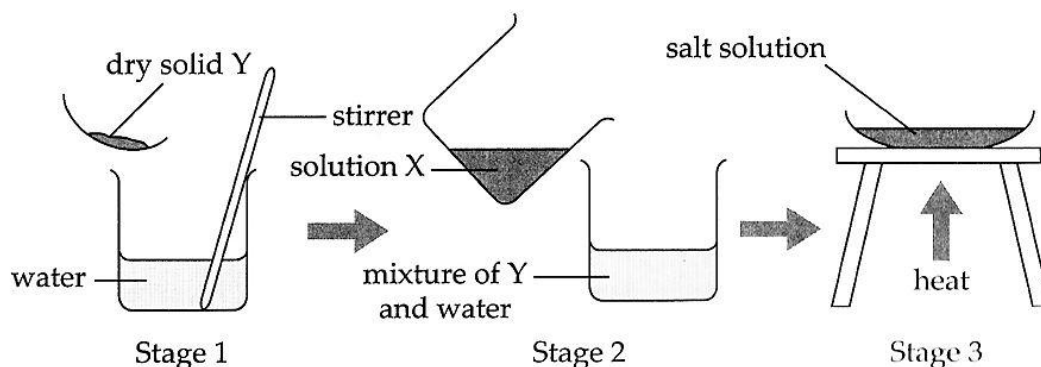


Fig. 32.1

Solutions X and Y have a pH of 3 and 9 respectively. At each stage, state and explain if a chemical or physical change is taking place. [4]

[Total: 10 marks]

OR

- 32 (a) An acid is added to some magnesium at room temperature.

The experimental setup and observation is shown in Fig. 32.2 below.

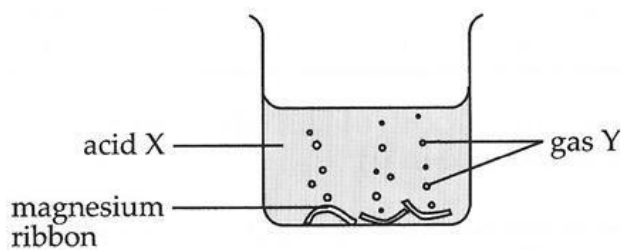


Fig. 32.2

Another experiment similar to Fig. 32.2 was setup. The same acid used in Fig. 32.2 was mixed with an unknown metal **S**.

The setup and observation is shown in Fig. 32.3 below.

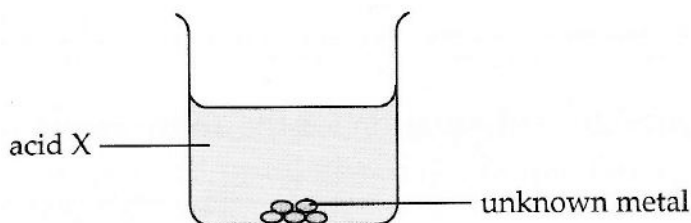


Fig. 32.3

- (i) Write a general word equation for the reaction in Fig. 32.2. [1]
- (ii) Describe a test that can be conducted to prove the identity of the gas produced in Fig. 32.2. [1]
- (iii) How did the observations in Fig. 32.2 and Fig. 32.3 differ? [1]
- (iv) Explain the difference in (iii). [2]

- (b) Elsie conducted an experiment to investigate the neutralisation effect that two different alkalis would have on the same volume of citric acid.

Fig. 32.4 below shows the results of the experiment.

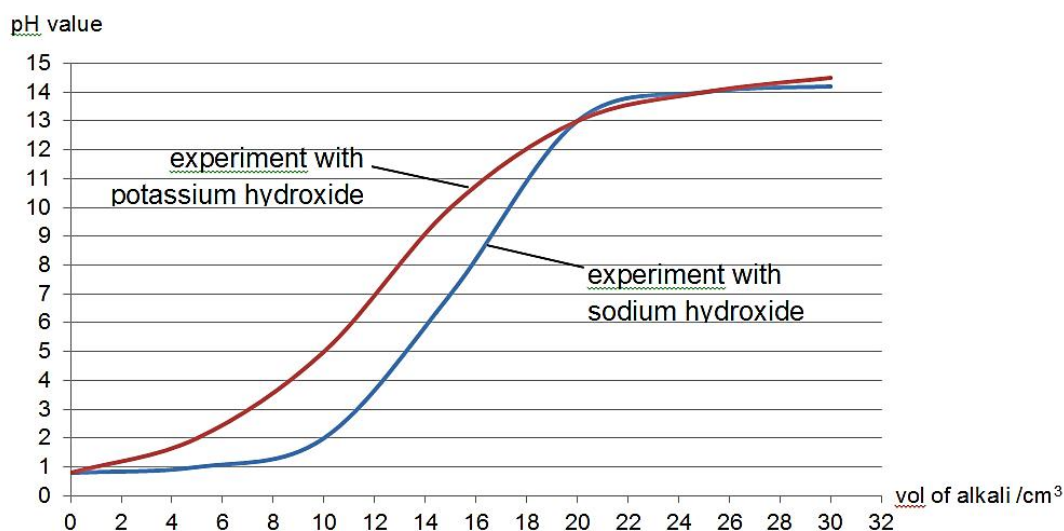


Fig. 32.4

- (i) What is the minimum volume of each alkali required to neutralise the acid? [2]
- (ii) What can Elsie conclude about the neutralising effects of the two alkalis on the citric acid? [1]
- (iii) State with reason if this neutralisation effect is a physical or chemical change. [2]

[Total: 10 marks]

Fig. 33.1 below shows what happens to solar energy from the sun as it enters into the Earth's atmosphere.

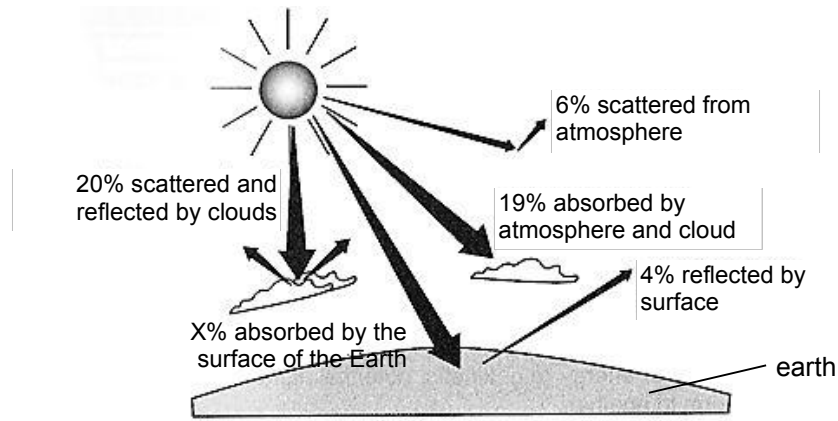


Fig. 33.1

- What percentage of solar energy is absorbed by the surface of the Earth? [1]
- From Fig. 33.1, how does the Earth's atmosphere protect the Earth from excessive solar energy from the Sun? [1]
- Solar energy is a renewable source of energy and can be harnessed in solar heating systems to provide hot water for a house.

Fig. 33.2 below shows such a system.

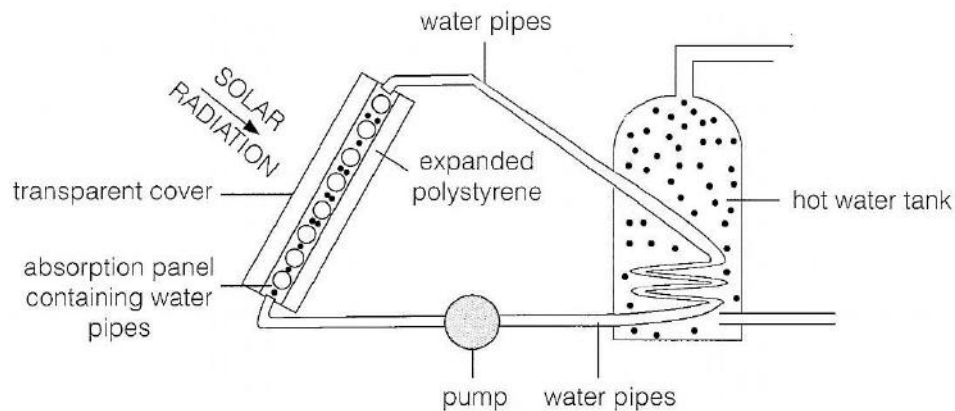


Fig. 33.2

- State what is meant by the terms 'a renewable source of energy'. [1]
- Suggest a colour for the absorption panel to be painted. Explain your choice. [2]
- Explain why there is a polystyrene backing board under the water pipes. [2]
- Explain how water in the water tank gets heated by the solar heating system. [3]

[Total: 10 marks]

- 34 (a)** Fig. 34.1 shows red blood cells.

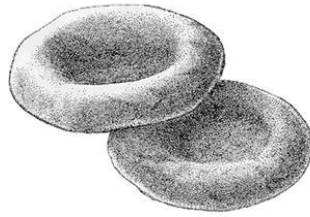


Fig. 34.1

- Explain how a red blood cell is adapted to its function. [3]
- (b)** Explain the meaning of “double circulation”. [2]
- (c)** Andy had his gall bladder surgically removed.
- (i)** The gall bladder stored a secretion by the liver. [2]
Name and describe the role of this secretion.
- (ii)** After the surgery, suggest the class of food Andy should avoid. [1]
- (d)** Distinguish between the terms “chemical digestion” and “physical digestion”. [2]

[Total: 10 marks]



Geylang Methodist School (Secondary)

End-of-Year Examination 2014

Candidate
Name

MARKING SCHEME

Class

Index Number

LOWER SECONDARY SCIENCE

Sec 2 Express

Additional materials : Optical Answer Sheet
Writing Paper

2 hour

Setter : Miss Cheryl Dorothy Nonis
Miss Ng Huey Shin

7 October 2014

Section A [20 marks]

1	A	11	D
2	B	12	C
3	C	13	A
4	A	14	D
5	B	15	C
6	A	16	C
7	C	17	C
8	D	18	B
9	C	19	B
10	A	20	D

Section B [50 marks]

Question No.			Answers	Marks
21	(a)		Eardrum (middle ear not accepted – too vague)	1
	(b)	(i)	Loudness of sound is determined by the <u>size of vibrations</u> .	1
		(ii)	For a sudden loud noise, there will be a <u>sudden increase in the size of vibrations of the eardrum</u> , causing it to rupture.	1
22	(a)		Mass of 1 car = 1500 kg Mass of 10 cars = 15000 kg Weight of 10 cars = 15000 x 10 = <u>150000 N</u>	1
	(b)		P = F / A 500 = 150000 / A A = <u>300 m²</u>	1 1
23	(a)		Component S is a <u>fuse</u> .	1
	(b)		The live wire is connected to the earth pin. OR The earth wire is connected to the live pin. OR The live wire is not connected to the fuse. OR The earth wire is connected to the fuse.	1
	(c)		When he plugs the lamp into the power socket the <u>metal casing of the lamp will be live</u> . <u>When he touches the lamp, he will get an electric shock.</u>	1 1
24	(a)		Blood vessel X: artery (both must be correct to get 1 mark) Blood vessel Y: vein Reason: • The <u>wall of X is thicker and more muscular</u> than Y. OR • The <u>wall of Y is thinner and less muscular</u> than X.	1 1
	(b)		• <u>Blood in vessel X travels at a high pressure</u> while blood in vessel Y travels at a <u>low pressure</u> . OR • <u>Blood in vessel X travels fast</u> while blood in vessel Y travels <u>slow and smoothly</u> . OR • <u>Blood in vessel X contains more nutrients and oxygen except for pulmonary artery</u> whereas <u>blood in vessel Y contains more wastes and carbon dioxide except for pulmonary vein</u> .	1
25	(a)	(i)	correct plots best fit line * refer to the graph at the back	1 1
		(ii)	triangle and 2 coordinates gradient formula answer in 3 sig. fig. rate of change in mass = gradient = - 0.407 (+/- 10%)	1 1 1
		(iii)	16 g/100cm ³ (based on the answer from the student's graph)	1
	(b)		Cell membrane is <u>partially permeable</u> which <u>allows only certain substances to pass through</u> .	1
	(c)		5 g/100cm ³ sugar solution has a <u>higher water potential than</u> the cell sap of the potato cells. <u>Water moved from the sugar solution into the potato cells by osmosis</u> . Potato cells become turgid and increase in mass.	1 1 1

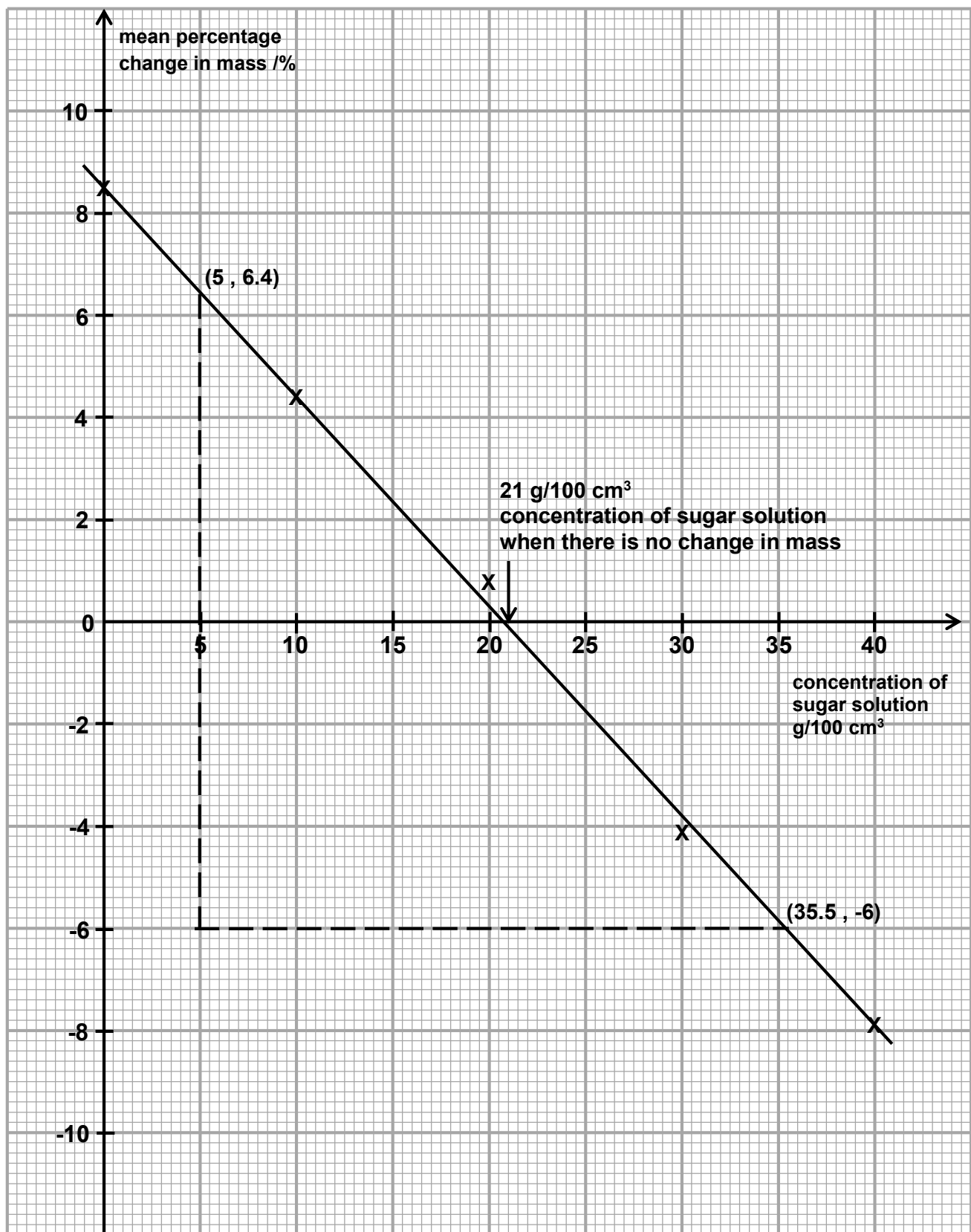
26	food	main nutrients in the food	location(s) of digestion	enzyme needed for digestion	end products of digestion	½ mark per correct ans
	bread	starch	mouth and small intestine	amylase	<i>maltose</i>	
		<i>maltose</i>	small intestine	maltase	glucose	
	chicken patty	proteins	<i>stomach and small intestine</i>	protease	polypeptide / simple protein molecule	
	Mayonn aise	<i>fats</i>	small intestine	lipase	fatty acids and glycerol	
27	(a)	P – ovary Q – cervix R – vagina				1 1 1
	(b)	- Serves as the <u>site for discharge of menses</u> (broken uterine lining, blood tissue and unfertilized egg) <u>during menstruation</u>. - Serves as the <u>site for deposition of semen during sexual intercourse</u>. OR - Serves as <u>birth canal</u> for the <u>labor of baby after pregnancy</u>.				1
	(c)	label X at uterine lining (not uterus)				1
28	(a)	<u>Part M allows the sperm to swim</u> actively while egg cannot swim due to absence of part M.				1
	(b)	Similarity: - Sperm and egg are required in fertilization. OR - Sperm and egg has 23 chromosomes in their nucleus. Difference: - Sperm is smaller size than egg. OR - Sperm is released in large amount (in millions) while egg is released 1 or a few per menstrual cycle. OR - Sperm is produced by testes while egg is by ovaries. OR - Sperm is motile while egg is immotile. OR - Sperm may carry X or Y chromosome while egg only carries X chromosome.				1 1
29	(a)	(i)	<u>Uterine lining break down and shed out</u> from the uterus during this period which is menstruation period.			1
		(ii)	<u>Uterine lining repairs and thickens</u> after menstruation.			1
	(b)	It thickens in order to <u>prepare the uterine lining for implantation of embryo</u> .				1
	(c)	1 st December				1

30	(a)	intra-uterine device	1
	(b)	IUD is an <u>effective</u> method that can <u>last for a long period</u> and most importantly it is just a <u>temporary method</u> .	1
	(c)	Rhythm method: not suitable as <u>Alice is always under a lot of stress</u> . This may affect her menstrual cycle. Contraceptive pills: They are <u>busy and absent-minded</u> . Alice may <u>forget to take the pills</u> . Tubal ligation: They <u>just want to prevent pregnancy for 3 years</u> , not forever.	1 1 1
31	(a)	Acquired Immune Deficiency Syndrome	1
	(b)	3000 + 1800 = 4800 cases	1
	(c)	20 – 24 age group <u>pre marital sex</u> between dates / <u>more sexually active</u> age group or <u>casual sex</u>	1 1

Section C [30 marks]

Question No.	Answers	Marks
E 32	(a) (i)	Indicators P and S. 1
	(ii)	Substance X is either <u>acidic</u> or <u>neutral</u> in nature. 1
	(iii)	He can use indicator S to confirm the nature of substance X. If substance X is <u>acidic</u> , indicator S will <u>remain blue</u> in colour. If substance X is <u>neutral</u> , indicator S will turn <u>colourless</u> . 1 1
	(iv)	He can use <u>Universal Indicator / pH meter</u> to confirm the nature of substance X. 1 Using these indicators he can <u>determine the pH value</u> substance X. 1
	(b)	Stage 1: <u>physical change</u> because solid Y is being dissolved in water. No new products are formed. 1
		Stage 2: <u>chemical change</u> because an <u>acid is being added to an alkali (neutralization)</u> . This will <u>produce new substances</u> which is a salt and water. 1 1
		Stage 3: <u>physical change</u> because the <u>salt solution is being evaporated</u> . No new products are formed. 1
O 32	(a) (i)	Metal + acid → salt + hydrogen gas 1
	(ii)	A <u>lighted splinter</u> can be inserted into the gas. If the gas is hydrogen gas, the <u>flame will be extinguished with a pop sound</u> . 1
	(iii)	<u>No gas was produced</u> in Fig. 30.3. 1
	(iv)	The metal did not react with the acid to produce hydrogen gas. 1 Not all metals will react with acids. 1
	(b) (i)	Vol. of potassium hydroxide needed = <u>12 cm³</u> Vol. of sodium hydroxide needed = <u>15 cm³</u> 1 1
	(ii)	A <u>smaller amount</u> of potassium hydroxide is needed to <u>neutralize a fixed amount of acid</u> compared to sodium hydroxide. 1
	(iii)	This is a <u>chemical change</u> . During neutralization, <u>new substances are formed</u> . They are <u>salt and water</u> . 1 1

33	(a)	100 – (20 + 6 + 19 + 4) = 51%	1	
	(b)	The Earth's atmosphere <u>absorbs</u> some of the solar energy and <u>scatters</u> some of the solar energy.	1	
	(c)	(i)	• Energy sources that <u>are infinite</u>. OR • Renewable sources of energy are <u>energy that can be sustained</u>. OR • Energy sources that are of <u>unlimited supply and enable us to use these sources continuously</u>.	1
		(ii)	Colour: Black	1
			Black surfaces are <u>good absorbers of heat</u> . Thus the <u>water in the water pipes can be heated more quickly</u> .	1
		(iii)	The polystyrene board is an <u>insulator/ poor conductor of heat</u> . Thus it helps to <u>prevent heat from the water and the water pipes from being lost to the surroundings</u> by conduction.	1 1
(iv)		<u>Water at the bottom</u> of the water tank gets heated up first, <u>becomes less dense and rises</u> .	1	
	<u>Cooler water</u> at the top of the tank that is <u>denser, sinks</u> .	1		
	This sets up a <u>convection current</u> in the water tank that will heat up the water.	1		
34	(a)	• Red blood cells have <u>haemoglobin</u> that <u>binds to oxygen</u> readily and loosely. • Red blood cells have <u>circular, biconcave disc-shape</u> that <u>increases the surface area</u> to volume ratio for <u>faster diffusion</u> of oxygen. • Red blood cells have <u>no nucleus</u>, thus having <u>more space</u> to contain <u>more haemoglobin</u> so that they can <u>transport more oxygen</u>.	1 1 1	
		(b)	• Blood circulates in <u>two paths</u>, one <u>from the heart to the lungs and back</u>. • Another <u>from the heart to the all parts of the body and back</u>. • Hence every time blood <u>flows around the entire body once</u>, it <u>passes through the heart twice</u>.	1 1
			(c)	(i)
	(ii)	Reduce fatty food		1
		(d)	• <u>Chemical digestion</u> is the <u>breakdown of food into simpler substances by enzymes</u> using chemical reactions. • <u>Physical digestion</u> is the <u>breakdown of food into smaller pieces using forces and mechanical action</u> without enzymes involving.	1 1



$$\text{rate of change in mass} = \text{gradient} = \frac{-6 - 6.4}{35.5 - 5} = \frac{-12.4}{30.5} = -0.407 \text{ (3 sig. fig.)}$$

Class	Index Number	Name
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HENDERSON SECONDARY SCHOOL



END-OF-YEAR EXAMINATION 2014 SECONDARY 2 EXPRESS

Lower Secondary Science

Wednesday 1st October 2014
Booklets A and B : 2 hours

Additional materials :
Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your Name, Index number and Class on all the work you hand in.
Do not use staples, paper clips, highlighters, glue or correction fluid.

For Section A, shade your answers in soft pencil on the OTAS form.

There are **thirty** questions in this section. 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 be deducted for a wrong answer.
Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 11.

BOOKLET A

Hand in OTAS separately from the booklet A.

This document consists of **11** printed pages.

Setter: Ms Evelyn Wu

[Turn over

Section A [30 marks]

1 Which of the following contains **only** elements?

- A bronze, gold, iron
- B chlorine, carbon dioxide, lead
- C salt, sugar, water
- D silicon, sulfur, zinc

2 The table shows information related to three different substances, P, Q and R. Substances Q and R have more than two components.

substance	information
P	made up of one type of atom
Q	components that make up the substance exist in a fixed ratio
R	components that make up the substance can still be seen

Based on the table, which of the following statements is **true**?

- A A chemical reaction is involved to produce substance Q but not substance R.
- B If substance R is mixed with substance P by physical means, the properties of the substances will change.
- C Substance P and Q cannot be separated into simpler substances.
- D Substance P must be a metal.

3 A substance has high boiling point and it is a good conductor of heat. This substance is **most likely** to be

- A chlorine.
- B copper.
- C nitrogen.
- D oxygen.

4 Which of the following is a property of metals?

- A brittle
- B dull
- C malleable
- D non-sonorous

5 Which of the following is a liquid at room temperature?

- A carbon
- B magnesium
- C mercury
- D zinc

- 6 Nadia is stung by a bee. Her mother rubs dilute acid on her wound to relieve the pain. What can you infer from this observation?

A The bee sting contains an element which reacts with the acid.
 B The bee sting is acidic.
 C The bee sting is alkaline.
 D The bee sting is neutral.

- 7 A student tested solutions X, Y and Z with universal indicator and recorded the following results.

solution	colour
X	green
Y	yellow
Z	purple

Which of the following shows the correct properties of the three solutions?

	X	Y	Z
A	acidic	alkaline	neutral
B	alkaline	acidic	neutral
C	alkaline	neutral	acidic
D	neutral	acidic	alkaline

- 8 Which of the following pairs when mixed will form a solution of pH 9?

A ammonia solution and water
 B equal volumes of hydrochloric acid and potassium hydroxide
 C magnesium and excess nitric acid
 D sodium hydroxide and water

- 9 Both solutions Q and R are of the same volume and consist of the same type of solute and solvent. Solution Q contains the maximum amount of solute. Solution R contains a small amount of solute.

Which of the following statements about the solutions Q and R is **false**?

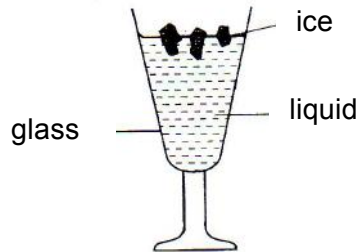
A Solution Q has more solute than solution R.
 B Solution Q is more dilute than solution R.
 C Solution R can dissolve more solute.
 D Solution R is more dilute than solution Q.

10 Which of the following changes are caused by exposure to light?

- I burning of charcoal
- II decomposition of silver bromide on film
- III manufacturing food by green plants
- IV production of vitamin D in skin

A I and II B I and III C II and III D II, III and IV

11 The diagram shows some pieces of ice being used to cool the glass of orange juice. What is the **main** process by which the orange juice at the bottom of the glass becomes cooled?



- A condensation
- B conduction
- C convection
- D radiation

12 The Siberian Husky is a breed of working dog that originated from eastern Siberia, where average temperatures are below 0°C .

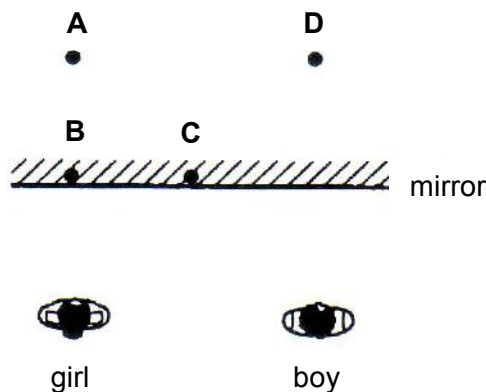
In Singapore, people who keep the Siberian Husky as pets have to keep them in air conditioned rooms. Why is this so?

- A Their owners want them to be as comfortable as possible.
- B Their thick fur can keep them warm in the cold air conditioned room.
- C Their thick fur makes them feel cold.
- D They are more used to the humidity in air conditioned rooms.

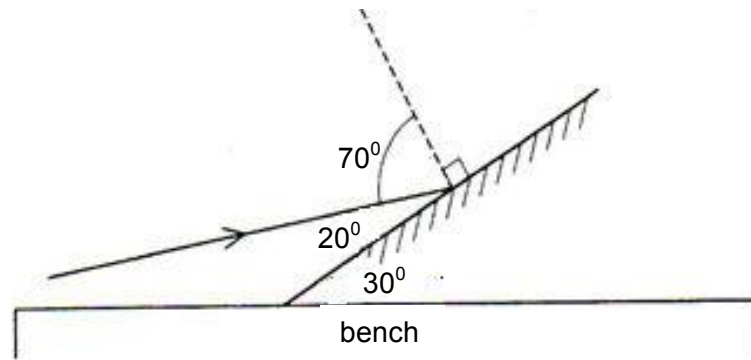
13 Where would you store fried rice to keep it as hot as possible?

- A metal box
- B metal plate
- C plastic box
- D porcelain plate

- 14 Which of the following household appliances needs the help of convection currents to work?
- A air-conditioner
 - B electric blender
 - C electric fan
 - D microwave oven
- 15 When a piece of metal is heated, which of the following physical quantity(s) will change?
- I density
 - II mass
 - III volume
 - IV weight
- A I only
 - B I and III only
 - C II and III only
 - D III and IV only
- 16 A fish in a pond appears to be 1.6 m from the surface of a pond. Given that the refractive index of water is 1.33, what is the real depth of the fish?
- A 0.84 m
 - B 1.20 m
 - C 2.13 m
 - D 2.93 m
- 17 What type of mirror is used in a dental instrument?
- A concave mirror
 - B convex mirror
 - C plane mirror
 - D shiny mirror
- 18 A boy stands beside a girl in front of a large plane mirror. They are both of the same distance from the mirror. Where does the boy see the girl's image?

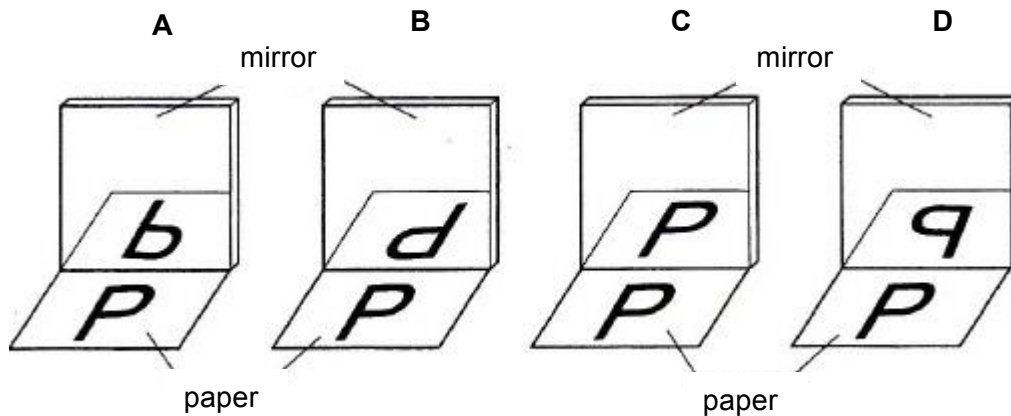


- 19 A mirror is placed tilted at an angle of 30° to the bench. A ray of light is directed so that it hits the mirror at an angle of 20° to the surface of the mirror.



What is the angle of reflection of the ray?

- A 20° B 30° C 50° D 70°
- 20 A student looks at the letter P on a piece of paper, and its reflection in a mirror. What does he see?



- 21 Edmund and Eugene run up Bukit Timah hill at the same time. Edmund weighs more than Eugene.

Which statement is **true** about the power produced?

- A Edmund produces more power.
 B Eugene produces more power.
 C It is impossible to tell who produces more power.
 D They both produce the same power.

- 22** Four electric heating elements convert electrical energy into heat energy. Which heating element has the **lowest** power rating?

	energy converted
A	100 J in 5 s
B	200 J in 5 s
C	500 J in 20 s
D	600 J in 20 s

- 23** Which process best describes how electricity is produced in a power station?
- A** steam → boils water → water turns turbine → generator produces electricity
- B** steam → condenses to water → water turns generator → turbines produce electricity
- C** steam → turns generator → turbine produces electricity
- D** steam → turns turbines → generator produces electricity

- 24** Merida released an arrow towards the target.



Some information about the energy involved is given below.

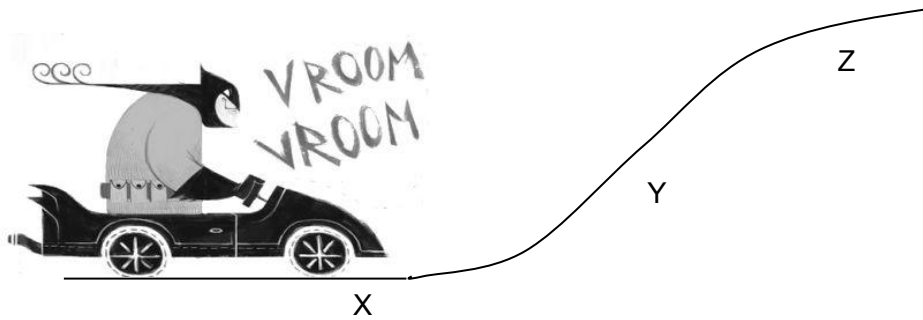
Elastic potential energy before arrow is released = 375 J

Kinetic energy of the arrow when it is released = 350 J

What is the amount of energy lost when the arrow is released?

- A** 0 J **B** 25 J **C** 375 J **D** 725 J

- 25 Batman drives his Batmobile up a slope at constant speed as shown in the figure below.



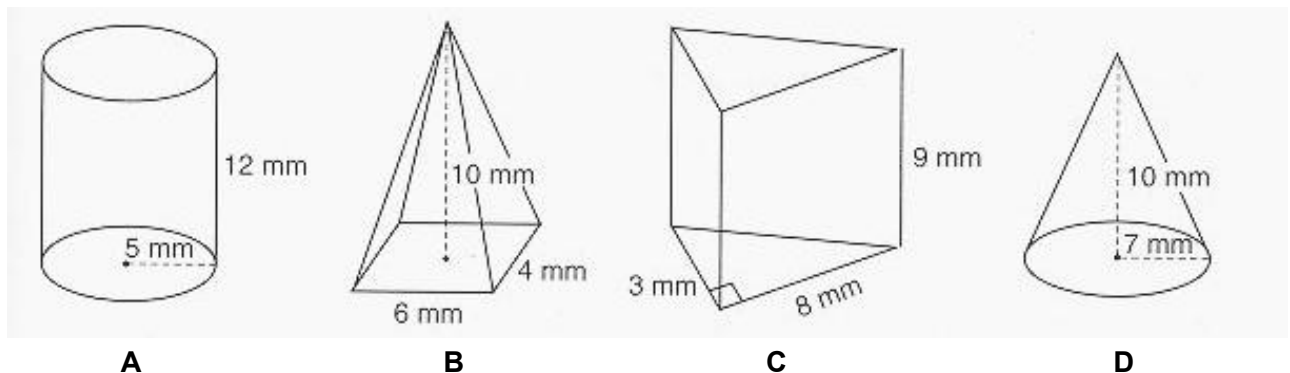
Assuming no energy is lost to the surroundings, what can you say about the energy possessed by Batman and his Batmobile?

- A The kinetic energy at Y is less than that at X.
 B The potential energy at X is the greatest.
 C The potential energy is always greater than the kinetic energy.
 D The total energy at Z is equal to the total energy at X.
- 26 Greg is working on a research report on renewable energy sources for a school project. Some information which he found is given below.

- I A renewable energy source is one which will be used up one day.
 II Some examples of renewable energy source are the sun, the wind and the sea.
 III Fossil fuel is the most commonly used renewable energy source used today.

Which information is/are **correct** ?

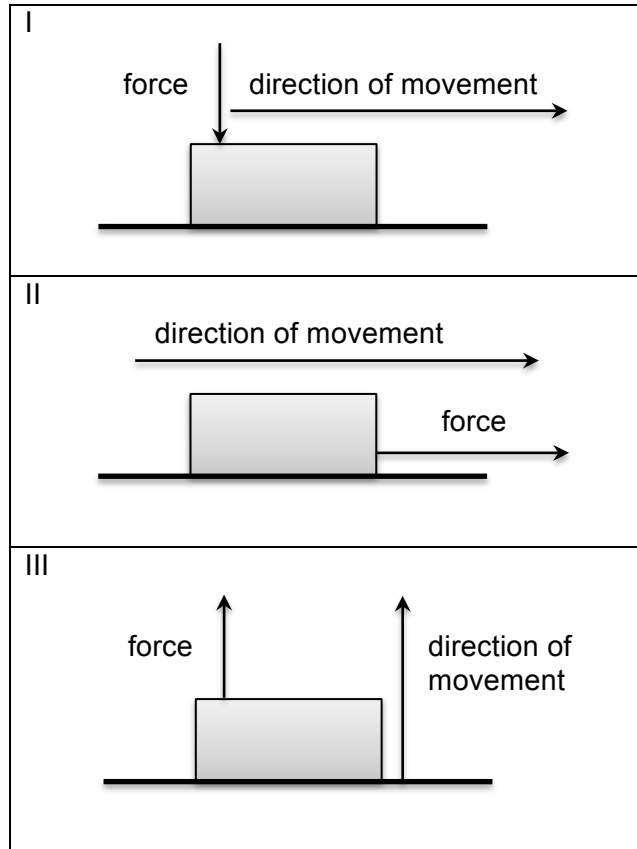
- A I only
 B II only
 C I and III
 D I, II and III
- 27 Four objects A, B, C and D of different shapes are resting on a horizontal surface. All the four objects, which are not drawn to scale, have the same weight. Which object would exert the greatest pressure on the surface?



28 Which of the following objects works using magnetic force?

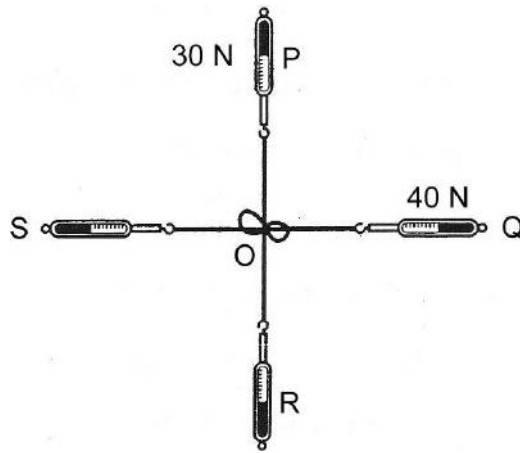
- A compass
- B electric iron
- C microwave oven
- D spring balance

29 Which of the following show(s) **no** work done on the box?



- A I only
- B II only
- C I and III
- D II and III

- 30 The diagram shows four forcemeters (spring balances) joined together by pieces of string with a knot at O. The strings are at 90° to each other.



The knot at O does not move when the readings on P and Q are as shown. What are the readings on R and S?

	R	S
A	0 N	70 N
B	30 N	40 N
C	40 N	30 N
D	70 N	0 N

--- End of Booklet A ---

58-71 Lanthanoid series		79-103 Actinoid series	
140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	150 Sm Samarium 62
152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66
165 Ho Holmium 67	167 Er Erbium 68	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	238 U Uranium 92	238 Pa Protactinium 91	238 Np Neptunium 93
244 Pu Plutonium 94	244 Am Americium 95	244 Cm Curium 96	244 Bk Berkelium 97
244 Cf Californium 98	244 Es Einsteinium 99	244 Fm Fermium 100	244 Md Mendelevium 101
244 No Nobelium 102	244 Lr Lawrencium 103	244 Yb Ytterbium 70	244 Lu Lutetium 71

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

Class	Index Number	Name
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HENDERSON SECONDARY SCHOOL



END OF THE YEAR EXAMINATION 2014 SECONDARY 2 EXPRESS

Lower Secondary Science

Wednesday 1st October 2014
Booklets A and B : 2 hours

Additional materials :
Writing paper (upon request only)

READ THESE INSTRUCTIONS FIRST

Write your Name, Index number and Class.
Do not use staples, paper clips, highlighters, glue or correction fluid.
For Sections B and C, write in dark blue or black pen.
You may use a soft pencil for any diagrams or graphs.

Section B (40 marks)

Answer **all** questions in Section B.
Write your answers in the spaces provided on the question paper.

Section C (30 marks)

Answer **all** questions in Section C.
Write your answers in the spaces provided on the question paper.

In calculations, you should show all the steps in your working, giving your answer at each stage.

The number of marks is given in brackets [] at the end of each question or part question.

Take the value of the gravitational field strength (g) on Earth to be 10 N/kg.

BOOKLET B

Hand in Booklet A separately from Booklet B.

Setter: Ms Evelyn Wu

This document consists of **12** printed pages

[Turn over

Section B (40 marks)

- 1 (a) "The solubility of baking soda is 9.5 g/100 cm³ water at room temperature."
Explain what this statement means.

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

- (b) (i) In an experiment, Natasha stirred 6 g of baking soda in 50 cm³ of water.
What would she observe? Explain your answer with reference to the information
given in 1(a).

observation

.....
.....

explanation

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

- (ii) Natasha repeated the experiment under the same conditions but this time she
stirred the mixture *very vigorously*.

How does this action affect the result of this experiment?

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

- (iii) List two other variables that can increase the rate of dissolving baking soda in
water.

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

- 2 (a) A student heated some substances in air and tabulated the results in the table given below.

substance	observations		
	before heating	during heating	after heating
magnesium ribbon	silvery grey solid	bright glow was given off	white solid
copper wire	reddish brown solid	black solid	black solid
lead foil	silvery grey solid	molten silvery grey droplets	silvery grey solid

- (i) Which substance undergoes a physical change?
Give a reason, supporting your answer with an evidence from the experiment.
-
-
-
-[2]

- (ii) Write a word equation to represent the combustion of any **one** of the substances in the table above.
-[1]

- (b) For each of the situation below, write the name of the reaction and a word equation for the reaction taking place.

- (i) Pauline was trying to melt some sugar in a pot. However, she left the pot on the stove for too long and the sugar turned into a black solid. She noticed steam being produced.
- Name of reaction:[1]
- Word equation:[1]

- (ii) Wilson passed electricity through green copper chloride solution. A reddish brown solid appears and chlorine gas is produced.
- Name of reaction:[1]
- Word equation:[1]

3 (a) Complete the following word equations:

[4]

(i) calcium +

→ calcium sulfate +gas

(ii) hydrochloric acid +

→ calcium chloride + carbon dioxide gas + water

(iii) nitric acid + iron hydroxide → + water

(b) Describe a test for the presence of hydrogen? List the positive result in your answer.

.....

[2]

(c) Ah Mei inserted an egg into a bottle of vinegar. She left the bottle of vinegar with the egg on the table. After a week, she was shocked to observe that the egg had no shell. Explain what has happened?

.....

[2]

- 4** A boat is between two cliffs. Cliff A is nearer to the boat than cliff B.
The boat sounded its horn once. Two clear echoes are heard by a person on the boat.
An echo is made when sound is reflected back or bounced back from a surface.

The first echo is heard 2.5 s after the horn sounds.

The second echo is heard 4.0 s after the horn sounds.

(a) Which cliff (A or B) caused the first echo ?[1]

- (b)** Sound travels at 330 m/s in the air.
Calculate the distance between the boat and cliff A.

distance between the boat and cliff A =m [2]

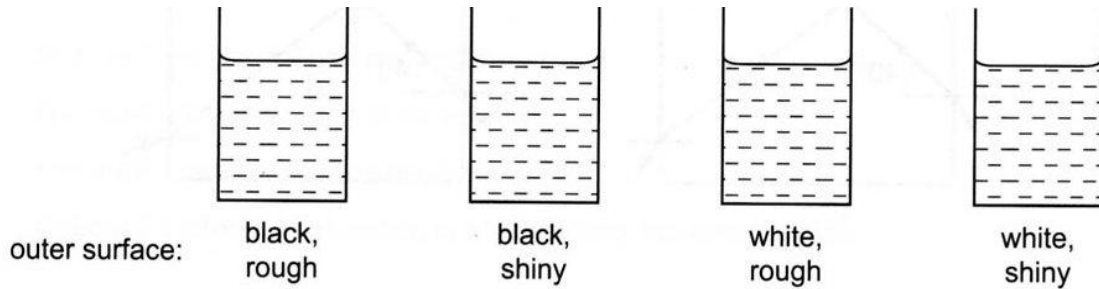
- (c)** Calculate the distance between the boat and cliff B.

distance between the boat and cliff B =m [2]

- (d)** Calculate the total distance between cliffs A and B.

total distance between cliffs A and B =m [2]

- 5 Four metal mugs are identical except for the colour and texture of their outer surfaces.



100 cm³ of water at 80°C is poured into each mug and the mugs are then left undisturbed for 20 minutes.

- (a) Arrange the mugs according to the rate at which they lose heat, starting with the one that loses heat most rapidly. [2]

1st :

2nd :

3rd :

4th :

- (b) In the above experiment, name the process by which heat is lost to the surroundings.

.....[1]

- (c) Slow cooling is preferred when we want to keep things hot for a long time. Suggest and explain two ways how heat loss can be reduced in the storage of hot food.

.....

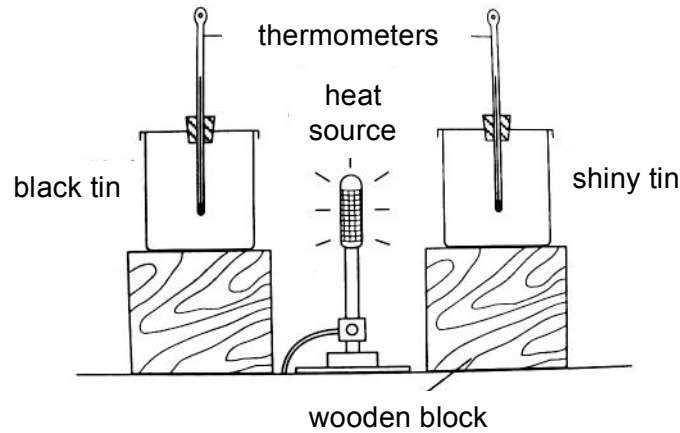
[2]

- (d) Where should an air-conditioner be placed in a room so that the room gets cold within the shortest period of time? Explain your answer.

.....

[2]

- 6 A set-up of two tins is shown below.



- (a) Describe and explain what happens if the heat source is switched on for 20 minutes.

.....

[2]

- (b) After some time, the heat source is switched off when both thermometers register the same temperature.

Describe what will be observed to the temperatures measured by the thermometers in the next 20 minutes. Explain your answer.

observation:

.....

explanation:

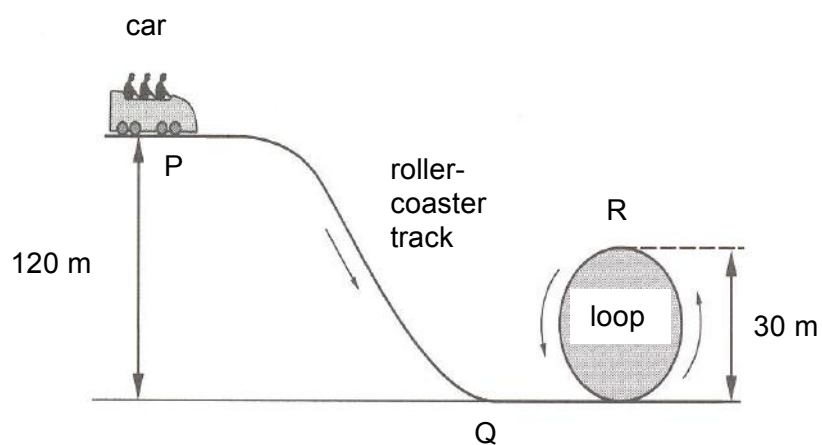
.....
[2]

- (c) Explain why convection currents **cannot** take place in solids.

.....
[1]

Section C (30 marks)

7



The diagram shows a 150 kg car on the roller-coaster track being released from rest at a height of 120 m.

- (a) (i) What is the gravitational potential energy of the car before being released from rest at P?

gravitational potential energy of the carJ [2]

- (ii) What is the kinetic energy of the car when it is at Q?

kinetic energy of the carJ [1]

(iii) What is the velocity of the car at Q?

velocity of the carm/s [3]

(iv) What is the gravitational potential energy of the car when it is at R?

gravitational potential energy of the carJ [2]

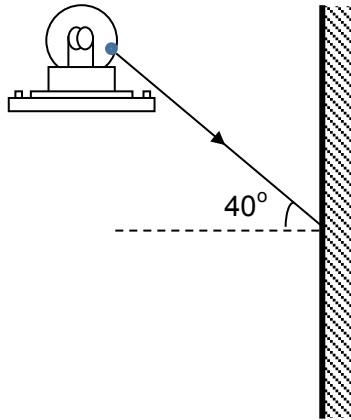
(b) What is the energy change as the car goes down the slope?

.....[1]

(c) In the real world, energy conversion from one form to another is not always 100%.
Suggest what has happened to some of the gravitational potential energy ?

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

- 8 The figure below shows a light ray from a lit light bulb hitting the surface of a plane mirror. Consider the light ray as coming from the point on the lit light bulb.



- (a) The light ray bounces off the surface of the plane mirror. What is the name for this change in direction of the light ray?

.....[1]

- (b) On the diagram,

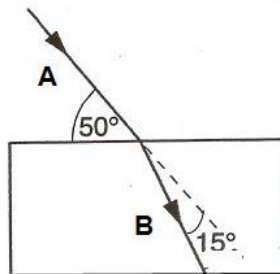
- (i) mark accurately, with a dot and letter **B**, the position of the image of the bulb,
 (ii) show the path of the light ray after it bounces off the surface of the plane mirror,
 (iii) mark and write the angle of reflection.

[3]

- (c) State one characteristic of the image formed.

.....[1]

- (d) A student traced the path of a light ray through a glass block. The angles that the student measured are shown in the figure below.



- (i) Define the term 'refraction'.

.....
[1]

- (ii) Calculate the angle of incidence and the angle of refraction as the light enters the glass block.

angle of incidence° [1]

angle of refraction° [1]

- (iii) Use the results in (d)(ii) to calculate the refractive index of the glass block.

refractive index =[2]

- 9 (a) As people get older, many suffer from hearing loss. A hearing aid can help 90% of these people. It picks up sounds and converts them into electrical signals. It then amplifies these signals, converts them back into sounds and sends these sounds into the ear.

- (i) Suggest one other cause of hearing loss (other than ageing).

.....[1]

- (ii) What are the two energy changes that take place in the hearing aid?

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

- (b) What are two things that a player can do to produce higher notes on a guitar?

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

- (c) Explain why a dog whistle can be heard by dogs, but not by man.

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

- (d) A boy has a weight of 500 N. He puts on a pair of roller skates which has a total area of 0.5 m^2 in contact with the ground. The pressure exerted by the boy wearing the pair of roller skates on the ground is 1300 N/m^2 . Calculate the weight of the pair of roller skates.

weight of roller skates =N [3]

- (e) A wooden block of mass 30 kg being pulled across the floor, at a constant speed by a force of 70 N. The distance moved along the plane is 12.0 m.

Calculate the work done to move the block up the inclined plane.

work done =J [2]

- End of Booklet B -

Marking scheme EOY 2014 – Secondary 2 Express

Section A [30m]

1. D	7. D	13. C	19. D	25. D
2. A	8. A	14. A	20. A	26. B
3. B	9. B	15. B	21. A	27. C
4. C	10. D	16. C	22. A	28. A
5. C	11. C	17. A	23. D	29. A
6. C	12. B	18. A	24. B	30. B

Section B [40m]

1a	The maximum amount of baking soda that can dissolved in a 100g of water at room temperature is 9.5g .	1
1bi	observation : There will be solids in the mixture/ excess baking soda remain undissolved.	1
	explanation : the concentration of 6g in 50cm ³ of water = $6 \times 2 = 12\text{g}/100\text{cm}^3$, which is greater than the solubility of 9.5g/cm ³ as mentioned in 1(a).	1
1bii	Those baking soda that dissolved will be dissolved at a faster rate .	1
1biii	Heat/increase the temperature of the mixture/use hot water OR Crush the baking soda into powder	1 1
2ai	Lead foil. The change is reversible. OR The molten silvery grey droplets becomes silvery grey solid again. OR No new substance is formed. OR There is no change in the silvery grey solid after heating.	1 1 OR 1 OR 1 OR 1
2aii	magneisum + oxygen → magnesium oxide OR copper + oxygen → copper oxide	1
2bi	thermal decompositon sugar → water/steam + carbon	1 1
2bii	electrolysis copper chloride → copper + chlorine	1 1
		1
3ai	sulfuric acid, hydrogen	1
3aii	calcium carbonate	2
3aiii	iron nitrate	1
3b	Insert a lighted splint into a test-tube of the gas. The lighted splint extinguishes with a pop sound.	1 1
3c	Egg shell contains calcium carbonate. Vinegar, ethanoic acid, reacted with the shell and dissolved it.	1 1
4a	cliff A	1
4b	$2.5 \times 330 = 825 \text{ m}$ $825 \text{ m} / 2 = 412.5 \text{ m}$	1 1
4c	$4.0 \times 330 = 1320 \text{ m}$ $1320 \text{ m} / 2 = 660 \text{ m}$	1 1
4d	$412.5 + 660 = 1072.5 \text{ m}$	1 1 OR

	OR $(2.5+4.0) \times 330 \text{ m} / 2$ $= 1072.5 \text{ m}$	1 1
5a	1 st : black and rough 2 nd : black and shiny 3 rd : white and rough 4 th : white and shiny (every 2 correct = 1m)	2
5b	Radiation	1
5c	Slow cooling can be achieved by storing the food in a styrofoam/ plastic box as these are poor conductors of heat and will help to keep the food hot for a longer time. Hot food could be put into a white and shiny container as such surfaces are poor radiators of heat and will help to keep the food hot for a longer time.	1 1
5d	top part of the room hot air rises, cold air sinks.	1 1
6a	The thermometer in the <u>black tin</u> shows a faster/higher rise in temperature The black tin is a <u>better absorber of heat by radiation</u> compared to the shiny tin.	1 1
6b	The temperature measured at the black tin will <u>decrease rapidly/steeper</u> compared to the temperature measured at the shiny tin. The black tin is a better radiator [1] compared to the shiny tin.	1 1
6c	In solids, the molecules are held in fixed positions, convection currents cannot be set up.	1

Section C [30m]

7ai	GPE = $mgh = 150 \times 10 \times 120$ $= 180\,000 \text{ J}$	1 1
7aii	KE=GPE=180 000 J	1
7aiii	KE = $\frac{1}{2}mv^2 = 180\,000$ $0.5 \times 150 \times v \times v = 180\,000$ $150v^2 = 360\,000$ $v^2 = 2400$ $v = \text{square root of } 2400 = 49.0\text{m/s}$ (alternative method to get eventual answer is allowed)	1 1 1
7aiv	GPE = $mgh = 150 \times 10 \times 30$ $= 45000 \text{ J}$	1 1
7b	gravitational potential energy $\rightarrow$ kinetic energy	1
7c	Energy is lost as friction OR sound energy OR heat energy	1

8a	Reflection	1
8b		3
8c	laterally inverted, same size, upright (any one)	1
8di	Refraction is the <u>bending of light as light passes from one medium to another.</u>	1
8dii	angle of incidence = $(90-50)^\circ = 40^\circ$ angle of refraction = $(40-15)^\circ = 25^\circ$	1 1
8diii	refractive index = $\sin i / \sin r$ $= \sin 40^\circ / \sin 25^\circ$ (method : ECF from 8dii) $= 1.52$	1 1
9a(i)	Prolonged exposure to loud sounds.	1
9a(ii)	sound energy $\rightarrow$ electrical energy electrical energy $\rightarrow$ sound energy	1 1
9b	Tighten/shorten the string/use a thinner string (any 2)	2
9c	Dog whistle produces sounds outside/above/below man's range of hearing	1
9d	Force = 1300×0.5 $= 650 \text{ N}$ Weight of the skates = $650 - 500 = 150 \text{ N}$	1 1 1
9e	Work done = 70×12.0 $= 840 \text{ J}$	1 1

Science (Chemistry)

Section A: Multiple Choice Questions (15 marks)

Answer **all** the questions in the table provided on page 6.

1 Which of the following is likely to be a pure compound?

- A** A blue powder which dissolves in water.
- B** A liquid which gives two fractions when distilled.
- C** Orange crystals which melt over the range 55 °C to 60 °C.
- D** Yellow crystals which melt at 58 °C.

2 Which of the following consist of **only** compounds?

(i) air (ii) oxygen (iii) steam (iv) carbon dioxide

- A** (i) and (ii)
- B** (ii) and (iii)
- C** (iii) and (iv)
- D** (iv) only

3 An ion X^+ has 22 nucleons and 10 electrons. What does the nucleus of X^+ contain?

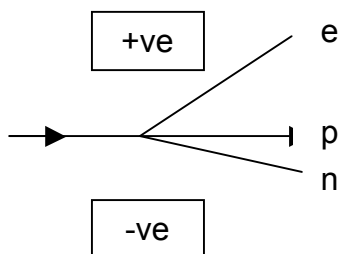
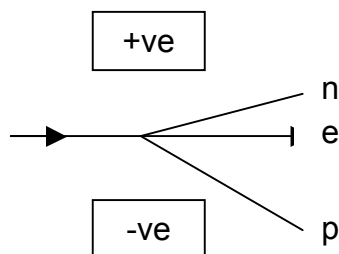
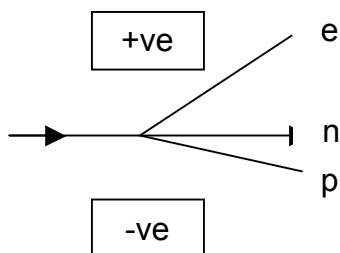
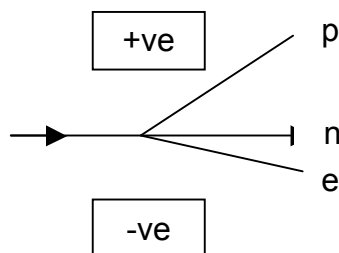
	Protons	Neutrons
A	9	13
B	10	12
C	11	11
D	12	10

4 What would be the likely formula of the compound formed between elements X and Y which are found in Group III and V respectively?

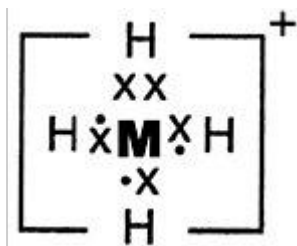
- A** XY
- B** X_2Y_3
- C** X_3Y_2
- D** X_3Y_5

- 5 How many atoms are shown by the formula $\text{Pb}(\text{NO}_3)_2$?
- A 3
B 5
C 6
D 9
- 6 Metal Y forms a carbonate with the formula YCO_3 . What will be the formula for the chloride of metal Y?
- A YCl
B YCl_2
C YCl_3
D Y_2Cl_3
- 7 Which statement about atoms is **incorrect**?
- A A nucleus always contains protons and neutrons.
B Nearly all the mass of the atom is concentrated in the nucleus.
C The number of neutrons can be equal to the number of electrons.
D The nucleus is very small in comparison with the total size of the atom.
- 8 Which of the following particles contains 8 neutrons, 8 protons and 10 electrons?
- A A nitrogen ion
B A neon atom
C An aluminum ion
D An oxygen ion
- 9 In which one of these substances below is there the smallest number of electrons shared?
- A F_2
B CH_4
C CO_2
D H_2O

- 10** A beam of particles is made up of protons (p), neutrons (n), and electrons (e). The beam is passed through a pair of positively-charged and negatively-charged plates. Which of the following correctly show the path of the beam through the charged plates?

A**B****C****D**

- 11** The ion $[\text{MH}_4]^+$ can be represented by the "dot and cross" diagram shown below.



Only the valence electrons of each element are shown.

In which group of the Periodic Table does element **M** belong to?

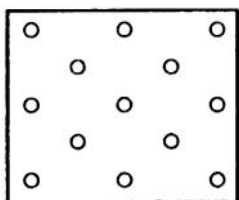
- A** II
B III
C V
D VI

12 Which of the following does not result in a chemical change?

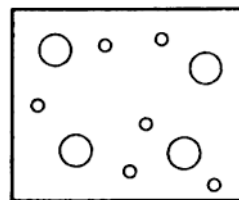
- A Adding sulfuric acid to magnesium
- B Adding salt to a water
- C Adding vinegar to sodium carbonate
- D Adding yeast to dough to bake a bread

13 Which diagram represents the element chlorine gas?

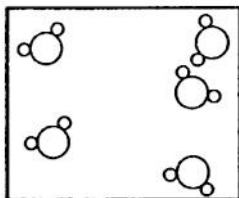
A



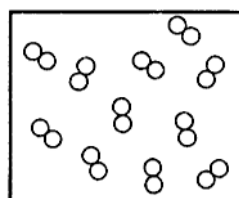
C



B



D



14 Which is the correct balanced equation for the reaction of sulfuric acid, H_2SO_4 ?

- A $\text{H}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4 + \text{HCl}$
- B $\text{H}_2\text{SO}_4 + \text{Mg} \rightarrow \text{MgSO}_4 + \text{H}_2$
- C $\text{H}_2\text{SO}_4 + \text{NaOH} \rightarrow \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$
- D $\text{H}_2\text{SO}_4 + \text{NH}_3 \rightarrow (\text{NH}_4)_2\text{SO}_4$

- 15** The information given shows a process of decomposition taking place in a test tube upon strong heating.



Which one of the following statements is **incorrect**?

- A** **Q** could be a compound.
B **R** could be a compound.
C **P** could be an element.
D Both **Q** and **R** could be compounds.

Section A Answers

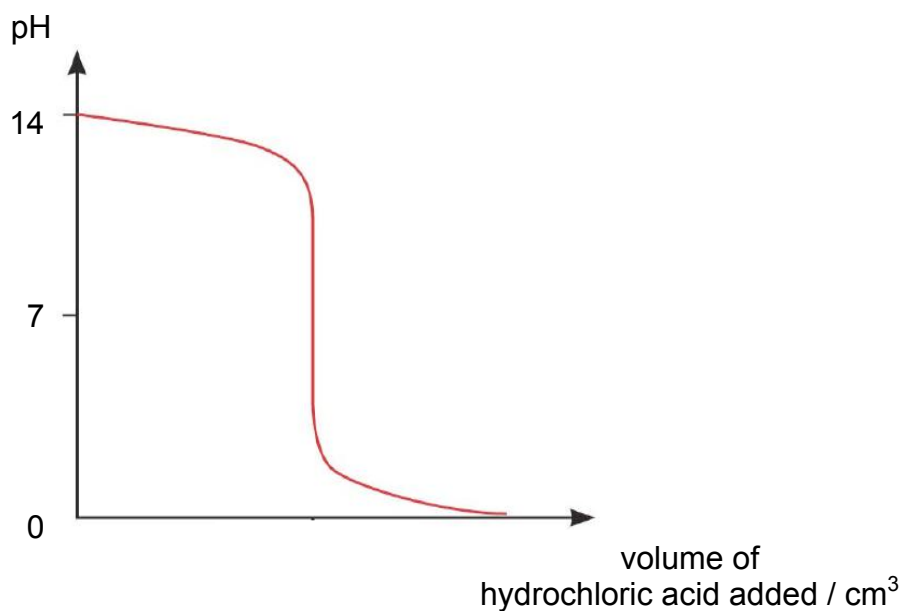
1	2	3	4	5	6	7	8	9	10

11	12	13	14	15

Section B (15 marks)

Answer all the questions in the spaces provided.

- 1 In an experiment, hydrochloric acid was added from a burette to a conical flask containing aqueous sodium hydroxide. The pH of the resulting mixture was recorded as volume of hydrochloric acid was added. The graph below shows the results of the experiment.



- (a) What is the name of this reaction?
- [1]
- (b) From the graph above, which pH shows the end of the reaction between sodium hydroxide and hydrochloric acid?
- [1]
- (c) The reaction between sodium hydroxide and hydrochloric acid produces sodium chloride and water. Write a balanced chemical equation for the reaction between sodium hydroxide and hydrochloric acid.

..... [1]

- (d) At the beginning of the experiment, Universal Indicator was added to the solution. State the colour of the Universal Indicator in the solution at the respective pH values. [2]

pH	Colour of the Universal Indicator
14	
7	

- 2 The table below shows the number of sub-atomic particles in five atoms, **V** to **Z**. These letters are not the symbol of the elements.

atom	number of protons	number of electrons	number of neutrons
V	7	7	8
W	7	7	7
X	9	9	10
Y	18	18	12
Z	13	13	14

- (a) Which two atoms are isotopes?

Explain your answer.

[2]

.....

.....

- (b) Which atom does not react with other atoms to form compounds?

Explain your answer.

[2]

.....

.....

- (c) State the type of bonding formed between atoms **W** and **X**.

Explain your answer.

[2]

.....

.....

- (d) Atoms **W** and **Z** form a compound.

Draw a 'dot-and-cross' diagram to show the bonding in the compound formed between the atoms of **W** and **Z**.

[2]

- (e) Two atoms **X** form a diatomic molecule.

Draw a 'dot-and-cross' diagram to show the bonding formed between the atoms of **X**.

[2]

Section C (20 marks)

Answer all the questions in the spaces provided.

- 3** The table shows the results of an experiment in which copper and copper carbonate were heated separately. In each case, **5.0 g** of the substance was heated.

Substance	Appearance before heating	Appearance after heating	Mass of substance after heating / g
copper	pink-brown	black	6.2
copper carbonate	green	black	3.2

- (a) (i)** When copper is heated in air, state whether a chemical or physical reaction has occurred. Explain your answer. [2]

.....

.....

- (ii)** Calculate the increase in mass for part **(a)(i)** of the question. [1]

- (iii)** Explain why there is an increase in mass after the copper sample has been heated. [1]

.....

.....

- (iv)** Write the word equation for part **(a)(i)** of the question. [2]

.....

.....

- (b)** When green copper carbonate is heated, a black substance is formed together with a gas. When this gas is passed through limewater, a white precipitate is seen.

(i) Calculate the decrease in mass after the copper carbonate is heated. [1]

(ii) Explain the decrease in mass of copper carbonate. [2]

.....
.....

(iii) Identify the gas that evolved during the reaction. [1]

.....
.....

- 4 Natasha carried out an investigation to identify substance **X** which is either calcium metal or calcium carbonate.

Test	Observation	Conclusion
Place a spatula of substance X into a test-tube. Add 5 cm ³ of hydrochloric acid into the test-tube.	Bubbles of gas are formed. Substance X disappears.	It is calcium metal.

- (a) Explain why Natasha cannot conclude that substance **X** is calcium metal from the test carried out. [1]

.....

.....

- (b) Describe in detail the test Natasha should carry out in order to confirm that substance **X** is calcium metal. [2]

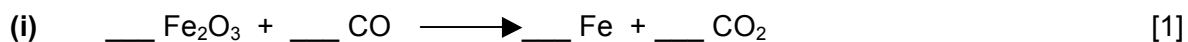
.....

.....

- (c) Name and give the chemical formula of the salt formed from the reaction. [2]

.....

- (d) Balance the following chemical equations.



- (e) The table shows information about the chlorides of some elements in Period 3. The elements are labelled **W**, **X**, **Y** and **Z**. You need not identify **W**, **X**, **Y** and **Z**.

element	formula of chloride	melting point / °C	boiling point / °C
W	WCl₂	714	1418
X	XCl	790	1407
Y	YCl₄	-70	58
Z	Z₂Cl₂	-80	138

- (i) Which of the elements, **W**, **X**, **Y** and **Z**, are likely to be non-metals?
Explain your answer.

[2]

.....

.....

- (ii) Arrange the elements in order of increasing atomic number.

[1]

.....

End of Chemistry Section

The Periodic Table of the Elements

Group																	
I	II	1 H hydrogen 1										III	IV	V	VI	VII	0
Key relative atomic mass atomic symbol name atomic number																	
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	64 Cu copper 29	65 Zn zinc 30	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36	
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	98 Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54	
133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	207 Pb lead 82	209 Bi bismuth 83	210 Po polonium 84	210 At astatine 85	222 Rn radon 86	
87 Fr francium 87	88 Ra radium 88	89 Ac actinium 89	†														

Key

relative atomic mass
atomic symbol
name
atomic number

*58-71

Lanthanoid
series

†90-103

Actinoid
series

140	Ce	cerium	58	141	Pr	Praseodymium	59	144	Nd	neodymium	60	-	Pm	promethium	61	150	Sm	samarium	62	152	Eu	europium	63	157	Gd	gadolinium	64	159	Tb	terbium	65	162	Dy	dysprosium	66	165	Ho	holmium	67	167	Er	erbium	68	169	Tm	thulium	69	173	Yb	ytterbium	70	175	Lu	lutetium	71
232	Th	thorium	90	-	Pa	protactinium	91	238	U	uranium	92	-	Np	neptunium	93	-	Pu	plutonium	94	-	Am	americium	95	-	Cm	curium	96	-	Bk	berkelium	97	-	Cf	californium	98	-	Es	einsteinium	99	-	Fm	fermium	100	-	Md	mendelevium	101	-	No	nobelium	102	-	Lr	lawrencium	103

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

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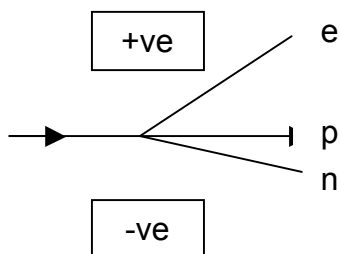
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- D X_3Y_5

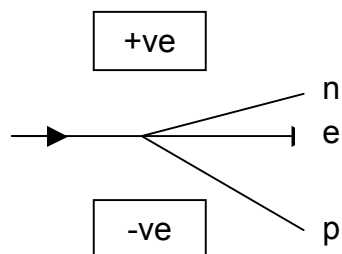
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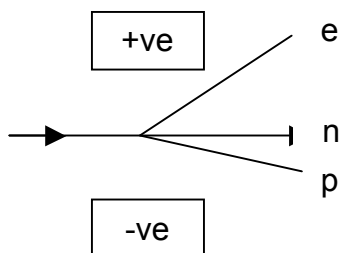
A



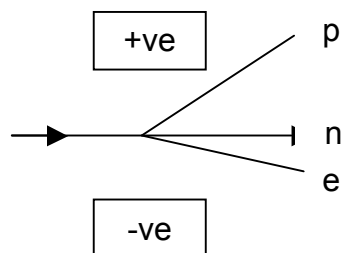
B



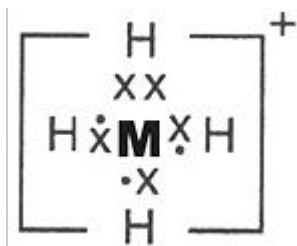
C



D



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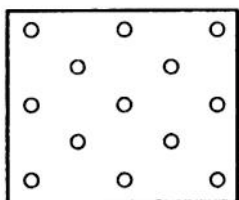
- A II
B III
C V
D VI

12 Which of the following does not result in a chemical change?

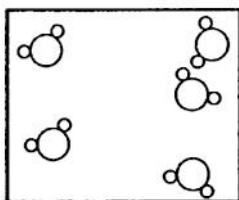
- A Adding sulfuric acid to magnesium.
- B Adding salt to a water.
- C Adding vinegar to sodium carbonate.
- D Adding yeast to dough to bake a bread.

13 Which diagram represents the element chlorine gas?

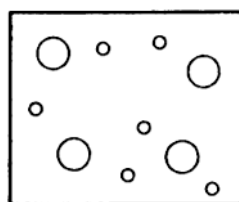
A



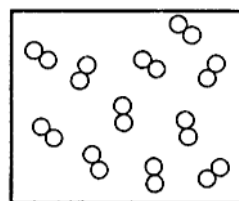
B



C



D



14 Which equation is balanced?



15 The information given shows a process of decomposition taking place in a test tube upon strong heating.



Which one of the following statements is incorrect?

A Q could be a compound.

B R could be a compound.

C P could be an element.

D Both Q and R could be compounds.

Section A Answers

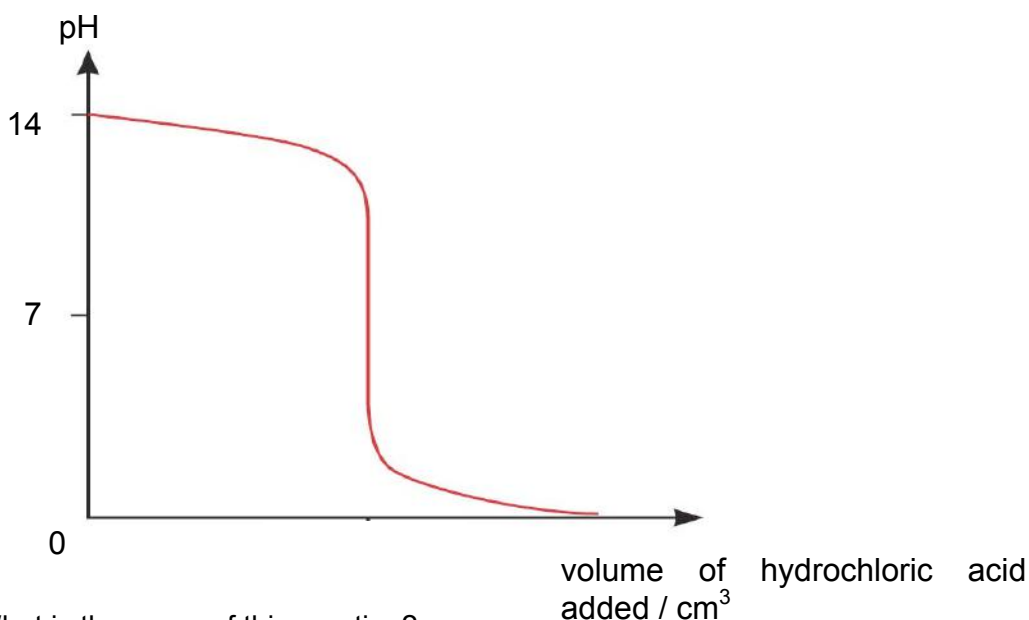
1	2	3	4	5	6	7	8	9	10

11	12	13	14	15

Section B (15 marks)

Answer all the questions in the spaces provided.

- 1 (a) In an experiment, hydrochloric acid was added from a burette to a conical flask containing aqueous sodium hydroxide. The pH of the resulting mixture was recorded as volume of hydrochloric acid was added. The graph below shows the results of the experiment.



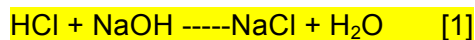
- (a) What is the name of this reaction?

Neutralisation [1]

- (b) From the graph above, which pH shows the end of the reaction between sodium hydroxide and hydrochloric acid?

7

- (c) The reaction between sodium hydroxide and hydrochloric acid produces sodium chloride and water. Write a balanced chemical equation for the reaction between sodium hydroxide and hydrochloric acid.



- (d) At the beginning of the experiment, Universal Indicator was added to the solution. State the colour of the Universal Indicator in the solution at the respective pH values. [2]

pH	substance(s) in the conical flask
14	Violet
7	Green

- 2 The table below shows the number of sub-atomic particles in five atoms, **V** to **Z**. These letters are not the symbol of the elements.

atom	number of protons	number of electrons	number of neutrons
V	8	8	9
W	8	8	10
X	9	9	10
Y	10	10	10
Z	11	11	12

- (a) Which two atoms are isotopes? [1]

V and W. [1]

They have the same proton number but different number of neutrons. [1]

- (b) Which atom does not react with other atoms to form compounds?
Explain your answer. [2]

Y. [1] Stable as it has full valence electron shell [1]

- (c) State the type of bonding formed between atoms **W** and **X**.
Explain your answer. [2]

Covalent bond [1] Both W and X are atoms of non-metal elements. Hence, they will share their valence electrons to achieve octet configuration.

- (d) Atoms **W** and **Z** form a compound.

Draw a 'dot-and-cross' diagram to show the bonding in the compound formed between the atoms of **W** and **Z**. [2]

Ionic Bond with transfer of electron [1]

1 W, 2 Z with octet configuration [1]

- (e) Two atoms **W** form a diatomic molecule.

Draw a 'dot-and-cross' diagram to show the bonding formed between the atoms of **W**. [2]

Covalent bond [1]

Sharing of 2 electron from each atom [1]

Section C (20 marks)

Answer **all** the questions in the spaces provided.

- 3 The table shows the results of an experiment in which copper and copper carbonate were heated separately. In each case, **5.0 g** of the substance was heated.

Substance	Appearance before heating	Appearance after heating	Mass of substance after heating / g
Copper	pink-brown	black	6.2
Copper carbonate	green	black	3.2

- (a) (i) When copper is heated in air, state whether a chemical or physical reaction has occurred. Explain your answer. [2]

Chemical change [1]

This is because there is a change in the mass [1/2] and colour [1/2] from the original reactant

- (ii) Calculate the increase in mass for part (a)(i) of the question. [1]

The increase is $(6.2 - 5) = 1.2 \text{ g}$ [1]

- (iii) Explain why there is an increase in mass after the copper sample has been heated. [1]

On heating, copper reacts with oxygen in the air to form a new substance.

- (iv) Write the word equation for part (a)(i) of the question. [2]

copper + oxygen $\rightarrow$ copper oxide

Correct reactants – [1]

Correct product – [1]

- (b) When green copper carbonate is heated, a black substance is formed together with a gas. When this gas is passed through limewater, a white precipitate is formed in it.

- (i) Calculate the decrease in mass after the copper carbonate is heated. [1]

The decrease is $(5 - 3.2) = 1.8 \text{ g}$ [1]

- (ii) Explain the decrease in mass of copper carbonate. [2]

On heating, copper carbonate undergoes thermal decomposition.

The decrease in mass is due to the gas (carbon dioxide) formed has escaped into the surrounding air and only the black solid (copper oxide) remains in the test tube.

- (iii) Identify one of the products formed at the end of the reaction. [1]

Carbon dioxide or Copper oxide

- 2 Natasha carried out an investigation to identify substance X which is either calcium metal or calcium carbonate.

Test	Observation	Conclusion
Place a spatula of substance X into a test-tube. Add 5 cm ³ of hydrochloric acid into the test-tube.	Bubbles of gas are formed. Substance X disappears.	It is calcium metal.

- (a) Explain why Natasha cannot conclude that substance X is calcium metal from the test carried out. [1]

Both calcium metal and calcium carbonate produce gas when reacted with acid. [1]

- (b) Describe in detail the test Natasha should carry out in order to confirm that substance X is calcium metal. [3]

Test: use a lighted splint and placed near the gas. If flame extinguish with "pop" sound [1], hydrogen gas [1] is present thus can conclude that substance X is a metal.

- (c) Name and give the chemical formula of the salt formed from the reaction. [1]

Calcium Chloride, CaCl₂

Balance the following chemical equations. [1]



(d)

What instrument can be used to verify the pH value of the solutions? The table shows information about the chlorides of some elements in Period 3. The elements are labelled **W**, **X**, **Y** and **Z**. You need not identify **W**, **X**, **Y** and **Z**.

element	formula of chloride	melting point / °C	boiling point / °C
W	WCl₂	714	1418
X	XCl	790	1407
Y	YCl₄	-70	58
Z	Z₂Cl₂	-80	138

- (i) Which of the elements, **W**, **X**, **Y** and **Z**, are likely to be non-metals? Explain your answer.

Y and Z [1]. Since the chlorides have low melting and boiling points, this means that they are most likely to be covalent compounds [1] with simple molecular structures.

- (ii) Arrange the elements in order of increasing atomic number. [1]

X, W, Y, Z [1]

The Periodic Table of the Elements

Group																			
I	II											III	IV	V	VI	VII	0		
																	1 H hydrogen 1		4 He helium 2
7 Li lithium 3		9 Be beryllium 4		Key relative atomic mass atomic symbol name atomic number										11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11		24 Mg magnesium 12												27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	64 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36		
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	— Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54		
133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	— Po polonium 84	— At astatine 85	— Rn radon 86		
— Fr francium 87	— Ra radium 88	— Ac actinium 89																	

*58-71
Lanthanoid
series
†90-103
Actinoid
series

140 Ce cerium 58	141 Pr Praseodymium 59	144 Nd neodymium 60	— Pm promethium 61	150 Sm samarium 62	152 Eu europium 63	157 Gd gadolinium 64	159 Tb terbium 65	162 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71
232 Th thorium 90	— Pa protactinium 91	238 U uranium 92	— Np neptunium 93	— Pu plutonium 94	— Am americium 95	— Cm curium 96	— Bk berkelium 97	— Cf californium 98	— Es einsteinium 99	— Fm fermium 100	— Md mendelevium 101	— No nobelium 102	— Lr lawrencium 103

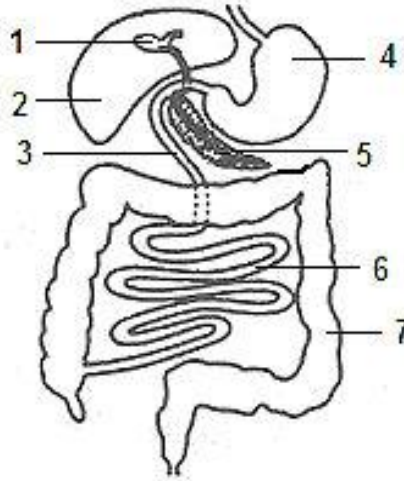
The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

Candidate Name _____

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Science (Biology)**Section A: Multiple Choice Questions (15 marks)**Answer **all** the questions in the table provided on page 20.

- 1 The diagram below shows part of the digestive system in human.



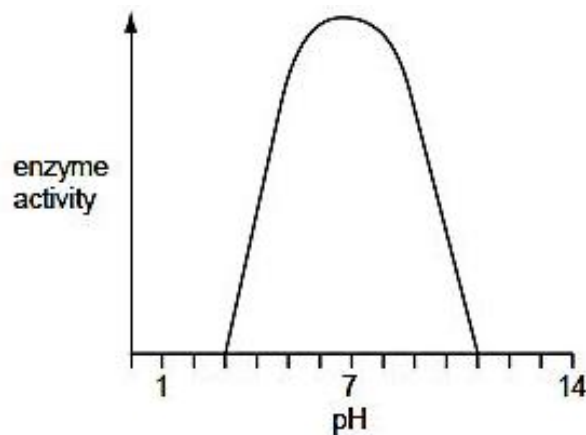
Digestion of proteins occur in structures

- A** 2 and 3
B 3 and 4
C 4 and 5
D 6 and 7
- 2 Specially formulated soap powders boast of their ability to remove oily stains completely. Which type of substance do you think could be found in these soap powders?
- A** Amylase
B Protease
C Lipase
D Maltase

- 3 Which enzyme and condition is responsible for the digestion of starch in the small intestine?

	<u>Enzyme</u>	<u>Condition</u>
A	Lipase	Alkaline
B	Amylase	Acidic
C	Protease	Acidic
D	Amylase	Alkaline

- 4 The graph shows the activity of an enzyme.



What does the graph show about the activity of the enzyme?

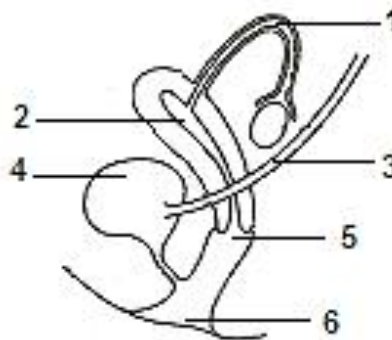
- A** It is denatured at high temperatures.
B It is most active in acidic conditions.
C It is most active in neutral conditions.
D It is unaffected by pH.
- 5 Which of the following can pass through the cell membrane?
- A** Starch and glucose
B Protein and maltose
C Polypeptides and amino acids
D Glycerol and amino acids

- 6 An unknown food was tested with three various food tests. The result is recorded as below.

Test	Result
Iodine test	Blue black colour observed.
Biuret test	Blue solution observed.
Ethanol Emulsion Test	Cloudy white emulsion observed.

What nutrients does the food contain?

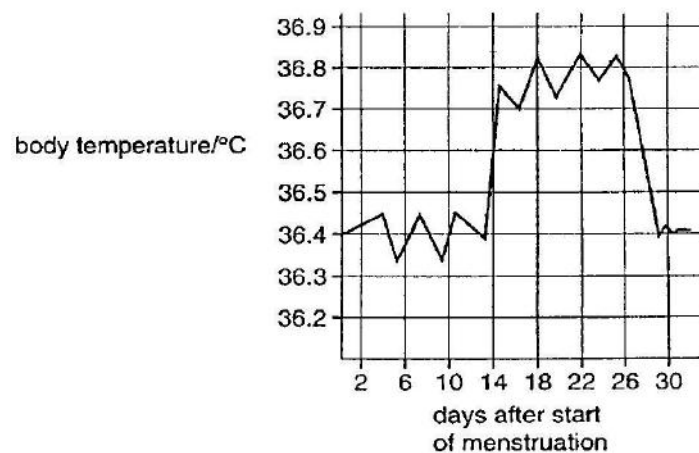
- A Protein and fats only.
 B Starch and fats only.
 C Starch and protein only.
 D Starch, protein and fats.
- 7 The diagram below shows the side view of the reproductive system of a woman.



Where do these three processes normally occur?

	Sperms deposition	Fertilization	Implantation
A	5	2	4
B	6	3	5
C	5	1	2
D	6	3	4

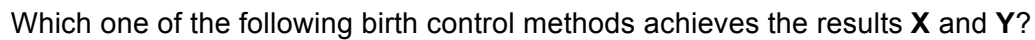
- 8 Offspring of sexual reproduction will _____
- A have only half the number of chromosomes as their parents.
 - B have twice as many chromosomes as their parents.
 - C have the same number of chromosomes as their parent.
 - D look exactly the same as either one of their parents.
- 9 Non identical twins are twins that are genetically different from each other. How can such twin arise?
- A Two sperm cells fertilising the same egg.
 - B Two sperm cells fertilising two separate eggs.
 - C Two eggs being fertilised by one sperm cell.
 - D One zygote dividing into two cells that each develops into a foetus.
- 10 The graph shows how a woman's body temperature varies during her menstrual cycle.



What happens to her body temperature when she ovulates?

- A It falls from about 36.8°C to about 36.4°C.
- B It remains at about 36.4°C.
- C It remains at about 36.7°C.
- D It rises from about 36.4°C to about 36.8°C.

- 12** The figure below shows a classification of birth control methods.

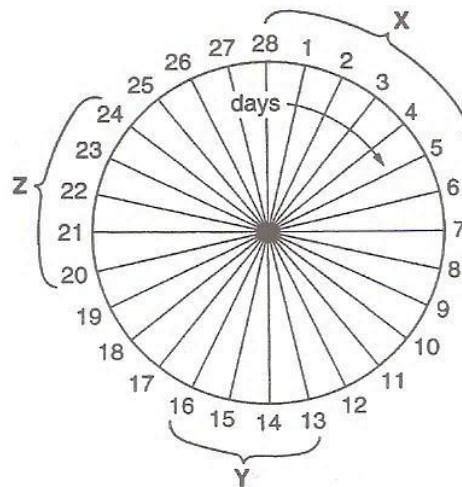


13 Which of the following is **not** associated with abortion?

- 14** Gonorrhoea and syphilis are different from each other because gonorrhoea _____.

- A** is caused by a bacteria while syphilis is caused by a virus
- B** only affects the male while syphilis affects both male and female
- C** is treatable and syphilis is not
- D** affects mainly the reproductive organs while syphilis affects the whole body

- 15 The diagram represents the menstrual cycle.



Which events may occur at **X**, **Y** and **Z**?

	X	Y	Z
A	Implantation	Ovulation	Menstruation
B	Menstruation	Ovulation	Implantation
C	Ovulation	Implantation	Menstruation
D	Ovulation	Menstruation	Implantation

Section A Answers

1	2	3	4	5	6	7	8	9	10

11	12	13	14	15

Section B (15 marks)

Answer all the questions in the spaces provided.

- 1 The table below shows the nutrients present in 100g of three food samples, **A**, **B**, and **C**.

Nutrient	Grams in food A	Grams in food B	Grams in food C
Protein	10.9	5.3	1.8
Fat	0.7	3.5	30.0
Carbohydrate	80.3	4.0	50.0
Calcium	0.2	1.75	0.1
Fibre	6.0	3.0	0.0
Water	4.0	88.0	78.0
Vitamins present	A, B ₁	A, B ₁ , C, D	A, B ₁ , C, D

- (a) Which food is recommended for [1]

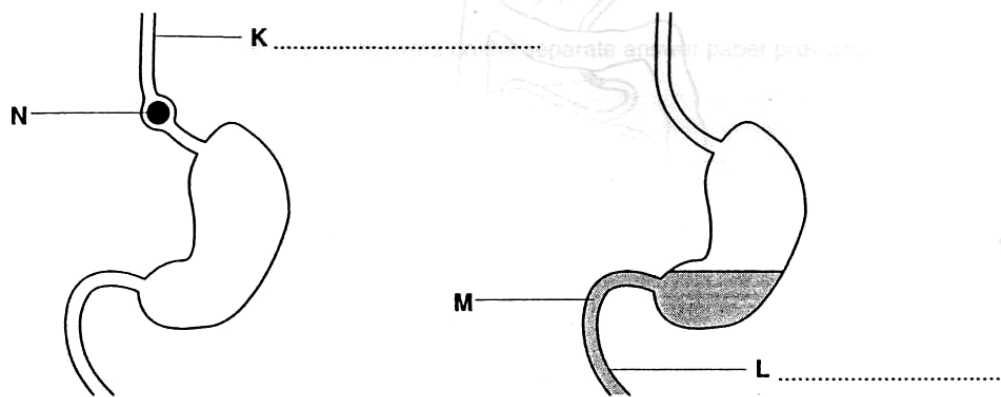
(i) growth and repair _____

(ii) bone growth _____

- (b) Explain why a diet of **only** food **B** would not meet the need of adults. [2]

- (c) If a person is having a diet of **only** food **C**, predict the health implications that the person may face. Explain your answer. [2]

- 2 The diagram below shows some food just before it enters the stomach and the same food as it leaves the stomach four hours later.



- (a) On the diagram, label structures **K** and **L**. [1]
- (b) The food consisted solely of lean meat and potatoes. By placing ticks in the appropriate boxes below, show how the major components of the food compare at positions **M** and **N**. [3]

	More at M than at N	Less at M than at N	Almost the same at M and N
Starch			
Protein			
Fibre			

- (c) Name the region of the alimentary canal which will contain fibre in the highest proportion and give reason for your answer. [1]

- 3 The diagram below shows a calendar page on which a woman has circled the date of her first day of menstruation.

June						
M	T	W	T	F	S	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

- (a) On which date would she expect the menstruation to end? [1]

- (b) On which date would she expect her next menstruation to begin? [1]

- (c) If the woman decided to use natural method of birth control, when is the period that she should abstain from sexual intercourse? [1]

- (d) Describe the events that take place if an egg is not fertilised in the woman's body. [2]

Section C (20 marks)

Answer all the questions in the spaces provided.

- 4 (a)** Milk is an important source of protein and fat in the diet of many people. [5]
Describe how the nutrients in milk are digested in the human gut.

[illegible]

- (b) The table compares the mass of protein and fat found in a sample of whole milk and skimmed milk.

nutrient	mass/ g per 100 g	
	whole milk	skimmed milk
protein	3.4	3.5
fat	3.9	0.1

Using information in the table, explain why a person with a damaged liver [3]
might be recommended to drink skimmed milk rather than whole milk.

- (c) X'tra Slim pill is a new product that is introduced for people with obesity. The [2]
product is found to contain amylase inhibitor and lipase inhibitor. (An inhibitor
will denature enzymes) Suggest how this product helps in reducing body
weight.

- 5 (a) Compare human male and female sex cells in terms of numbers and [4]
movement. In each case, **suggest reasons** for the differences you describe.

- (b) Describe the role of placenta during the development of the foetus. [2]

- (c) Sexually transmitted infections (STI) are dangerous because they can cause [4]
serious health problems or even death. One of the sexually transmitted
infections is caused by a virus.

State the full name of this STI and virus. Describe its effects on the human
body.

END OF PAPER

Secondary 2 Express Science Biology SA2 Answer Scheme

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15																
B	C	D	C	D	B	C	C	B	D	B	B	B	D	B																
Section B																														
1(a)(i)	Food A [1/2] Food B [1/2]													1																
(b)	Food B is low in carbohydrate. [1] The diet is insufficient to <u>provide</u> the amount of <u>energy</u> [1/2] needed for an adult's <u>daily acitivity</u> . [1/2]													2																
(c)	Constipation [1/2] , low in fibre intake [1/2] Coronary heart diseases or obesity [1/2] , high in fat intake [1/2] <i>Medical conditions must be correct for explanation to be awarded marks.</i>													2																
2(a)	K : oesophagus [1/2] L : Small intestine [1/2]													1																
2(b)	<table><tr><td></td><td>More at M than at N</td><td>Less at M than at N</td><td>Almost the same at M and N</td></tr><tr><td>Starch</td><td></td><td></td><td>/</td></tr><tr><td>Protein</td><td></td><td>/</td><td></td></tr><tr><td>Fibre</td><td></td><td></td><td>/</td></tr></table>														More at M than at N	Less at M than at N	Almost the same at M and N	Starch			/	Protein		/		Fibre			/	3
	More at M than at N	Less at M than at N	Almost the same at M and N																											
Starch			/																											
Protein		/																												
Fibre			/																											
2(c)	Large intestine[1/2] Fibre is unable to be digested in human body. [1/2] <i>Reject: Anus Large intestine / rectum must be mentioned for explanation to be awarded marks.</i>													1																
3(a)	8 th June													1																
3(b)	2 nd July													1																
3(c)	14 th June – 20 th June <i>Reject: fertile period, Day 11-17.</i>													1																
3(d)	The egg will <u>die</u> . [1] The thick uterus wall and blood capillaries will <u>break down</u> [1/2] <u>Dead egg, broken uterus wall and blood</u> is <u>discharged</u> from the vagina during menstruation. [1/2] <i>Must describe the events. Simply mentioned dead egg is not accepted.</i>													2																
Section C																														
4(a)	<u>Protein</u> is digested into <u>polypeptide</u> by <u>protease 1</u> in the <u>stomach</u> . [1] <u>Protein</u> is digested into <u>polypeptide</u> by <u>protease 1</u> in the <u>small intestine</u> . [1] <u>Polypeptide</u> is digested into <u>amino acids</u> by <u>protease 2</u> in the <u>small intestine</u> . [1] <u>In the small intestines, bile emulsify fats to increase the surface area of fat molecules for lipase to work on it.</u> [1]													5																

	Fat is digested into <u>fatty acids and glycerol</u> by <u>lipase</u> in the <u>small intestine</u> . [1]	
4(b)	A damaged liver is <u>unable to produce bile</u> to emulsify fat in milk. [1/2] Emulsified fats has <u>greater surface area for lipase</u> to digest them faster [1/2] Person with damaged liver is <u>less able to digest fats completely</u> [1/2] Skimmed milk contains <u>less fat</u> to digest [1/2] <u>Protein content</u> in both milk are about the <u>same</u> [1/2] So skimmed milk is <u>just as nutritious as whole milk</u>. [1/2]	3
4(c)	Due to the inhibitors <u>amylase and lipase</u> will be <u>denatured</u> and cannot digest starch and lipids. [1/2] So no <u>glucose and fatty acids and glycerol</u> would be <u>absorbed by body</u> [1/2] Body will make use of <u>its stored fats or glycogen</u> to produce energy leading to weight loss [1]	2
5(a)	Only <u>one</u> ovum is released every 28 days but <u>millions of sperms</u> are released each time. [1] Large number of sperm is released to <u>increases</u> the chances of fertilization. [1] Sperm can move with the help of its tail but ovum is <u>unable to move on its own</u>. [1] Sperms have to be motile because it has to <u>find its way in the female system, up the uterus to reach the oviduct</u> for fertilization [1] COMPARISION MUST BE SIDE BY SIDE .	[4]
5(b)	Placenta's role is to enable exchange of substances between the foetus and the mother [1/2] Placenta allows <u>glucose and oxygen</u> to diffuse from the <u>mother's blood</u> into the <u>foetus's blood</u>. [1] It also allows <u>carbon dioxide and waste products</u> to diffuse from the <u>foetus blood</u> to <u>mother's blood</u>. [1]	2
5(c)	Acquired Immune Deficiency Syndrome [1] , Human Immunodeficiency virus [1] HIV virus attacks the white blood cells which help the body to fight infections. [1] When the body's immune system is weaken, these symptoms appear : - Frequent tiredness - Loss of appetite - Loss of weight - Prolonged fever - Night sweats - Skin rash - Persistent diarrhoea - Frequent flu ($\frac{1}{2}$ mark for at least 2 symptoms mentioned above) 8-10years later, patient may die due to lung infection, cancer of blood vessels, Kaposi sarcoma, brain infection and tuberculosis. ($\frac{1}{2}$ mark for at least 2 symptoms mentioned above.)	4

NAME		REG. NO.		CLASS	
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SERANGOON GARDEN SECONDARY SCHOOL

END-OF-YEAR EXAMINATION 2014

SUBJECT: LOWER SECONDARY SCIENCE (BIOLOGY)

LEVEL: SECONDARY TWO EXPRESS

DATE: 8TH OCTOBER 2014 (WEDNESDAY)

TIME: 0800 – 1000 HR

DURATION: 2 HOURS (TOGETHER WITH LSS (CHEMISTRY))

READ THESE INSTRUCTIONS FIRST

Write your full name, register number and class on all the work you hand in.
 Write in dark blue or black pen.
 You may use a pencil for any diagrams, graphs, tables or rough working.
 Do not use staples, paper clips, glue or correction fluid.

The use of an approved scientific calculator is expected, where appropriate.
 You may lose marks if you do not show your working or if you do not use appropriate units.

Section A

Answer **all** questions.
 Write your answers on the answer sheet provided on Page 6.

Section B

Answer **all** questions.
 Answers to Section **B** should be written on the spaces provided on the question paper.

Section C

Answer only **TWO out of three** questions.
 Answers to Section **C** should be written on the spaces provided on the question paper.

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.

Name/Signature of Parent/Guardian Date	FOR MARKER'S USE 50
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SECTION A: MULTIPLE CHOICE QUESTIONS (10 MARKS)

Choose the correct answer and write the answers on the Answer Sheet on **Page 6**.

1. The recommended diet for soldiers in freezing Arctic conditions is different from that recommended for tropical conditions. What should the Arctic diet include?

A Less fat
B Less fibre
C More energy
D More protein

2. Protease enzyme breaks down proteins to amino acids.

In the 'lock and key' hypothesis, what is the 'lock' and what is the 'key'?

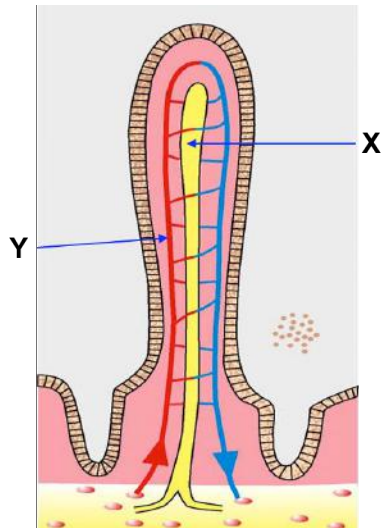
	Lock	Key
A	Amino acid	Protease
B	Protease	Amino acid
C	Protease	Protein
D	Protein	Protease

3. A student ate a bowl of cornflakes with milk for breakfast. The cornflakes contain only starch, while the milk contains fats and proteins.

Which of the following substances will not be found in his stomach after 2 hours?

A Maltose
B Polypeptides
C Starch
D Glucose

4. The diagram below shows a section through a villus.

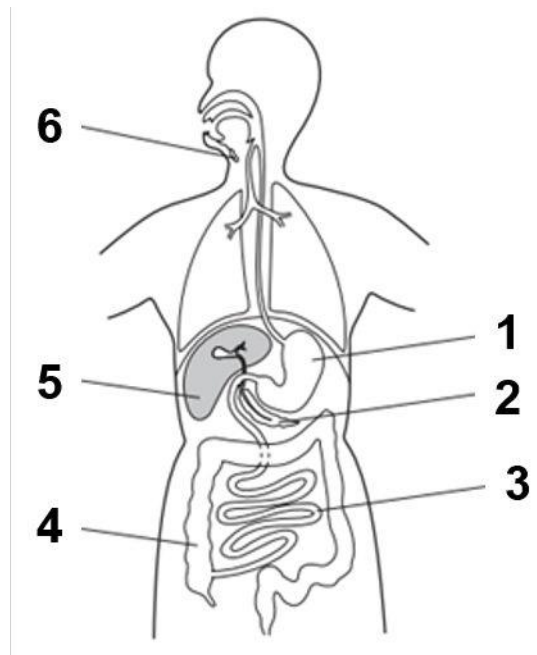


What are the functions of structures **X** and **Y**?

	X	Y
A	To carry blood	To transport amino acids
B	To transport glucose	To secrete enzymes
C	To transport fats	To transport amino acids
D	To transport amino acids	To carry blood

For questions 5 and 6, refer to the information given below.

The diagram below shows the digestive tract of a boy, Sam.



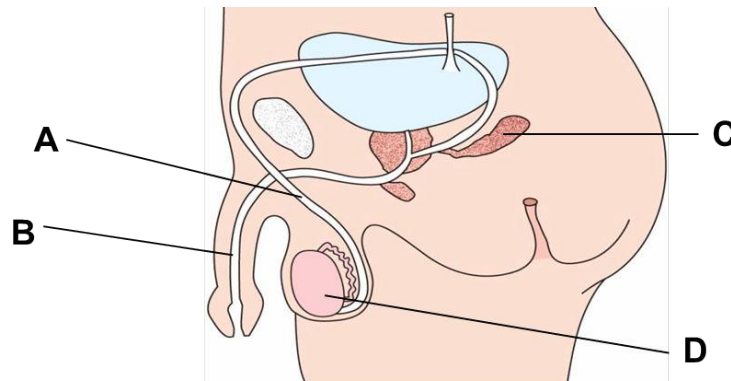
5. Sam just ate a hamburger, comprising a meat patty and two buns. In which of the above numbered structure(s) do(es) digestion of the meat patty occur?

Structure(s)

- | | |
|----------|--------------|
| A | 1 only |
| B | 2 and 5 only |
| C | 1 and 3 only |
| D | 2 and 6 only |
6. What is the main function of labelled structure 4?
- | | |
|----------|--|
| A | It absorbs digested food materials. |
| B | It absorbs water. |
| C | It gets rid of undigested food material from the body. |
| D | It produces enzymes to digest food. |
7. In which part of the female reproductive system does a zygote start to divide to form a ball of cells?
- | | |
|----------|---------|
| A | Uterus |
| B | Cervix |
| C | Ovary |
| D | Oviduct |

8. The diagram shows a section of the male reproductive system.

During vasectomy, which of the following labelled structures is operated on?



9. What is the best way to prevent the spread of the Human Immunodeficiency Virus (HIV)?

- A Always keep fit by taking regular exercise.
- B Do not drink from a cup that has been used by an infected person.
- C Ensure that the man uses a condom during sexual intercourse.
- D Be faithful to your spouse.

10. Which method of birth control does **not** prevent fertilization from occurring?

- A Taking contraceptive pills
- B Using a diaphragm
- C Using an intra-uterine device
- D Using a condom

Answer Sheet for Section A

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

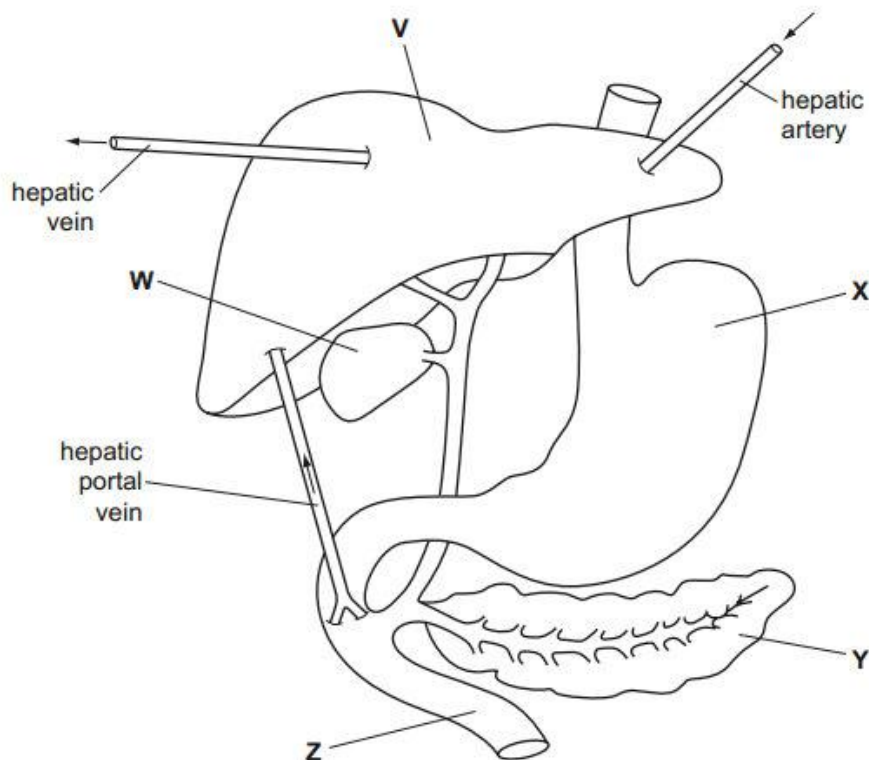
9. _____

10. _____

SECTION B: SHORT STRUCTURED QUESTIONS (20 MARKS)

Answer **ALL** the questions in this section, in the spaces provided.

1. The figure below shows a diagram of part of the digestive system, associated organs, and blood vessels.



- (a) Complete the table below to identify the labelled structures.

[3]

Letter	Name of Structure
W	
Y	
Z	

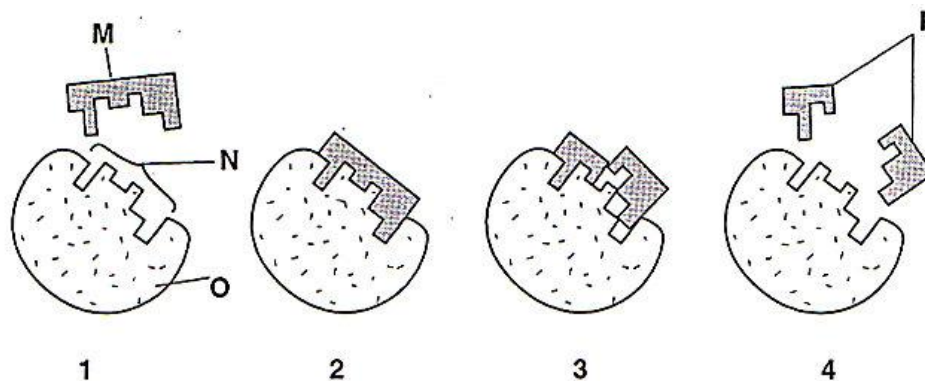
- (b) Structure X produces gastric juice, which contains the following components: hydrochloric acid, protease, and mucus.

State the functions of **hydrochloric acid** and **mucus** in structure X.

[2]

Component	Function
Hydrochloric acid	
Mucus	

2. The diagram below shows, in order, four stages in which an enzyme-controlled chemical reaction may occur.



- (a) Identify **M**, **N**, **O** and **P**.

[2]

M

N

O

P

- (b) With reference to the above diagram, state one property of an enzyme.

[1]

.....

.....

3. The diagram shows the enzymatic breakdown of a nutrient in the human body.



- (a) What is nutrient **X**, and what are the products **Y**? [2]

Nutrient X -

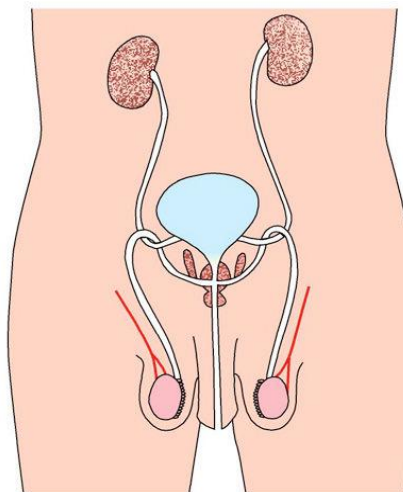
Products Y -

- (b) What is the enzyme that breaks down nutrient **X**, and which is/are the organ(s) that produces it? [2]

Enzyme -

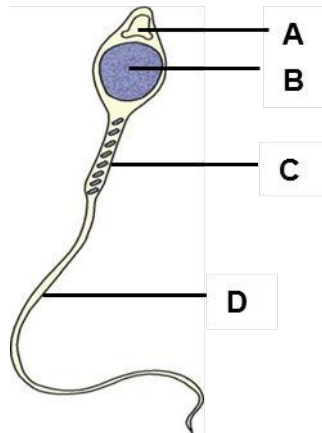
Organ(s) -

4. The diagram below shows the cross-section of the human male reproductive system.



- (a) Label on the above diagram, the following: (i) the urethra, (ii) testis, (iii) prostate gland [3]

(b) The testes produce the gamete as shown below.



(i) What is the name of the gamete as shown in the above diagram? [1]

.....

(ii) What is structure **C**, and why is it present in large numbers in the above gamete? [2]

.....

.....

(iii) The gamete above is very small but produced in large numbers. Explain how these two factors are important for human reproduction. [2]

.....

.....

.....

Section C: LONG STRUCTURED QUESTIONS (20 MARKS)

Answer only **TWO out of three questions** in this section in the spaces provided.

1. (a) Why is protein important in the human body?

[2]

.....

.....

.....

- (b) Enzymes are biological catalysts made of proteins. At high temperatures, the interactions between the amino acids in the proteins can be disrupted, causing the protein to lose its shape. This is known as denaturation.

Suggest a reason why the activity of salivary amylase slows down drastically when it is heated to 60 °C.

[2]

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.....

- (c) Some species of snakes secrete venom containing enzymes that can digest animal cells. By considering a key property of enzymes, explain why only a small drop of venom is sufficient to kill a large animal.

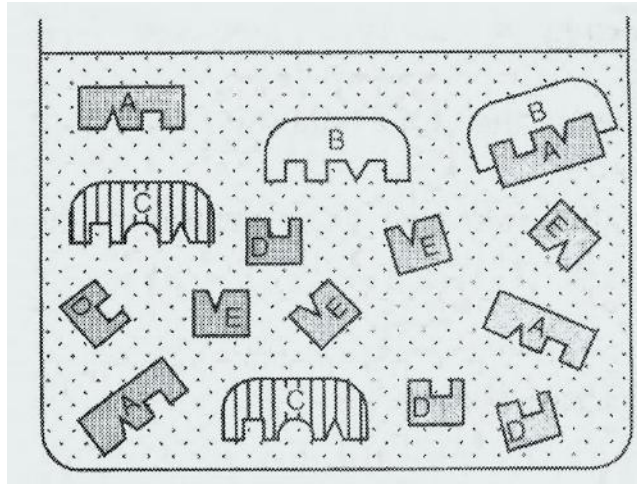
[2]

.....

.....

.....

- (d) A student mixed two different types of enzymes with one type of substrate in a beaker, as shown in the diagram below.



- (i) Which two labelled molecules are the enzymes?

[1]

.....

- (ii) With reference to the labelled molecules in the diagram, explain, using the lock-and-key hypothesis, why the substrate can form an enzyme-substrate complex with only one of the enzymes.

[3]

.....

2. (a) (i) A patient has a tumour in his gall bladder. He followed the recommendation by his doctor and went for an operation to remove his gall bladder.

How should his diet be modified after the operation? Explain your answer. [3]

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.....

- (ii) Another patient has a tumour in the ileum. However, this time, the doctor recommended treatment by chemicals and radiation.

Why is removal of the ileum not recommended by the doctor? [3]

.....

.....

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.....

- (b) John ate a biscuit as a snack. The biscuit contains only starch.

Describe the physical and chemical processes involved in the digestion of the biscuit by the digestive system. Include in your answer, the names and functions of any enzymes involved. [4]

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.....

.....

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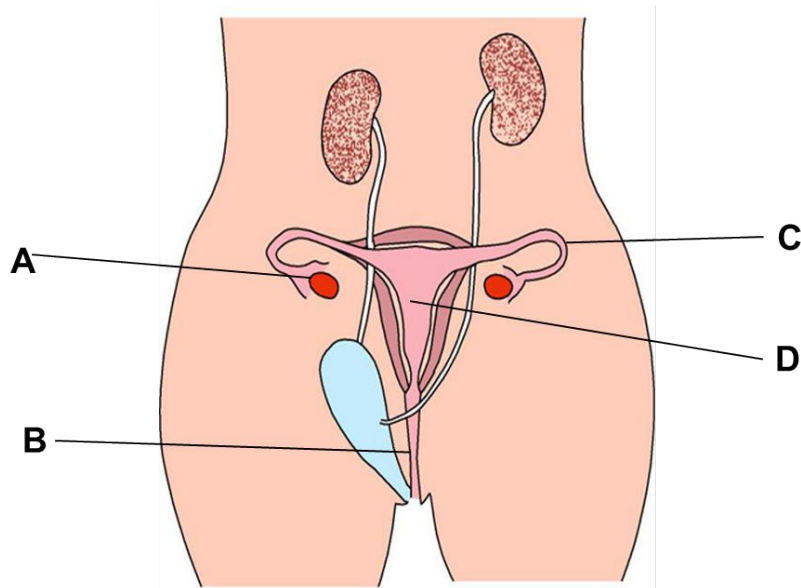
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.....

3. (a) The diagram below shows the human female reproductive system.



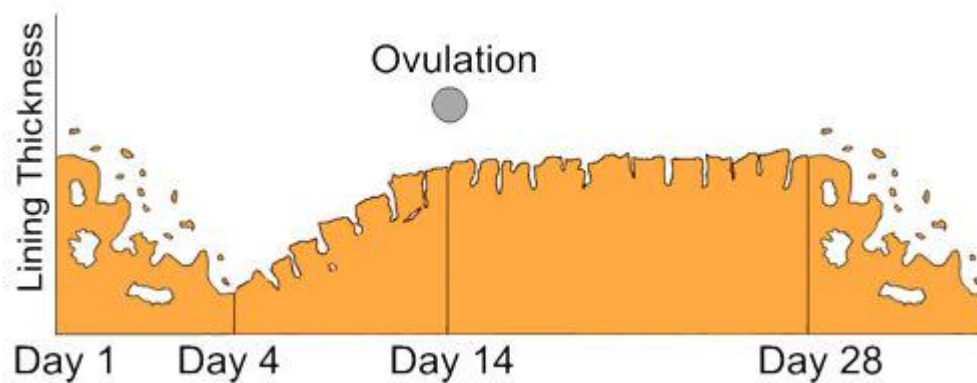
Name the structures **A**, **B**, **C**, **D**, and state their functions.

[4]

Structure	Name	Function
A		
B		
C		
D		

- (b) With the help of the below diagram, describe the changes to **the lining of the uterus** that take place during a 28-day menstrual cycle, assuming that no fertilization occurs.

[4]



.....

.....

.....

.....

.....

.....

- (c) The fertile period for women is approximately from day 11 to day 16 in a 28-day menstrual cycle.

In an attempt to prevent pregnancy, a woman had unprotected sex with her husband, 3 days before the start of her **predicted** fertile period.

Explain why the woman became pregnant even after her effort to avoid sexual intercourse during the fertile period.

[2]

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END OF PAPER

Secondary 2 LSS (Biology) EOY MS

Section A

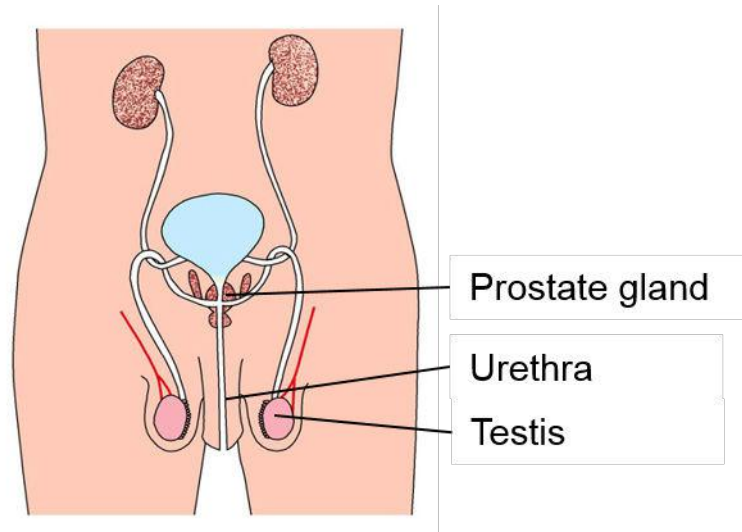
1. C
2. C
3. D
4. C
5. C
6. B
7. D
8. A
9. D
10. C

Section B

1. (a) W – Gall bladder
Y – Pancreas
Z – Duodenum

(1 mark each) [3]
- (b) Hydrochloric acid – kill microorganisms/provide acidic environment for protease [1]
Mucus – protect the stomach wall from acid and protease [1]
2. (a) M – substrate
N – active site
O – enzyme
P – products
(1/2 mark each) [2]
- (b) Enzyme remains unchanged at the end of reaction.
or
The shape of the active site is complementary to the substrate.
or
The enzyme breaks down the substrate to give products. [1]
3. (a) Nutrient X – fat/lipid [1]
Products Y – fatty acid and glycerol [1/2 mark each] [2]
- (b) Enzyme – lipase [1]
Organ(s) – pancreas [1/2], ileum [1/2] [2]

4. (a)



[1 mark each]

Note:

Testis [accept testes]

Prostate should not be labelled as seminal vesicles or Cowper's gland [3]

(b) (i) Sperm cell. [1]

(ii) Mitochondrion. (accept mitochondria) [1]
To provide sufficient energy [1/2] for movement of flagellum [1/2] [2]

(iii) Small – light enough to carry chromosomes efficiently/swim faster [1]
Large numbers – having numerous sperm cells increase chances of survival in female body [1], resulting in higher chance of fertilization. [2]

Section C

1. (a) Synthesize enzymes [1].
Synthesize protoplasm [1].
Growth and repair [1].
Synthesize hormones [1].
Synthesize antibodies [1].
[Any 2] [2]
- (b) Amylase loses its shape, causing its active site to lose its shape [1].
Starch can no longer fit into the active site [1], enzyme-substrate complex cannot be formed for digestion of starch.
(accept the use of 'enzyme' and 'substrate' for discussion) [2]
- (c) Enzymes remain unchanged at the end of reaction. [1] Only a small amount of enzyme is needed to digest a large number of animal cells. [1] [2]
- (d) (i) B [1/2] and C. [1/2] [1]
- (ii) Enzyme acts like a lock [1/2] while substrate acts like the lock [1/2].
Substrate A can fit into the active site of enzyme B [1/2], but not the active site of enzyme C [1/2], to form an enzyme-substrate complex [1/2].
Substrate A is broken down and released as products D and E. [1/2] [3]

2. (a) (i) He should decrease the amount of fats in his diet. [1]
 The gall bladder stores bile, [1/2] which emulsifies fats. [1/2]
 Without bile, fat digestion is slower and incomplete. [1] [3]
- (ii) Removal of the ileum will result in the death of the patient. [1]
 Absorption of food substances cannot take place in the absence of the ileum. [1]
 Cells in the body will be starved of the necessary nutrients [1]. [3]
- (b) The biscuit is first broken down into smaller pieces due to the cutting and grinding action in the teeth. [1/2]
 It is then mixed with saliva, which contains salivary amylase, [1/2] which digests the starch to give maltose. [1/2]
 In the stomach, the churning of the stomach breaks the biscuit down physically into even smaller parts. [1/2]
 In the duodenum, any remaining starch [1/2] will be broken down by pancreatic amylase. [1/2]
 Maltose will finally be broken down by maltase [1/2] to release glucose. [1/2] [4]
3. (a) A – ovary; [1/2] produces eggs [1/2]
 B – vagina; [1/2] allows deposition of semen during sexual intercourse [1/2]
 C – oviduct/fallopian tube; [1/2] carry the mature egg from the ovary to the uterus [1/2]
 D – uterus; [1/2] site where foetus develops during pregnancy [1/2] [4]
- (b) **Days 1 to 5:** Start of menstruation → discharge of dead ovum, broken uterus lining and blood [1]
Days 6 to 10: Uterine lining starts to grow and thicken [1]
Days 11 to 17: fertile period, [1/2] with ovulation on day 14
Days 18 to 28: uterine lining begins to thicken further to prepare for fertilized egg to implant. [1] If no fertilization occurs, the ovum will disintegrate together with the uterine lining. [1/2]
- (c) There could be changes to the menstrual cycle, resulting in the shifting of the fertile period, OR in the case of the woman, the fertile period might occur earlier due to earlier ovulation [1], due to various factors such as stress or diet OR her menstrual cycle is irregular/shorter than 28 days in the first place. [1] [2]

NAME		REG. NO.		CLASS	
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SERANGOON GARDEN SECONDARY SCHOOL

END-OF-YEAR EXAMINATION 2014

SUBJECT: LOWER SECONDARY SCIENCE (CHEMISTRY)

LEVEL: SECONDARY TWO EXPRESS

DATE: 8TH OCTOBER 2014 (WEDNESDAY)

TIME: 0800 – 1000 HR

DURATION: 2 HOURS (TOGETHER WITH LSS (BIOLOGY))

READ THESE INSTRUCTIONS FIRST

Write your full name, register number and class on all the work you hand in.

Write in dark blue or black pen.

You may use a pencil for any diagrams, graphs, tables or rough working.

Do not use staples, paper clips, glue or correction fluid.

The use of an approved scientific calculator is expected, where appropriate.

You may lose marks if you do not show your working or if you do not use appropriate units.

Section A

Answer **all** questions.

Write your answers on the answer sheet provided on Page 6.

Section B

Answer **all** questions.

Answers to Section **B** should be written on the spaces provided on the question paper.

Section C

Answer only **TWO out of three** questions.

Answers to Section **C** should be written on the spaces provided on the question paper.

A copy of the Periodic Table is printed on page 17.

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.

Name/Signature of Parent/Guardian Date	FOR MARKER'S USE 50
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This question paper consists of 17 printed pages and 1 blank page.

Setter: Mr Yeo Kee Sheng

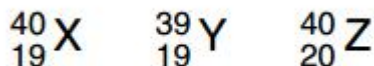
Vetter: Mrs Erica Tay

[Turn over

SECTION A: MULTIPLE CHOICE QUESTIONS (10 MARKS)

Choose the correct answer and write the answers on the Answer Sheet on **Page 6**.

- The melting point of rubidium is 39°C , while its boiling point is 688°C . Which of the following statements is true about the movement of rubidium particles at room temperature?
 - The particles vibrate about fixed positions.
 - The particles slide over one another continuously.
 - The particles dart about rapidly and randomly.
 - The particles spread out and occupy any available volume.
- 30 cm^3 of a gas is placed in a 50 cm^3 container. The temperature remains constant, but the pressure decreases. This is because
 - the distance between the gas particles **decreases**, and the rate of collisions between the particles and container wall **increases**.
 - the distance between the gas particles **increases**, and the rate of collisions between the particles and container wall **decreases**.
 - the kinetic energy of the gas particles **increases**.
 - the kinetic energy of the gas particles **decreases**.
- The letters **X**, **Y** and **Z** represent different atoms.



What can be deduced from the proton numbers and nucleon numbers of **X**, **Y** and **Z**?

- X** and **Y** are isotopes of one another.
- X** and **Z** are isotopes of one another.
- X** has more protons than **Y**.
- Z** has more neutrons than **Y**.

4. The table shows the boiling points of some of the gases present in air.

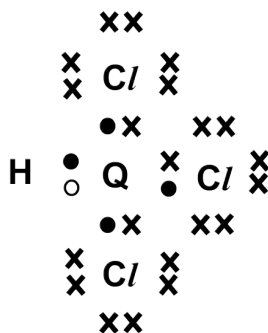
Gas	Boiling point/ °C
Argon	-186
Helium	-269
Neon	-246
Nitrogen	-196
Oxygen	-183

When air is cooled to $-200\text{ }^{\circ}\text{C}$, some of these gases liquefy.
Which gases liquefy?

- A Argon, helium and neon
- B Argon, nitrogen and oxygen
- C Helium and neon only
- D Helium, neon and nitrogen

For questions 5 and 6, refer to the information given below:

Element **Q** can combine with hydrogen and chlorine to form a compound $\text{HQC}l_3$.
The diagram below shows the electronic structure of $\text{HQC}l_3$ (outer shell electrons only).

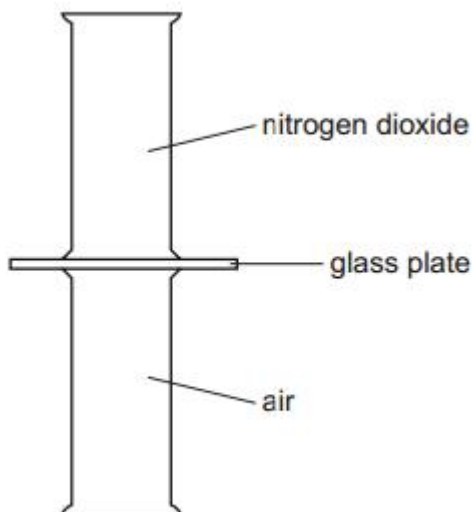


5. Which of these properties will this compound have?
- A It will be a solid at room temperature.
 - B It will be readily soluble in water.
 - C It will be a good conductor of electricity.
 - D It will have a low boiling point.
6. Which element can **Q** possibly be?

- A Sodium
- B Zinc
- C Silicon
- D Bromine

7. Nitrogen dioxide is a dark brown gas and is denser than air.

A gas jar containing nitrogen dioxide is sealed with a glass plate and is then inverted on top of a gas jar containing air.



The glass plate is removed.

Which one of the following correctly describes the colours inside the gas jars after a long period of time?

	Upper gas jar	Lower gas jar
A	Brown	Brown
B	Dark brown	Light brown
C	Colourless	Dark brown
D	Light brown	Dark brown

8. The formulae of the ions of four elements are shown below.



Which statement about these ions is correct?

- A** They all have the same number of electrons in their outer shells.
- B** They all have the same electronic structure as a noble gas.
- C** They all have the same number of protons in their nuclei.
- D** They all have more electrons than protons.

9. Elements **X** and **Y** combine to form the gas **XY₂**.

What are **X** and **Y**?

	X	Y
A	Chlorine	Magnesium
B	Magnesium	Chlorine
C	Fluorine	Oxygen
D	Oxygen	Fluorine

10. The table below gives the properties of four substances.

Which substance in the table could be sodium fluoride?

	State at room temperature	Solubility in water	Electrical conductivity of aqueous solution
A	Liquid	High	Poor
B	Liquid	Low	Poor
C	Solid	High	Good
D	Solid	Low	Good

Answer Sheet for Section A

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

SECTION B: SHORT STRUCTURED QUESTIONS (20 MARKS)

Answer **ALL** the questions in this section, in the spaces provided.

1. ^{37}Cl is an isotope of chlorine.

(a) Explain what is meant by the term *isotope*.

[1]

.....

(b) An **ion** of ^{37}Cl contains the following sub-atomic particles.

Particle	Number
X	20
Y	18
Z	17

Identify particles **X**, **Y** and **Z**.

[2]

Particle **X**

Particle **Y**

Particle **Z**

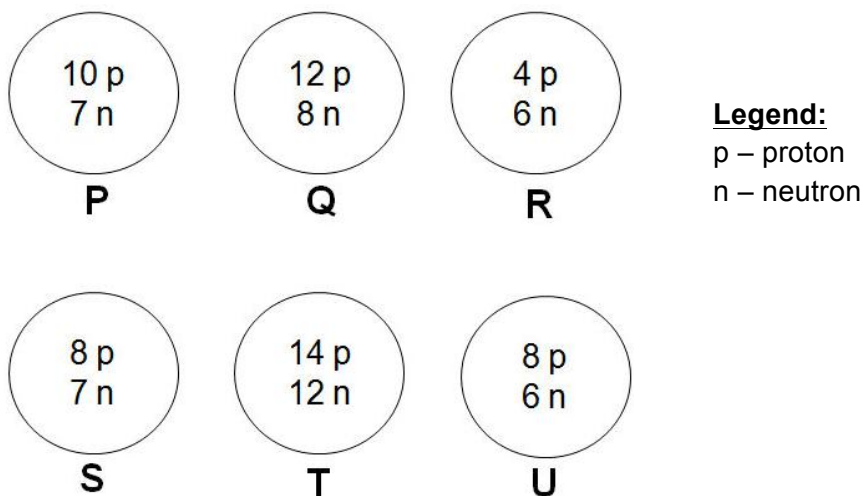
(c) ^{35}Cl is another isotope of chlorine.

Complete the following table to show the number of each type of particle in an **atom** of ^{35}Cl .

[2]

Particle	Number
X	
Y	
Z	

2. The diagram below shows the nuclei of atoms, **P**, **Q**, **R**, **S**, **T** and **U**.
(Note: They do not represent elements in the Periodic Table.)



- (a) Which atom(s) belong(s) to Group II of the Periodic Table? [1]
.....
- (b) Which atom(s) belong(s) to period 3 of the Periodic Table? [1]
.....
- (c) Which two atoms are isotopes of each other? [1]
.....
- (d) Which atom is a noble gas? Explain your answer. [2]
.....
.....
- (e) What is the formula of an ion of **S**? [1]
.....

3. The following table gives some information about several substances.

Substance	Type of bonding	Melting point/ °C	Boiling point/ °C
Chlorine	covalent	-220	-188
Lead (II) bromide		370	914
Methane		-182	-161
Bromine		-7	59
Sodium chloride		801	1413
Magnesium oxide	ionic	2852	3600

- (a) Complete the above table by predicting the type of bonding present in lead (II) bromide, methane, bromine, and sodium chloride. [2]
- (b) Name the substances that are **not** solids at room temperature and pressure. [1]
-
- (c) Which substance is a liquid over the largest temperature range? [1]
-
- (d) Which substances conduct electricity when molten? [1]
-
- (e) Draw particle diagrams below to show the arrangement of the particles at room temperature: [2]

(i) in methane



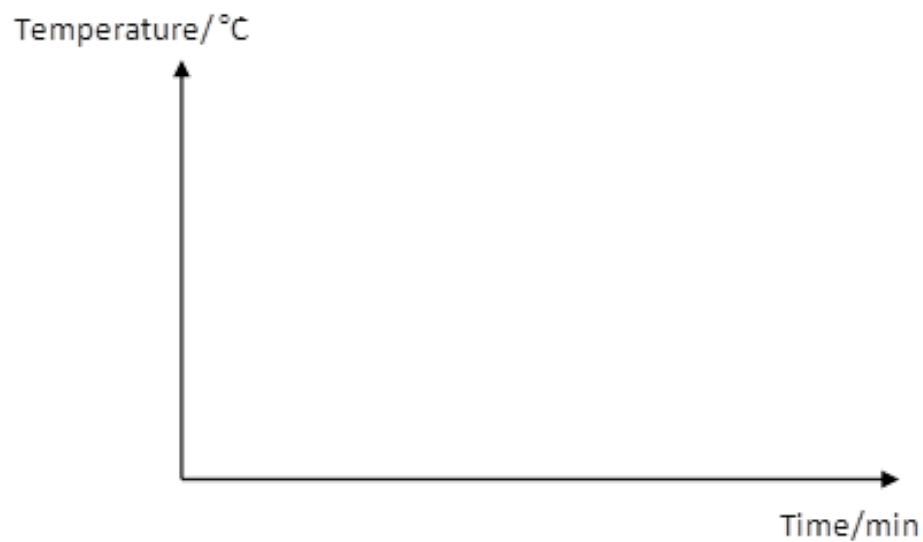
(ii) in bromine



- (f) Peter, a scientist, heated a sample of bromine from 0 °C to 120 °C.

Sketch a heating curve for bromine for this temperature range of 0 °C to 120 °C. Label the heating curve with relevant values of melting point and/or boiling point.

[2]



Section C: LONG STRUCTURED QUESTIONS (20 MARKS)

Answer only **TWO out of three questions** in this section in the spaces provided.

1. Hydrogen chloride is a covalent molecule. At room temperature, it is a colourless gas which forms white fumes of hydrochloric acid upon contact with atmospheric humidity. Therefore, it is extremely corrosive and should be handled with care.

- (a) (i) Draw a dot-and-cross diagram to show the bonding in a molecule of hydrogen chloride.

Note: You only need to show the outer shell electrons.

[1]

- (ii) Hydrogen chloride is a gas.
When it dissolves in water, it forms ions.

hydrogen chloride $\rightarrow$ hydrogen ion + chloride ion

Draw a dot-and-cross diagram to show the structure of a chloride ion.

[1]

- (iii) Hydrogen chloride gas does not conduct electricity. However, an aqueous solution of hydrogen chloride does conduct electricity. Explain why hydrogen chloride behaves differently as a gas and as an aqueous solution.

[2]

.....

- (b) In covalent bonding, a **single bond** involves the sharing of two electrons. A **double bond**, on the other hand, involves the sharing of four electrons.
- (i) Methane, **CH₄**, is a hydrocarbon, which is made up of only carbon and hydrogen atoms covalently bonded together. Methane contains **four single bonds**.

Draw a dot-and-cross diagram to show the structure of **CH₄**.

Note: You only need to show the outer shell electrons.

[2]

- (ii) Another hydrocarbon, ethene, **C₂H₄**, contains **one double bond** and **four single bonds**.

Draw a dot-and-cross diagram to show the structure of **C₂H₄**.

Note: You only need to show the outer shell electrons.

[2]

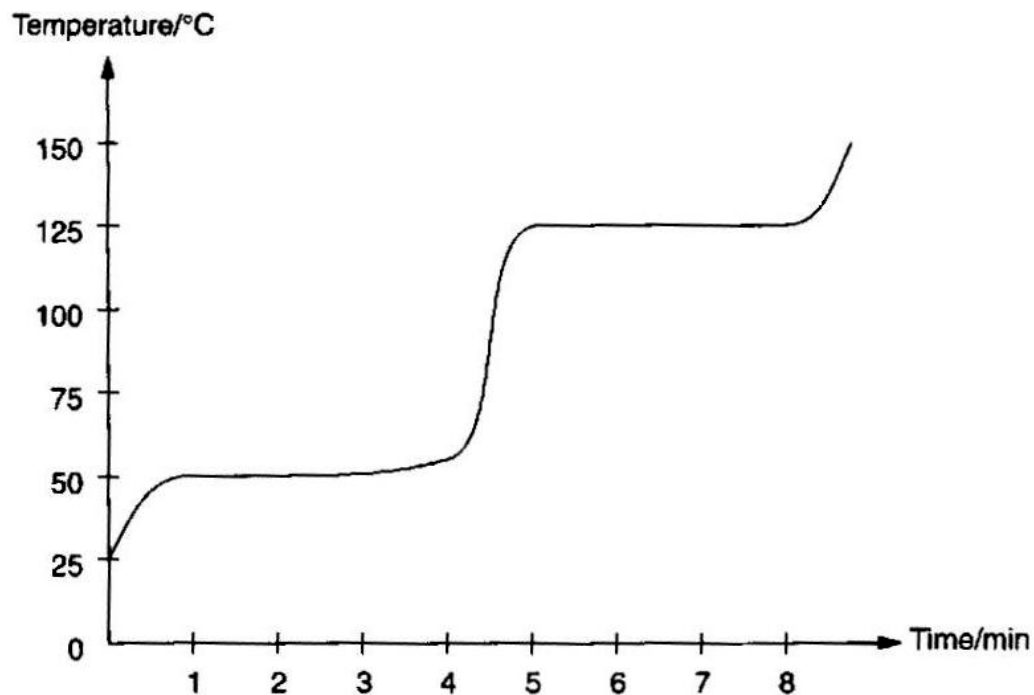
- (iii) Ethene can react with hydrogen gas, **H₂**, to form another hydrocarbon called ethane, **C₂H₆**. Ethane contains **seven single bonds**.

Draw a dot-and-cross diagram to show the structure of **C₂H₆**.

Note: You only need to show the outer shell electrons.

[2]

2. (a) The graph below shows the heating curve of a substance **Q**. The substance started as a solid, melted to become a liquid and later boiled to become a gas.



- (i) What is the freezing point of substance **Q**? [1]

.....

- (ii) At what temperature does both liquid and gas exist together? [1]

.....

- (iii) Describe the arrangement of particles of substance **Q** at 64 °C. [1]

.....

- (b) Dry ice, the solid form of carbon dioxide, is often used as a cooling agent for preserving food. Dry ice sublimates to form carbon dioxide at -78°C .

- (i) Describe and explain the changes that occur in the movement of particles of carbon dioxide when it is heated from -100°C to 0°C . [2]

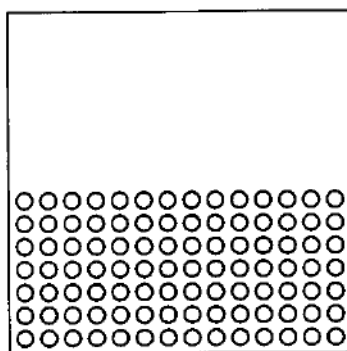
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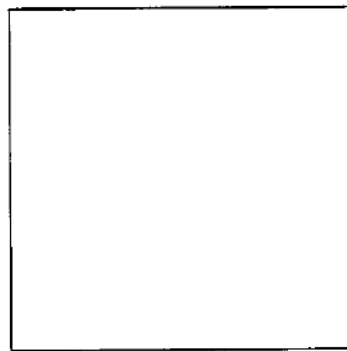
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- (ii) Box **A** represents the arrangement of particles in carbon dioxide at -79°C .

Draw a diagram in box **B** to show the arrangement of particles in carbon dioxide at -77°C . [1]



Box A



Box B

- (c) The particulate model of matter can be used to account for many properties of matter. Explain the following phenomena using this model.

- (i) Steam has a low density. [2]

.....

.....

.....

.....

- (ii) Water can be obtained when steam is compressed. [2]

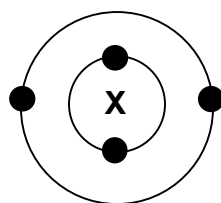
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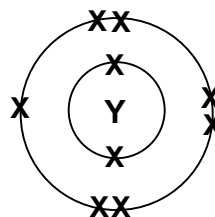
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3. The diagrams below show the atomic structures of two elements **X** and **Y**.



Element **X**



Element **Y**

- (a) Write down the chemical symbol of the ions formed by **X** and **Y**. [2]

Element	Chemical symbol of its ion
X	
Y	

- (b) Suggest the chemical formula of the compound formed between **X** and **Y**. [1]

.....

- (c) Draw a dot-and-cross diagram to show the structure of the compound formed between **X** and **Y**. [2]

- (d) “*The compound of **X** and **Y** has a low melting point.*” Do you agree with the statement? Explain your answer. [2]

.....

- (e) A compound, **Z**, consists of **carbon** and atoms of **Y** chemically bonded together.

- (i) What type of bonding is present in **Z**? [1]

.....

- (ii) Draw the dot-and-cross diagram for compound **Z** in the space below.
Note: You only need to show the outer shell electrons. [2]

END OF PAPER

The Periodic Table of the Elements

Group																	
I	II	III						IV	V	VI	VII	0					
		1 H hydrogen 1															
7 Li lithium 3	9 Be beryllium 4							11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10				
23 Na sodium 11	24 Mg magnesium 12							27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18				
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	127 I iodine 53	131 Xe xenon 54
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	101 Ru ruthenium 44	101 Rh rhodium 45	103 Pd palladium 46	106 Ag silver 47	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	210 Po polonium 84	210 Rn radon 86
133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	210 Po polonium 84	210 At astatine 85	210 Rn radon 86
87 Fr francium	88 Ra radium	89 Ac actinium															

58-71 Lanthanoid series

†90-103 Actinoid series

140 Ce cerium 58	141 Pr praseodymium 59	144 Nd neodymium 60	152 Eu europium 63	150 Sm samarium 62	159 Tb terbium 65	162 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71		
232 Th thorium 90	238 Pa protactinium 91	238 U uranium 92	238 Np neptunium 93	238 Pu plutonium 94	238 Am americium 95	238 Cm curium 96	238 Bk berkelium 97	238 Cf californium 98	238 Es einsteinium 99	238 Fm fermium 100	238 Md mendelevium 101	238 No nobelium 102	238 Lr lawrencium 103

Key

a

X

b

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

*58-71 Lanthanoid series
+90-103 Actinoid series

Key

a

X

b

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

Secondary 2 LSS (Chemistry) EOY MS

Section A

1. A
2. B
3. A
4. B
5. D
6. C
7. A
8. B
9. D
10. C

Section B

1. (a) Isotopes are atoms of the same element [0.5] with the same number of protons but different number of neutrons. [0.5]
(accept: same proton/atomic number, different mass/nucleon number) [1]
- (b) X Neutron
Y Electron
Z Proton [2]
(all correct: 2 marks; each error -1 mark)
- (c) X 18
Y 17
Z 17 [2]
(all correct: 2 marks; each error -1 mark)
2. (a) Q and R. (missing/extra -1/2 each) [1]
- (b) Q and T. (missing/extra -1/2 each) [1]
- (c) S and U. (both: 1 mark) [1]
- (d) P. [1] Full valence/outermost shell. [1] [2]
- (e) S^{2-} . [1]

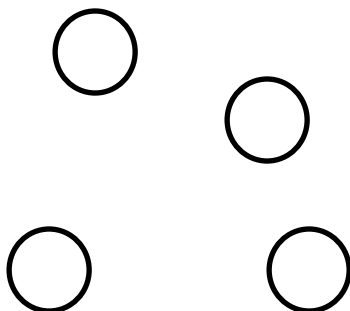
3. (a)	Lead (II) bromide	Ionic	[0.5]
	Methane	Covalent	[0.5]
	Bromine	Covalent	[0.5]
	Sodium chloride	Ionic	[0.5]

(b) Chlorine, methane, bromine. (missing/extra: -1/2 each) [1]

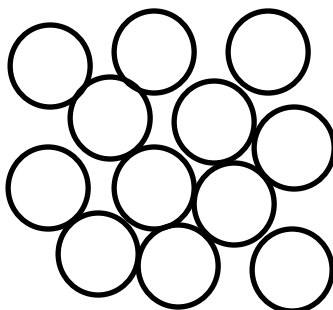
(c) Magnesium oxide [1]

(d) Lead (II) bromide, sodium chloride, magnesium oxide.
(missing/extra: -1/2 each) [1]

(e) (i) In methane Far apart; show disorder [1]



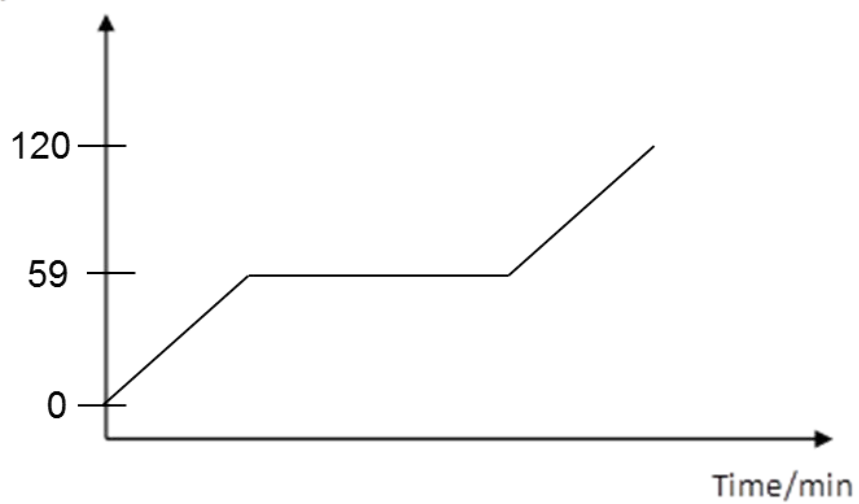
(ii) In bromine Close together; show disorder [1]



(f)

Temperature/°C

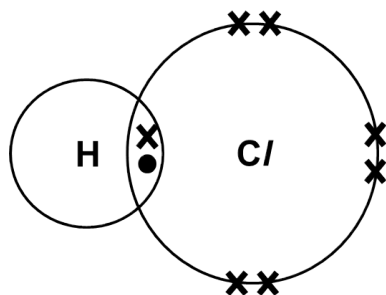
[2]



correct shape (1); correct labelling of boiling point at 59 °C. (1)
wrong labelling of starting and ending temperature (-1/2)

Section C

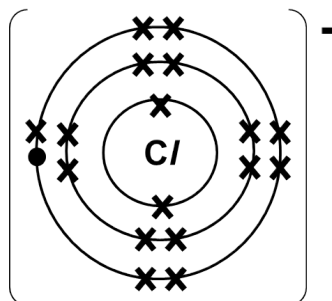
1. (a)
(i)



[1]

Missing electrons/shells (-1); missing chemical symbol (-1); Failure to differentiate electrons of hydrogen and chlorine using dots and crosses (-1/2); showing inner electron shells (-1/2)

(a)
(ii)



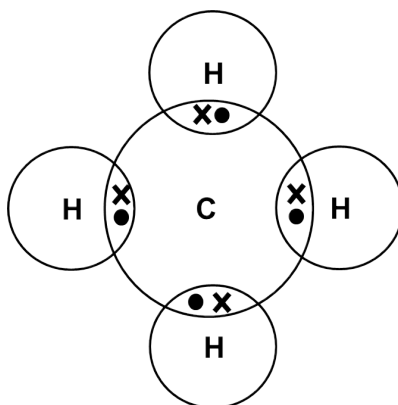
[1]

Missing electrons/shells (-1); missing chemical symbol (-1); missing bracket (-1/2); missing charge for ion (-1)

(a) As a gas, HCl exists as neutral diatomic molecules. [1]
(iii) Upon dissolving in water, HCl ionizes into mobile H^+ and Cl^- ions, which are responsible for electrical conductivity. [1]

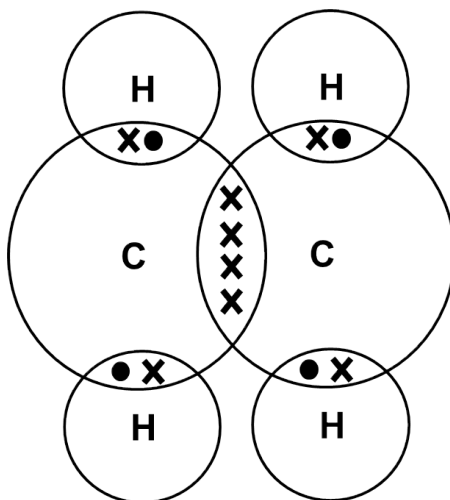
[2]

(b)
(i)



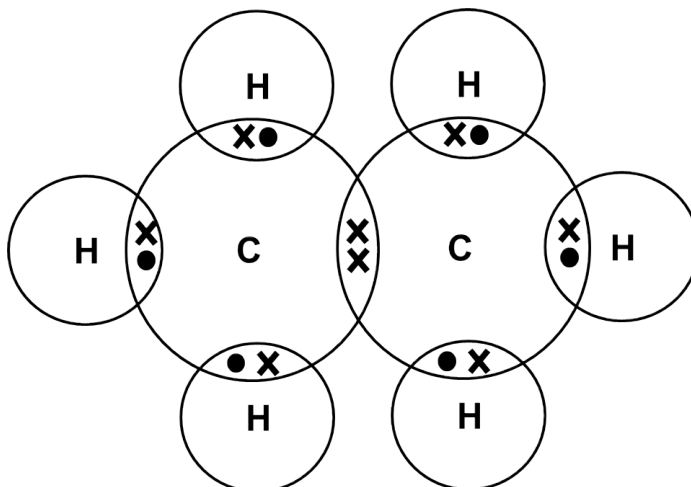
Missing electrons/shells (-2); missing chemical symbol (-2); Failure to differentiate electrons of hydrogen and carbon using dots and crosses (-1); showing inner electron shells (-1)

(b)
(ii)

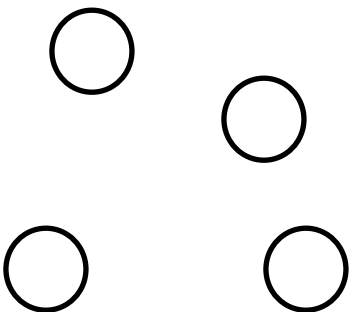


Missing electrons/shells (-2); missing chemical symbol (-2); Failure to differentiate electrons of hydrogen and carbon using dots and crosses (-1); showing inner electron shells (-1)

(b)
(iii)



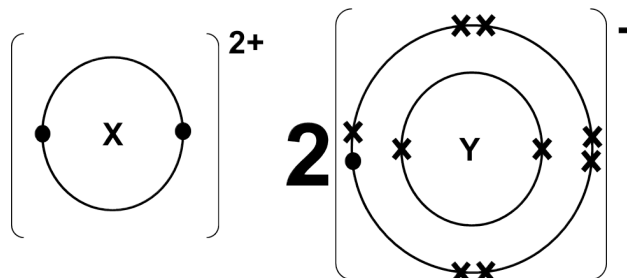
Missing electrons/shells (-2); missing chemical symbol (-2); Failure to differentiate electrons of hydrogen and carbon using dots and crosses (-1); showing inner electron shells (-1)

2. (a)
- (i) 50 °C. (Accept 48 °C to 53 °C) [1]
 - (ii) 125 °C (Accept 125 °C to 128 °C) [1]
 - (iii) Close together [0.5]; disorderly [0.5] [1]
- (b)
- (i) When carbon dioxide is heated, its particles gain energy and start to move more quickly. Their movement changes from vibrating about their fixed positions, [1] to moving randomly and rapidly. [1] [2]
 - (ii) Far apart; show disorder [1]
- 
- (c)
- (i) Steam is a gas. [1/2] In a given volume, the particles will spread out to occupy any available space [1] and there are a lot of empty spaces between particles [1/2]. Hence, steam has low density. [2]
 - (ii) In a given volume, the particles in gaseous state are spaced far apart from one another [1/2]. However, when a pressure is exerted, the particles are now packed closer to one another [1/2], like that of the arrangement of particles in liquid state [1/2]. The forces of attraction between particles become strong again. [1/2] [2]

3. (a) X^{2+} [2]
 Y^- (1 mark each)

(b) XY_2 [1]

(c) [2]



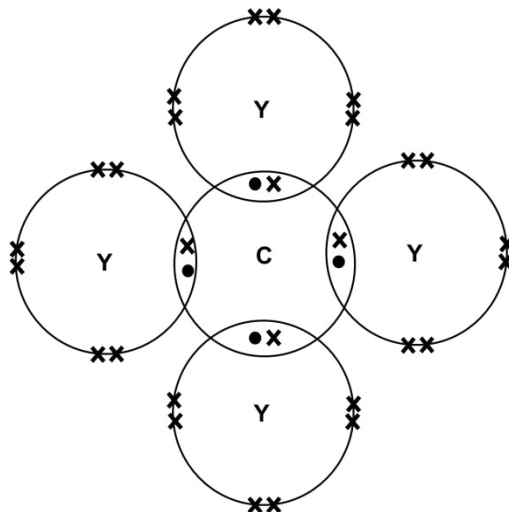
Missing electrons/shells (-2); missing chemical symbol (-2); missing bracket (-1); missing charge for ion (-2); Failure to differentiate electrons of calcium and chlorine using dots and crosses (-1); failure to balance number of calcium and chlorine ions (-1)

(d) No. [1] [2]

Large amounts of energy needed to overcome the strong ionic bonds/
 electrostatic forces of attraction between the ions. [1]

(e) [1]
 (i) Covalent [1]

(ii) [2]



Missing electrons/shells (-2); missing chemical symbol (-2); Failure to differentiate electrons of carbon and Y using dots and crosses (-1); showing inner electron shells (-2); writing fluorine instead of Y (-1)

NAME	CLASS	INDEX No.
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Parent's / Guardian's Signature: _____ Date: _____



ST. PATRICK'S SCHOOL END-OF-YEAR EXAMINATIONS 2014

SUBJECT : GENERAL SCIENCE

DATE : 8 October 2014

LEVEL : SECONDARY 2 EXPRESS

DURATION: 2 HOURS

INSTRUCTIONS TO CANDIDATES

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

1. Write your name, class and index number on the **Question Paper** and the **Optical Answer Sheet** in the spaces provided. **It is also required that you WRITE and SHADE your index number on the Optical Answer Sheet.**
2. This paper consists of **Three (3) Sections : Section A, Section B and Section C.**
3. Answer **ALL** questions in **Section A** on the **Optical Answer Sheet** provided.
4. Answer **ALL** questions in **Section B** in the spaces provided.
5. Answer **ANY THREE FULL** questions out of 4 in **Section C** on the **writing paper** provided. Start each question on a new sheet of paper.
6. Calculators may be used where necessary. **Give answers to Three (3) significant figures.**
7. **DO NOT DETACH** any sections from this paper.
8. At the end of the examination, arrange your answers to **Section C in order** and tie with the string provided.
9. Submit the **Optical Answer Sheet, this paper and answers to Section C SEPARATELY.**

INFORMATION FOR CANDIDATES:

The number of marks is given in brackets [] at the end of each question.

For Examiner's Use Only

Section	A (30 m)	B (40 m)	C (30 m)	Total (100 m)	Grade	Target Grade
Score						

This question paper consists of **26** printed pages.
A copy of the Periodic Table is printed on page 26.

SECTION A: [30 marks]

Each question is provided with **four** possible answers (**A**, **B**, **C** and **D**). Select the most appropriate answer and **shade** your choice on the **Optical Answer Sheet** provided.

- 1 The diagram shows the third period of the Periodic Table.

23 Na Sodium 11	24 Mg Magnesium 12
--------------------------	-----------------------------

27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
-----------------------------	---------------------------	-----------------------------	-------------------------	------------------------------	-------------------------

Moving from left to right across the period, the elements _____.

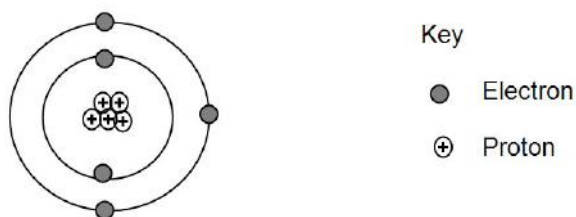
- A** become more acidic
B become more dense
C change from metal to non-metal
D change from gas to liquid to solid
- 2 The table shows the number and the type of atoms in one molecule of different substance.

	Chemical formula	Number of atoms	Type of atoms
I	CF ₄	5	2
II	HBr	2	2
III	H ₂ SO ₄	7	3
IV	S ₈	1	8

Which of the following is **NOT** correct?

- A** **IV** only
B **II** and **III** only
C **I,II** and **III** only
D **I,II, III** and **IV**

- 3 The diagram shows only the protons and electrons in an atom of Boron. The neutrons are not shown.



With the help of the Periodic Table, how many neutrons are there in the nucleus of this atom?

- A 5
B 6
C 10
D 11
- 4 Which of the following can interact with matter to bring about a chemical change?

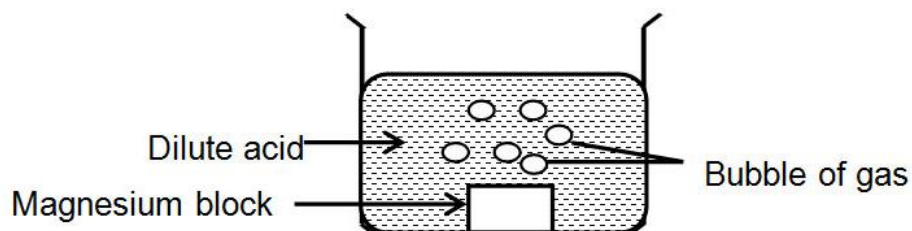
I	energy
II	magnetism
III	matter

- A I only
B II only
C I and III only
D I, II and III
- 5 Indigestion tablets are used to neutralize the gastric juice in our stomach if we have indigestion.

Which one of the following is a possible ingredient found in indigestion tablets?

- A Hydrochloric acid
B Magnesium hydroxide
C Nitric acid
D Sodium chloride

- 6 The diagram shows a magnesium block added into dilute acid.

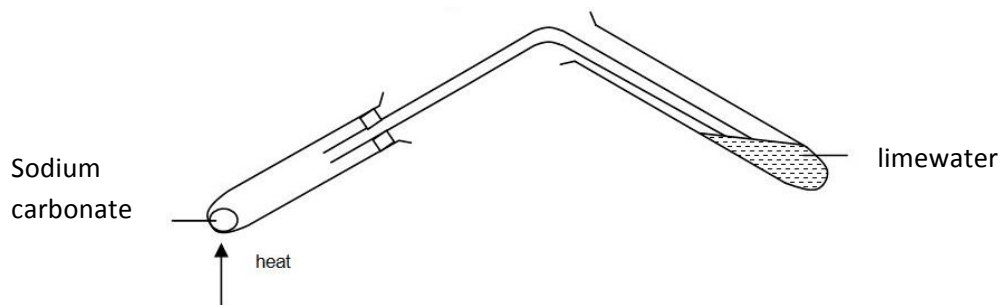


Which of the following statement(s) about this diagram is/are correct?

I	If hydrochloric acid is used, one of the compounds in the solution is magnesium sulfate.
II	The bubbles of gas would produce a 'pop' sound when a lighted splint is used to test its presence.
III	The mixing of substances leads to formation of new substances.
IV	When excess magnesium block remains in the solution, the pH value of the solution will be 7.

- A I
B II
C II, III and IV
D I, II and III

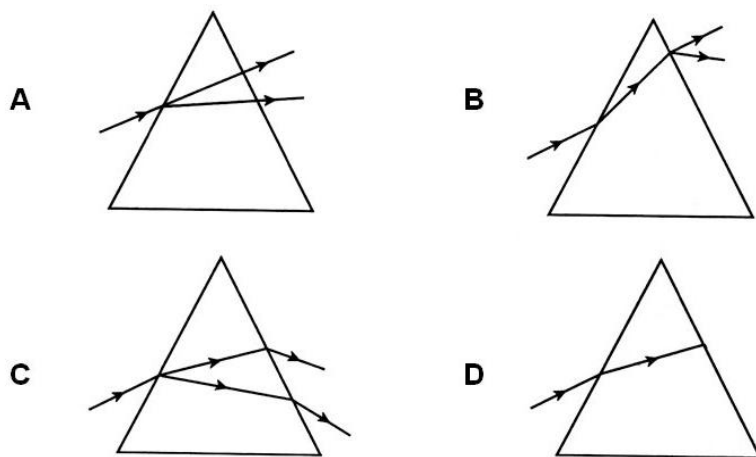
- 7 The diagram shows white sodium carbonate being heated until no more change is seen. The solid left in the test tube is black and the gas released turns limewater chalky.



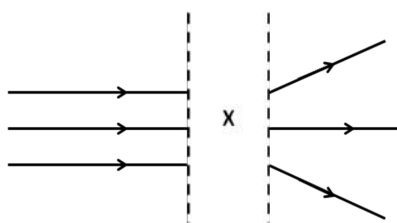
Which one of the following statements is true about this experiment?

- A The experiment shows a combustion reaction.
B The experiment shows a combination reaction.
C The experiment shows the electrolysis of a substance.
D The experiment shows a thermal decomposition reaction.

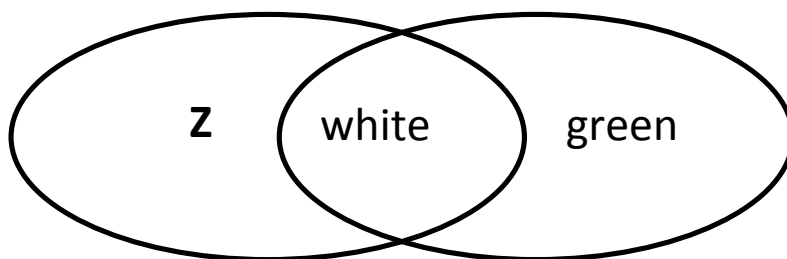
- 8 Which one of the following occurs when white light passes through a prism?



- 9 The diagram shows rays of light passing through an object **X**. What could be **X**?



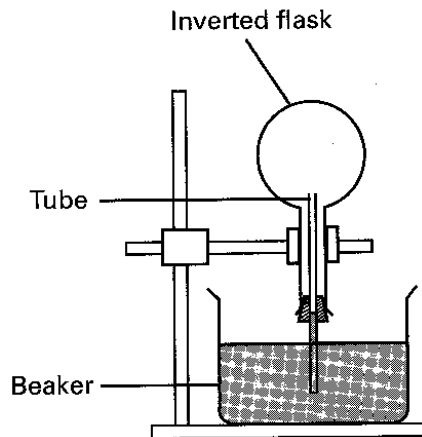
- A** A diverging lens
B A converging lens
C A glass block
D A plane mirror
- 10 Two beams of coloured light, **Z** and green were mixed as shown.



What could the coloured light **Z** be?

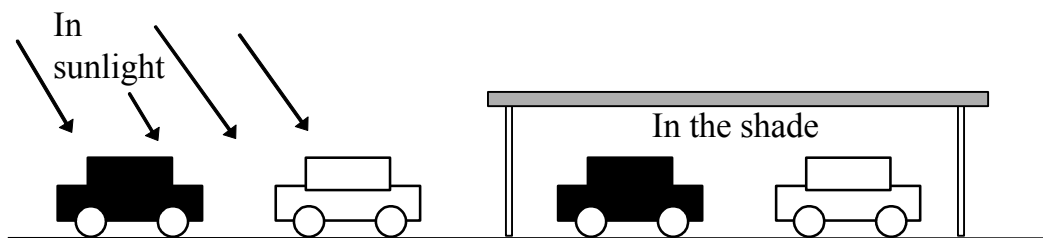
- A** blue
B red
C magenta
D yellow

- 11 The diagram shows an inverted flask containing air. A tube is placed into the flask and then placed in a beaker of water as shown.



What will be observed if ice is placed in contact with the bottom of the inverted flask?

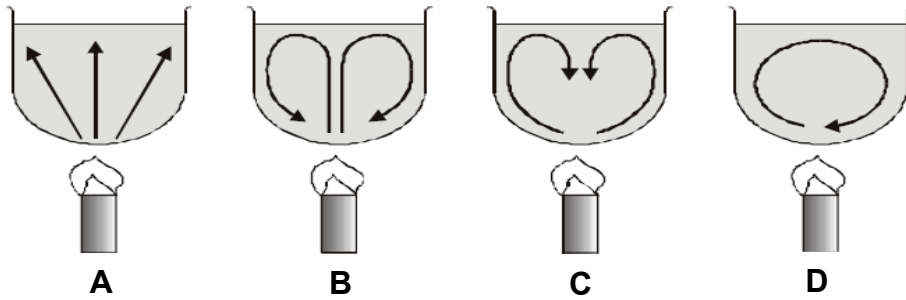
- A Bubbles will be formed in the water.
 - B Nothing will be observed.
 - C The water level in the tube will drop.
 - D The water level in the tube will rise.
- 12 Two cars, one painted dull black and the other a shiny white, were left in the sun. When the two cars had reached the same temperature they were driven into the shade.



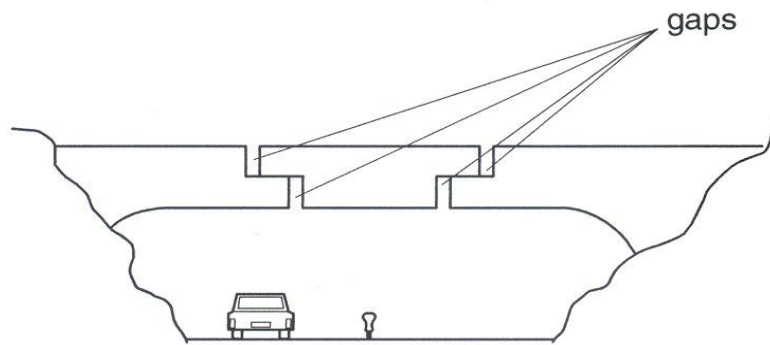
When in the sun, which car was heated up faster? And when in the shade, which car would cool down faster?

- | | In the sun | In the shade |
|---|-----------------------------|-------------------------------|
| A | White car heated up faster. | White car cooled down faster. |
| B | White car heated up faster. | Black car cooled down faster. |
| C | Black car heated up faster. | White car cooled down faster. |
| D | Black car heated up faster. | Black car cooled down faster. |

- 13 Which one of the following best represents the convection currents formed when a liquid in a container is being heated?



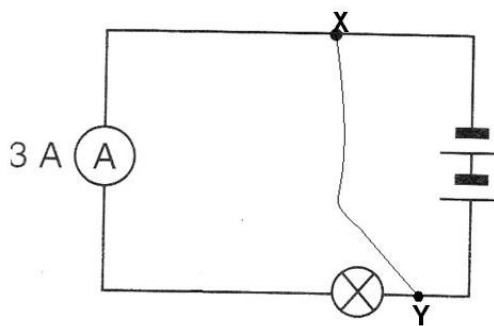
- 14 A bridge above a road is made up of three concrete sections. The middle section rests on two supporting sections but gaps are left on both sides.



What is the main reason for leaving gaps between each concrete section?

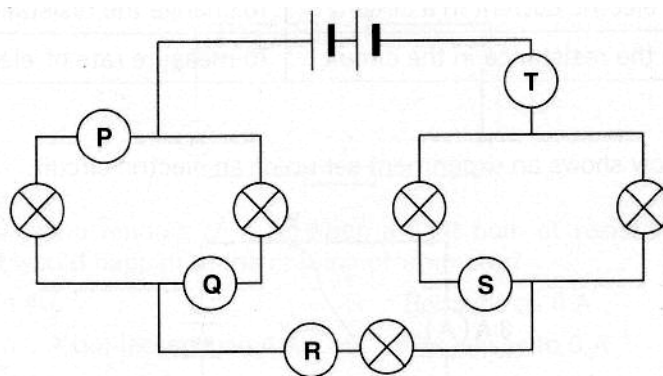
- A to make the bridge wider
 - B to allow room for expansion
 - C to let rain water seep through
 - D to slow down traffic on the bridge
- 15 Which one of the following statement is **incorrect**?
- A Loudness of sound is measured in decibel.
 - B Sound waves cannot travel through a solid.
 - C Sound is characterized by properties of a wave.
 - D Sound requires a medium to be transmitted.
- 16 What is the approximate range of audible frequencies for a young person?
- A 1 Hz to 2 kHz
 - B 20 Hz to 20 kHz
 - C 20 kHz to 200 kHz
 - D 1000 kHz to 20 000 kHz

- 17 The diagram shows an experimental set-up of an electric circuit.



What would happen to the electric circuit when a conducting wire is connected between points **X** and **Y**?

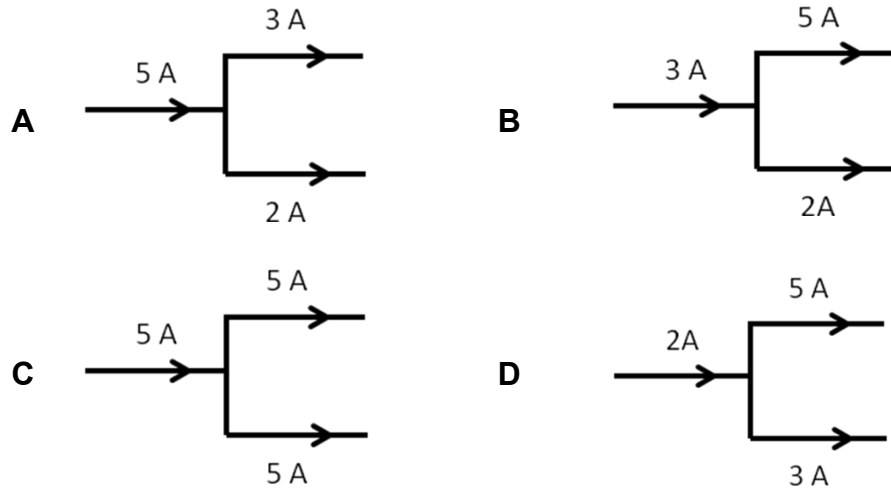
- A** The brightness of the bulb and the reading of the ammeter remain the same.
 - B** The brightness of the bulb decreases but the reading of the ammeter is lesser than 3 A but greater than 0A.
 - C** The brightness of the bulb decreases but the reading of the ammeter is more than 3A.
 - D** There is no brightness for the bulb and the reading of the ammeter becomes zero.
- 18 The diagram shows the arrangement of five ammeters, **P** to **T** in an electric circuit. The circuit contains five identical light bulbs.



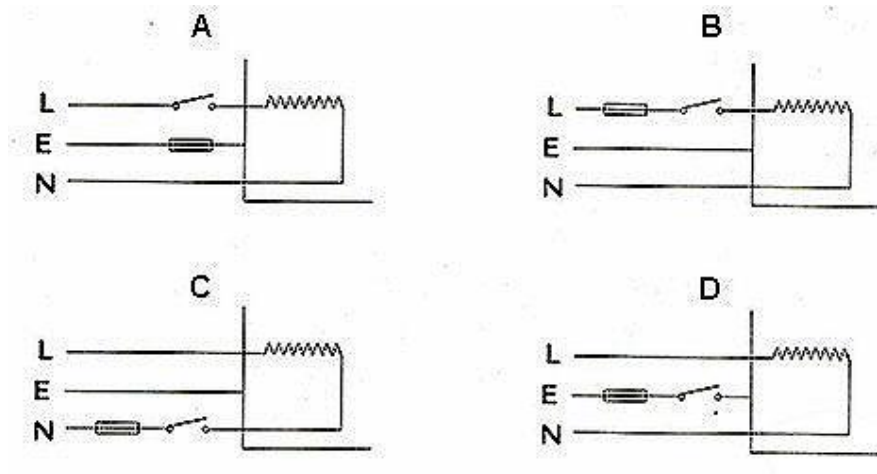
Which of the following ammeters show the same ammeter readings?

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

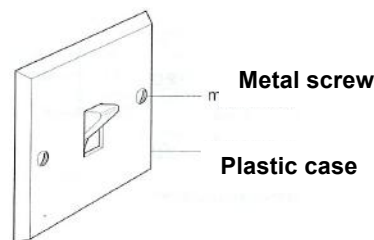
19 Which diagram shows possible currents at a junction in an electrical circuit?



20 Which circuit shows the correct positions for the fuse and switch in the electric heater?

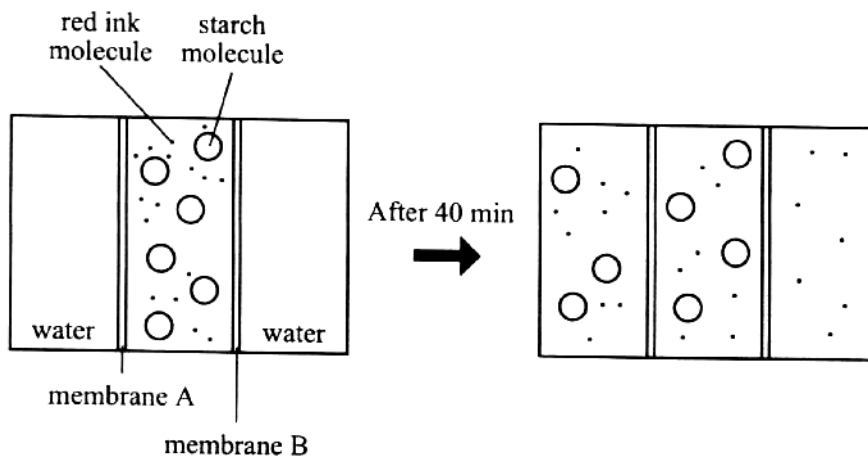


21 The diagram shows an electric switch. This type of switch should not be used in a washroom where there is a lot of moisture on the hand. What is the main reason for this?



- A The metal parts might rust.
- B The moisture might stop the switch working.
- C Soapy water might make the plastic slippery.
- D The switch might give an electric shock when used.

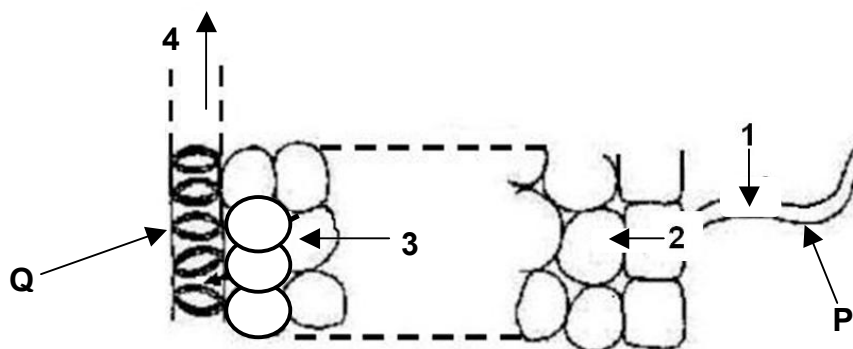
22 Look at the experimental set-up.



Which membrane(s) is/are partially permeable?

- | | | | |
|----------|---------------------------------|----------|------------------------|
| A | Membrane A only | B | Membrane B only |
| C | Membranes A and B | D | None of the membranes |

Refer to diagram for question **23** and **24**.



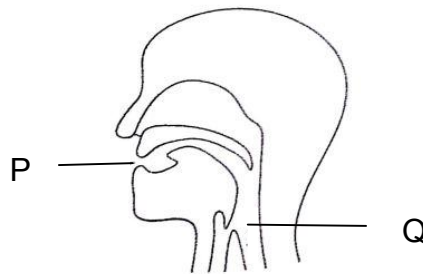
23 Which is the structure shown in **Q** and **P**?

- | | Q | P |
|----------|----------------|----------------|
| A | Phloem | Xylem |
| B | Root hair cell | Phloem |
| C | Phloem | Root hair cell |
| D | Xylem | Root hair cell |

24 The diagram shows the pathway of water movement from the soil to the leaves of a plant. Osmosis occurs in

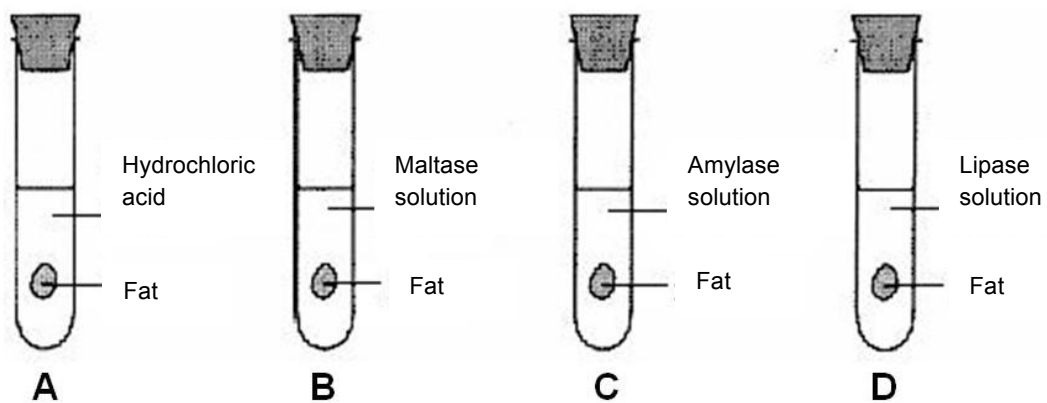
- | | | | |
|----------|---------------------------------------|----------|---|
| A | 1 and 2 only | B | 3 and 4 only |
| C | 1 , 2 and 3 only | D | 1 , 2 , 3 and 4 |

- 25** Solid food is chewed at **P** and enters the oesophagus at **Q**.



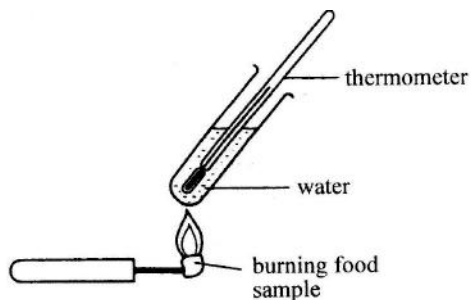
How does the food at **Q** differ from the food at **P**?

- A** It contains less protein.
 - B** It contains more starch.
 - C** It has larger surface area.
 - D** It has larger particles.
- 26** The diagrams show apparatus used to investigate enzyme action.



The tubes were kept at 37 °C. Which tube contained the least fat after 2 hours?

- 27 Four equal masses of different food were burned as shown.



The temperature of the water was measured before and after each experiment and recorded as shown.

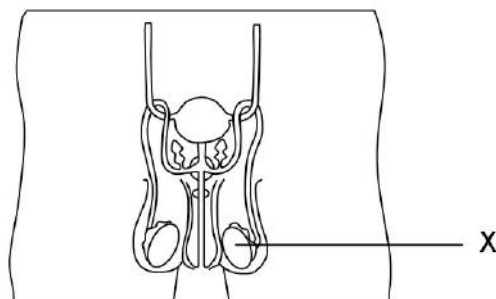
Food sample	Water temperature/ °C	
	at start	at end
P	18	50
Q	16	97
R	19	35
S	18	80

Which food sample probably contains:

- (i) the most amount of fat?
(ii) the least amount of fat?

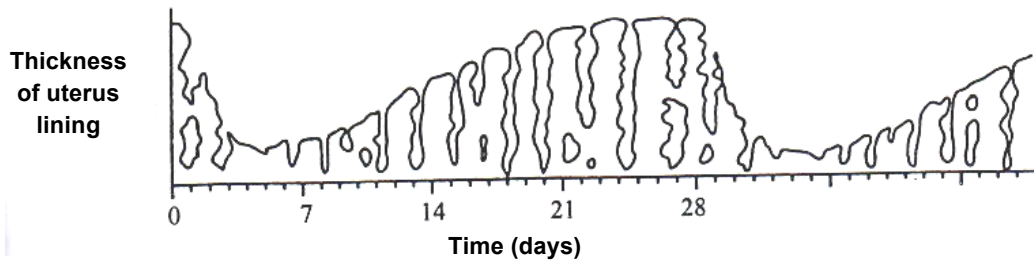
	(i)	(ii)
A	Q	R
B	R	S
C	Q	P
D	S	R

- 28 The diagram shows part of the male reproductive system. What is the function of **X**?



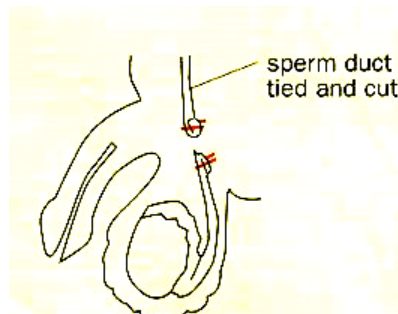
- A** to store sperms
B to produce fluids
C to produce sex hormones
D to transport sperms to the urethra

- 29** The diagram shows the changes in lining of the uterus during the menstrual cycle.



On which day would intercourse likely to result in pregnancy?

- A** Day 7
 - B** Day 14
 - C** Day 21
 - D** Day 28
- 30** Name the contraception method used in the following diagram.

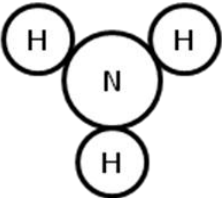
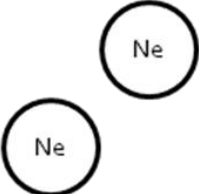


- A** Vasectomy
- B** Spermicides
- C** Tubal ligation
- D** Intrauterine contraceptive device

SECTION B: [40 marks]

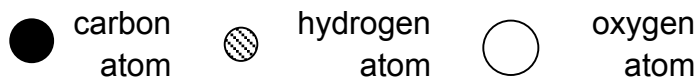
Answer **ALL** the questions in the spaces provided.

1 (a) Write the chemical formula for the following diagrams.

	Diagram	Formula
(i)		
(ii)		

[2]

(b) Using the following symbols,

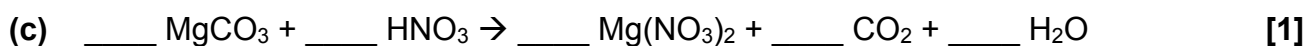


Draw the diagrams of the molecules to represent the following chemical formula.

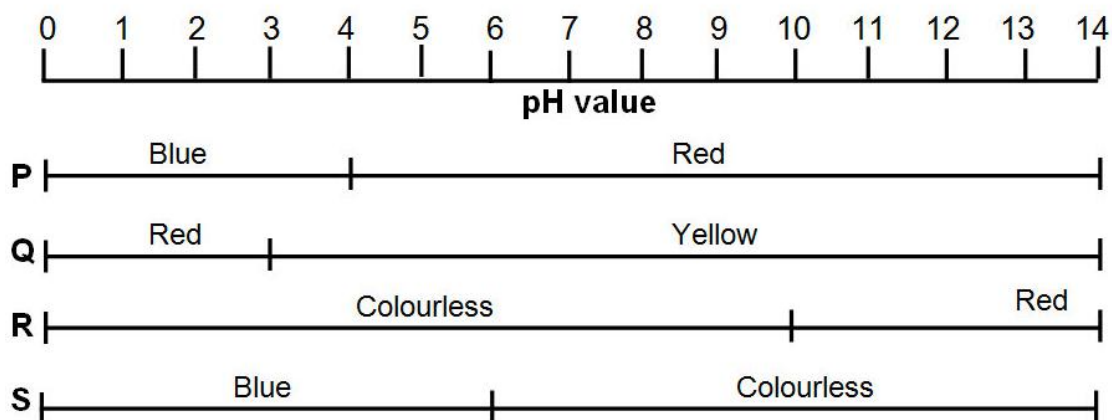
	Formula	Diagram
(i)	CO	
(ii)	CH ₄	
(iii)	C ₂ H ₄	

[3]

2 Balance the following chemical equations by putting the correct values in the blanks.



- 3 The figure shows four different types of indicators, **P** to **S**, with their corresponding colour changes.



The pH values of some common substances is shown in the following table.

Substance	Detergent solution	Lime juice	Sulfuric acid	Distilled water
pH	11	5	2	7

By writing the code letters of the indicators, answer the following questions.

- (a) Which indicator(s) would give the same colour in detergent solution?

[1]

- (b) Which indicator (s) would become colourless in distilled water?

[1]

- (c) Which substance(s) would cause indicators **P** and **S** to turn blue?

[1]

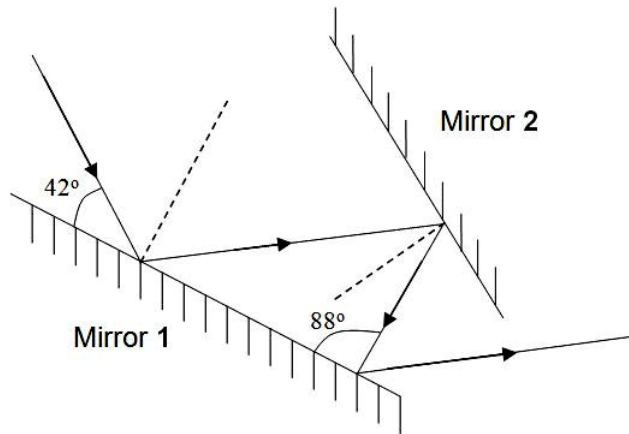
- (c) Using indicator **P**, William wants to test if lemons are acidic.

State whether **P** is a suitable indicator for the test. Explain your answer.

[2]

- 4 (a) The diagram shows a light ray reflected by two mirrors, 1 and 2 in an experiment.

Diagram is not drawn to scale.



- (i) Find the angle of incidence when the light ray first falls on mirror 1.

_____ [1]

- (ii) Showing your working clearly, find the angle of reflection on mirror 2.

_____ [2]

- (b) The diagram shows a pebble placed at the bottom of an empty tank as shown in Figure I.

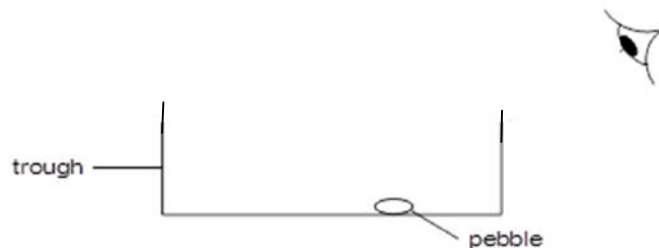


Figure I

- (i) Explain why the observer is unable to see the pebble.

_____ [1]

- (ii) Water is now added into the trough, as shown in Figure II. The observer is now able to see the pebble.

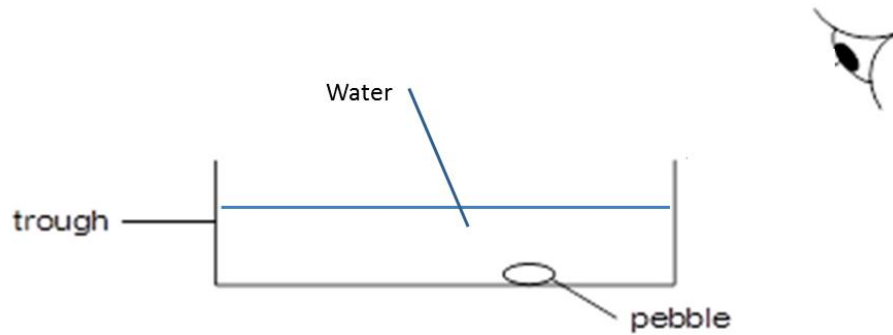


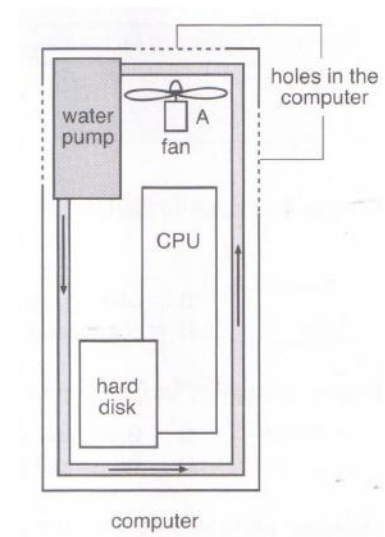
Figure II

On Figure II, draw the ray diagram to show how the observer is able to see the pebble.

[3]

- 5 The diagram shows how water is used to cool the inside of a gaming computer.

Water is pumped through a pipe in the computer. When the computer is in use, the CPU becomes hot. It loses its thermal energy to the water flowing in the pipe placed near it.



- (a) How is the heat transferred from the CPU to the water in the pipe?

[1]

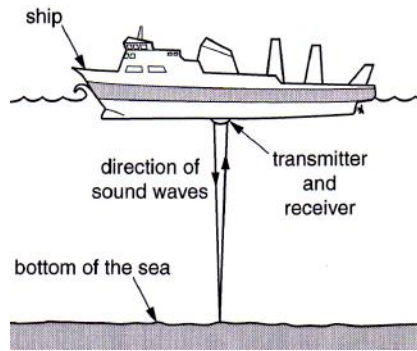
- (b) State a suitable metal for the pipe and briefly explain your answer.

[2]

- (c) The metal pipes are painted black. Explain why.

[1]

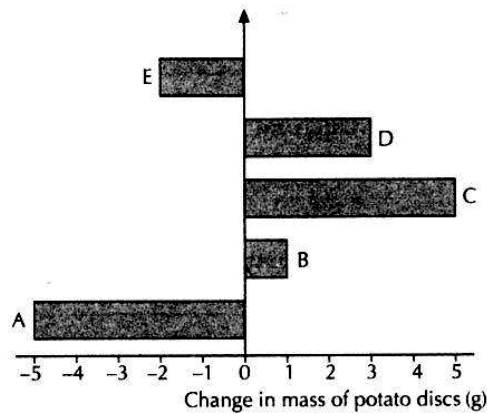
- 6 The figure shows a device that is used to measure the depth of the sea beneath a ship. The speed of sound in water is 1500 m/s and the time between the sound being transmitted to the bottom of the sea and being detected by the receiver is 1.6 s.



Calculate the distance between the ship and the bottom of the sea.

[3]

- 7 Five freshly cut potato discs (**A** to **E**) each weighing 10 g were immersed in sucrose solutions of different concentrations for 2 hours. They were then removed from the solutions, dried and weighed again. The change in mass of each disc was recorded in a bar chart as shown.



- (a) Which potato disc was immersed in sucrose solution of

(i) the highest concentration: _____

(ii) the lowest concentration: _____

[2]

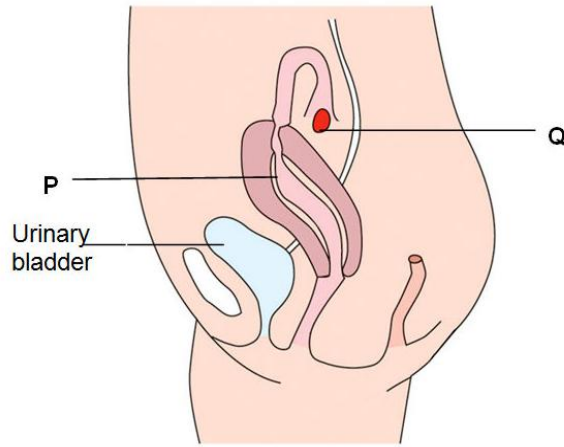
- (b) Explain how you arrived at the answers in (a).

[4]

- (c) What would happen to the mass of the potato disc if it was immersed in sucrose solution of equal concentration to its cells?

[1]

8 The following shows a diagram of the female reproductive system.



(a) Name structures **P** and **Q**.

(i) **P:** _____

(ii) **Q:** _____ [2]

(b) Study the diagram and explain why a woman has a greater tendency to feel the urge to urinate when she is pregnant.

_____ [1]

(c) Using the letter "**R**", label clearly on the diagram the part where an intra-uterine device (IUD) is placed. [1]

(d) Based on your understanding of development in human body, explain why a 5 year old girl is theoretically unable to be pregnant.

_____ [2]

SECTION C: [30 marks]

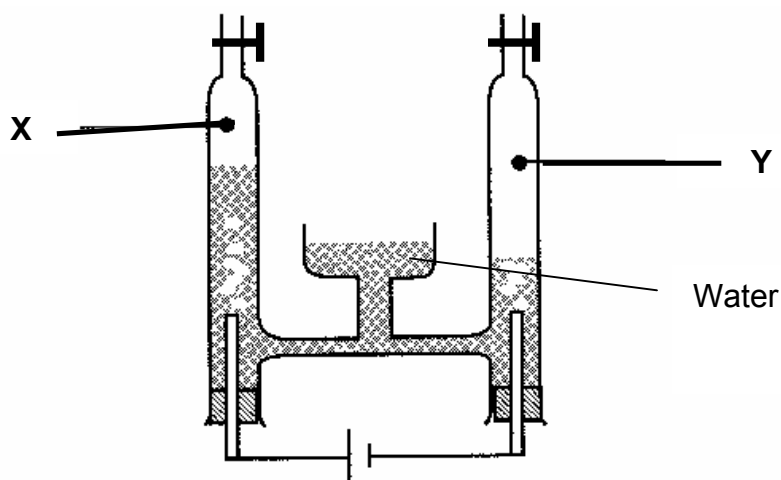
Answer any **THREE** questions in this section on the writing paper provided.

- 1 (a) In an experiment, calcium carbonate is added into dilute hydrochloric acid solution, and a gas is given off.

- (i) State two physical properties of an acid. [2]
- (ii) Write the word equation for the reaction. [1]
- (iii) Describe a chemical test for the gas produced. [2]
- (iv) State the chemical formula of calcium carbonate and hydrochloric acid. [2]

- (b) The diagram shows another experimental setup. The apparatus is filled with water, and an hour later, two different gases, **X** and **Y** were produced.

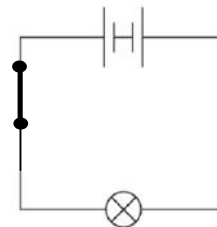
The volume of gas **Y** produced was *twice* that of gas **X**.



- (i) There is a chemical change taking place inside the apparatus. What causes the change to take place? [1]
- (ii) Identify gases **X** and **Y**. Explain your answer. [2]

- 2 (a) A doctor wants to use a small torch to look down the student's throat. When he switches the torch on, it does not work.

The figure shows the circuit diagram for the torch.



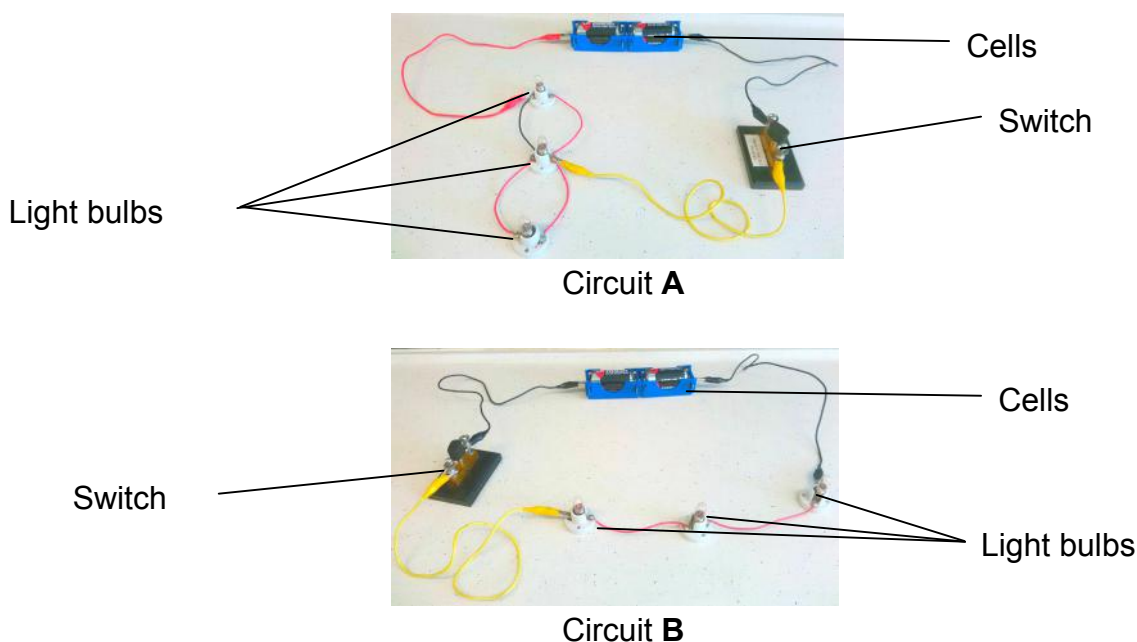
- (i) State why the torch does not work, even though all electrical components are working. [1]

- (ii) By correcting the fault stated in (i), draw the correct circuit diagram. Include in your diagram, the electrical components to measure

- the current through the bulb
- the potential difference across the bulb

[3]

- (b) The figure shows three identical light bulbs connected in two different ways as shown in circuits A and B.

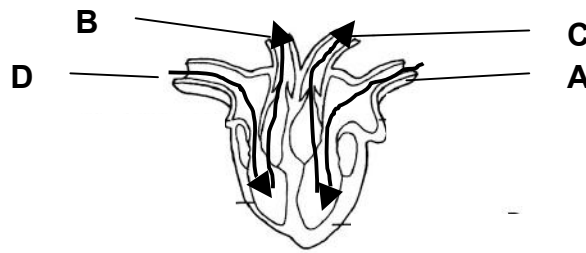


- (i) Compare the brightness of the light bulbs in both circuits and state which circuit will have brighter light bulbs. Explain your answer. [3]

- (ii) State one advantage of connecting the light bulbs as shown in circuit A. [1]

- (iii) If each light bulb has a resistance of $2\ \Omega$, and the voltage of the cell is $2\ \text{V}$, calculate the current drawn from the cells in circuit A. [2]

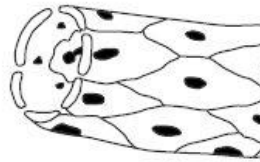
- 3 The diagram shows the heart and the arrows show the flow of blood in the heart. **A**, **B**, **C** and **D** are blood vessels.



- (a) (i) State which of the above blood vessels are arteries and which are veins. [2]

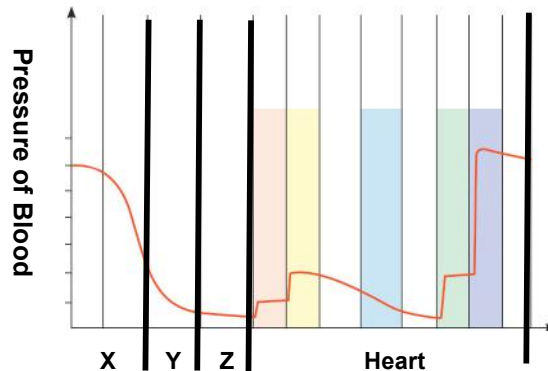
- (ii) Explain your answer in (a)(i). [2]

- (b) The diagram shows a short length of a blood capillary.



Explain how the wall is suited to the functions of this blood vessel. [2]

- (c) The figure shows the pressure of the blood as it passes through the blood vessels and heart.

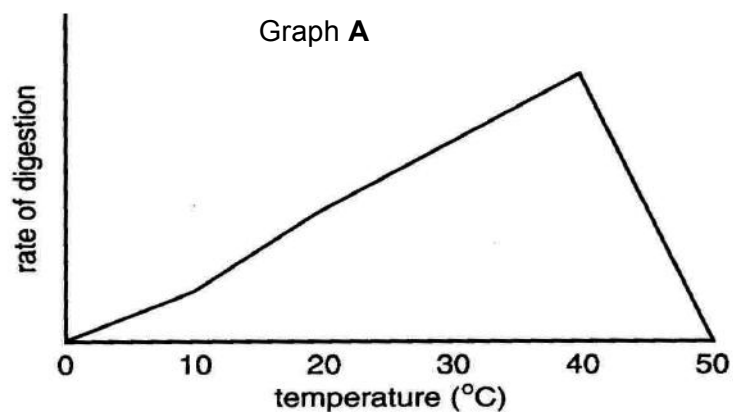


- (i) Copy the table below onto your writing paper and state which labelled section (**X**, **Y** and **Z**) of the graph shows the correct pressure of the blood as it passes through the different blood vessels:

Part	X, Y or Z
Arteries	
Capillaries	
Veins	

- (ii) Explain how blood pressure might be affected by eating foods rich in animal fats and cholesterol. [2]

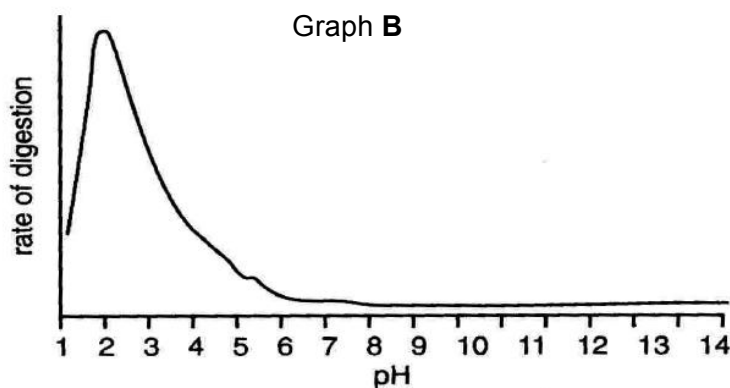
- 4 (a) Enzymes are affected by temperature.



Graph A shows the effect of temperature on the rate of digestion.

- (i) At what temperature is the enzyme most active? [1]
- (ii) State the range of temperature where the rate of digestion falls sharply. [1]
- (iii) Briefly explain why the rate of digestion falls sharply stated in (a)(ii). [1]

- (b) Enzymes are also affected by pH.



Graph B shows the effect of pH on the rate of digestion.

- (i) State the pH at which the enzymes are most active. [1]
- (ii) What is secreted in the stomach to give the pH value in (b)(i) so that the enzymes can perform optimally? [1]

- (c) The table shows how the amount of nutrients in food changes as the food gets digested in the alimentary canal. The initial amount of each nutrient is 10 g.

Initial Amount of Nutrient	Mouth	Organ X	Small Intestine
Protein (10 g)	Remains at 10 g	10 g drops to 7 g	7 g drops to 0 g
Fats (10 g)	Remains at 10 g	Remains at 10 g	10 g drops to 0 g
Starch (10 g)			

- (i) Using the information given in the table, identify organ **X** and explain your answer. [2]

- (ii) Study the table and predict the amount of starch present in

- mouth
- Organ **X**
- small intestine

[2]

- (iii) Copy and complete the following equation which shows the digestion of fats in the small intestine.

Fats → 3 molecules of _____ + 1 molecule of _____

[1]

~ End of Paper ~

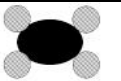
[illegible]

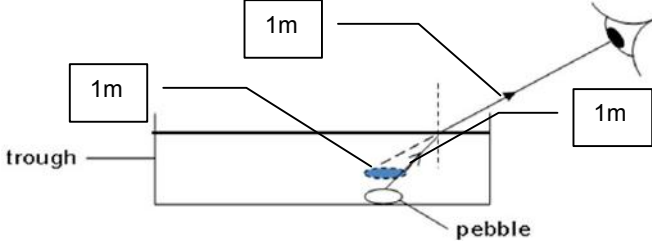
The volume of one mole of any gas is 24 dm^3 at room temperature and

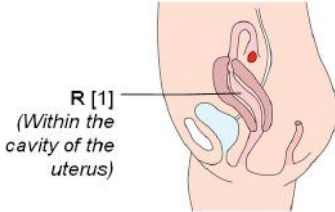
SECTION A [30 marks]

1	2	3	4	5	6	7	8	9	10
C	A	B	C	B	C	D	C	A	C
11	12	13	14	15	16	17	18	19	20
D	D	B	B	B	B	B	D	A	B
21	22	23	24	25	26	27	28	29	30
D	B	D	C	C	D	A	C	B	A

SECTION B [40 marks]

1	(a)(i)	H ₃ N OR NH ₃	[1]
	(ii)	Ne OR 2 NE	[1]
		- for (a), do inform the class the correct arrangement of atoms for ammonia, and all formulas should be in the simplest ratio	
	(b)(i)		[1]
	(ii)		[1]
	(iii)		[1]
		- for (b), ignore the incorrect size; no marks awarded if the patterns drawn are incorrect	
2	(a)	N ₂ O + 4 H ₂ → 2 NH ₃ + H ₂ O	[1]
	(b)	CH ₄ + 2 O ₂ → CO ₂ + 2 H ₂ O	[1]
	(c)	MgCO ₃ + 2 HNO ₃ → Mg(NO ₃) ₂ + CO ₂ + H ₂ O	[1]
		- accept answers as long as they are balanced, but inform class it must always be in simplest ratio	
3	(a)	P and R	[1]
	(b)	R and S	[1]
	(c)	Sulfuric acid	[1]
	(d)	No [1] Indicator P change at pH 4, but the pH of lime juice is at 5 OR pH 5 is still acidic [1]	[2]
		- for (d), if answer is yes, no marks awarded for entire part - candidate must state the range where the indicator does not cover for pH, to be awarded the 1m	
4	(a)(i)	48 °	[1]

	(ii)	Working [1] Answer [1] Answer = 25 °	[2]
	(b)(i)	The side of trough blocking light [1/2m] Light travels in straight lines [1/2m]	[1]
		- for b (i), accept also the side of trough is opaque	
	(ii)	 - no OR wrong direction arrows: -1/2 m - image not clearly above: -1m - if image drawn wrongly, NO marks awarded	[3]
5	(a)	Conduction [1/2m] Radiation [1/2m]	[1]
	(b)	Aluminium [1] The material is a good heat conductor [1] - wrong type of metal stated, NO marks awarded for entire part	[2]
	(c)	Black is a good radiator/emitter of heat [1] - if state only black is good absorber [1/2] only	[1]
6		$d = 1500 \times 1.6$ [1] $= 2400 / 2$ [1] $= 1200 \text{ m}$ [1]	[3]
7	(a)(i)	A	[1]
	(ii)	C	[1]
	(b)	Potato disc A showed the most decrease in mass compared to the other potato discs. This means that Potato disc A had lost the most water due to osmosis. [1] Therefore the solution that Potato disc A was immersed in must have had the lowest water potential / potato has higher water potential than sucrose solution. [1] Potato disc C showed the most increase in mass compared to the other potato discs. This means that Potato disc C had the most number of water molecules entering into its cells by osmosis. [1] Therefore the solution that Potato disc C was immersed in must have had the highest water potential / potato has lower water potential than sucrose solution. [1]	[4]

		Note that “water concentration” is accepted.	
	(c)	The mass of the potato disc will remain unchanged / nothing will happen to the mass	[1]
8	(a)(i)	P: Uterine lining / Lining of the uterus	[1]
	(ii)	Q: Ovary (<i>Must be singular</i>) Ovaries: $\frac{1}{2}$ M	[1]
	(b)	Weight of foetus is acting on the (urinary) bladder Reject: - Bladder shrinks - Bladder enlarges	[1]
	(c)	 R [1] (Within the cavity of the uterus)	[1]
	(d)	She has not undergone puberty [1], hence has yet to produce female sex hormones [1] and gametes/ ova [1]. Max: [2]	[2]

Section C [30 marks]

1	(a)(i)	[Any 2 acceptable answers.] § Sour § Good conductor of electricity § Turns blue litmus red. § Corrosive. - pH less than 7 NOT accepted	[2]
	(ii)	Calcium carbonate + hydrochloric acid → carbon dioxide + water + calcium chloride - reactants correct – 1/2 m - products correct – 1/2 m	[1]
	(iii)	Bubble into limewater [1] White precipitate is seen in limewater [1] - accept chalky NOT milky	[2]
	(iv)	CaCO₃ [1] HCl [1] - if chemical reaction is given, just mark the reactants	[2]
	(b)(i)	Electricity - Electrolysis not allowed	[1]
	(ii)	Y = Hydrogen gas, X = Oxygen gas [1] There is 2 atoms of hydrogen to 1 oxygen atom in each water molecule [1] - ECF; if first part wrong, NO marks awarded for entire (bii)	[2]

	(b)	The <u>one-cell</u> thick walls [1] allow <u>diffusion of substances easily</u> [1]. - diffusion and easily/efficiently/faster must be present to be awarded 1m for second part - independent marking	[2]				
	(c)(i)	Artery – <u>X</u> Capillary – <u>Y</u> Vein – <u>Z</u> - all correct: 2 m - 1 wrong: 1 m - 2 wrong: 0 m	[2]				
	(ii)	increase accumulation of fats in the blood vessels [1], causing blood vessels to constrict / causing blockage [1]	[2]				
4	(a)(i)	40°C. - +/- 1 °C	[1]				
	(ii)	Between 40°C to 50°C - +/- 1 °C	[1]				
		Wrong or missing units = -1/2 m each					
	(iii)	The enzymes becomes denatured after pH 2.	[1]				
	(b)(i)	pH 2 - range is 1.9 to 2.1 accepted	[1]				
	(ii)	hydrochloric acid	[1]				
	(c)(i)	Stomach [1] No lipase present, but protease is present in stomach [1]	[2]				
	(ii)	<table border="1"> <tr> <td>Starch (10 g)</td> <td>10 g to 5 g</td> <td>Remain at 5 g</td> <td>5 g to 0 g</td> </tr> </table> - Entire row : 2 m - 1 mistake: 1 m - 2 mistakes: 0 m - the last component must be 0 to be marked correct	Starch (10 g)	10 g to 5 g	Remain at 5 g	5 g to 0 g	[2]
Starch (10 g)	10 g to 5 g	Remain at 5 g	5 g to 0 g				
	(iii)	Fats → 3 molecules of Fatty Acids + 1 molecule of Glycerol - no 1/2 marks awarded	[1]				



YUHUA SECONDARY SCHOOL

CANDIDATE NAME			
CLASS	2E	INDEX NUMBER	

END OF YEAR EXAMINATION 2014

Secondary Two Express

SCIENCE

PAPER 1

1 hour

ADDITIONAL MATERIALS: OTAS Sheet
Electronic Calculator

INSTRUCTIONS TO CANDIDATES

Do not open until you are told to do so.

Write in soft pencil.

Do **not** use staples, paper clips, highlighters, and glue or correction fluid.

Write your name, class and register number in the spaces provided at the top of this page and on the OTAS sheet provided.

There are **forty** questions in 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 OTAS sheet.

INFORMATION FOR CANDIDATES

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.

At the end of the examination, submit the OTAS and this question paper separately. A periodic table is attached on page 16.

Gravity is considered as 10 N/kg unless otherwise stated.

Values are to be left in 3 significant figures unless otherwise stated.

This question paper consists of 16 printed pages.

[Turn over]

1 Which of the following is **not** a chemical change?

- A Heating an egg over a stove.
- B Chopping a piece of garlic into smaller pieces.
- C A plant carrying out photosynthesis.
- D Adding urine to an acidic jellyfish wound.

2 The colour of universal indicator at different pH values is given below.

pH	1	4	11
Colour	Red	Yellow	Blue

What are the colours observed when a few drops of Universal indicator are added separately to dilute hydrochloric acid, vinegar and aqueous sodium hydroxide?

	Hydrochloric acid	Vinegar	Sodium hydroxide
A	Blue	Yellow	Red
B	Red	Yellow	Blue
C	Red	Blue	Yellow
D	Yellow	Red	Blue

3 Carbon monoxide is a pollutant emitted from car exhausts.
Why is it harmful to humans?

- A It has no colour, taste or smell.
- B It has a corrosive action on lung tissue.
- C It forms a stable compound with blood.
- D It combines with oxygen in the lungs.

- 4 Which one of the following is an example of a reaction where matter and heat interact?

A Photosynthesis B Respiration
C Electroplating D Neutralisation

- 5 The proton number of aluminium, Al, is 27 and it is in Group III.
What is the likely formula for aluminium oxide?

A Al_2O B Al_2O_3
C AlO D AlO_2

- 6 The proton numbers of three elements are given below.

Element	X	Y	Z
Proton number	19	20	16

Which of the following sets correctly represents the ions formed by these elements?

A X^- , Y^{2+} , Z^{2+} B X^+ , Y^{2-} , Z^{2+}
C X^+ , Y^{2+} , Z^{2-} D X^{2-} , Y^+ , Z^{2-}

- 7 Which ionic equation represents the neutralisation of dilute nitric acid and potassium hydroxide?

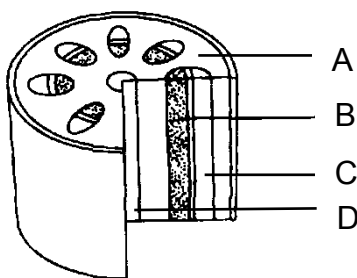
A $\text{KOH(aq)} + \text{HNO}_3\text{(aq)} \rightarrow \text{KNO}_3\text{(aq)} + \text{H}_2\text{O(l)}$
B $\text{OH}^-\text{(aq)} + \text{HNO}_3\text{(aq)} \rightarrow \text{NO}_3^-\text{(aq)} + \text{H}_2\text{O(l)}$
C $\text{K}^+\text{(aq)} + \text{NO}_3^-\text{(aq)} \rightarrow \text{KNO}_3\text{(aq)}$
D $\text{H}^+\text{(aq)} + \text{OH}^-\text{(aq)} \rightarrow \text{H}_2\text{O(l)}$

- 8 A word equation is shown below.



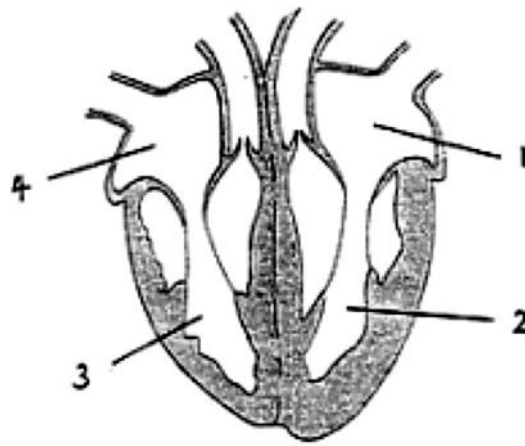
What is the balanced chemical equation for this reaction?

- A $\text{C} + \text{CO}_2 \rightarrow 2\text{CO}$
 B $2\text{C} + \text{CO}_2 \rightarrow 2\text{CO}$
 C $2\text{C} + \text{CO} \rightarrow 2\text{CO}_2$
 D $\text{C} + \text{CO}_2 \rightarrow \text{C}_2\text{O}_2$
- 9 The micrograph below shows a cross-section of part of a stem. Which tissue transports water and mineral salts?



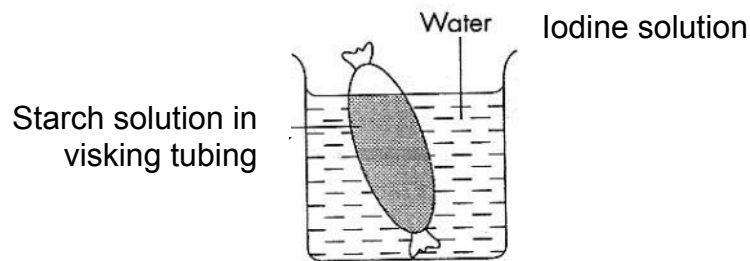
- 10 Which of the following processes described below does **not** involve diffusion?

- A The absorption of digested food substances from the small intestine to the bloodstream.
 B The movement of gases in and out of a leaf.
 C The transfer of carbon dioxide from the capillaries to the air sacs in the lungs.
 D The transport of water molecules up the xylem vessels.
- 11 The diagram shows a section through a human heart. Which is the correct flow of blood through the heart from the rest of the body?



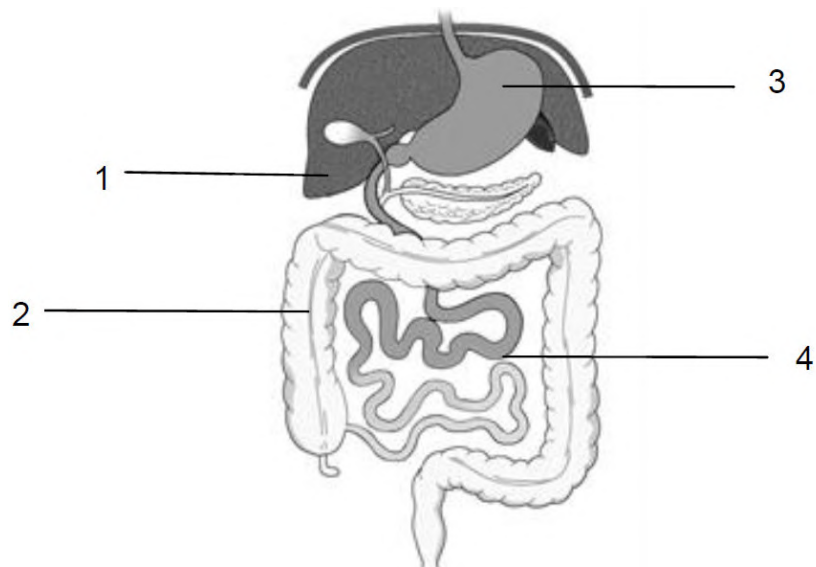
- | | | | |
|---|---------|---|---------|
| A | 1→2→3→4 | B | 3→4→2→1 |
| C | 4→3→1→2 | D | 1→2→4→3 |

- 12** The apparatus shown below was set up and left for two hours.
Which of the following shows the correct colouration after two hours?



- | | In visking tubing | In beaker |
|---|--------------------------|------------------|
| A | Brown | Brown |
| B | Blue black | Brown |
| C | Blue Black | Blue black |
| D | Brown | Blue black |

- 13** The diagram shows part of the human alimentary canal.
Which structure(s) is/are involved in protein digestion?



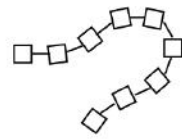
- | | | | |
|---|---------|---|---------|
| A | 3 only | B | 2 and 3 |
| C | 3 and 4 | D | 4 only |

14 Which of the following substance(s) have to be digested before it is absorbed into the bloodstream?

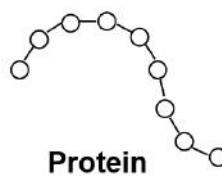
- I Amino acids
- II Glucose
- III Starch
- IV Fatty acids

- | | | | |
|---|------------|---|------------|
| A | III only | B | II and III |
| C | III and IV | D | I and IV |

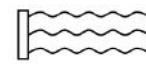
15 The molecules below represent molecules of starch, protein and fat.



Starch

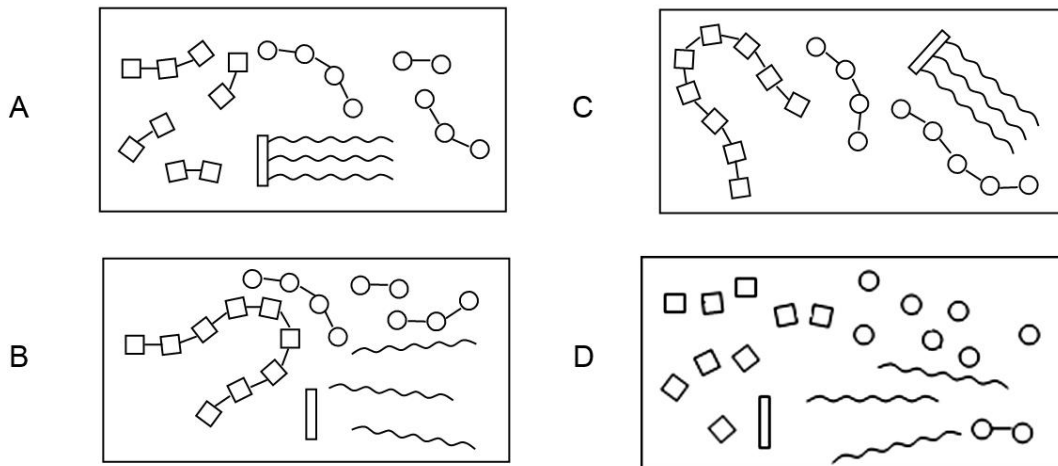


Protein



Fat

Which of the following diagrams best represent the products of digestion in the small intestine?



- 16 The table below shows the enzymes used in the digestive system. Which of the following is **incorrect**?

	Enzyme	Used in
A	Salivary amylase	Mouth
B	Lipase	Stomach
C	Carbohydrase	Small intestine
D	Protease	Stomach

- 17 A woman has contracted a sexually transmitted infection. Non-itchy rash appeared in her body which disappeared after some time and she suffered from a mild case of fever. Which of the following disease is the woman suffering from?

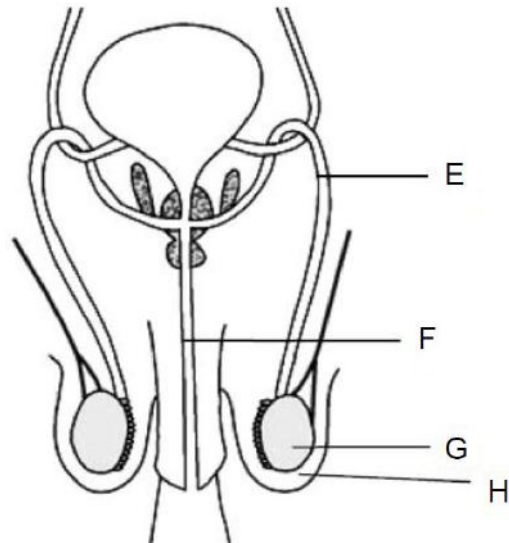
- | | | | |
|---|------------|---|-----------|
| A | AIDS | B | Chlamydia |
| C | Gonorrhoea | D | Syphilis |

18 Which of following is true of human sexual reproduction?

- I A zygote with 23 pairs of chromosomes is formed.
- II An ovum divides into new cells.
- III Fertilisation must occur.
- IV The children are identical to their parents.

- | | | | |
|---|-----------------|---|-----------------|
| A | I and II only | B | I and III only |
| C | II and III only | D | III and IV only |

19 The diagram shows part of the reproductive system of a man.
What are the structures E, F, G and H?

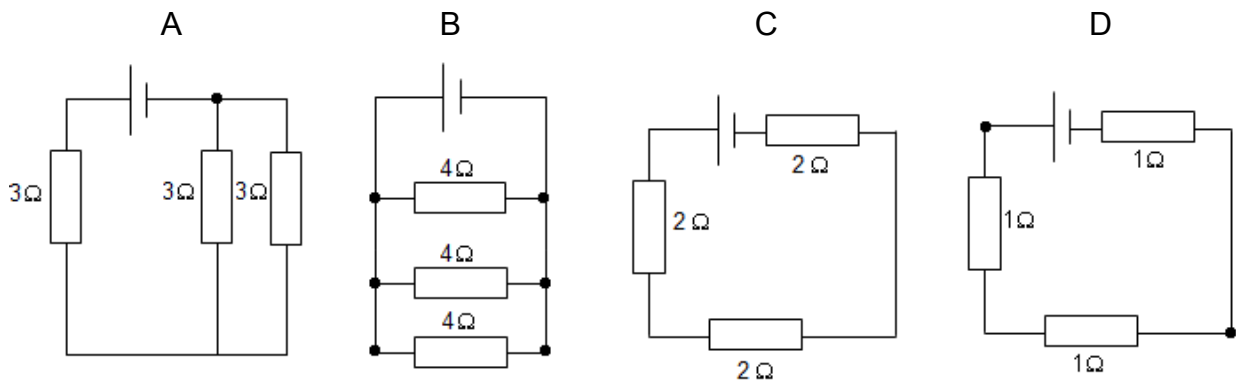


	E	F	G	H
A	Sperm duct	Urethra	Testis	Scrotum
B	Sperm duct	Urethra	Scrotum	Testis
C	Urethra	Sperm duct	Testis	Scrotum
D	Urethra	Sperm duct	Scrotum	Testis

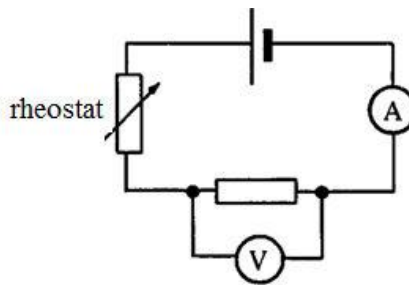
20 Which of the following birth control methods will alter the uterus lining?

- | | | | |
|---|-----------|---|----------------------|
| A | Condom | B | Contraceptive pills |
| C | Diaphragm | D | Intra-uterine device |

21 The diagram below shows 4 circuits. Which of the following circuit has the least resistance?



- 22** Which of the following shows how the ammeter reading will be affected if the resistance of the rheostat is increased while voltage remains unchanged?



Ammeter reading

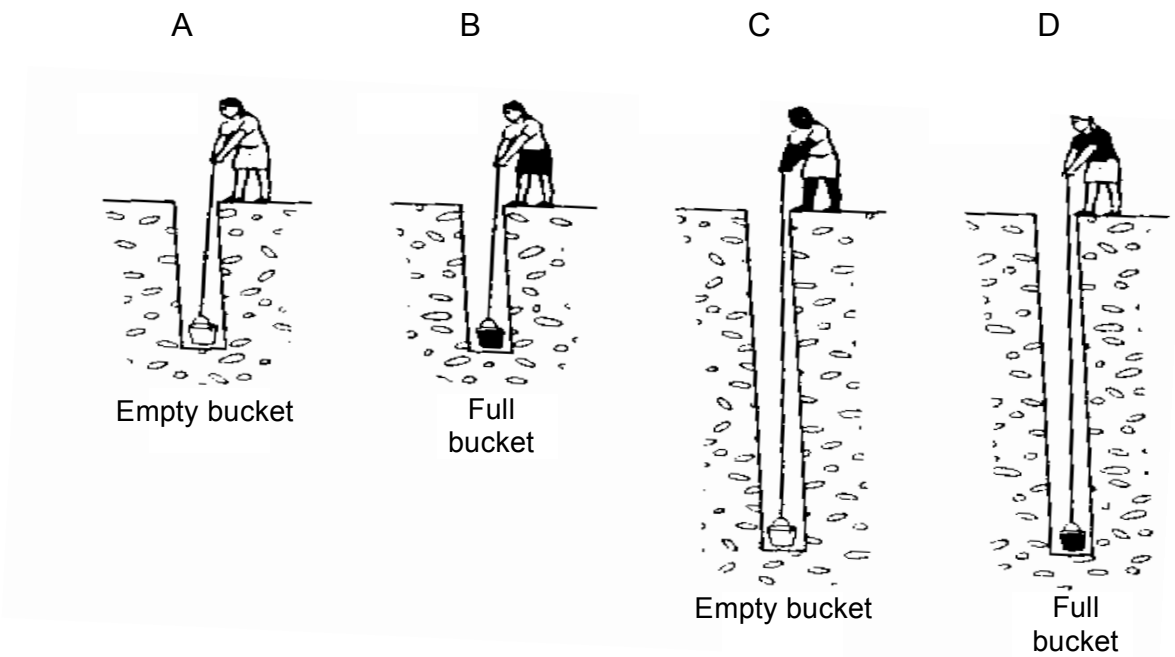
- A Decreases
 B Remains unchanged
 C Increases
 D Zero
- 23** Which of the following should the fuse of an electric appliance be connected to?
- | | |
|----------------|----------------|
| A Earth wire | B Live wire |
| C Metal casing | D Neutral wire |
- 24** If the cost of 1 kWh of electricity is 80 cents, what is the total cost of operating the following electrical appliances for 3 hours?

- B Separating metals and non-metals using a magnetic crane
- C Swimming in the open sea against ocean waves
- D Having an apple fall from a tree

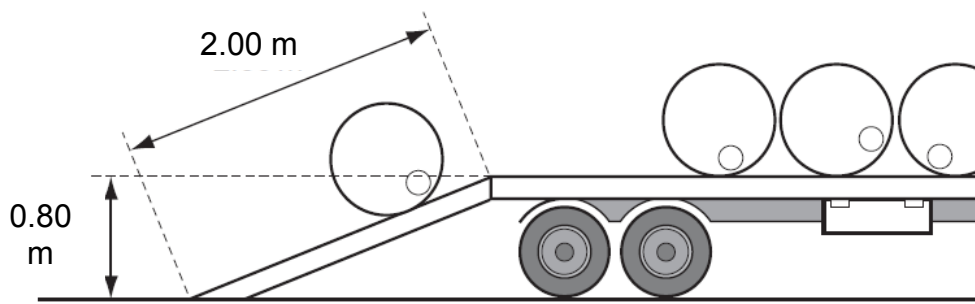
28 Which of the following destructive nature of forces is caused by the sudden release of the forces on the earth's crustal plates?

- | | | | |
|---|-----------|---|----------|
| A | Volcanoes | B | Tsunamis |
| C | Typhoons | D | Floods |

29 The diagram below shows 4 different ladies tasked to lift a bucket from the bottom of a well. Which of the following girls does the most work?



30 A workman rolls a barrel of weight 2000 N up a plank of length 2.00 m and on to a lorry. The back of the lorry is 0.80 m above the horizontal surface of the road.



What is the work done on the barrel against gravity?

- | | | | |
|---|--------|---|--------|
| A | 1000 J | B | 1600 J |
| C | 2500 J | D | 4000 J |

- 31** A man lifts a box of mass 10 kg vertically upwards by 1.2 m. Given that it takes 3 s to do the work, what is the power generated by the man?

- | | | | |
|---|------|---|------|
| A | 4 W | B | 12 W |
| C | 36 W | D | 40 W |

- 32** Which of the following sources of energy does not need a turbine to generate electricity?

- | | | | |
|---|-------------------|---|--------------|
| A | Geothermal energy | B | Tidal energy |
| C | Solar energy | D | Wind energy |

- 33** In which of the following scenarios does sound travel the fastest?

- | | |
|---|---|
| A | Shouting across the classroom |
| B | Sonar that measures that depth of the sea |
| C | A vibration through the wall |
| D | An explosion in space |

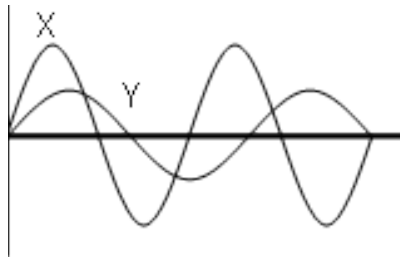
- 34** What is the unit of measurement for the loudness of a sound?

- | | | | |
|---|----------|---|-------|
| A | Amps | B | Hertz |
| C | Decibels | D | Watts |

35 Which one of the following is related to the frequency of a sound wave?

- | | | | |
|---|--------|---|----------|
| A | Pitch | B | Quality |
| C | Volume | D | Distance |

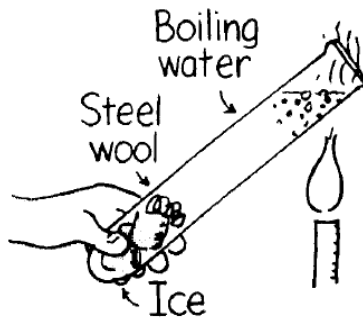
36 The displacement-time graphs for two musical notes X and Y are shown below.



Which of the following deductions is correct?

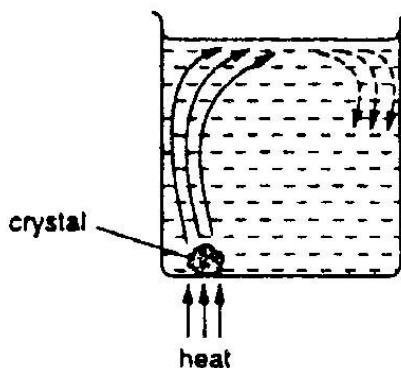
- | | |
|---|----------------------------------|
| A | X is louder and of lower pitch. |
| B | X is softer and of higher pitch. |
| C | Y is softer and of lower pitch. |
| D | Y is louder and of higher pitch. |

37 Water in a boiling tube is boiling at the top while the size of the ice at the bottom of the tube remains unchanged. What does the experiment show?

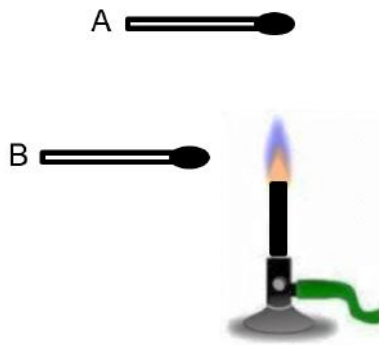


- A Ice is a poor conductor of heat.
- B Water is a poor conductor of heat.
- C Steel wool is a good insulator of heat.
- D Heat at the top has dissipated into the surrounding air.

- 38** The diagram shows a crystal being heated in a beaker of water. The crystal releases a dye which shows how the water circulates around the beaker. Why does the water above the crystal rise?



- A The water contracts and its density decreases.
 - B The water contracts and its density increases.
 - C The water expands and its density decreases.
 - D The water expands and its density increases.
- 39** Which of the following is the reason why matchstick **A** will start burning at a further distance from the flame than matchstick **B**?



- A Heat conducts upwards faster than to the side.
- B Heat radiates upwards faster than to the side.
- C **A** gains heat both from convection and radiation whereas **B** gains heat only from radiation.
- D **A** gains heat both from convection and conduction whereas **B** gains heat only from radiation.

40 Which of these decreases the rate of radiation from a hot object?

- I Increasing smoothness and shininess of object
- II Decreasing darkness of object
- III Increasing temperature of object

- | | | | |
|---|------------|---|-----------|
| A | I only | B | I and II |
| C | II and III | D | I and III |

END OF PAPER

The Periodic Table of the Elements

Group																	
I	II	1 H hydrogen 1										III	IV	V	VI	VII	0
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	64 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	101 Ru ruthenium 44	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	127 Te tellurium 52	128 I iodine 53	131 Xe xenon 54	–	Rn radon 86
133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	–	Po polonium 84	At astatine 85
– Fr francium 87	– Ra radium 88	– Ac actinium 89															

*58-71 Lanthanoid series

†90-103 Actinoid series

140 Ce cerium 58	141 Pr praseodymium 59	144 Nd neodymium 60	– Pm promethium 61	150 Sm samarium 62	152 Eu europium 63	157 Gd gadolinium 64	159 Tb terbium 65	162 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71
232 Th thorium 90	– Pa protactinium 91	238 U uranium 92	– Np neptunium 93	– Pu plutonium 94	– Am americium 95	– Cm curium 96	– Bk berkelium 97	– Cf californium 98	– Es einsteinium 99	– Fm fermium 100	– Md mendelevium 101	– No nobelium 102	– Lr lawrencium 103

Key

a

X

b

a = relative atomic mass

X = atomic symbol

b = proton (atomic) number



YUHUA SECONDARY SCHOOL

CANDIDATE NAME			
CLASS	2E	INDEX NUMBER	

END OF YEAR EXAMINATION 2014

Secondary Two Express

SCIENCE

PAPER 2

1 hour 30 mins

ADDITIONAL MATERIALS: Electronic Calculator

INSTRUCTIONS TO CANDIDATES

Write your name, class and index number on all the work you hand in.
Write in blue or black pen on both sides of the paper.
You may use a soft pencil for any diagrams, graphs or rough working.
Do **not** use staples, paper clips, highlighters, and glue or correction fluid.

Section A (30 marks)

Answer **ALL** the questions in the spaces provided on the question paper.

Section B (30 marks)

Answer any **THREE** questions on the lined pages.

Number of marks allocated is given in [] at the end of each question or part question.

A copy of the Periodic Table is printed on page 18.

Section A	30
Section B	30
Total	60

This question paper consists of 14 printed pages 4 lined pages.

[Turn over]

1 This table shows some information about atoms of the elements **X**, **Y** and **Z**. (The letters do not represent the atomic symbols of the elements.)

element	ion	atomic number	number of neutrons	Nucleon number	electronic configuration
X	X²⁻		16	32	2.8.6
Y		4		9	2.2
Z	Z⁺	11	12	23	

- (a) (i)** Complete the table above. [2]

- (ii) Give the formula of the compound formed by **X** and **Z**. [1]

.....

- (b)** For each of the following equations, you are required to

- Predict the reactants
- Write the balanced chemical equation with state symbols
- Write the net ionic equation

- (i) Magnesium + → Magnesium + [1]
 Sulfate

- (ii)** Balanced chemical equation with state symbols [1]

.....

- (iii) Net ionic equation with state symbols [1]

.....

- 2 (a)** Figure 2.1 shows a human red blood cell, viewed under a

microscope. Figure 2.2 shows the same human red blood cell after it has been placed into a more concentrated salt solution.



Figure 2.1

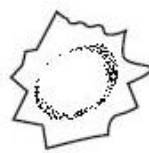


Figure 2.2

Explain how osmosis has produced the effect in the cell in Figure 2.2. [2]

.....

.....

(b) Figure 2.3 shows a human heart and the flow of blood in it.

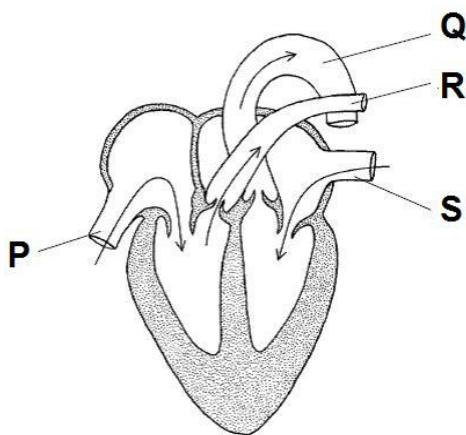


Figure 2.3

Identify the blood vessels that carry oxygenated blood and deoxygenated blood. [2]

Oxygenated blood:

Deoxygenated blood:

6 V, 9 W. Bulb Y and Z are identical with the same ratings.

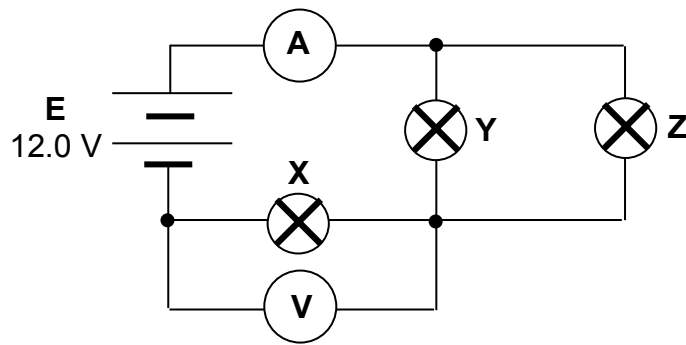


Figure 3

If the voltmeter has a reading of 6 V,

(a) (i) calculate the reading of the ammeter. [2]

(ii) calculate the resistance of Bulb X. [2]

(iii) calculate the total cost of switching on the circuit for 8 days, [2]
given that the cost of electricity is \$1.20 per kWh.

(iv) Explain how a fuse works and the type of electrical hazard it [2]

can prevent.

.....

.....

.....

- 4 Figure 4 shows two teachers and three students pulling in opposite directions on the rope during a game of tug of war. Each student pulls with a force of 250 N and each teacher pulls with a force of 400 N.

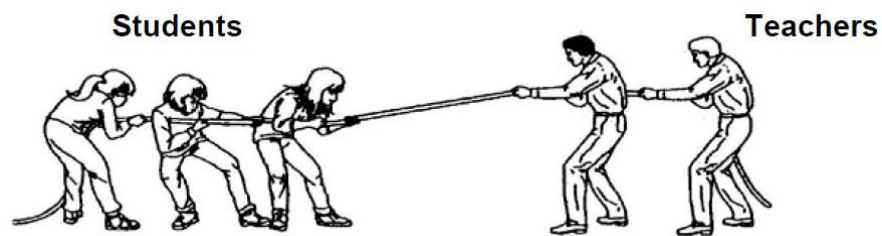


Figure 4

- (a) (i) What is the resultant force on the rope? [2]

Resultant force: N

- (ii) Who will win the tug of war? [1]

.....

- (iii) If the winners of the tug of war moved a total of 0.8 m, calculate [2]

the work done by the winners.

Work done: J

- (b) The picture below shows a person perform a stunt by lying on a bed of nails [2]
of nails.



Explain why people can perform the “bed of nails” stunt without being hurt.

.....

.....

.....

.....

- 5 Figure 5 shows a model of a hydroelectric power station.

Water from the reservoir flows through the turbine. The turbine turns a generator. The generator is used to operate a lamp.

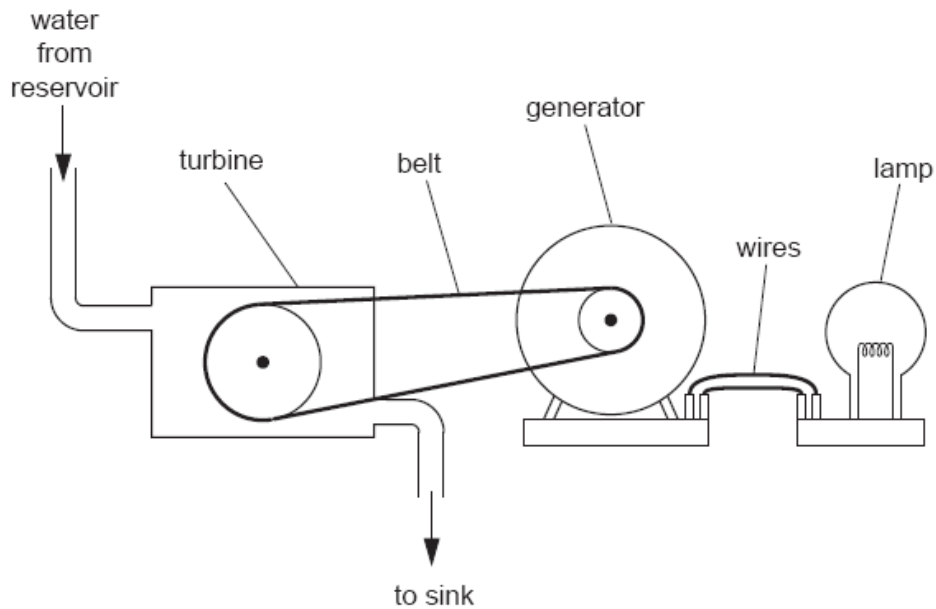


Figure 5

- (a) (i) State the energy conversions that take place from the water in the reservoir to the lamp that is shining. [1]

.....

.....

- (ii) Suggest the advantage of using hydroelectrical power instead of fossil fuels. [1]

.....

.....

- (iii) Suggest a harmful effect of using hydroelectrical power. [1]

.....

.....

- (b)** The water from the reservoir fall to the turbine through a height of [2]
75 cm. The mass of the water flows through the turbine in 5.0 secs is
2.0 kg. Calculate the power delivered to the turbine.

Power = W

Section B [30 marks]

Answer **THREE** out of four questions in the spaces provided on the question paper.

Begin each question on a new page.

6 (a) Study the word equation given below.

Magnesium + Oxygen $\rightarrow$ Magnesium oxide

(i) Explain why this chemical reaction is called an oxidation. [1]

(ii) Name the type of energy necessary to cause this chemical reaction to take place.

(iii) Silver bromide solution is usually stored in dark bottles in the laboratory. Suggest a reason for doing so. [3]

Write a word equation to support your answer.

(b) In year 2090, Singapura is severely affected by air pollution.

- Citizens living in Singapura suffered from shortness of breath, headaches and fatigue.
- Statues and cars parked in open spaces were found to be corroded after it rained. Fishes were also found to be dead in the Jurong lake.

(i) Suggest the air pollutant which causes the citizens suffer from the above. Explain your suggestion. [2]

(ii) Suggest the cause of the death of the fishes and corrosion of statues and cars. [2]

Suggest and explain how air pollutants can lead to the cause stated above.

(iii) Suggest how you can test the lake water to check its acidity. [2]
Suggest an observation for the test used to check acidity.

- 7 (a) Figure 7.1 shows part of the human digestive system. The small intestine is labelled.

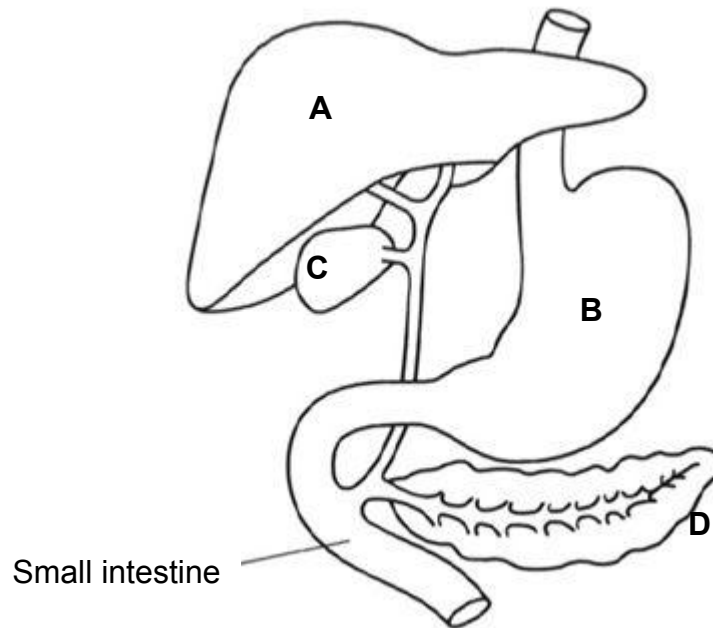
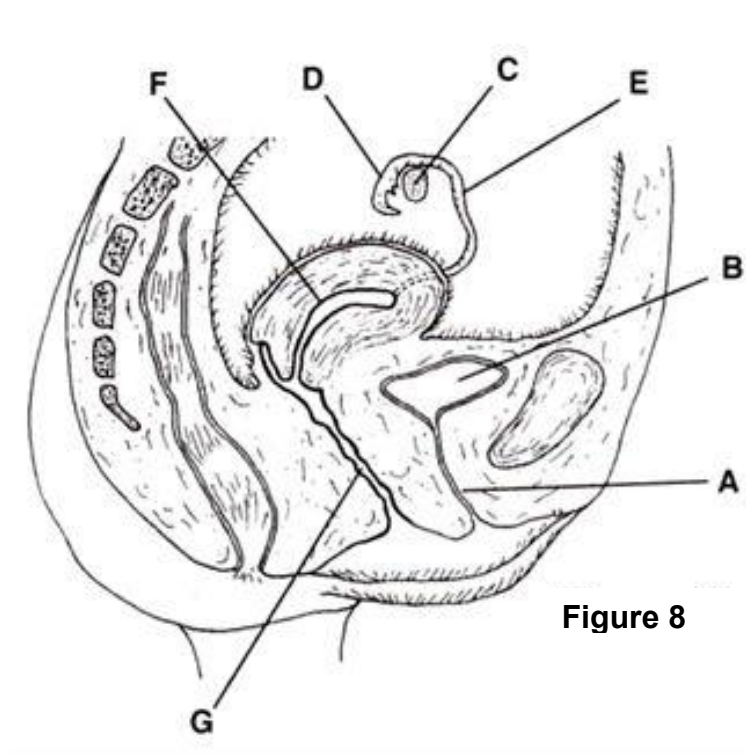


Figure 7.1

- (i) Identify the parts labelled A, B, C and D. [2]
- (ii) Describe the digestion of a meal made up of egg and rice through the alimentary canal. Include in your answer the name of enzymes, substances digested and products formed. [4]
- (iii) Explain how the small intestine is adapted to absorption. [2]
- (b) Explain why it is not advised for humans to consume raw meat and/or partly cooked food. [2]

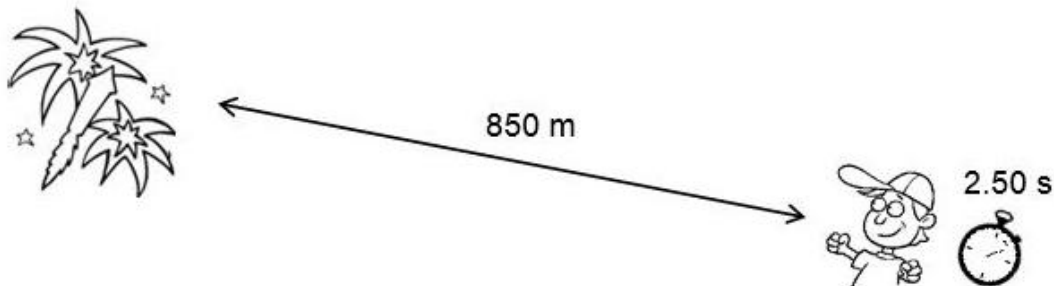
8 Figure 8 shows the side view of the human female reproductive system.



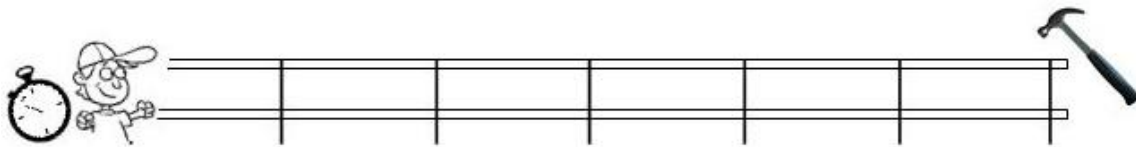
- (a) Using the letters in the diagram, indicate the site where: [4]
- (i) ova are produced.
 - (ii) fertilisation normally occurs.
 - (iii) embryo is implanted.
 - (iv) sperms are deposited during ejaculation.
- (b) Outline the steps of fertilisation. [3]
- (c) Suggest one change that only boys experience during puberty. [1]
- (d) Discuss the harmful effects of abortion. [2]

- 9 (a) Louis set up experiment **A** as shown below to determine the speed of sound. He started his stopwatch when he saw the fireworks explode and stopped his stopwatch when he heard the sound of the explosion.
- In experiment **B**, Louis took the time taken for sound of a knocking hammer to travel through a metal railing.

- (i) Suggest how the speed of sound in experiment **A** and **B** will differ. [2]
Explain the difference.



Experiment A



Experiment B

- (ii) The sound produced in experiment **A** is loud and low pitch whereas [1]
the sound produced in experiment **B** is soft and high pitch.
Explain the difference in terms of vibration of the sound waves.
- (iii) Describe how the parts of the ear help Louis to hear the sounds. [3]

- (b) (i) Paper steamboat is a very popular Japanese cuisine where the food [2]
is placed in paper and cooked over the flame.
Explain, using knowledge of the process of thermal energy transfer,
why the paper will not catch fire easily.



Paper Steamboat

- (ii) The diagram below shows the back view of a refrigerator. [2]
Explain why cooling fins of a refrigerator are made from aluminium
and painted black.



Cooling fins

PAPER 1

1. B	2. B	3. C	4. B
5. B	6. C	7. D	8. A
9. B	10. D	11. C	12. B
13. C	14. A	15. D	16. B
17. D	18. B	19. A	20. D
21. B	22. A	23. B	24. A
25. D	26. D	27. C	28. B
29. D	30. B	31. D	32. C
33. C	34. C	35. A	36. C
37. B	38. C	39. C	40. B

Section A: [30 Marks]

Answer **ALL** the questions in the spaces provided on the question paper.

1(a)(i)	element	ion	atomic number	number of neutrons	Nucleon number	electronic configuration	[2] 2 correct 1 m
	X	X ²⁻	<u>16</u>	16	16	2.8.6	
	Y	<u>Y²⁺</u>	4	<u>5</u>	9	2.2	
	Z	Z ⁺	11	12	23	<u>2.8.1</u>	
(a)(ii)	Z ₂ X						[1]
(b)(i)	- Sulfuric acid - Hydrogen gas						[1] [1]
(ii)	Mg (s) + H ₂ SO ₄ (aq) → MgSO ₄ (aq) + H ₂ (g)						[1]
(iii)	Mg (s) + 2 H ⁺ (aq) → Mg ²⁺ (aq) + H ₂ (g)						[1]

2(a)	Movement of water molecules from a region of higher water potential (inside the cell) to a region of lower water potential (concentrated salt solution) through a partially permeable membrane.	[1]
	•	
(b)	Oxygenated: Q, S Deoxygenated: P, R	[1] [1]
3(a)(i)	$I = P / V = 9 \text{ W} / 6 \text{ V}$ $= 1.5 \text{ A}$	[1] [1]
(a)(ii)	$R = V / I = 6 \text{ V} / 1.5 \text{ A}$ (ecf) $= 4 \Omega$	[1] [1]
	•	
(a)(iii)	$P = IV$ $= 1.5 \text{ A} \times 12.0 \text{ V} = 18 \text{ W}$ (ecf) Cost = $(18/1000) \times (8 \times 24) \times 1.20$ (ecf) $= \$ 4.15$	[1] [1]
(a)(iv)	• Fuse melts and breaks the circuit when the current is too high. • Prevent overloading/electric fires	[1]
4(a)(i)	Total force of students = $250 \times 3 = 750 \text{ N}$ Total force of teachers = $400 \times 2 = 800 \text{ N}$ Resultant force = $800 - 750 = 50 \text{ N}$ in direction of teachers/ to the right.	[1] [1]
(a)(ii)	Teachers	[1]
(a)(iii)	$W = F \times D$ $W = 800 \text{ N} \times 0.8$ (ecf for this step if (a)(i) is wrong)	[1]

	= 640 J	[1]
(b)	• Their weight is spread out over the area in contact with the nails. • Surface area is increased which causes pressure to be decreased.	[1] [1]
5(a)(i)	Gravitational potential energy → Kinetic Energy → Electrical Energy → Light Energy (if student includes heat energy, accept)	[1]
(a)(ii)	No air pollution /renewable	[1]
(a)(iii)	• Causes deforestation to clear land space to build hydroelectric power station <u>OR</u> • Causes death of fishes when they are sliced by the turbine blades.	[1]
(b)	• Power = work done / time = [0.75 x (2.0/10)] / 5.0 =3.0 W	[1] [1]

Section B: (30 marks)

Answer **THREE out of FOUR** questions in the spaces provided on the question paper.

6(a)(i)	• There was a gain of oxygen	[1]
(a)(ii)	• Heat energy	[1]
(a)(iii)	Exposure to light will <u>decompose</u> silver bromide into silver, which produces <u>dark areas</u> on the flim. light Silver bromide → silver + bromine	[1] [1]

(b)(i)	Carbon monoxide. Carbon monoxide <u>binds with haemoglobin</u> to prevent the transport of oxygen, leading to shortness of breath, headaches and fatigue.	[1] [1]
(b)(ii)	Acid rain Sulfur dioxide and nitrogen dioxide dissolve in rainwater to form acid rain.	[1] [1]
(b)(iii)	Check acidity with any one of the following and corresponding observations: • pH meter – $0 < \text{pH} < 7$ • blue litmus paper; turns red • universal indicator; turns red, orange or yellow • natural indicators such as red cabbage, hydrangea; pink for red cabbage and blue for hydrangea.	[2] 1m for test 1m for results
7(a)(i)	A: Liver B: stomach C: gall bladder D: pancreas All correct 2m, 1 wrong 3m, 2 wrong 1m	[2]
(a)(ii)	• Rice contains starch/carbohydrates, which are digested in the mouth by amylase to form maltose. • Maltose is further digested in the small intestine by maltase to form glucose. • Egg contains proteins, which are digested in the stomach by protease to form polypeptides. • Polypeptides are further digested in the small intestine by protease to form amino acids.	[4]
(a)(iii)	• 7 metres long/long; increases surface area to volume ratio to	[2]

	increases rate of diffusion of digested food molecules <u>OR</u> One cell thick wall; shortens the distance between intestinal contents and blood vessels so that absorption can happen faster.	
(b)	- Bacteria are found in raw or partly cooked food. - Bacteria can cause infections when they enter the intestine or produce toxins that are absorbed in the blood stream to make humans ill.	[1] [1]
8(a)	(i) C (ii) E (iii) F (iv) G	[1] [1] [1] [1]
8(b)	- Sperms deposited in the vagina swim up to the oviduct to meet the ovum - head of sperm enters ovum and changes the membrane of the ovum so that no other egg can enter. - Nucleus of sperm fuses with nucleus of ovum to form zygote.	[1] [1] [1]
8(c)	- Breaking of voice/deepening of voice - Production of male hormones and sperms - Growth of facial hair - Any other acceptable answers	[1]
8(d)	- Cause depression from guilt - Cause damage or infection of uterus; excess bleeding or cause female to be unable to be pregnant in future - Any other acceptable answers	[1] [1]
9(a)(i)	- Speed of sound in A will be slower than in B. - Sound travels faster in a denser medium which is the metal	[1] [1]

	railing as compared to air.	
(a)(ii)	Sound produced in A is of <u>lower frequency/lesser number of vibrations per second</u> and has <u>larger vibrations</u> as compared to B. OR Sound produced in B is of <u>higher frequency/greater number of vibrations per second</u> and has <u>smaller vibrations</u> as compared to B.	[1]
(a)(iii)	• The outer ear help to <u>collect the sound waves</u> and directs them to the ear drum and cause it to vibrate • Middle ear contains small bones to <u>magnify vibrations</u>. • Inner ear contains nerve cells which <u>change the vibrations to electrical signals</u> and <u>carries them to the brain</u>.	[1] [1] [1]
9(b)(i)	• heat is conducted away from the paper to the water [1] • which is then transferred away by convection current [1] ; paper will not get hot enough to burn	[2]
9(b)(ii)	• made of aluminium as it is a good conductor of heat • painted black as black surfaces are good radiators of heat.	[1] [1]