NAME	CLASS	INDEX NO.

Parent's / Guardian's Signature: _____ Date: _____

ST. PATRICK'S SCHOOL
END-OF-YEAR EXAMINATIONS 2016

SUBJECT : GENERAL SCIENCE

LEVEL : SECONDARY 2 EXPRESS

DATE : 07 OCT 2016

DURATION : : 2 HOUR

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 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 24 printed pages.
A copy of the Periodic Table has been printed on page 24.

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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 answer in the **Optical Answer Sheet** provided.*

1 Which one of the following statements about mass is true?

A Mass varies according to location.
B Mass and weight are equal and interchangeable.
C Mass varies according to the amount of matter in the object.
D Mass varies according to the shape the object is molded into.

2 Which of the following properties make(s) copper a suitable material for electrical wiring?

I High ductility
II High malleability
III High melting point
IV High electrical conductivity.

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

For questions **3** and **4**, refer to the data, which shows the number of hours and electrical energy consumed by Timothy's home appliance in a day.

Appliance	Electrical energy consumed per day (kWh)	Duration of usage per day (hour)
W	2.5	1
X	3.5	1
Y	17.0	17
Z	21.0	14

3 Which one of the following appliances has the lowest power rating?

A W
B X
C Y
D Z

4 If the power supply company charges $ 0.20 per kWh, what is the total cost of energy consumed by all the appliances in 30 days?

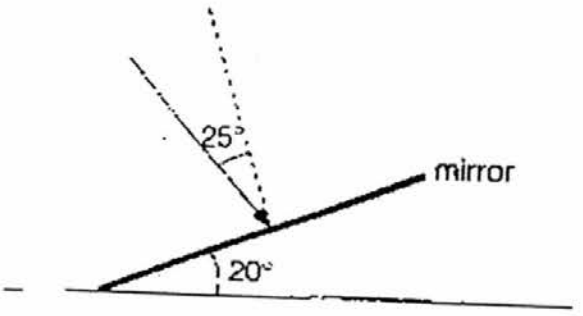
A $ 8.80
B $ 117.80
C $ 264
D $ 3534

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5 Which one of the following is true of a fuse?

A A fuse should be fixed on the earth wire.
B A fuse can only be found in a three-pin plug.
C A fuse of any current rating can be used in a circuit.
D A fuse blows when too large a current flows through the circuit.

6 A plane mirror is inclined at 20 ° to the horizontal floor. A light ray strikes at an angle of incidence of 25 °.



What is the angle of reflection?

A 5 °
B 20 °
C 25 °
D 45 °

7 Which one of the following colours is not found in the spectrum of white light?

A Black
B Violet
C Yellow
D Indigo

8 What colour would a yellow shirt appear under cyan light in a dark room?

A Red
B Green
C Blue
D Black

9 Isaac accidentally caused a dent in his ping-pong ball. Which one of the following will restore the ball to its original shape?

A Place the ball in hot water.
B Place the ball in the freezer.
C Squeeze the ball on all sides.
D Heat the ball over a non-luminous flame.

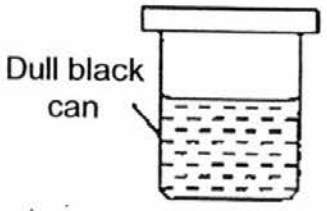
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10 When you stand on bare feet with one foot on the stone floor and the other on the carpet, the stone floor feels colder than the carpet. What is the most likely explanation?

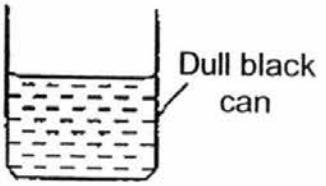
A Air is unable to circulate through the carpet fibres.
B The stone floor is at a lower temperature than the carpet.
C The carpet radiates more heat towards your feet as compared to the stone floor.
D The stone floor conducts more heat away from your feet as compared to the carpet.

11 Four similar cans contain the same volume of water initially at 90 °C. Which one of the following cans of water will be the warmest after 5 minutes?

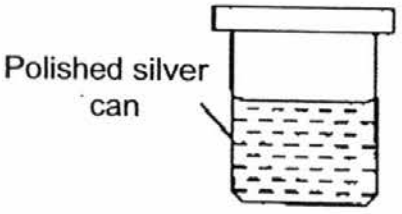
A



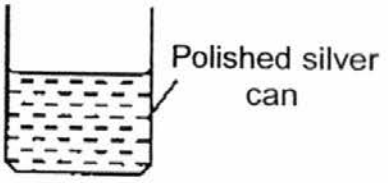
B



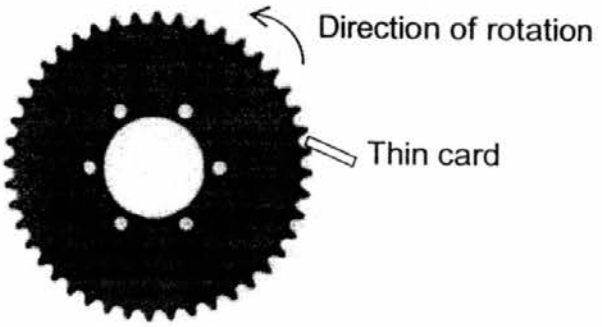
C



D



12 A piece of thin card is held against the teeth of a wheel. When the wheel is turned at a high speed, a note is heard. Which one of the following will **lower** the pitch of the note?



A Use a thinner card.
B Turn the wheel more quickly.
C Use a wheel that has fewer teeth.
D Press the card against the wheel with a smaller force.

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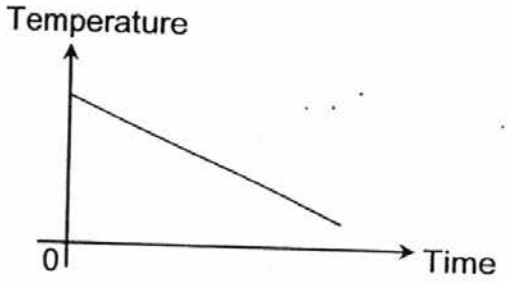
13 Which one of the following is **not** an atom?

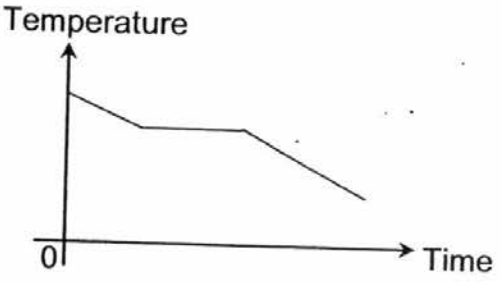
	Neutrons	Protons	Electrons
A	7	8	8
B	8	9	10
C	11	10	10
D	11	11	11

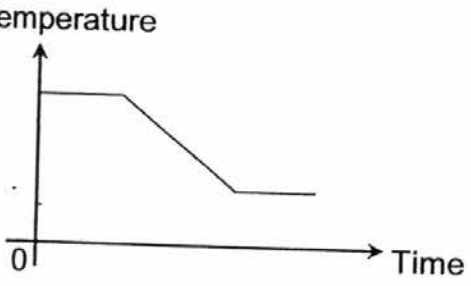
14 Shane found an unknown element. He later finds that it has 5 electrons more than a sodium atom. What element could it be?

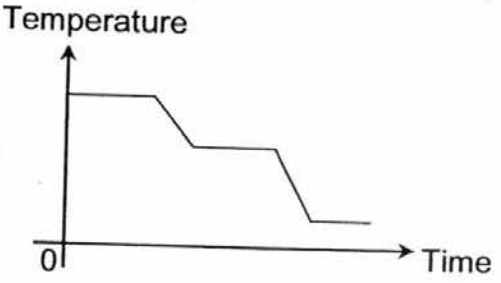
A Silicon
B Sulfur
C Carbon
D Fluorine

15 Which graph shows the temperature change when steam at 120 °C is cooled to 20 °C?

A


B


C


D


16 Which one of the following is the reason why matter expands upon heating?

A Heat energy causes the particles to move faster and become further apart.
B Heat energy causes the particles to move faster and become closer together.
C Heat energy causes the particles to move slower and become further apart.
D Heat energy causes the particles to move slower and become closer together.

17 What happens when the temperature of a solution is increased?

A Rate of dissolving decreases.
B The solution will become diluted.
C Solubility of the solute increases.
D Less solute can be dissolved in the solvent.

18 Which one of the following groups contains mixtures only?

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A Air, milk, carbon
B Salt, sugar, water
C Sulfur, oxygen, steel
D Milk, seawater, blood

19 Which one of the following is an important factor for the successful use of paper chromatography?

A Presence of heat
B Difference in colours
C Difference in boiling points
D Difference in solubility of dyes

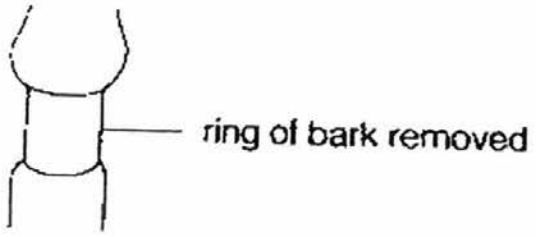
20 Which one of the following products is incorrect when the reactant undergoes combustion in air?

	Reactant	Product
A	Sulfur	Hydrogen sulfide
B	Carbon	Carbon dioxide
C	Hydrogen	Water
D	Magnesium	Magnesium oxide

21 Which one of the following is a balanced chemical equation?

A $K_2MnO_4 + Cl_2 \rightarrow KMnO_4 + 2KCl$
B $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$
C $4NaHCO_3 \rightarrow 2Na_2CO_3 + H_2O + 2CO_2$
D $Al + NaOH + 4H_2O \rightarrow NaAl(OH)_4 + 2H_2$

22 A ring of bark is removed from a balsam plant.



What causes the swelling in the stem above the removed ring?

A Accumulation of salts and water due to the removal of the xylem tissue.
B Accumulation of salts and water due to the removal of the phloem tissue.
C Accumulation of food materials due to the removal of the xylem tissue.
D Accumulation of food materials due to the removal of the phloem tissue.

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23 Which one of the following processes is responsible for pulling water up a plant?

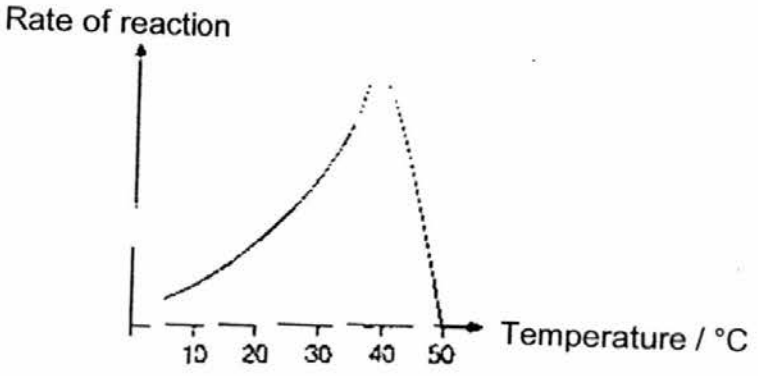
A Osmosis
B Diffusion
C Transpiration
D Photosynthesis

24 Where does chemical digestion take place?

I Mouth
II Stomach
III Small intestine
IV Large intestine

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

25 The graph shows the relationship between temperature and the rate of an enzymatic reaction.

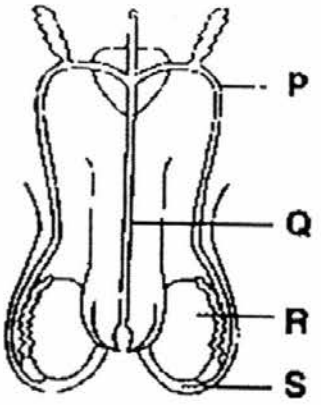


Which one of the following statements is most appropriate?

A The enzymes are inactive at 40 °C.
B The enzymes denature at low temperatures.
C The optimum temperature for the reaction is 50 °C.
D The enzymatic activity increases with temperature up to 40 °C.

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26 The diagram shows the reproductive system of a man.



What are the structures **P**, **Q**, **R** and **S**?

	P	Q	R	S
A	Sperm duct	Urethra	Testis	Scrotum
B	Sperm duct	Urethra	Scrotum	Testis
C	Urethra	Sperm duct	Scrotum	Testis
D	Urethra	Sperm duct	Testis	Scrotum

27 Which one of the following correctly describes ligation?

A It is a permanent contraceptive method.
B It is performed to the sperm ducts of a man.
C It prevents implantation of embryo from occurring.
D It involves the removal of the ovaries from a woman.

28 A newly wedded couple decides to do some family planning to avoid pregnancy. In which week should the couple not have sexual intercourse if the woman's menstrual period started on 5 Feb?

Week	Feb						
	Mon	Tue	Wed	Thu	Fri	Sat	Sun
A	1	2	3	4	5	6	7
B	8	9	10	11	12	13	14
C	15	16	17	18	19	20	21
D	22	23	24	25	26	27	28
	29						

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29 A campaign is introduced to the public to reduce the spread of HIV. Which one of the following advice should be included?

A Do not hug people who are carriers of HIV.
B Do not talk with people who are carriers of HIV.
C Do not share cups with people who are carriers of HIV.
D Be faithful and have sexual intercourse with one partner only

30 Which one of the following about sexually transmitted infections (STIs) is correct?

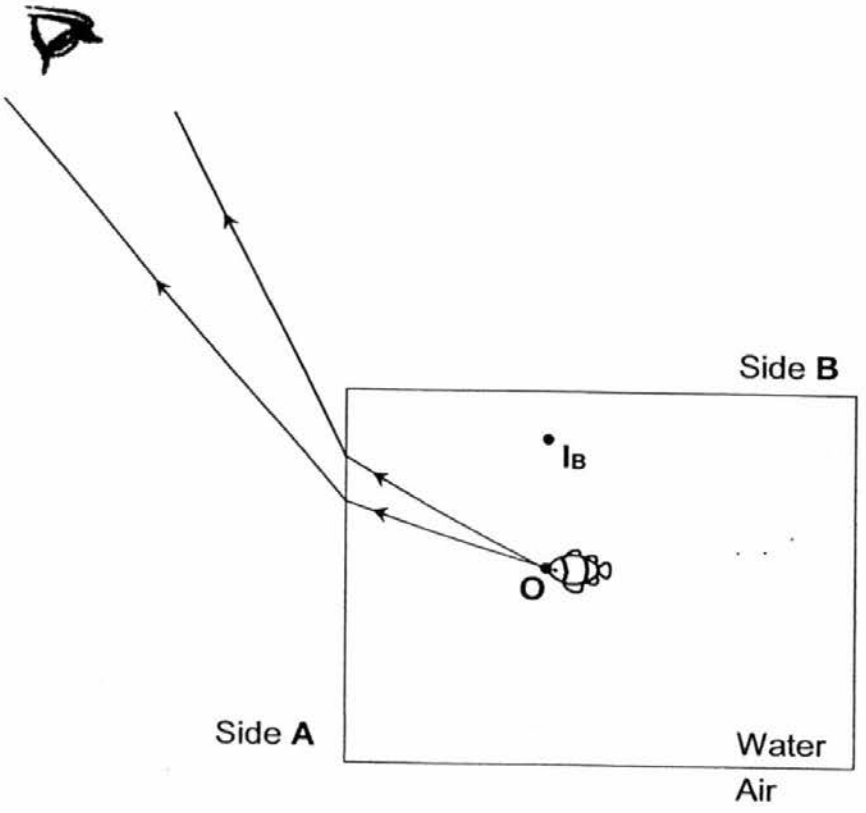
A STIs are only caused by bacteria.
B All STIs are fatal and untreatable.
C STIs cannot be passed on from mothers to their babies.
D People infected by STIs look and feel healthy in the early stages of infection.

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SECTION B : [40 marks]

Answer **ALL** *questions in this section. Show your workings and write your answers in the space provided.*

1 The diagram shows a plan view of a fish tank containing a clownfish.



Joel can see two images of the clownfish when he looks from side **A** and side **B** of the tank.

(a) The two rays of light, from the clownfish, that is refracted at side **A** of the fish tank has been drawn.

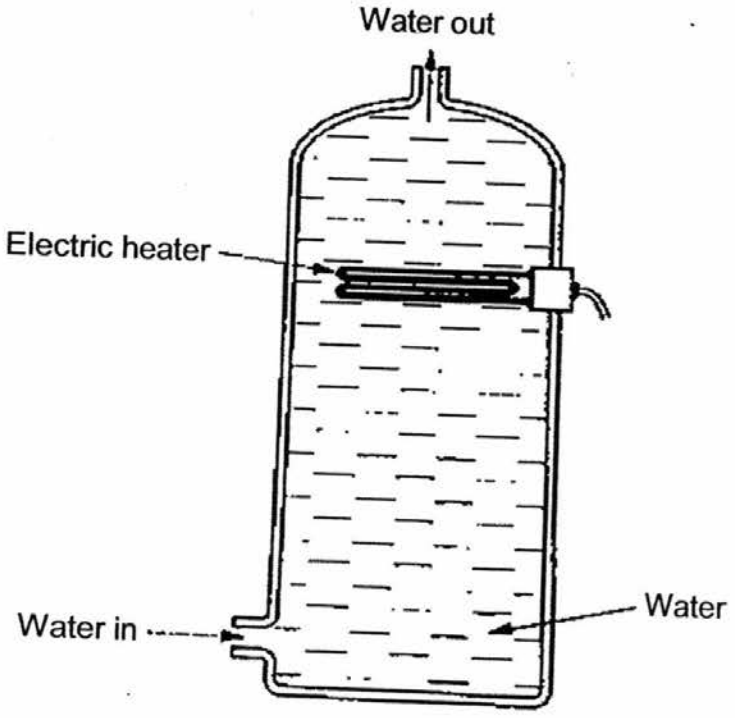
With the help of these two rays, locate and label the position of the image, I_A, of the clownfish due to the refraction at side **A**. **[2]**

(b) The image of the clownfish can also be seen due to the refraction at side **B**. The position of the image is located at I_B.

Complete the ray diagram by drawing two light rays from the clownfish, to show how Joel sees the image from side **B**. **[3]**

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2 The diagram shows a hot-water tank with an electric heater.



(a) Explain how the water above the heater becomes warm.

.....

.....

.....

.....

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

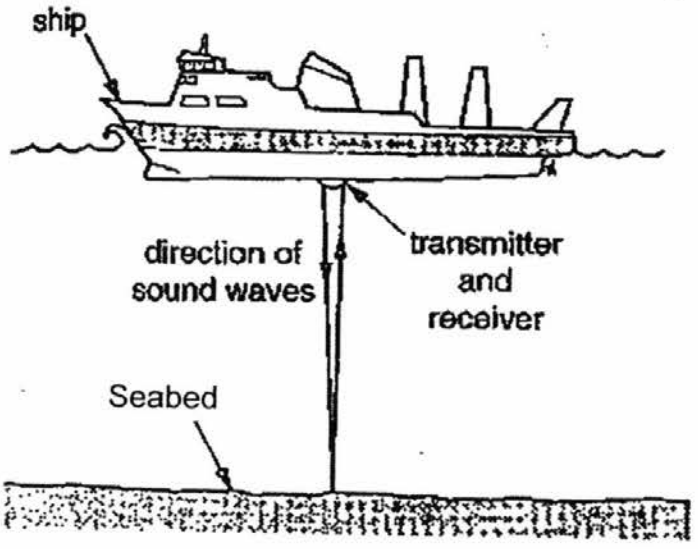
(b) Explain why the heater would not be able to heat up the water at the bottom of the tank.

.....

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

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3 A ship is making use of an echolocation device to determine the depth of the sea beneath it.



(a) The speed of sound in water is 1500 m/s. The time taken for the sound pulse to reach the seabed and then return to the ship is 1.8 s.

Calculate the distance between the ship and the seabed.

[2]

(b) Briefly explain how sound is transmitted through water.

.....

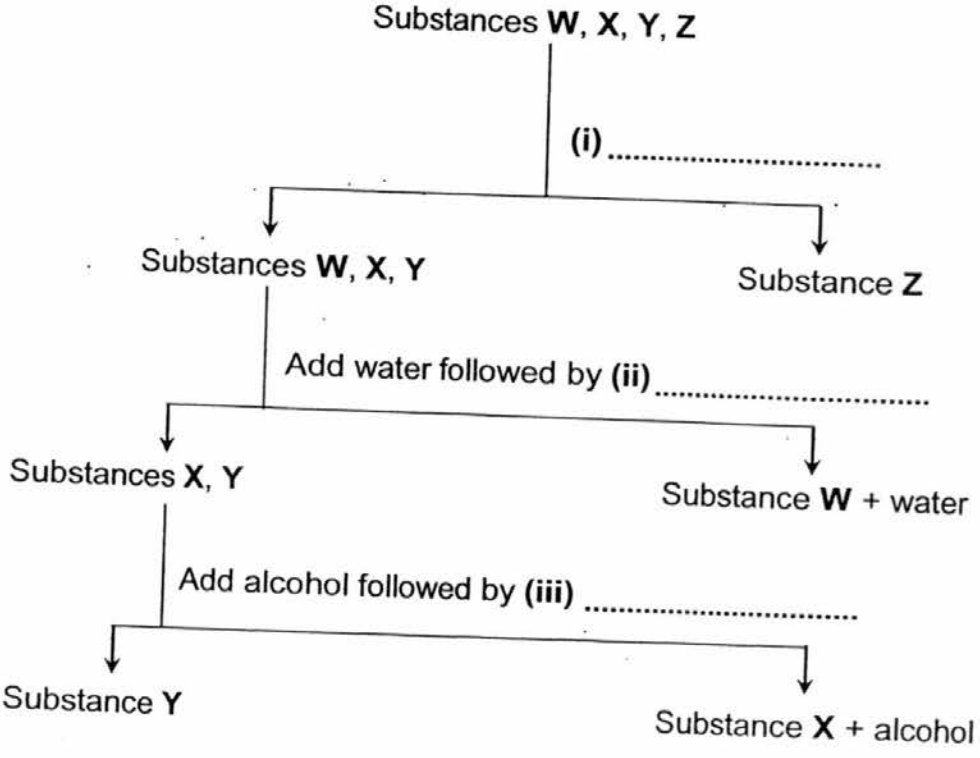
..... **[2]**

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4 Alex was given a mixture of four different solid substances, **W**, **X**, **Y**, and **Z**. Below is some information about these substances.

	W	**X**	**Y**	**Z**
Soluble in water	Yes	No	No	No
Soluble in alcohol	Yes	Yes	No	No
Attracted to magnet	No	No	No	Yes
Effects of heat	Does not decompose	Decomposes	Does not decompose	Does not decompose

(a) Alex conducted a series of separation techniques to separate each of the substances **W**, **X**, **Y** and **Z** from the mixture. Complete the flow chart by filling in the blanks with suitable separation techniques.



[3]

(b) To obtain pure and dry samples of substance **W**, Alex performed evaporation to dryness to the mixture obtained in **(a)(ii)**. He decided to use the same method to obtain pure dry samples of substance **X** as well.

Suggest **two** reasons why it is unwise to do the same for substance **X**.

.....

.....

[2]

(c) Hence, name a suitable separation technique to obtain a pure and dry sample of substance **X** from the mixture obtained in **(a)(iii)**.

.....

[1]

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5 Photochromic lenses are eyeglass lenses that darken automatically when exposed to sunlight, then turn clear again when you return indoors.



Low sunlight



Moderate sunlight



Bright sunlight

The lenses contain silver chloride (AgCl), which decomposes into silver and chlorine when stimulated by sunlight. The metallic silver appears as very small 'flakes', which are evenly distributed in the mass of white silver chloride, making the lenses look grey. In the absence of sunlight, silver and chlorine recombine, making the lenses clear again.

(a) Write down the word equation for the decomposition of silver chloride in photochromic lenses.

.....

[1]

(b) Hence, write down a balanced chemical equation for the decomposition reaction.

.....

[2]

(c) A student commented that the photochromic lens is an example of both a chemical change because new substances are formed, and a physical change because it is reversible.

Do you agree with the student? Explain why.

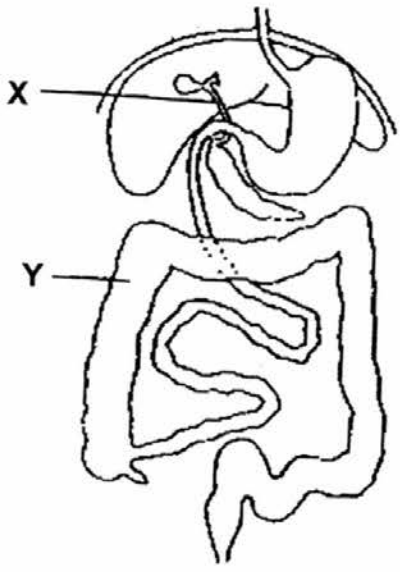
.....

.....

[2]

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6 The diagram shows the human alimentary canal.



(a) Name the secretion, which passes down tube **X** and explain how it helps in fat digestion.

.....

..... [2]

(b) In cases of diarrhoea, name the major process in region **Y**, which is no longer occurring naturally.

..... [1]

(c) Cellulose is a complex carbohydrate.

(i) There are no enzymes in the human body that digests cellulose. State what happens to cellulose in the human alimentary canal.

..... [1]

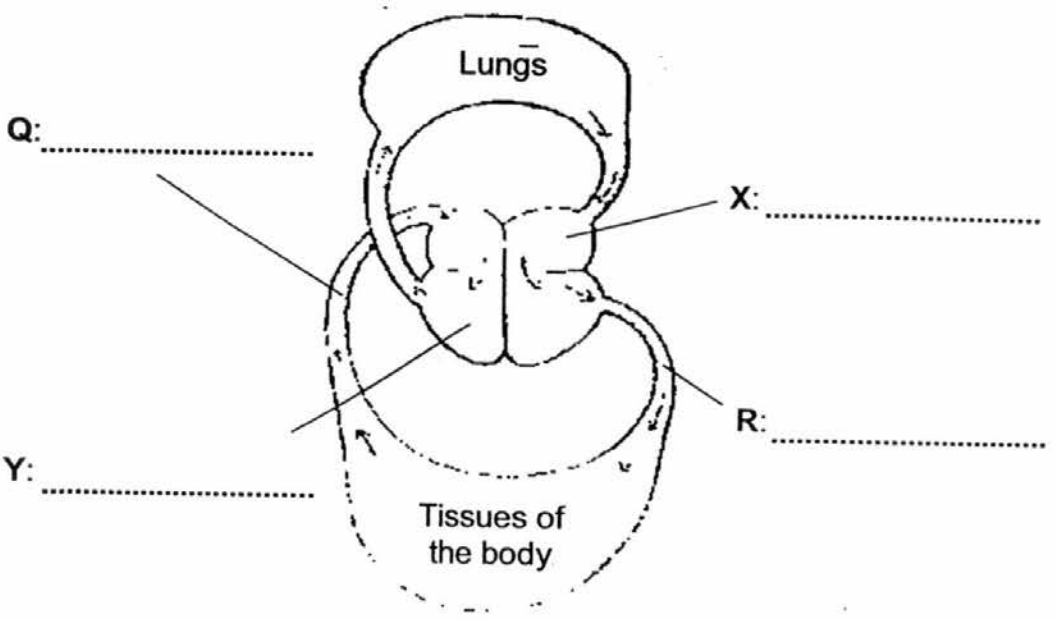
(ii) Unlike humans, many herbivorous mammals have a large appendix containing bacteria, which digest the cellulose cell wall of plants.

Suggest the likely end product of cellulose digestion in herbivorous mammals.

..... [1]

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7 The diagram represents the human circulatory system.



(a) On the diagram,

(i) label the blood vessels **Q** and **R**, **[2]**

(ii) label structures **X** and **Y**. **[2]**

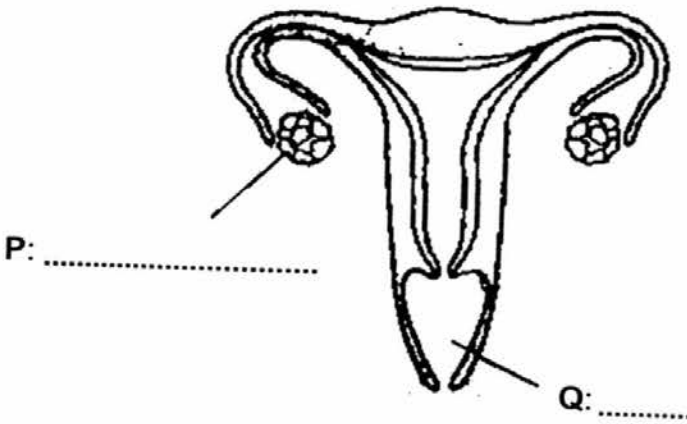
(b) State **one** difference between the structure of blood vessel **R** and that of a blood capillary.

.....

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

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8 The diagram shows the reproductive organ of a woman.



(a) Label parts **P** and **Q**.

[2]

(b) By studying the diagram carefully, indicate why this woman is infertile. Explain your answer.

.....

.....

[2]

(c) Place an **X** on the diagram to show where a fertilized ovum would be implanted in a healthy woman.

[1]

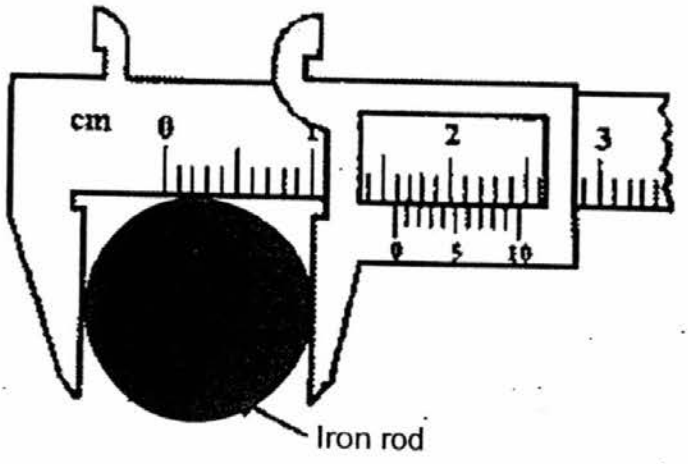
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SECTION C: [30 marks]

Each question carries **10 marks**. *Answer any* **THREE FULL** *questions in this section. Show your workings and write your answers on the writing paper provided.*

1 **(a)** Gabriel plans to determine the purity of an iron rod by calculating its density.

(i) To find the diameter of the iron rod, he makes use of a pair of vernier calipers.



What is the diameter of the iron rod? **[1]**

(ii) Given that the length and mass of the iron rod is 4.60 cm and 70 g respectively,

(A) calculate the volume of iron rod, (Take π = 3.142, volume of cylinder = $\pi r^2 h$) **[1]**

(B) and hence, calculate the density of the iron rod. **[2]**

(b) An ironsmith heats solid iron to 1538 °C in order to for it to melt and be cast into spherical ball bearings.

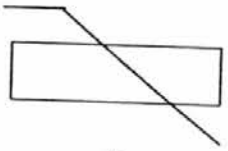
(i) Using diagrams, draw out the particles of solid iron and molten iron. **[2]**

(ii) Hence, describe the differences in the arrangement and movement of the particles in solid iron compared to molten iron. **[2]**

(iii) Explain why the density of molten iron is lower than that of solid iron of equal mass. **[2]**

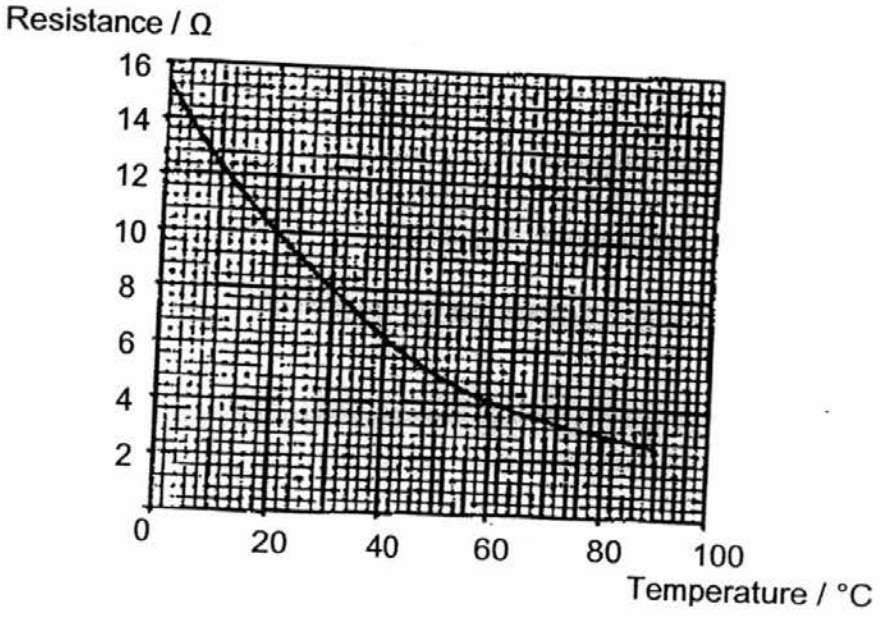
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2 The resistance of an electrical component **X**, as shown in the diagram, changes with temperature.



X

The following graph shows the variation of the resistance of **X** with temperature.



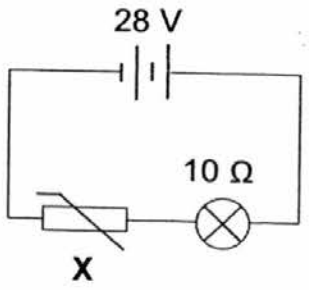
(a) From the graph, determine the resistance of **X**

(i) at 20 °C, **[1]**

(ii) at 60 °C. **[1]**

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(b) The electrical component **X** is connected in series with a 10 Ω light bulb and a 28 V battery as shown in the diagram.



(i) For a temperature of 60 °C, using your answer in **(a)(ii)**, calculate

(A) the total resistance of the circuit, **[1]**

(B) the total current in the circuit, **[2]**

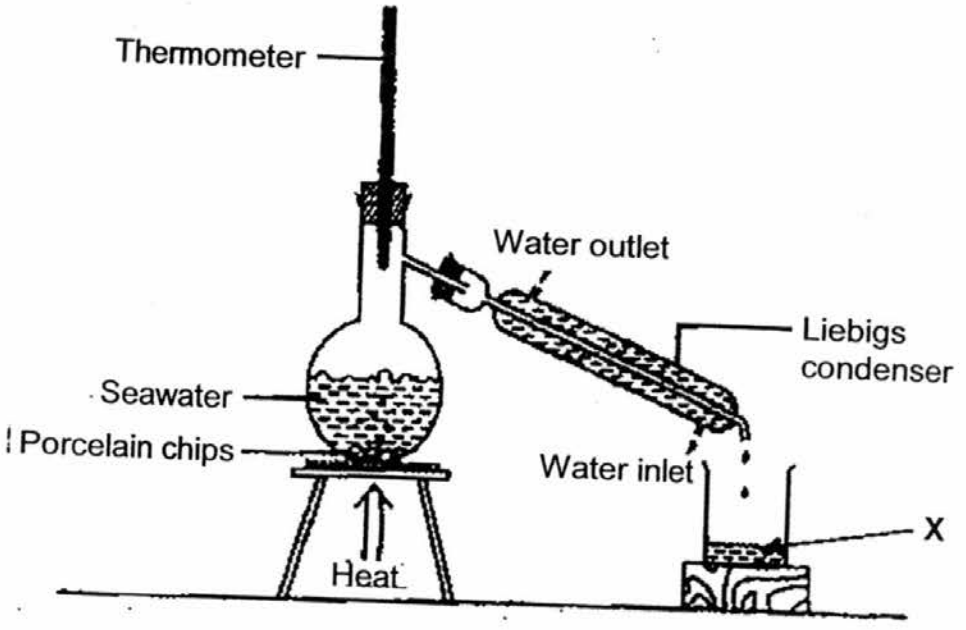
(C) the potential difference across the light bulb. **[2]**

(ii) When the temperature decreases, state and explain what happens to the current in the circuit. **[2]**

(iii) Hence, deduce the brightness of the light bulb. **[1]**

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3 **(a)** The diagram shows the apparatus used for the distillation of seawater.



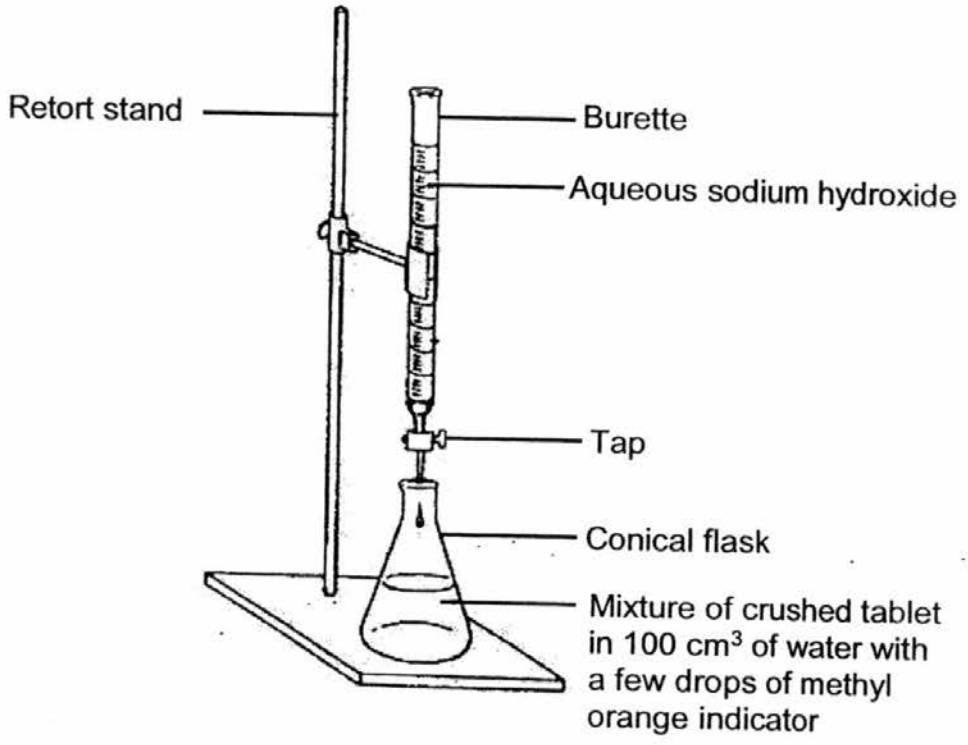
(i) What is the function of the porcelain chips in the seawater? **[1]**

(ii) What is the function of the thermometer? **[1]**

(iii) What is **X** known as? Identify the liquid. **[2]**

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(b) Aspirin is a medication used to treat pain and fever. It is made from a weak acid, salicylic acid. The following experimental set-up is used to find out the concentration of acid found in aspirin.



A few drops of methyl orange indicator is added to the conical flask containing a mixture of a crushed tablet in 100 cm^3 of water. Then, aqueous sodium hydroxide is slowly released from the burette into the conical flask until the point where the mixture is of pH 7.

(i) State the likely pH of the mixture in the conical flask at the start of the experiment. **[1]**

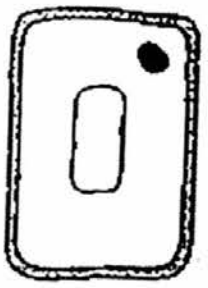
(ii) Name the reaction involved in the experiment. **[1]**

(iii) Hence, state the general equation for this reaction. **[1]**

(iv) It is later found that methyl orange indicator is not suitable for this experiment. Explain why, and suggest a suitable indicator for the experiment. **[3]**

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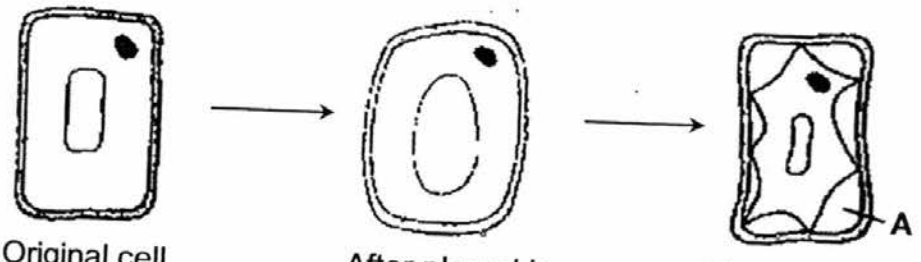
4 **(a)** The following shows a cell from an organism.



(i) Name the type of living organism in which a cell similar to the one above could be found? **[1]**

(ii) State **<u>two</u>** reasons for your choice in **(a)(i)**. **[2]**

(b) The cell is placed in solution **X** for 10 minutes, and is then transferred into solution **Y** for another 10 minutes. **Figure I** and **Figure II** show the appearance of the cell after being placed in **X**, and then **Y** respectively.



Original cell

After placed in solution **X** for 10 minutes

Figure I

After placed in solution **Y** for 10 minutes

Figure II

(i) The solutions used are concentrated salt solution and distilled water. Identify **X** and **Y**. **[2]**

(ii) Explain what has occurred to cause the cell to appear as it does when it is placed in solution **X**. **[3]**

(iii) What will be found in region **A** of **Figure II** after the cell is placed in solution **Y**? Explain your answer. **[2]**

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SA2 St. Patrick's School

DATA SHEET
The Periodic Table of the Elements

Group I	Group II										Group III	Group IV	Group V	Group VI	Group VII	Group 0
							1 H Hydrogen 1									4 He Helium 2
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 Sulphur 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	226 Ra Radium 88	227 Ac Actinium 89 †															

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

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

Key: a X b — a = relative atomic mass; X = atomic symbol; b = proton (atomic) number

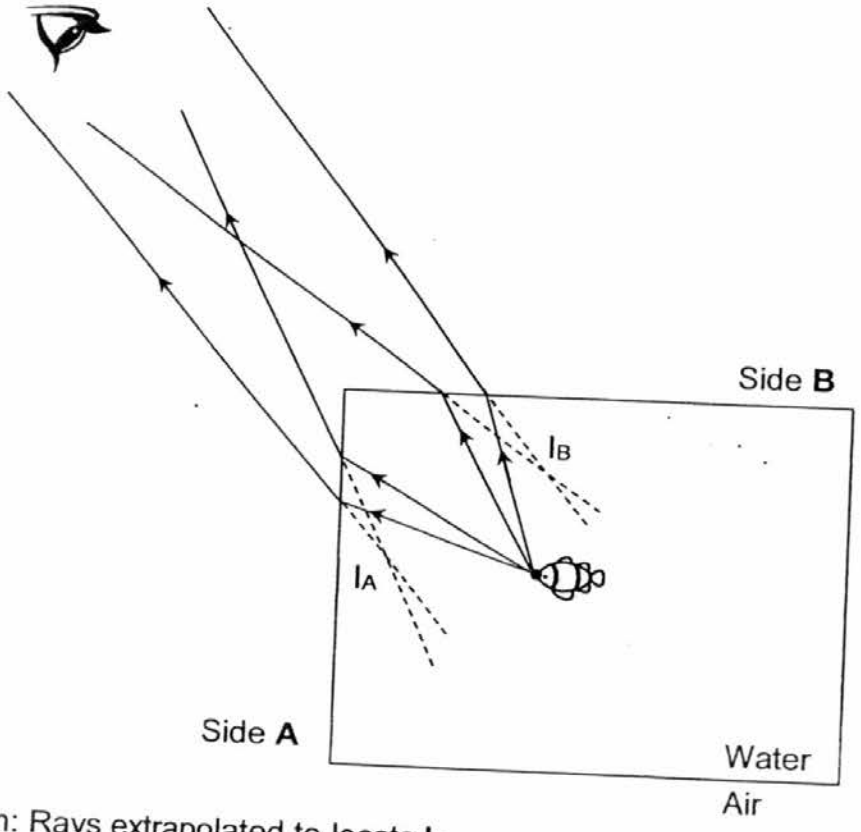
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2016 SA2 Sec 2 EXP Science Answers

Section A [Total 30m]

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

Section B [Total 40m]

1	 1m: Rays extrapolated to locate I_A. 1m: Label I_A at the point of intersection of the extrapolations. 1m: Two rays drawn extrapolated from I_B to eye. 1m: Direction of arrows from fish towards the eye. 1m: Rays from fish that bend away from the normal at side **B**.	5m	Total 5m

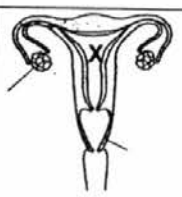
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2a	Water around the heater gets <u>heated up, becomes less dense</u> [1] compared to the water around it and <u>rises</u> [1/2]. As the warm water rises, it <u>pushes the cooler water to the bottom / cooler water sinks</u>. [1/2] <u>Convection currents will be set up</u> [1].	3m	Total 5m
2b	There are <u>no convection currents</u> [1] set up below the heater as cooler water, being denser, will remain at the bottom of the tank. Water is also a <u>poor conductor of heat</u> [1] and will only be heated up by conduction very slowly. 1m: The water molecules will be pushed upwards and get heated up via conduction as they pass through the heater.	2m	
3a	Distance to and from the seabed = 1500 * 1.8 = 2700 m [1] Distance between ship and seabed = 2700 / 2 = 1350 m [1]	2m	Total 4m
3b	Sound is transmitted through vibrations [1] of water molecules forming regions of the <u>compression</u> [½] and <u>rarefactions</u> [½].	2m	
4a	Magnetic separation [1] Filtration [1] Filtration [1] Accept: Use of magnet, Magnet, Magnetism, Magnetic pull, Magnetic attraction Reject: Filter paper, Filter funnel Ignore mild spelling errors	3m	Total 6m
4b	The solvent, alcohol, is flammable. [1] **X** will decompose under strong heating. [1]	2m	
4c	Crystallisation	1m	
5a	Silver chloride → Silver + Chlorine Accept: Silver chloride + heat / sunlight → Silver + Chlorine Reject: Silver chloride → Silver + Chloride	1m	Total 5m

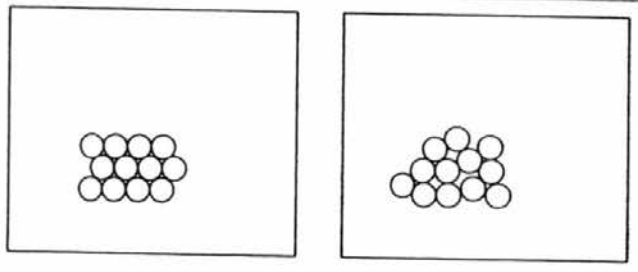
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5b	$2\ AgCl \rightarrow 2\ Ag + Cl_2$ 1/2m: Correct chemical formula for Silver (Ag) 1/2m: Correct chemical formula for chlorine gas (Cl_2) 1m: Correct balancing (Awarded only if the chemical formula of all three substances are correct) Deduct 1m for using "=" instead of "→" Reject: AG, CL, CL_2, Cl^2 Reject: Sunlight → $2\ AgCl \rightarrow 2\ Ag + Cl_2$ Reject: $2\ Ag + Cl_2 \rightarrow 2\ AgCl$	2m	
5c	Disagree [1]. It is not a physical change as it is <u>not reversible by physical means</u> [1]. Accept: It is only a chemical change as the change is <u>only reversible by chemical means</u>. Accept: It is only a chemical change as <u>no physical change can result in formation of new substances</u>. Reject all explanations if "Agree".	2m	
6a	Bile [1]. It <u>emulsifies</u> [1] fats. Accept: It <u>increases the surface area</u> of fats. Accept: It physically <u>breaks down fats into smaller droplets</u>.	2m	Total 5m
6b	Absorption of water (and mineral salts).	1m	
6ci	It remains <u>undigested</u>. Accept: It is <u>excreted as faeces</u>. Accept: It passes through the canal as digestive fibre. Reject: It turns fats into fibre.	1m	
6cii	Glucose 1/2m: Maltose Reject: Sucrose, Starch, Glycogen, Maltase	1m	
7a	**Q**: Vena Cava OR Vein **R**: Aorta OR Artery **X**: Left [0.5] atrium [0.5] **Y**: Right [0.5] ventricle [0.5] Reject: Pulmonary artery, Pulmonary vein	1m each [4]	Total 5m
7b	The capillary is one-cell thick but **R** has <u>thicker and more muscular walls</u>.	1m	

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8a	**P**: Ovary **Q**: Vagina 1/2m: **Egg** / Ovum Reject: Ovule	1m each [2]	
8b	The fallopian tubes / oviducts are blocked [1]. This will prevent any sperms from reaching and fertilising any released ovum / egg [1]. 1/2m: The **ovary tubes** are blocked. Reject: This will prevent implantation of the ovum from taking place.	2m	Total 5m
8c	 (Accept anywhere within the uterus)	1m	

Section C [Total 30m]

1ai	(i) 1.57 cm	1m	
1aii	A. Volume $= 3.142 * (1.57 / 2)^2 * 4.60$ $= 8.91\ cm^3$ (3 s.f.)	1m	
	B. Density $= 70 / 8.90642317$ [1] $= 7.86\ g/cm^3$ (3 s.f.) [1]	2m	
1b	(i) 	2m	Total 10m
	(ii) Solid iron particles are packed tightly in a fixed, regular pattern while molten iron particles are randomly arranged. [1] Solid iron particles vibrate about their fixed positions while molten iron particles are free to slide past one another. [1]	2m	
	(iii) Particles of liquids are usually spaced slightly further apart compared to that of solids, resulting molten iron to have a larger volume compared to solid iron given equal masses. [1] Since density is the measure of mass per unit volume [1], molten iron will be less dense compared to solid iron.	2m	

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2a	(i) 10 Ω	1m	Total 10m
	(ii) 4 Ω	1m	
2bi	A. Total resistance = 10 + 4 = 14 Ω ECF from **2a** to be awarded.	1m	
	B. Current = 28 / 14 [1] = 2 A [1] ECF from A to be awarded.	2m	
	C. P.d. across light bulb = 10 * 2 [1] OR 28 * 10 / 14 = 20 V [1] ECF from A and B to be awarded.	2m	
2bii	When temperature decrease, the <u>total resistance</u> in the circuit <u>increases</u>. [1] Hence <u>current</u> in the circuit <u>decreases</u>. [1]	2m	
2biii	Since current in the circuit decreases, <u>brightness</u> of Y <u>decreases</u>.	1m	

3a	(i) It is to ensure a smooth boiling process.	1m	Total 10m
	(ii) It is to measure the <u>temperature of the vapour</u> entering the Liebigs Condenser. Accept: It is to measure boiling point of water 1/2m: It is to measure temperature of air in the flask 1/2m: It is to measure temperature of heat supplied Reject: It is to ensure constant temperature	1m	
	(iii) **X** is the distillate [1]. It is water [1].	2m	
3b	(i) 3 ≤ pH < 7 Accept: pH 1 or pH 2	1m	
	(ii) Neutralisation reaction	1m	
	(iii) Acid + Alkali → Salt + Water	1m	
	(iv) Methyl orange changes from red to yellow at pH 4 [1]. The mixture is hence, still acidic and has not reached pH 7. [1] He could use litmus / universal indicator / red cabbage indicator / pH meter / bromothymol blue / phenolpthalein instead. [1] 1m: Methyl orange does not change colour at pH 7. 1/2m: Methyl orange shows **orange** even when the solution is acidic, neutral or alkaline. Reject: Cabbage	3m	

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4a	(i) Plant. Accept: Leaf cell, fern, fungi, root cell	1m	
	(ii) It has a <u>cell wall</u> [1] and <u>one central large vacuole</u> [1]. Accept: It has a regular / fixed shape Accept: It has no chloroplast (if (i) stated fungi / root cell) Reject all answers if (i) stated Animal cell.	2m	
4b	(i) **X** is distilled water [1] and **Y** is concentrated salt solution [1].	2m	
	(ii) There must have been a <u>higher water potential in **X** compared to that in the cell</u> [1]. This resulted in <u>osmosis</u> [1] to take place where <u>water molecules will move through the partially permeable cell membrane</u> [1] into the cell, causing the cell to appear turgid. 1/2m: water **osmosized** into the cell Reject: cell absorb water	3m	Total 10m
	(iii) Solution **Y** will be found in **A**. [1] The cell membrane pulls away from the cell wall as the cell becomes flaccid, <u>creating space for solution **Y** to enter</u> [1] through the permeable cell wall. Accept: Salt solution will be found in **A**. Accept: The cell wall is fully permeable. Reject: The cell membrane pulls away from the cell wall. Reject: Salt will be found in **A**. Reject all explanations if "salt" or "**Y**" was not mentioned at all.	2m	

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