TANGLIN SECONDARY SCHOOL

END-OF-YEAR EXAMINATION 2018

Secondary 2 Express

NAME _____

CLASS _____ **INDEX NO.** _____

GENERAL SCIENCE

Section A **2 hours**

(Sections A, B and C)

Additional Materials: Optical Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.
Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.

Section A
Answer **all** questions. There are **thirty** multiple choice questions on this paper.
For each question, there are four possible answers, **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and shade 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.
Any rough working should be done in this booklet.

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

The use of an approved scientific calculator is expected, where appropriate.

For Examiner's Use	
Total	30

This document consists of **12** printed pages.

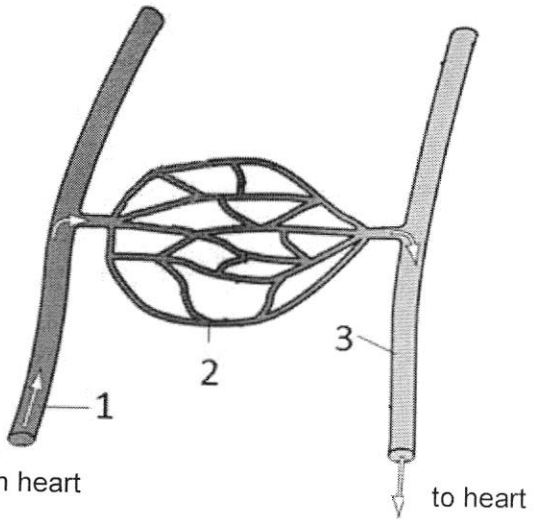
Section A: 30 marks

1. Which components of blood are involved in the transport of substances?

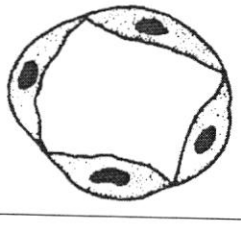
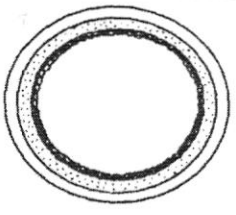
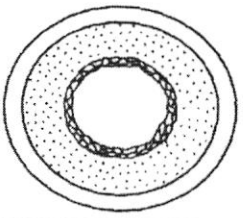
I. plasma
II. platelets
III. red blood cells
IV. white blood cells

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

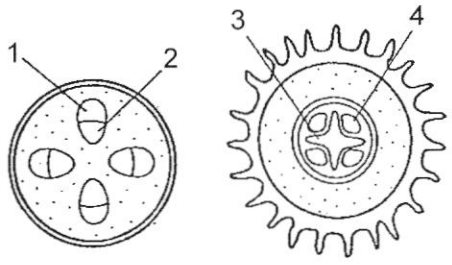
2. The diagram shows three types of blood vessel, 1, 2 and 3.



Which of the cross-sectional diagrams match those of blood vessels 1, 2 and 3?

	cross-section of blood vessel (not drawn to scale)		
			
A	1	2	3
B	2	1	3
C	2	3	1
D	3	2	1

3. The diagrams show the cross-sections of the stem and root of a plant.

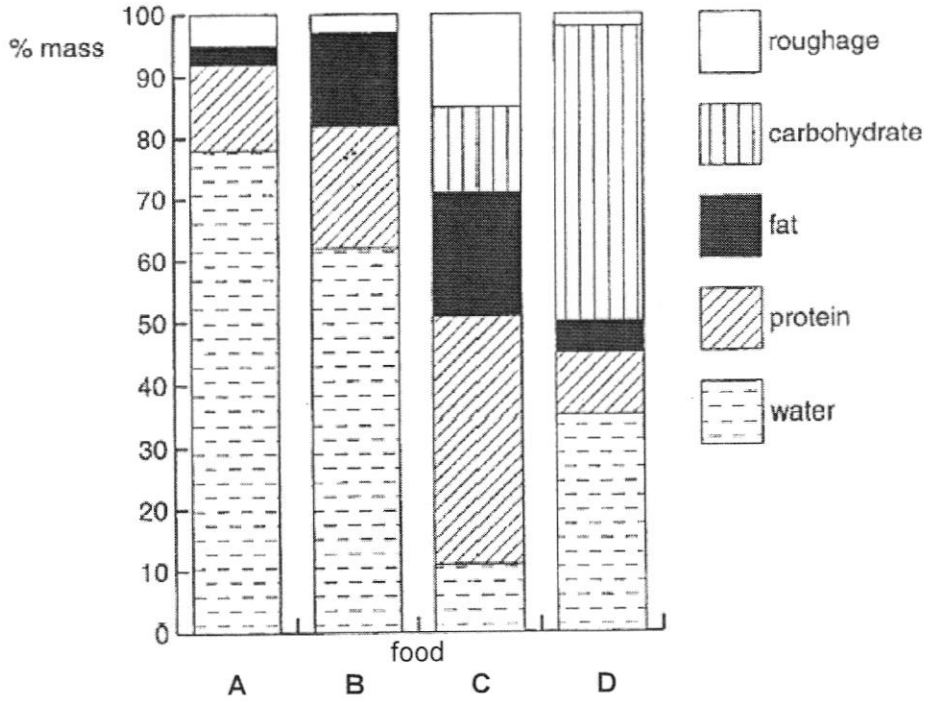


Which row correctly labels the vessels?

	phloem	xylem
A	1 and 3	2 and 4
B	1 and 4	2 and 3
C	2 and 3	1 and 4
D	2 and 4	1 and 3

4. Four food substances are analysed. The diagram shows the results of the analysis.

Which food will provide the most energy after consumption?



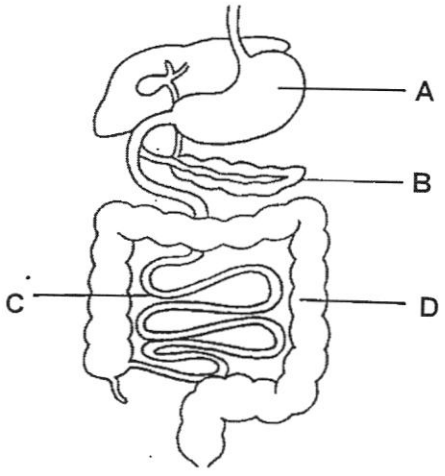
5. The table shows the results when four foods are tested with Benedict's solution and biuret reagent.

Which food contains reducing sugar but not proteins?

	colour obtained with Benedict's solution	colour obtained with biuret reagent
A	blue	blue
B	blue	violet
C	red	blue
D	red	violet

6. The diagram below shows a section of the human digestive system.

In which structure does the absorption of most food molecules occur?



7. Which description does **not** match the contraceptive method?

	contraceptive method	description (how it works)
A	condom	as a barrier to sperm
B	contraceptive pill	hinders implantation
C	natural (rhythm)	absence of ovum
D	vasectomy	absence of sperm in semen

8. Which statement is **not** true about sexually transmitted infections?

A AIDS can be transmitted by sharing instruments that are likely to break the skin.
B HIV-infection will develop into AIDS.
C Gonorrhoea is caused by bacteria.
D Syphilis cannot be cured by antibiotics.

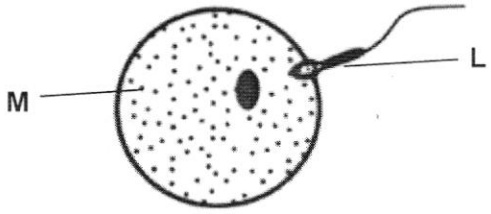
9. The diagram shows a calendar marker by a lady to indicate the first day of her menstruation.

September						
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

Which period should she and her husband have sexual intercourse if they intend to have a baby?

A 1st – 7th September
B 5th – 11th September
C 10th – 17th September
D 18th – 24th September

*For questions **10** and **11**, refer to the diagram which shows an event happening in the female reproductive system.*



10. Which row correctly states the event and the location it occurs at?

	event	location
A	fertilisation	oviduct
B	fertilisation	vagina
C	pregnancy	oviduct
D	pregnancy	uterus

11. Which row correctly identifies **L** and **M**?

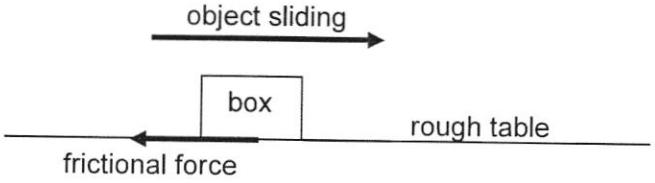
	L	**M**
A	sperm	ovary
B	sperm	ovum
C	testis	ovum
D	testis	ovary

12. A circus act involves a performer lying on a large number of nails pointing upwards. The performer suffers no skin damage.

Which statement explains this?

A The performer's weight is spread over a large area, which decreases the pressure.
B The performer's weight is spread over a large area, which increases the pressure.
C The performer's weight is spread over a small area, which decreases the pressure.
D The performer's weight is spread over a small area, which increases the pressure.

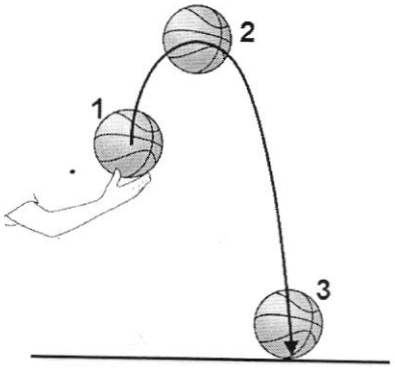
13. A stationary box is pushed and then allowed to slide along a rough table. The diagram shows the direction of the frictional force.



What is a possible effect of the frictional force on the sliding box?

A It changes the direction of the sliding box.
B It has no effect on the sliding box.
C It increases the speed of the sliding box.
D It slows down the sliding box.

14. A basketball is thrown upwards. The picture below traces the motion of the ball from the instant it leaves the hand until the time it hits the ground.



Assuming negligible air resistance, the total amount of 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.

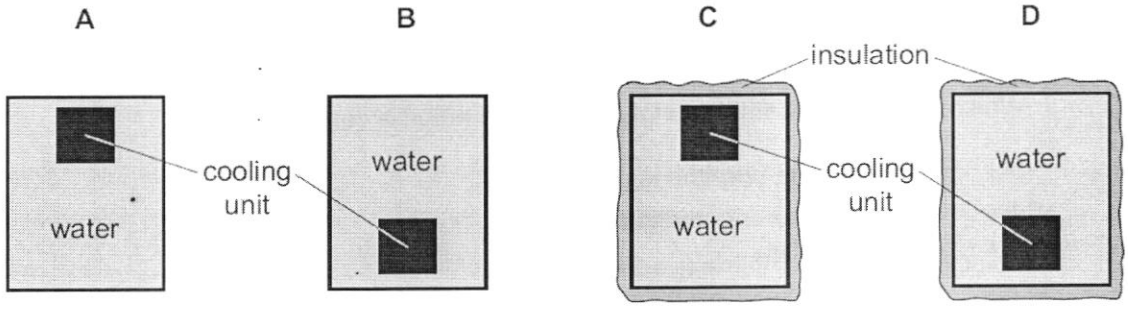
15. Which statements about biomass fuels and fossil fuels are correct?

I. Biomass fuels generate less pollution than fossil fuels.
II. Both are limited and will run out one day.
III. Both are renewable sources of energy.
IV. Both originate from plants and animals.

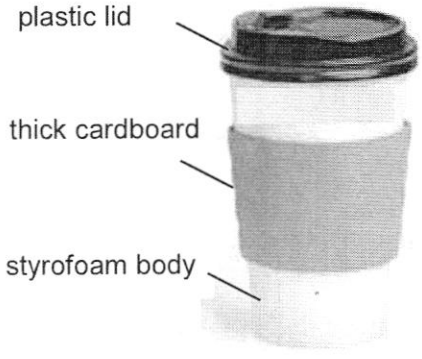
A I and IV only
B I and II only
C I, III and IV only
D II and III only

16. Four identical metal tanks in a room each contains the same amount of water. The water is at the same temperature as the room. Two of the tanks are insulated, and two of the tanks are not insulated. A cooling unit is placed in each of the tanks, in the position shown.

In which tank does all the water become cool the most quickly?



17. Which part(s) of the cup reduce(s) heat lost through conduction?

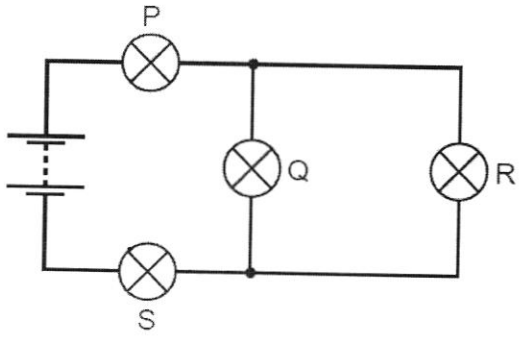


A plastic lid only
B plastic lid, thick cardboard and styrofoam body
C thick cardboard and styrofoam body
D thick cardboard only

18. What is the effect on the mass and volume of matter during contraction?

	mass	volume
A	decreases	decreases
B	increases	remains unchanged
C	remains unchanged	decreases
D	remains unchanged	increases

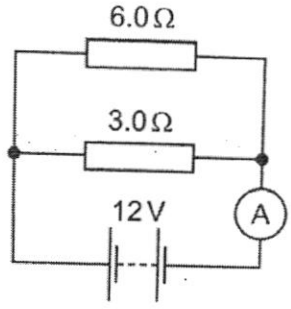
19. The diagram shows a circuit with four identical bulbs **P**, **Q**, **R** and **S**.



Which statement about the brightness of the bulbs is correct?

A **P** is the same brightness as **S**.
B **Q** is the same brightness as **P**.
C **Q** is brighter than **S**.
D **R** is brighter than **P**.

20. A 12 V battery in connected across a parallel arrangement of two resistors.



What is the total resistance of the circuit and the reading on the ammeter?

	total resistance	ammeter reading
A	0.5 Ω	2 A
B	2 Ω	6 A
C	9 Ω	4 A
D	9 Ω	6 A

21. Which appliance does **not** make use of a rheostat?

A	ceiling fans	**B**	electric iron
C	electric kettle	**D**	speakers

22. A mains electrical circuit uses insulated copper cable. The cable overheats.

Which change will prevent the cable from overheating?

A use thicker copper cable which has less resistance
B use thicker insulation which stops the heat escaping
C use thinner copper cable which has more resistance
D use thinner insulation which allows less heat to escape

23. An atom of an element X, has 17 protons and 20 neutrons.

Which chemical symbol represents this element?

A	$^{17}_{20}X$	**B**	$^{17}_{37}X$
C	$^{20}_{17}X$	**D**	$^{37}_{20}X$

24. Monosodium glutamate is a compound used as a food additive and a flavour enhancer. It has the chemical formula $C_5H_8NNaO_4$.

How many elements and atoms does it have?

	elements	atoms
A	4	17
B	5	17
C	5	19
D	6	19

25. The table shows the melting points and boiling points of four substances.

Which substance is a liquid at a room temperature of 25 °C?

	melting point / °C	boiling point / °C
A	-101	-34
B	-39	218
C	30	1550
D	327	927

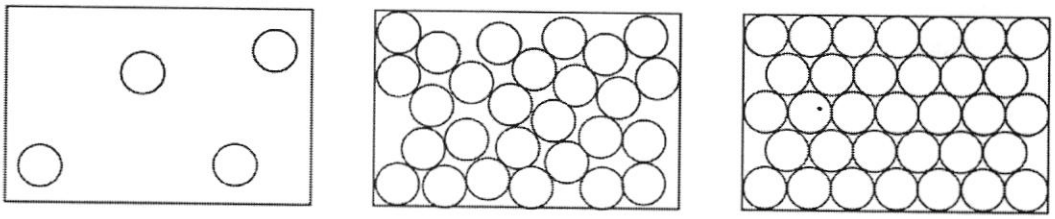
26. Burning petrol in air produces carbon dioxide, water vapour and heat.

What is petrol made up of?

I. carbon
II. hydrogen
III. oxygen

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

27. Diagrams **R**, **S** and **T** represent the three states of matter.

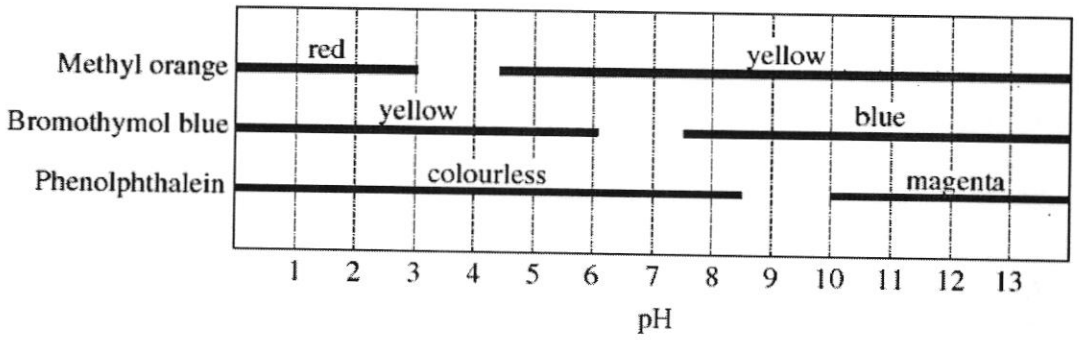


R S T

Which change is a result of gain in heat from the surrounding?

A R → S
B R → T
C S → T
D T → S

28. The diagram shows the colour ranges of three indicators at various pH values.



If a solution is yellow in methyl orange, blue in bromothymol blue and colourless in phenolphthalein, what is the pH range of the solution?

A 4.5 to 6.0
B 6.0 to 7.5
C 7.5 to 8.5
D 8.5 to 10.0

29. Gas bubbles can be formed in a solution for various reasons.

In which situation is the formation of bubbles a sign of chemical reaction taking place?

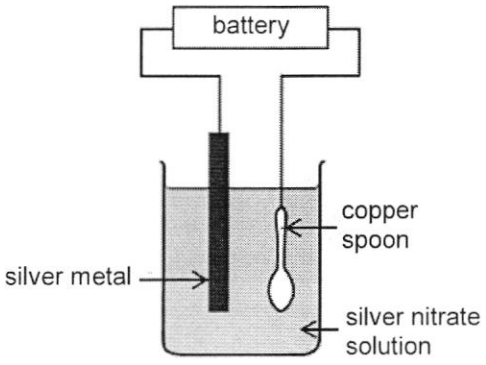
A A can of fizzy drink is opened.

B A piece of magnesium ribbon dissolving in dilute nitric acid.

C A pot of hot soup boiling at 100 °C.

D A swimmer exhaling underwater.

30. The diagram shows an experimental set-up to electroplate the copper spoon with silver.



Which statement about the experiment is **not** correct?

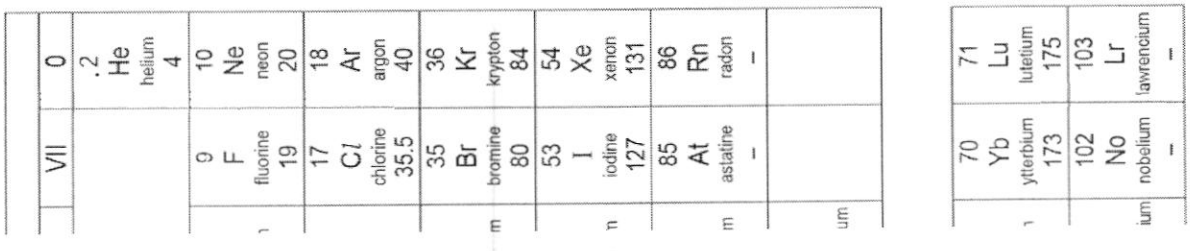
A It is a chemical change caused by electricity.

B It is a chemical reaction to break down a compound.

C Simpler substances are obtained as products.

D The change can be reversed by switching off the power supply.

End of Section A



TANGLIN SECONDARY SCHOOL

END-OF-YEAR EXAMINATION 2018

Secondary 2 Express

NAME

CLASS **INDEX NO.**

GENERAL SCIENCE

Sections B and C **2 hours**

Sections A, B and C

Candidates answer on the Question Paper.

Additional Materials: 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 a soft pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, glue or correction fluid.

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

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

The use of an approved calculator is expected, where appropriate.

For Examiner's Use	
Total	70

This document consists of **16** printed pages.

Section B: 40 marks

1. A student designed an experimental setup to show the movement of substances. He removed the skin of the potato and cut a well in the middle. He poured 80% glucose solution in the well. The potato was placed in a petri dish filled with distilled water as seen in Fig. 1.1.

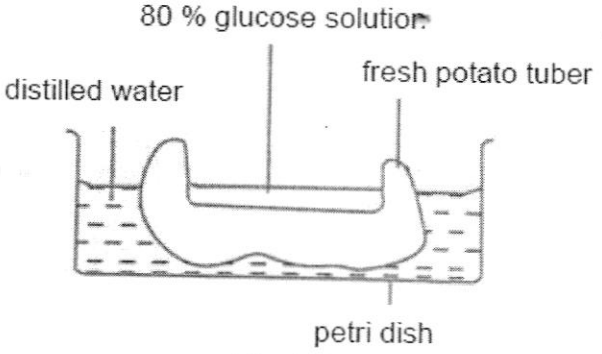


Fig. 1.1

After one hour, the level of distilled water decreased while the level of glucose solution increased.

(a) Name the process that resulted in the change in levels of the glucose solution in the well and the distilled water in the petri dish.

..... [1]

(b) Name the part that controls the movement of substances into and out of the plant cell.

..... [1]

(c) Explain the results of the experiment.

.....

.....

.....

.....

..... [3]

[Total: 5m]

2. The graphs **A** and **B** in Fig. 2.1 show the percentage of two classes of food nutrients as they go through the mouth, stomach and small intestine.

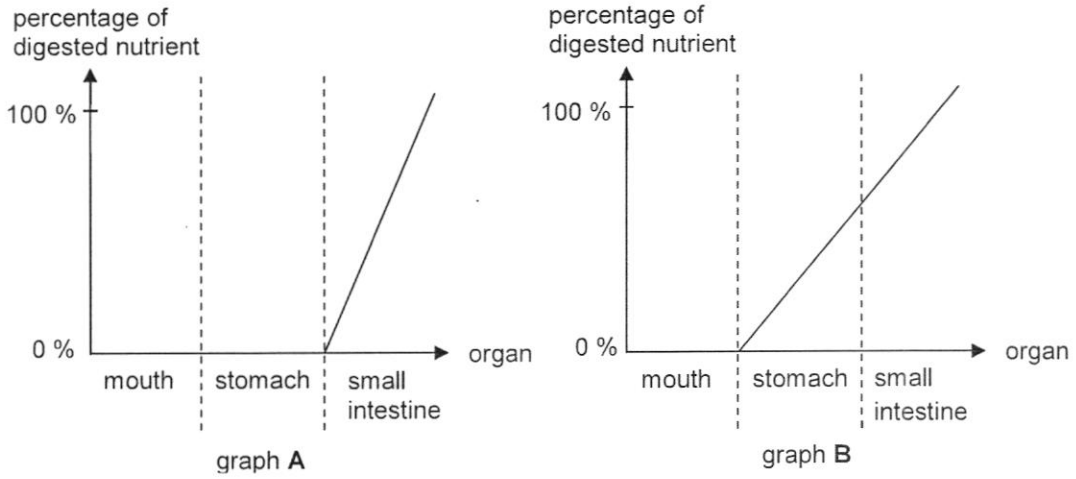


Fig. 2.1

(a) State and explain which graphs **A** or **B** in Fig. 2.1 represents the digestion of fats.

.....

.....

..... [2]

(b) **(i)** Complete the graph in Fig. 2.2 to show the digestion of starch in the human digestive system. [1]

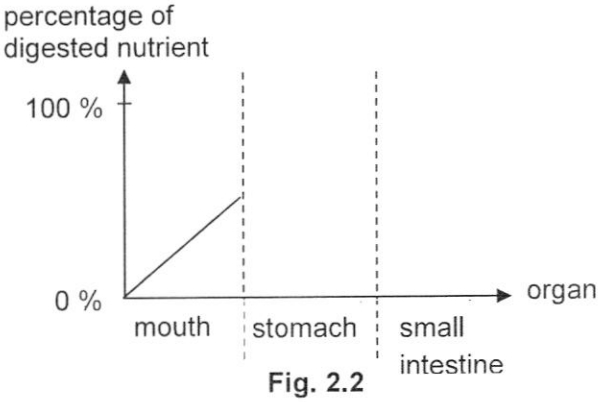


Fig. 2.2

(ii) Explain the shape of your graph in **(b)(i).**

.....

.....

.....

..... [3]

[Total: 6m]

3. Fig 3.1 shows an elevator (lift) which takes people to different floors in a tall building. The elevator travels up the lift shaft pulled by long metal cables and an electric motor. There are no people in the elevator, which has stopped at the bottom floor.

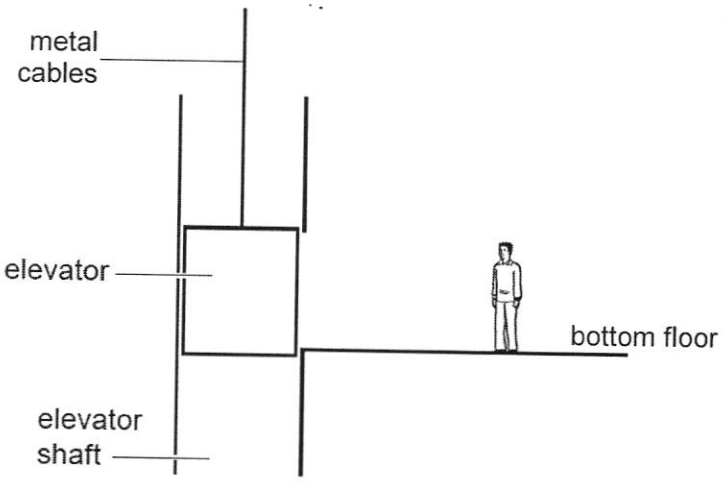


Fig. 3.1

(a) **(i)** On Fig. 3.1 draw two arrows to show the action of the **two** main forces acting on the elevator when it stopped. [1]

(ii) One force is measured and found to be 5000 N.

State whether the other force is 5000 N or has a different value. Give a reason for your answer.

.....

..... [1]

(b) A man who has a mass of 73 kg enters the elevator. The elevator begins to move upwards at an average speed of 8 m/s. It moves 90 m up from the bottom floor and stops at the top floor.

(i) Calculate the time taken by the elevator to travel from the bottom floor to the top floor of the building.

time taken ..... [1]

(ii) Calculate the work done by the elevator's electric motor when it transports the man from the bottom floor to the top floor of the building.

work done ..... [3]

(iii) State the energy change that takes place as the elevator moves from the bottom floor to the top floor of the building.

..... [1]

(iv) The elevator maintenance engineer made the following statement.

> The elevator is a machine which is 100% efficient as all the energy supplied by the electric motor is used to move the elevator from one floor to another.

Do you agree with his statement? Explain your answer.

.....

..... [1]

[Total: 8m]

4. Fig. 4.1 shows an experiment set up by a student. A piece of magnesium was added to excess colourless solution **X**. Magnesium chloride salt solution and hydrogen gas were produced.

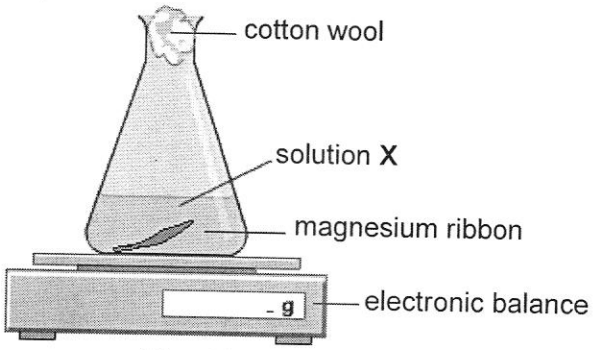


Fig. 4.1

Fig. 4.2 shows how the mass of reactants changes with time.

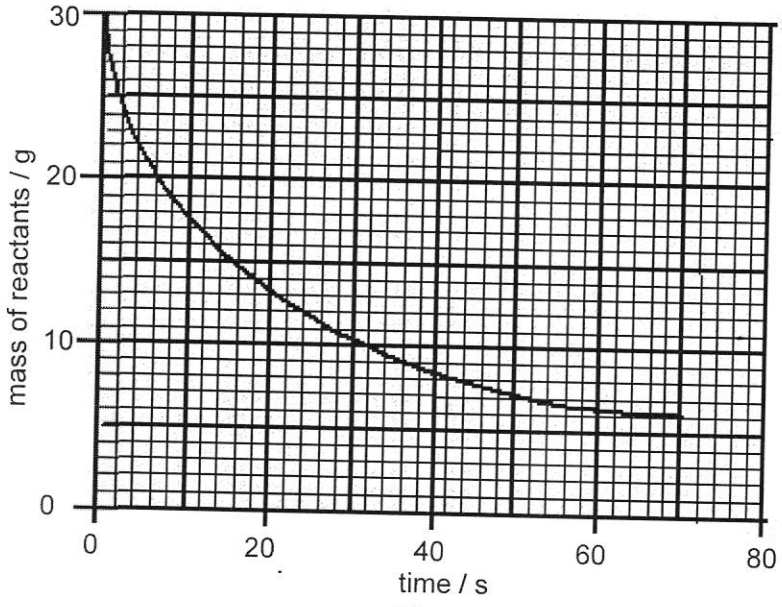


Fig. 4.2

(a) Name the colourless solution **X**.

.....[1]

(b) **(i)** Use the information in Fig. 4.2 to deduce the time taken for the reaction to complete.

.....[1]

(ii) State an observation to indicate that the reaction is completed.

.....[1]

(c) Determine the mass of hydrogen gas produced. Show your working.

.....[1]

[Total: 4m]

5. Fig. 5.1 shows a model of the structure of a particle of beryllium, Be.

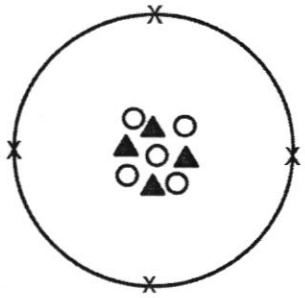


Fig. 5.1

(a) Complete Table 5.1 to show the names, relative masses and charges of each sub-atomic particle represented by the respective symbols in Fig. 5.1.

Table 5.1

symbol	name	relative mass	relative charge
X		$\frac{1}{1840}$	
O			
▲			

[3]

(b) Use the information in Fig. 5.1 to explain whether the particle of beryllium is neutral.

.....

.....

..... [2]

(c) Fig. 5.2 shows how a particulate model of beryllium can change when it is burned in air.

Fig. 5.2

(i) Complete the label in Fig. 5.2 for the name of the product. [1]

(ii) Explain why the reaction in Fig. 5.2 is a chemical change.

.....

..... [1]

(iii) By comparing the atoms of the reactants and products, explain if the reaction in Fig. 5.2 follows the law of conservation of mass.

.....

..... [1]

[Total: 8m]

6. Fig. 6.1 shows the internal part of an electric iron that is just switched on.

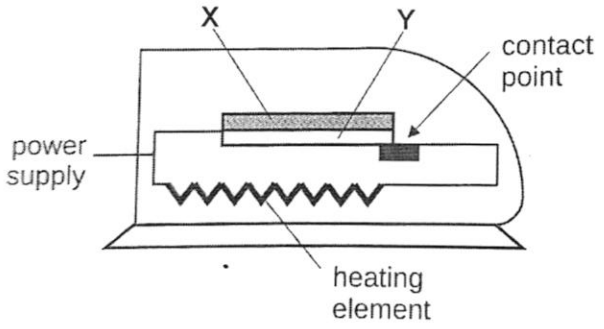


Fig. 6.1

(a) An electric iron makes use of a bimetallic strip to be a thermostat. The bimetallic strips consists of two different metals, **X** and **Y**, which has different thermal conductivities. Table 6.1 shows the thermal conductivities of three metals.

Table 6.1

metal	thermal conductivity (W / mK)
steel	54
brass	111
copper	386

(i) Use the information in Table 6.1 to deduce the metals **X** and **Y** are made of. Hence, describe and explain how the bimetallic strip acts as a thermostat in an electric iron to keep the temperature at 80 °C.

X: ..... Y: .....

.....

.....

.....

.....

..... [5]

(ii) State the main mode of heat transfer from the iron to a shirt during ironing.

..... [1]

(b) Chen Xu irons his uniform 3 times a week and spends 25 minutes ironing each time. The electric iron he uses has a rating of 1100 W, 240 V.

(i) Calculate the amount of electric energy (in kWh) used in a month, to iron his uniform. (Assume that there are only four weeks in a month).

electric energy = ... [2]

(ii) Calculate the cost of using the iron in a month if one unit of energy cost 26 cents.

cost = ... [1]

[Total: 9m]

Section C: 30 marks

7. (a) Two copper cans **A** and **B** are placed equal distances from a radiant heater, as shown in Fig. 7.1.

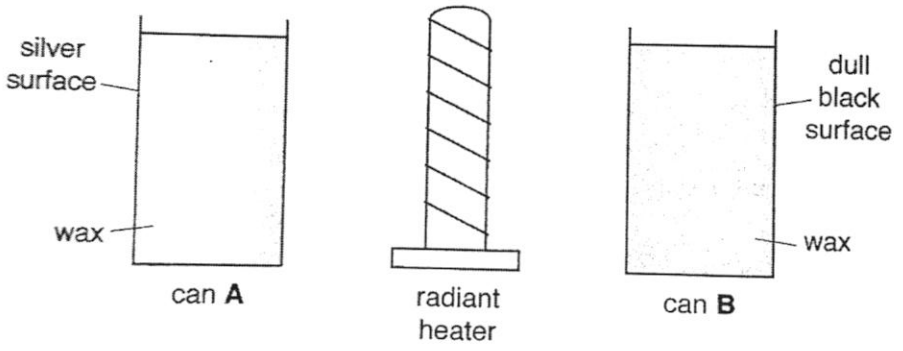


Fig 7.1

The two cans have the same mass and are of the same shape and size. Can **A** is painted silver and can **B** is painted dull black. The cans contain equal masses of solid wax.
The heater is switched on and after some time, the wax in both cans starts to melt.

(i) State and explain which can of wax is the first to melt completely.

.....

.....

..... [2]

(ii) Explain why heat energy cannot be transferred effectively between the radiant heater and the cans by conduction and convection.

conduction: .....

.....

convection: .....

..... [2]

(b) Fig. 7.2 shows the temperature of the wax in can **B** as it is heated over time.

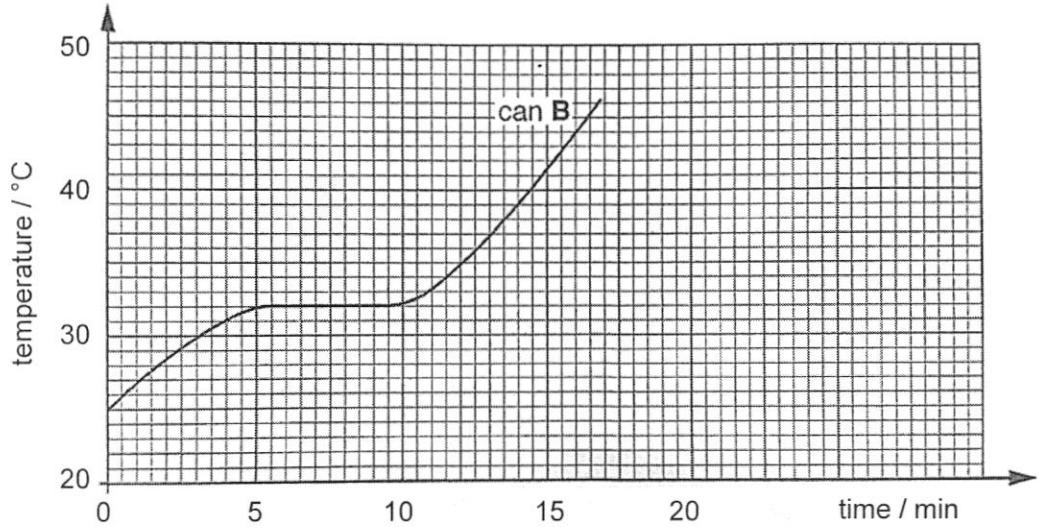


Fig. 7.2

(i) Use the information in Fig. 7.2 to deduce the melting point of the wax.

..... [1]

(ii) Describe how the motion and the arrangement of the molecules of the wax change as the wax is heated for the first 15 minutes.

.....

.....

.....

..... [3]

(iii) After the radiant heater is turned off, state and explain what will happen to the wax in can **B**.

.....

.....

..... [2]

[Total: 10m]

8. A thermistor is an electrical component with a resistance that changes with temperature. A student investigates how the resistance of a thermistor changes with temperature. He connects the thermistor in series with a resistor **Y** of resistance 5 Ω and a 12 V battery, as shown in Fig. 8.1.

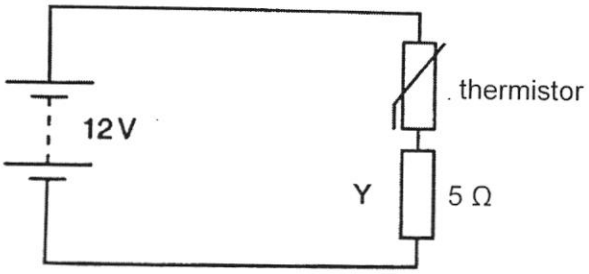


Fig. 8.1

(a) On Fig. 8.1, draw a voltmeter symbol, correctly connected, to measure the potential difference across the thermistor. [1]

Fig. 8.2 shows the variation with temperature of the resistance of the thermistor.

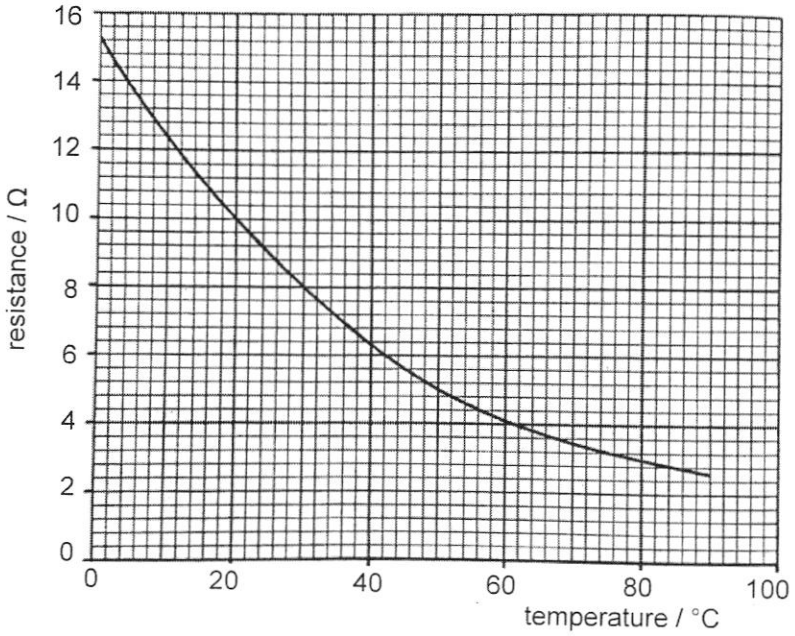


Fig. 8.2

(b) The student measured the resistance of the thermistor at a temperature of 30 °C.

(i) Use Fig. 8.2 to determine the resistance of the thermistor.

..... [1]

(ii) Calculate the total resistance of the circuit.

total resistance ..... [1]

(iii) Calculate the current in the circuit.

current ..... [1]

(iv) What is the size of the current flowing through resistor **Y**? Explain your answer.

.....

..... [1]

(v) Calculate the potential difference across resistor **Y**.

potential difference ..... [1]

(c) Use Fig. 8.2 to describe and explain what happens to the current in the circuit as the temperature of the thermistor rises.

.....

.....

..... [2]

(d) When the circuit in Fig. 8.1 is connected to an AC power supply, a fuse is connected in the circuit. State the function of a fuse and describe how it works.

.....

.....

..... [2]

[Total: 10m]

9 **(a)** A student investigated the thermal decomposition of metal carbonates using the apparatus shown in Fig. 9.1.

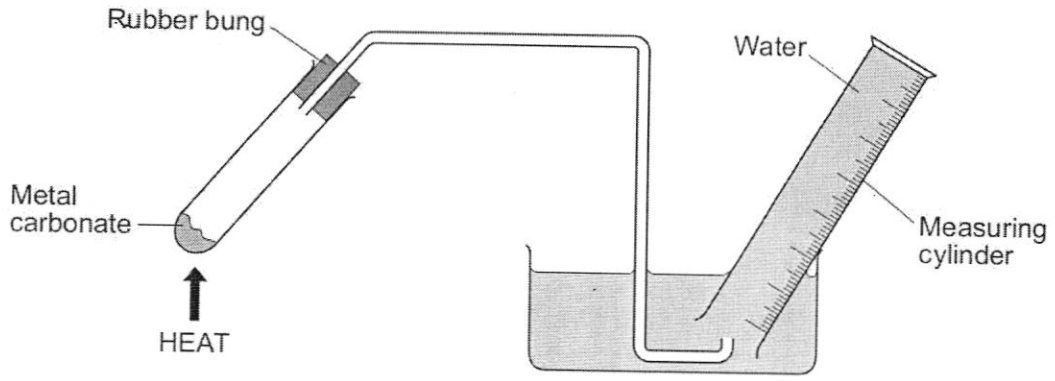


Fig. 9.1

After heating the metal carbonate for five minutes, the student measured the volume of gas collected.

Table 9.1 shows the volume of gas collected for three different metal carbonates.

Table 9.1

metal carbonate	volume of gas collected / cm^3
magnesium carbonate	20
sodium carbonate	0
zinc carbonate	24

(i) Use the data in Table 9.1 to deduce which metal carbonate did not undergo a chemical change. Explain your answer.

.....

.....

..... [2]

The student performed another experiment using copper carbonate. After heating, a black metal oxide and a gas were produced.

(ii) Write a word equation to show the thermal decomposition of copper carbonate.

..... [1]

(iii) Describe a test to identify the gas produced in this reaction.

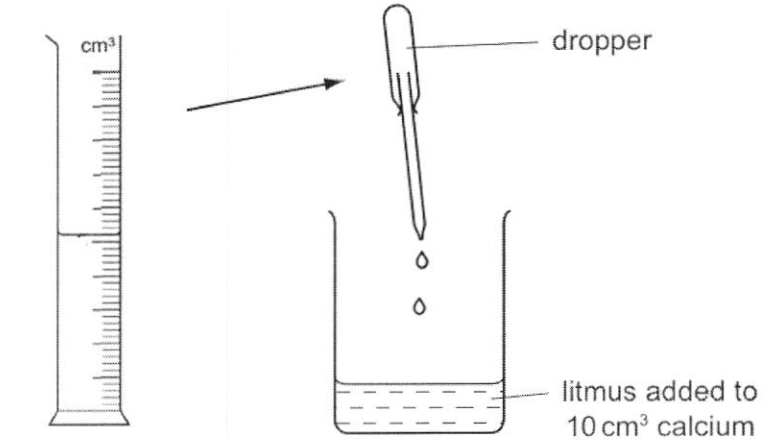
test .....

observation ..... [2]

(b) A farmer's crop is growing poorly. He thinks that the soil in his field may be too acidic.

He collected some soil from his field and mixed it with water. He filtered the mixture to obtain the soil washing as the filtrate. He then carried out the following steps:

1. He placed 10 cm^3 of calcium hydroxide solution in a beaker and adds a few drops of litmus.
2. He placed 10 cm^3 of the soil washing in a measuring cylinder.
3. He used a dropper to add soil washing from the measuring cylinder, drop by drop, to the calcium hydroxide in the beaker, until the litmus changes colour.



soil washing **A**

(i) State the name of the reaction that takes place when an acid is added to an alkali.

..... [1]

(ii) The colour of litmus in solutions of different pH are shown in Table 9.2.

Table 9.2

pH value	1	7	14
colour of litmus	red	purple	blue

State the change in colour of the litmus.

..... [1]

(c) Fig. 9.2 shows the reading on the measuring cylinder containing the soil washing after the litmus has changed colour.

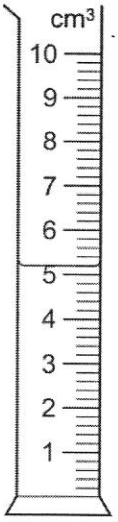


Fig. 9.2

(i) Calculate the volume, V, of soil washing added to the calcium hydroxide.

..... [1]

(ii) The soil is considered acidic when the concentration of acid is above 0.05 units. The concentration of acid in the soil washing can be determined using the equation given below.

$$\text{concentration of acid} = \frac{(2 \times 0.013 \times 10)}{V}$$

Use calculations to deduce whether the soil is too acidic to grow crops. Show your working and leave your answer to three decimal places.

..... [2]

[Total: 10m]

END OF PAPER

Tanglin Secondary School
End of Year Exam 2018
Sec 2 Express
General Science

Section A: (30m)

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

Section B: (30m)

S/N		Marks
1	(a) osmosis	[1]
	(b) Cell membrane	[1]
	(c) Distilled water has **higher water concentration** than potato cells; while potato cells has **higher water concentration** than 80% glucose solution; water molecules move into the potato and into the glucose solution.	[1] [1] [1]
	Total	5
2	(a) (i) Graph A; Digestion of fats (into fatty acids and glycerol) only takes place **in small intestine as it contains lipase**, thus % of digested nutrient increase	[1] [1] [1]
	(b) (i) flat horizontal line (stomach), % increase (small intestine) (ii) In the mouth, starch is digested by salivary amylase into maltose; There is no digestion of starch or maltose in the stomach; Carbohydrase/maltase in the small intestine digests maltose into glucose, thus the % of digested nutrient increases.	[1] [1] [1]
	Total	6
3	(a) (i) arrow up and arrow down – gravitational force (ii) both forces are of the same value, elevator is stationery/ not moving.	[1] [1]
	(b) (i) 11.25 s (ii) weight of man = 73 x 10 = 730N Total force = 730 + 5000 = 5730N Work done = 5730 x 90 = 515700 Nm	[1] [1] [1] [1]
	(iii) kinetic energy to gravitational potential energy (iv) No, energy will be **lost as heat (and sound)** due to frictional force.	[1] [1]
	Total	8

4	(a) hydrochloric acid	[1]
	(b) (i) accept values between 62 to 64 s	[1]
	(ii) magnesium ribbon disappears / no more effervescence	[1]
	(c) 30 – 6 = 24 g	[1]
	Total	4
5	(a)	[3]

symbol	name	relative mass	relative charge	
	electron		-1	[1]
	neutron	1	0	[1]
	proton	1	+1	[1]

	(b) there are 4 electrons which are negatively charged;	[1]
	and 4 protons which are positively charged. Hence, it is neutral.	[1]
	(c) (i) 2 molecules of beryllium oxide	[1]
	(ii) the atoms of the reactants rearranged and a new substance is formed	[1]
	(iii) Yes it follows. There are 2 atoms of beryllium and 2 atoms of oxygen before and after the reaction.	[1]
	Total	8
6	(a) (i) **X**: steel & **Y**: brass/copper or **X**: brass & **Y**: copper	[2]
	- When it is too hot / above 80°C, brass which has a **higher thermal conductivity** will **expand more** than steel;	[1]
	- bimetallic strip will **bend upwards / away** from the contact point and the circuit becomes open / **no current** flow through;	[1]
	- When bimetallic strip cools, it **returns back** to its origin position and closes the circuit / **current can flow** through	[1]
	(ii) conduction	[1]
	(b)(i) power = 1.1kW, time = 25/60 h	
	Electric energy per week = 1.1 x 25/60 x 3	[1]
	Electric energy per month = 1.1 x 25/60 x 3 x 4	
	= 5.5 kWh	[1]
	(ii) Cost of electricity = 5.5 x 0.26	
	= $1.43	[1]
	Total	9

Section C: (30m)

S/N		Marks
7	(a)(i) Can B; Dull and black surface is a **better absorber of heat** than silver surface, thus wax **melts faster**. (ii) - air molecules (between the can and heater) are far apart, thus heat energy cannot be transferred through vibrations; - hot air near the heater will rise so heat energy cannot be transferred sideways. (b) (i) 32 °C (ii) Intially solid state, wax particles are closely packed together and vibrates in fixed position; - As the temperature increases, the particles vibrate faster; - After 10 mins, wax melts, particles are slightly further apart and slide across each other. (iii) wax will solidify; Surrounding air is colder, wax will lose heat energy to the surrounding	[1] [1] [1] [1] [1] [1] [1] [1] [1] [1]
	Total	10
8	(a) (i) sodium carbonate; No gas was collected / 0 cm^3 of gas collected (ii) copper carbonate → copper oxide + carbon dioxide (iii) test: bubble the test into limewater observation: white precipitate is formed (b) (i) Neutralisation (ii) blue to purple (iii) V = 10 – 5.2 = 4.8 cm^3 (iv) (2 x 0.013 x 10) / 4.8 = 0.542 cm^3 (3.s.f) Value is more than 0.05, thus the soil is too acidic to grow crops.	[1] [1] [1] [1] [1] [1] [1] [1] [1] [1]
	Total	10
9	(a) voltmeter drawn parallel to thermistor (b)(i) 8Ω (ii) 8 + 5 = 13 Ω (iii) I = V/R = 12 / 13 = 0.923 A	[1] [1] [1] [1]

	(iv) 0.923A, current flowing throughout a series circuit is the same. **Note: if value is correct without correct explanation, no marks will be awarded.**	[1]
	(v) V= I x R = 0.923 x 5 = 4.615 V	[1]
	(c) As the temperature increases, the current increases; Because the resistance decrease.	[1] [1]
	(d) – to protect electrical components and wire from electrical overload or short circuit.	[1]
	- when large amount of electricity flows through the fuse, it will melt and create an open circuit.	[1]
	Total	10