Name	Class	Teacher code

SCIENCE

10BC

Year 10 Examination 2015

10BC – 120 Marks

Answer all questions in the spaces provided on the paper.
Show all your working in calculations.
Give units for all answers (e.g. km or ^{o}C) unless they have already been provided.
Check you have pages 1 – 32.

Question	m/c	1	2	3	4	5	6	7	8	9	10	11	Total
Marks gained													
Marks available	30	5	5	5	5	5	4	3	4	3	5	6	80

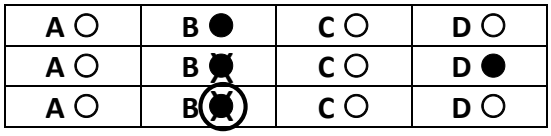
Question	12	13	14	15	16	17	18	19	Total
Marks gained									
Marks available	6	4	7	4	4	4	6	5	40
									120

There are no questions printed on this page

MULTIPLE CHOICE

Thinking with evidence in Science - Multiple Choice Questions

- Use a **blue or black pen**
- For each answer **completely fill in the circle** as shown.
- Do **not** extend beyond the circles.
- If you want to change your answer **you must** cross out your original answer as shown.
- If you change your mind about an answer you have crossed out and now want to choose it, draw a ring around the cross as shown.



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

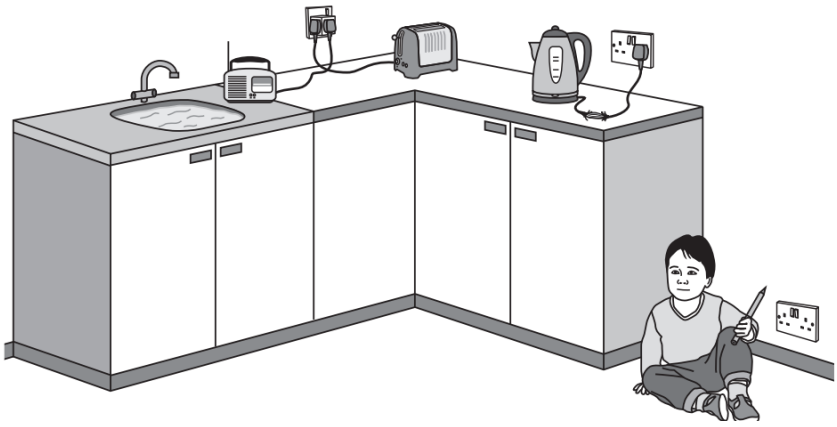
Do NOT answer questions 31-40 from the booklet.

Answer ALL the questions in the spaces provided.

Question One: [5 marks]

Electricity needs to be used safely. It can cause an electrical shock. Look at the picture of the kitchen.

(a) (i) Circle three electrical hazards you can see in the picture.



(ii) Explain what might happen in one of the 3 hazards you have circled.

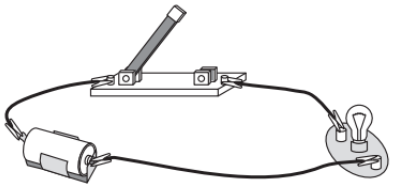
_____

_____

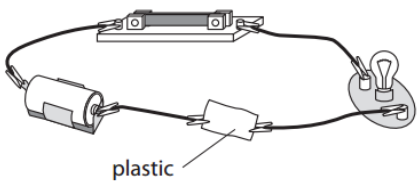
_____

(b) Students investigate how to light up a bulb. In which circuit will the bulb light? (Circle your answer.)

A



B



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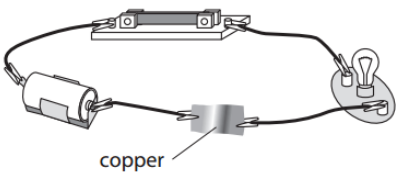

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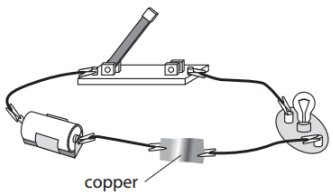
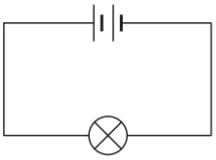


(c) All the bulbs in the circuits below will light up. "M" is a motor. Which circuit will have the brightest bulb? (Circle your answer.)

A



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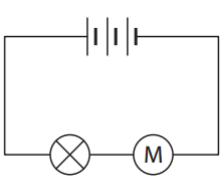

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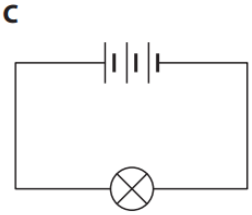
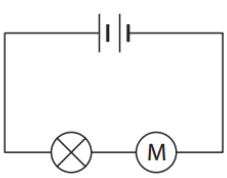


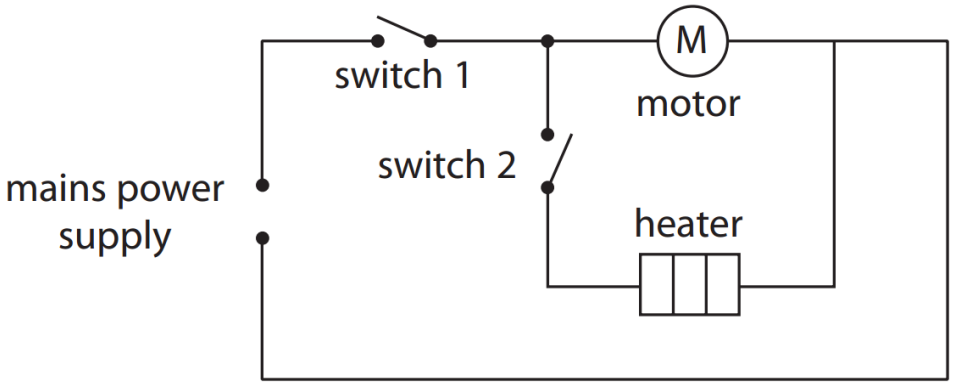
D



Amy has a hairdryer.

She drew a diagram of the circuit inside the hairdryer.

The motors turn the fan and the heater warms the air.

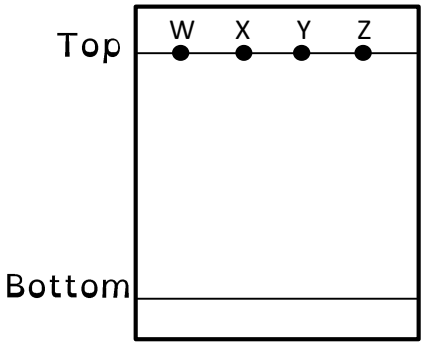


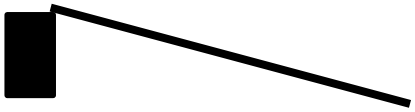
(d) Explain which of the switches must be closed for the hairdryer to just blow cold air.

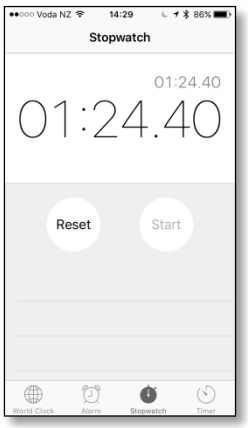
(e) Explain which of the switches must be closed for the heater to work.

Question Two: [5 marks]

Viscosity is how easily a liquid flows. **The more viscous an oil is, the slower it will flow.**
A student compared the viscosity of four different oils, W, X, Y and Z, at different temperatures. He put a drop of oil on the top line and timed how long it took to reach the bottom line.







Oil W was heated to 20°C. The time taken for oil W to flow from the top to the bottom line was recorded using his iPhone.

The student repeated the procedure for oil W at temperatures of 30°C, 40°C and 50°C. The student then used oils X, Y and Z in the same way.

Oil	Time taken (s)			
	At 20°C	At 30°C	At 40°C	At 50°C
W		74	79	54
X	55	50	45	40
Y	36	33	30	27
Z	115	105	95	85

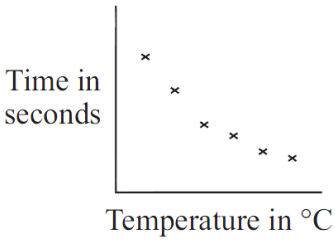
(a) Convert the time shown on the iPhone into seconds and write the value *in the table*. (Ignore the split seconds).

(b) When testing oil W at the four temperatures shown, the dependent variable is (Circle your answer.)
A. the choice of oil.
B. the time the oil takes to travel between top and bottom line.
C. the oil temperature
D. the distance between the top and the bottom line.

(c) A measurement that appears to be anomalous (is an outlier) is for (Circle your answer.)
A. oil Y at 40 °C.
B. oil X at 30 °C.
C. oil W at 40 °C.
D. oil Z at 30 °C.

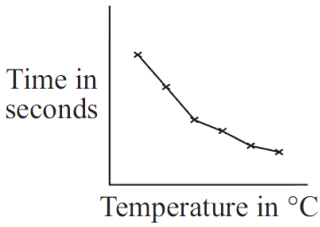
(d) Which oil is most viscous? Explain how you know.

Another group of students tested oil W over six temperatures. Their results, plotted on a temperature–time graph, looked like this.

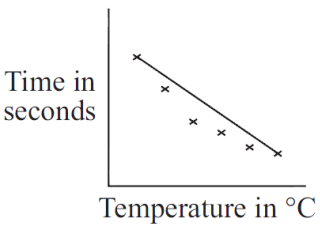


(e) Which one of the following shows the most appropriate (best) line for the results? (Circle your answer.)

A



B



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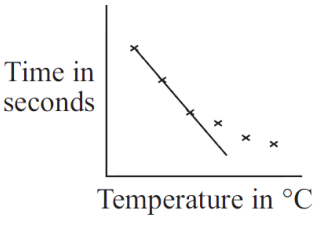
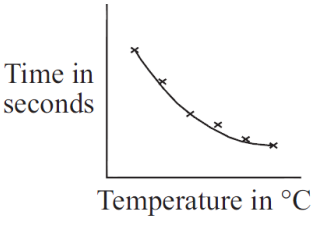
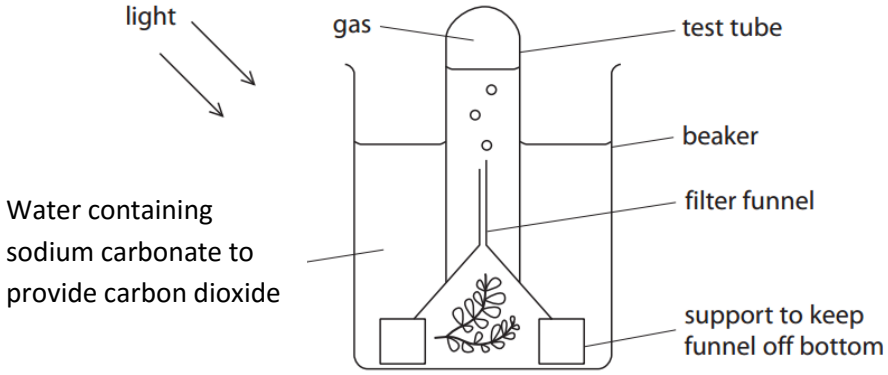


D



Question Three: [5 marks]

Mikaya investigated the effect of red, green and blue light on how fast pond weed makes oxygen gas.



She shone different coloured lights on the pond weed. She counted the number of bubbles released per minute.

Trial	Number of bubbles release per minute		
	Blue light	Green light	Red light
1	12	1	10
2	10	1	11
3	2	1	9
Average	11	1	10

(a) What is the independent variable in this investigation?

_____

(b) Give TWO other variables (things) that Mikaya should keep the same in order to make this a fair experiment.

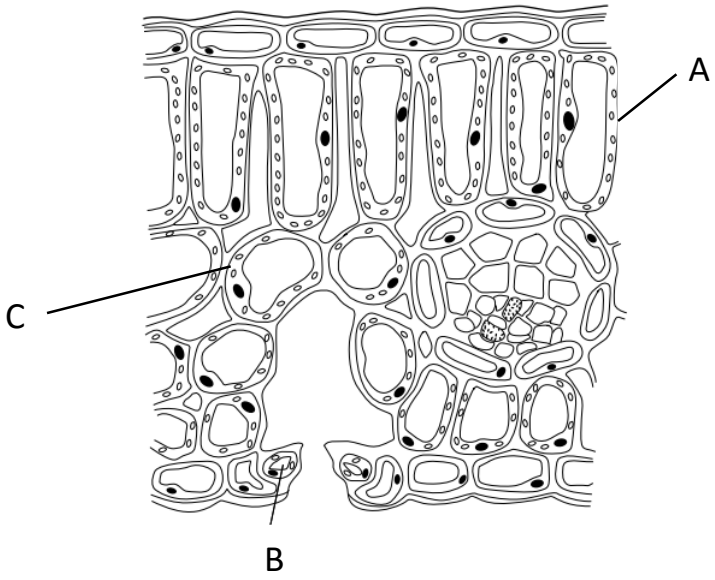
1. _____

2. _____

(c) Apart from doing three trials for each light, give one other reason why the data in the table is reliable.

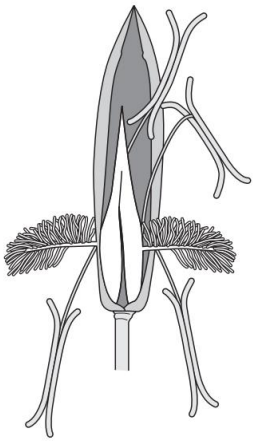
(d) Write a conclusion for this investigation.

(e) The diagram shows a cross section through a leaf. The cell that will make most glucose (sugar) is: (Circle your answer.)



Question Four: [5 marks]

Some flowering plants transfer pollen by using insects. Others use wind.



(a) How can you tell that this plant is wind-pollinated?

(b) Insects do not visit wind-pollinated flowers very often. Why not?

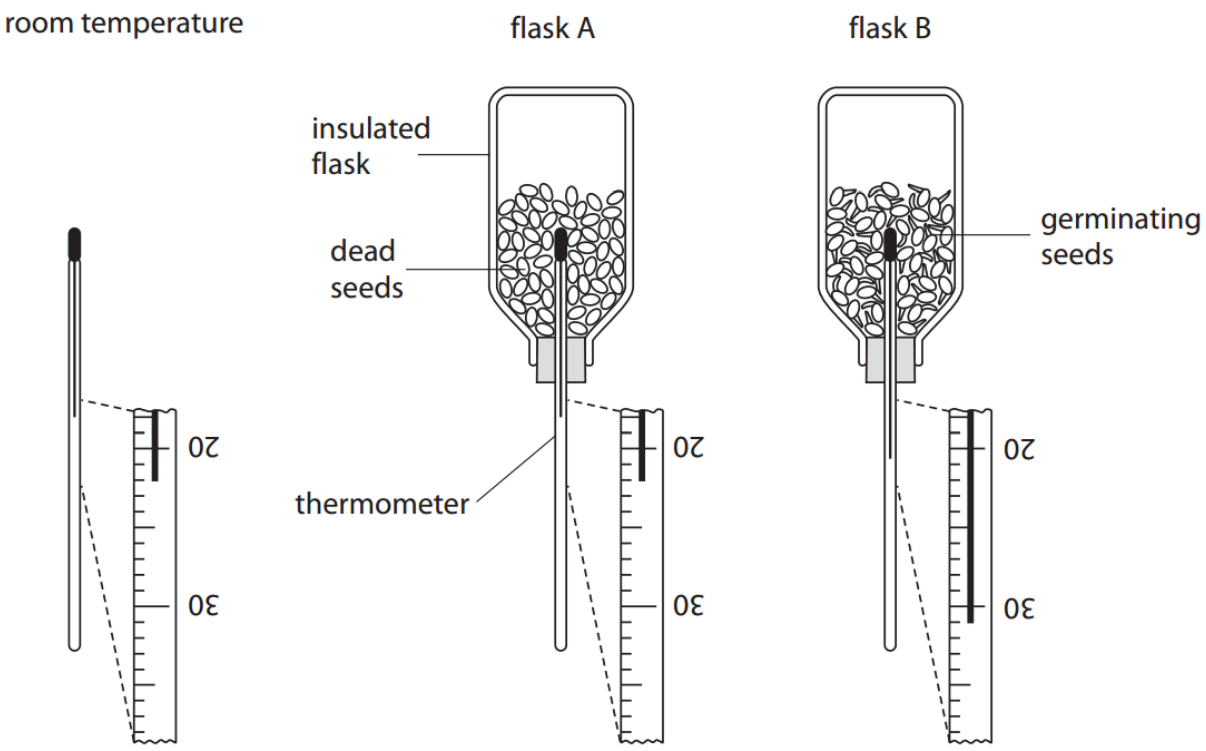
Some people have hay fever, an allergy to pollen made by flowering plants.

(c) Why is hay fever usually caused by wind-pollinated plants rather than insect pollinated plants?

Flora investigated whether seeds release energy when they begin to grow (germinate). She set up two insulated flasks of seeds. She placed them in a room at a constant temperature for two days.

- A contains dead seeds.
- B contains germinating seeds.

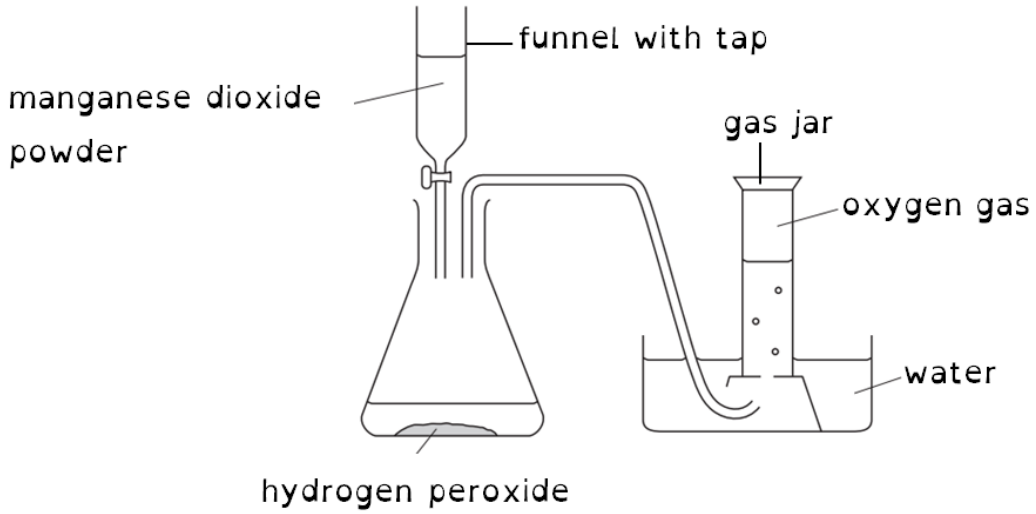
(d) How much has the temperature in flask B increased by over the two days? Show your working.



(e) What conclusion could Flora draw from this experiment?

Question Five: [5 marks]

Kate draws this diagram to show how she will make oxygen gas.



She forgets to draw a piece of apparatus (laboratory equipment) and makes a mistake in the labelling.

(a) What is the mistake in the labelling of the diagram?

_____

_____

(b) What is the missing piece of apparatus?

_____

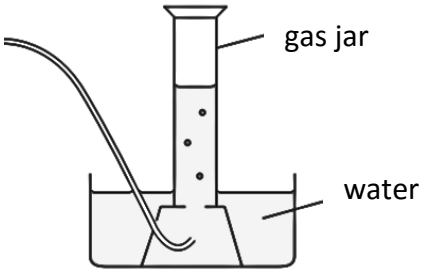
(c) Explain why this piece of apparatus is necessary.

_____

_____

This same apparatus can be used to collect carbon dioxide.

This is done by mixing calcium carbonate and dilute hydrochloric acid.



(d) Complete the word equation.
calcium carbonate + hydrochloric acid → _____ + water + carbon dioxide

(e) Explain how limewater can be used to test for carbon dioxide gas; what would you do and what you would see happening?

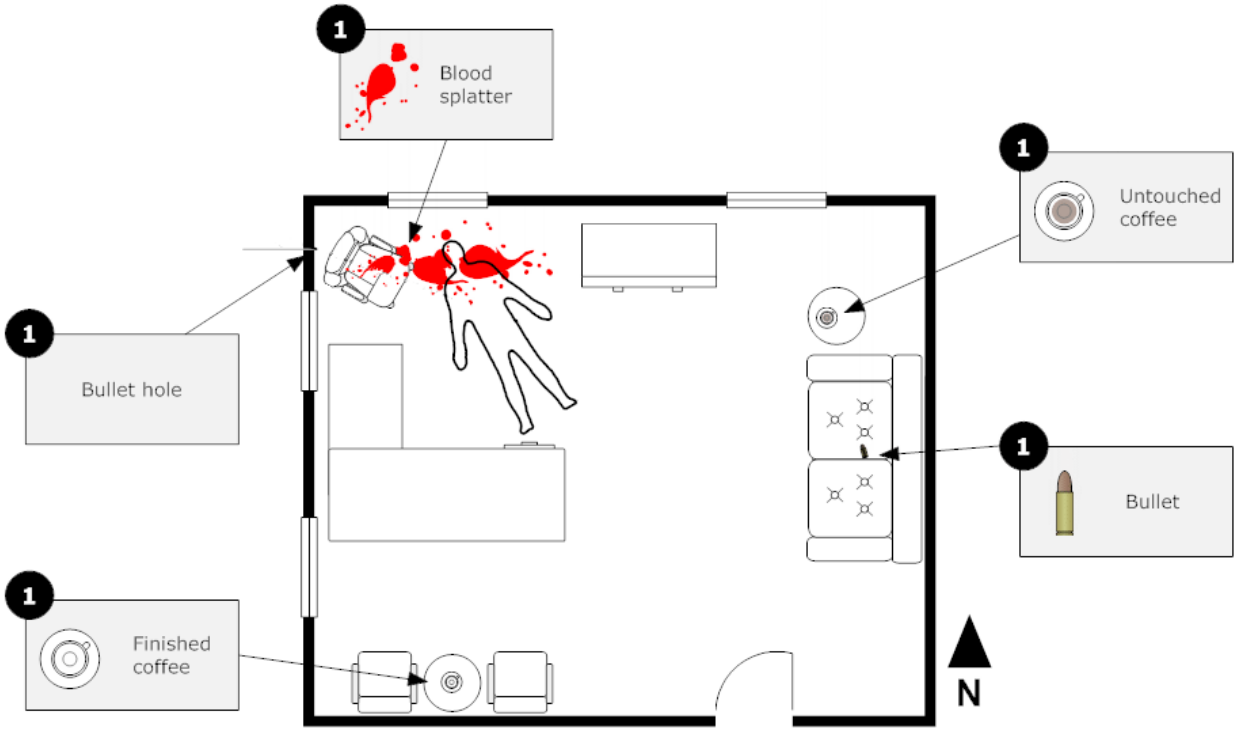
_____

_____

_____

Question Six: [4 marks]

Forensic scientists look for evidence at the crime scene.



(a) Put an X on the crime scene map to show where you think the murderer was when he shot the victim.

(b) Describe how the forensic scientist would find (reveal) and collect (lift) or make a permanent record of the fingerprints at the crime scene.

(c) Identify the two fingerprint types below.

1. 

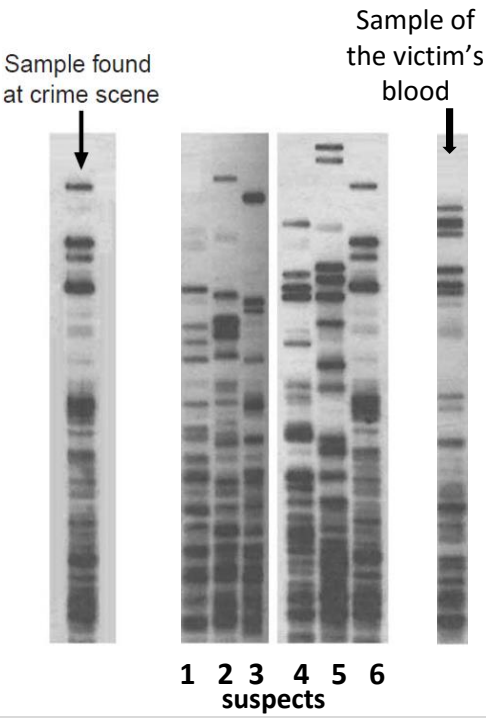
2. 

1.

2.

Some DNA was recovered from the crime scene.

(d) Which suspect has DNA that matches the DNA sample found at the crime scene?

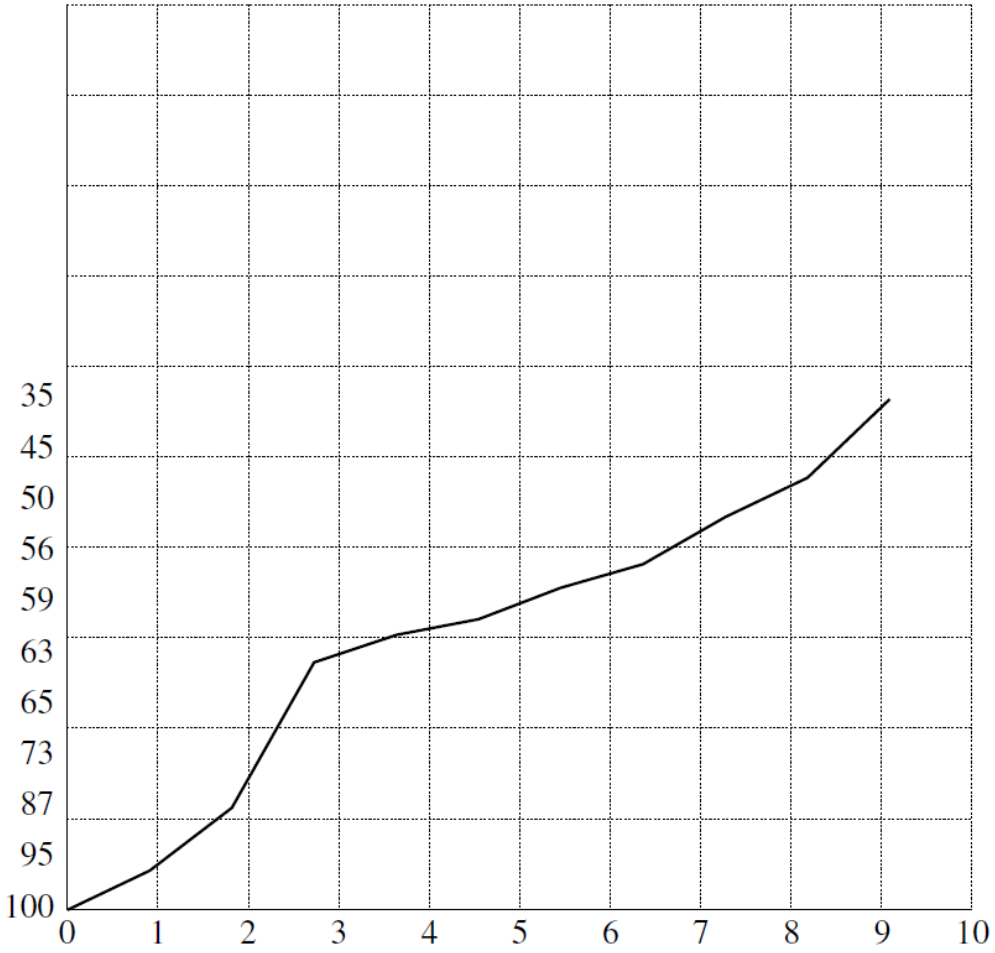


Question Seven: [3 marks]

Dion and Raumati did an experiment to observe boiled water as it cooled. Their results are shown in the table.

Time (minutes)	0	1	2	3	4	5	6	7	8	9	10
Temperature (°C)	100	95	87	73	65	63	59	56	50	45	35

Dion's graph is shown below.
List five corrections you would make to Dion's graph.



1.

2.

3.

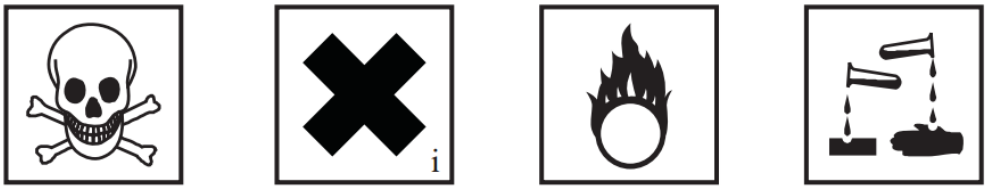
4.

5.

Question Eight: [4 marks]

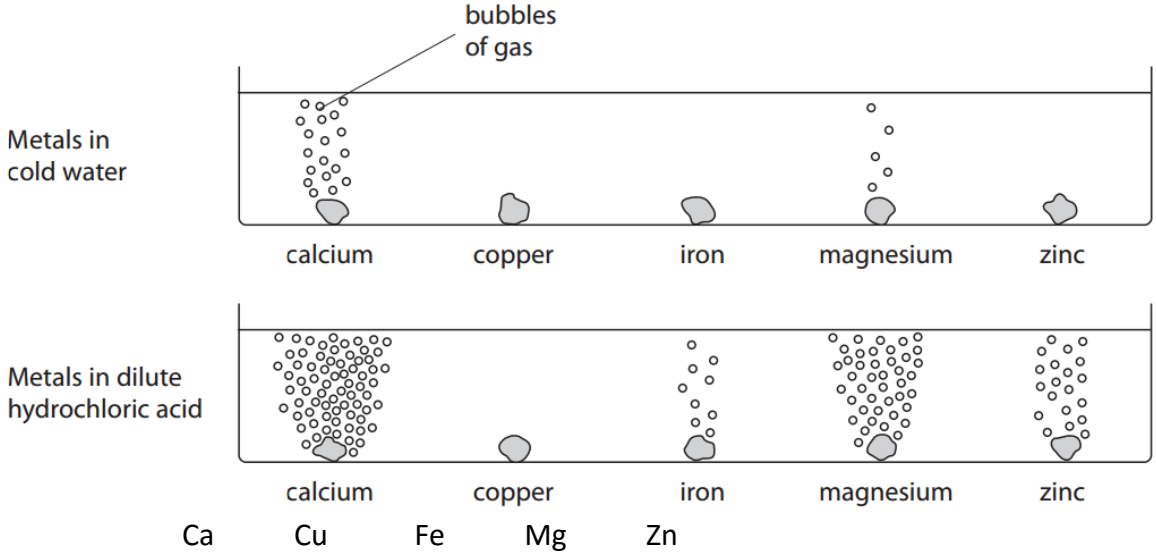
The diagrams show the reactions of some metals with cold water and dilute hydrochloric acid.

(a) Which symbol would you find on a bottle of hydrochloric acid? (Circle your answer.)



A B C D

Answer the questions, using only the metals that appear in the diagrams.



Ca Cu Fe Mg Zn

(b) Write the names of two metals that react with cold water.

1. 2.

(c) Write the name of one metal that reacts with dilute hydrochloric acid but not with cold water.

(d) Arrange the five metals in order of reactivity. Use their chemical symbols.

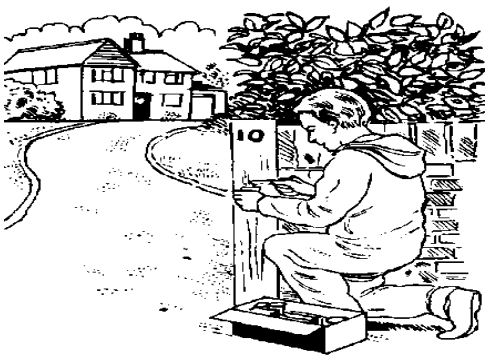
most reactive ____ ____ ____ ____ ____ least reactive

Question Nine: [3 marks]

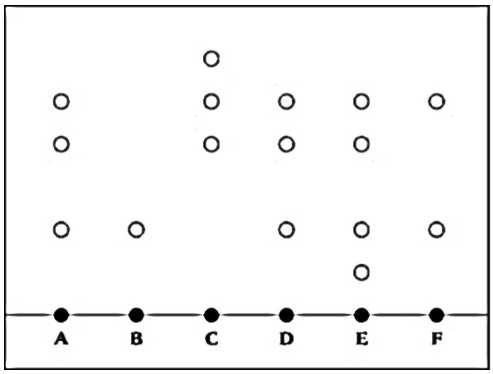
Police were called to 10 Purnell Place because there had been a burglary.

There were bits of red paint on the gatepost.

The police think that the robbers' van scraped the gatepost when they were making their getaway.



The scientists used chromatography to find out the make of the getaway vehicle.



A = Paint from gate post, B-F = Paint samples

(a) The scientists could not use water as a solvent when they carried out their tests. Why not?

(b) Which manufacturer uses the same paint as the paint from the gatepost? How can you tell?

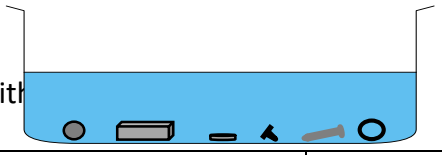
The chromatography test does not *prove* that the getaway vehicle was made by the manufacturer in your answer to question (c).
Some Courier vans are red, so the marks could have been made when a parcel was delivered.

(c) How could you show that the paint did not come from a Courier van?

Question Ten: [5 marks]

Liam wanted to take some objects out of the glass tank without getting his hands wet. He used a strong magnet to slide them out of the glass tank. They were (from left to right): glass marble, eraser, copper coin, drawing pin, iron nail, and gold ring.

(a) Complete the table with



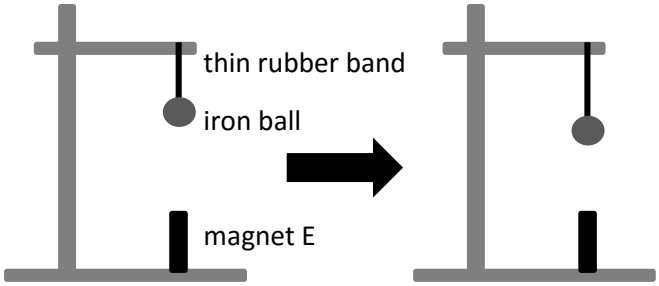
Objects removed from glass tank	Objects that remained in the glass tank

Anna had four magnets. She brought them, one by one, into a box of paperclips. She counted the number of paperclips each magnet attracted.

Magnet	A	B	C	D
Number of paperclips attracted	5	7	3	11

(b) She concluded "smaller magnets are stronger than larger magnets." Is her conclusion correct? Explain your answer.

Allister set up an experiment to compare the strength of 4 bar magnets E, F, G and H. When he placed magnet E under the iron ball, the ball moved downwards.



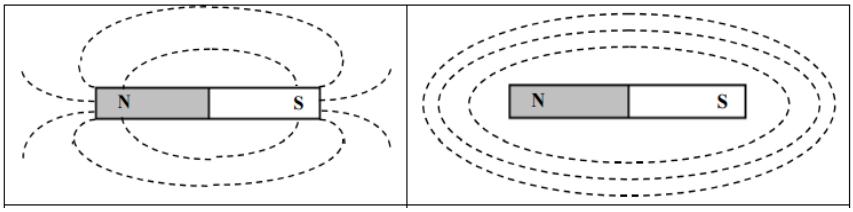
He repeated the experiment for the other 3 magnets.

(c) What could he measure to compare the strength of 4 bar magnets?

(d) Tom wanted to show the pattern of the magnetic field around a bar magnet.

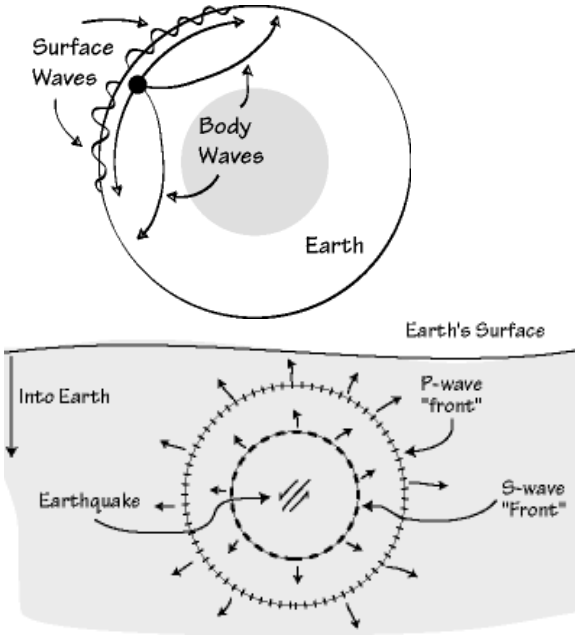
(i) Name a substance or a piece of equipment Tom could use to show the pattern of the magnetic field around a magnet.

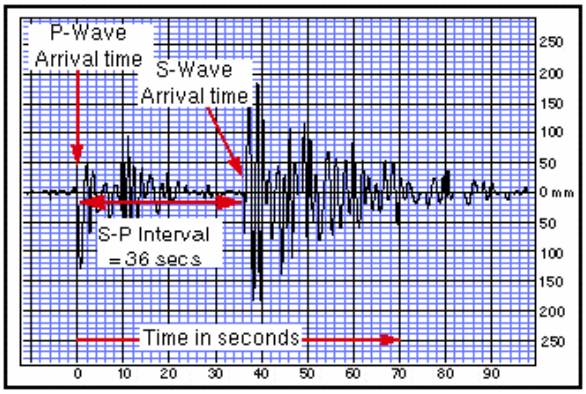
(ii) Write the letter P below the pattern you would expect to get if you did this experiment.

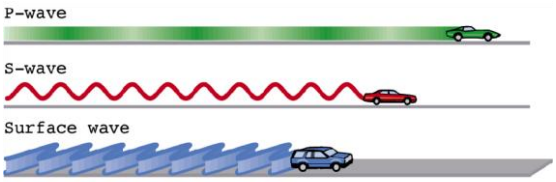


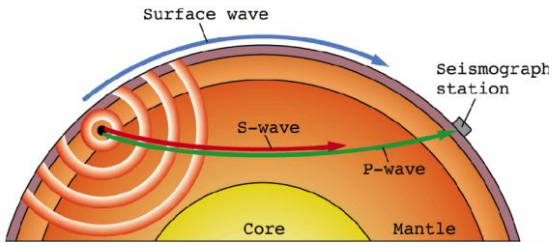
Question Eleven [6 marks]

A student collected 4 images from the internet as part of a poster she was preparing for homework.









(a) Give a similarity between P and S waves.

_____

_____

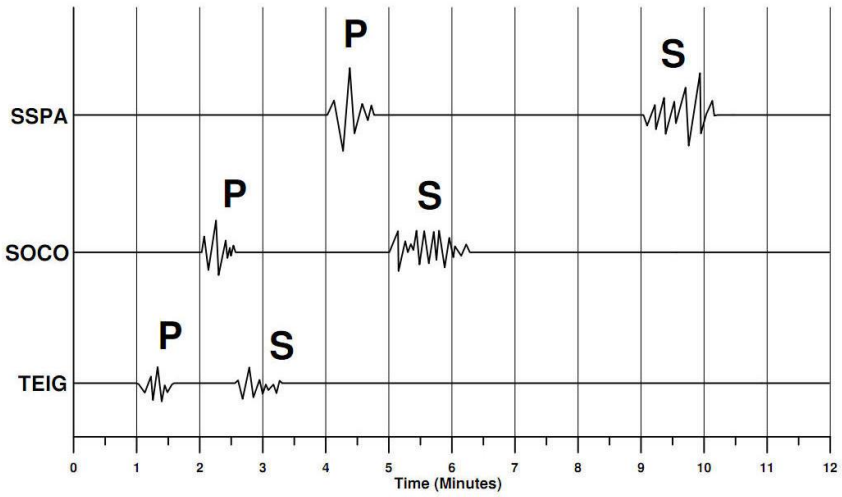
(b) Give a difference between P and S waves.

_____

_____

This shows the arrival of P and S waves at 3 different monitoring stations.

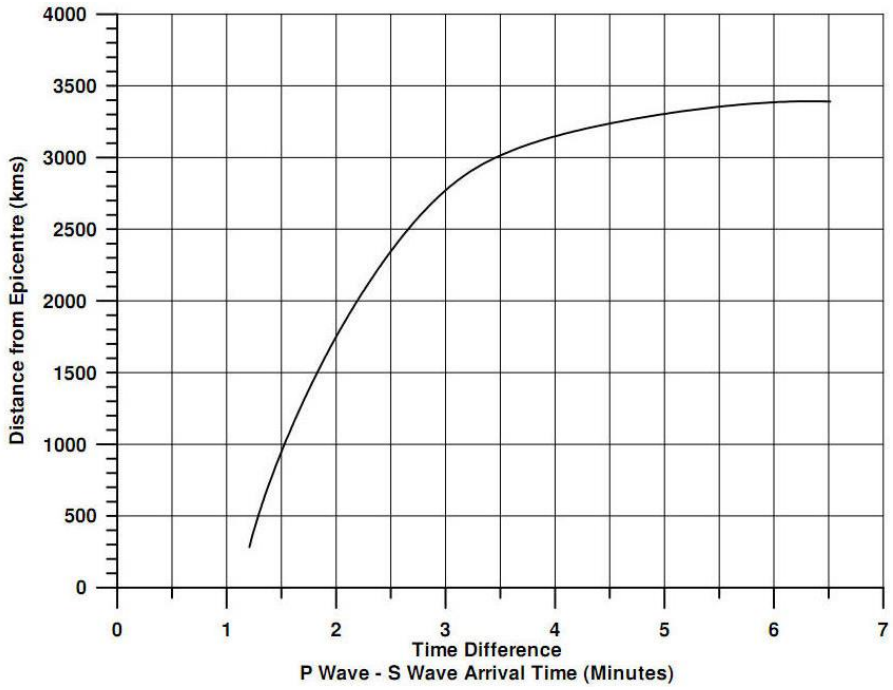
The time difference between arrival of P and S waves for the SSPA monitoring station is 5 minutes.



(c) Work out the time difference between P and S waves for the SOCO monitoring station.

_____

The graph below can be used to estimate the distance of a monitoring stations from the epicentre. SSPA is 3300 km from the epicentre.

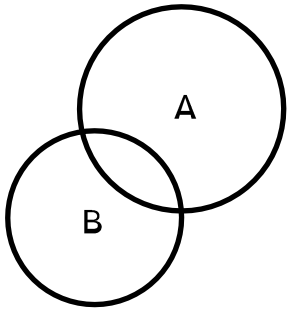


(d) Use the time difference between arrival of P and S waves to estimate the distance of the SOCO monitoring stations from the epicentre.

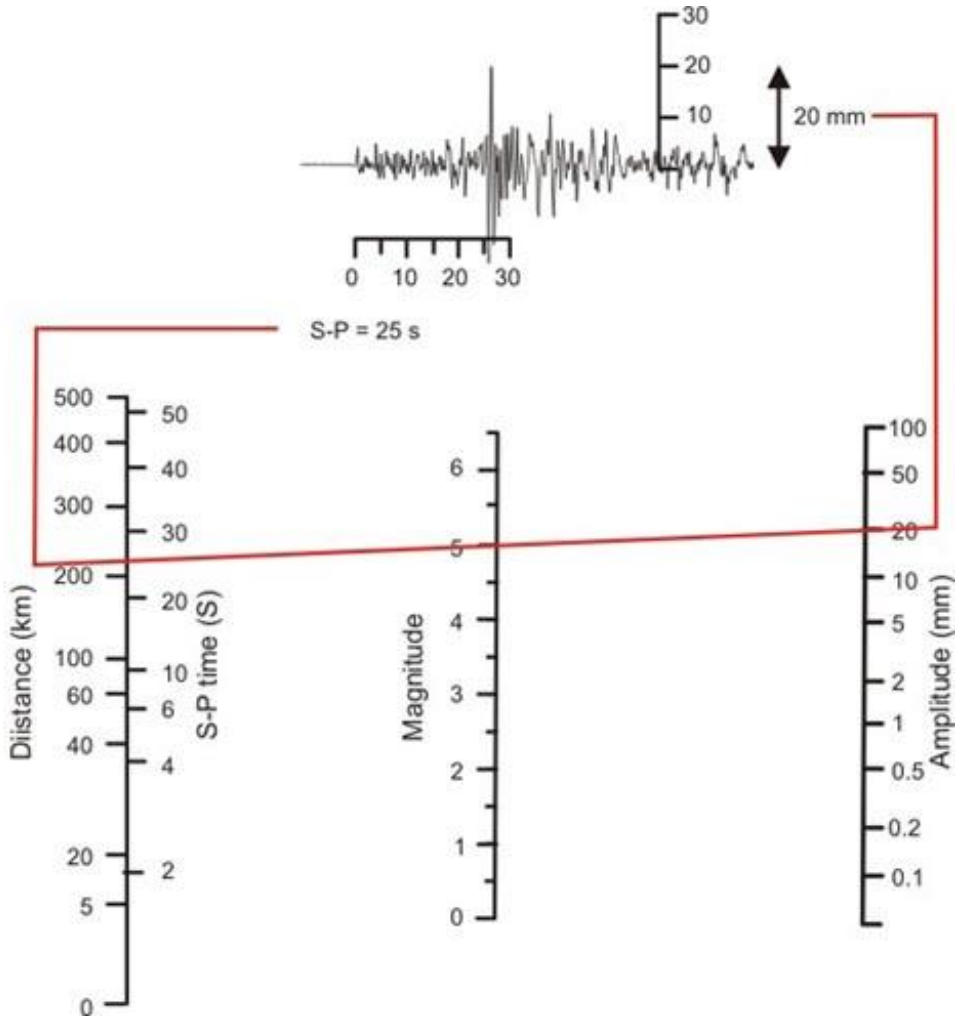
SOCO _____ km

(e) To work out the location of an earthquake the distance of the earthquake must be found from at least **three** seismic recording stations.

Why are two stations, stations A and B, not enough?



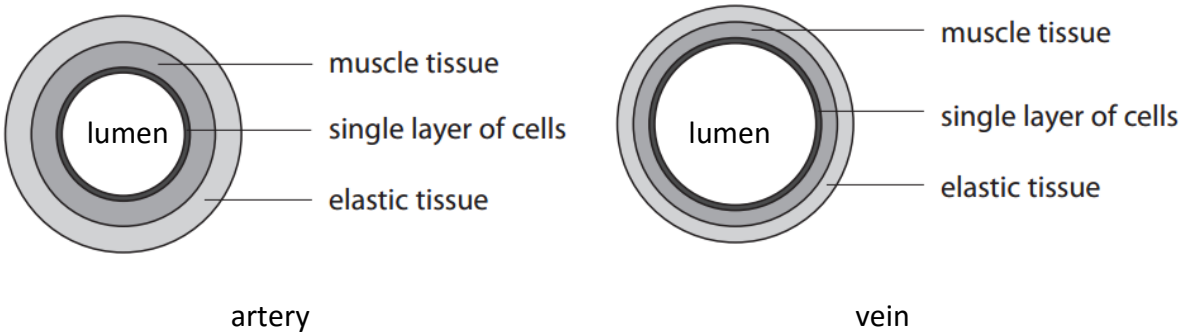
(f) (i) How is the magnitude of an earthquake estimated? Refer to the example below in your explanation.



(ii) If the S-P time is 40 s and the amplitude is 0.5 mm, estimate the magnitude of the earthquake. Show your working on the diagram above .

Question Twelve: [6 marks]

Arteries and veins are important blood vessels in the circulatory system.



artery vein

(a) Explain ONE difference in the structure of an artery and a vein.

_____

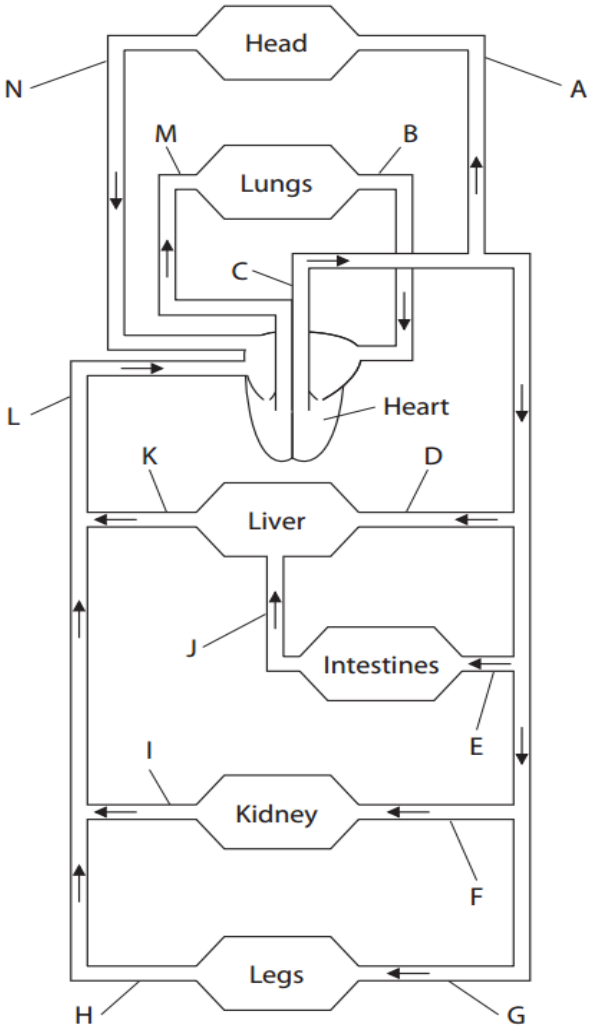
_____

_____

(b) The diagram shows the human circulatory system.

The blood vessels are labelled with letters.

The plasma in the blood vessels can contain different concentrations of substances.



Give the letter for the blood vessel that:

(i) carries blood away from the heart _____

(ii) supplies your brain ____

(iii) contains the least oxygen _____

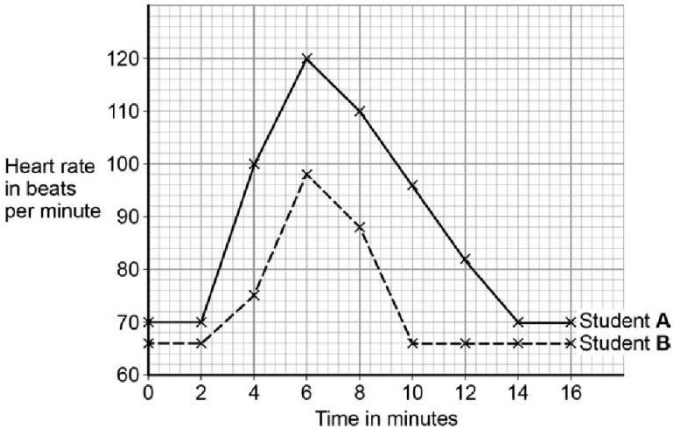
(iv) contains the most glucose after a meal _____

(c) The diagram shows the contraction and relaxation of the atria and ventricles during several heartbeats. Each square represents a time of 0.1 second.

(i) For how long do the ventricles contract during one heartbeat?

(ii) How many heartbeats does the diagram show?

Simon (student A) and Guy (student B) investigated how exercise affected heart rate. They measured their resting pulses for 2 minutes. Then both boys started running at 2 minutes.



(d) For how many minutes did the students run?

(e) Student Guy is fitter than Simon. Use the graph to give two pieces of evidence that support this statement.

1.

2.

Groups of students took part in an investigation into the effect of exercise on pulse rate. They wanted to investigate the effect of the sex of an individual on their pulse rate during exercise.

Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
					
Males	Males	Females	Females	Males	Females
Heavy exercise	Light exercise	Heavy exercise	Heavy exercise	Light exercise	Light exercise
50 step-ups	10 step-ups	50 sit-ups	50 step-ups	10 sit-ups	20 step-ups

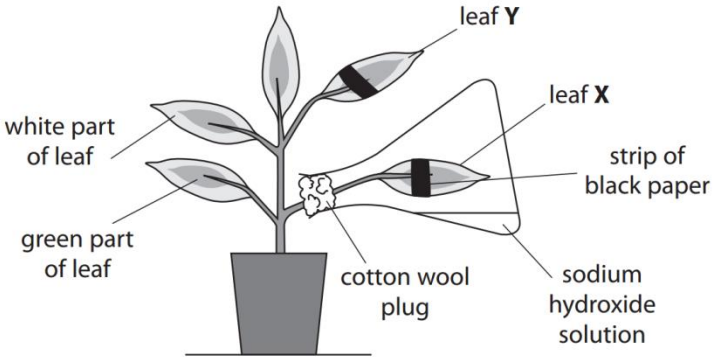
(f) Which two groups should be compared to investigate the effect of the sex of an individual on their pulse rate during exercise?

Question Thirteen: [4 marks]

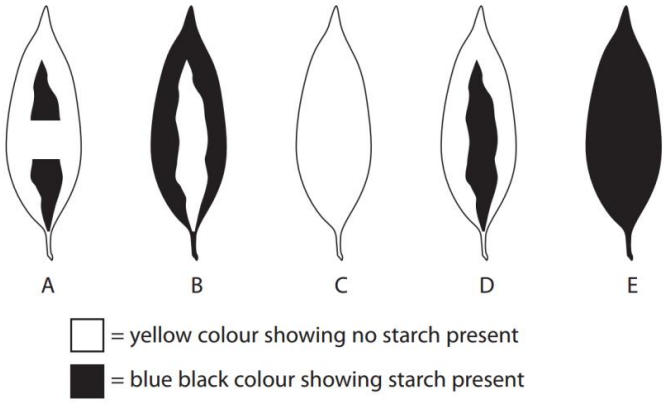
The diagram shows a plant with variegated (green and cream) leaves. The plant was left it in the dark for 24 hours to remove all starch.

- Leaf X then had a strip of black paper attached to both the upper and lower surfaces. It was then sealed in a flask containing a solution of sodium hydroxide. This absorbs carbon dioxide.
- Leaf Y also had a strip of black paper attached to both the upper and lower surfaces.

The plant was then placed in the light for 24 hours and then a starch test was carried out on leaf X and leaf Y.



The five leaves, A to E, show the possible appearance of leaf X and leaf Y after the starch test.



(a) Which of the leaves matches the result you would get after testing leaf X and leaf Y for starch?

(i) leaf X _____

(ii) leaf Y _____

(b) The table describes the steps used to test the leaves for starch. It also gives the reason for each stage. Complete the table.

Step		Reason(s)
1.	Put the leaf in boiling water.	Softens the leaf. Destroys enzymes in the leaf that might break down any starch.
2.	Turn the Bunsen burner off.	
3.	Cover the leaf with ethanol and put the tube back in hot water.	Removes the green colouring, called _____.
4.	Dip the leaf in hot water.	Soften the leaf again so the chemical used in step 5. can enter the leaf.
5.	Add iodine solution to the leaf.	A blue-black colour shows starch is present.

(c) The diagram show two vessels found in the stem of plants.
Tick (✓) the vessel that is transporting water and mineral ions.
Explain your choice.

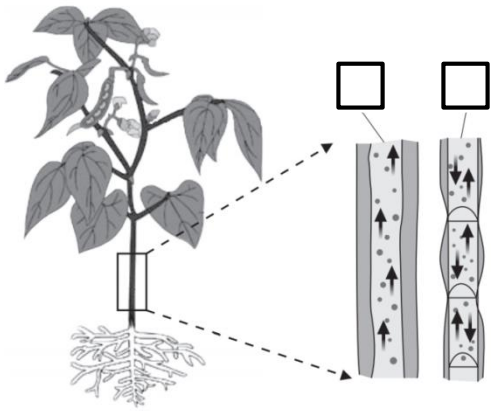
_____

_____

_____

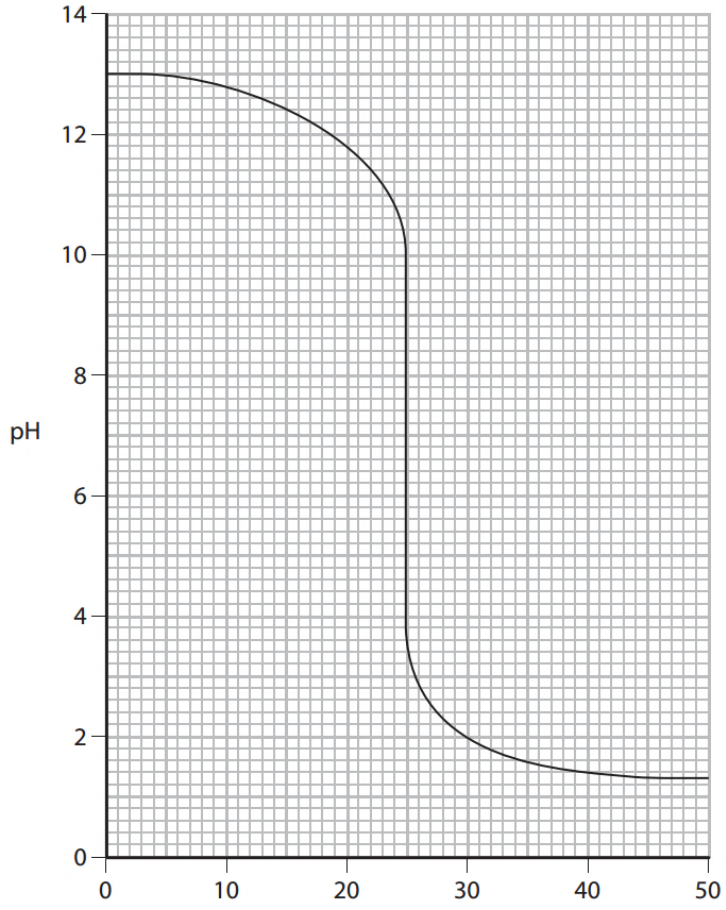
_____

_____



Question Fourteen: [7 marks]

50 mL of hydrochloric acid is added gradually to 50 mL of sodium hydroxide solution containing some universal indicator. The graph shows how the pH of the solution changes as the acid is added.



(a) Use the graph to answer these questions.

(i) What is the pH of the sodium hydroxide solution before any acid is added? _____

(ii) What is the pH of the solution after 40 mL of acid is added? _____

(iii) How much acid is needed to completely neutralise the sodium hydroxide? _____

The table shows the colour of universal indicator at different pH values.

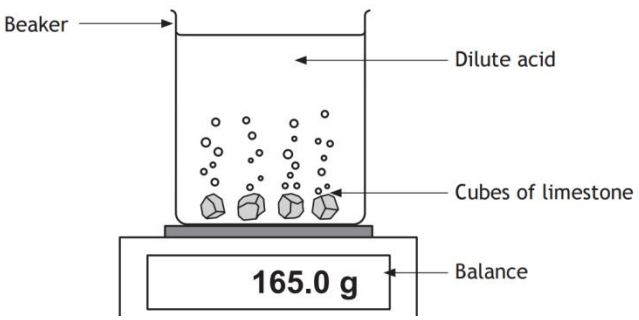
pH	0–2	3–4	5–6	7	8–9	10–12	13–14
Colour	red	orange	yellow	green	blue	indigo	violet

(b) Complete the table below to show the colour of the solution when 20 and 35 mL of acid has been added.

Volume of hydrochloric acid added (mL)	Colour of solution
20	
35	

Rainwater is a naturally occurring weak acid. Atmospheric pollution can cause rainwater to become more acidic. Rainwater reacts with limestone.

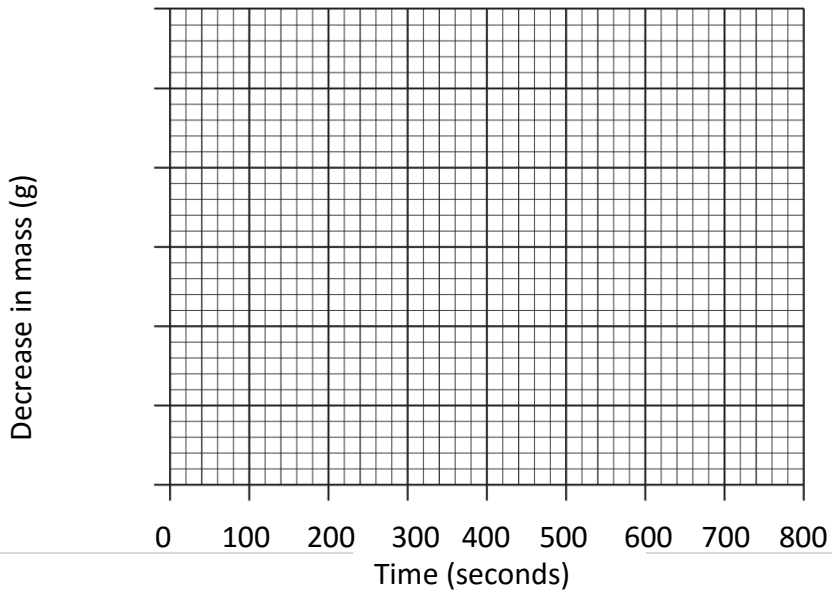
During this reaction, the mass of limestone reduces and carbon dioxide is produced. The apparatus below can be used to measure this loss in mass of limestone as it reacts with acid. The table shows the loss in mass of the flask and contents over time.



Time (seconds)	*Mass of flask and contents* (g)	*Decrease in mass* (g)
0	150·0	0·0
100	147·5	2·5
200	144·0	3·5
300	140·0	4·0
400	135·7	4·3
500	131·2	4·5
600	126·7	4·6

(c) Use the information from the table to complete the **line graph** by:

- adding the **scale** to the vertical (y) axis;
- plotting the line graph to show the **decrease in mass** over time, using x's.
- Joining the points with a smooth freehand line



(d) Predict the decrease in mass at 800 seconds.

_____

(e) Describe what effect acidic pollution in the atmosphere could have on a limestone statue.

_____

_____

_____

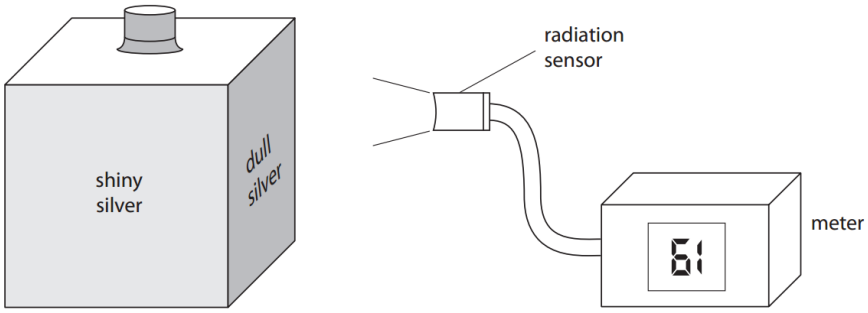
_____

_____

_____

Question Fifteen: [4 marks]

Sarah used a piece of apparatus called a Leslie's cube. This apparatus was devised in 1804 by John **Leslie**, a Scottish mathematician and physicist. The hollow cube has four different surfaces.
She carefully filled the cube with boiling water so that the temperature of each surface is the same. She used the radiation sensor to measure the **radiation emitted** from each surface.



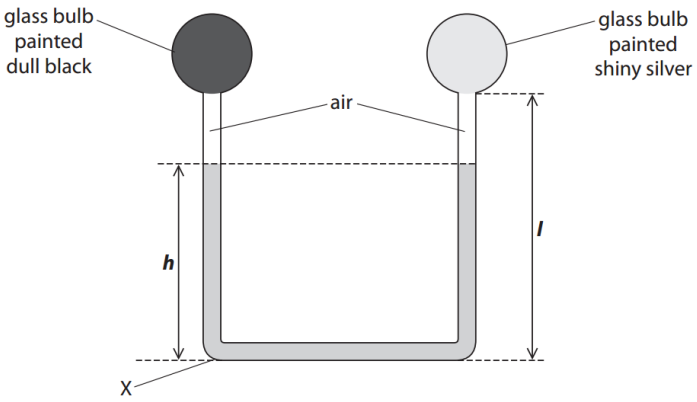
Sarah's results are shown below.

(a) Draw a line linking each surface colour with its correct meter reading. One has been done for you.

surface colour	meter reading
shiny black	87
dull black	61
dull silver	70
shiny silver	47

(b) The temperature of each surface is the same, but the radiation sensor gives a different reading for each surface. What can you conclude from this?

Leslie also invented a "differential thermometer".
The diagram shows the design of this thermometer.
The bulbs are filled with air and are connected by a tube which contains liquid.



Sarah placed this thermometer in bright sunlight for a few minutes.

She observed that the liquid level

- fell on the side of the dull black bulb making ***h*** lower
- rose on the side of the shiny silver bulb

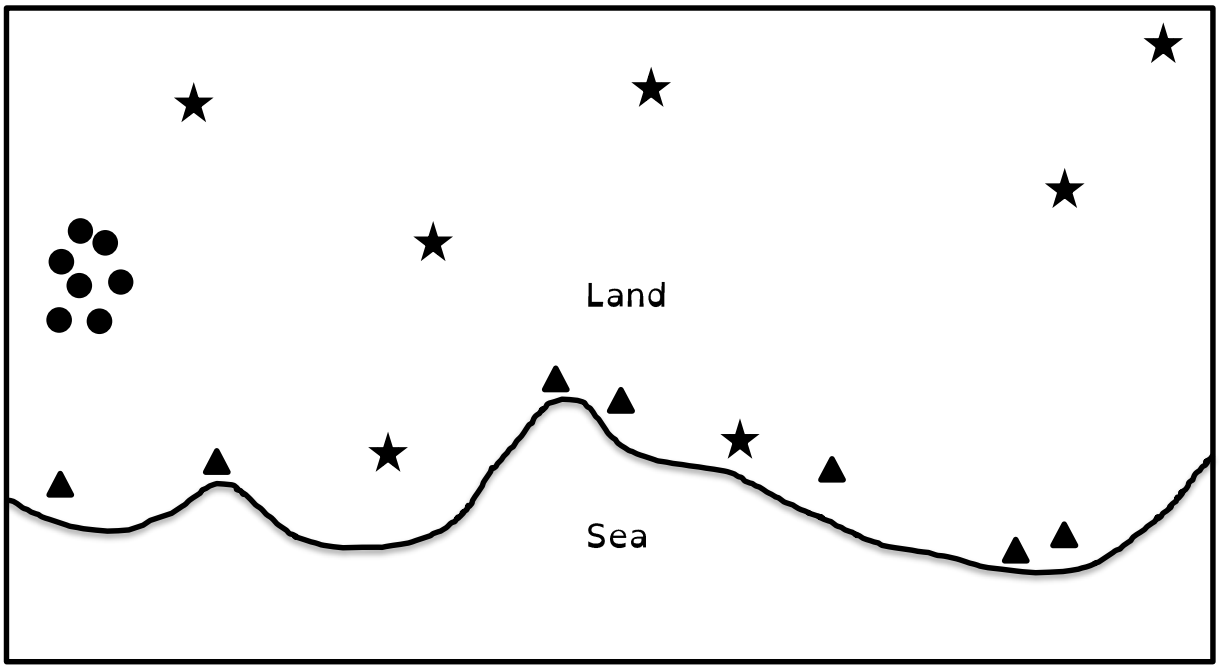
(c) Explain these observations.

Question Sixteen: [4 marks]

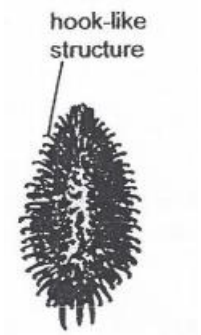
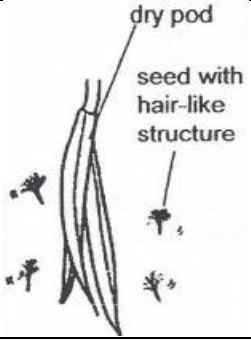
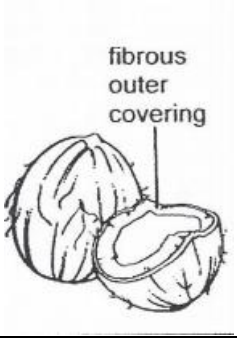
(a) Why is it important that plants disperse their seeds?

The diagram below shows part of an island where three types of plants, X, Y and Z are growing.

Plant X ▲ Plant Y ★ Plant Z ●



The diagrams below show the fruits of plants A, B, C and D.

A	B	C	D
			

(b) Explain which of the fruits A, B, C or D are most likely to belong to plants X, Y and Z? One fruit will not be needed.

Plant X has fruit ____

Reason

Plant Y has fruit ____

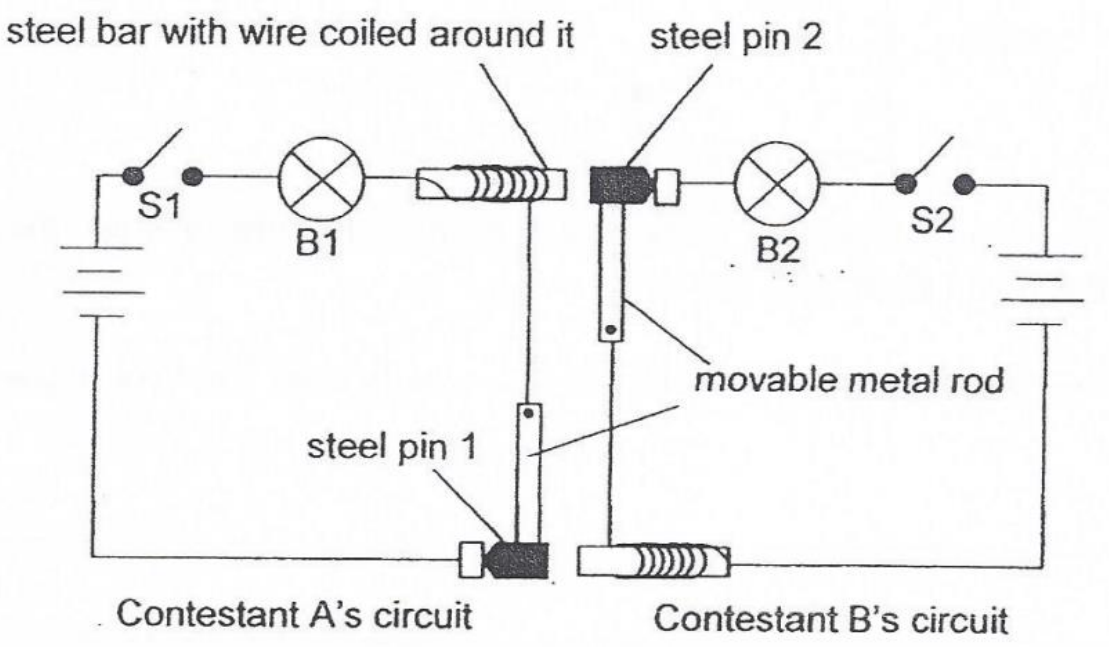
Reason

Plant Z has fruit ____

Reason

Question Seventeen: [4 marks]

In a quiz show between two contestants, the contestant who wants to answer a question first has to close his switch first. Two circuits, one for each contestant, are shown below.

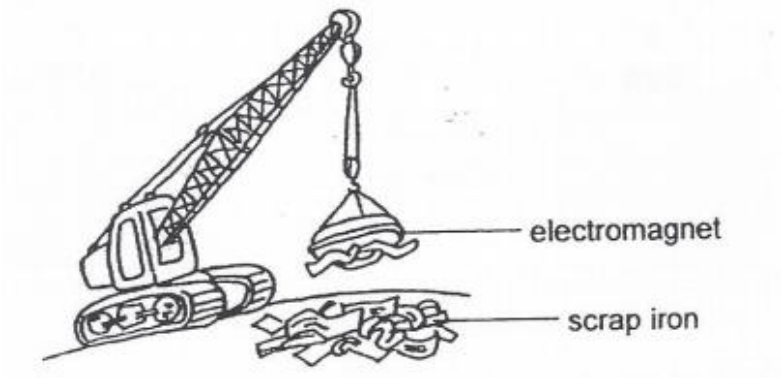


Each circuit consists of a movable metal rod fixed to one end of the circuit. The other end of the rod is attached to a steel pin which is not fixed to the circuit. The wire of each circuit is coiled around a soft iron bar. When both switches are open, a spring mechanism (not shown in the diagram) moves the rods to their original positions.

(a) Explain what happens to the bulbs B1 and B2 if only S2 is closed.

(b) For a particular question, contestant A closes his switch before contestent B. When contestent B closes his switch, will B2 light up? Explain your answer.

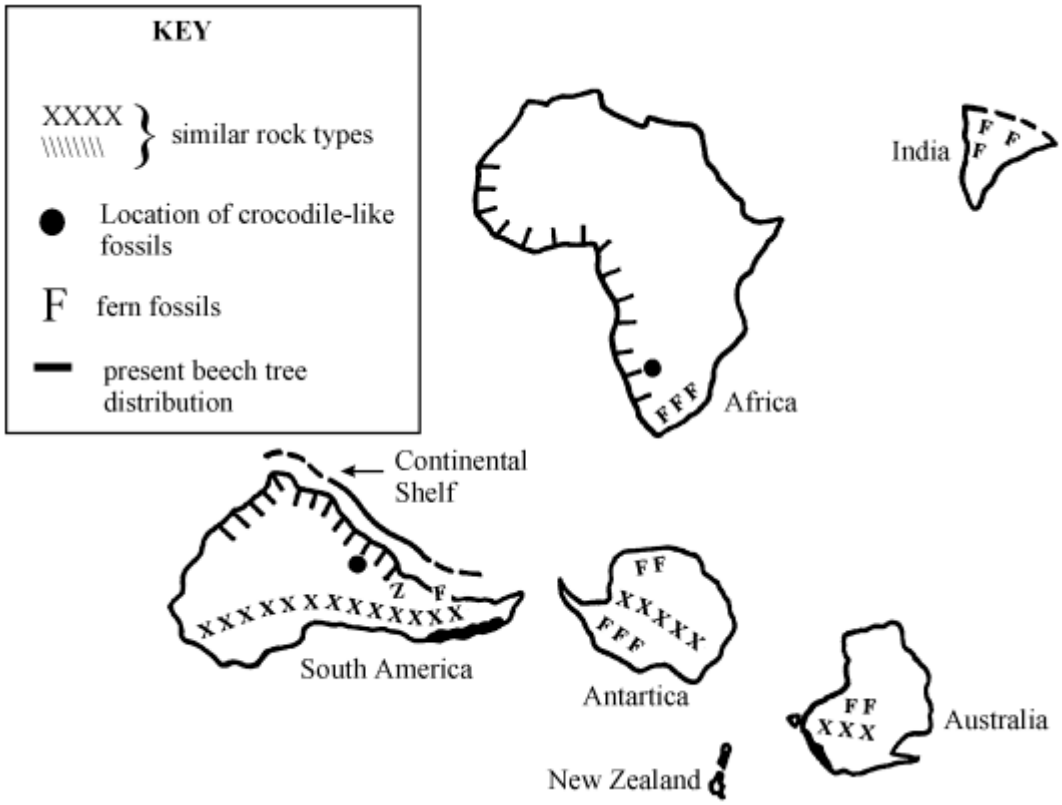
The picture shows an electromagnet being used to lift scrap iron in a scrapyard.



(c) Describe the advantages and disadvantages of using an electromagnet and not a permanent magnet in a scrapyard.

Question Eighteen: [6 marks]

This task is about shifting continents and plate tectonics.



The diagram represents landmasses as they now appear.

(a) What was the name of the super-continent these landmasses originally made up?

Scientists have used many types of evidence to support the theory of continental drift (or plate tectonics).

(b) Use the information from the diagram above and your own knowledge to describe any **two** pieces of evidence that would indicate that these landmasses were once joined.

1.

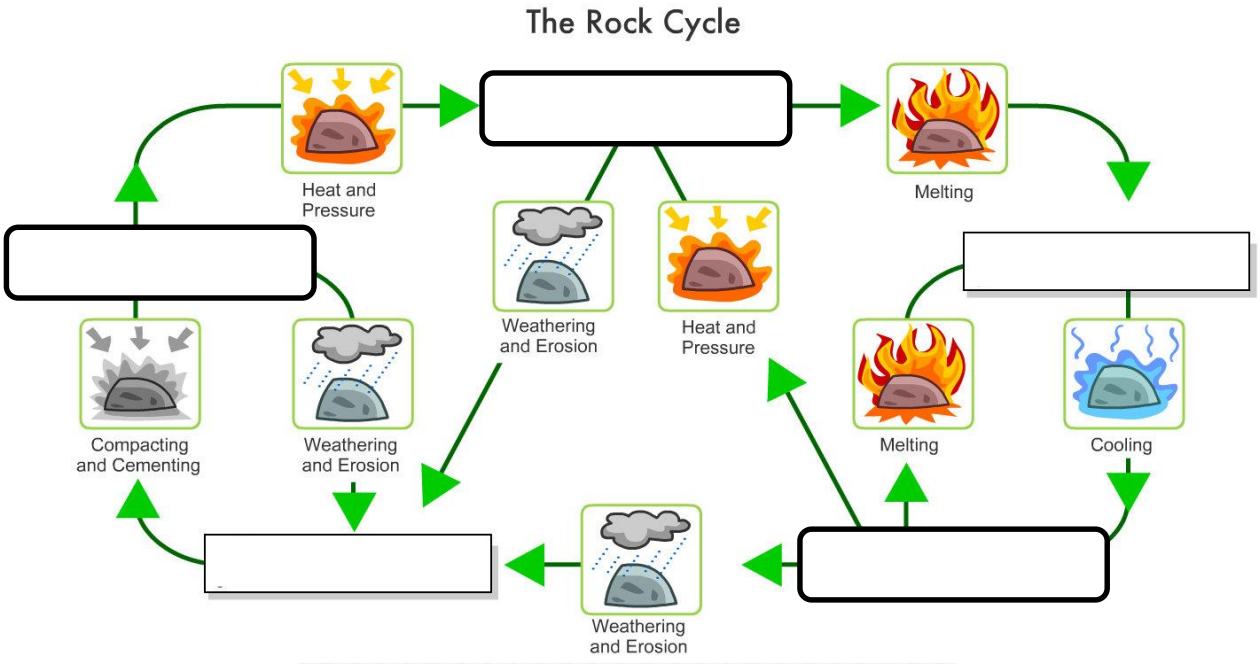
2.

On the diagram of South America there is a "**Z**".

(c) Put another **Z** on Africa at the place where these landmasses of Africa and South America were most likely joined.

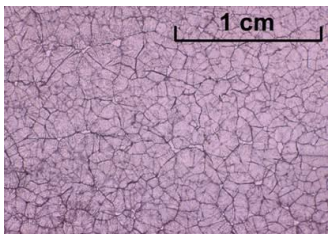
(d) Complete the diagram of the rock cycle. Use the words below.

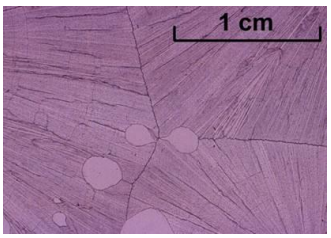
igneous magma metamorphic sediment sedimentary



The crystal size of igneous rocks is related to the rate of cooling of the molten rock.

(e) A chemical called salol was melted in a boiling-tube in a hot water bath. A few drops of the melt are placed, using a glass rod, onto two slides – one cooled in a freezer and one warmed in a water bath (and then dried). The crystals that formed were observed using a microscope.

Slide 1 

Slide 2 

(i) Which slide was the cooled slide?

_____

(ii) Choose any one of these igneous rocks and explain how / where it formed.

Granite **Obsidian** **Rhyolite** **Scoria**



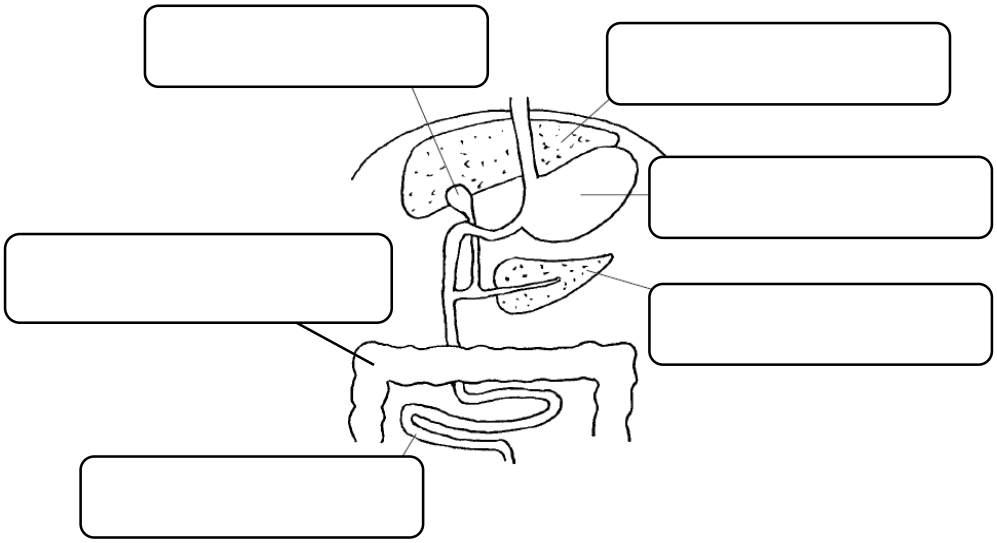

Rock chosen: _____

_____

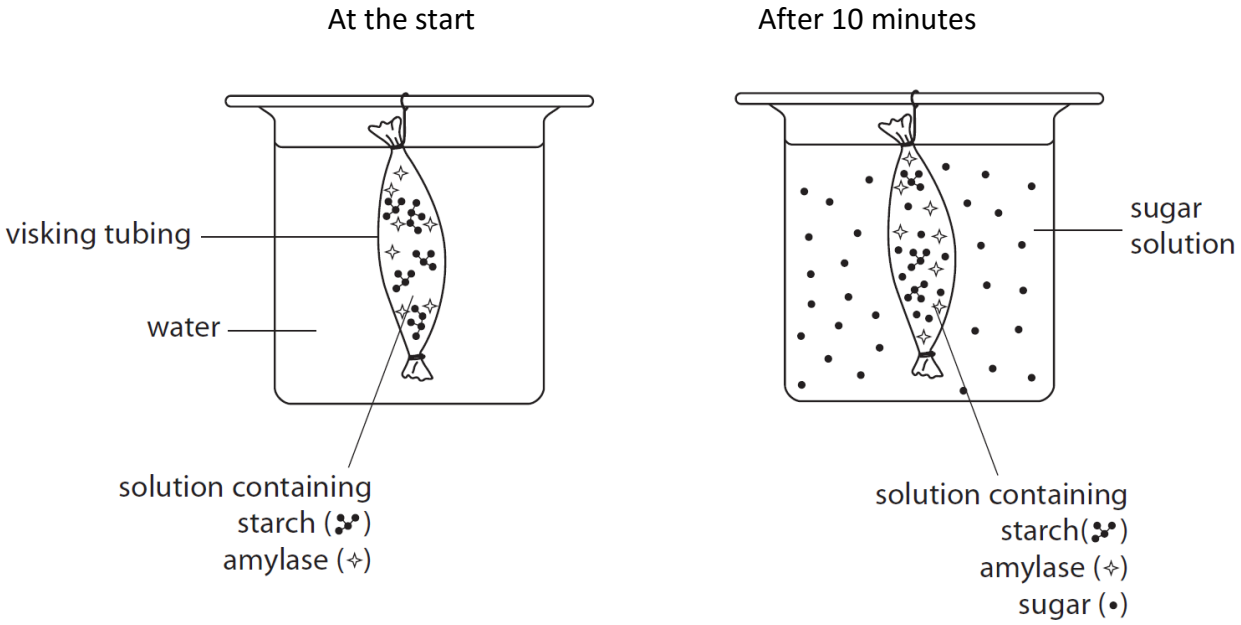
_____

Question Nineteen: [5 marks]

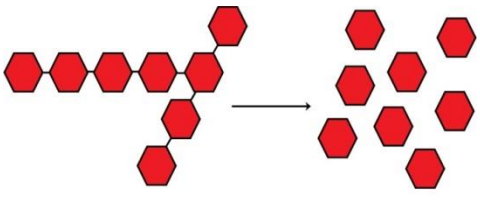
(a) Here are some parts of the human body which all are involved in the digestion of food. Label any **three** parts.



The experiment shows how Visking tubing can be used to **model** the small intestine. Visking tubing is made of a plastic material through which small molecules can pass.



Amylase is an enzyme that digests starch.



The concentration of glucose in the distilled water was measured at the start and then every five minutes. The results are shown in the table.

Time (minutes)	Concentration of glucose in distilled water (g / mL)
0	0.0
5	0.1
10	0.4
15	0.5
20	0.8
25	0.8
30	0.8

(b) Describe the results of this investigation.

(c) Explain the results of this investigation.

This experiment uses Visking tubing to **model** the small intestine. This model *does not* fully represent the structure and function of the small intestine. This model has some strengths and weaknesses.

(d) Tick (✓) any 2 strengths and cross (×) any 2 weaknesses of the model.

- ❑ The model has amylase
- ❑ The model membrane is not one cell thick
- ❑ The model has no peristalsis
- ❑ The model does not have villi / a large surface area
- ❑ The model has a thin permeable membrane
- ❑ In the model there is water instead of blood
- ❑ In the model, the glucose diffuses out

END OF EXAMINTION