Sc

KEY STAGE 3

TIER 3–6

2004

Science test

Paper 1

Please read this page, but do not open the booklet until your teacher tells you to start. Write your name and the name of your school in the spaces below.

First name _____

Last name _____

School _____

Remember

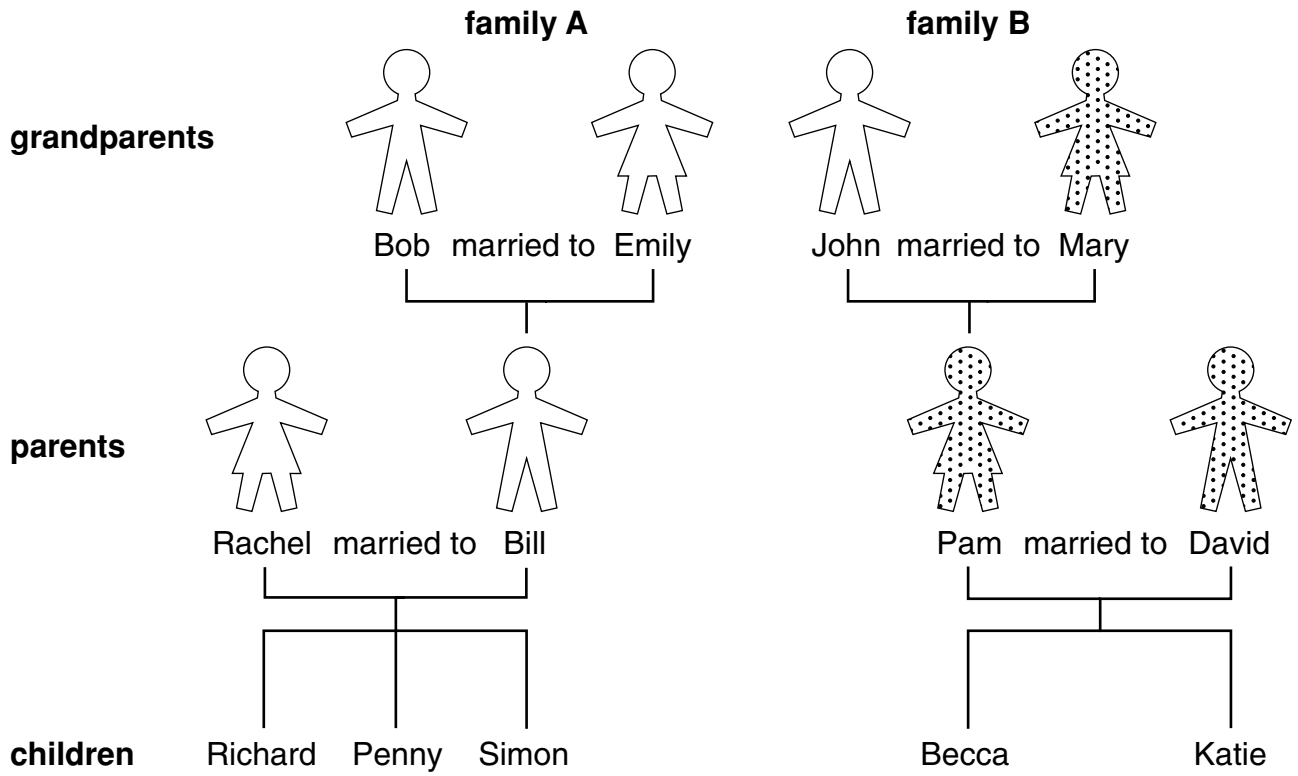
- The test is 1 hour long.
- You will need: pen, pencil, rubber, ruler, protractor and calculator.
- The test starts with easier questions.
- Try to answer all of the questions.
- The number of marks available for each question is given below the mark boxes in the margin. You should not write in this margin.
- Do not use any rough paper.
- Check your work carefully.
- Ask your teacher if you are not sure what to do.

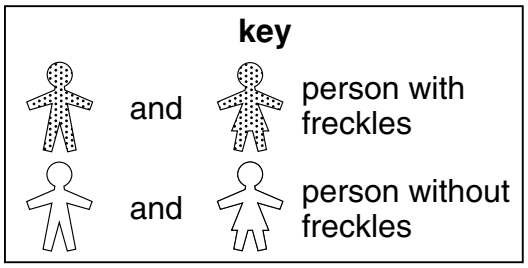
For marker's use only

Total marks	

QCA/04/1208

1. The diagram shows two families. Some of the people in the diagram have freckles.





(a) (i) Which children are most likely to have freckles?
Tick the correct boxes.

Richard	Simon	Katie	Penny	Becca
☐	☐	☐	☐	☐

☐ 1ai
1 mark

(ii) How did you decide?

_____

_____

☐ 1aii
1 mark

(iii) Suggest why Bill does **not** have freckles.

_____

_____

1aiii

1 mark

(b) (i) Which **two** cells pass on information from parents to their children?
Tick the **two** correct boxes.

bone cell	☐	cheek cell	☐
egg cell	☐	muscle cell	☐
red blood cell	☐	sperm cell	☐

1bi

1 mark

(ii) Which organ system produces these two cells?
Tick the correct box.

circulatory system	☐
digestive system	☐
reproductive system	☐
respiratory system	☐

1bii

1 mark

maximum 5 marks

Total

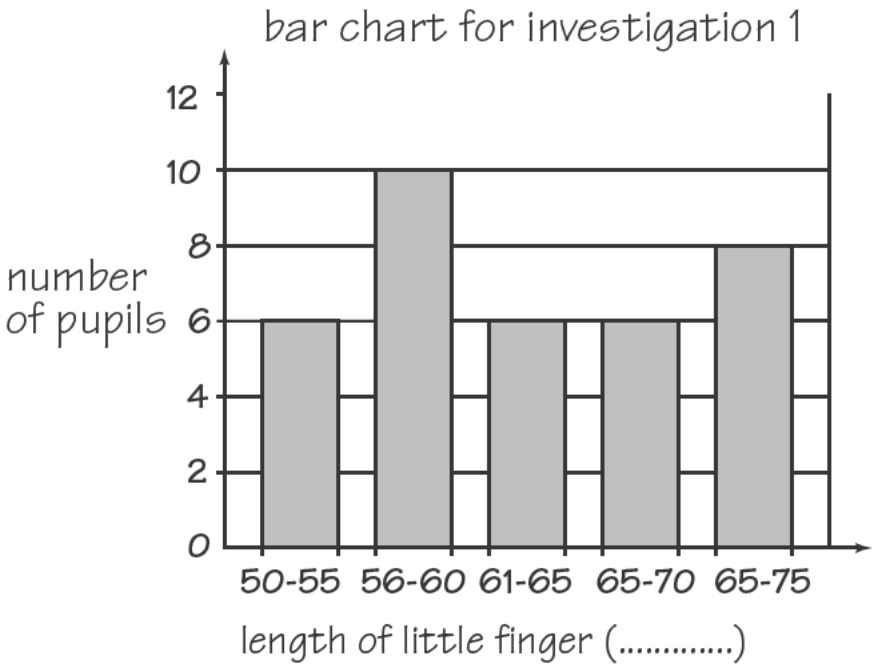
5

2. John and Sarah investigated how pupils in their class were the same and different. First they measured the length of each pupil's little finger.

(a) Why should each pupil keep their little finger straight while it was being measured?

2a
1 mark

(b) The bar chart shows their results.



2bi
1 mark

(i) **On the dotted line** under the bar chart, give the units of measurement they used.

(ii) Give **one** mistake they made in the way they grouped the finger lengths in their bar chart.

2bii
1 mark

(c) John and Sarah then counted the number of pupils who can and **cannot** roll their tongues.
What method did they use to collect their data?
Tick the correct box.

Observe pupils' tongues.	☐	Look at books.	☐
Identify factors to keep the same.	☐	Measure pupils' tongues.	☐

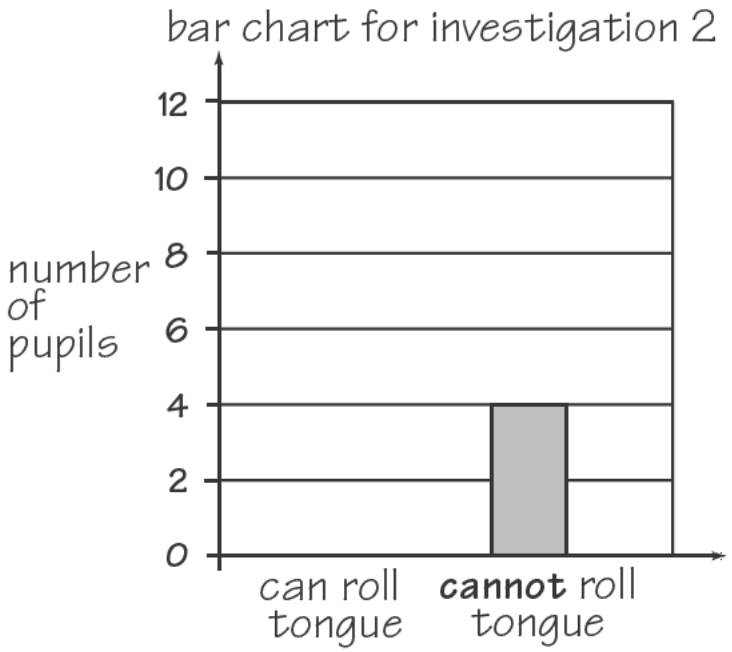
☐ 2c
1 mark

(d) They recorded their results in a table.

results for investigation 2

can roll tongue	**cannot** roll tongue
10	4

Draw a bar on the chart below to show how many pupils can roll their tongues.



☐ 2d
1 mark

(e) Look at their **bar charts** for investigations 1 and 2.
How can you tell that they used different numbers of pupils in each investigation?

_____

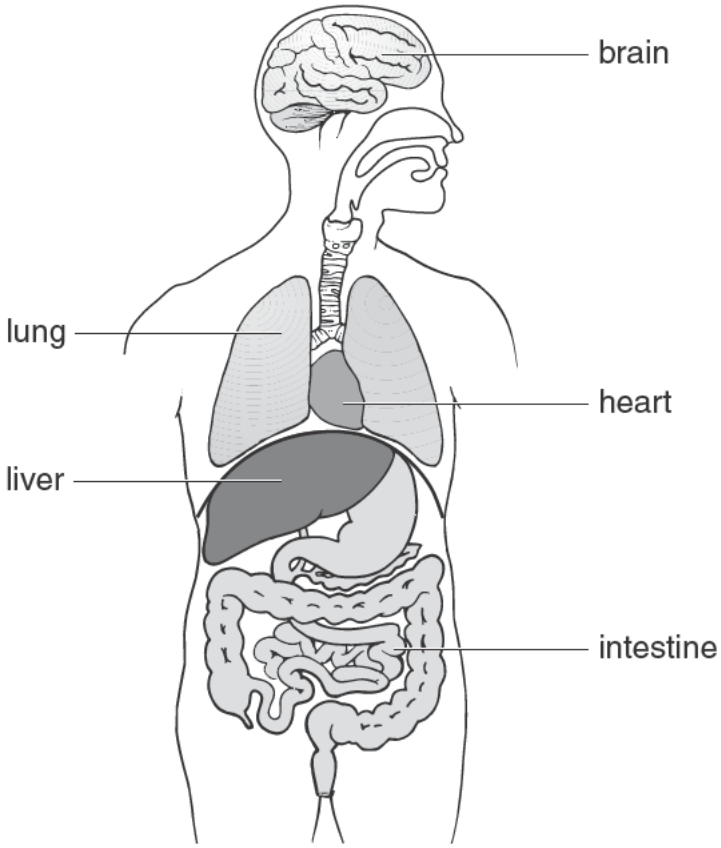
_____

☐ 2e
1 mark

maximum 6 marks

Total ☐ 6

3. The diagram shows some of the organs of the human body.



(a) The heart pumps blood around the body.

(i) What useful gas does the blood take in from the air in the lungs?

_____

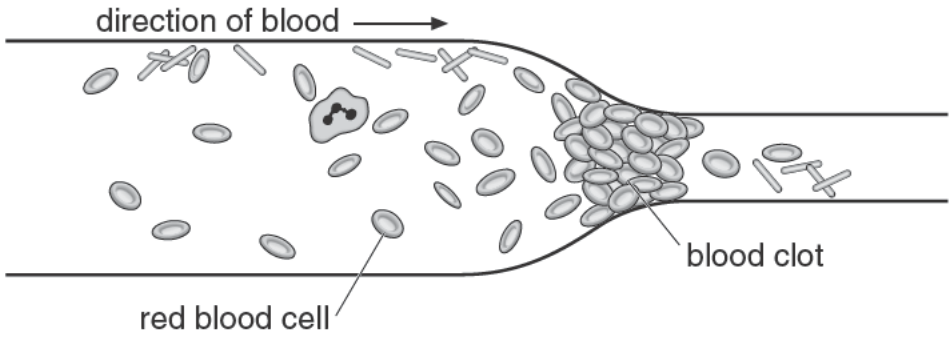
3ai
1 mark

(ii) What useful substance does the blood take in from the intestine?

_____

3aii
1 mark

(b) Blood vessels carry blood to organs of the body.
Sometimes a blood clot forms in a blood vessel as shown below.



a blood vessel *not to scale*

A blood clot may stop an organ working properly.
Give **one** reason for this.

_____

_____

3b
1 mark

(c) Rahma cut his foot on a piece of glass. A scab formed over the cut.
Give **one** way a scab protects the body.

_____

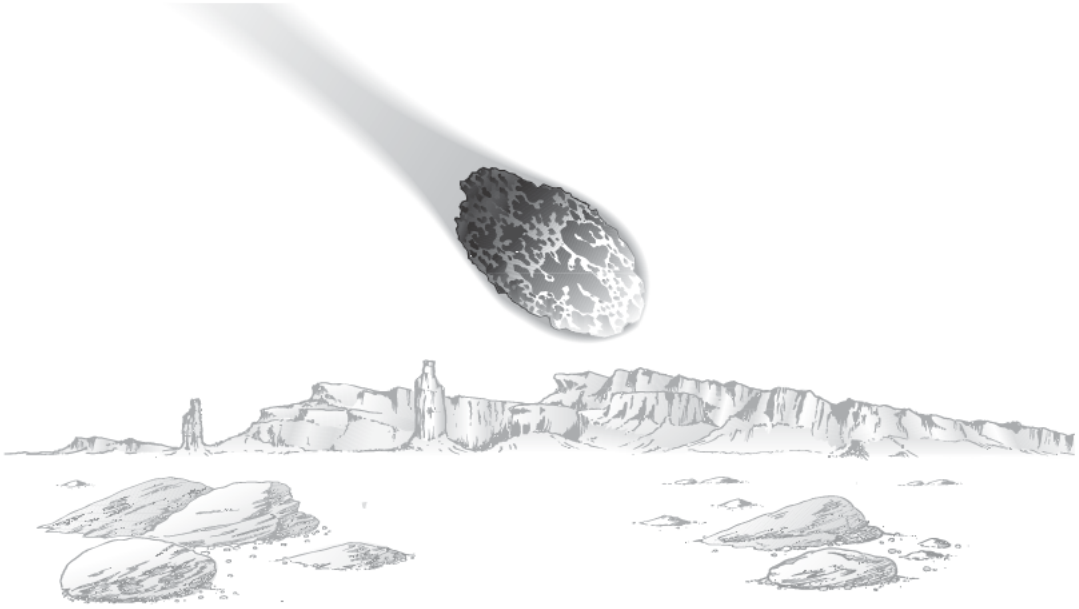
_____

3c
1 mark

maximum 4 marks

Total
4

4. A meteorite landed on Earth. It contained a new element.
Scientists called the element jovium.



(a) The list below shows some properties of jovium.

Which **two** properties suggest that jovium could be a metal?
Tick **two** boxes.

It has a high melting point. ☐

It does **not** stick to a magnet. ☐

It is a blue solid. ☐

It is a good conductor of heat and electricity. ☐

It glows in the dark. ☐

☐ 4a
1 mark

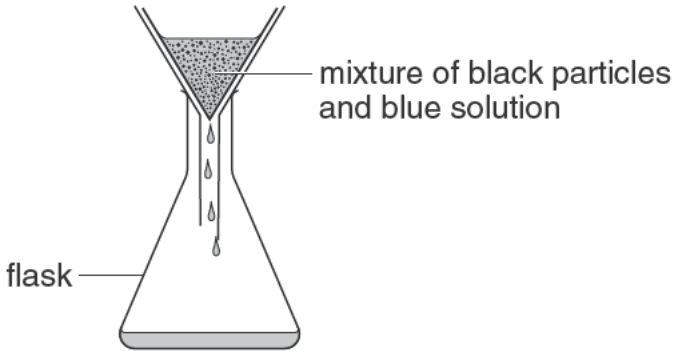
☐ 4a
1 mark

(b) A scientist put a piece of the meteorite in water and stirred it.
This produced a blue solution with tiny, solid, black particles in it.

He separated the black particles from the blue solution using the apparatus below.

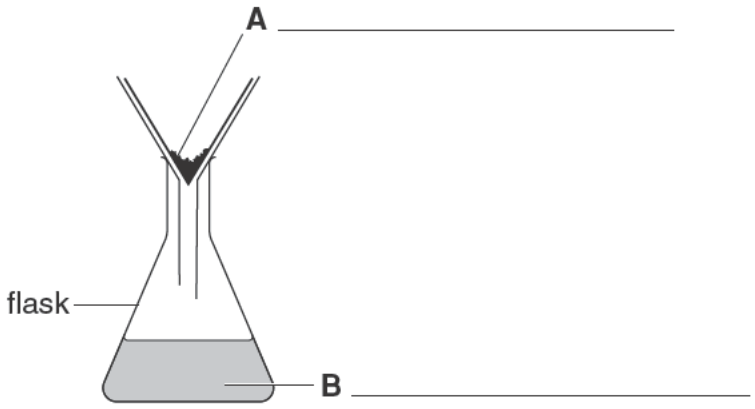
(i) Give the name of this method of separation.

_____



4bi
1 mark

(ii) The diagram below shows the results.
What do the labels A and B show? Write your answers on the lines.



4bii
1 mark

4bii
1 mark

(c) The scientist poured the contents of the flask into a dish.
Two days later there were blue crystals in the dish, but **no** liquid.

at the start **two days later**

What happened to the liquid in the dish?

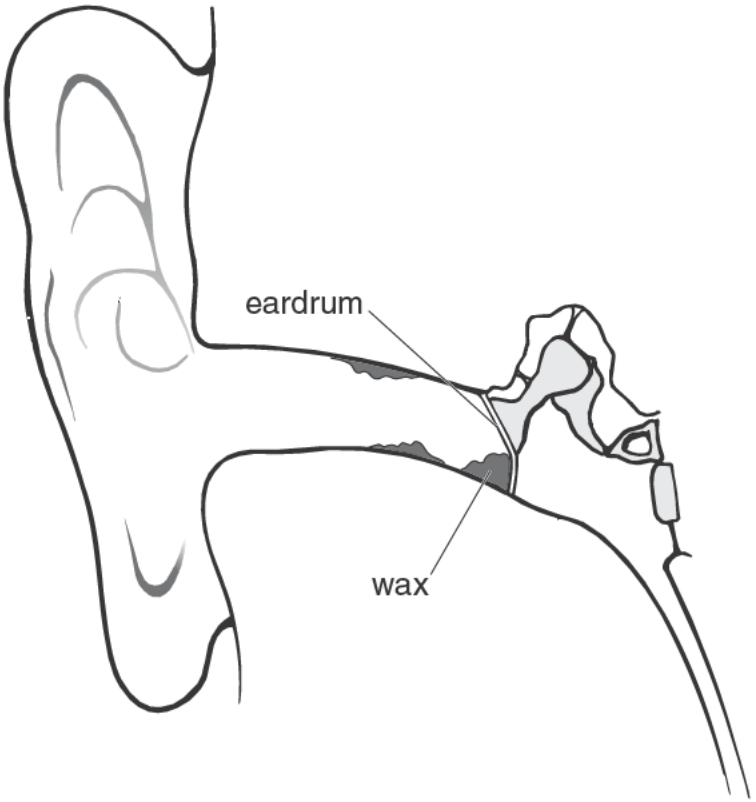
_____

4c
1 mark

maximum 6 marks

Total
6

5. The diagram below shows part of the human ear.



We can hear somebody speaking because sound waves enter our ears.

(a) (i) What do our eardrums do when sound waves reach them?

5ai
1 mark

_____

(ii) Sometimes a lot of wax is produced in the ear.
The wax rests against the eardrum, as shown above.

Give **one** reason why we **cannot** hear very well when our ears contain a lot of wax.

5aii
1 mark

_____

_____

(b) The table below shows the lowest and highest frequencies that five living things can hear.

living thing	lowest frequency (Hz)	highest frequency (Hz)
human	20	20 000
sparrow	300	20 000
dog	20	45 000
cat	20	64 000
rabbit	300	42 000

(i) Which **three** living things from the table **cannot** hear a frequency of 43 000 Hz?

_____ and _____ and _____

5bi

1 mark

(ii) From the table, choose the living thing that can hear the biggest **range** of frequencies.

_____

5bii

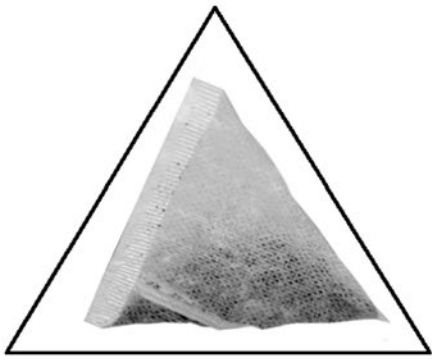
1 mark

maximum 4 marks

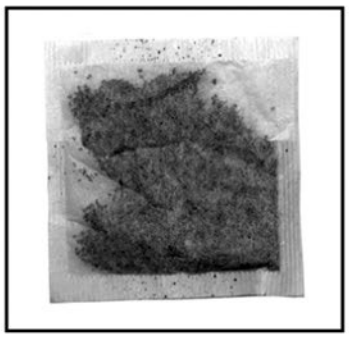
Total

4

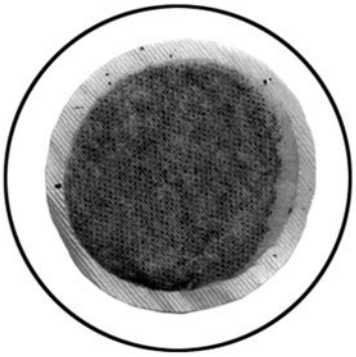
6. Tea bags are made in different shapes.



triangle



square



circle

Some pupils want to find out which shape of tea bag lets tea dissolve most quickly.
They make two plans for their investigation as shown below.

FIRST PLAN

We will use 3 tea bags and 3 beakers.

SECOND PLAN

Collect three beakers.
Collect three different tea bags.
Put one tea bag in each beaker.
Add 150 cm^3 of water at 65°C.
Keep the temperature of the water the same.
Measure the time taken for the tea to dissolve.
Find out which is the quickest for making tea.

(a) How is the second plan better than the first plan?

6a

1 mark

(b) Why should they take care when they add hot water at 65°C to the tea bags?

6b

1 mark

(c) Ben and Vicky drew a cross on some paper. They put each beaker, in turn, over the cross. They poured hot water into the beaker, dropped in the tea bag and watched the water change colour.

To see which shape of tea bag let the tea dissolve the quickest, they measured the time until the liquid was too dark for them to see the cross.

How did the cross help to make their test more accurate?

_____

6c
1 mark

(d) (i) They recorded their measurements in a table as shown below.

shape of tea bag	time taken until cross cannot be seen (minutes)
triangle	8
square	15
circle	10

Which part of their investigation was recorded in the table?
Tick the correct box.

explanations	☐	results	☐
conclusions	☐	plans	☐

6di
1 mark

(ii) Give the **three** shapes of tea bags in the order in which the tea dissolved.
Use the table above to help you.

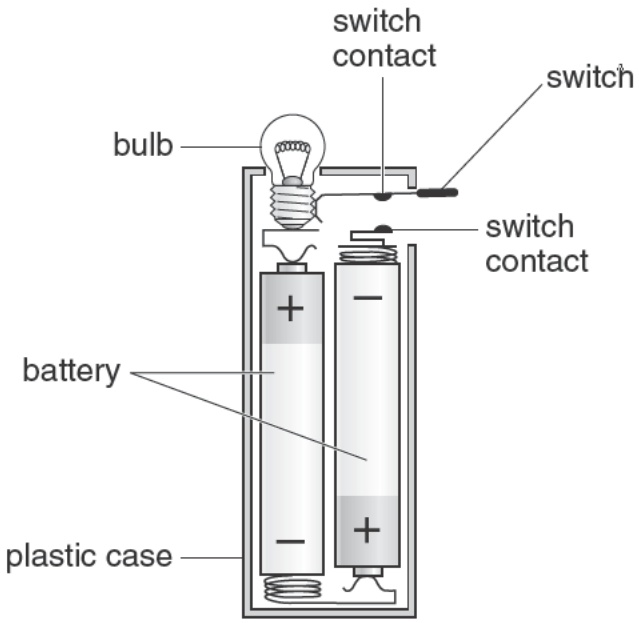
quickest _____ _____ _____ slowest

6dii
1 mark

maximum 5 marks

Total
5

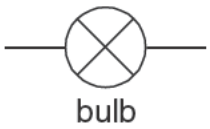
7. (a) The drawing below shows the parts of a torch.



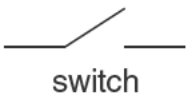
(i) Paul closed the switch.
Why did this turn on the torch?

7ai
1 mark

(ii) The diagrams below show symbols for a battery, a bulb and a switch.
Connect the symbols to make a series circuit for the torch.

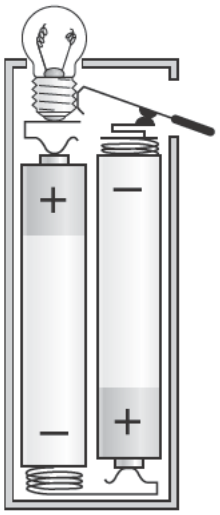


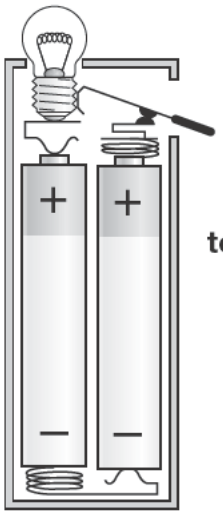
7aii
1 mark



(b) The drawings below show two other torches. In both torches, the bulbs will **not** light even when Paul closes the switches.

torch A





torch B

Look carefully at the drawings.

(i) Why is the circuit of torch A **not** complete?

_____ 7bi

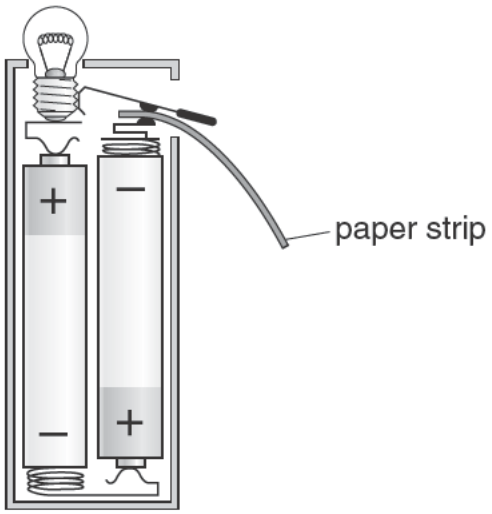
1 mark

(ii) What could you do to torch B to get the bulb to light?

_____ 7bii

1 mark

(c) When Paul bought his torch there was a paper strip between the contacts of the switch as shown below.



Paul had to remove the paper strip before he could turn the torch on. Give the reason for this.

_____

_____ 7c

1 mark

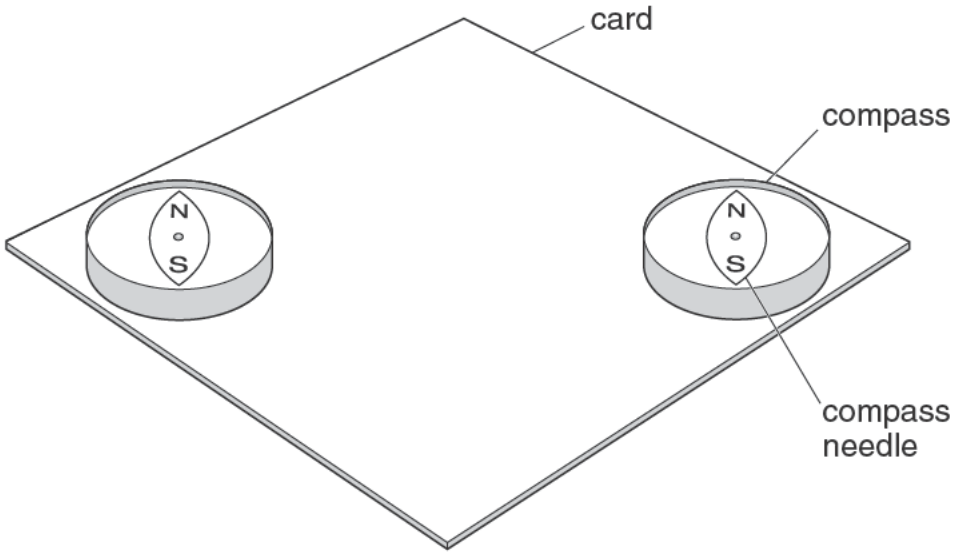
maximum 5 marks

Total

5

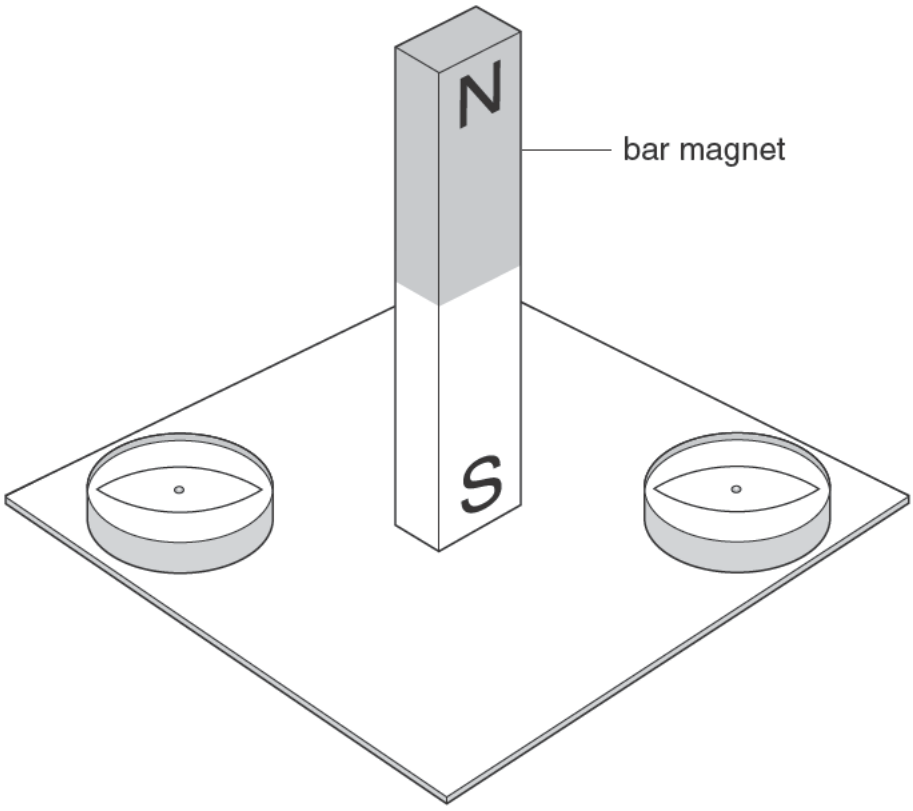
8. A compass needle is a small magnet with a North pole, N, and a South pole, S.

Ruth placed two compasses onto a piece of card.
Both compass needles pointed in the direction shown below.



(a) Ruth placed a bar magnet with its **South pole** between the two compasses.
The compass needles moved as shown below.

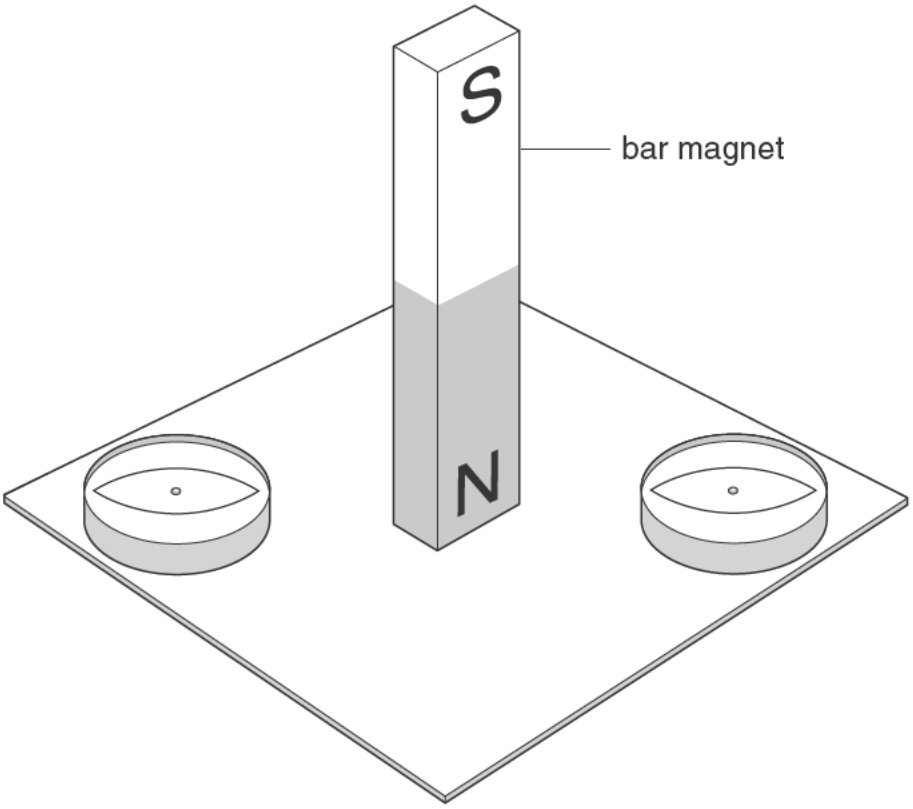
On the diagram below, label the North pole and South pole of each compass needle.
Use the letters N and S.



8a
1 mark

(b) Ruth turned the bar magnet round so that the **North pole** was between the two compasses.

On the diagram below, label the North pole and South pole of each compass needle now.
Use the letters N and S.



8b
1 mark

(c) Ruth repeated her experiment with an aluminium bar instead of a bar magnet.

What happened to the compass needles?

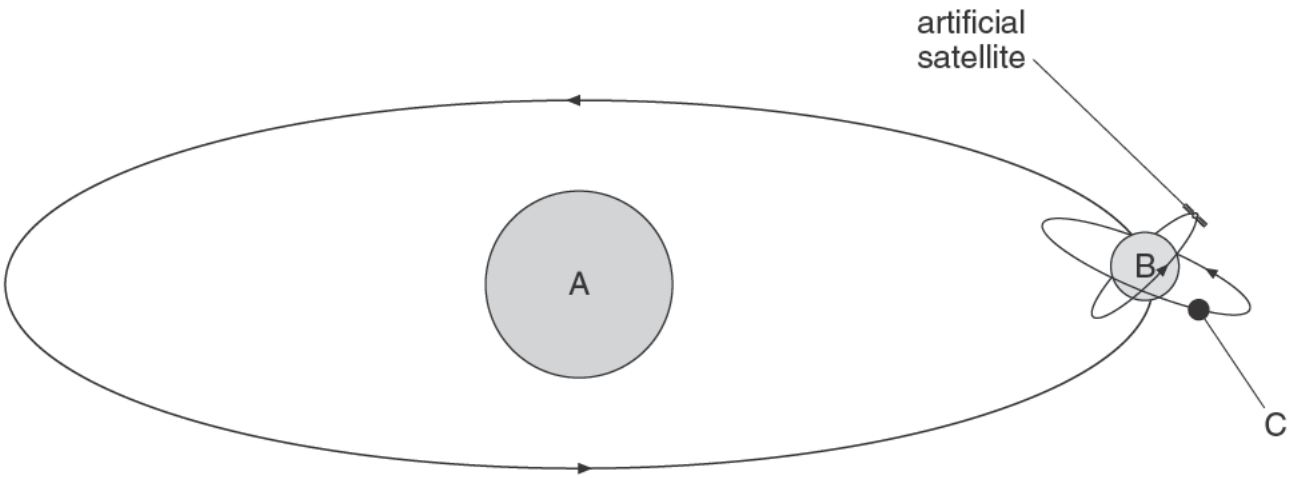
_____

8c
1 mark

maximum 3 marks

Total
3

9. The diagram below shows the Earth, the Sun, the Moon and an artificial satellite.



not to scale

(a) Which letters, on the diagram, show the Earth, the Sun and the Moon?

the Earth _____

the Sun _____

the Moon _____

9a
1 mark

9a
1 mark

(b) Give **one** use of a satellite.

_____

_____

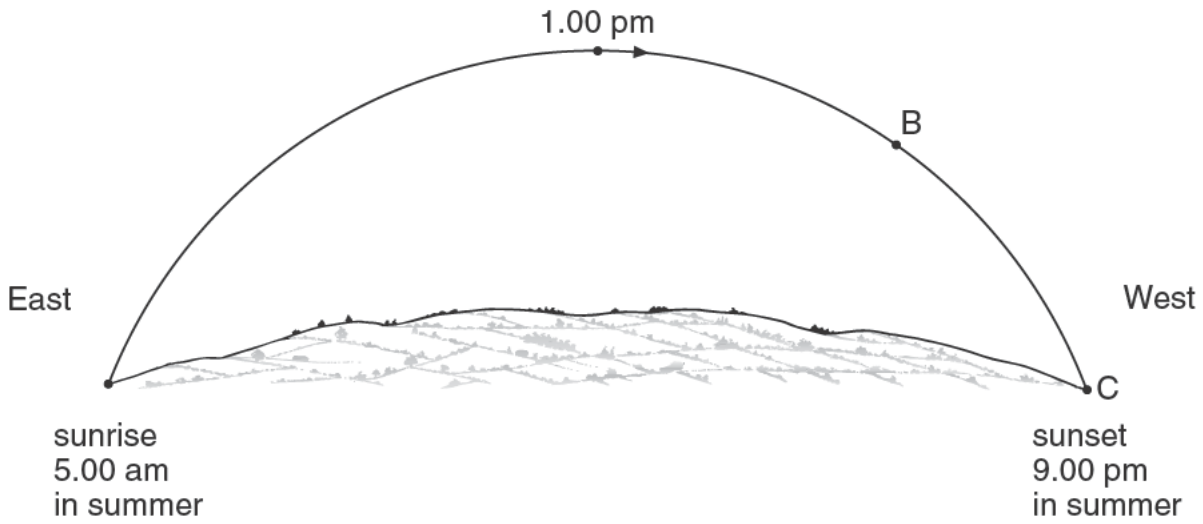
9b
1 mark

(c) Which of the following is a source of light?
Tick the correct box.

the Earth	☐	the Moon	☐
the Sun	☐	a satellite	☐

9c
1 mark

(d) The curve shows the path of the Sun in the sky from sunrise to sunset in England one day in **summer**.



(i) **On the curve**, mark the position of the Sun at 9.00 am.
Label this point A.

9di
1 mark

(ii) The Sun seemed to move from point B to point C.
How many hours did this take?
Tick the correct box.

2 hours	☐	6 hours	☐
4 hours	☐	8 hours	☐

9dii
1 mark

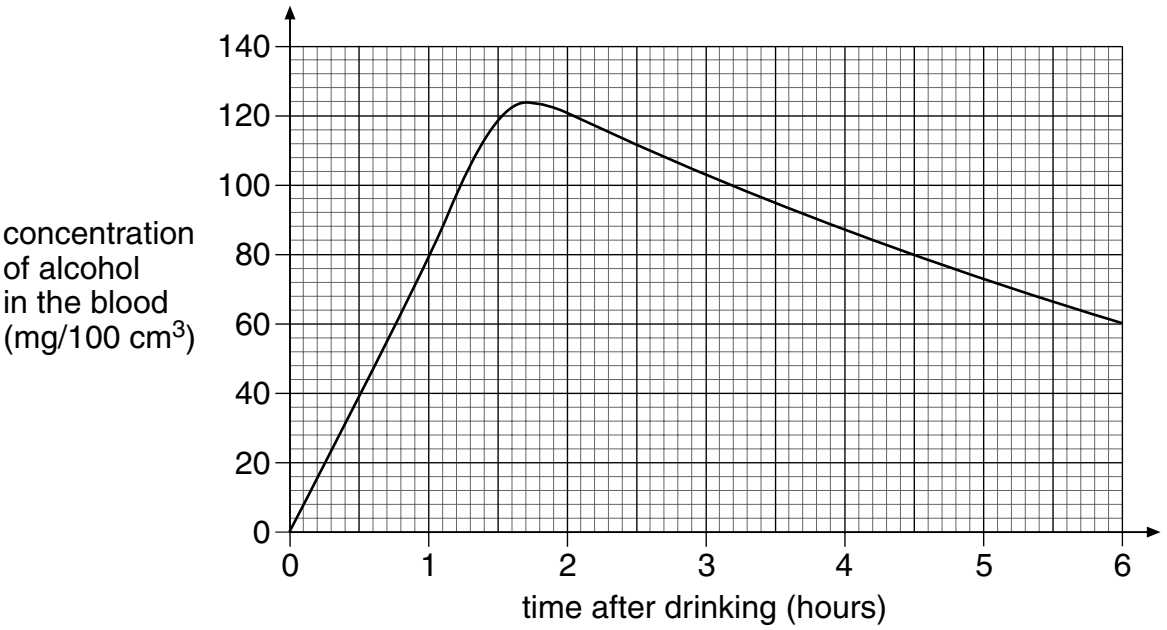
(e) **On the diagram above**, draw the path of the Sun from sunrise to sunset on a day in **winter**.

9e
1 mark

maximum 7 marks

Total
7

10. (a) The graph below shows how the concentration of alcohol in a person's blood changed after drinking alcoholic drinks.



It is illegal to drive if the concentration of alcohol in the blood is higher than 80 mg/100 cm^3.

Use the graph to find out how long the concentration of alcohol in this person's blood was higher than 80 mg/100 cm^3.

_____ hours

10a
1 mark

(b) Why does alcohol in the blood increase the chance of having an accident? Tick the correct box.

It causes slurred speech.	☐	It dulls the senses of taste and smell.	☐
It increases the size of the pupil in the eye.	☐	It increases the time taken to react.	☐

10b
1 mark

(c) Alcohol is absorbed into the bloodstream from the stomach.
Digested food is absorbed into the blood from a different part of the digestive system.
Give the name of this part.

_____

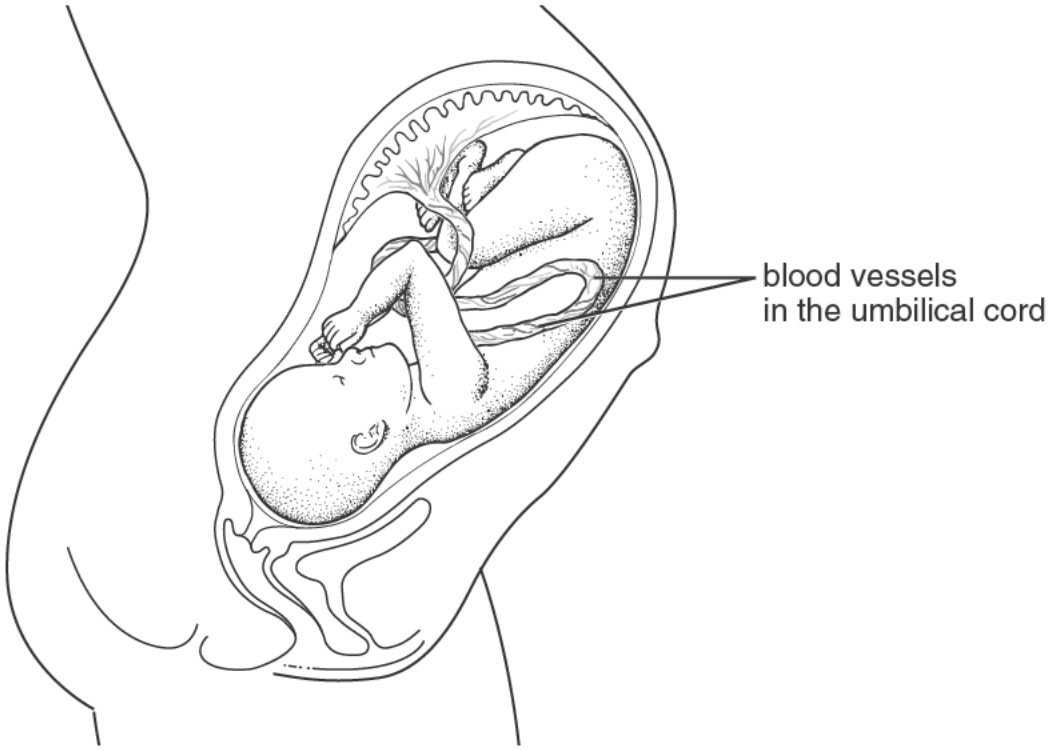
10c
1 mark

(d) Give the name of **one** organ that is damaged by drinking a lot of alcohol over a long period of time.

_____

10d
1 mark

(e) The drawing below shows a foetus in its mother's uterus.



If a pregnant woman drinks large quantities of alcohol, the blood vessels in the umbilical cord may get very narrow for a while.

Give **one** way this could affect the foetus.

_____

_____

10e
1 mark

maximum 5 marks

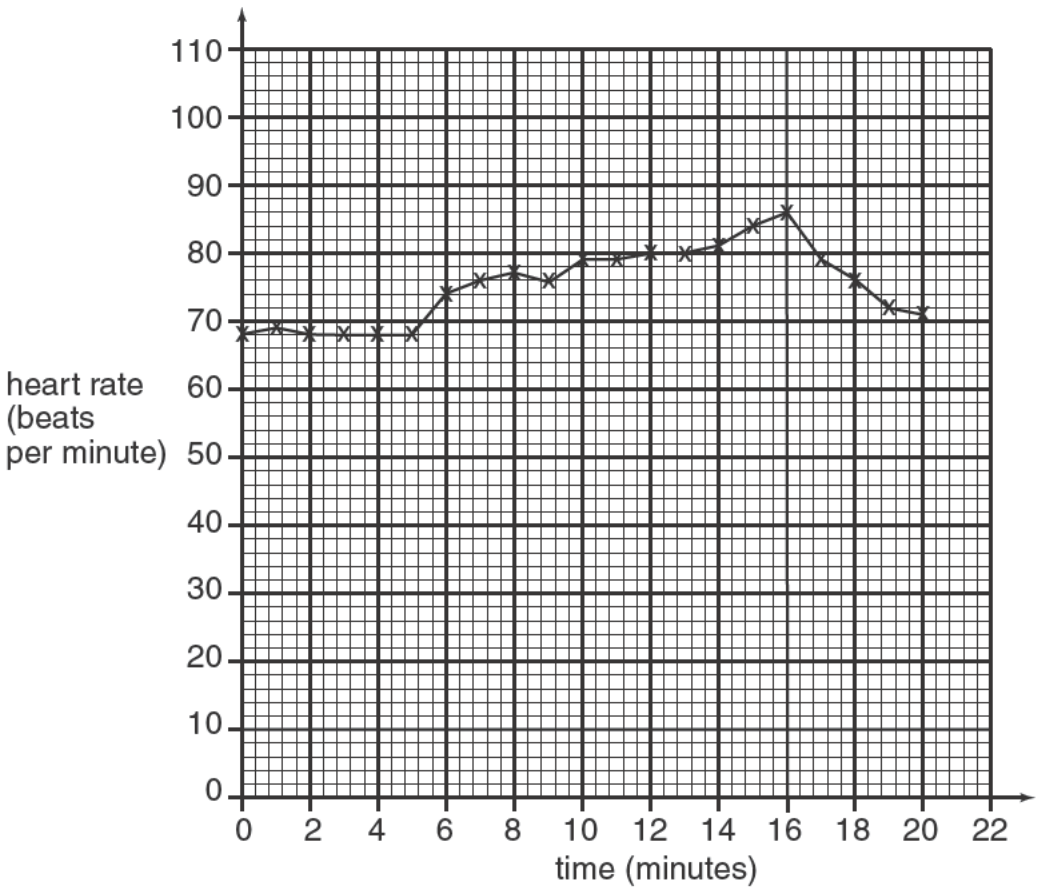
Total
5

11. Harry investigated the effects of fizzy cola drink on his heart rate.

First he measured his heart rate every minute for 5 minutes when sitting down. Then he drank some cola.

He continued to measure his heart rate at regular intervals.

This is a graph of his results.



(a) Why did Harry measure his heart rate every minute for 5 minutes before drinking his cola?

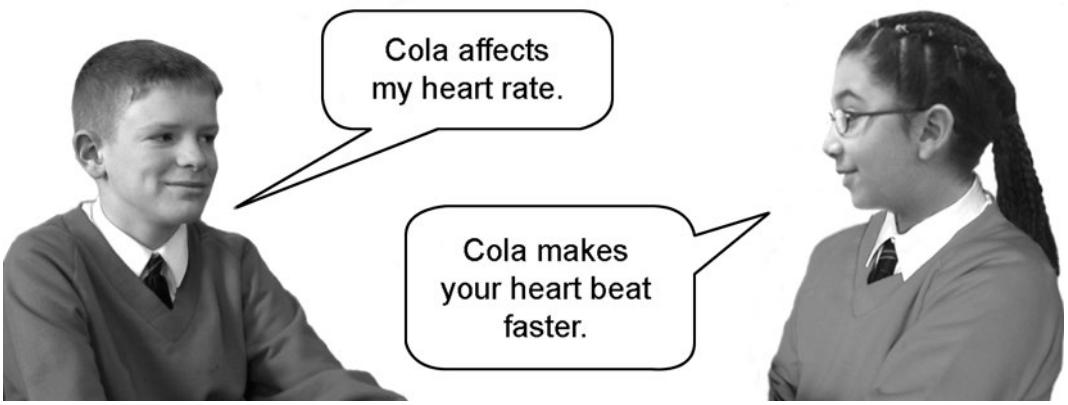
11a
1 mark

(b) Harry says cola affects his heart rate.

What evidence is there in the graph to support his idea that cola affects his heart rate?

11b
1 mark

(c) Harry and Yasmin came to the following conclusions.



Harry Yasmin

Explain why Yasmin's conclusion is better than Harry's conclusion.

11c
1 mark

(d) Yasmin said, "We should also measure Harry's heart rate after he drinks fizzy water".

How would measuring Harry's heart rate after he drinks fizzy water improve the investigation?

11d
1 mark

maximum 4 marks

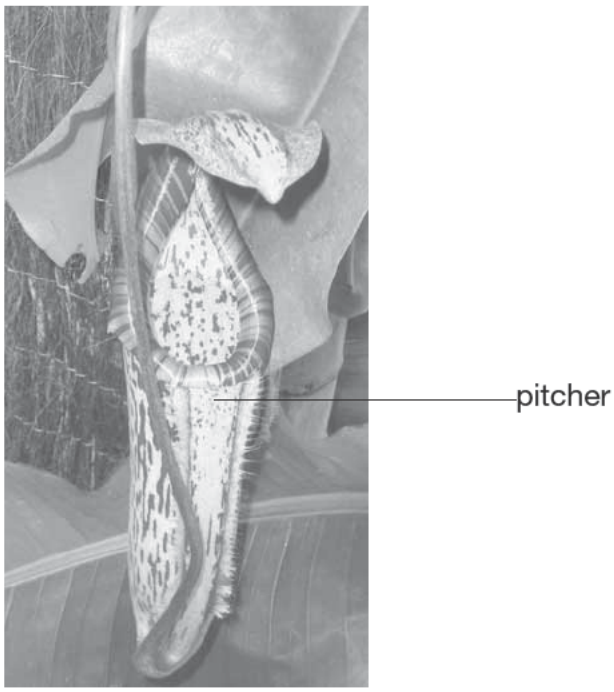
Total
4

12. (a) Plants need nitrogen compounds for growth.
Give the name of the type of plant cell that absorbs water and nitrogen compounds from the soil.

12a
1 mark

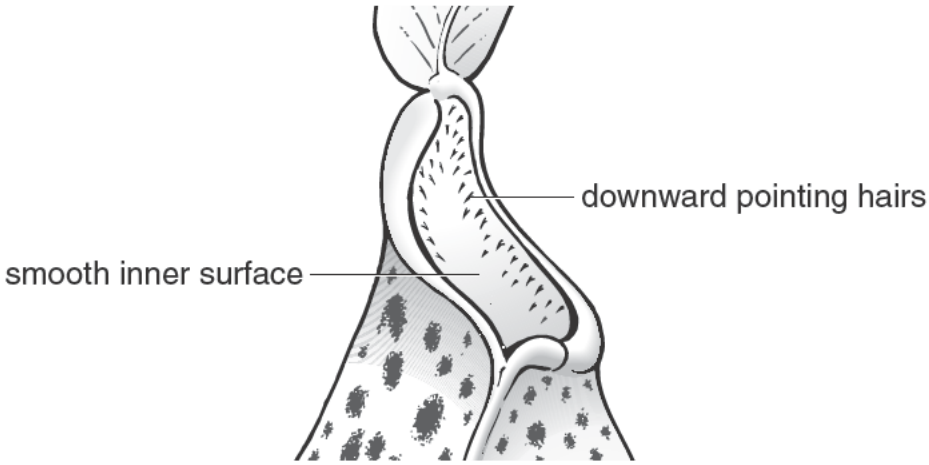
_____

(b) The photograph shows a pitcher plant.
Pitcher plants get nitrogen compounds from insects.
They digest insects in leaves shaped like containers called pitchers.



In the bottom of the pitcher there is a liquid. Insects are attracted to the plant. They fall into the liquid.

The inner surface of the pitcher is very smooth and slippery with downward pointing hairs as shown below.



Suggest the function of the smooth, slippery surface with downward pointing hairs.

_____

_____

12b
1 mark

(c) There are useful bacteria living in the liquid. They produce enzymes to help digest the insects.
Both the bacteria and the pitcher plant absorb some of the products of digestion.

How does the number of insects that fall into the liquid affect the number of these useful bacteria?

_____

_____

12c
1 mark

(d) Pitcher plants also have ordinary green leaves where photosynthesis takes place.

(i) Complete the word equation for photosynthesis.

_____ + water → glucose + _____

12di
1 mark

(ii) Glucose is a carbohydrate.

Why are carbohydrates needed by living things?
Tick the correct box.

to provide energy	☐	to provide liquid	☐
to provide immunity	☐	to provide minerals	☐

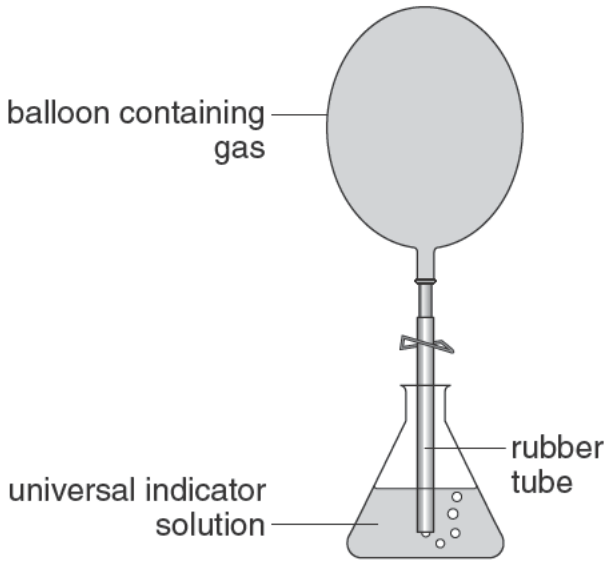
12di
1 mark

12dii
1 mark

maximum 6 marks

Total
6

13. A scientist compared the acidity of four gases to see which gas might cause acid rain.
She used four balloons to collect the gases.
She then bubbled the gases, in turn, through a fresh sample of green, neutral, universal indicator solution.



(a) Three of the gases caused the indicator to change colour.
The scientist added drops of alkali to the indicator until the indicator changed back to green.
Her results are shown in the table below.

gases collected	change in colour of indicator	number of drops of alkali needed to change the indicator back to green
exhaust gases from a car	green to red	31
carbon dioxide	green to red	160
air	no change	0
human breath	green to yellow	10

Use information in the table opposite to answer part (i) and part (ii) below.

(i) Which gas dissolved to form the most acidic solution?

_____

Explain your choice.

_____

_____

13ai
1 mark

(ii) Which gas formed a neutral solution?

_____

Explain your choice.

_____

_____

13aii
1 mark

(iii) What effect does an alkali have on an acid?

_____

13aiii
1 mark

(b) Some metals react with acids in the air.
Complete the word equation for the reaction between zinc and hydrochloric acid.

zinc + hydrochloric acid → _____ + _____

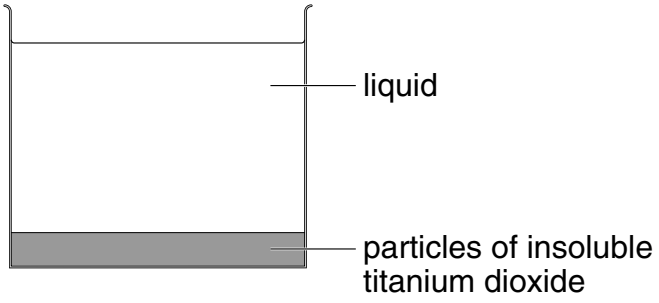
13b
1 mark

13b
1 mark

maximum 5 marks

Total
5

14. (a) Samantha opened a tin of white paint. The paint consisted of a liquid and particles of titanium dioxide that are insoluble in the liquid.
The paint had separated into two layers, as shown below.



(i) What type of substance is the paint?
Tick the correct box.

14ai
1 mark

a compound ☐ an element ☐ a mixture ☐

(ii) What type of substance is titanium dioxide?
Tick the correct box.

14aii
1 mark

a compound ☐ an element ☐ a mixture ☐

(iii) Why did the particles of insoluble titanium dioxide sink to the bottom?

14aiii
1 mark

(b) Samantha stirred the paint and used it to paint a window frame.
She got some of the paint on the glass.

Samantha could **not** get the paint off the glass with water.
When she used a different liquid called white spirit the paint came off.

Why could she remove the paint with white spirit but **not** with water?

_____

_____

14b

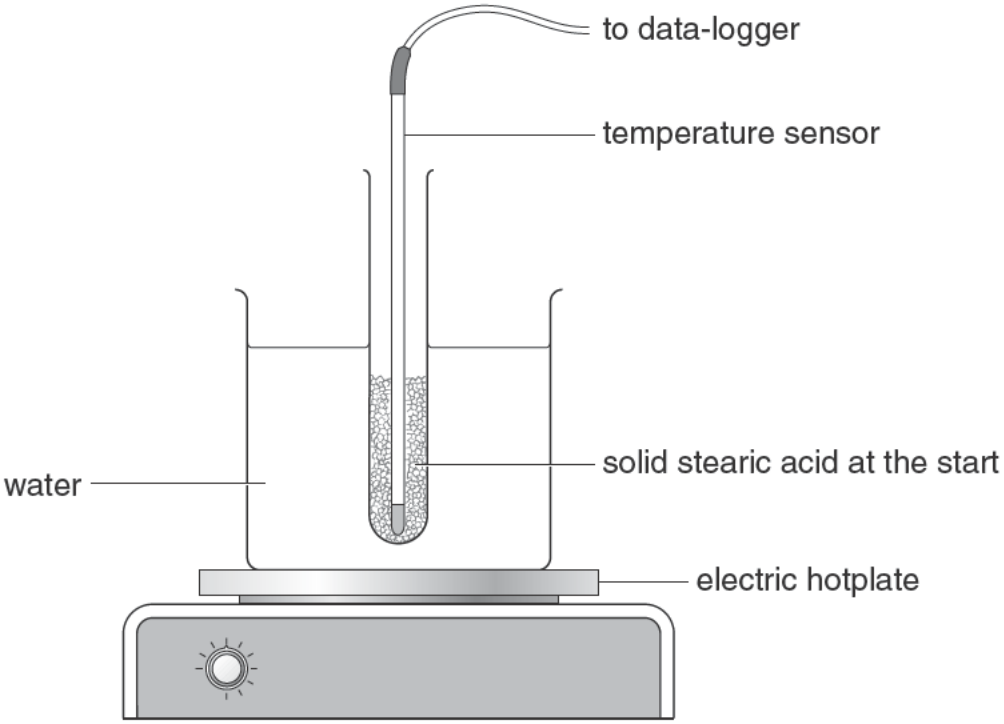
1 mark

maximum 4 marks

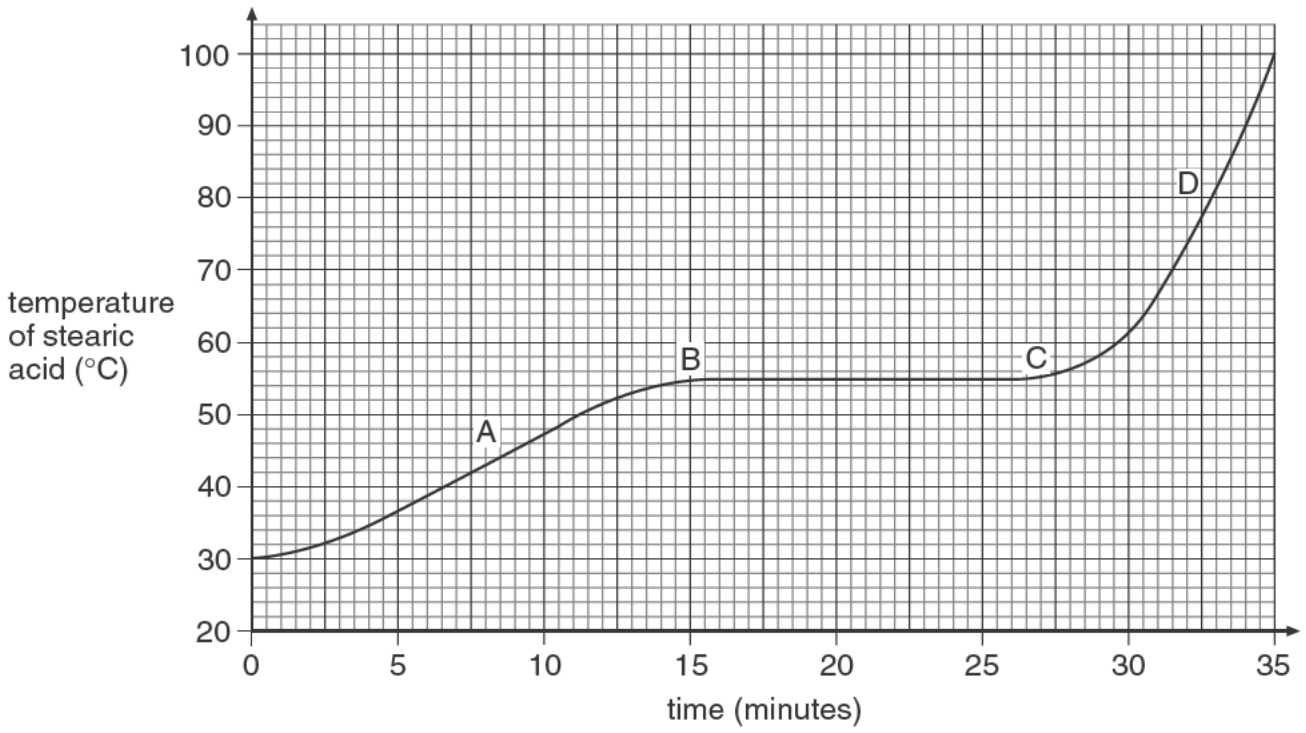
Total

4

15. Alan put a test-tube containing solid stearic acid into a beaker of cold water.
He heated the water until it boiled.



He used a temperature sensor attached to a data-logger to record the temperature of the stearic acid over a period of 35 minutes.
A graph of the results is shown below.



Stearic acid is a solid at room temperature.

(a) (i) Which **letter** on the graph opposite shows the point at which the stearic acid began to change state?

_____ 15ai

1 mark

(ii) Use the graph to find the **temperature** at which the stearic acid began to change state.

_____ °C 15aii

1 mark

(iii) Look at the graph. What was the physical state of the stearic acid:

at point A? _____ 15aiii

1 mark

at point D? _____ 15aiii

1 mark

(b) The test-tube transfers thermal energy from the water to the stearic acid.

By what method is most of the thermal energy transferred?
Tick the correct box.

conduction	☐	evaporation	☐
convection	☐	radiation	☐

15b

1 mark

(c) Stearic acid boils at 360°C.
The stearic acid could **not** boil in this experiment.
Give the reason for this.

_____

_____ 15c

1 mark

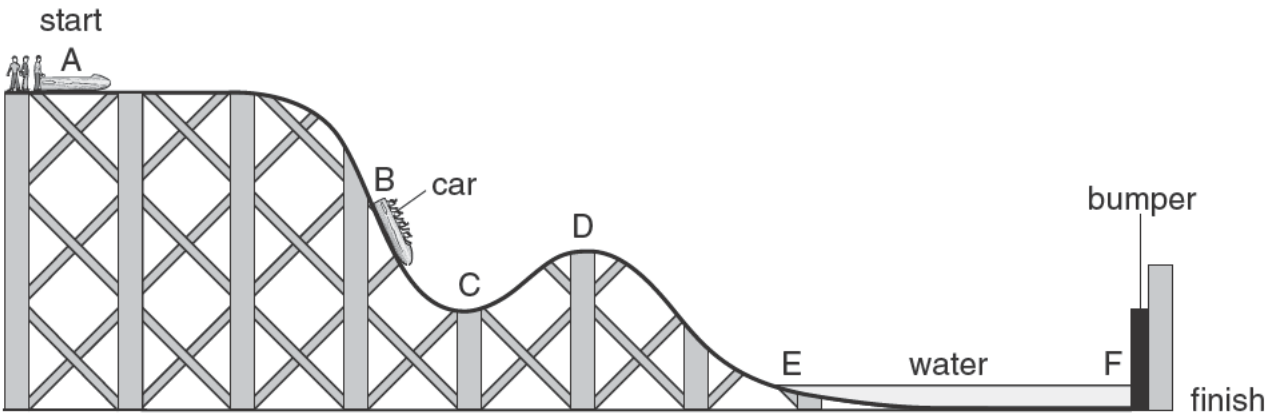
maximum 6 marks

Total

6

16. The photograph shows some pupils in a log car on a theme-park ride.

The drawing below shows the ride.
The letters A, B, C, D, E and F show different points along the track.



The car starts from A and travels to F, where it stops by hitting a bumper.
At E the car enters a trench filled with water.

(a) (i) At which **two** points does the car have **no** kinetic energy?
Give the **two** correct letters.

_____ and _____

16ai
1 mark

(ii) At which point does the car have the **most** gravitational potential energy?
Give the correct letter.

_____

16aii
1 mark

(iii) At which point does the car have **some** kinetic energy and the **least** gravitational potential energy?
Give the correct letter.

_____

16aiii
1 mark

(b) (i) The cars are **not** powered by a motor.
What force causes the cars to move along the track from B to C?

_____

16bi
1 mark

(ii) When a car splashes through the water at E, it slows down.
What force acts on the car to slow it down?

_____

16bii
1 mark

(c) Complete the sentence below by choosing from the following words.

chemical	**gravitational potential**	**kinetic**
light	**sound**	**thermal**

When the car hits the bumper at F, its _____ energy

is transferred into _____ energy and

_____ energy.

16c
1 mark

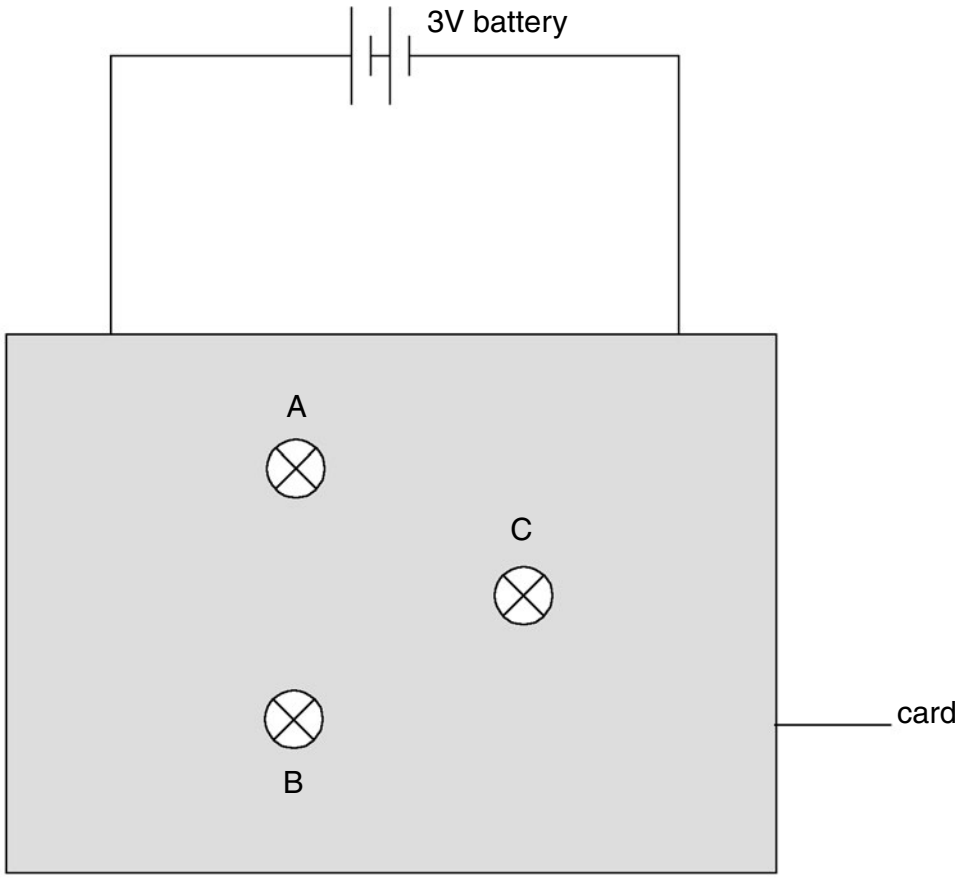
16c
1 mark

16c
1 mark

maximum 8 marks

Total
8

17. Imran built a puzzle circuit with three identical bulbs and a 3V battery.
He covered the connections to the bulbs with a piece of card as shown below.
The bulbs could be seen through holes in the card.

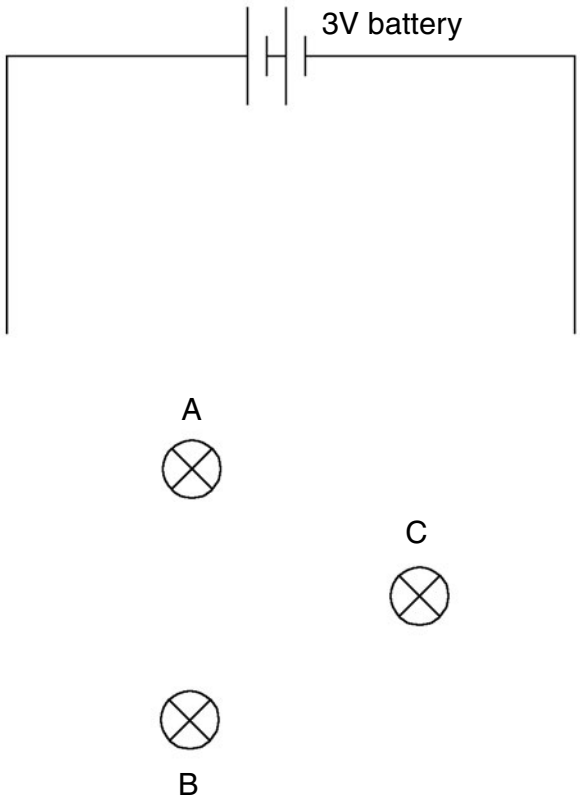


All the bulbs were on but their brightness was different.

Lucy removed bulbs A, B and C in turn. Before connecting each bulb back into the circuit she observed the effect on the other two bulbs.
She recorded her observations in the table below.

bulb removed	observations
A	B and C stayed on
B	C went off A stayed on
C	B went off A stayed on

(a) Complete the circuit diagram below to show how the three bulbs could be connected.
Use your knowledge of series and parallel circuits, and the observations in the table to help you.



17a
1 mark

17a
1 mark

(b) Imran used three identical bulbs but their brightness was different.

Which bulb was the brightest? Give the letter.

_____

Give the reason for your choice.

_____

_____

17b
1 mark

(c) Imran added a switch to the circuit so that he could turn all three bulbs on and off at the same time.

Place a letter **S** on your circuit diagram where this switch could be placed.

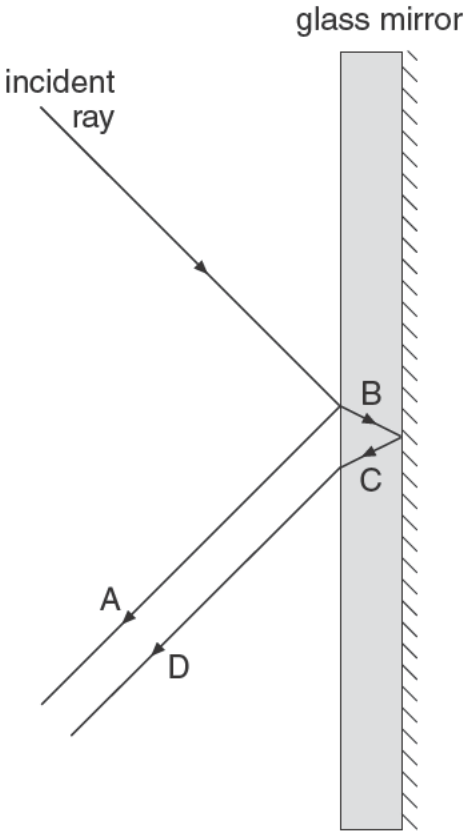
17c
1 mark

PLEASE TURN OVER FOR THE LAST QUESTION

maximum 4 marks

Total
4

18. The diagram shows a ray of light hitting the surface of a mirror made from thick glass.
The incident ray is both reflected and refracted.



(a) (i) Give the letters of the **two** reflected rays.

_____ and _____

18ai
1 mark

(ii) Give the letter of **one** refracted ray.

_____

18aii
1 mark

(b) The incident ray is brighter than ray A.
Give **one** reason for this.

_____

_____

18b
1 mark

maximum 3 marks

Total
3