

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 _____

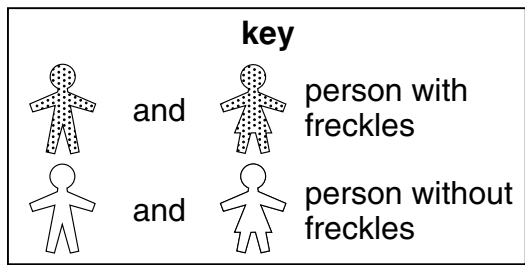
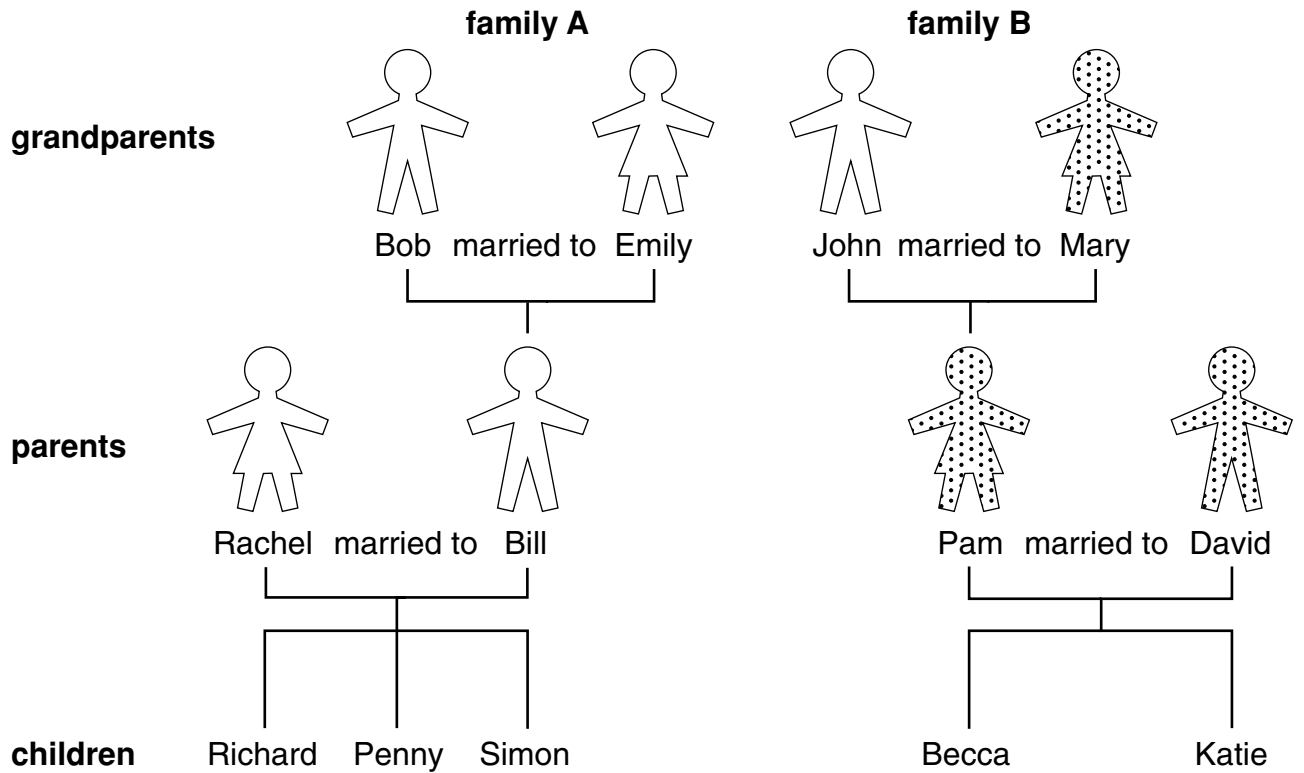
Remember

- 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	
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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

(ii) How did you decide?

1ai
1 mark

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	<input type="checkbox"/>	cheek cell	<input type="checkbox"/>
egg cell	<input type="checkbox"/>	muscle cell	<input type="checkbox"/>
red blood cell	<input type="checkbox"/>	sperm cell	<input type="checkbox"/>

1bi
1 mark

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

circulatory system	<input type="checkbox"/>
digestive system	<input type="checkbox"/>
reproductive system	<input type="checkbox"/>
respiratory system	<input type="checkbox"/>

1bii
1 mark

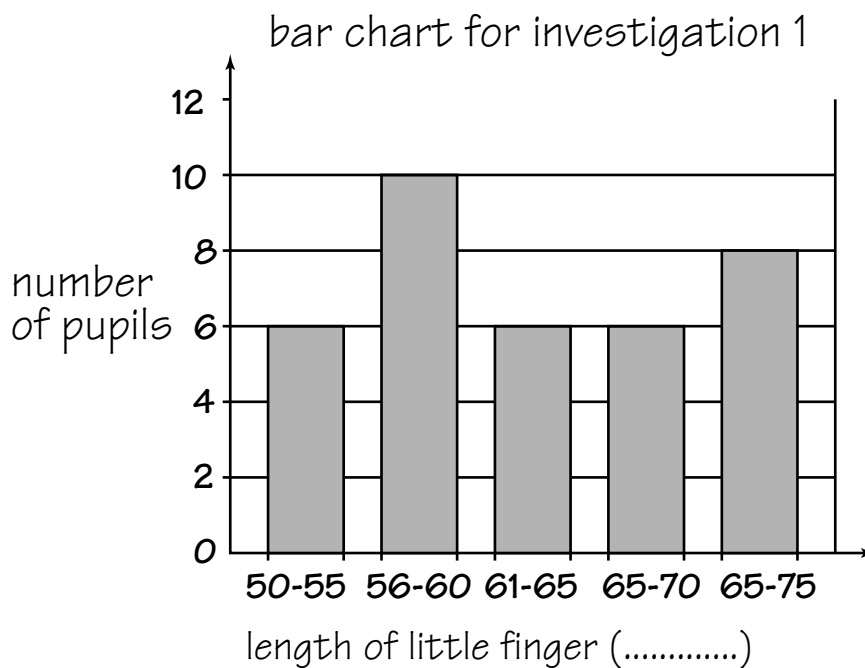
maximum 5 marks

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.	<input type="checkbox"/>	Look at books.	<input type="checkbox"/>
Identify factors to keep the same.	<input type="checkbox"/>	Measure pupils' tongues.	<input type="checkbox"/>

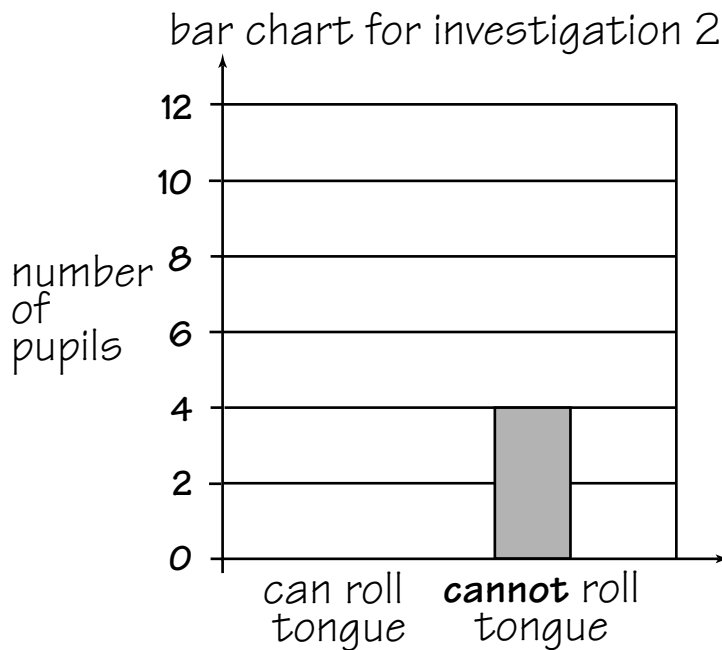
2c
1 mark

- (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.



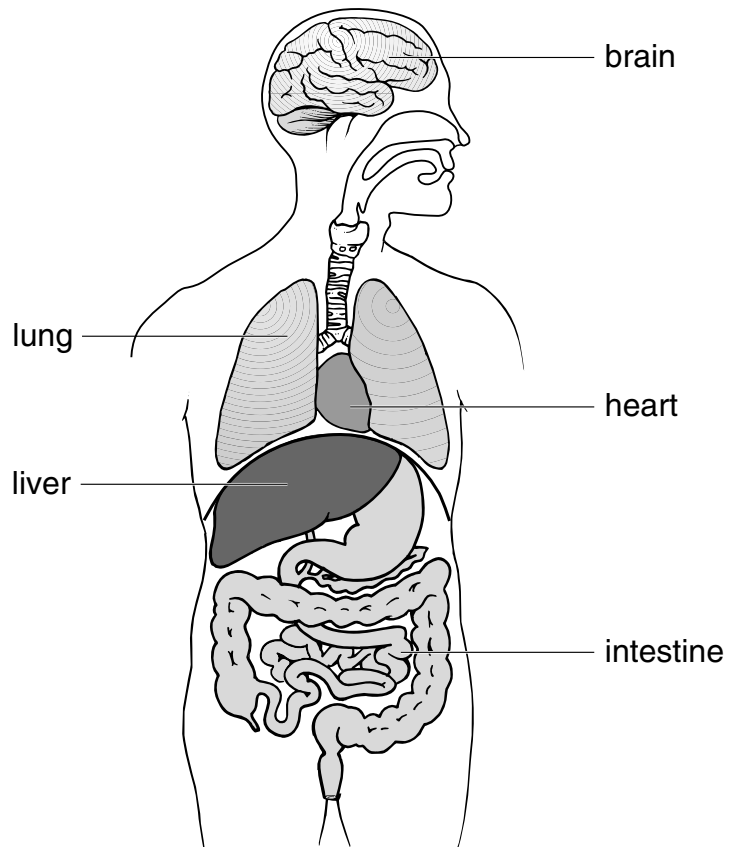
2d
1 mark

- (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

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?

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

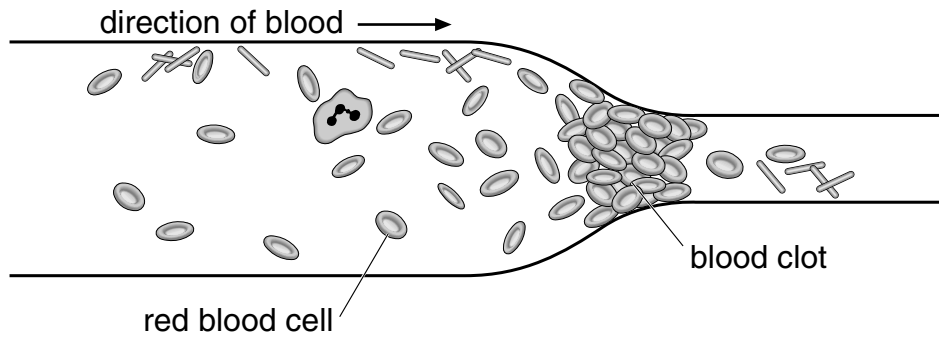
3ai

1 mark

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.

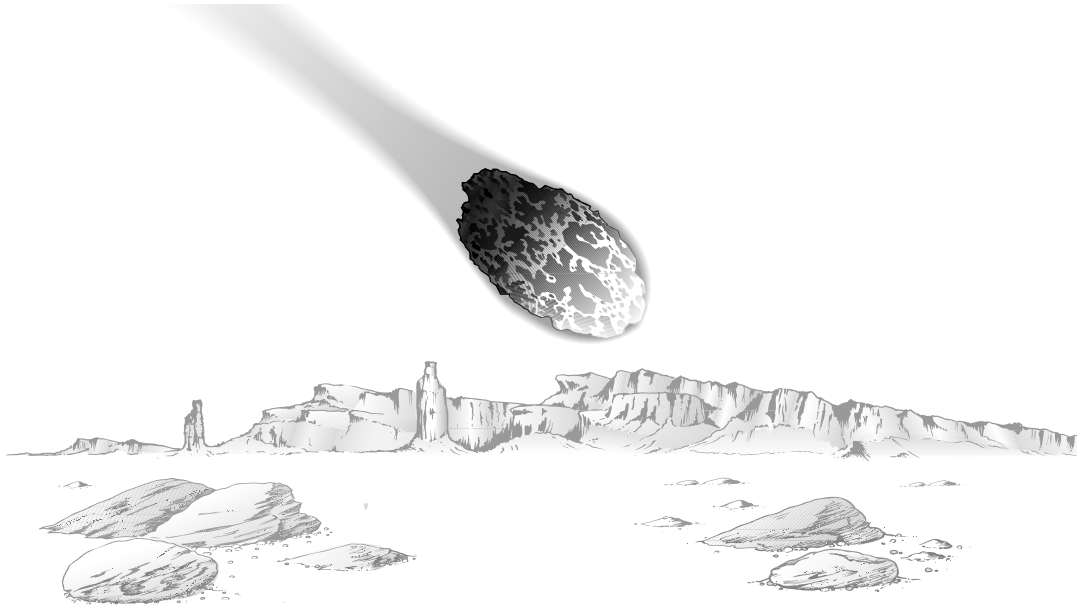
3b
1 mark

- (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

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

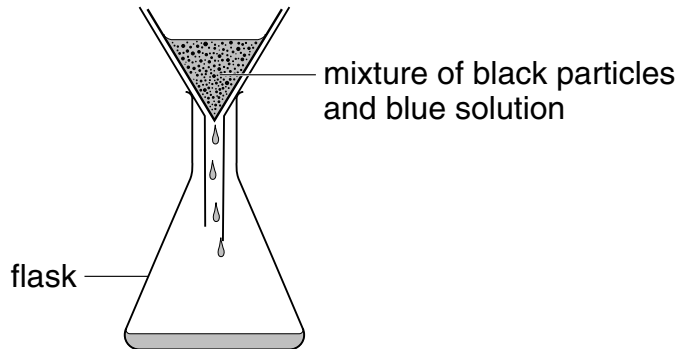
4a

1 mark

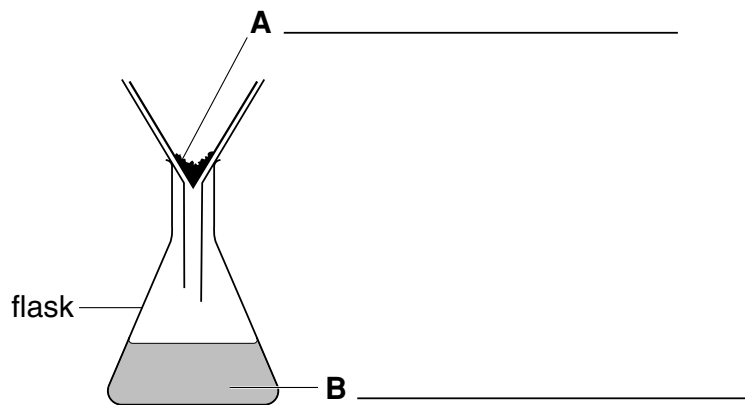
- (b) A scientist put a piece of the meteorite in water and stirred it. This produced a blue solution with tiny, solid, black particles in it.

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

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



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



- (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



blue crystals

two days later

What happened to the liquid in the dish?

4bi
1 mark

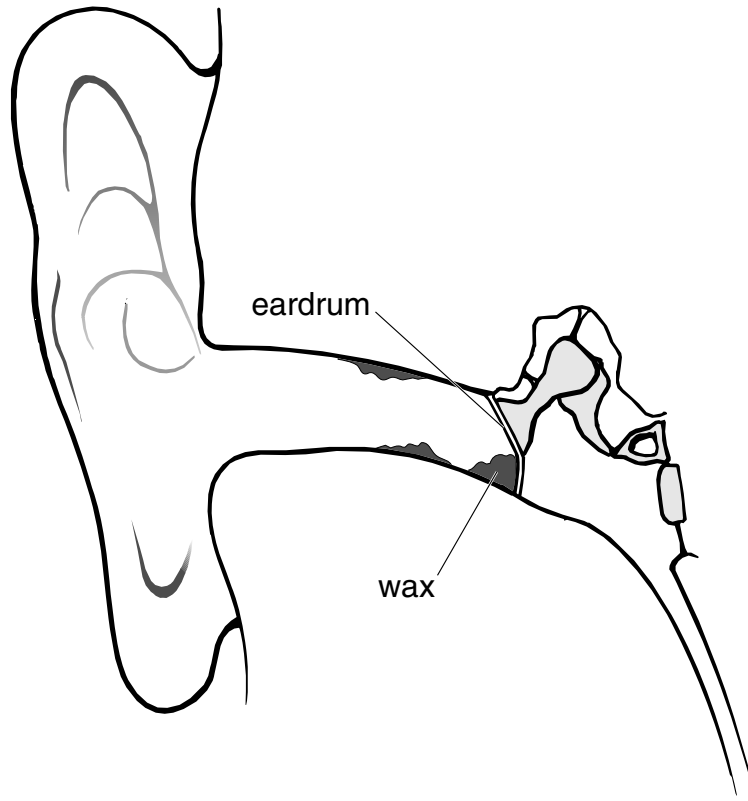
4bii
1 mark

4bii
1 mark

4c
1 mark

maximum 6 marks

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?

(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.



5ai

1 mark



5aia

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 _____

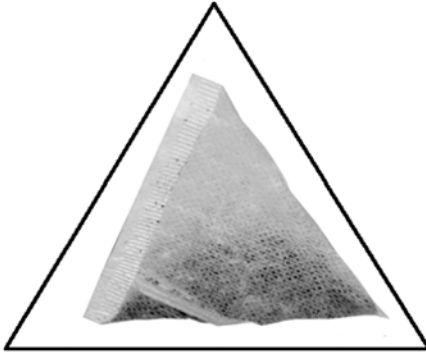
5bi
1 mark

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

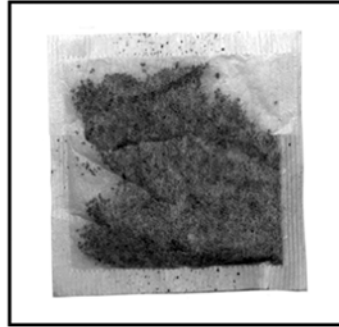
5bii
1 mark

maximum 4 marks

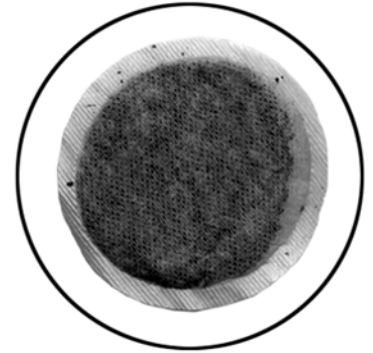
6. Tea bags are made in different shapes.



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 cm³ 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.

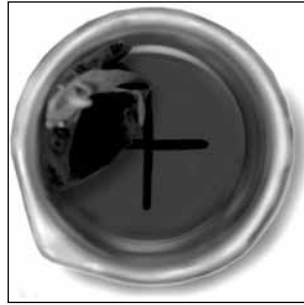
(a) How is the second plan better than the first plan?

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

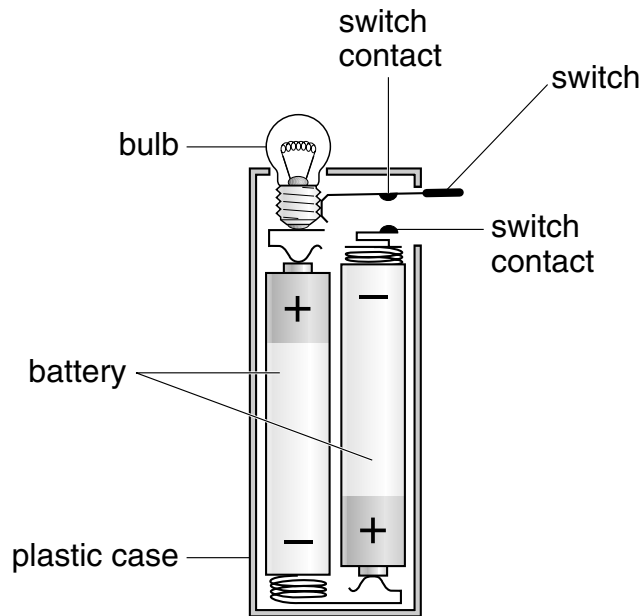
- (ii) Give the **three** shapes of tea bags in the order in which the tea dissolved. Use the table above to help you.

quickest _____ slowest

6dii
1 mark

maximum 5 marks

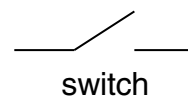
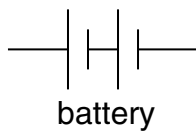
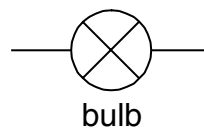
7. (a) The drawing below shows the parts of a torch.



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

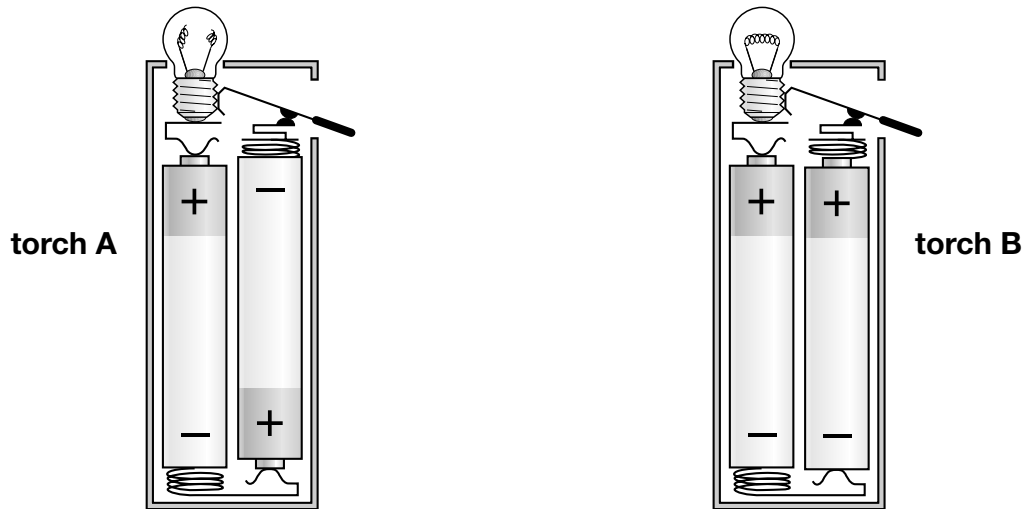
7ai
1 mark

(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.

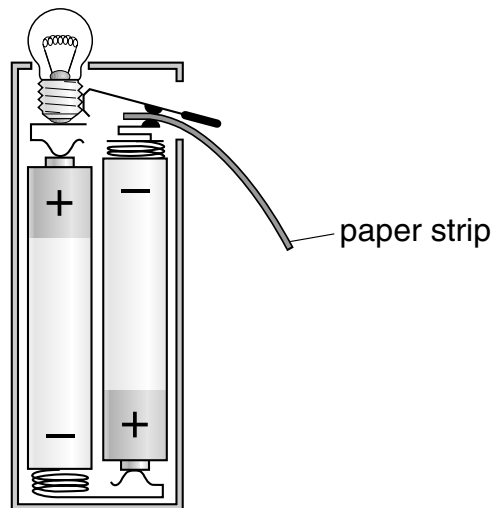


Look carefully at the drawings.

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

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

- (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.

maximum 5 marks

7bi
1 mark

7bii
1 mark

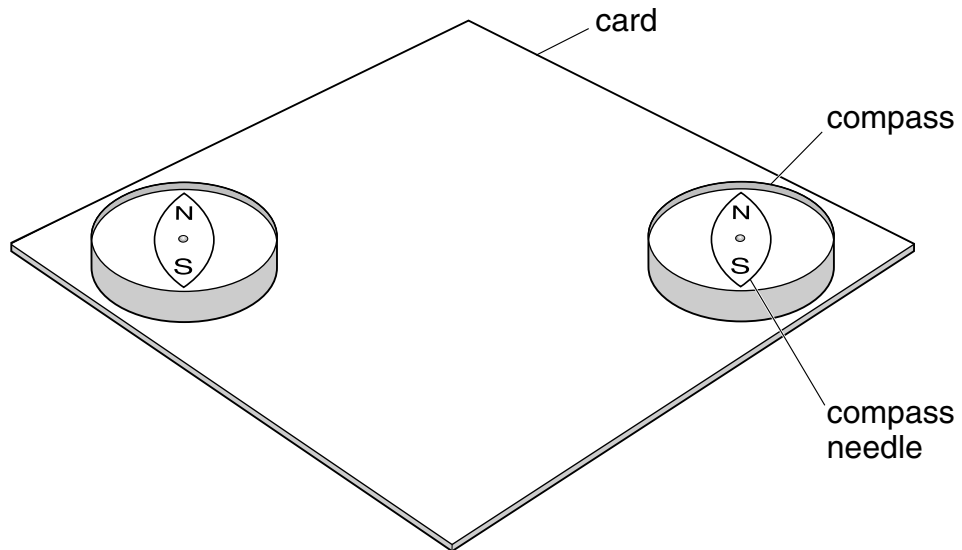
7c
1 mark

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.

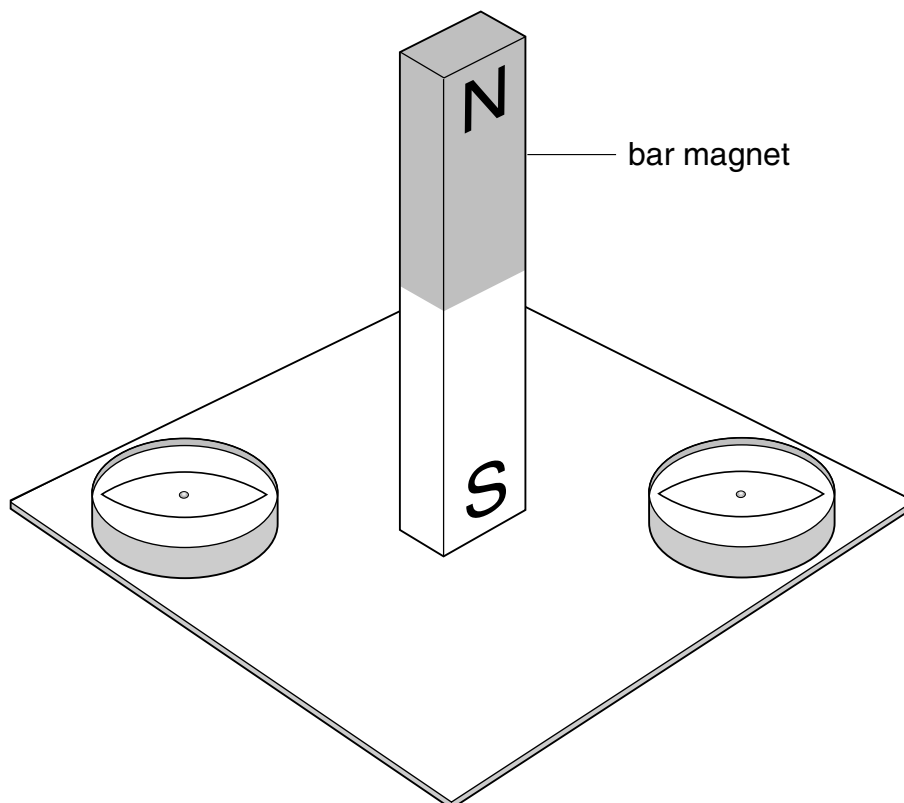
Both compass needles pointed in the direction shown below.



(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.

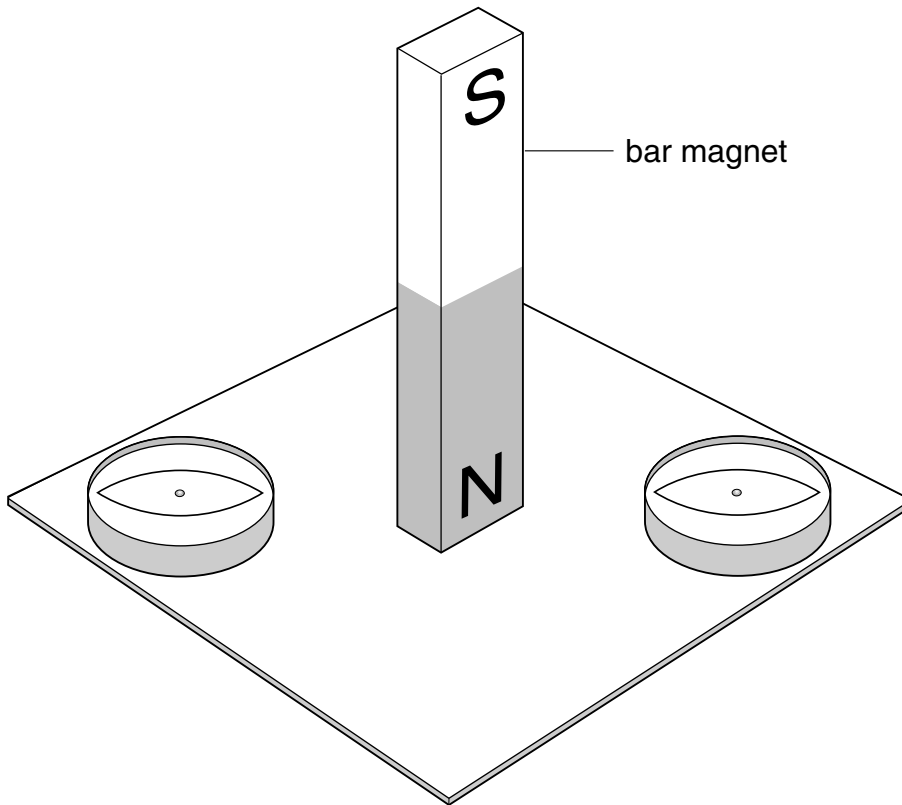
Use the letters N and S.



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.



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

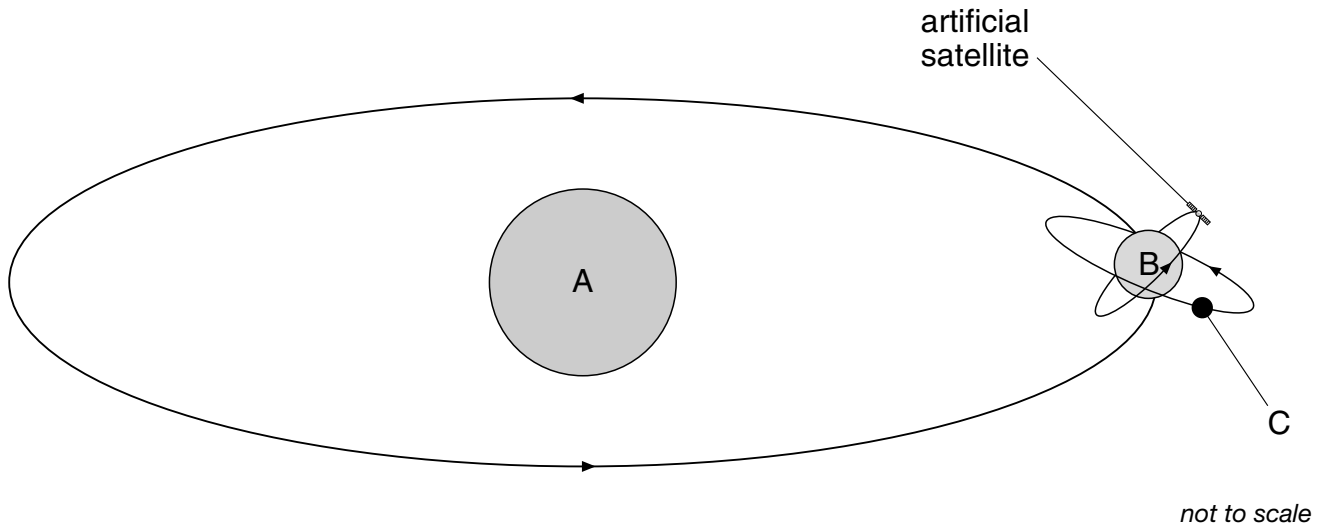
What happened to the compass needles?

8b
1 mark

8c
1 mark

maximum 3 marks

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



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

the Earth _____

the Sun _____

the Moon _____

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

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

the Earth

the Moon

the Sun

a satellite

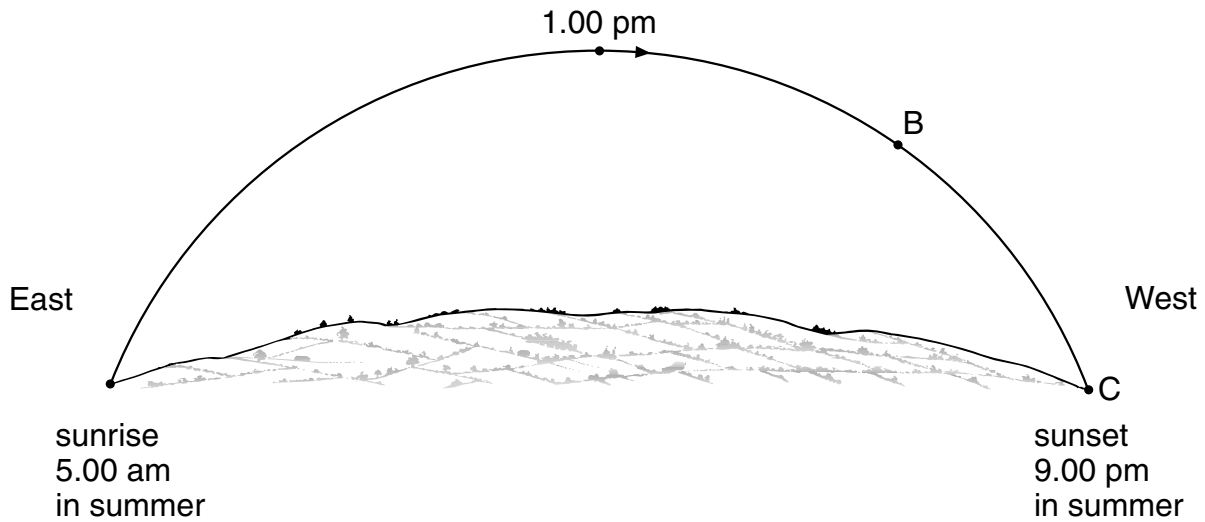
9a
1 mark

9a
1 mark

9b
1 mark

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

2 hours	<input type="checkbox"/>	6 hours	<input type="checkbox"/>
4 hours	<input type="checkbox"/>	8 hours	<input type="checkbox"/>

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

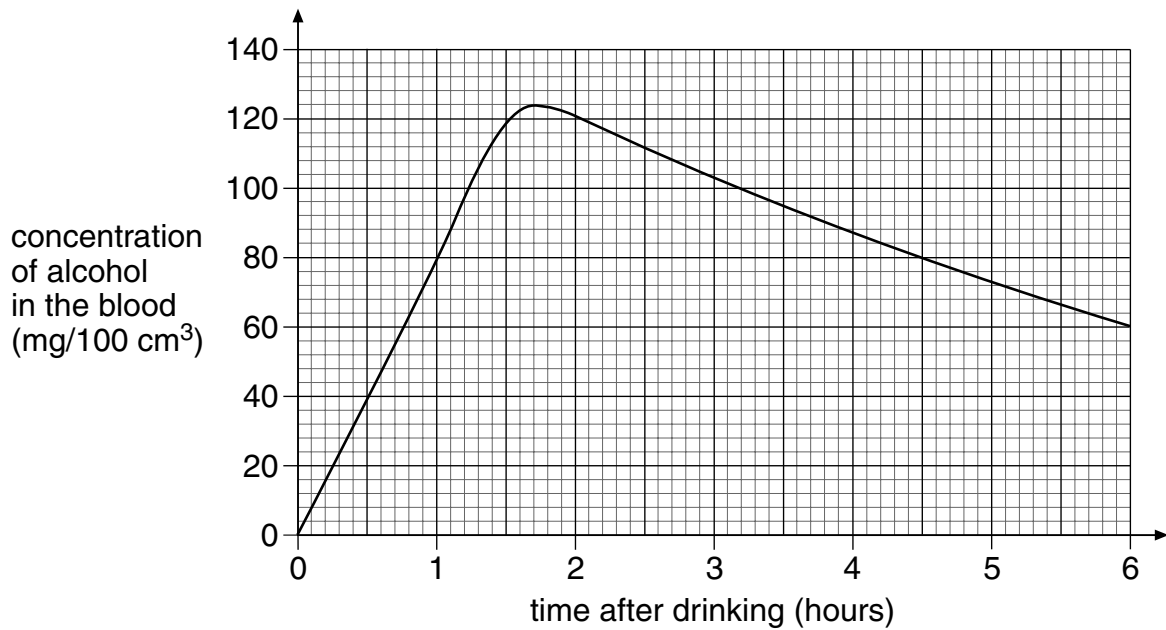
9di
1 mark

9dii
1 mark

9e
1 mark

maximum 7 marks

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 cm³.

Use the graph to find out how long the concentration of alcohol in this person's blood was higher than 80 mg/100 cm³.

_____ 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.

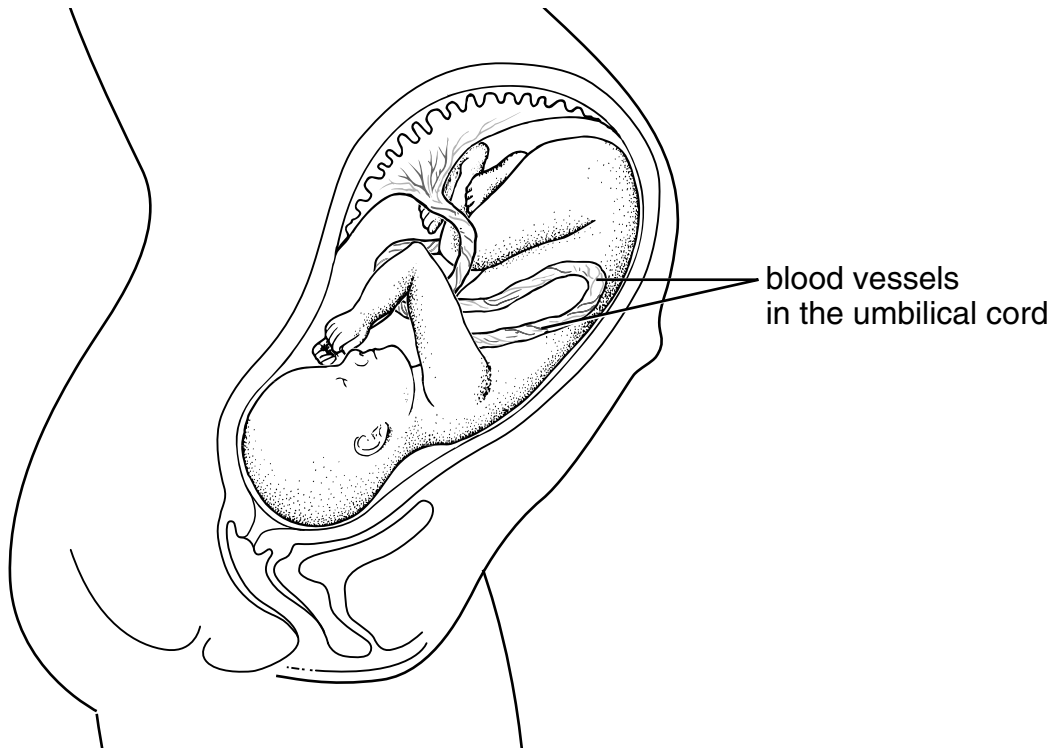
It increases the time taken to react.

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.

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

- (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.

10c

1 mark

10d

1 mark

10e

1 mark

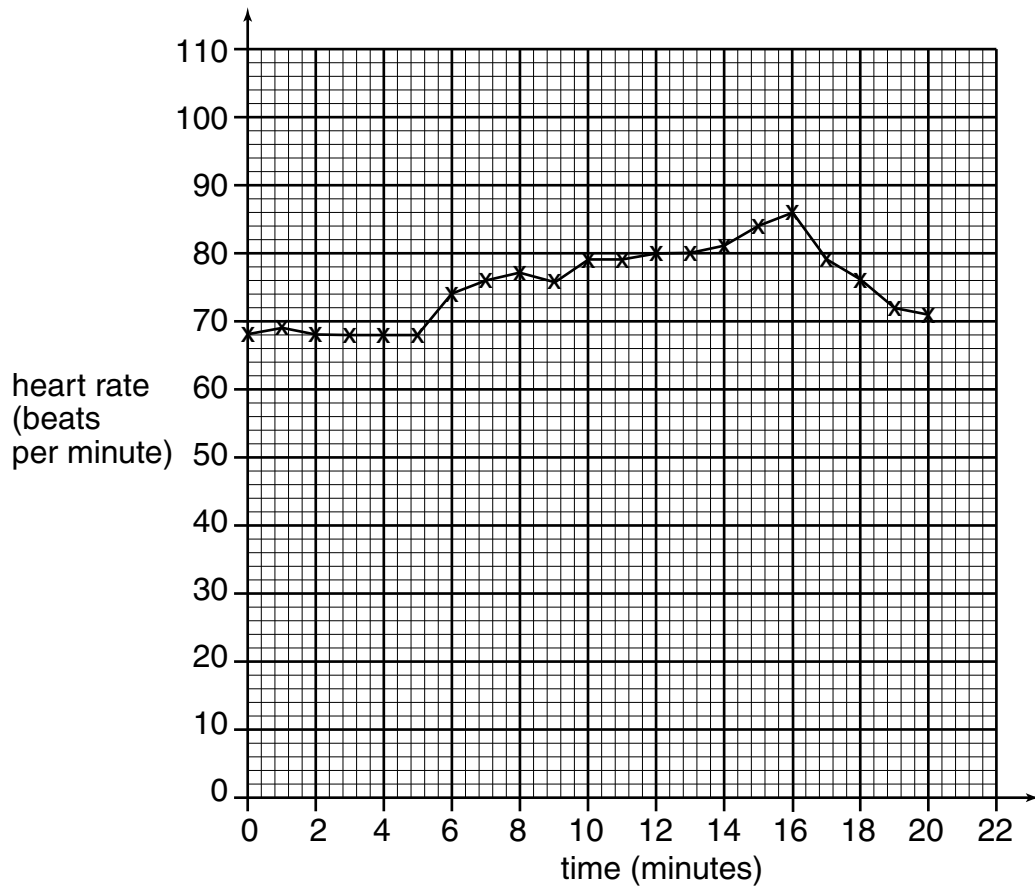
maximum 5 marks

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?

(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?



11a

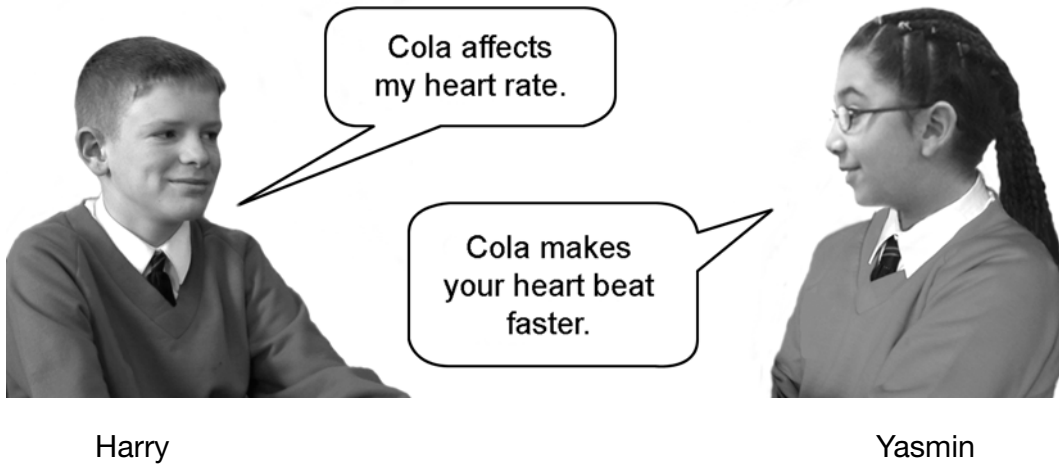
1 mark



11b

1 mark

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



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

(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?

11c
1 mark

11d
1 mark

maximum 4 marks

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

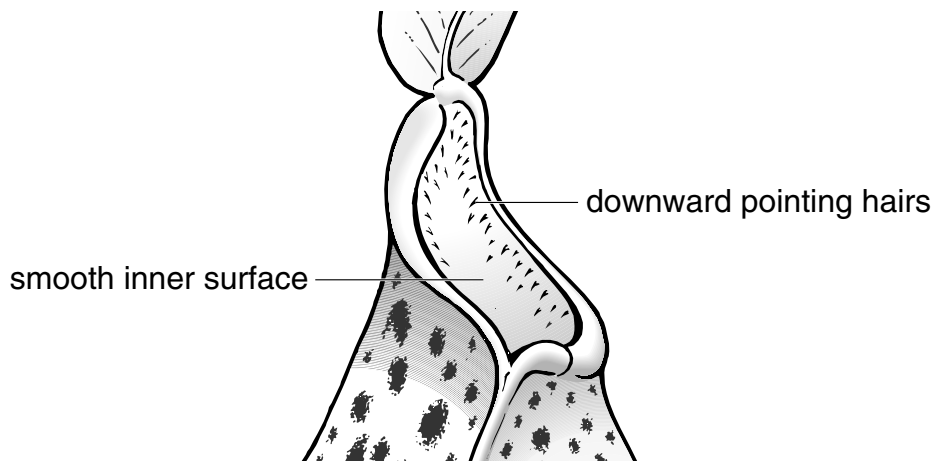
- (b) The photograph shows a pitcher plant.
Pitcher plants get nitrogen compounds from insects.
They digest insects in leaves shaped like containers called pitchers.



pitcher

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

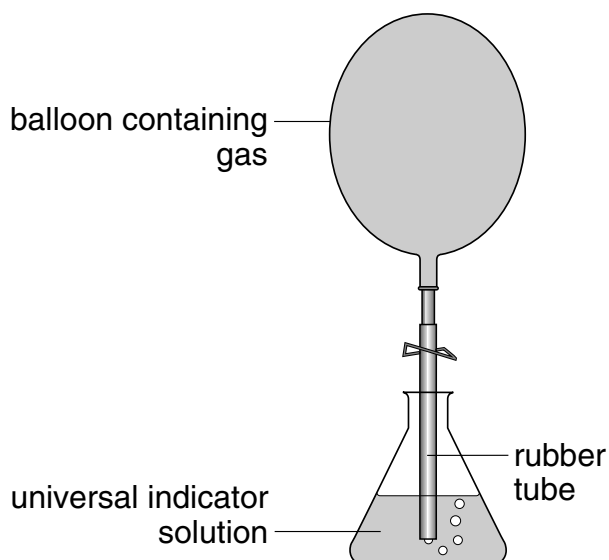
to provide minerals

12di
1 mark

12dii
1 mark

maximum 6 marks

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

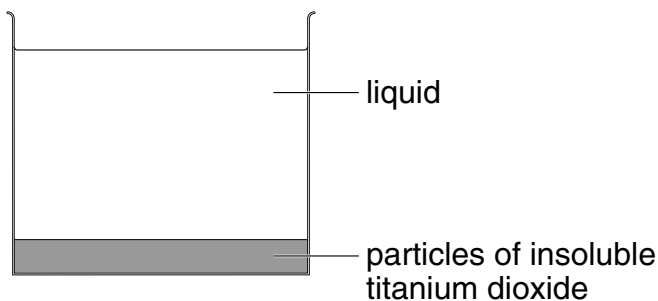
1 mark

13b

1 mark

maximum 5 marks

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.

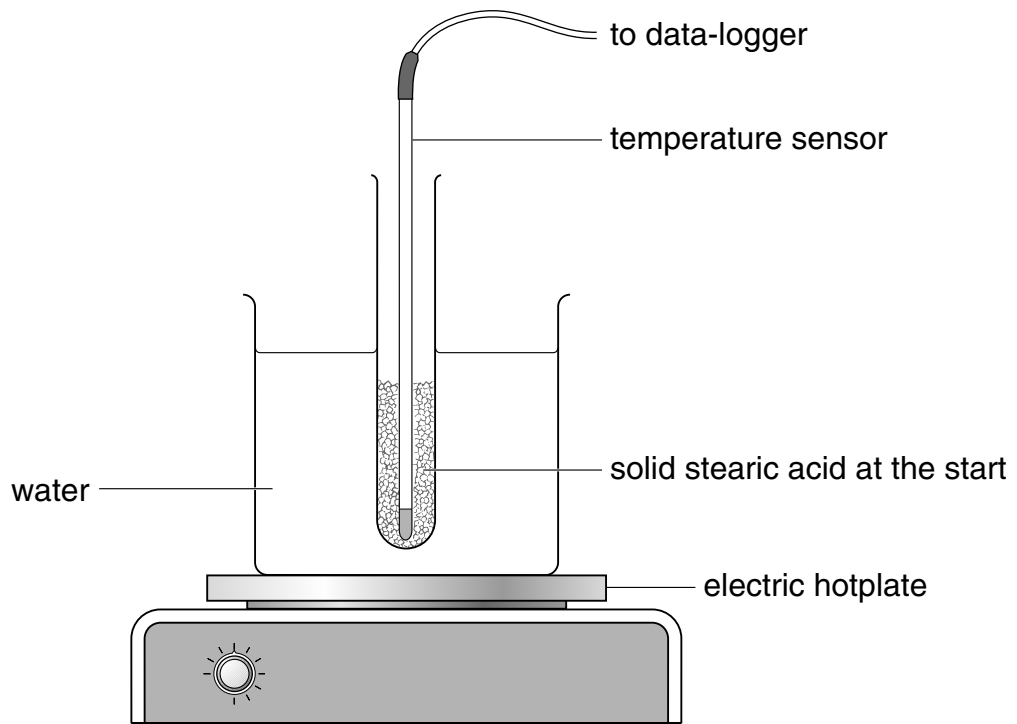
Why could she remove the paint with white spirit but **not** with water?

14b

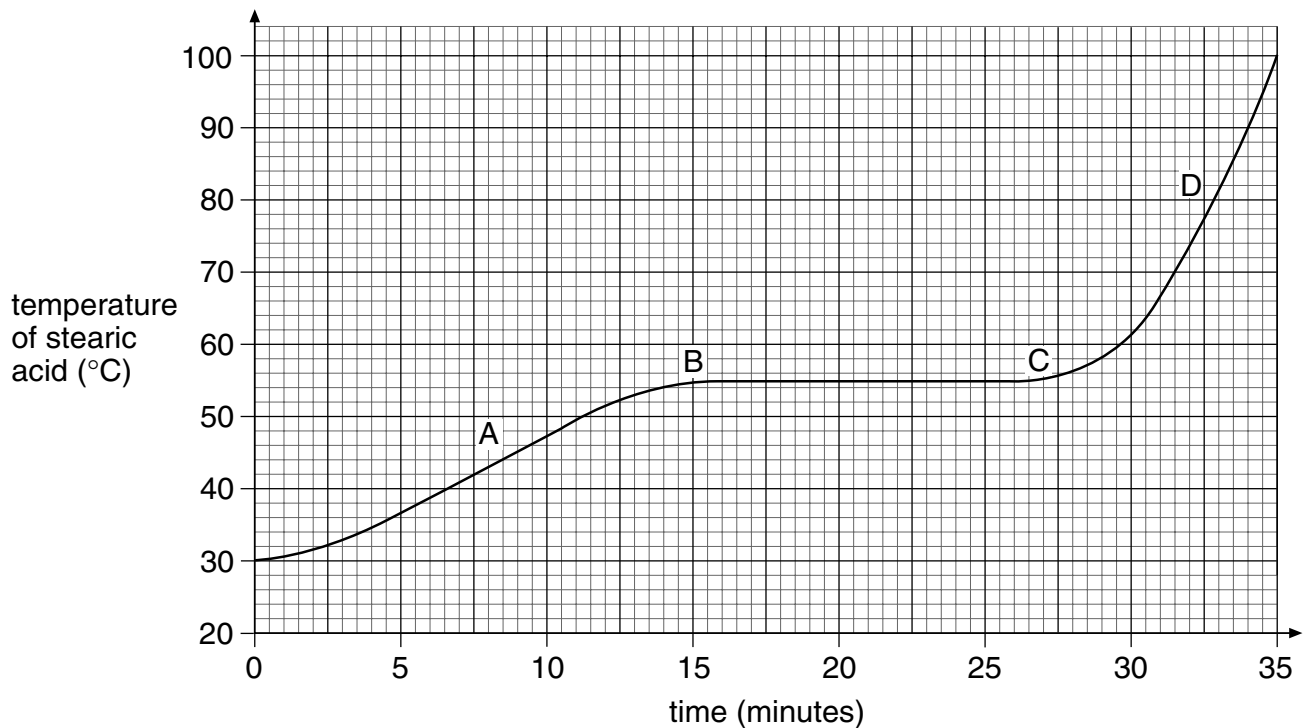
1 mark

maximum 4 marks

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

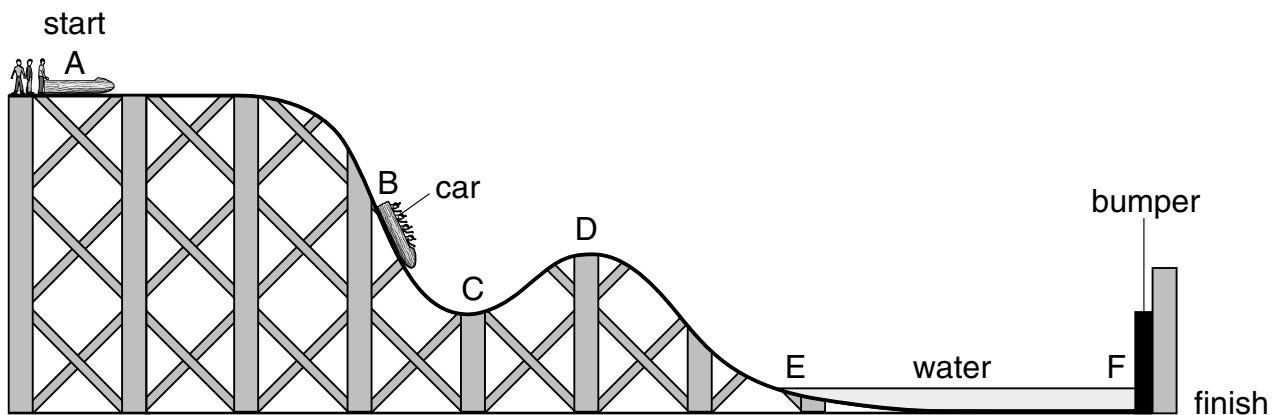
maximum 6 marks

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 _____

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



16ai

1 mark



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

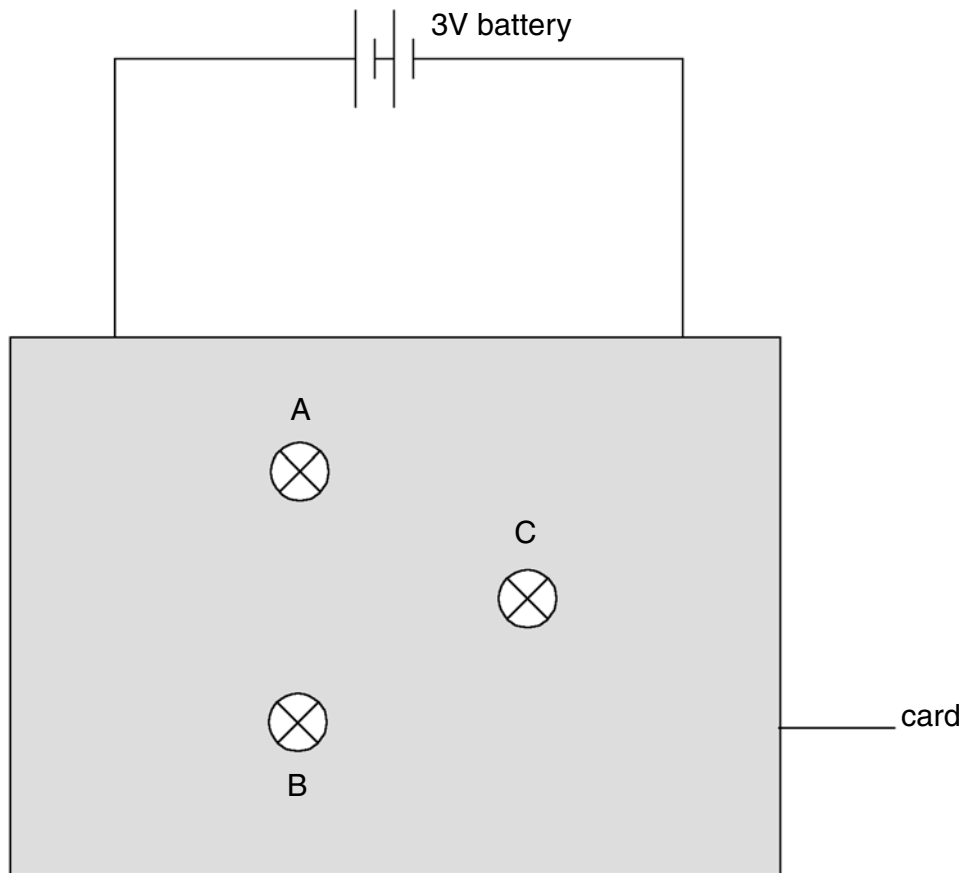
1 mark

16c

1 mark

maximum 8 marks

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.

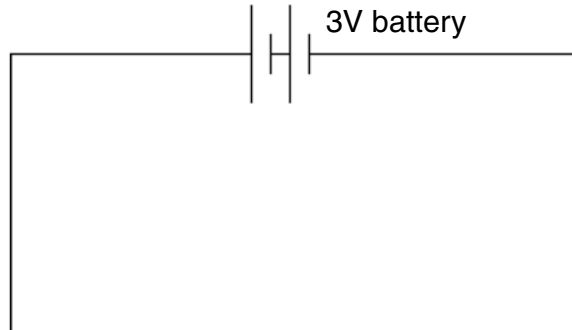


All the bulbs were on but their brightness was different.

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.

- (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.

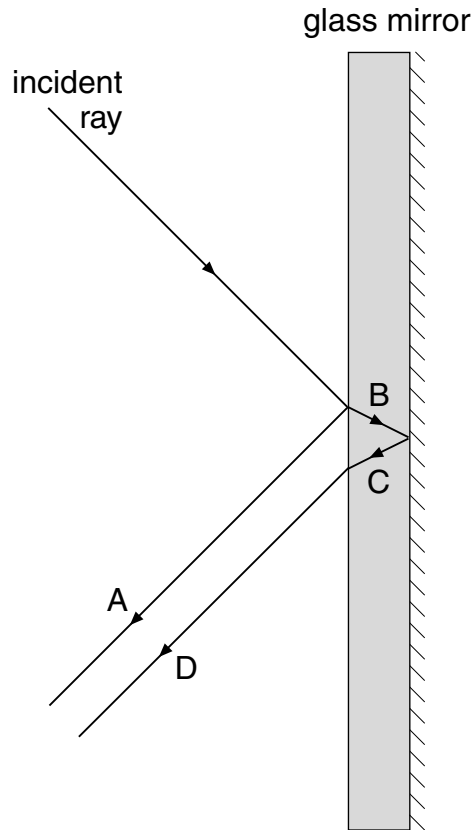
17b
1 mark

17c
1 mark

PLEASE TURN OVER FOR THE LAST QUESTION

maximum 4 marks

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

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

maximum 3 marks

18ai
1 mark

18aii
1 mark

18b
1 mark

Total

3