A

AQA

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

GCSE

COMBINED SCIENCE: TRILOGY

Higher Tier
Biology Paper 1H

H

8464/B/1H

Tuesday 14 May 2019 Afternoon

Time allowed: 1 hour 15 minutes

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]

JUN198464B1H01

For this paper you must have:
- **a ruler**
- **a scientific calculator.**

INSTRUCTIONS

- **Use black ink or black ball-point pen.**
- **Answer ALL questions in the spaces provided.**
- **Do all rough work in this book. Cross through any work you do not want to be marked.**
- **In all calculations, show clearly how you work out your answer.**

INFORMATION

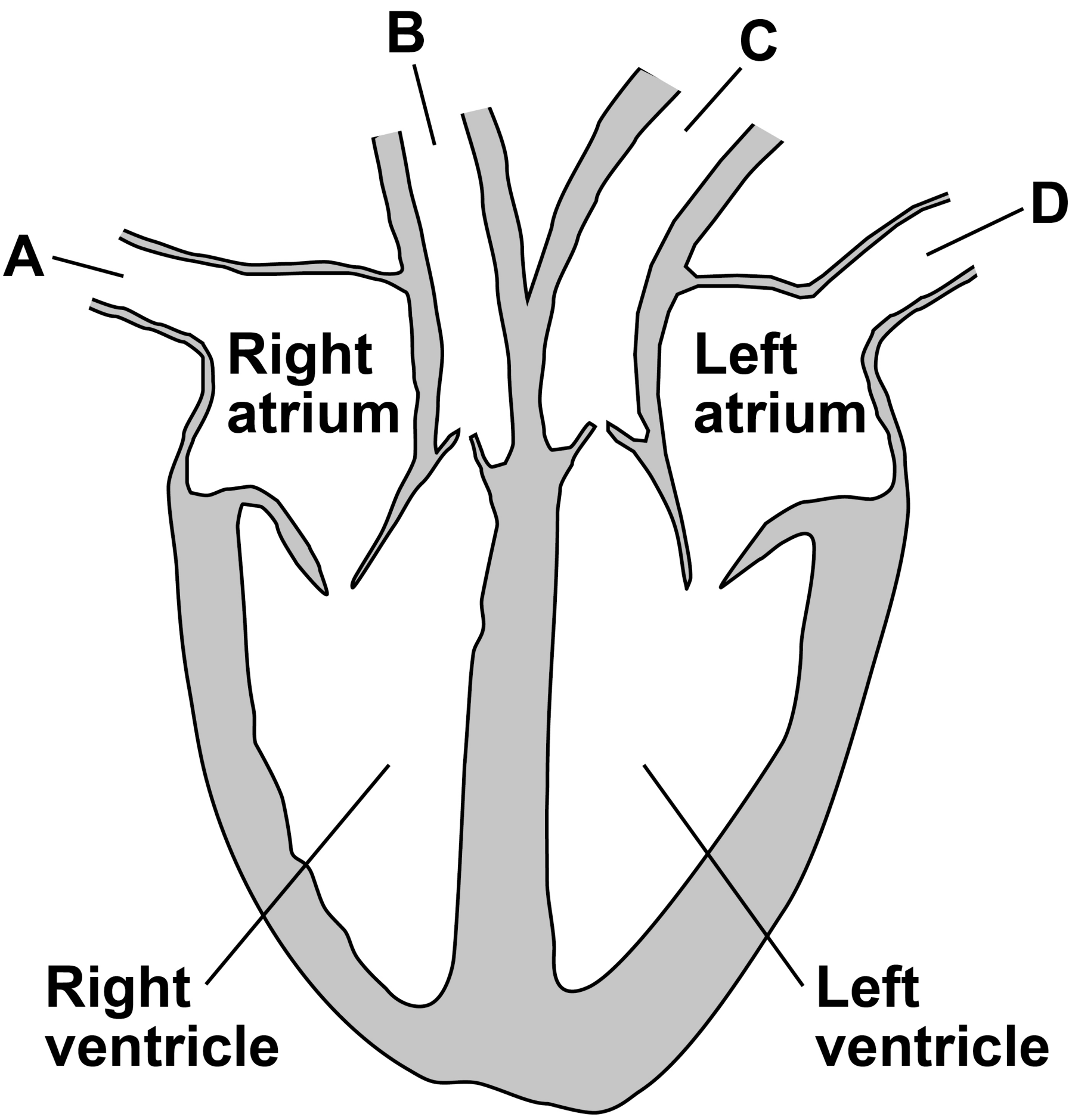
- **The maximum mark for this paper is 70.**
- **The marks for questions are shown in brackets.**
- **You are expected to use a calculator where appropriate.**
- **You are reminded of the need for good English and clear presentation in your answers.**

DO NOT TURN OVER UNTIL TOLD TO DO SO

0 1

FIGURE 1 shows a human heart.

FIGURE 1



0 1 . 1

Which blood vessel carries deoxygenated blood away from the heart to the lungs? [1 mark]

Tick (✓) ONE box.

- ☐ **A**
- ☐ **B**
- ☐ **C**
- ☐ **D**

0 1 . 2

The natural resting heart rate is controlled by a group of cells that act as a pacemaker.

Where in the heart are 'pacemaker cells' found? [1 mark]

Tick (✓) ONE box.

- ☐ **Left atrium**
- ☐ **Left ventricle**
- ☐ **Right atrium**
- ☐ **Right ventricle**

Some people may be treated with a drug to slow their heart rate.

0 1 . 3

Digitalis is a drug that slows the heart rate.

Where does the drug digitalis originate from? [1 mark]

Tick (✓) ONE box.

- ☐ **Bacteria**
- ☐ **Foxgloves**
- ☐ **Mould**
- ☐ **Willow**

[Turn over]

Beta blockers are another type of drug that slows the heart rate.

TABLE 1, on the opposite page, shows information for people who do not take beta blockers and for people who do take beta blockers.

- Stroke volume is the volume of blood pumped out of the heart each time it beats.
- Cardiac output is the total volume of blood pumped out of the heart each minute.

TABLE 1

	No beta blockers taken		Taking beta blockers	
	At rest	During exercise	At rest	During exercise
Heart rate in beats per minute	68	150	52	88
Stroke volume in cm^3	80	120	X	98
Cardiac output in cm^3 per minute	5440	18 000	2800	8624

BLANK PAGE

0 1 . 4

Calculate stroke volume X in TABLE 1, on page 9.

Use the equation:

cardiac output = stroke volume × heart rate

Give your answer to 2 significant figures. [3 marks]

Stroke volume X = _____ cm^3

[Turn over]

Repeat of TABLE 1

	No beta blockers taken		Taking beta blockers	
	At rest	During exercise	At rest	During exercise
Heart rate in beats per minute	68	150	52	88
Stroke volume in cm^3	80	120	X	98
Cardiac output in cm^3 per minute	5440	18 000	2800	8624

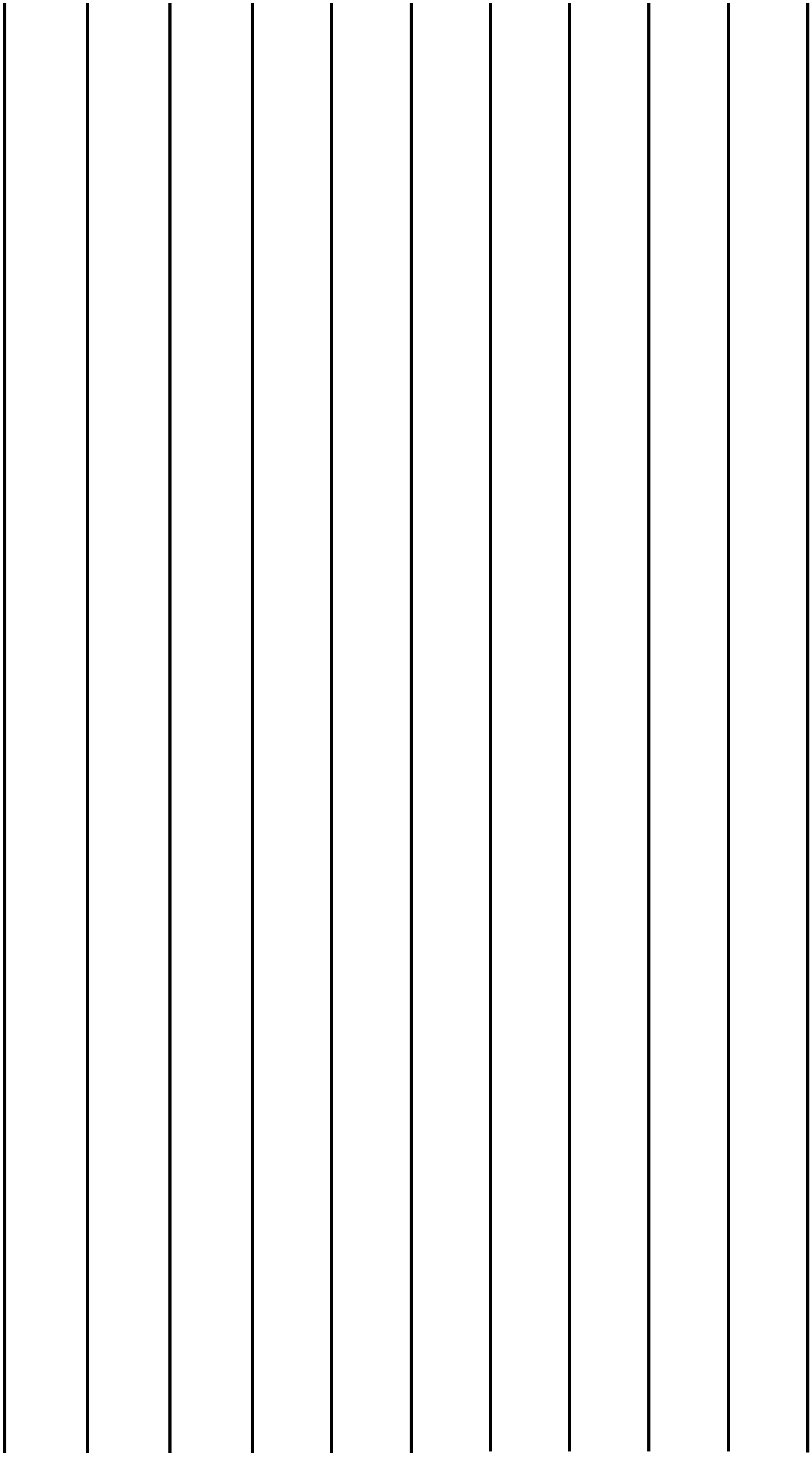
0 1 . 5

Some people who take beta blockers get out of breath when they exercise.

Explain why beta blockers can have this effect during exercise.

You should refer to information given in TABLE 1, on the opposite page. [6 marks]

[Turn over]



BLANK PAGE

0 2

This question is about digestion.

0 2 . 1

Name the enzyme that digests starch in the human digestive system. [1 mark]

_____

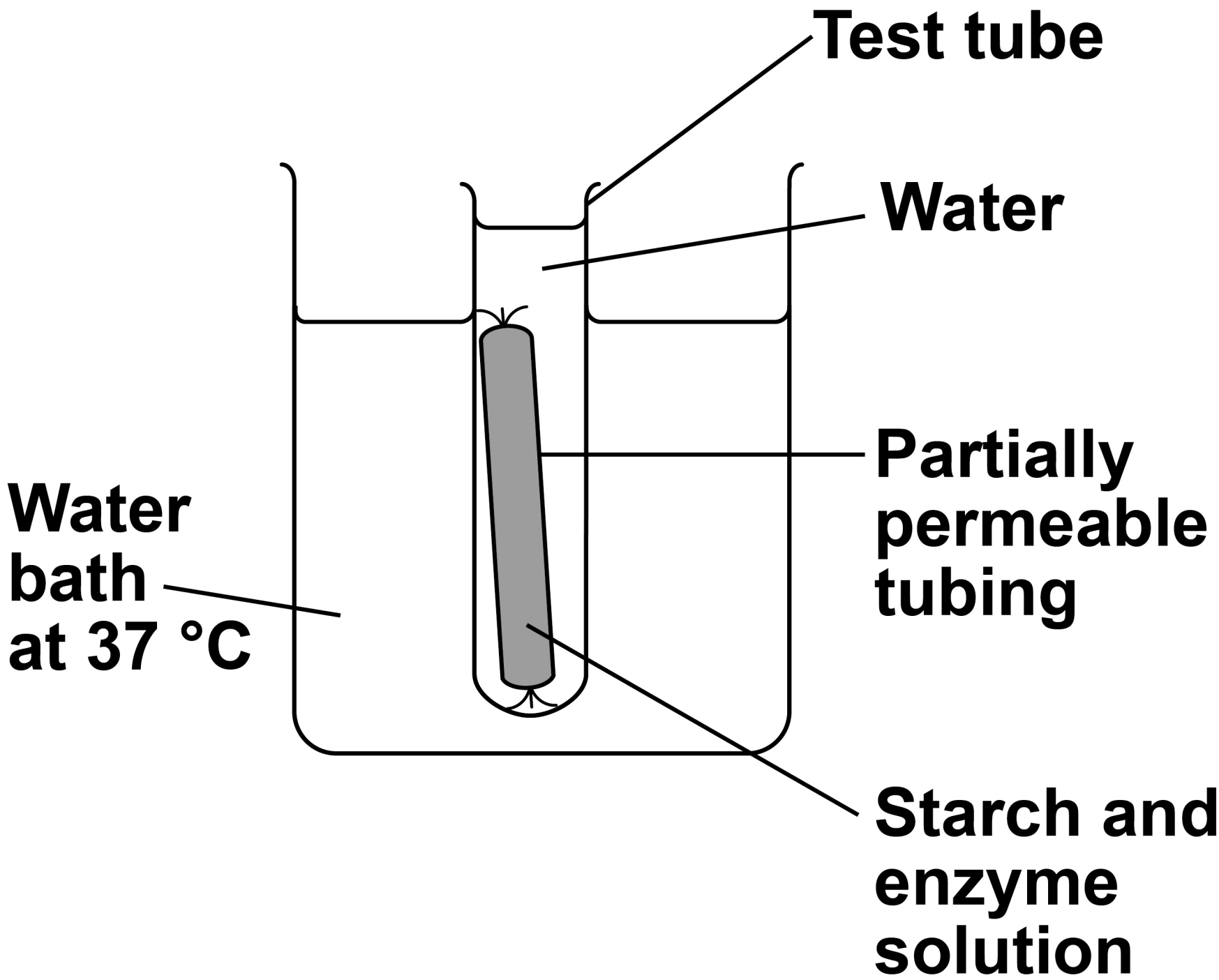
_____

[Turn over]

A student set up a model to represent the digestion and absorption of food molecules in the digestive system.

FIGURE 2 shows the student's model.

FIGURE 2



This is the method used.

1. **Fill a test tube with water at 37 °C**
2. **Test the water for starch and for sugar.**
3. **Mix together starch and enzyme solution and immediately test it for starch and for sugar.**
4. **Fill some partially permeable tubing with the starch and enzyme mixture.**
5. **Seal the tubing and place it in the test tube of water.**
6. **Place the test tube in a water bath at 37 °C**
7. **After 30 minutes, test the mixture inside the partially permeable tubing and test the water in the test tube for starch and for sugar.**

[Turn over]

BLANK PAGE

0 2 . 2

Suggest which parts of the body the partially permeable tubing and the water in the test tube represent. [2 marks]

Partially permeable tubing

Water in the test tube

[Turn over]

TABLE 2 shows the results.

TABLE 2

Test	Description of liquid	Result of starch test	Result of sugar test
1	Mixture inside tubing at start	✓	×
2	Water in the test tube at start	×	×
3	Mixture inside tubing after 30 minutes	✓	✓
4	Water in the test tube after 30 minutes	×	✓

KEY

✓ = Present

× = Not present

0 2 . 3

Name the reagents used to test for starch and for sugar. [2 marks]

Starch _____

Sugar _____

_____

0 2 . 4

Why was there no sugar present in test 1? [1 mark]

_____

_____

_____

REPEAT OF TABLE 2

Test	Description of liquid	Result of starch test	Result of sugar test
1	Mixture inside tubing at start	✓	x
2	Water in the test tube at start	x	x
3	Mixture inside tubing after 30 minutes	✓	✓
4	Water in the test tube after 30 minutes	x	✓

KEY

✓ = Present

x = Not present

0 2 . 5

Explain the results for test 3. [2 marks]

BLANK PAGE

0 2 . 6

Explain the results for test 4. [2 marks]

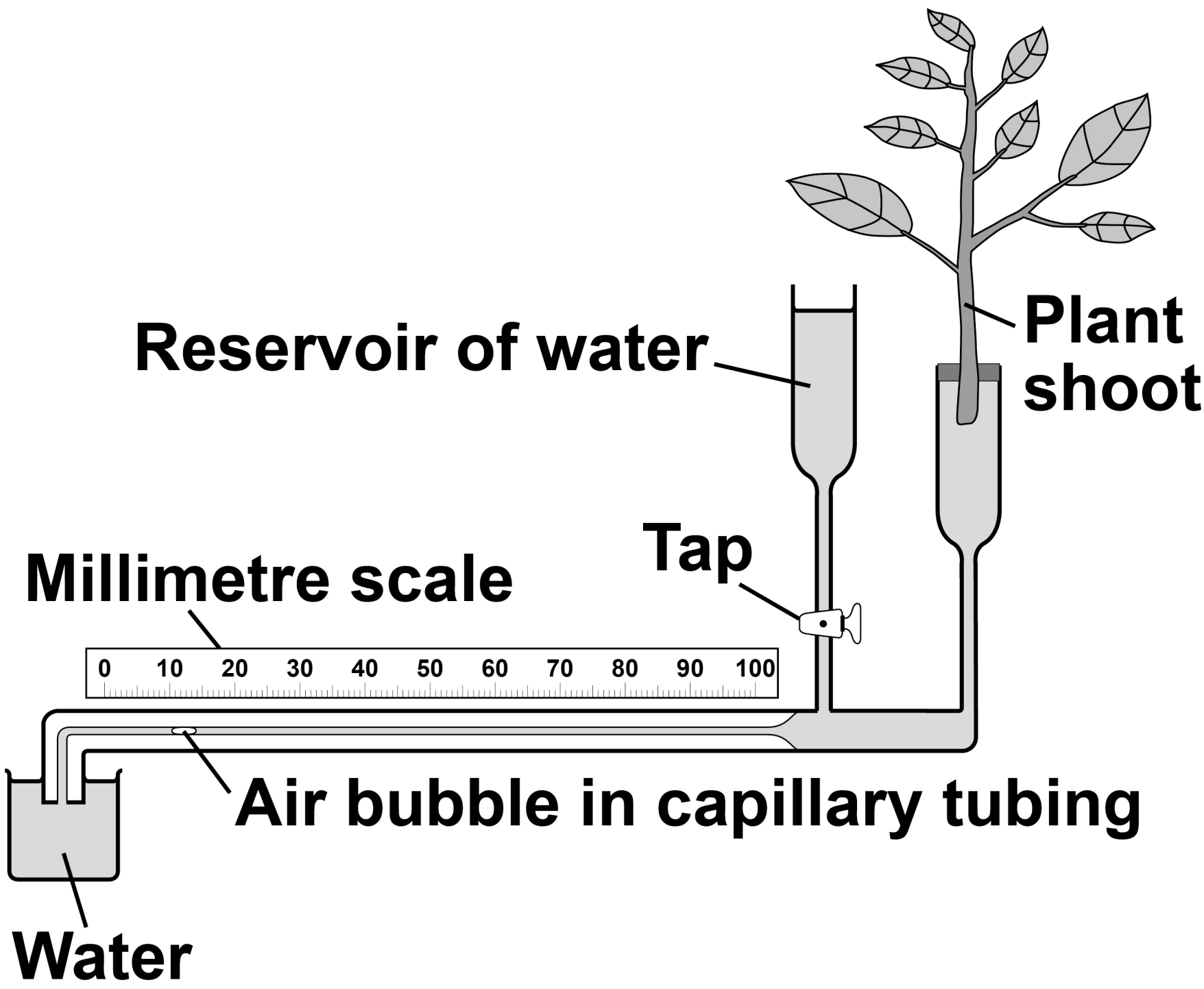
10

0 3

A student used a potometer to investigate the rate of water uptake in a plant shoot.

FIGURE 3 shows a potometer.

FIGURE 3



As the shoot takes in water the air bubble moves.

The rate of water uptake is the distance the air bubble moves in a given time.

This is the method used.

1. **Place the potometer in moist air at 25 °C**
2. **Position the air bubble at 0 mm in the capillary tube.**
3. **Record the position of the air bubble in the capillary tube every minute for 5 minutes.**
4. **Repeat steps 2 and 3 with the potometer in different conditions.**

[Turn over]

TABLE 3 shows the conditions used.

TABLE 3

Investigation	Conditions
A	Moist air at 25 °C
B	Dry air at 15 °C
C	Dry air at 25 °C

0 3 . 1

After investigation A the air bubble had moved part way along the capillary tube.

Suggest how the student moved the air bubble back to 0 mm for the start of investigation B. [1 mark]

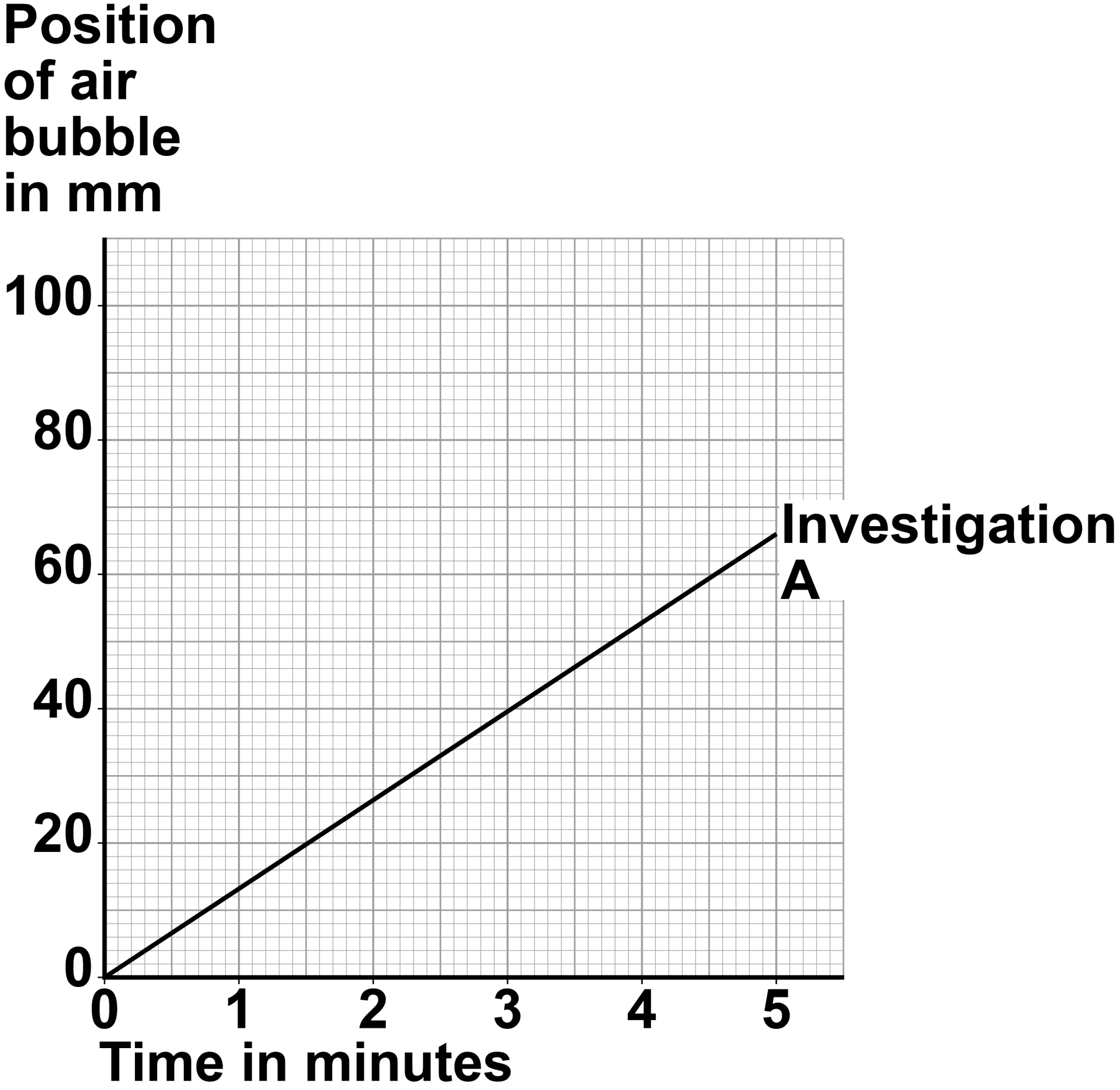
0 3 . 2

Capillary tubing is very narrow.

Explain why narrow tubing was used.
[2 marks]

FIGURE 4 shows the results for investigation A.

FIGURE 4



0 3 . 3

The cross-sectional area of the capillary tube was 0.8 mm^2

Calculate the rate of water uptake for investigation A in mm^3/min [3 marks]

Rate = _____ mm^3/min

[Turn over]

0 3 . 4

TABLE 4 shows the results from investigation B.

TABLE 4

Time in minutes	Position of air bubble in mm
0	0
1	6
2	16
3	22
4	30
5	42

Plot the data from TABLE 4 on FIGURE 4, on page 32.

You should:

- **draw a line of best fit**
- **label the line B.**

[3 marks]

0 3 . 5

Investigation C was carried out in dry air at 25 °C

Draw a line on FIGURE 4, on page 32, to show the results you would expect for investigation C.

Label the line C. [1 mark]

0 3 . 6

The investigations were carried out in daylight.

The air bubble would NOT move if the investigations were done in the dark.

Explain why. [3 marks]

13

0 4

Pathogens are microorganisms that cause infectious diseases.

0 4 . 1

What type of pathogen causes malaria?

[1 mark]

Tick (✓) ONE box.

☐ **Bacterium**

☐ **Fungus**

☐ **Protist**

☐ **Virus**

[Turn over]

0 4 . 2

Give TWO methods used to prevent people catching malaria.

Give a reason why each method works.
[4 marks]

Method 1

Reason

Method 2

Reason

0 4 . 3

Describe TWO differences between a bacterial cell and a eukaryotic cell.
[2 marks]

1

2

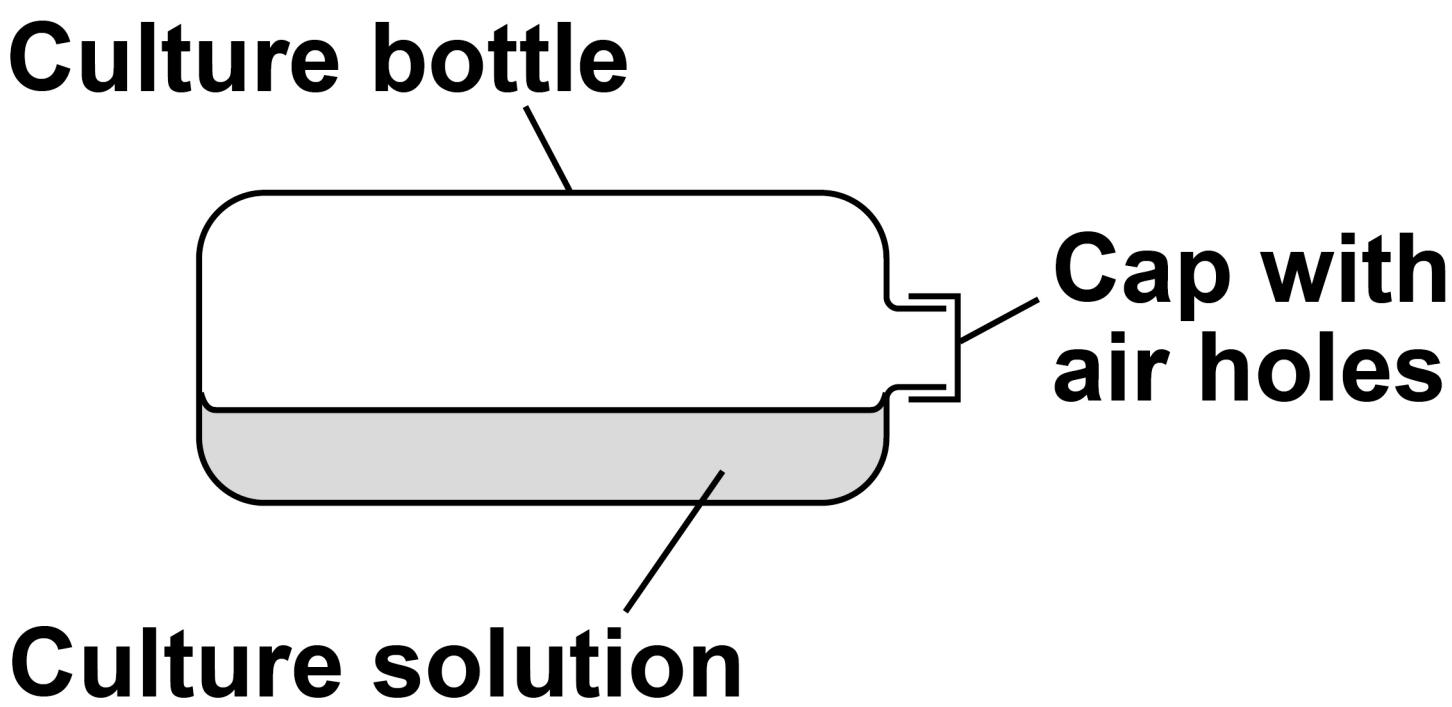
A scientist investigated the population growth of bacteria in a culture solution.

At the start of the investigation the culture solution contained all the nutrients the bacteria needed.

The scientist determined the number of living bacterial cells in the solution every hour over two days.

FIGURE 5 shows the apparatus used.

FIGURE 5

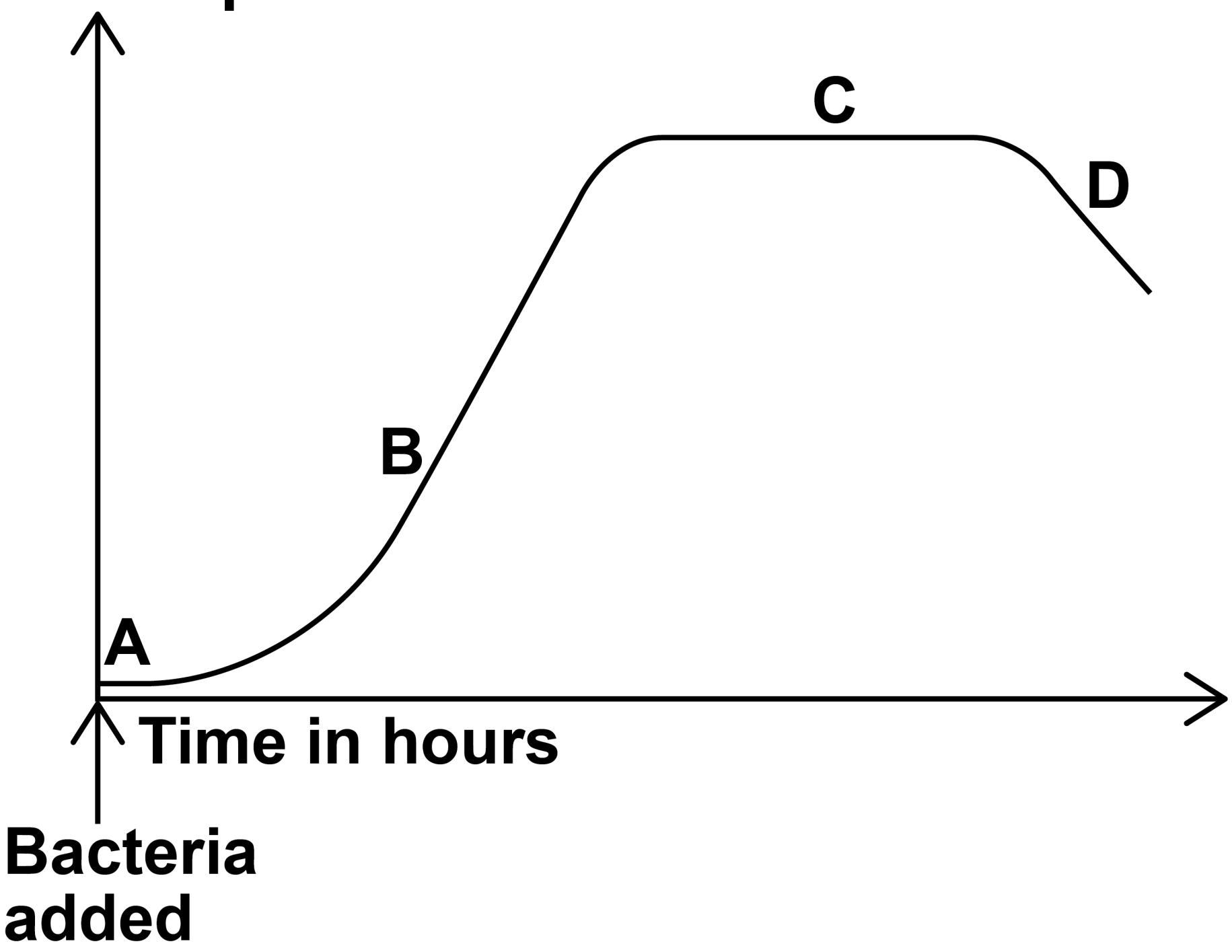


0 4 . 4

Describe why there are air holes in the cap of the culture bottle. [1 mark]

FIGURE 6 shows the scientist's results.

FIGURE 6



0 4 . 5

Give ONE reason for what is happening to the number of bacteria at each of the stages. [4 marks]

Stage A

Stage B

Stage C

Stage D

[Turn over]

0 4 . 6

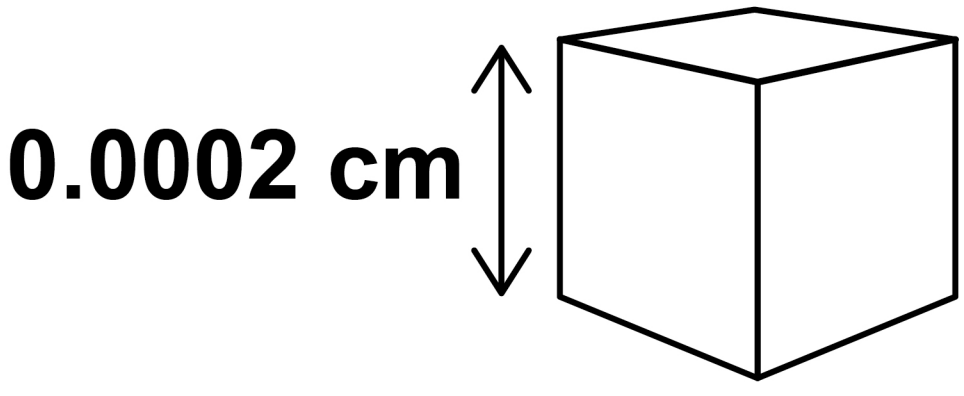
FIGURE 7 shows two cubes.

Cube X represents a bacterial cell.

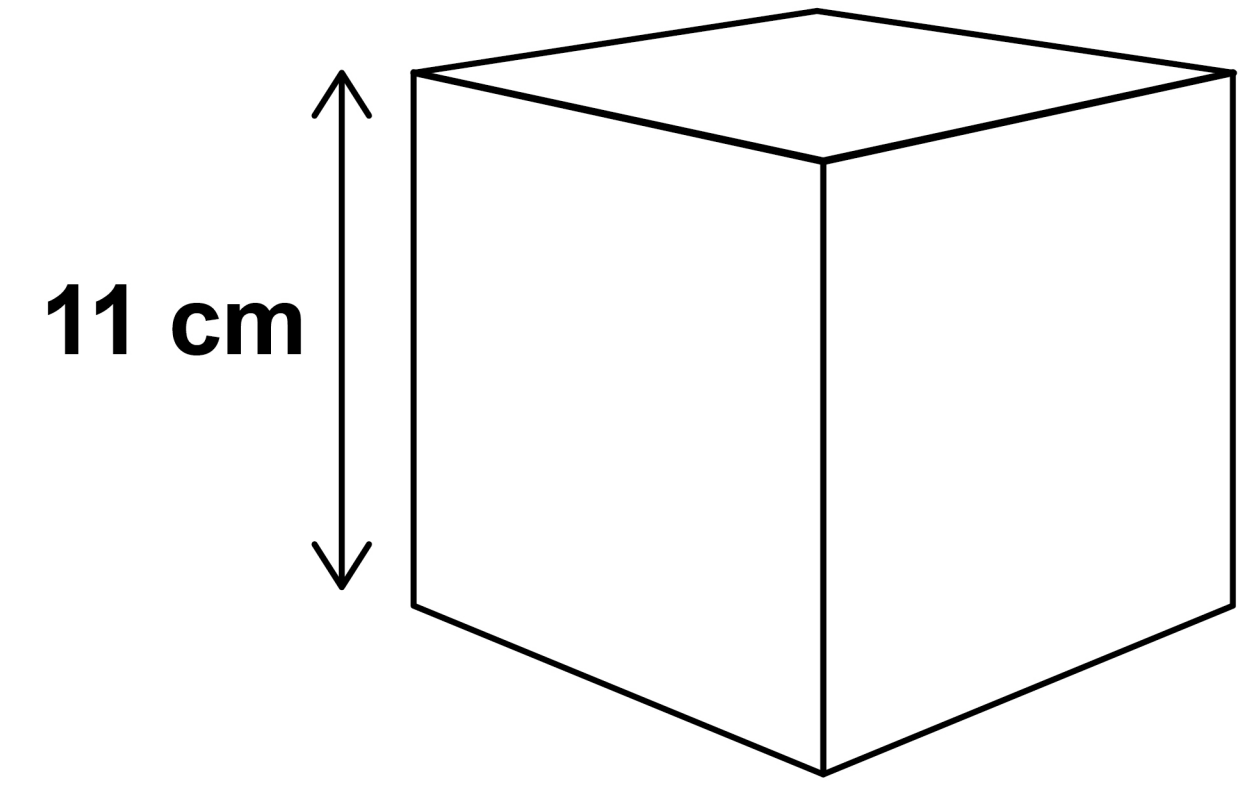
Cube Y represents a small multicellular organism.

FIGURE 7

CUBE X



CUBE Y



A bacterial cell can absorb all the nutrients it needs by diffusion through its outer surface.

Explain why a multicellular organism CANNOT absorb all the nutrients it needs by diffusion through its outer surface.

You MUST include calculations in your answer.

Use FIGURE 7. [5 marks]

46

17

BLANK PAGE

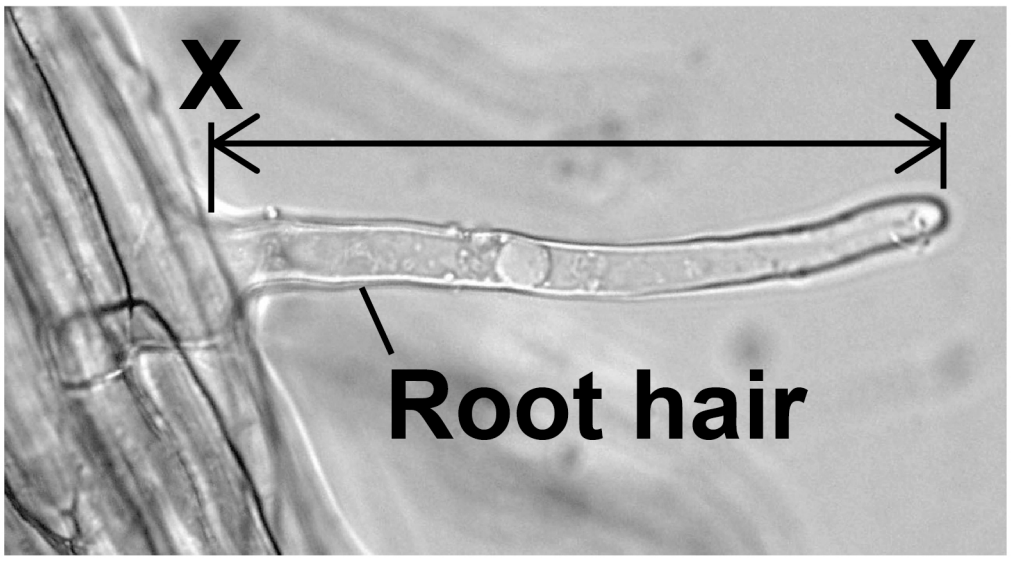
[Turn over]

0 5

FIGURE 8 shows a root hair viewed using a microscope.

FIGURE 8

It is not drawn accurately.



0 5 . 1

The root hair was viewed at a magnification of ×50

The image length of the root hair X–Y is 43 mm

Calculate the real length of the root hair in micrometres (μm). [4 marks]

Real length = _____ μm

[Turn over]

0 5 . 2

A microscope has a ×5 eyepiece lens.

Describe how to use this microscope to observe a prepared slide of root hair cells at a magnification of ×50 [4 marks]

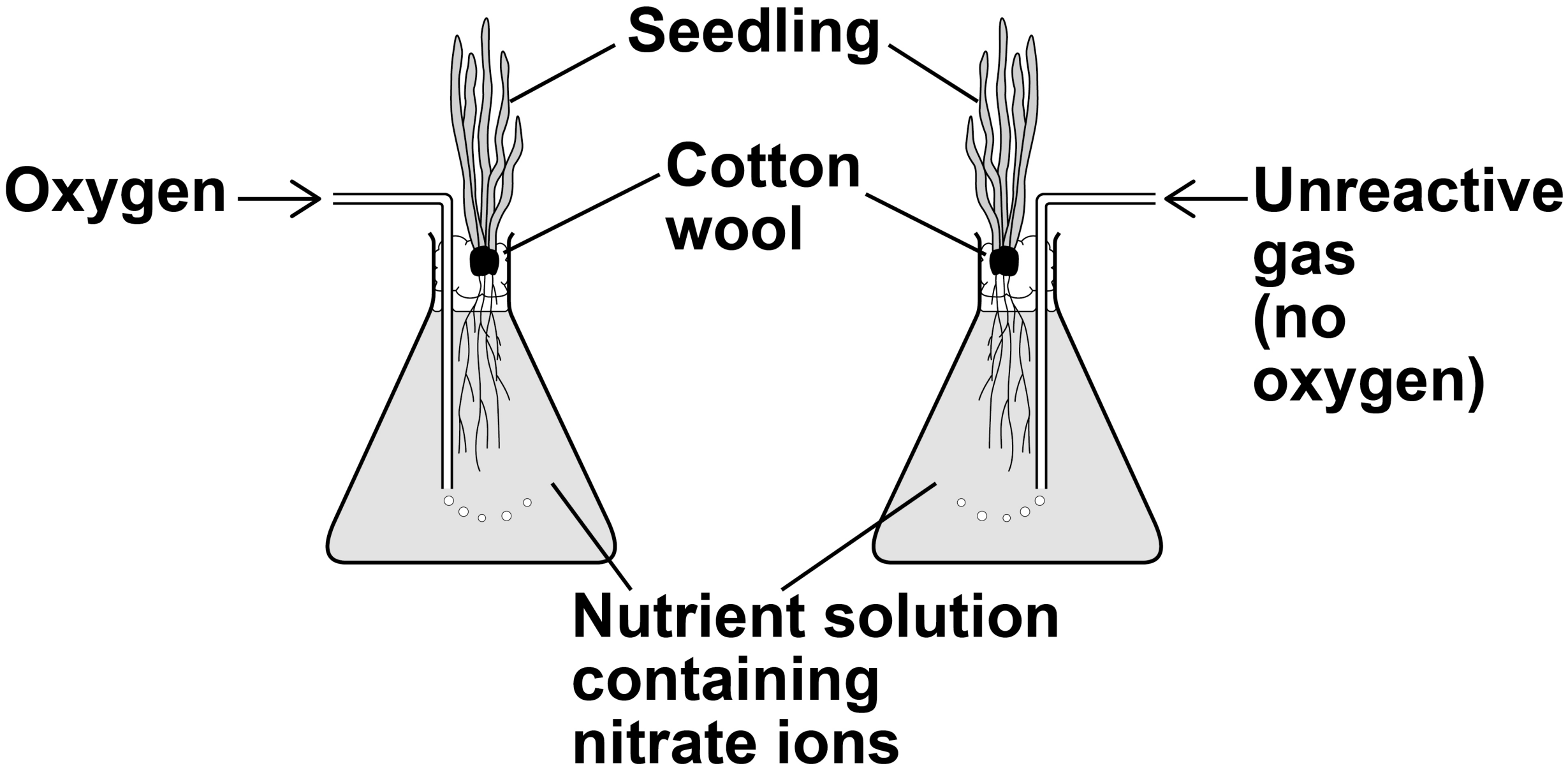
[Turn over]

Root hair cells absorb water and mineral ions from the soil.

A scientist investigated the rate of nitrate ion uptake by two seedlings.

FIGURE 9 shows how the investigation was set up.

FIGURE 9



The scientist determined the mass of nitrate ions absorbed by each seedling every 30 minutes for 4 hours.

TABLE 5, on page 54, shows the results.

[Turn over]

TABLE 5

Time in hours	Total mass of nitrate ions absorbed by seedling in arbitrary units	
	With oxygen added	With no oxygen added
0	0	0
0.5	100	60
1.0	145	95
1.5	170	105
2.0	195	115
2.5	215	120
3.0	235	125
3.5	250	130
4.0	265	130

0 5 . 3

Describe the changes in the rate of absorption of nitrate ions for the seedling with NO oxygen added.

Use information from TABLE 5. [3 marks]

[Turn over]

0 5 . 4

Explain what the results in TABLE 5, on page 54, show about how nitrate ions are absorbed. [4 marks]

[Turn over]

0 5 . 5

Nitrate ions are essential for plants to grow.

Describe how nitrate ions are used in a plant to help the plant grow. [3 marks]

5

8

END OF QUESTIONS

18

BLANK PAGE

BLANK PAGE

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
TOTAL	