A

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

GCSE

COMBINED SCIENCE: TRILOGY

Higher Tier

Biology Paper 1H

H

8464/B/1H

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]

JUN218464B1H01

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

INSTRUCTIONS

- **Use black ink or black ball-point pen.**
- **Pencil should only be used for drawing.**
- **Answer ALL questions in the spaces provided.**
- **If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).**
- **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

Plants absorb light for photosynthesis.

0 1 . 1

Which is the equation for photosynthesis? [1 mark]

Tick (✓) ONE box.

☐ $C_6H_{12}O_6 + 6\,O_2 \longrightarrow 6\,CO_2 + 6\,H_2O$

☐ $6\,CO_2 + 6\,H_2O \longrightarrow C_6H_{12}O_6 + 6\,O_2$

☐ $6\,H_2O + 6\,O_2 \longrightarrow C_6H_{12}O_6 + 6\,CO_2$

☐ $6\,O_2 + 6\,CO_2 \longrightarrow C_6H_{12}O_6 + 6\,H_2O$

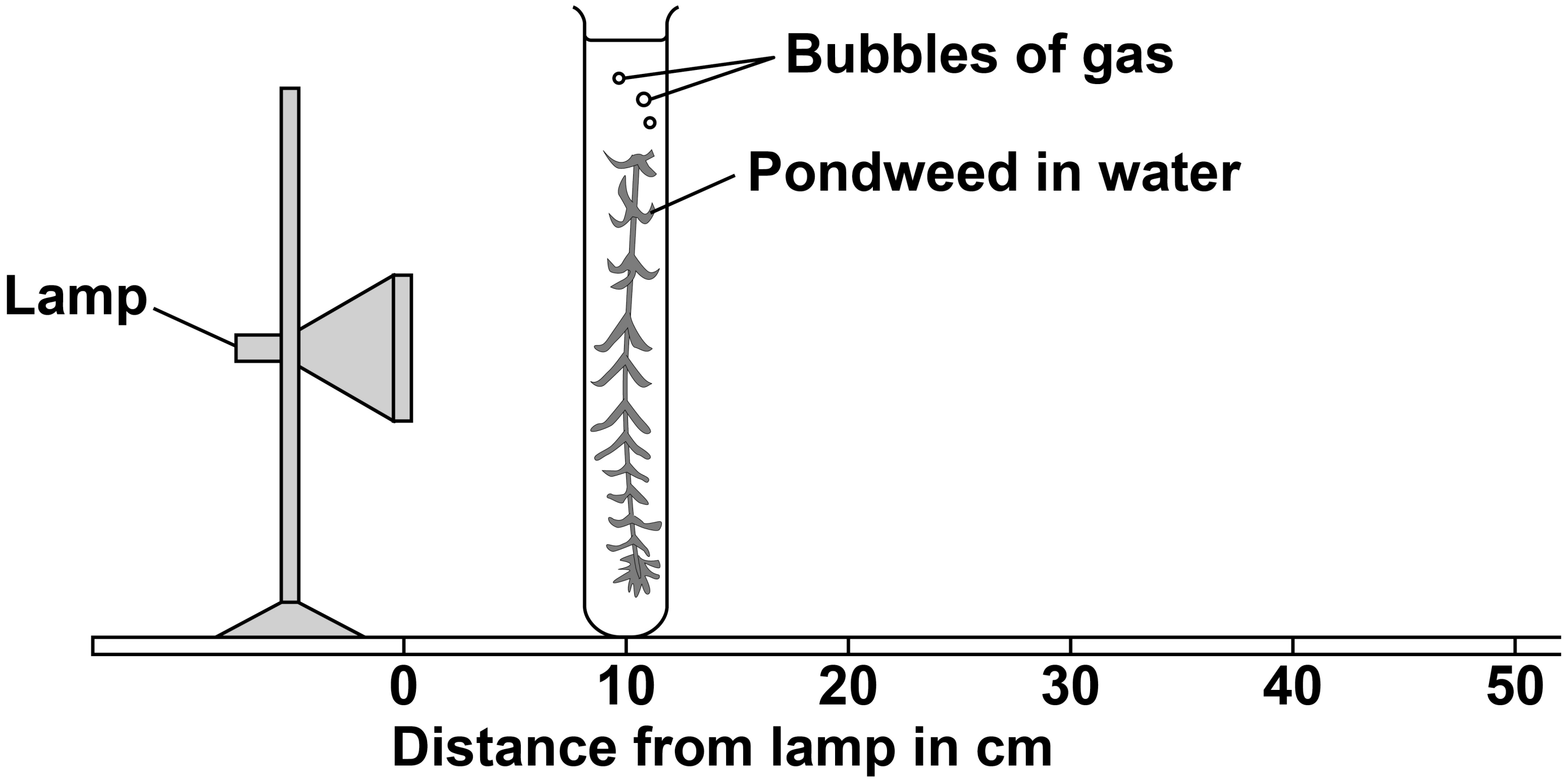
A student investigated the effect of light intensity on the rate of photosynthesis.

FIGURE 1, on the opposite page, shows the apparatus.

This is the method used.

1. **Set up the apparatus as shown in FIGURE 1.**
2. **Place the pondweed 10 cm away from the lamp.**
3. **Switch on the lamp.**
4. **Record the number of bubbles of gas produced in 5 minutes.**
5. **Repeat steps 2 to 4 with the pondweed at different distances from the lamp.**

FIGURE 1



[Turn over]

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0 1 . 2

What was the independent variable in this investigation?
[1 mark]

Tick (✓) ONE box.

☐ **Distance of the pondweed from the lamp**

☐ **Length of the piece of pondweed**

☐ **Number of bubbles of gas produced**

☐ **Time taken to collect the gas**

[Turn over]

The lamp gets warm when it is on. This causes the temperature of the water to increase.

0 1 . 3

Explain how an increase in temperature would affect the results of this investigation. [2 marks]

0 1 . 4

Suggest ONE way the investigation could be improved so the temperature of the water does NOT increase. [1 mark]

0 1 . 5

Suggest TWO improvements to the investigation so the results would be more valid.

Do NOT refer to controlling the temperature of the water. [2 marks]

1 _____

_____

_____

2 _____

_____

_____

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[Turn over]

TABLE 1 shows the results.

TABLE 1

Distance of pondweed from the lamp in cm	Number of bubbles of gas produced in 5 minutes
10	120
20	56
30	31
40	16
50	10

0 1 . 6

Calculate the rate of photosynthesis when the pondweed was 40 cm from the lamp.

Give the rate of photosynthesis as the number of bubbles of gas produced per minute. [1 mark]

_____

_____

_____

Rate = _____ bubbles of of gas produced per minute

REPEAT OF TABLE 1

Distance of pondweed from the lamp in cm	Number of bubbles of gas produced in 5 minutes
10	120
20	56
30	31
40	16
50	10

0 1 . 7

Give ONE conclusion that can be made from TABLE 1. [1 mark]

_____

_____

_____

[Turn over]

0 1 . 8

Plot the data from TABLE 1, on page 16, on FIGURE 2, on the opposite page.

Draw a line of best fit. [3 marks]

0 1 . 9

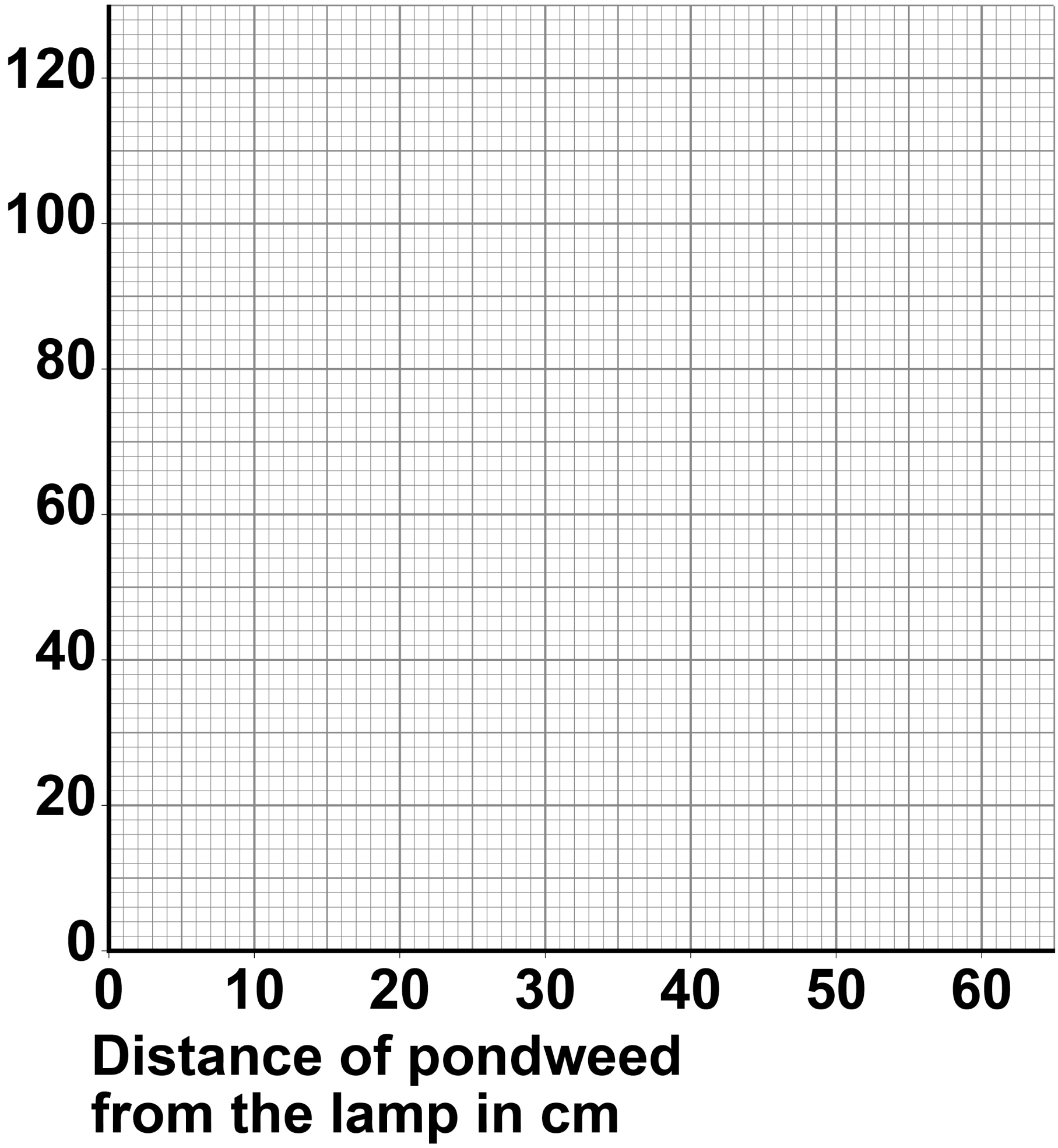
Predict the number of bubbles that would be produced in 5 minutes if the pondweed was 60 cm from the lamp.

Use FIGURE 2. [1 mark]

Number of bubbles produced in

5 minutes =

FIGURE 2


Number of bubbles of gas produced in 5 minutes
120
100
80
60
40
20
0
0
10
20
30
40
50
60
Distance of pondweed from the lamp in cm

0 2

Describe how to test a sample of food for protein, starch and sugar.

Give the colours that would be seen if the food sample contained protein, starch and sugar. [6 marks]

[Turn over]

0 3

Fermentation in yeast is used in the manufacture of bread and alcoholic drinks.

The equation for fermentation is:

glucose ⟶ ethanol + carbon dioxide

0 3 . 1

Fermentation is an exothermic reaction.

What does exothermic mean? [1 mark]

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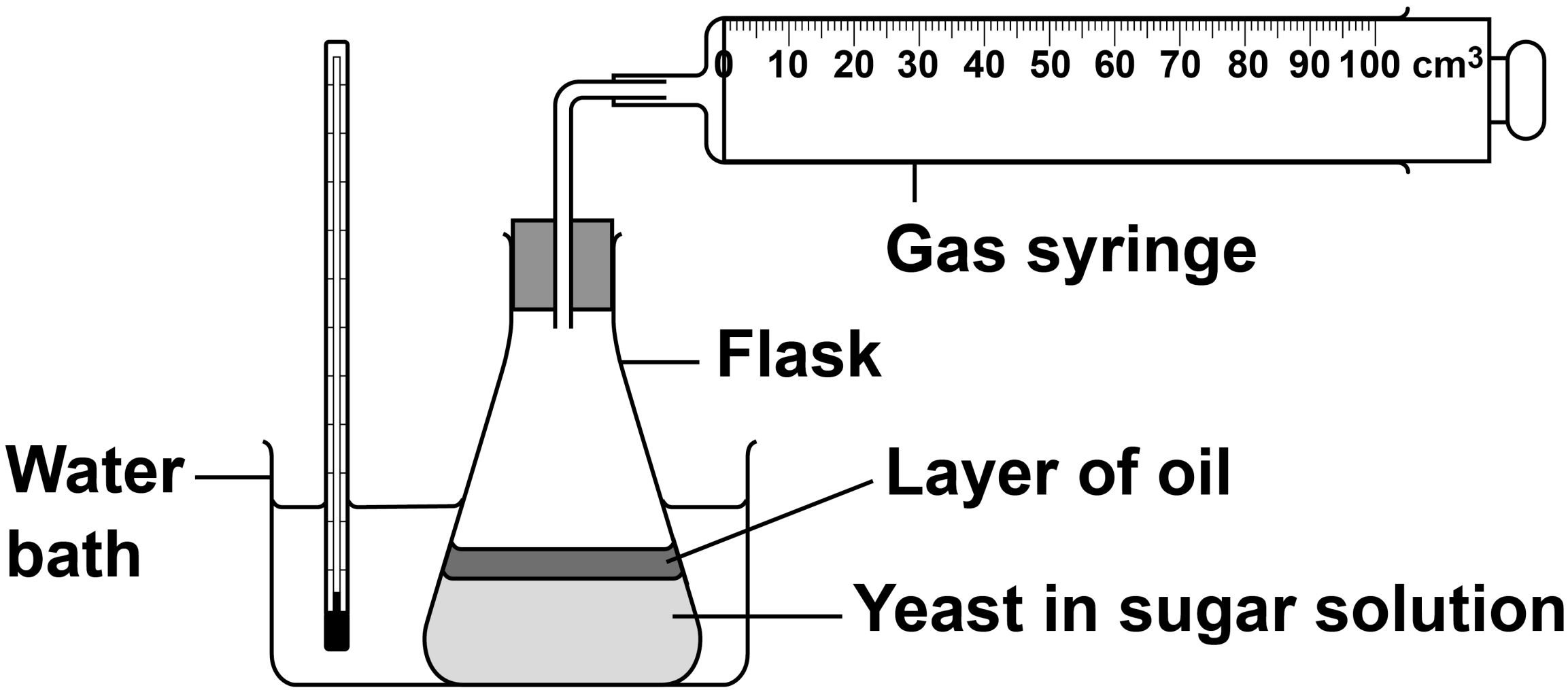
[Turn over]

A student investigated the effect of temperature on fermentation in yeast.

FIGURE 3 shows the apparatus.

FIGURE 3



This is the method used.

1. **Mix yeast with sugar solution in a flask.**
2. **Pour a layer of oil over the surface of the mixture.**
3. **Put the flask in a water bath at 2 °C and leave for 20 minutes.**
4. **Attach a gas syringe.**
5. **Record the volume of gas collected every 5 minutes for 30 minutes.**
6. **After 30 minutes move the flask to a water bath at 35 °C.**
7. **Continue to record the volume of gas collected every 5 minutes.**

[Turn over]

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0 3 . 2

Suggest why a layer of oil was needed on the surface of the mixture. [1 mark]

_____

_____

0 3 . 3

Suggest why the mixture was left for 20 minutes before the gas syringe was attached. [1 mark]

_____

_____

[Turn over]

Steps 1 to 4 of the method were repeated at 35 °C.

The volume of gas collected was recorded every 5 minutes for 45 minutes.

TABLE 2, on the opposite page, shows the results for both flasks for the first 30 minutes.

TABLE 3, on page 30, shows the results for the last 15 minutes, when both flasks were at 35 °C.

TABLE 2

Time in minutes	Volume of gas collected in cm^3	
	Flask at 2 °C	Flask at 35 °C
0	0	0
5	0	26
10	0	52
15	0	78
20	0	98
25	0	108
30	0	115

[Turn over]

TABLE 3

Time in minutes	Volume of gas collected in cm^3	
	Flask at 2 °C moved to 35 °C	Flask kept at 35 °C
35	2	120
40	7	123
45	22	124

0 3 . 4

Explain the results from 0 minutes to 45 minutes for the flask that was at 2 °C and was then moved to 35 °C.

Use TABLE 2, on page 29, and TABLE 3.

[3 marks]

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0 3 . 5

Explain the results from 0 minutes to 45 minutes for the flask kept at 35 °C.

Use TABLE 2, on page 29, and TABLE 3, on page 30. [4 marks]

0	4

Pathogens are microorganisms that cause diseases.

Gonorrhoea, malaria and measles are three diseases in humans.

0 4 . 1

Draw ONE line from each disease to the pathogen that causes the disease.
[3 marks]

DISEASE	PATHOGEN
Gonorrhoea	Bacterium
Malaria	Fungus
Measles	Protist
	Virus

[Turn over]

0 4 . 2

Malaria is transmitted by mosquitos.

Male mosquitos can be sterilised so they are infertile.

The spread of malaria is reduced by releasing sterile mosquitos into the environment.

Explain how releasing sterile mosquitos reduces the spread of malaria. [2 marks]

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[Turn over]

Pathogens also cause diseases in plants.

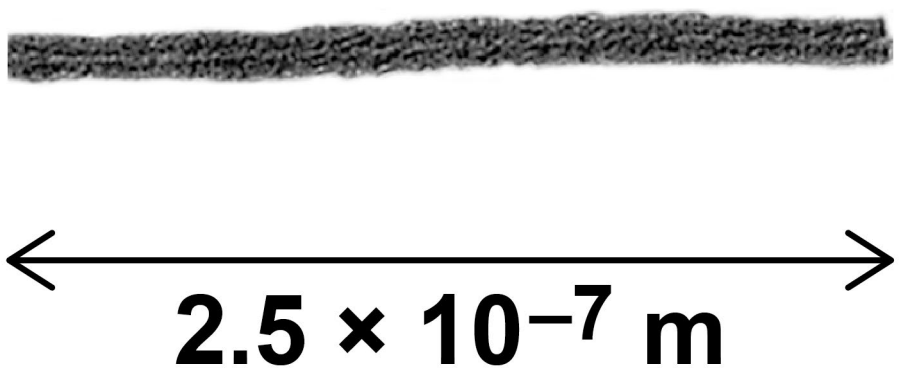
FIGURE 4 shows a rose black spot fungal spore and a tobacco mosaic virus.

FIGURE 4

The images are NOT to the same scale.

Rose black spot fungal spore

Tobacco mosaic virus



0 4 . 3

Name the piece of equipment used to view the virus. [1 mark]

---

0 4 . 4

How many times longer is the fungal spore than the virus?

Use FIGURE 4. [3 marks]

Number of times longer = _____

0 4 . 5

Explain why plants infected with tobacco mosaic virus grow slowly.
[3 marks]

12

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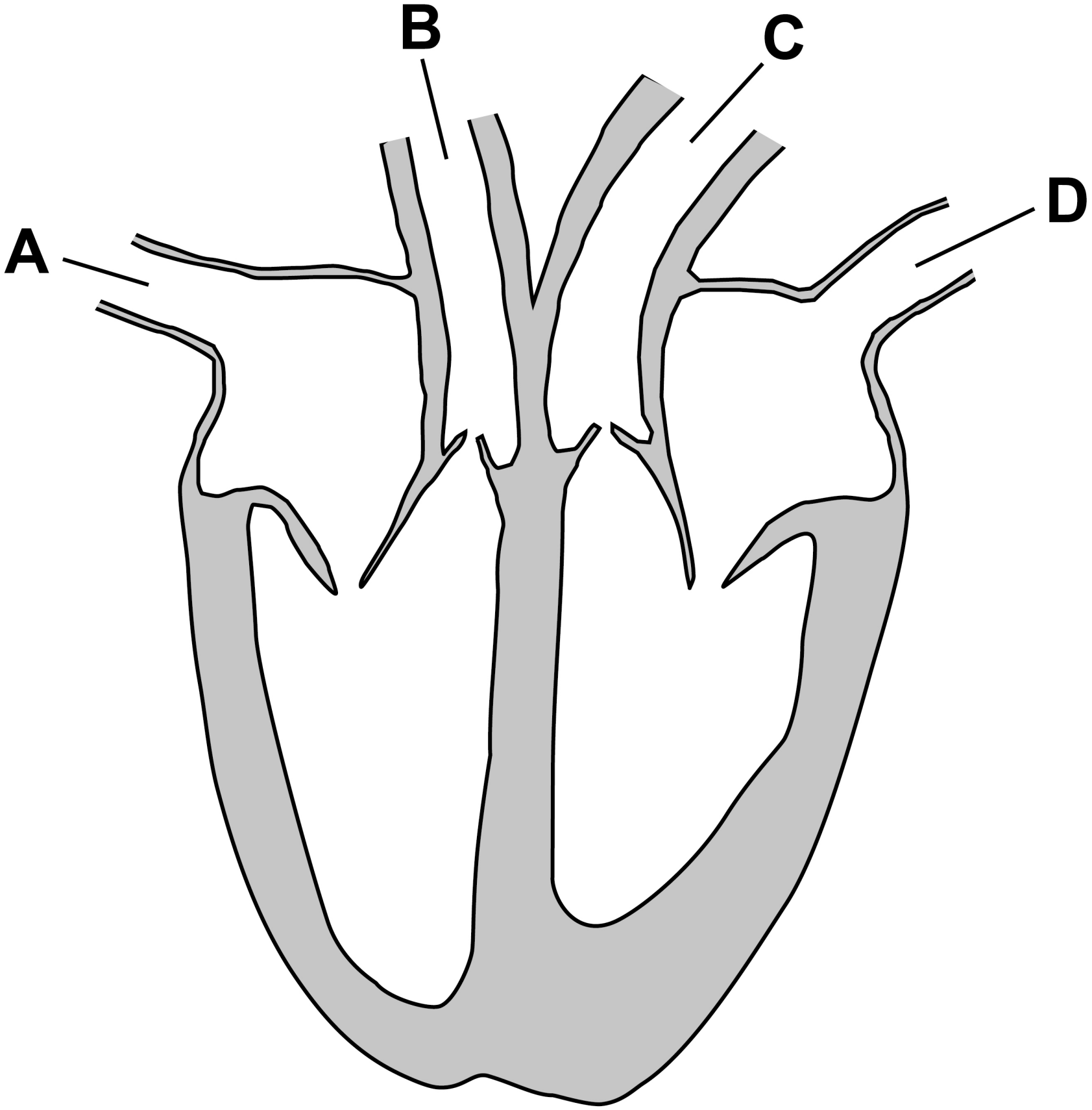
[Turn over]

0 5

FIGURE 5 shows the human heart.

FIGURE 5



0 5 . 1

Which blood vessel transports blood with the highest oxygen concentration INTO the heart? [1 mark]

Tick (✓) ONE box.

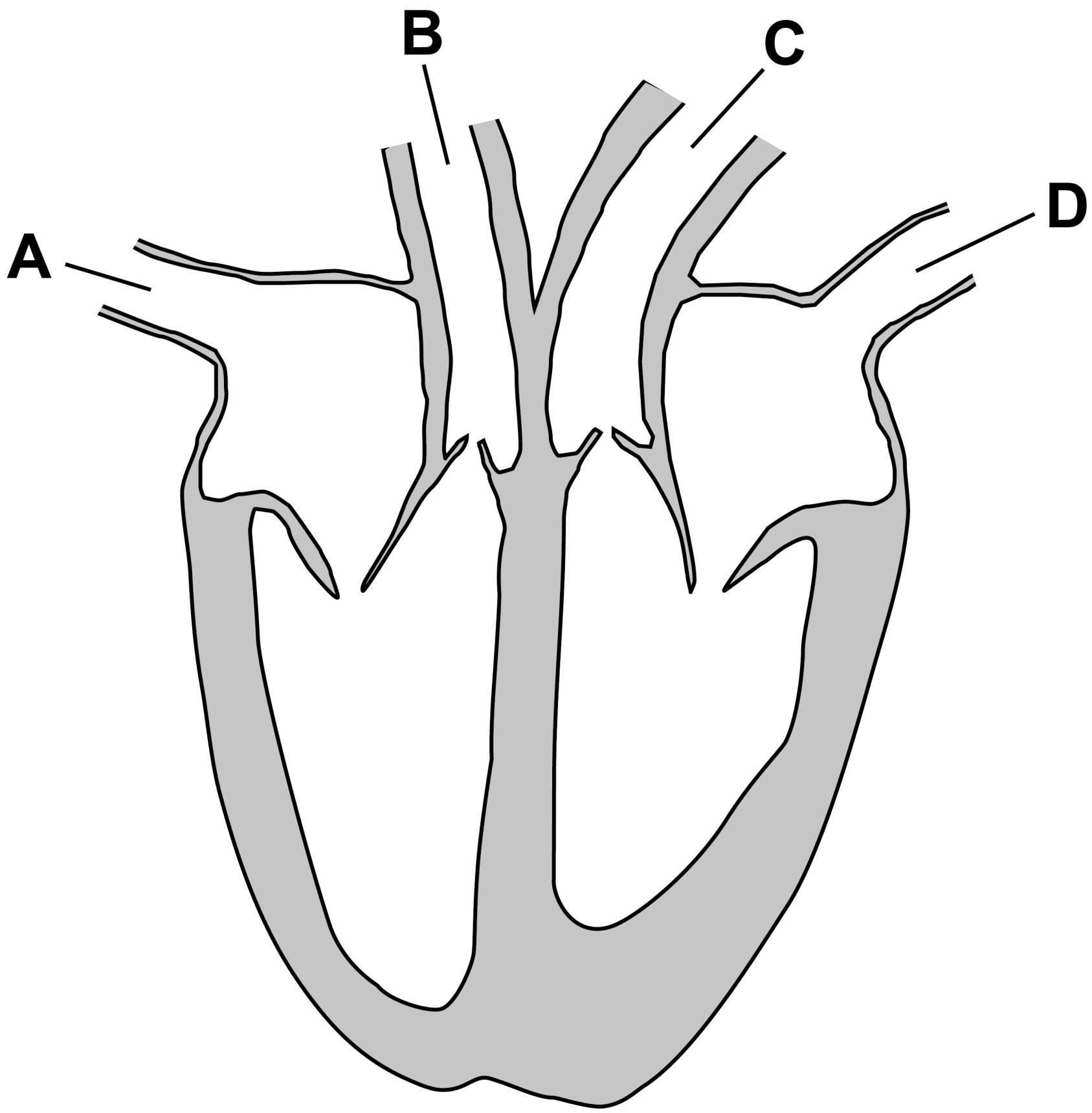
☐ **A**

☐ **B**

☐ **C**

☐ **D**

REPEAT OF FIGURE 5



0 5 . 2

Blood pressure is a measure of the force of the blood against the walls of the blood vessels.

Which blood vessel transports blood at the highest pressure? [1 mark]

Tick (✓) ONE box.

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

[Turn over]

0 5 . 3

What is the correct order for blood flowing through the heart to the lungs? [1 mark]

Tick (✓) ONE box.

☐ **left atrium ⟶ left ventricle ⟶ pulmonary artery**

☐ **left atrium ⟶ left ventricle ⟶ pulmonary vein**

☐ **right atrium ⟶ right ventricle ⟶ pulmonary artery**

☐ **right atrium ⟶ right ventricle ⟶ pulmonary vein**

Every year thousands of people in the UK have heart attacks.

A heart attack is caused when the heart muscle cells do NOT get enough oxygen, causing the cells to die.

0 5 . 4

Statins and stents are two treatments used to reduce the risk of someone having a heart attack.

Evaluate the use of statins compared with the use of a stent to reduce the risk of a heart attack. [6 marks]

0 5 . 5

Many people who survive a heart attack get out of breath easily when they exercise gently.

Explain why heart attack survivors get out of breath easily. [4 marks]

Scientists have developed patches of beating heart cells to repair damaged heart tissue.

The patches are placed onto areas of the heart where cells have died. New cells grow to replace the dead cells.

The patches are made using a person's own cells that are converted into stem cells.

0 5 . 6

Explain why stem cells are used to make the patches. [2 marks]

0 5 . 7

The scientists could have used human embryonic stem cells to make the patches.

Give TWO advantages of using stem cells made from the person's own cells, rather than using embryonic stem cells. [2 marks]

1 _____

_____

_____

2 _____

_____

17

0 6

This question is about plant transport systems.

0 6 . 1

Describe how water is transported from the soil to the atmosphere through a plant. [4 marks]

0 6 . 2

Dissolved sugars are moved through a plant in phloem tissue.

What is the name of the process that moves dissolved sugars through phloem tissue? [1 mark]

Phloem tissue is made of sieve tube cells and companion cells.

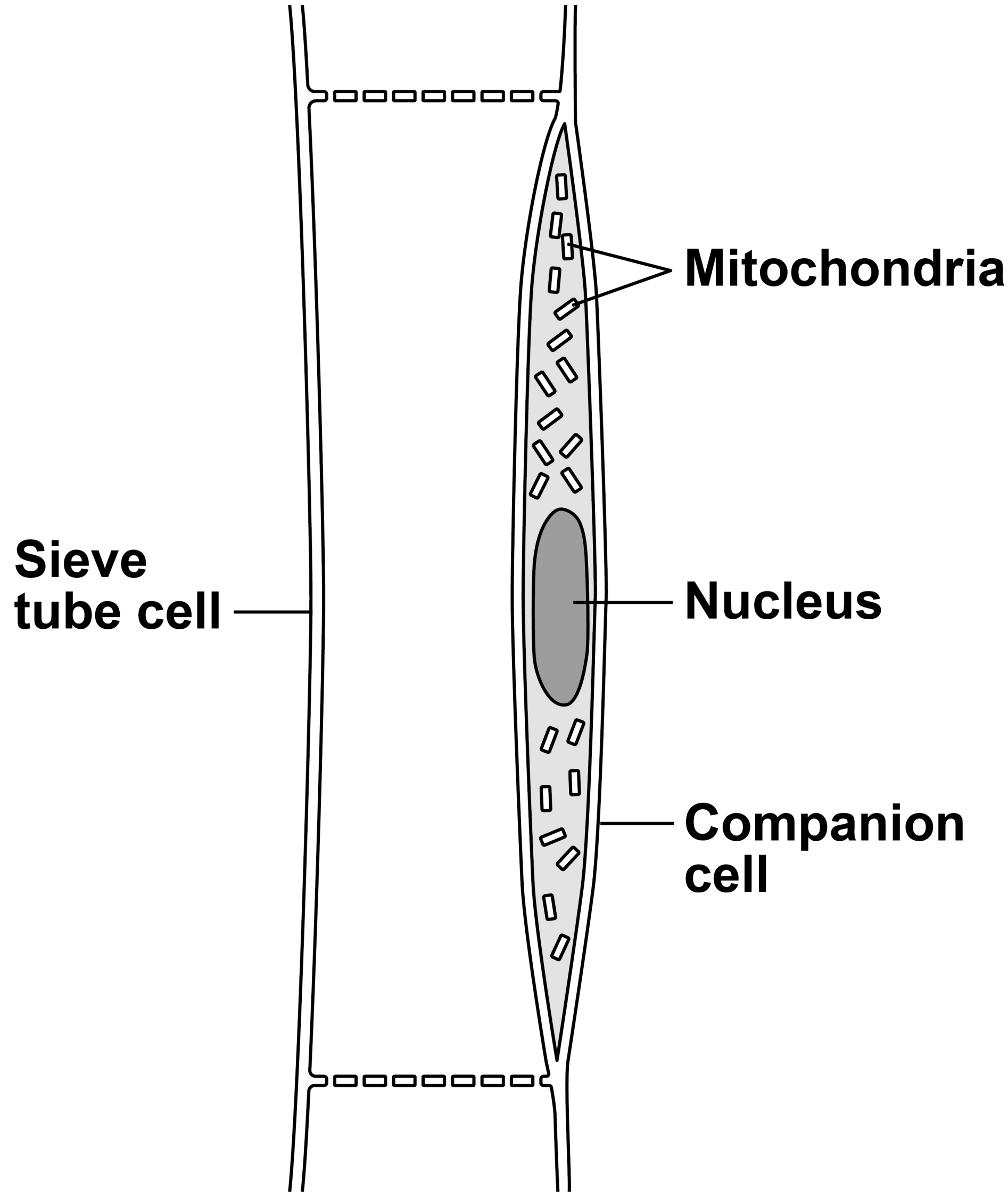
FIGURE 6, on the opposite page, shows a section of phloem tissue.

0 6 . 3

Explain ONE way SIEVE TUBE CELLS are specialised for their function.

Use FIGURE 6. [2 marks]

FIGURE 6



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0 6 . 4

What does the structure of the companion cells suggest about the process that moves dissolved sugars through the phloem tissue?

Give a reason for your answer.

Use FIGURE 6, on page 55. [2 marks]

0 6 . 5

Describe why it is important that dissolved sugars are moved both upwards AND downwards in a plant. [3 marks]

END OF QUESTIONS

12

Additional page, if required.

Write the question numbers in the left-hand margin.

Additional page, if required.

Write the question numbers in the left-hand margin.

Additional page, if required.

Write the question numbers in the left-hand margin.

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For Examiner's Use	
Question	Mark
1	
2	
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4	
5	
6	
TOTAL	