AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE
COMBINED SCIENCE: TRILOGY

H

Higher Tier
Biology Paper 1H

Time allowed: 1 hour 15 minutes

Materials

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.
- Fill in the boxes at the top of this page.
- 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.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	

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.

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0 1 Plants absorb light for photosynthesis.

0 1 . 1 Which is the equation for photosynthesis?

[1 mark]

Tick (✓) **one** box.

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

$6\,CO_2 + 6\,H_2O \rightarrow C_6H_{12}O_6 + 6\,O_2$ ☑

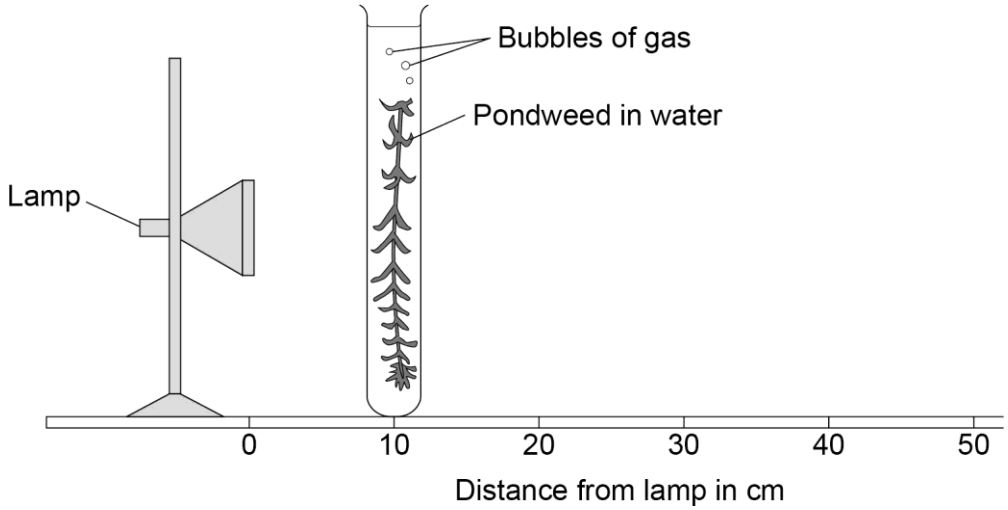
$6\,H_2O + 6\,O_2 \rightarrow C_6H_{12}O_6 + 6\,CO_2$ ☐

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

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

Figure 1 shows the apparatus.

Figure 1



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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.

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 ☐

Question 1 continues on the next page

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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]

Bubbles of gas would be produced faster because enzymes work faster.

0 1 . 4 Suggest **one** way the investigation could be improved so the temperature of the water does **not** increase.

[1 mark]

use an LED (lamp)

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 Use the same bulb

2 Repeat and calculate a mean.

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Question 1 continues on the next page

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ANSWER IN THE SPACES PROVIDED

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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 = 3 bubbles of gas produced per minute

0 1 . 7 Give **one** conclusion that can be made from **Table 1**.

[1 mark]

as light intensity decreases the rate of photosynthesis decreases

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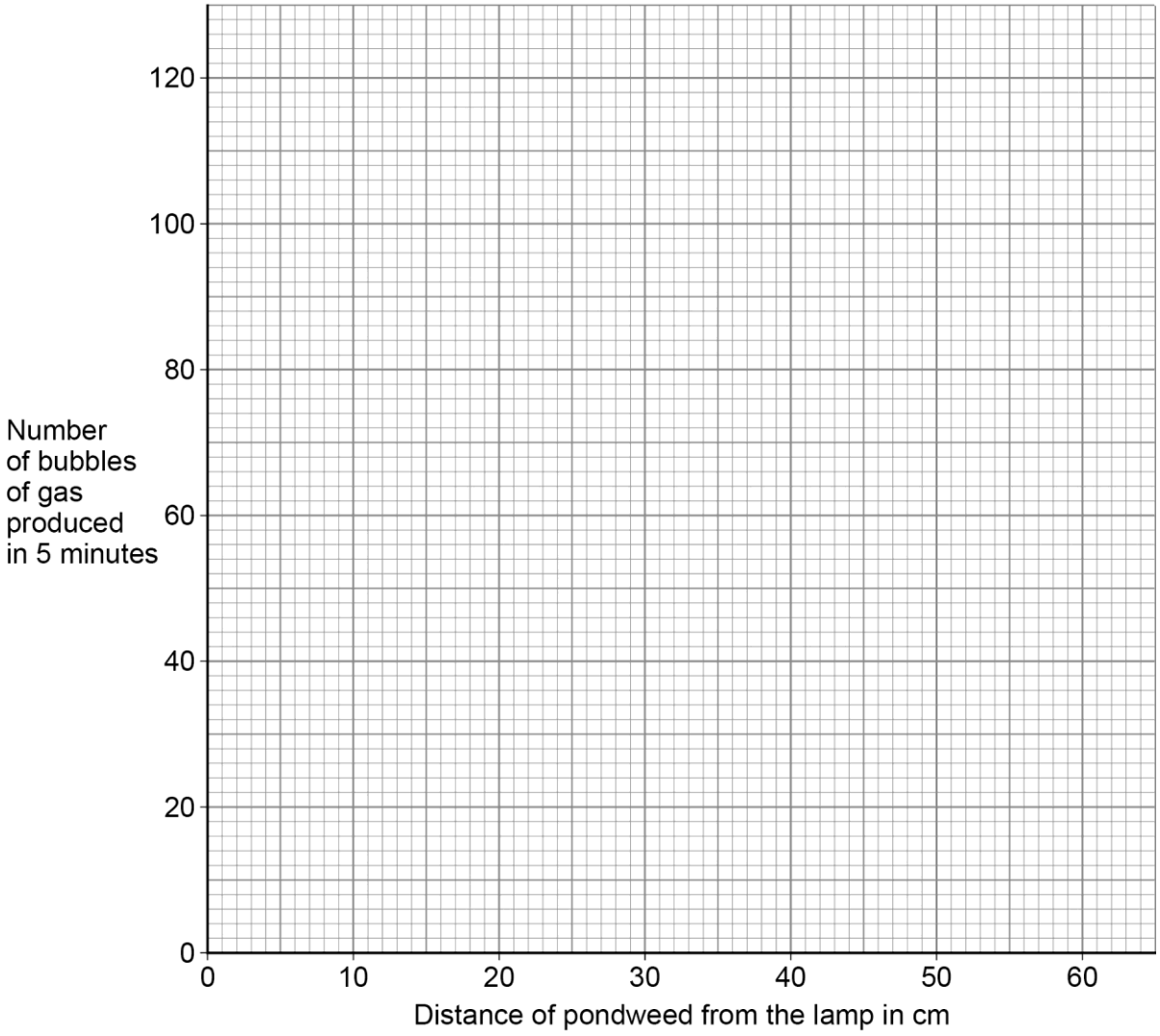
0 1 . 8 Plot the data from **Table 1** on **Figure 2**.

Draw a line of best fit.

[3 marks]

Figure 2



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 = 8

13

Turn over ►

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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]

Protein
• grind up food
• add Biuret (reagent / solution)
or
add copper sulfate (solution) and sodium hydroxide (solution)
or
add Biuret 1 and Biuret 2
• turns purple / lilac
Starch
• add iodine (solution)
• turns black / blue-black / dark blue
- ignore blue / purple
Sugar
• grind up food
• mix with water
• add Benedict's (reagent / solution)
• heat mixture (65 °C)
• in a water bath
• turns (brick) red / orange / brown / green / yellow

6

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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?

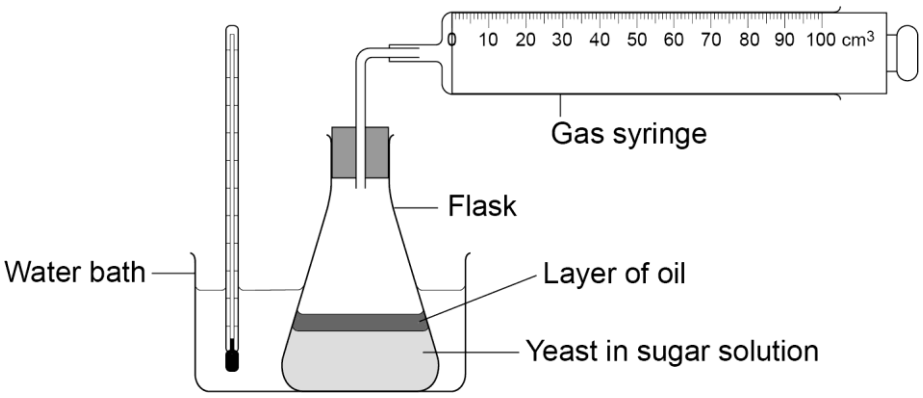
[1 mark]

Releases energy (to the surroundings)

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

Figure 3 shows the apparatus.

Figure 3



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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.

0 3 . 2 Suggest why a layer of oil was needed on the surface of the mixture.

[1 mark]

To keep oxygen out

0 3 . 3 Suggest why the mixture was left for 20 minutes before the gas syringe was attached.

[1 mark]

To allow the mixture cells to reach the temperature.

Question 3 continues on the next page

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 shows the results for both flasks for the first 30 minutes.

Table 3 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

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

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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** and **Table 3**.

[3 marks]

2 °C is) too cold for enzymes / yeast to work
(so) no carbon dioxide / gas produced
or
(so) fermentation did not occur
or
fermentation was very slow
enzymes become active at 35 °C so carbon dioxide / gas was produced

0 3 . 5 Explain the results from 0 minutes to 45 minutes for the flask kept at 35 °C.

Use **Table 2** and **Table 3**.

[4 marks]

ideal / suitable temperature for enzymes / yeast to work
(so) carbon dioxide / gas produced (rapidly)
(after time / 15 minutes) rate / fermentation slowed
(because) sugar / glucose / food began to run out
or
(because) increased concentration of ethanol / alcohol started to kill the cells

10

Turn over for the next question

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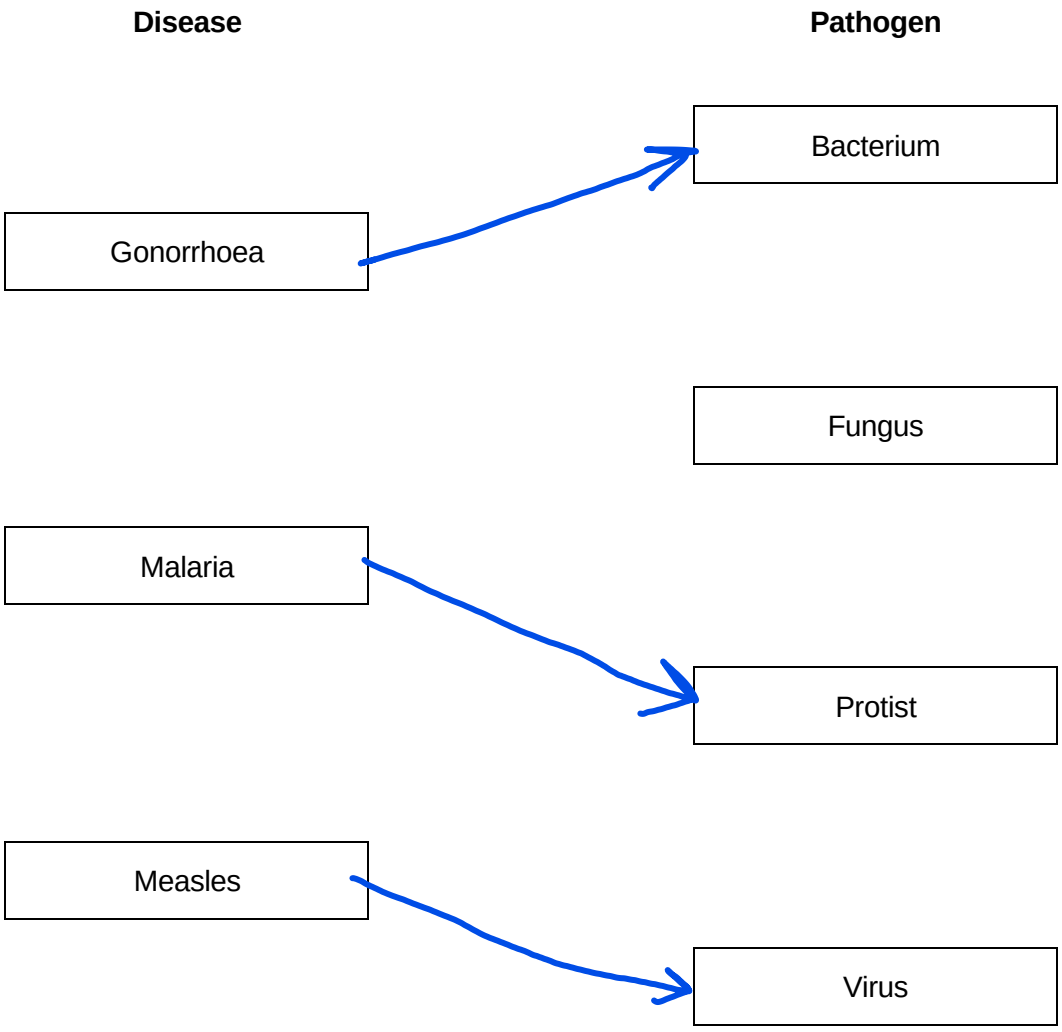
0 4 Pathogens are microorganisms that cause diseases.

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]



Question 4 continues on the next page

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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.

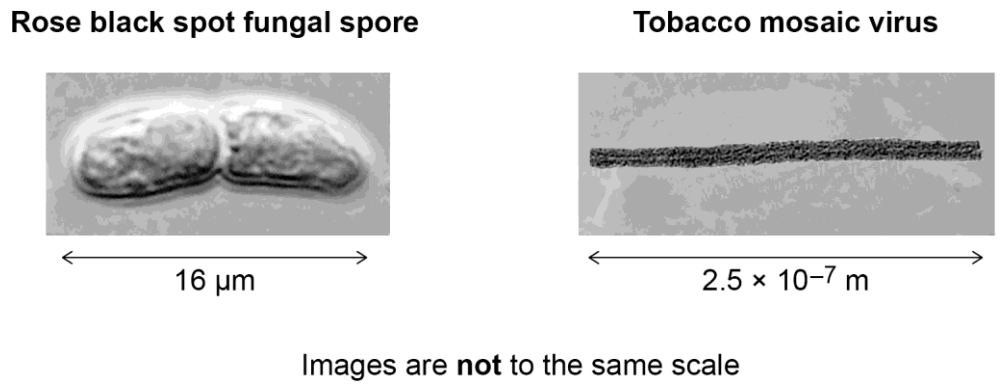
[2 marks]

reduces breeding / reproduction (in mosquitos)
(so) fewer mosquitos to bite people
or
(so) fewer mosquitos to pass on pathogen / protist

Pathogens also cause diseases in plants.

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

Figure 4



0 4 . 3 Name the piece of equipment used to view the virus.

[1 mark]

Electron Microscope

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0 4 . 4 How many times longer is the fungal spore than the virus?

Use **Figure 4**.

[3 marks]

Fungal spore = 1.6×10^{-5} m

or

Virus = 2.5×10^{-7} m

$\frac{1.6 \times 10^{-5}\text{m}}{2.5 \times 10^{-7}\text{m}}$

Number of times longer = 64

0 4 . 5 Explain why plants infected with tobacco mosaic virus grow slowly.

[3 marks]

less chlorophyll in leaves
(so) reduced photosynthesis
(so) less glucose produced so less amino acids / proteins / cellulose made

12

Turn over for the next question

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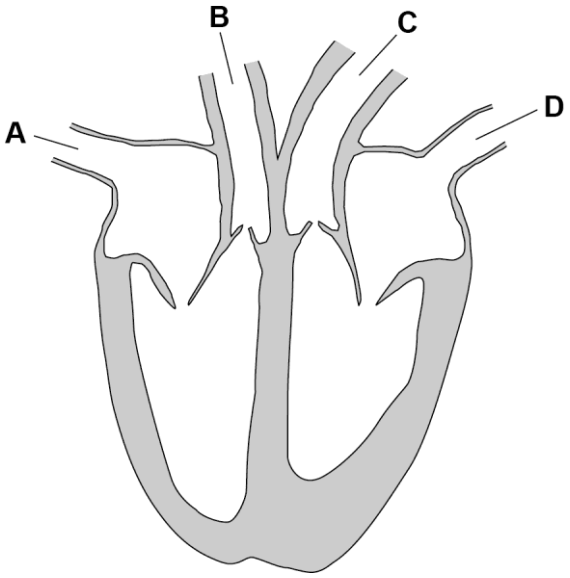
0 5 **Figure 5** shows the human heart.

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** ☑

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** ☐

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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 ☐

Question 5 continues on the next page

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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]

Advantages of statins
- easy to take or not invasive (procedure)
- decrease blood cholesterol
- slow down build-up of fatty materials in arteries
- maintain blood flow to heart muscle cells
- low cost (compared to stent operation)

Disadvantages of statins
- might be side effects of drug eg muscle pain
- effects take time to happen
- drug will need to be taken long term
- might forget to take drug

Advantages of stent
- blocked artery is held open
- blood flow to heart muscle cells is increased
- stent will remain in place for a long time
- effect of stent is immediate
- rapid recovery from operation

Disadvantages of stent
- risk of infection from operation
- risk of surgery eg heart attack or bleeding
- risk of thrombosis or blood clot

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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]

heart (muscle) cannot contract / pump as effectively / powerfully
(so) less blood pumped out of heart or to body (on each beat / contraction)
(so) less oxygen (reaches cells / body) for (aerobic) respiration
(so) breathing rate increases to supply more oxygen

Question 5 continues on the next page

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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]

stem cells are undifferentiated cells
(therefore) can form heart (muscle) cells

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 cells will not be rejected

2 Adult can give consent

17

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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]

(absorbed from soil) by osmosis through root hair (cells)
travels through xylem (vessels) to the leaves
lost through stomata (to atmosphere)
idea of driven by evaporation / transpiration

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]

Translocation

Question 6 continues on the next page

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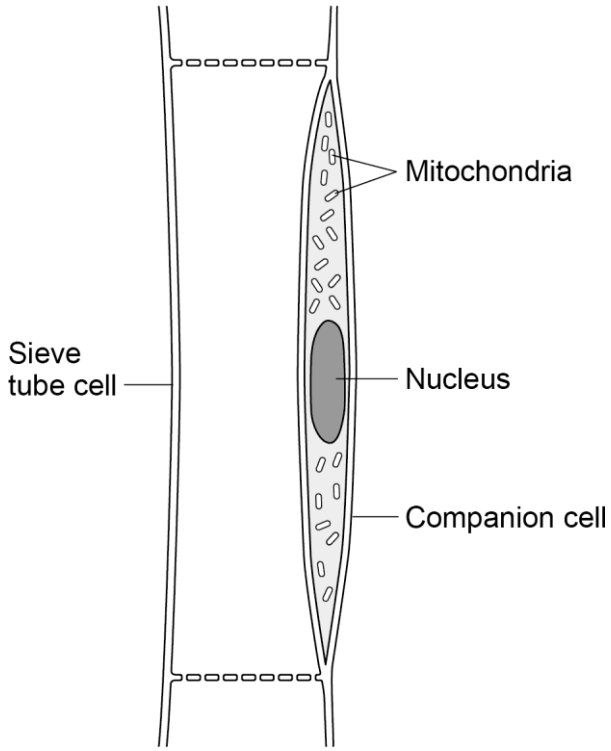
Phloem tissue is made of sieve tube cells and companion cells.

Figure 6 shows a section of phloem tissue.

Figure 6



0 6 . 3 Explain **one** way **sieve tube cells** are specialised for their function.

Use **Figure 6**.

[2 marks]

have pores in the end walls (so) dissolved sugars / food / contents can move from cell to cell

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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**.

[2 marks]

Requires Energy

0 6 . 5 Describe why it is important that dissolved sugars are moved both upwards **and** downwards in a plant.

[3 marks]

12

END OF QUESTIONS

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