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

Tuesday 13 May 2025 Afternoon Time allowed: 1 hour 15 minutes

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

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.

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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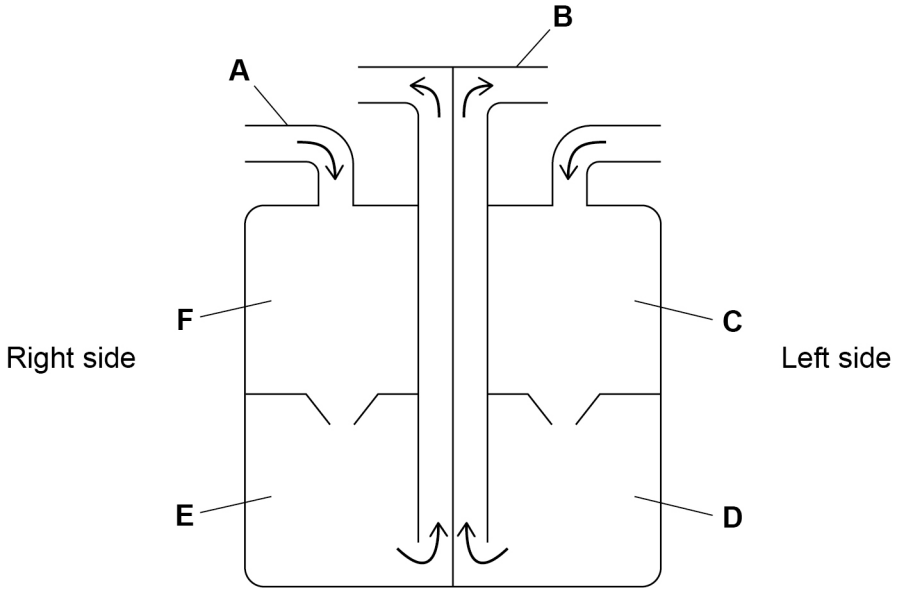
0 1 The heart is an organ that pumps blood around the body.

Figure 1 is a model of the heart and shows the direction of blood flow.

Figure 1



0 1 . 1 Draw **one** line from each blood vessel shown in **Figure 1** to the name of the blood vessel.

[2 marks]

Blood vessel	Name
	Aorta
A	Pulmonary artery
B	Pulmonary vein
	Vena cava

Do not write outside the box

0 1 . 2 Heart rate is controlled by a group of cells.

The group of cells acts as a pacemaker.

Where would the pacemaker be located in **Figure 1**?

[1 mark]

Tick (✓) **one** box.

C ☐ **D** ☐ **E** ☐ **F** ☐

0 1 . 3 Heart muscle cells contain many mitochondria.

Explain why heart muscle cells contain many mitochondria.

[3 marks]

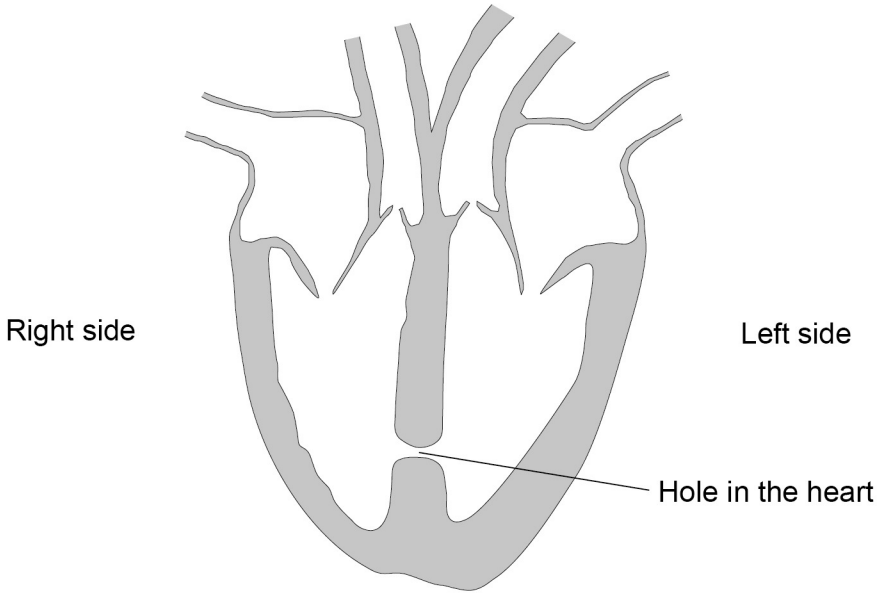
Question 1 continues on the next page

Do not write outside the box

A small number of people are born with a 'hole in the heart'.

Figure 2 shows the position of a hole in the heart.

Figure 2



0 1 . 4 The hole allows some blood from the right side of the heart to mix with blood in the left side of the heart.

Suggest **two** symptoms of having a hole in the heart.

[2 marks]

1 _____

_____

2 _____

_____

Do not write outside the box

0 1 . 5 In an operation to repair a hole in the heart:

- a flexible tube is inserted into a blood vessel and guided to the heart
- a mesh patch is passed down the tube
- the mesh patch covers the hole.

Heart tissue grows around the mesh and closes the hole.

Suggest **two** possible risks of this operation to repair a hole in the heart.

[2 marks]

1 _____

_____

2 _____

_____

10

Turn over for the next question

Do not write outside the box

0 2 Chickenpox is an infectious disease that affects young children.

0 2 . 1 One symptom of chickenpox is small blisters on the skin.

Suggest **one** way chickenpox spreads from an infected person to other people.

[1 mark]

_____

_____

0 2 . 2 Chickenpox is caused by a type of pathogen that **cannot** be treated with antibiotics.

Give the reason why chickenpox **cannot** be treated with antibiotics.

[1 mark]

_____

_____

A vaccine that could be used to protect against chickenpox has been produced.

0 2 . 3 What does a vaccine contain that causes a person to become immune to a disease?

[1 mark]

_____

_____

0 2 . 4 Give **three** reasons why a new vaccine must be tested.

[3 marks]

1 _____

_____

2 _____

_____

3 _____

_____

Do not write outside the box

0 2 . 5 Explain how a vaccine for chickenpox gives immunity against the disease.

You should refer to how the body responds to:

- the vaccine
- chickenpox pathogens that enter the body after vaccination.

[6 marks]

Extra Space

12

Turn over for the next question

Do not write outside the box

There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED

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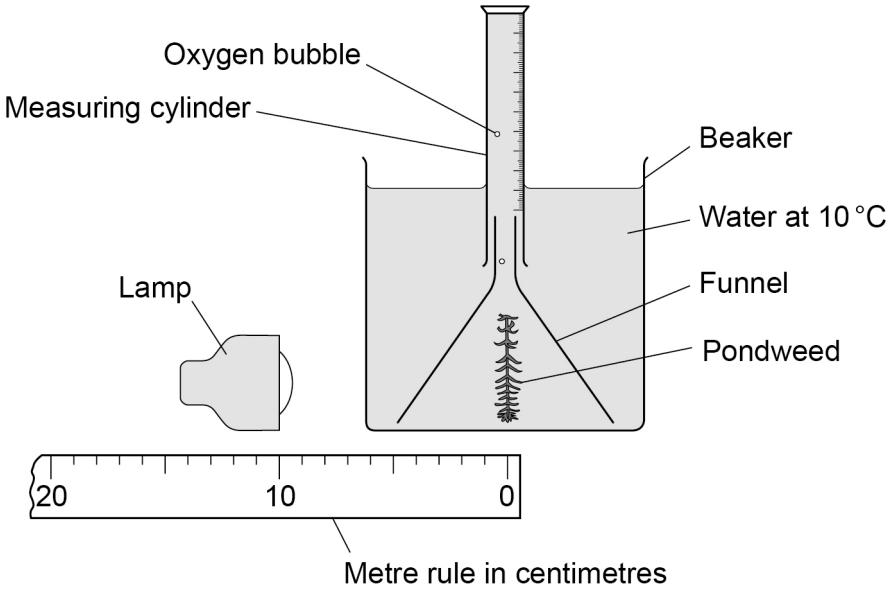
0 3 Photosynthesis is important for plant growth.

A student used pondweed to investigate the rate of photosynthesis.

Figure 3 shows the apparatus used.

Figure 3



This is the method used.

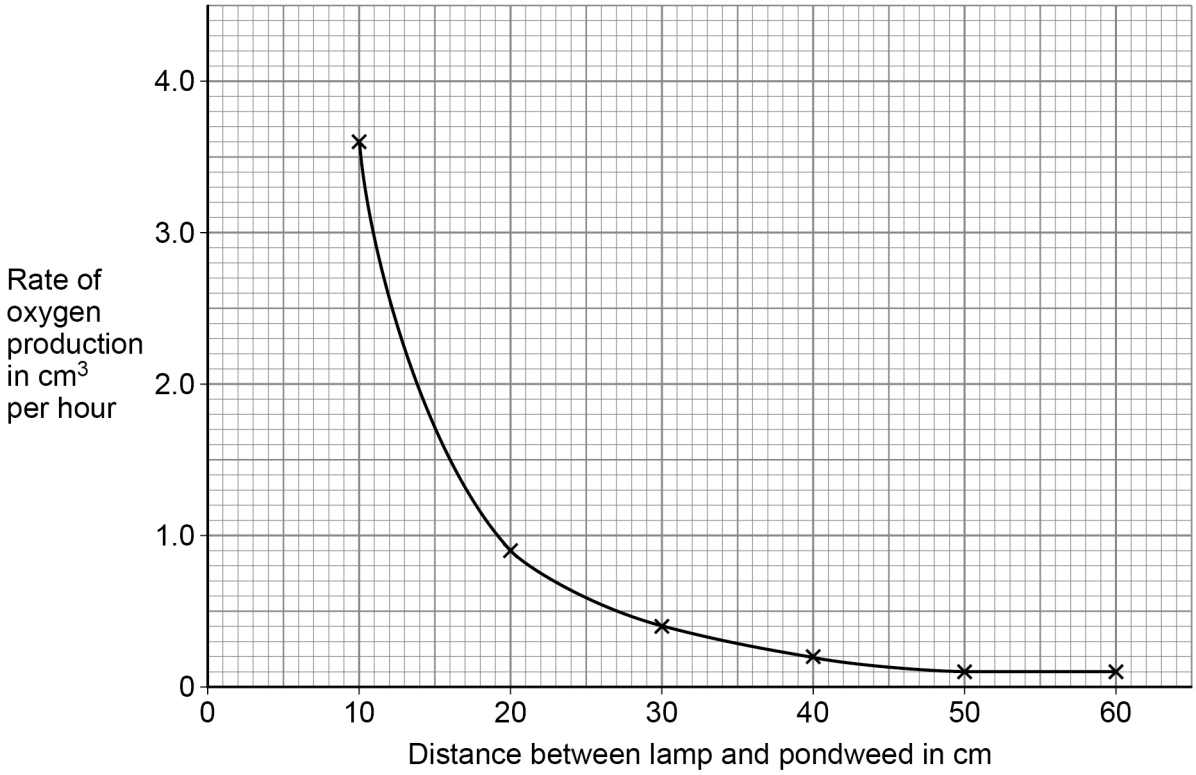
1. Set up the apparatus as shown in **Figure 3**.
2. Switch on the lamp.
3. After 2 hours, record the volume of oxygen collected in the measuring cylinder.
4. Repeat steps 1 to 3 a further five times, increasing the distance between the lamp and the pondweed each time.
5. Calculate the rate of oxygen production for each distance.

Question 3 continues on the next page

Do not write outside the box

Figure 4 shows the results.

Figure 4



0 3 . 1 Which measuring cylinder should the student have used to give the most accurate results?

[1 mark]

Tick (✓) **one** box.

10 cm^3 measuring cylinder with intervals of 0.1 ± 0.01 cm^3 ☐

10 cm^3 measuring cylinder with intervals of 0.2 ± 0.01 cm^3 ☐

20 cm^3 measuring cylinder with intervals of 0.1 ± 0.02 cm^3 ☐

20 cm^3 measuring cylinder with intervals of 0.2 ± 0.02 cm^3 ☐

Do not write outside the box

0 3 . 2 Light intensity can be calculated using the inverse square law.

The equation shows the inverse square law.

$$\text{light intensity} \propto \frac{1}{(\text{distance from light source})^2}$$

Explain how light intensity changed as the distance of the pondweed from the light source was doubled.

Include calculations in your answer.

Use data from **Figure 4**.

[3 marks]

Question 3 continues on the next page

Do not write outside the box

The student did the investigation at 10 °C.

The student repeated the investigation at 20 °C and again at 80 °C.

0 3 . 3 Explain how repeating the investigation at **20 °C** would affect the results.

[3 marks]

0 3 . 4 Explain how repeating the investigation at **80 °C** would affect the results.

[2 marks]

9

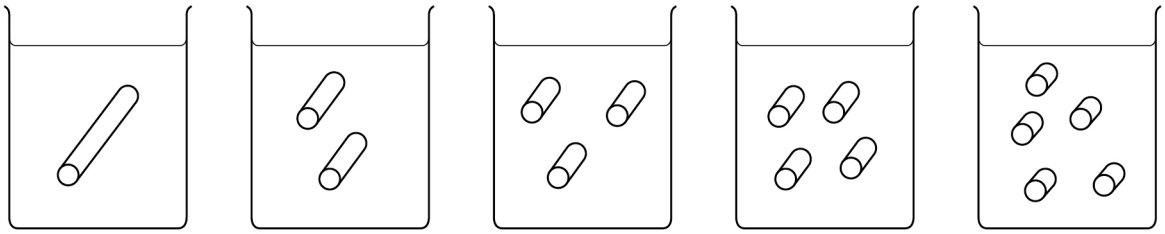
Do not write outside the box

0 4 A student investigated the effect of surface area on the mass of potato pieces placed in water.

This is the method used.

1. Cut 5 cylinders from one potato. Cut each cylinder to a length of 3 cm.
2. Cut 4 of the cylinders into different numbers of pieces.
3. Dry each piece of potato on a paper towel.
4. Record the mass of each group of potato pieces.
5. Put each group of potato pieces into different beakers containing distilled water as shown in **Figure 5**.
6. After 30 minutes remove and dry each group of potato pieces.
7. Record the mass of each group of potato pieces.
8. Calculate the percentage increase in mass for each group of potato pieces.

Figure 5



Beaker **A** Beaker **B** Beaker **C** Beaker **D** Beaker **E**

Question 4 continues on the next page

Do not write outside the box

Table 1 shows the results.

Table 1

Beaker	Total surface area of potato pieces in cm^2	Percentage (%) increase in mass
A	7.4	4.4
B	8.1	4.9
C	8.9	5.3
D	9.7	5.5
E	10.5	5.6

0 4 . 1 Why is it more valid to calculate the **percentage increase** in mass rather than using the increase in mass?

[1 mark]

0 4 . 2 Describe the relationship between total surface area and percentage increase in mass.

Use **Table 1**.

[2 marks]

Do not write outside the box

0 4 . 3 Explain why the potato pieces increased in mass.

[2 marks]

0 4 . 4 The student repeated the investigation.

The potato pieces were in the beakers of distilled water for 24 hours.

Explain what results would be expected after leaving the investigation set up for 24 hours.

[3 marks]

Question 4 continues on the next page

Do not write outside the box

0 4 . 5 The method used is repeated below.

1. Cut 5 cylinders from one potato. Cut each cylinder to a length of 3 cm.
2. Cut 4 of the cylinders into different numbers of pieces.
3. Dry each piece of potato on a paper towel.
4. Record the mass of each group of potato pieces.
5. Put each group of potato pieces into different beakers containing distilled water as shown in **Figure 5** on page 13.
6. After 30 minutes, remove and dry each group of potato pieces.
7. Record the mass of each group of potato pieces.
8. Calculate the percentage increase in mass for each group of potato pieces.

A different student wanted to investigate the effect of salt concentration on potato tissue.

Describe how the student could change the method to investigate the effect of salt concentration on potato tissue.

[2 marks]

_____

_____

_____

_____

_____

10

Do not write outside the box

0 5 This question is about plants.

0 5 . 1 Some plants can respire anaerobically.

Which are the **two** products of anaerobic respiration in plants?

[2 marks]

Tick (✓) **two** boxes.

- Carbon dioxide ☐
- Ethanol ☐
- Glucose ☐
- Lactic acid ☐
- Water ☐

Question 5 continues on the next page

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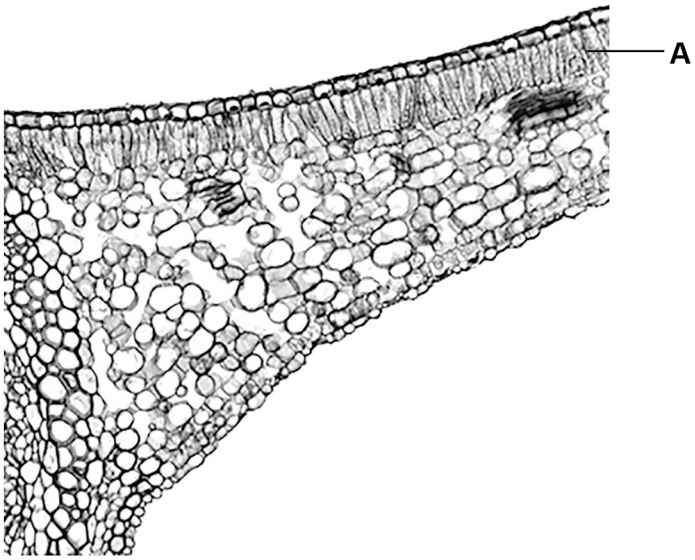
Figure 6 shows the structure of part of a leaf

Figure 6



0 5 . 2 What is the name of tissue **A**?

[1 mark]

_____

0 5 . 3 Explain how tissue **A** is adapted to its function.

[2 marks]

_____

_____

_____

_____

Do not write outside the box

0 5 . 4 Plants absorb water from the soil.

Describe how water is transported from the soil through plant tissues to the atmosphere.

[5 marks]

Extra space

10

Turn over for the next question

Do not write outside the box

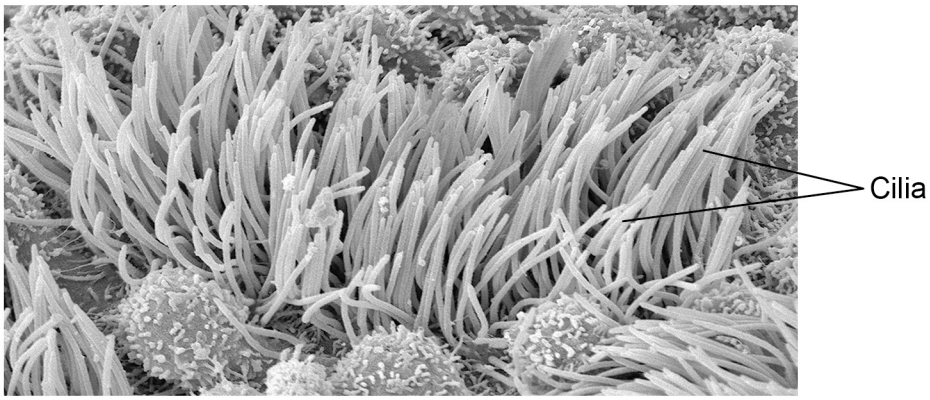
0 6 Ciliated cells have small hair-like structures called cilia on the cell surface.

Ciliated cells are found in the trachea and in the oviducts.

Oviducts are part of the female reproductive system.

Figure 7 shows cilia lining an oviduct.

Figure 7



0 6 . 1 Give **one** piece of evidence that an electron microscope was used to produce the image shown in **Figure 7**.

Do **not** refer to colour in your answer.

[1 mark]

_____

_____

0 6 . 2 Describe the function of ciliated cells in the **oviduct**.

[1 mark]

_____

_____

Do not write outside the box

0 6 . 3 The mean length of the cilia in an image was 6 mm.

The cilia were viewed at a magnification of 1.5×10^3

Calculate the real mean length of the cilia.

Give your answer in micrometres (μm).

[5 marks]

Real mean length = _____ μm

Question 6 continues on the next page

Do not write outside the box

Red blood cells are a type of cell found in humans.

People with anaemia do **not** have enough red blood cells.

0 6 . 4 Explain why a person with anaemia is likely to experience muscle fatigue.

[2 marks]

Do not write outside the box

Scientists have produced red blood cells from stem cells in a laboratory.

The scientists:

- collected a sample of blood from a donor
- extracted 5×10^5 stem cells from the sample.

Each stem cell was developed into 100 000 red blood cells.

35% of the red blood cells made from stem cells are suitable to use in a patient.

0 6 . 5 Calculate the number of red blood cells made from the donor's sample that could be used in a patient.

Give your answer in standard form.

[4 marks]

Number of red blood cells (in standard form) = _____

Question 6 continues on the next page

Do not write outside the box

0 6 . 6 Patients with anaemia are sometimes given a blood transfusion.

A blood transfusion is when a patient is given blood.

The patient can be given red blood cells:

- produced from stem cells in a laboratory

  or

- from a whole blood donation.

Table 2 gives information about the two sources of red blood cells.

Table 2

Red blood cells produced from stem cells	Red blood cells from a whole blood donation
• A small sample of blood is collected from the patient. • The total cost is £15 per 10 cm^3 of cells produced. • All of the new cells can function for 120 days.	• 470 cm^3 of blood is collected from a donor. • The blood donation is separated into its different parts. • Red blood cells make up 45% of whole blood. • The total cost of a blood donation is £130. • The cells can function for between 1 and 120 days.

Do not write outside the box

Evaluate the use of red blood cells:

- produced from stem cells in a laboratory
- from a whole blood donation.

You should refer to costs in your answer.

[6 marks]

Extra Space

19

END OF QUESTIONS

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Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**

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