Write your name here:

Surname	Other names

16+ Scholarship Paper 2025

Subject: Biology

Time: 1 Hour

You must have:

Pen Calculator

Pencil Ruler

Total Marks

60

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name.
- Answer the questions in the answer sheets provided**.**
  - *there may be more space than you need*.

Information

- The total mark for this paper is 60
- The marks for **each** question are shown in brackets
  - *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

1 Catalase is an enzyme found in many cells.

This enzyme controls the breakdown of hydrogen peroxide into water and oxygen.

$$2H_2O_2 \longrightarrow 2H_2O + O_2$$

hydrogen peroxide — water — oxygen

A teacher uses this method to investigate the effect of pH on catalase.

Step 1 cut a cylinder of potato tissue into six equal sized discs

Step 2 measure 10 cm^3 of hydrogen peroxide solution and place into a boiling tube

Step 3 add a pH buffer solution to the tube to keep the pH at 7

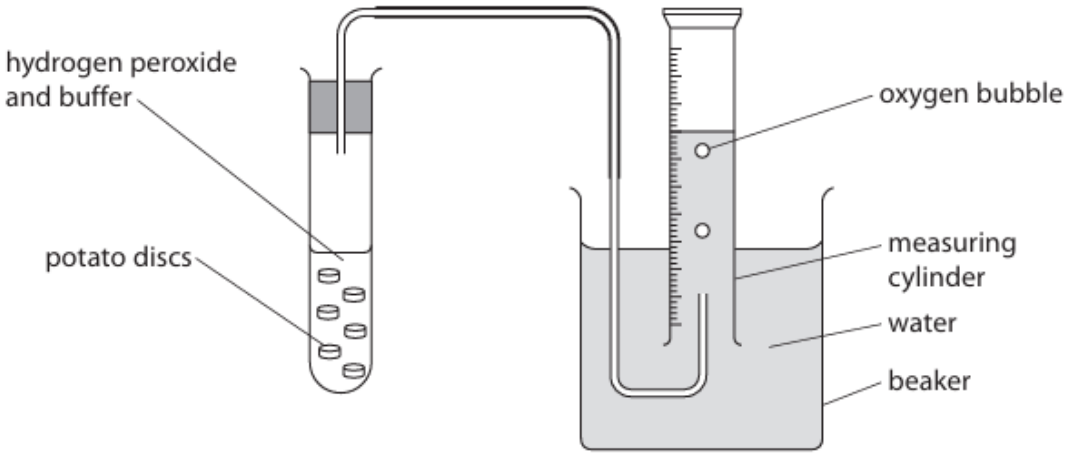
Step 4 add the six potato discs to the boiling tube

Step 5 collect the gas given off by the reaction in an inverted 20 cm^3 measuring cylinder

Step 6 measure the total volume of gas collected after five minutes

Repeat steps 1 to 6 using four different pH buffers (pH 4, pH 5, pH 6 and pH 8).

The diagram shows the teacher's apparatus.



(a) State what is meant by the term **enzyme**.

(1)

(b) Suggest why each potato cylinder was cut into six discs rather than left as one cylinder.

(1)

.....

.....

(c) (i) Give the dependent variable in this experiment.

(1)

.....

.....

(ii) The teacher controls the time for gas collection and also the volume of hydrogen peroxide used.

State two other abiotic variables the teacher should control in this experiment.

(2)

1 .....

2 .....

(d) The table shows the teacher's results.

pH of solution	Volume of oxygen after 5 minutes in cm^3	Mean rate of reaction in cm^3 per minute
4	4	0.8
5	6	1.2
6	7	1.4
7	12	2.4
8	3	0.6

(i) Calculate the percentage change in the mean rate of reaction as the pH is changed from pH 4 to pH 7.

(2)

percentage change = ... %

(ii) The teacher calculated the mean rate of reaction by collecting the oxygen released for the first five minutes of the reaction.

Explain why the mean rate of reaction changes beyond the first five minutes.

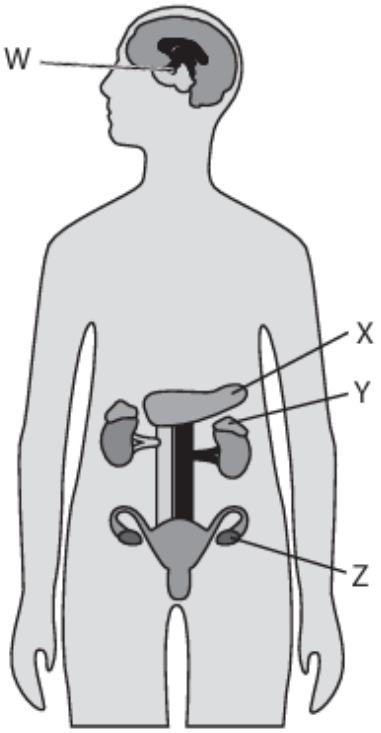
(2)

(iii) Explain the effect of changing pH on an enzyme-controlled reaction.

(3)

(Total for Question 2 = 12 marks)

2 The diagram shows four glands in the human body labelled W, X, Y and Z.



(a) LH is a hormone involved in the menstrual cycle.

(i) Which labelled gland produces LH?

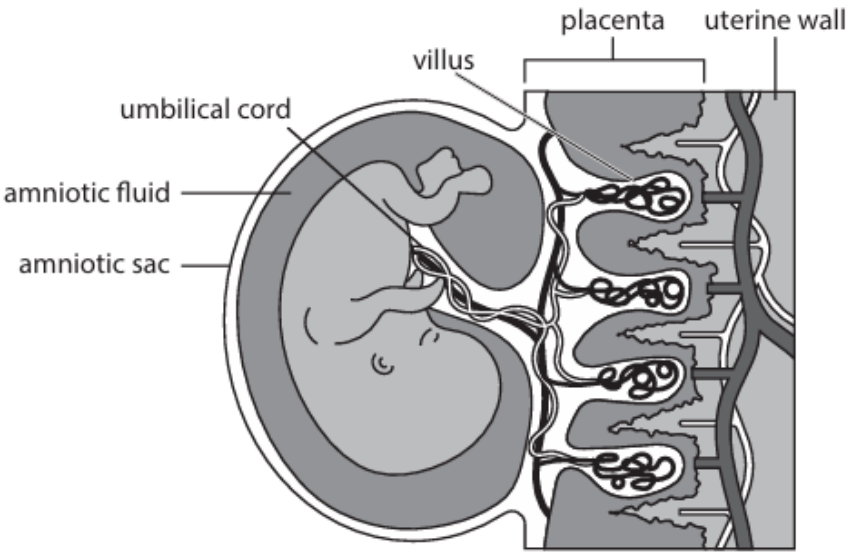
(1)

- ☒ **A** W
- ☒ **B** X
- ☒ **C** Y
- ☒ **D** Z

(ii) Describe the functions of LH during the menstrual cycle.

(2)

(b) The diagram shows a fetus developing in a uterus.



Explain how the amniotic fluid and placenta enable the safe growth of the fetus.

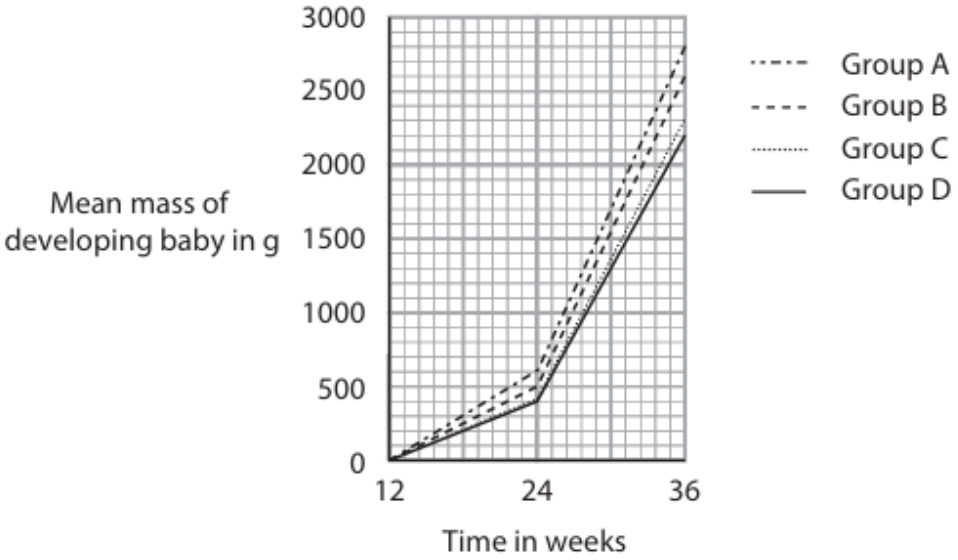
(3)

(c) Scientists investigated the effects of tobacco smoking and taking mineral ion supplements on the growth of developing babies during pregnancy.

The scientists looked at four groups of mothers.

- **Group A** non-smokers taking mineral ion supplements
- **Group B** non-smokers not taking mineral ion supplements
- **Group C** smokers taking mineral ion supplements
- **Group D** smokers not taking mineral ion supplements

The graph shows the mean masses of developing babies at 12 weeks of pregnancy at 24 weeks of pregnancy and at birth (36 weeks).



(ii) Comment on the effect of smoking and the effect of taking mineral ion supplements on the growth of babies.

Use the graph and your own knowledge to help your answer.

(4)

(Total for Question 2 = 10 marks)

3. Some farmers apply more nitrogen fertiliser and more water to their fields than are needed.

Explain the biological consequences of applying more nitrogen fertiliser and more water than needed.

(5)

(Total for Question 3 = 5 marks)

4 **(a)** Fig. 1.1 is a transmission electron micrograph of cells from the leaf of a plant.

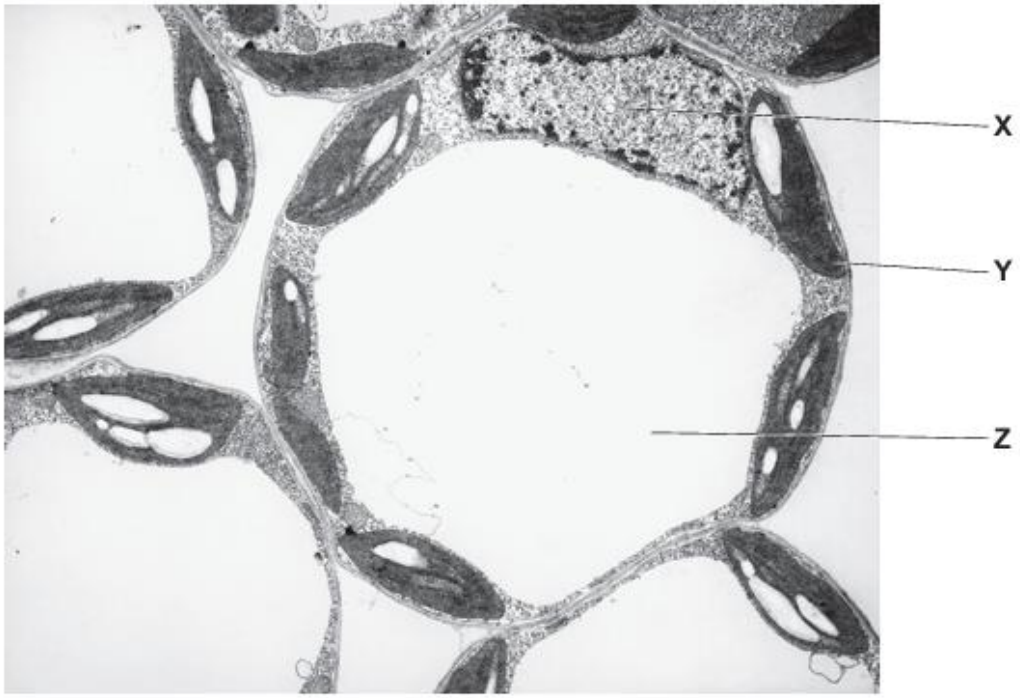


Fig. 1.1

(i) Name the cell structures **X**, **Y**, and **Z**.

X .....

Y .....

Z .....

[3]

(ii) State **two** ways in which the structure of an animal cell differs from plant cells such as those shown in Fig. 1.1.

1 .....

.....

2 .....

.....

[2]

(b) (i) Cell structure **Y** in Fig. 1.1 contains a large starch granule (grain).

Name the chemical reagent used to test for starch **and** state the colour change that will be seen if starch is present.

reagent .....

colour change ..... [2]

(ii) Starch granules contain amylose and amylopectin.

Describe the similarities **and** differences between the structure of amylose and the structure of amylopectin.

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..... [4]

[Total: 11]

5 A student investigated the effects of air movement on the rate of transpiration by using a potometer.

(a) Define the term transpiration.

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..... [2]

The potometer used by the student is shown in Fig. 5.1.

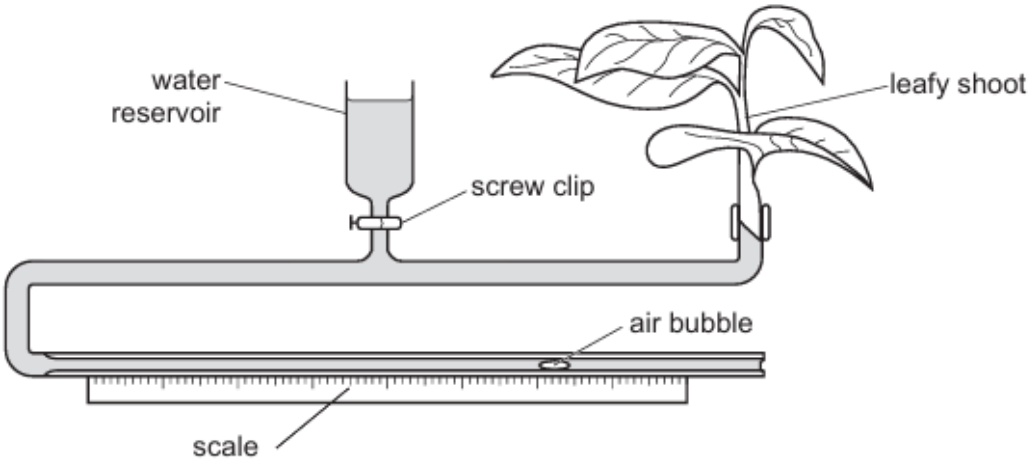

Fig. 5.1

The student recorded the distance the air bubble in the apparatus had moved after ten minutes with no air movement.

The rate of water uptake was used as a measure of the rate of transpiration.

The apparatus was then reset using the reservoir, and the experiment was repeated a further two times. All other variables were standardised during the three experiments.

Table 5.1 shows the results recorded by the student.

Table 5.1

experiment	distance moved by the bubble in 10 minutes / mm
1	12.5
2	12.0
3	11.5

(b) Use Table 5.1 to calculate the mean rate of movement of the bubble.

..... mm min^{-1} [1]

(c) The student carried out another experiment using the same plant. In this experiment a fan was used to blow air across the leaves of the plant. All other variables were standardised.

The results showed that the bubble moved further in 10 minutes.

The student concluded that air movement increases the rate of transpiration.

Explain why air movement increases the rate of transpiration.

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..... [2]

(d) Explain how water moves up through a xylem vessel in the stem of the plant in the potometer, shown in Fig. 5.1.

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..... [4]

[Total: 9]

6 Fig. 6.1 is a diagram of sections through the heart showing two stages of the cardiac cycle, **A** and **B**.

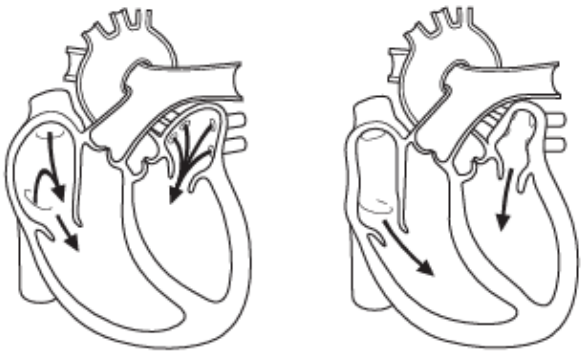

Fig. 6.1

(a) Name stage **B** in Fig. 6.1 **and** state one piece of evidence from the diagram that supports your answer.

stage **B** .....

evidence .....

.....

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.....

..... [2]

(b) **(i)** Draw a label line on Fig. 6.1 to identify **one** semilunar valve. Label the valve **S**. [1]

(ii) Describe the role of the semilunar valves in the cardiac cycle.

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..... [2]

[Total: 5]

End of Exam