



Cambridge O Level

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BIOLOGY

5090/42

Paper 4 Alternative to Practical

May/June 2025

1 hour

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [].

This document has **8** pages.



- 1 Catalase is an enzyme found in living cells. This enzyme catalyses the breakdown of hydrogen peroxide into oxygen and water. Some plant cells are a source of catalase.

If some material from a plant is crushed and added to water, a suspension of the contents of the plant's cells can be obtained.

When hydrogen peroxide solution is added to this suspension, the oxygen produced is released as bubbles of gas. These bubbles collect to form a foam on top of the suspension.

The height of any foam produced can be measured. Greater height indicates greater catalase activity.

A student investigated the activity of catalase in the cells of three different species of plant by measuring the height of foam produced in each. They used three suspensions of cells, one each of celery, apple and potato, provided in separate beakers.

The student followed these instructions:

- use a clean stirring rod to stir the celery cell suspension in the beaker
- use a syringe to add 2 cm^3 of celery cell suspension to a clean test-tube
- use a clean syringe to add 2 cm^3 of hydrogen peroxide solution to this test-tube
- immediately start timing
- after 60 seconds, measure the height of any foam produced and record your measurement.

Repeat these instructions using the apple cell suspension and then the potato cell suspension.

(a) Fig. 1.1 shows the total contents of each of the three test-tubes after 60 seconds.

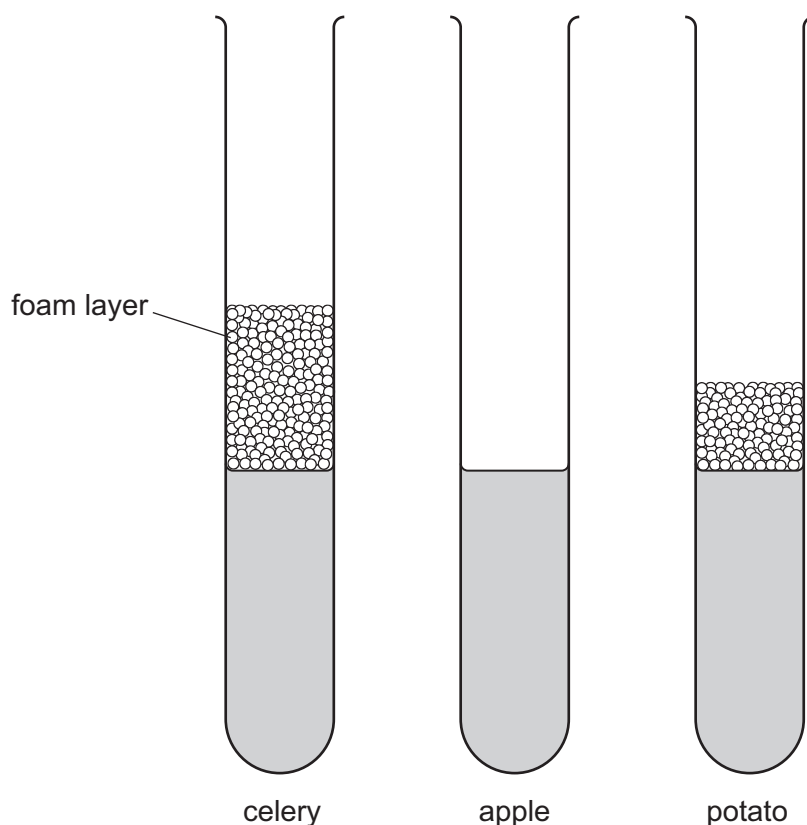


Fig. 1.1





- (i) Measure the height of any foam produced in each test-tube and record these values in a table. [7]

- (ii) Use your results to place the three species of plant cells in order of catalase activity.

most active	
↓	
least active	

[1]

- (b) (i) Suggest why the three plant tissues were crushed before adding the hydrogen peroxide solution.

.....
 [1]

- (ii) Suggest why the plant suspensions were stirred before adding the hydrogen peroxide solution.

.....

 [2]

- (iii) State **one** variable that was controlled in this investigation.

.....
 [1]





- (iv) Suggest **two** reasons why repeating the investigation would give the student more confidence in the results.

1

.....

2

.....

[2]

- (c) Another student used the same procedure using a celery cell suspension and hydrogen peroxide. Instead of using a test-tube, they used a measuring cylinder. They measured the total volume of the contents of the measuring cylinder every minute for 5 minutes.

These measurements are shown in Table 1.1. The student did not record the measurement at 4 minutes.

Table 1.1

time / minutes	total volume of contents / cm ³
0	4.0
1	11.0
2	16.0
3	19.5
5	20.5

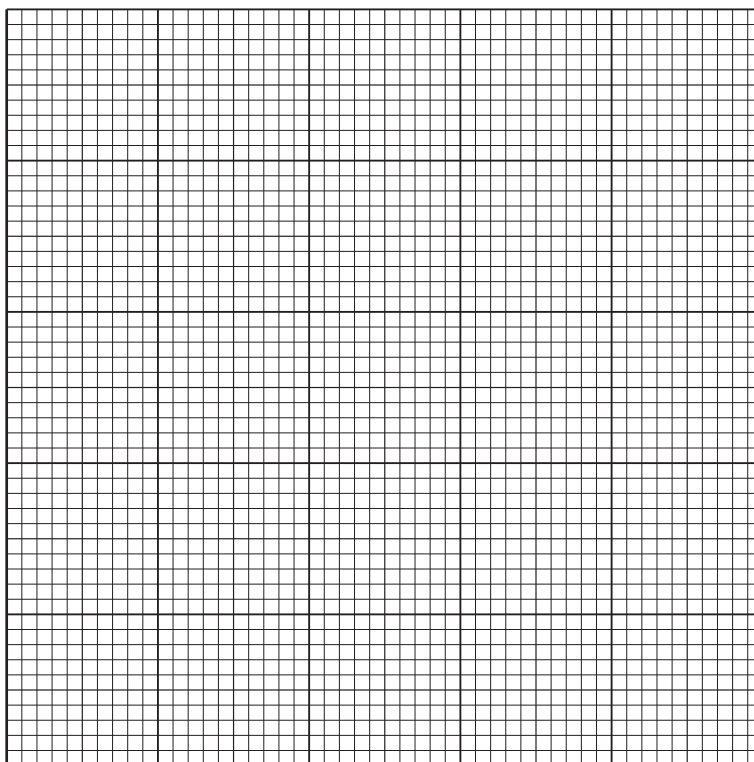




- (i) Construct a graph of the data in Table 1.1 on the grid below.

Join your plotted points with ruled, straight lines.

[4]



- (ii) Use your graph to estimate the total volume of the contents of the measuring cylinder at 4 minutes.

Show your working on your graph.

total volume at 4 minutes [3]

- (iii) Describe and explain the shape of your graph.

.....

 [3]

[Total: 24]



2 Fig. 2.1 is a photomicrograph of a section of a celery plant.

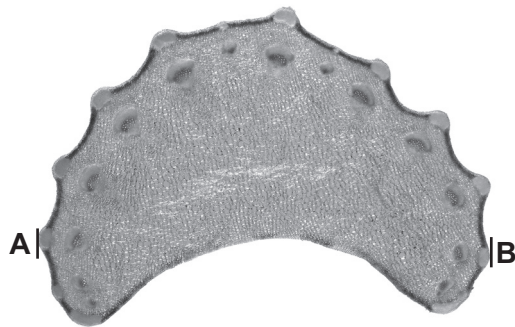


Fig. 2.1

(a) In the space below, make a large drawing of the plant section as it appears in the photomicrograph.



- (b) (i) Draw a straight line to join **A** and **B** on Fig. 2.1. This is the length of the plant section in the photomicrograph. Measure and record this length.

length **A–B** mm [1]

- (ii) **On your drawing**, draw a straight line in the same position as the line **A–B** you have drawn on the photomicrograph. Measure and record the length of this line.

length of line on drawing mm [1]

- (iii) Use your measurements in **(b)(i)** and **(b)(ii)** to calculate the magnification of your drawing compared to the photomicrograph. Record your answer to 2 decimal places.

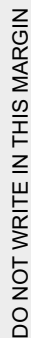
Show your working.

magnification $\times$ [3]

[Total: 10]



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