Cambridge Assessment International Education

# Cambridge IGCSE™

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*2231347896*

**BIOLOGY** **0610/63**

Paper 6 Alternative to Practical **May/June 2024**

**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 **16** pages. Any blank pages are indicated.

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**1** Catalase is an enzyme that catalyses the breakdown of hydrogen peroxide to form water and oxygen.

A student investigated the activity of catalase in tissues from two different plants.

The oxygen produced during the breakdown of hydrogen peroxide forms a foam.

The height of the foam can be used as a measure of the activity of the catalase present in plant tissue.

The student used this method:

Step 1 Label one test-tube **P** and another test-tube **A**.

Step 2 Cut a cylinder of tissue from a potato and a cylinder of tissue from an apple.

Step 3 Cut a potato cylinder into five equal pieces. Each piece should be approximately 4 mm in length, as shown in Fig. 1.1.

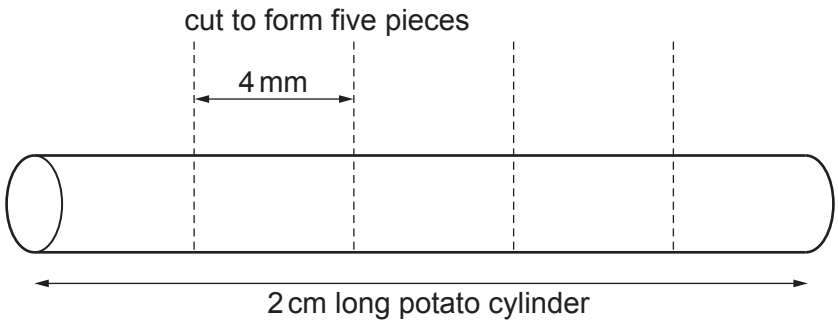


**Fig. 1.1**

Step 4 Put all five potato pieces into test-tube **P**. Place the test-tube in a test-tube rack.

Step 5 Repeat steps 3 and 4 using the apple cylinder and the test-tube labelled **A**.

Step 6 Use a syringe to put 15 $cm^3$ of hydrogen peroxide solution into test-tube **P**.

Step 7 Start a stop-clock and wait for five minutes.

Step 8 After five minutes, place a ruler against the outside of test-tube **P** and measure the maximum height of the foam.

Step 9 Repeat steps 6 to 8 with test-tube **A** and the pieces of apple.

Fig. 1.2 shows a diagram of test-tube **P** and test-tube **A** in step 8 and step 9.

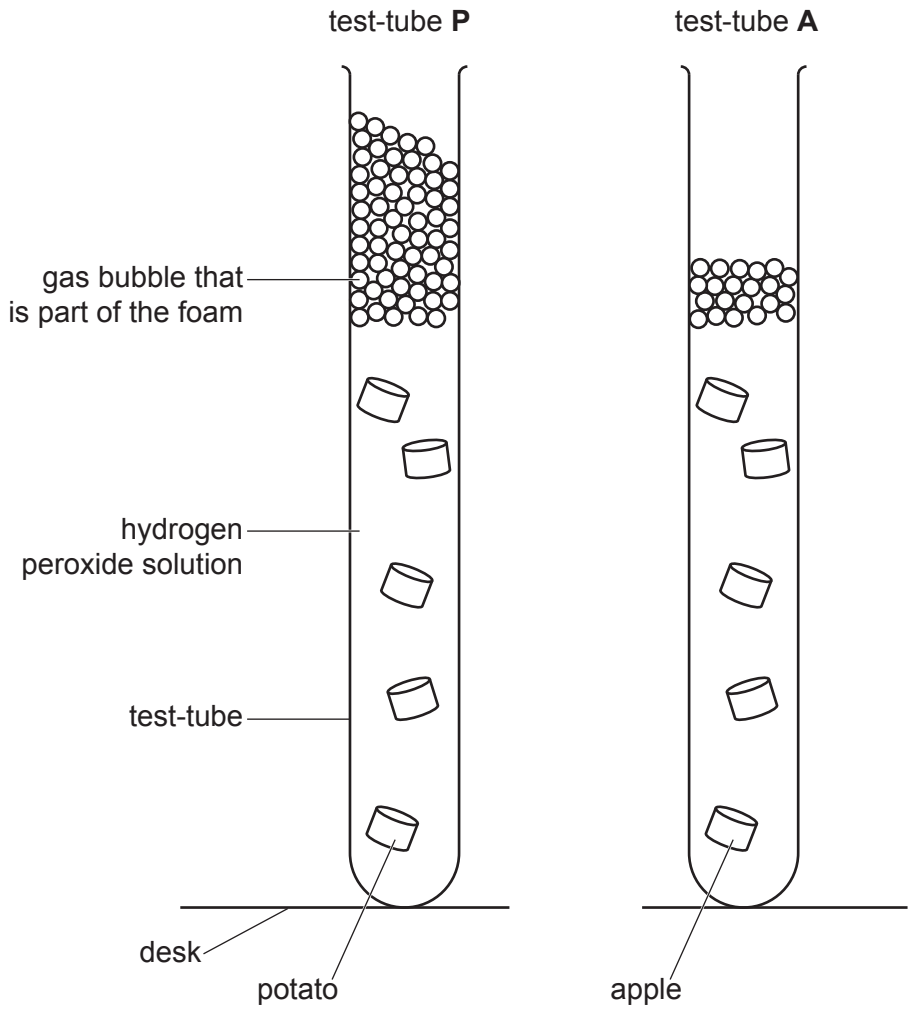


**Fig. 1.2**

**(a)** **(i)** Measure the maximum heights of the foam in test-tube **P** and test-tube **A** in Fig. 1.2.

Prepare a table and record these measurements in your table.

[3]

**(ii)** State a conclusion for the results.

.....

.....

..... [1]

**(iii)** State the independent and dependent variables in this investigation.

independent .....

dependent .....
[2]

**(iv)** State **two** variables that were kept constant in this investigation.

1 .....

2 .....
[2]

**(v)** Identify **one** possible source of error in step 8 and describe an improvement to the method that would eliminate this error.

error in step 8 .....

.....

.....

improvement .....

.....

.....
[2]

**(vi)** Identify **one** safety hazard when carrying out this investigation and describe how the risk of this hazard could be reduced.

safety hazard .....

.....

method of reducing risk.....

.....

.....
[2]

**(b)** Describe how you could test samples of potato and apple to determine if vitamin C is present.

Give the result of a positive test.

test .....

.....

result .....

.....
[2]

**(c)** Amylase is an enzyme that catalyses the breakdown of starch to form reducing sugars.

Plan an investigation to determine the effect of temperature on the rate of breakdown of starch by amylase.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

[Total: 20]

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**2** Fig. 2.1 is a photomicrograph of part of an egg case from a species of stick insect, *Acrophylla titan*.

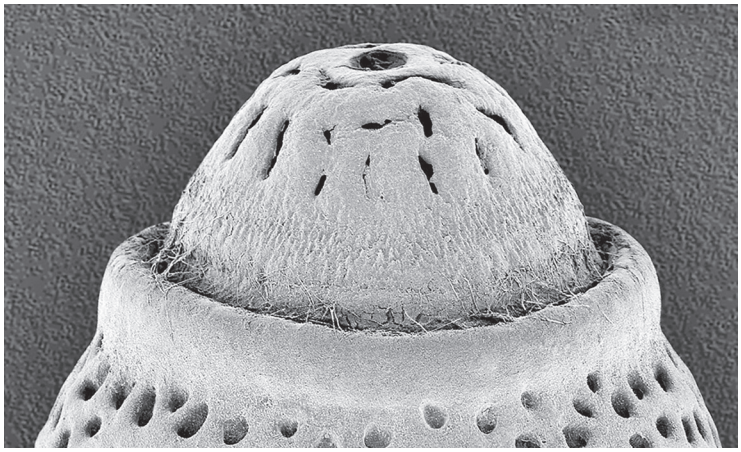


**Fig. 2.1**

**(a)** **(i)** Draw a large diagram of the part of the egg case shown in Fig. 2.1.

[4]

**(ii)** Line **PQ** on Fig. 2.2 represents the length of the whole egg case.

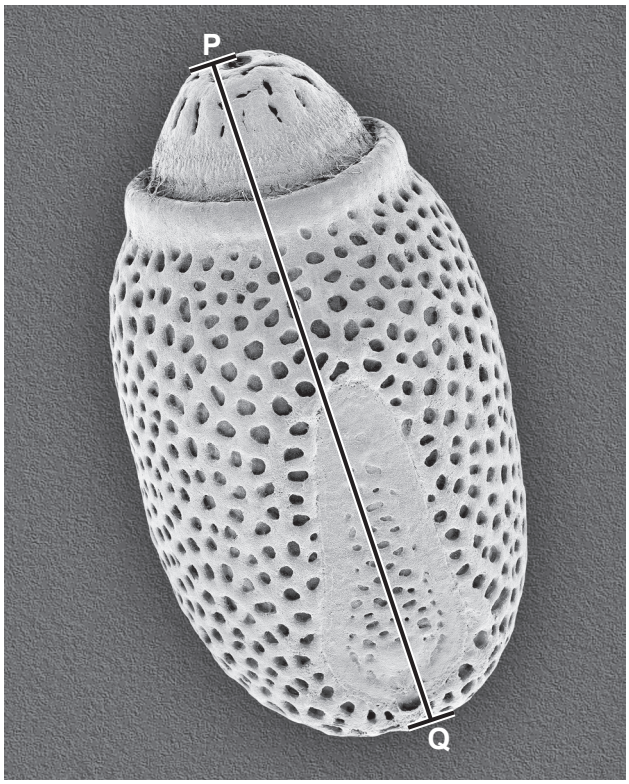



**Fig. 2.2**

The actual length of the egg case is 4.5 mm.

Measure the length of line **PQ** on Fig. 2.2.

length of line **PQ** ..... mm

Calculate the magnification of the photomicrograph using the formula and your measurement.

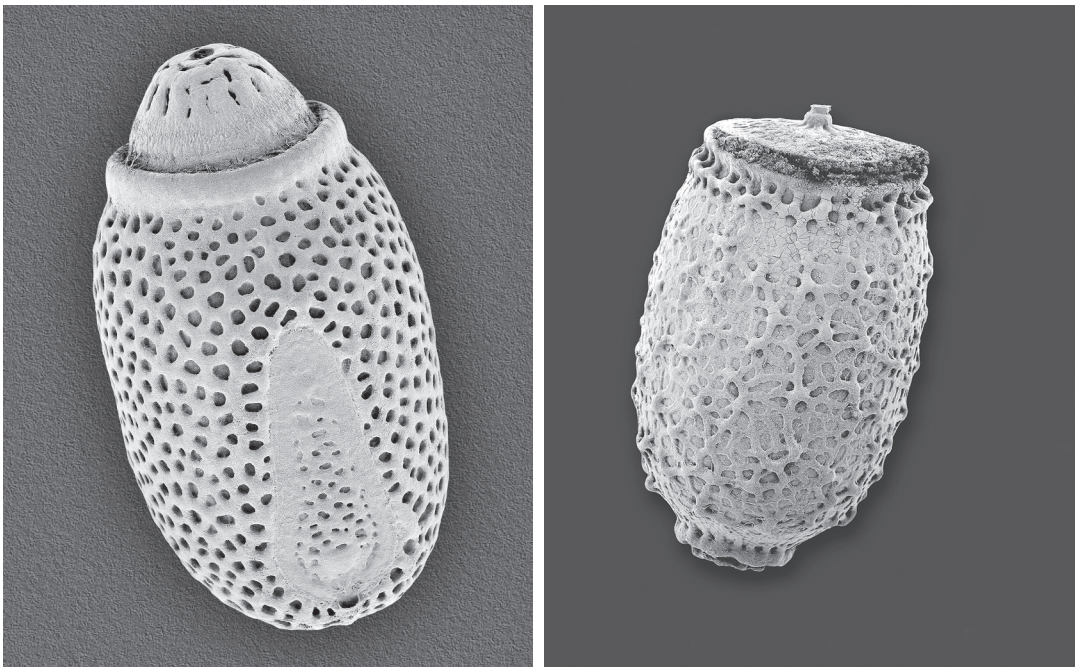
$$\text{magnification} = \frac{\text{length of line } \mathbf{PQ}}{\text{actual length of the egg case}}$$

Give your answer as a whole number.

Space for working.

.....
[3]

**(iii)** Fig. 2.3 shows photomicrographs of the egg cases of *Acrophylla titan* and another species of stick insect, *Lonchodes amaurops*. The magnification of both photomicrographs is the same.



*Acrophylla titan* *Lonchodes amaurops*

**Fig. 2.3**

State **three** visible differences between the two egg cases shown in Fig. 2.3.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

**(b)** The rate of respiration in a stick insect can be measured using a simple respirometer, as shown in Fig. 2.4.

As the stick insect respires the drop of coloured liquid moves along the capillary tube.

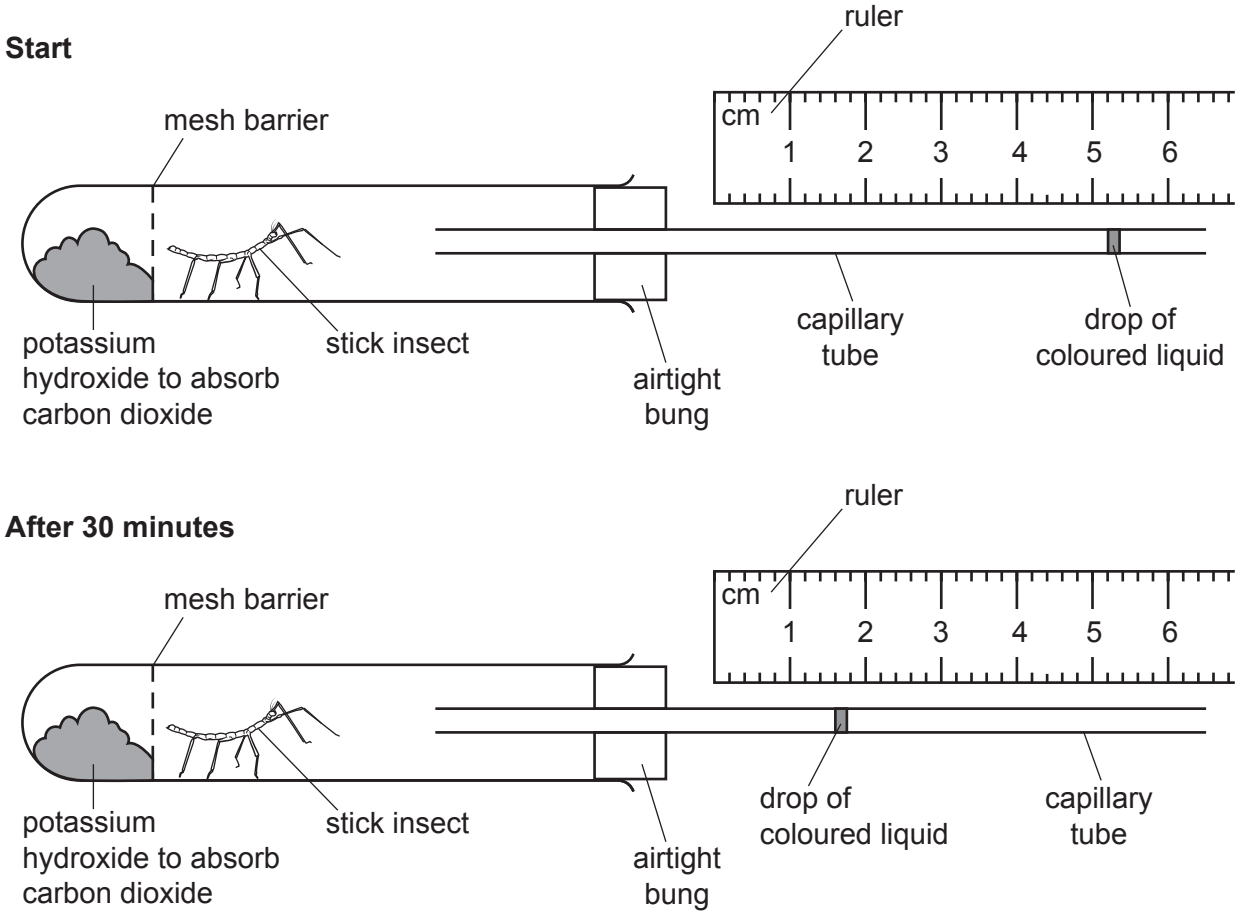



**Fig. 2.4**

**(i)** Record the position in mm of the drop of coloured liquid in the capillary tube shown in Fig. 2.4 at the **start** and **after 30 minutes**.

start ..... mm

after 30 minutes ..... mm

[1]

**(ii)** The capillary tube has an internal radius of 0.25 mm.

Using the information in **2(b)(i)**, calculate the volume of oxygen used by the stick insect in 30 minutes.

Use a value for $\pi$ of 3.14.

Space for working.

..... $mm^3$

[2]

**(iii)** Using your answer to **2(b)(ii)**, calculate the rate of oxygen use by the stick insect.

..... $mm^3$ per minute [1]

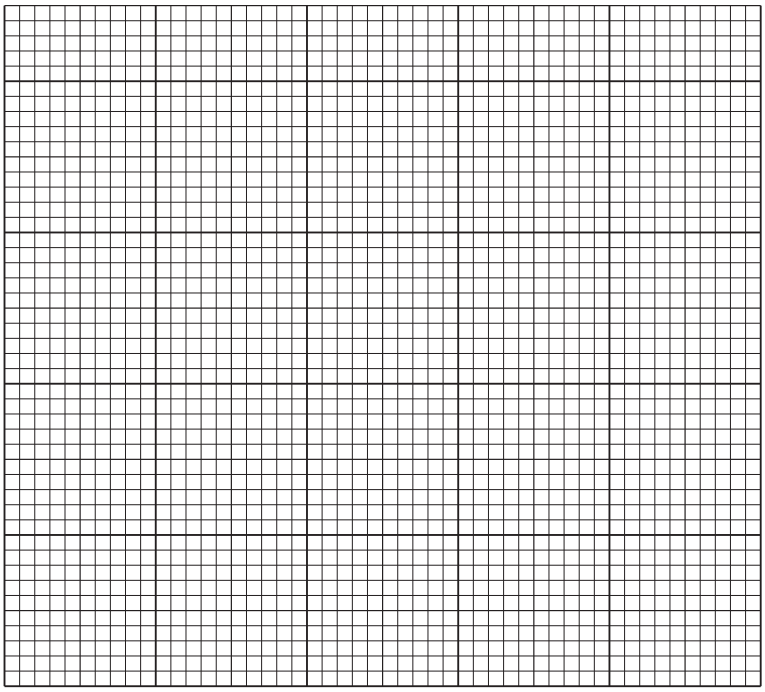
**(c)** Scientists used a respirometer to investigate the effect of temperature on the rate of oxygen use by stick insects.

The results of the investigation are shown in Table 2.1.

**Table 2.1**

| temperature / °C | rate of oxygen use / $mm^3$ per mg per minute |
|---|---|
| 10 | 0.58 |
| 15 | 0.96 |
| 20 | 1.10 |
| 25 | 1.24 |
| 30 | 1.30 |

**(i)** Using the data in Table 2.1, plot a line graph on the grid to show the effect of temperature on the rate of oxygen use.



[4]

**(ii)** Use your graph to estimate the rate of oxygen use by stick insects at a temperature of 18 °C.

Show on your graph how you obtained your estimate.

..... $mm^3$ per mg per minute
[2]

[Total: 20]

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