Cambridge Assessment International Education

# Cambridge IGCSE™ (9–1)

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| CANDIDATE NAME | | | | | | | | | |
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**BIOLOGY** **0970/62**

Paper 6 Alternative to Practical **May/June 2021**

**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 **12** pages. Any blank pages are indicated.

DC (MB) 212495


**[Turn over**

**1** Catalase is an enzyme found in living cells. It catalyses the break-down of hydrogen peroxide to form water and oxygen. In this investigation a celery extract was used as a source of catalase.

A student investigated the effect of catalase concentration on the rate of oxygen production.

The student made five different concentrations of celery extract by diluting the celery extract by 50% in each successive dilution.

Step 1 Five beakers were labelled **A**, **B**, **C**, **D** and **E**.

Step 2 A 10 $cm^3$ measuring cylinder was used to place 10 $cm^3$ of celery extract into beaker **A**.

Step 3 The same measuring cylinder was used to transfer 5 $cm^3$ of celery extract from beaker **A** to beaker **B**. The same measuring cylinder was used to add 5 $cm^3$ of distilled water to beaker **B**.

Step 4 The same measuring cylinder was used to transfer 5 $cm^3$ of celery extract from beaker **B** to beaker **C**. 5 $cm^3$ of distilled water was added to beaker **C**.

Step 5 The same measuring cylinder was used to transfer 5 $cm^3$ of celery extract from beaker **C** to beaker **D**. 5 $cm^3$ of distilled water was added to beaker **D**.

Step 6 The same measuring cylinder was used to transfer 5 $cm^3$ of celery extract from beaker **D** to beaker **E**. 5 $cm^3$ of distilled water was added to beaker **E**.

**(a) (i)** Table 1.1 shows the concentrations of the celery extract in beakers **A** to **E**.

**Table 1.1**

| beaker | percentage concentration of celery extract |
|---|---|
| **A** | 100.00 |
| **B** | 50.00 |
| **C** | ..... |
| **D** | 12.50 |
| **E** | 6.25 |

Complete Table 1.1 by calculating and writing in the percentage concentration of celery extract in beaker **C**. [1]

Step 7 Small filter paper discs were dipped into the celery extracts in beakers **A** to **E**.

Step 8 The paper disc dipped in celery extract **A** was placed into a test-tube and was pushed to the bottom of the test-tube with a glass rod.

Step 9 A syringe was used to put 18 $cm^3$ of 1% hydrogen peroxide solution into the test-tube.

The apparatus is shown in Fig. 1.1.

The student recorded the time taken for the paper disc to rise to the surface of the hydrogen peroxide solution.

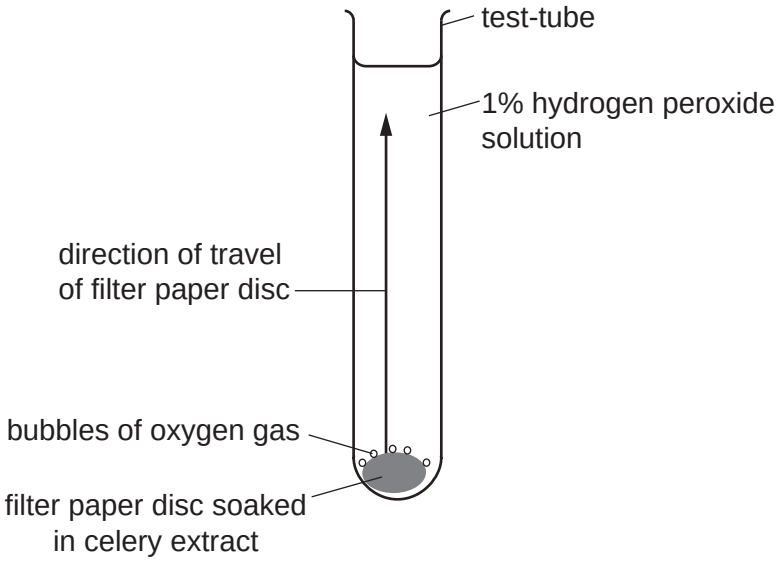


**Fig. 1.1**

Step 10 Steps 8 and 9 were repeated using the paper discs dipped in celery extracts **B**, **C**, **D** and **E**.

The times taken for each paper disc to rise are shown in Fig. 1.2.


celery extract **A** celery extract **B** celery extract **C** celery extract **D** celery extract **E**

**Fig. 1.2**

**(ii)** Prepare a table to record the results shown in Fig. 1.2. Record all the times in seconds.

[4]

**(iii)** State a conclusion for this investigation.

.....

.....

..... [1]

**(iv)** Identify the variable that the student changed (independent variable) and the variable that was measured (dependent variable) in this investigation.

independent variable .....

.....

dependent variable .....

.....

[2]

**(b) (i)** The oxygen gas produced by the reaction forms bubbles on the paper disc. The bubbles cause the disc to rise to the top of the hydrogen peroxide solution. The time taken for the disc to rise can be used to calculate the rate of the reaction.

Explain how you could calculate the rate at which the disc rises.

.....

.....

.....

..... [2]

**(ii)** Identify **one** source of error in step 4.

.....

.....

..... [1]

**(iii)** Describe a suitable control for this investigation.

.....

.....

..... [1]

**(c)** Sodium chloride affects the activity of the enzyme catalase.

This enzyme catalyses the break-down of hydrogen peroxide to release water and oxygen gas.

$$2H_2O_2 \xrightarrow{\text{catalase}} 2H_2O + O_2$$

hydrogen peroxide — water — oxygen

Plan an experiment to determine the effect of sodium chloride concentration on the volume of oxygen gas produced during this reaction.

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.....

.....

.....

.....

..... [6]

**(d)** The enzyme catalase is a protein.

State the test for protein and state the result of a positive test.

test .....

.....

positive test result .....

.....

[2]

[Total: 20]

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**2** **(a)** The photograph in Fig. 2.1 shows a leaf from a European holly tree (*Ilex aquifolium*).

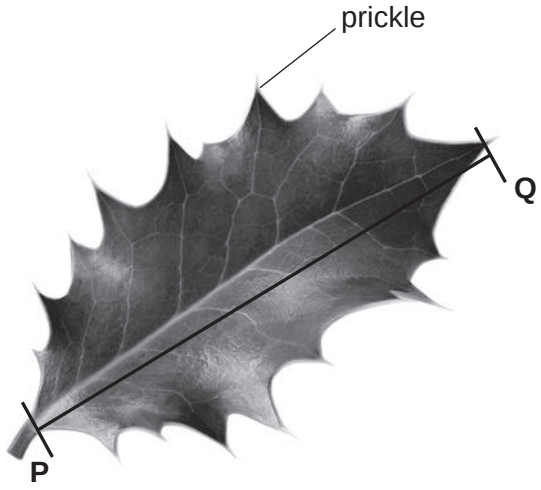



**Fig. 2.1**

**(i)** Draw a large diagram of the holly leaf shown in Fig. 2.1.

Do **not** label your drawing.

[4]

**(ii)** The line **PQ** on Fig. 2.1 shows the length of the leaf.

Measure the length of line **PQ** on Fig. 2.1. Include the unit.

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

Draw a line on your drawing in the same position as line **PQ** in Fig. 2.1.

Measure the length of the line you have drawn. Include the unit.

length of the line on your drawing .....

Calculate the magnification of your drawing using your measurements and the formula.

$$\text{magnification} = \frac{\text{length of the line on your drawing}}{\text{length of line } \mathbf{PQ} \text{ in Fig. 2.1}}$$

Space for working.

.....
[3]

**(b)** Students investigated the relationship between the number of prickles on holly leaves and the height of the leaves above the ground.

- The students collected leaves from a total of five holly trees.
- The students took leaves from seven different heights on each holly tree.
- They collected 10 leaves from each height on each tree.
- They counted the number of prickles on each of the holly leaves and calculated the average number of prickles per leaf at each height.

The results of the investigation are shown in Table 2.1.

**Table 2.1**

| height above ground on each holly tree / m | average number of prickles per leaf |
|---|---|
| 0.5 | 18 |
| 1.0 | 14 |
| 1.5 | 13 |
| 2.0 | |
| 3.0 | 8 |
| 4.0 | 3 |
| 5.0 | 1 |

**(i)** The students counted a total of 614 prickles on the leaves collected at a height of 2.0 metres.

Calculate the total number of leaves collected at 2.0 metres above ground .....

Calculate the average number of prickles per leaf.

Give your answer to the nearest whole number.

Space for working.

.....

[3]

**(ii)** State **two** ways the students ensured that they collected a representative sample of leaves.

1 .....

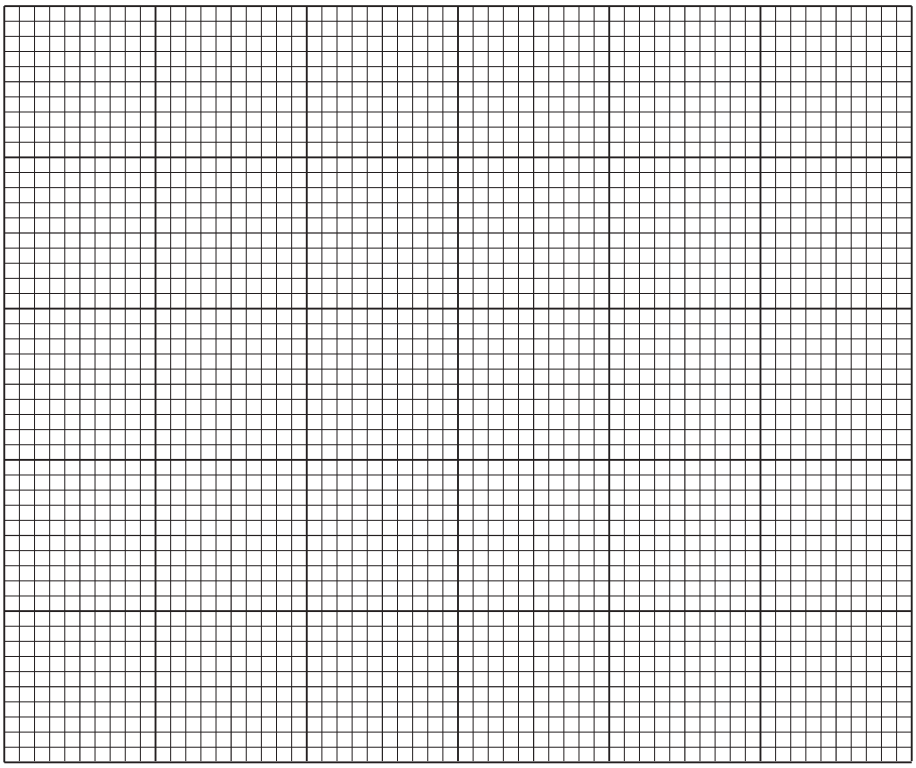
.....

2 .....

.....

[2]

**(iii)** Plot a line graph on the grid to show the data in Table 2.1. Include a line of best fit.



[4]

**(c)** Fig. 2.2 shows another holly leaf.

**Fig. 2.2**

Count and record the number of prickles on the leaf shown in Fig. 2.2.

Use the information in Table 2.1 or your graph in **2(b)(iii)** to estimate the height on the tree from which this holly leaf was collected.

number of prickles .....

estimated height on the holly tree ..... m

[2]

**(d)** Leaves contain starch.

State the solution used to test for starch and give the result of a positive test.

solution .....

.....

positive test result .....

.....

[2]

[Total: 20]