Enzymes

Question Paper 2

Level	IGCSE
Subject	Biology
Exam Board	CIE
Topic	Enzymes
Sub-Topic	
Paper Type	Alternative to Practical
Booklet	Question Paper 2

Time Allowed: **56 minutes**

Score: **/46**

Percentage: **/100**

1 Catalase is an enzyme found in plant and animal tissues.
It catalyses the breakdown of hydrogen peroxide into water and oxygen.

$$\underset{\text{hydrogen peroxide}}{2H_2O_2} \rightarrow 2H_2O + O_2$$

The activity of this enzyme can be measured by collecting the volume of oxygen gas given off as shown in Fig. 1.1.

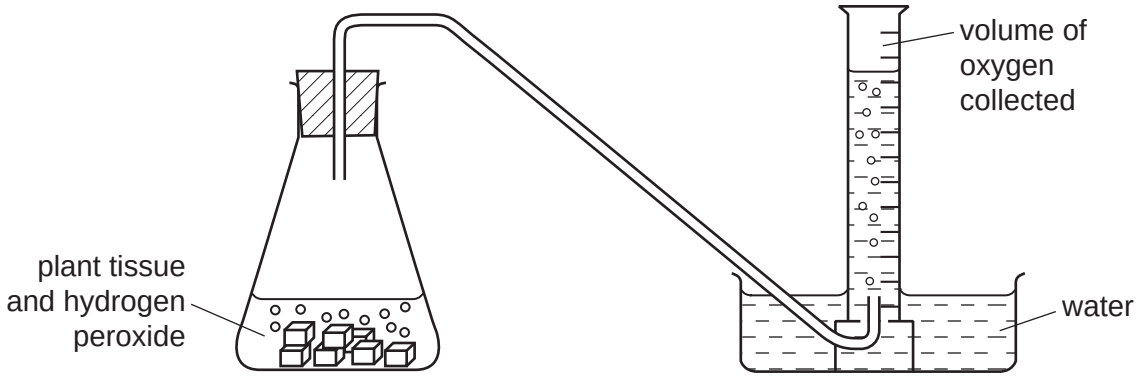

Fig. 1.1

Some students compared the catalase activity in two plant tissues, **sweet potato**, *Ipomoea batanus*, and **Irish potato**, *Solanum tuberosum*.

- 2.0 g of **sweet potato** was cut into small pieces.
- The small pieces were placed in a flask together with 25 cm^3 of hydrogen peroxide.
- The bung and delivery tube were fitted to the flask, as shown in Fig. 1.1.
- The volume of oxygen gas released was measured after 4 minutes (experiment 1).
- This was repeated three times (experiments 2, 3 and 4).
- The same procedure was carried out with 2.0 g of **Irish potato** cut into small pieces.
- The results are shown in Table 1.1.

Table 1.1

experiment	volume of oxygen gas / cm^3	
	sweet potato	**Irish potato**
1	32.0	12.5
2	20.0	9.0
3	35.5	8.5
4	28.0	10.0
total	115.5	
mean	28.9	

(a) (i) The total volume of oxygen gas and the mean volume of oxygen gas have been calculated for the **sweet potato**.

Calculate these values for the **Irish potato**.

Show your working below.

Write your answers in Table 1.1. [2]

(ii) Suggest why the tissues were cut into small pieces before being added to the flask.

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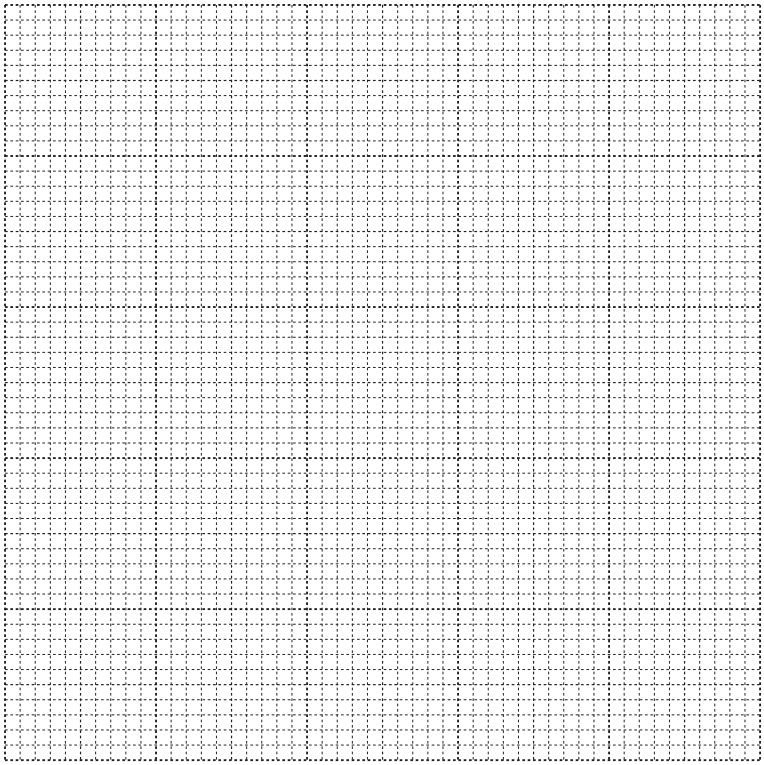
(b) (i) Draw a bar chart to show the volumes of oxygen gas collected for the **sweet potato**.

Draw a horizontal line across your bar chart to show the mean value.



[5]

(ii) Suggest two reasons for the variation in the results of the four **sweet potato** experiments.

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(c) Suggest and explain **two** ways in which a similar investigation could be planned to collect more reliable data.

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[Total: 14]

2 Enzymes are used commercially to extract fruit juices. The use of enzymes increases the volume of juice produced.

An investigation was carried out to determine the volume of apple juice produced at different temperatures.

Mixtures of apple pulp and enzyme were left for 15 minutes at different temperatures.

After 15 minutes, the mixtures were filtered and the juice collected.

Fig.1.1 shows the volume of juice collected from each mixture.

(a) (i) Record the volume of juice in each measuring cylinder in Table 1.1.

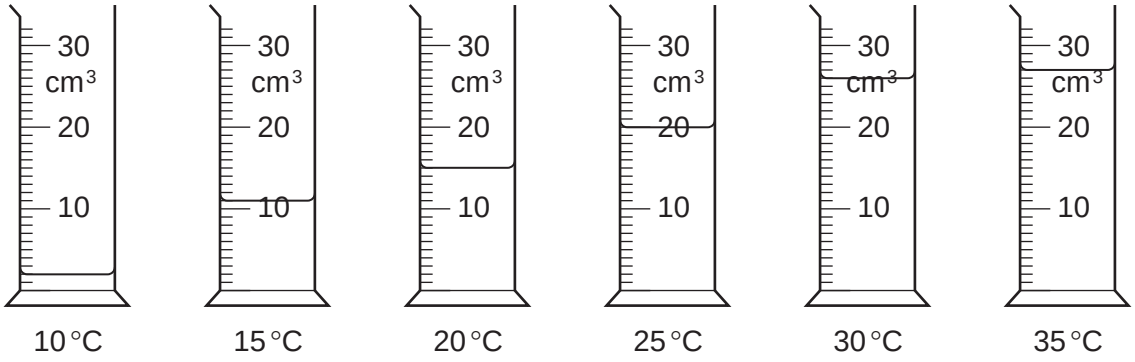


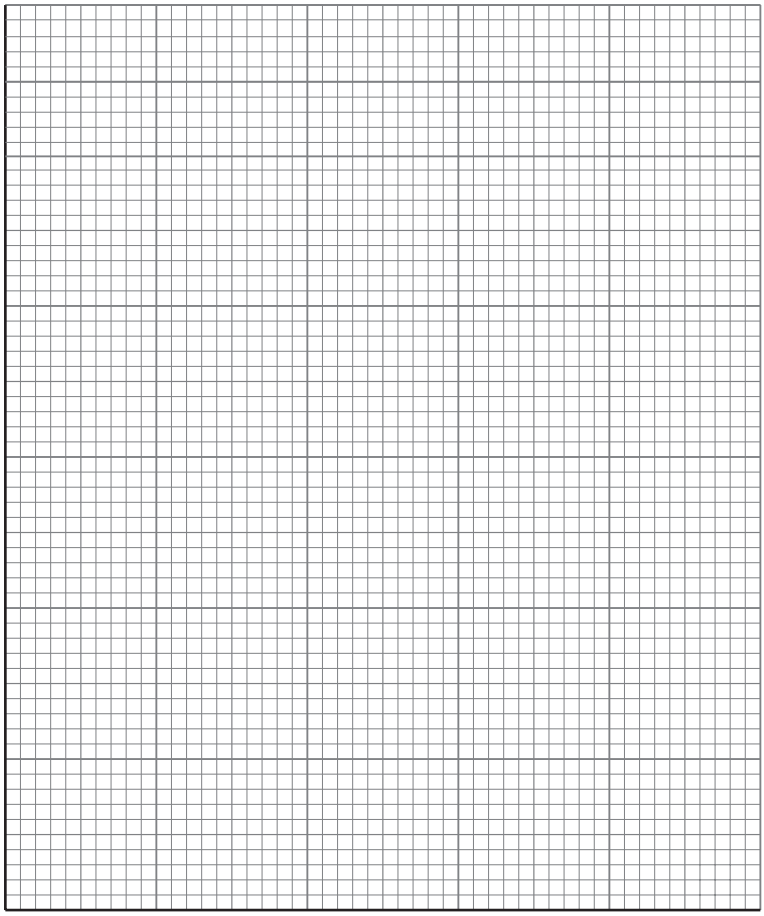
Fig. 1.1.

Table 1.1

temperature / °C	volume of juice collected / cm^3
10	
15	
20	
25	
30	
35	

[3]

(ii) Present the data in a suitable graphical form.



[5]

(iii) Describe the results.

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(b) Describe an investigation to show the effect of pH on the activity of the enzyme that is used to extract apple juice.

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[Total : 16]

3 Catalase is an enzyme which breaks down hydrogen peroxide into water and oxygen.

$$2\ H_2O_2 \rightarrow 2\ H_2O + O_2$$

By using small pieces of filter paper soaked in a solution of catalase, it is possible to measure the enzyme activity.

The pieces are placed in a solution of diluted hydrogen peroxide in a test-tube.

The filter paper rises to the surface as oxygen bubbles are produced.

The time taken for these pieces of filter paper to rise to the surface indicates the activity of catalase.

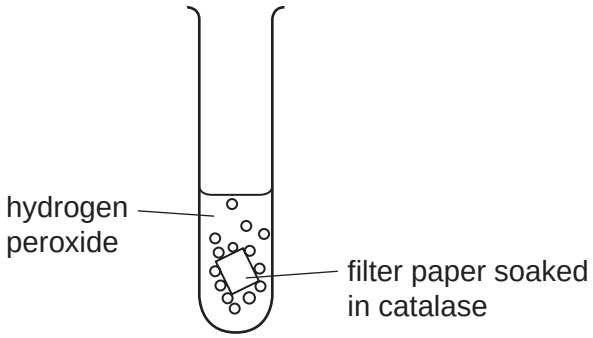


Fig. 3.1

An experiment was carried out to find the effect of pH on the activity of catalase.

Five test-tubes were set up as shown in Fig. 3.1, each with a different pH.

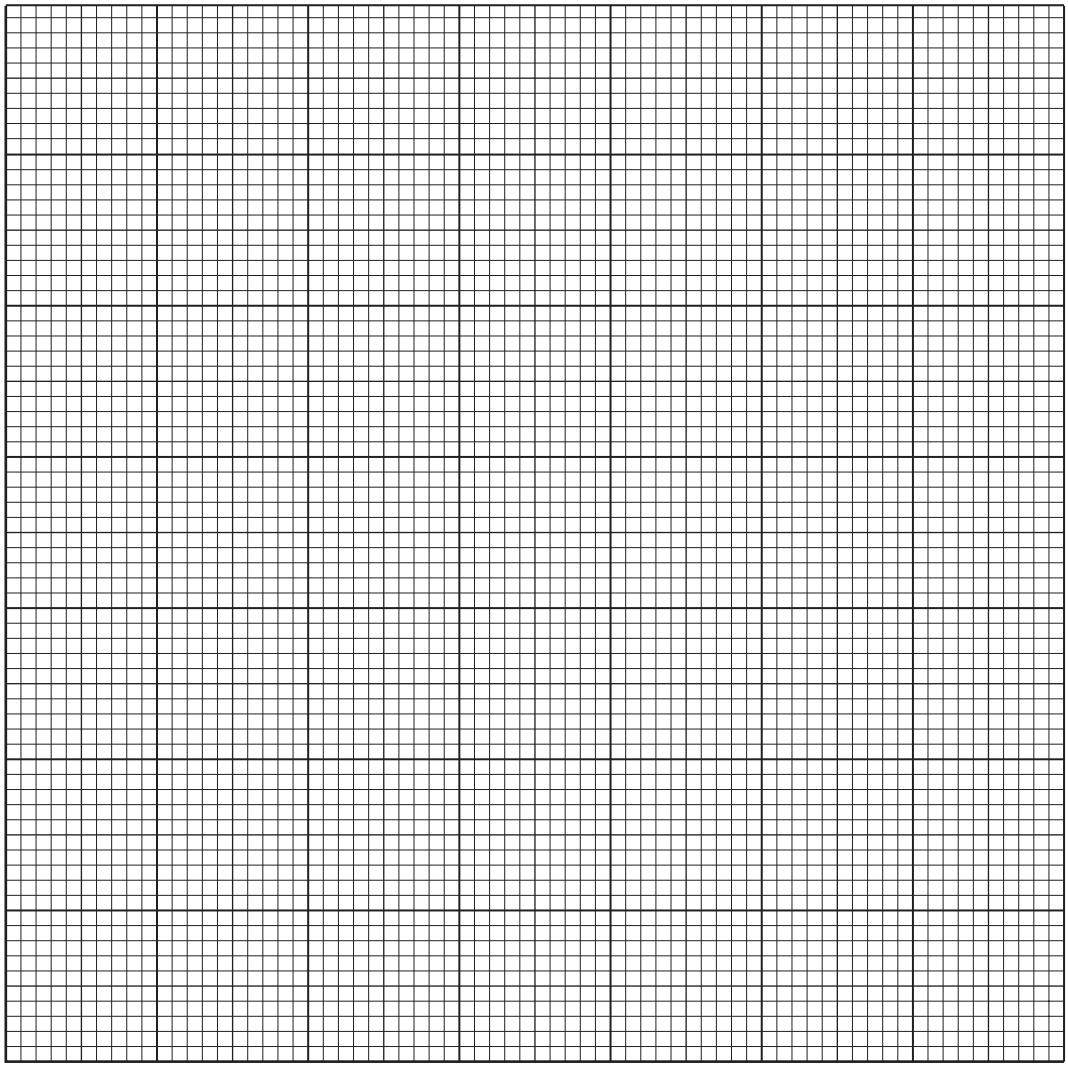
The same volume and concentration of hydrogen peroxide was used in each test-tube.

Table 3.1 on page 8 shows the results obtained for the experiment as described.

Table 3.1

pH	time taken for filter paper to rise / sec
3.0	62
4.0	54
5.0	35
6.0	25
7.0	20
8.0	50

(a) (i) Plot a line graph to show the time taken for the filter paper to rise against pH.



[4]

(ii) Describe the relationship between pH and the time taken for the filter paper to rise.

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(b) Suggest four ways in which this experiment could be improved.

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(c) Suggest how this experiment could be changed to investigate the effect of temperature on the activity of catalase.

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[Total: 16]