Enzymes

Question Paper 1

Level	IGCSE
Subject	Biology
Exam Board	CIE
Topic	Enzymes
Sub-Topic	
Paper Type	Alternative to Practical
Booklet	Question Paper 1

Time Allowed: **60 minutes**

Score: **/50**

Percentage: **/100**

1 Fig. 1.1 shows part of an orange.

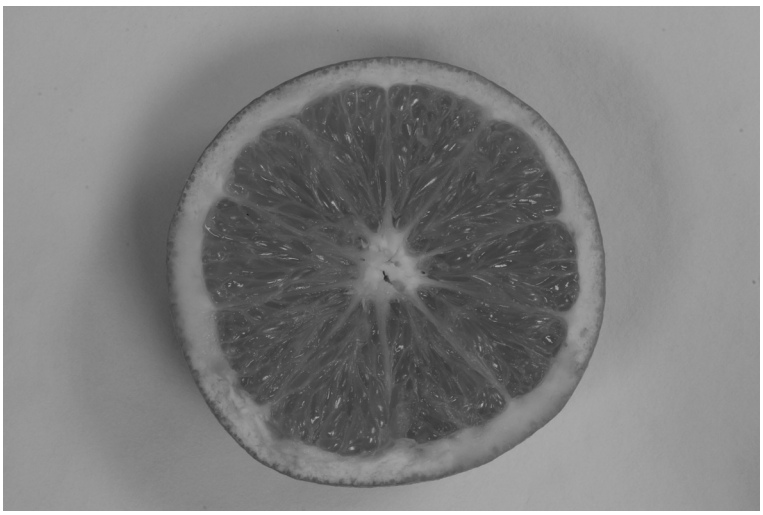

Fig. 1.1

(a) Make a large, labelled drawing of the cut surface of this fruit to show the internal structure.

[4]

Juice can be extracted from fruits on a commercial scale. This process uses an enzyme to digest part of the plant structure to release a larger volume of juice.

The juice of citrus fruits, such as the orange, is acidic.

Students investigated the effect of pH on the activity of this enzyme.

Buffer solutions **X** and **Y** were used to change the pH.

Pieces of Universal Indicator paper were used to test the pH of buffer solutions **X** and **Y**.

(b) Observe the shade of the pieces of Universal Indicator paper shown in Fig. 1.2 and estimate the pH by comparing with the chart.

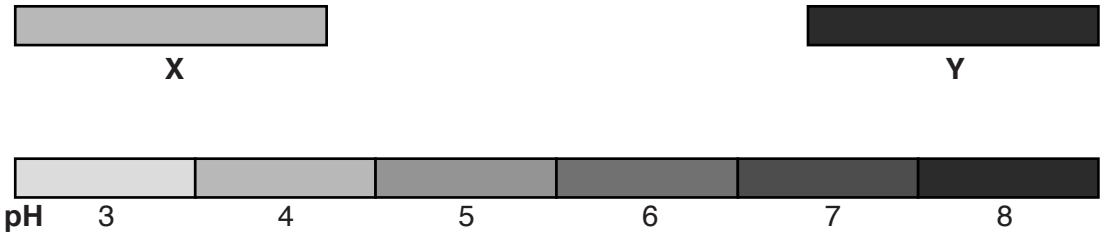

Fig. 1.2

pH of buffer **X** ..... pH of buffer **Y** .....

[2]

Four plastic cups **A**, **B**, **C** and **D** were set up as shown in Table 1.1.

Table 1.1

contents	volume of contents added / cm^3			
	A	**B**		
crushed fruit	25	25	25	25
buffer **X**	5	5		
buffer **Y**	–	–	5	
water	2	–	2	–
enzyme	–	2	–	2

(c) Suggest why water was added to cups **A** and **C**.

.....

.....

.....[1]

The contents of plastic cups **A**, **B**, **C** and **D** were stirred and left to stand for 10 minutes. The contents were then filtered into measuring cylinders.

The results are shown in Fig. 1.3.

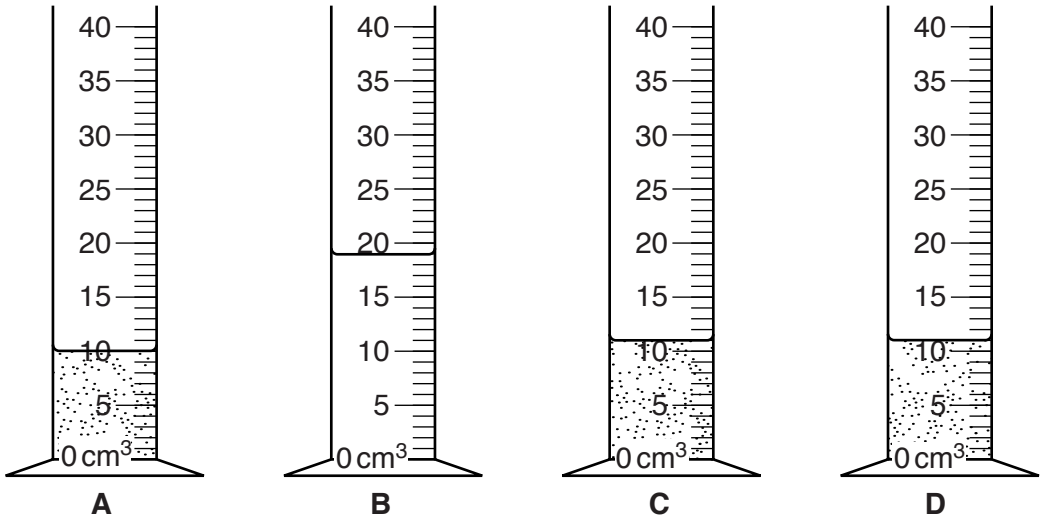

Fig. 1.3

(d) Complete Table 1.2 by recording:

- the units in the appropriate place
- the volume of filtered juice shown in Fig. 1.3.

Table 1.2

volume of juice filtered/……..			
A	**B**		
……..	…..….	……..	……..

[2]

(e) Compare the volumes and describe the appearance of the filtered juice in measuring cylinders:

(i) **A** and **B**

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.....[2]

(ii) **C** and **D**.

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.....

.....[2]

(f) Describe the effect of pH on the enzyme by comparing the volumes and the appearance of the filtered juice in measuring cylinders **B** and **D**.

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.....[3]

(g) **(i)** State **two** variables that were controlled in this investigation.

1 .....

2 .....
[2]

(ii) Suggest **two** ways in which you could modify this investigation to produce more accurate results.

1 .....

.....

2 .....

.....
[2]

[Total: 20]

2 During digestion, the enzyme amylase breaks down starch to maltose, a reducing sugar.

(a) Describe a test you could safely carry out to show the presence of starch in a solution.

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..... [3]

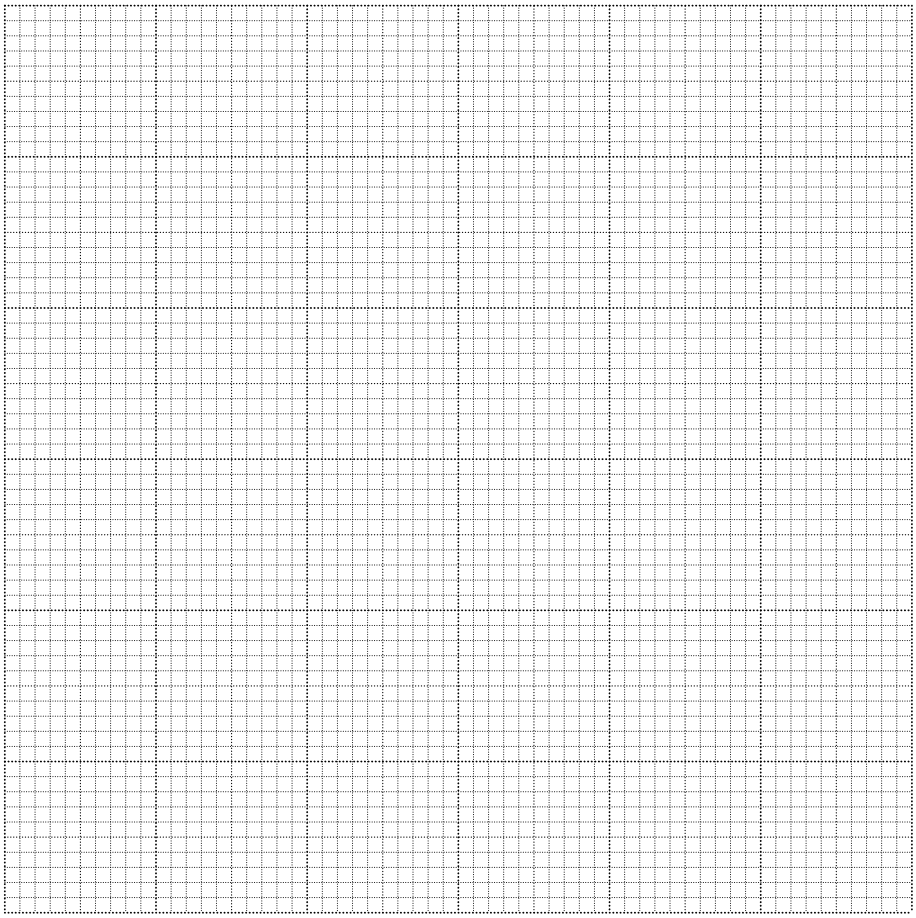
Some students investigated the effect of pH on the activity of amylase during the breakdown of starch. The starch test that you have described in **(a)** was carried out at intervals, until the starch was no longer present.

Their results, in Table 1.1, show the time in minutes for the breakdown of starch using solutions of different pH.

Table 1.1

pH	time / mins
3.0	4.1
4.0	0.5
5.0	0.8
6.0	1.5
7.0	3.5
8.0	4.8

(b) (i) Plot the data from Table 1.1 to show the effect of pH on the time taken for amylase to break down starch.



[4]

(ii) State the optimum (best) pH for the activity of amylase.

..... [1]

(iii) Use this formula to calculate the rate of activity of amylase at the pH given in **(b)(ii)**:

$$\text{rate of enzyme activity} = \frac{1}{\text{time taken in minutes}}$$

Show your working. Give your answer to the nearest whole number.

rate .....

[1]

(iv) Describe the effect of pH on the activity of amylase.

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..... [3]

(c) **(i)** Name **two** variables that need to be controlled in this investigation.

1 .....

2 .....

[2]

(ii) Explain **two** ways this investigation could be improved.

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..... [2]

[Total: 16]

3 Students investigated samples of amylase from 100 goats. 100 small filter paper discs were each soaked in a different sample of goat amylase. The students tested the activity of these amylase samples using plain paper. Plain paper contains starch.

A circle of plain paper was placed into a Petri dish as shown in Fig. 1.1. Iodine solution was used to stain the starch in the plain paper.

(a) When iodine solution reacts with the starch in the plain paper, what colour would you see?

.....

[1]

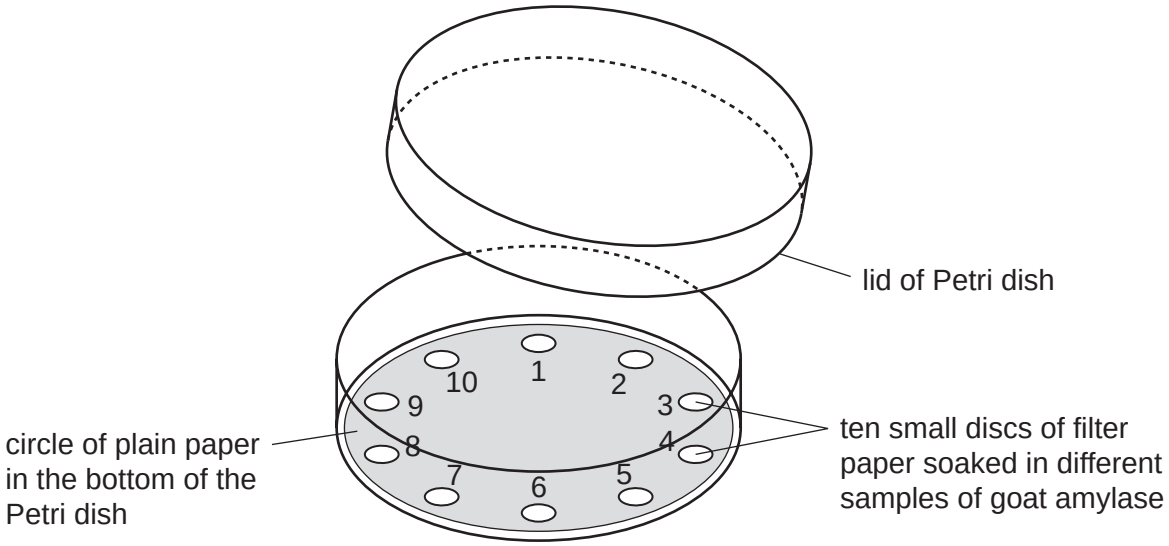


Fig. 1.1

Ten amylase soaked filter paper discs were placed into one of the Petri dishes as shown in Fig. 1.1.

Ten Petri dishes were set up as in Fig. 1.1.

The students lifted the filter paper discs at one-minute intervals and recorded the number of areas where there had been a reaction.

(b) How would the students know that a reaction had taken place?

.....

[1]

If a reaction had not taken place, the students replaced the disc of filter paper for another minute. This procedure was repeated for five minutes.

Their results are recorded in Table 1.1.

Table 1.1

time / minutes	number of **new** areas where there had been a reaction	**total** number of areas where there had been a reaction
1	14	14
2	28	42
3	18	60
4	12	.....
5	6	.....

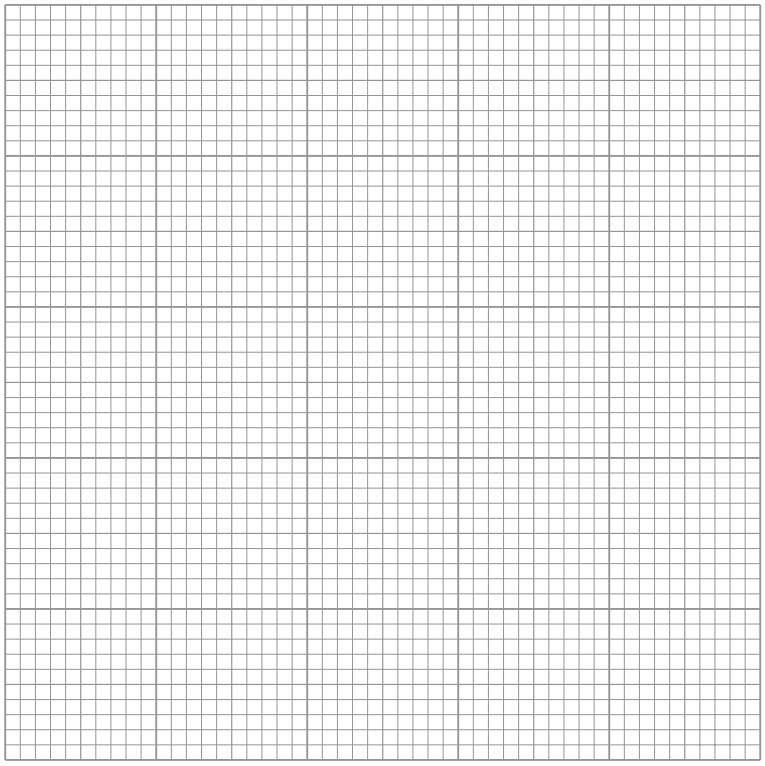
(c) (i) Complete Table 1.1 by calculating the total number of areas where there had been a reaction after 4 and 5 minutes.

Write your answers in the spaces in Table 1.1.

Show your working in the space below.

[2]

(ii) Plot the data from the **first two columns** in Table 1.1, to show the differences in the activity of amylase.



[5]

(iii) Suggest **two** reasons for the differences in amylase activity of the samples.

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..... [2]

(d) Suggest **three** ways in which you could improve this investigation.

1. .....

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2. .....

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3. .....

..... [3]

[Total: 14]