

PPQ 5 – Enzymes

1 Which substance is an enzyme?

- A bile
- B fibrinogen
- C lipase
- D maltose

2 (a) Enzyme activity is vital in human digestion.

Complete Table 4.1 by choosing appropriate words from the list.

amino acids amylase cellulose fatty acids
hydrochloric acid lipase protein starch water

Table 4.1

| substrate | enzyme | product |
|-----------|----------|---------------------|
| fat | | glycerol + |
| | protease | |
| | | maltose |

[6]

(b) Maltose is changed into glucose.

- (i) Which part of the blood carries glucose?[1]
- (ii) Which process, happening in all living cells, needs a constant supply of glucose?[1]
- (iii) Excess glucose is stored. Which carbohydrate is glucose changed into for storage?[1]
- (iv) Which organ is the main store of this carbohydrate?[1]
- (v) Name a hormone that causes glucose to be released from storage.[1]

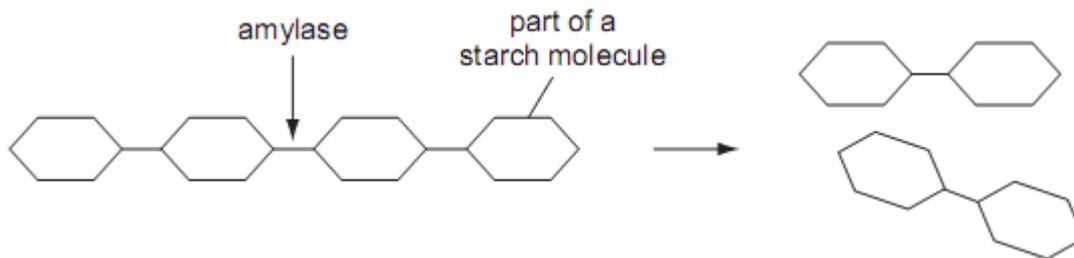
[Total: 11]

3 A human digestive enzyme breaks down its substrate at a fast rate at 35°C.

What would occur if the enzyme and substrate were kept at 75°C?

- A The enzyme would stop working and be denatured.
- B The reaction would continue at the same rate.
- C The reaction would take place more quickly.
- D The reaction would take place more slowly.

4 The diagram shows the action of amylase.



What is the function of the enzyme amylase?

- A breaks down the substrate into amino acids
- B changes the product into the substrate
- C increases the rate of starch breaking down into glucose
- D increases the rate of starch breaking down into maltose

5 Catalase is an enzyme found in plant and animal cells. It has the function of breaking down hydrogen peroxide, a toxic waste product of metabolic processes.

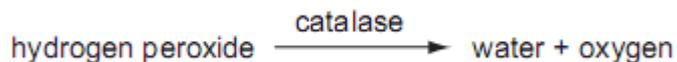
(a) (i) State the term used to describe the removal of waste products of metabolism.

PPQ 5 – Enzymes

(ii) Define the term enzyme. [1]

An investigation was carried out to study the effect of pH on catalase, using pieces of potato as a source of the enzyme. [2]

Oxygen is formed when catalase breaks down hydrogen peroxide, as shown in the equation.



The rate of reaction can be found by measuring how long it takes for 10 cm³ oxygen to be collected.

(b) (i) State the independent (input) variable in this investigation. [1]

(ii) Suggest two factors that would need to be kept constant in this investigation. [2]

1. [1]
2. [2]

Table 3.1 shows the results of the investigation, but it is incomplete.

Table 3.1

| pH | time to collect 10 cm ³ oxygen / min | rate of oxygen production / cm ³ min ⁻¹ |
|----|---|---|
| 4 | 20.0 | 0.50 |
| 5 | 12.5 | 0.80 |
| 6 | 10.0 | 1.00 |
| 7 | 13.6 | 0.74 |
| 8 | 17.4 | |

(c) Calculate the rate of oxygen production at pH 8.

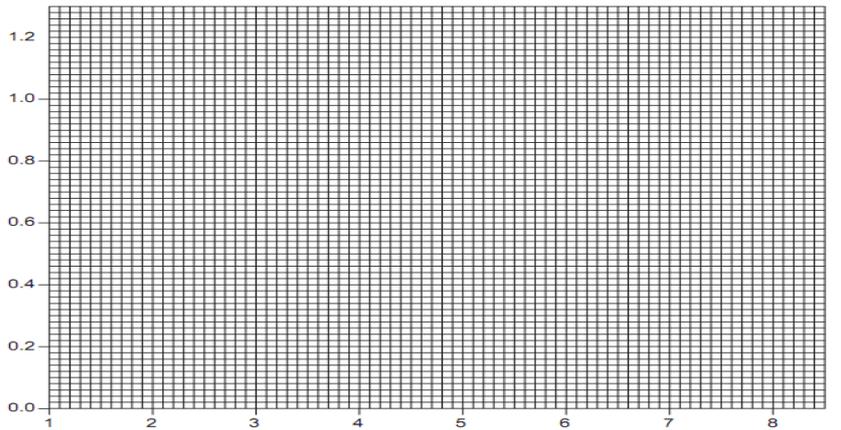
Show your working. Write your answer in Table 3.1 [2]

(d) Complete the graph by plotting the rate of oxygen production against pH.

PPQ 5 – Enzymes

7

(d) Complete the graph by plotting the rate of oxygen production against pH.



For Examiner's Use

[4]

(e) (i) Using data from the graph, describe the changes in the reaction rate between pH 4 and pH 8.

.....

 [2]

(ii) Explain the change in the reaction rate between pH 6 and pH 8.

.....

 [3]

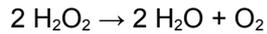
[Total: 17]

[4]
 (e) (i) Using data from the graph, describe the changes in the reaction rate between pH 4 and pH 8.

..... [2]
 (ii) Explain the change in the reaction rate between pH 6 and pH 8.

..... [3]
 [Total: 17]

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



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.

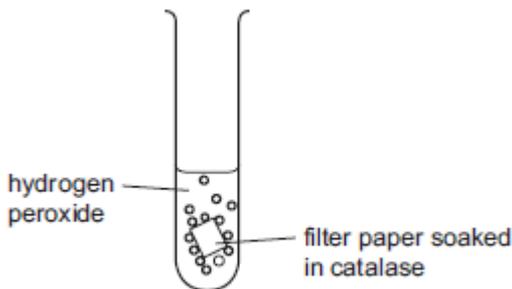


Fig. 3.1

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.

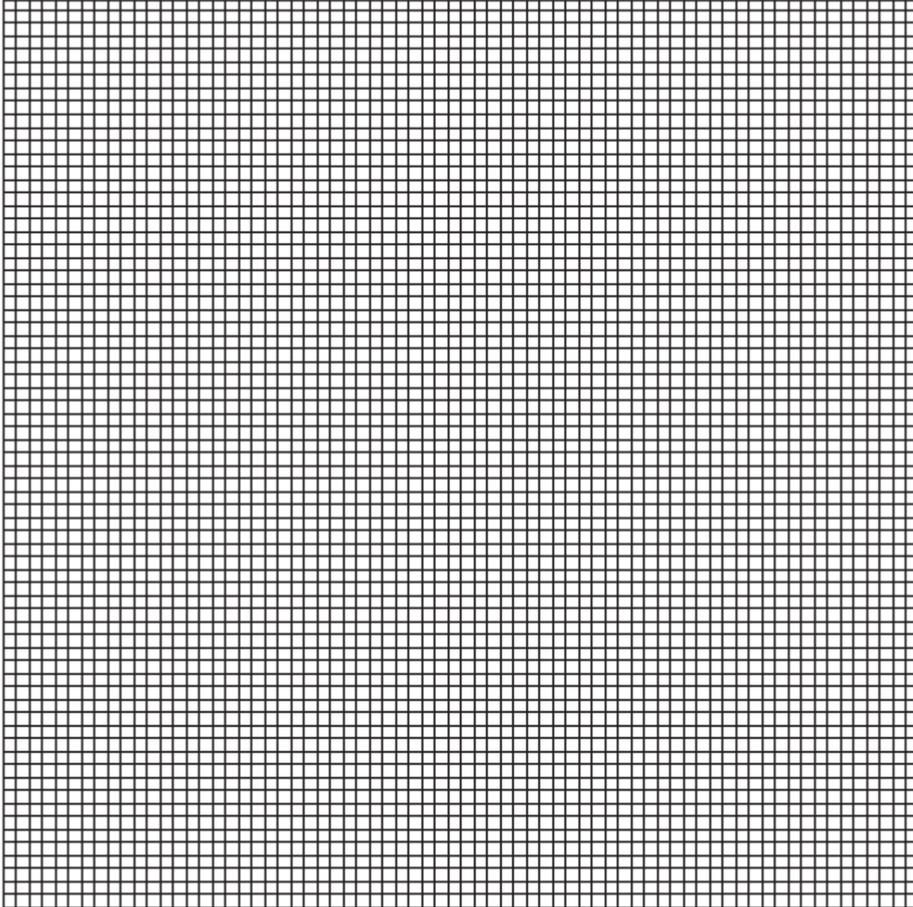
Table 3.1 on page 8 shows the results obtained for the experiment as described.

PPQ 5 – Enzymes

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.

[2]

(b) Suggest four ways in which this experiment could be improved. [4]

(c) Suggest how this experiment could be changed to investigate the effect of temperature on the activity of catalase. [6]

[Total: 16]

7 What are enzymes made of?

- A carbohydrates
- B DNA
- C fats
- D proteins

8 At which temperature do most enzymes from the human body become completely denatured?

- A 0 °C
- B 27 °C
- C 40 °C
- D 65 °C