

- 1 Fig. 1.1A shows a buttercup, *Ranunculus cymbalaria*. Fig. 1.1B shows details of a flower of the same plant.



Fig. 1.1

- (a) Explain, **using only features visible in Fig. 1.1**, why *Ranunculus cymbalaria* is classified as a dicotyledonous plant rather than as a monocotyledonous plant.

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..... [2]

Fig. 1.2 shows a transverse section through a buttercup root at the end of the cold winter (**W**) and at the end of the warm, moist summer (**S**). At the end of the winter, the cells contain very few starch grains. At the end of the summer, most of the root cells contain many starch grains.

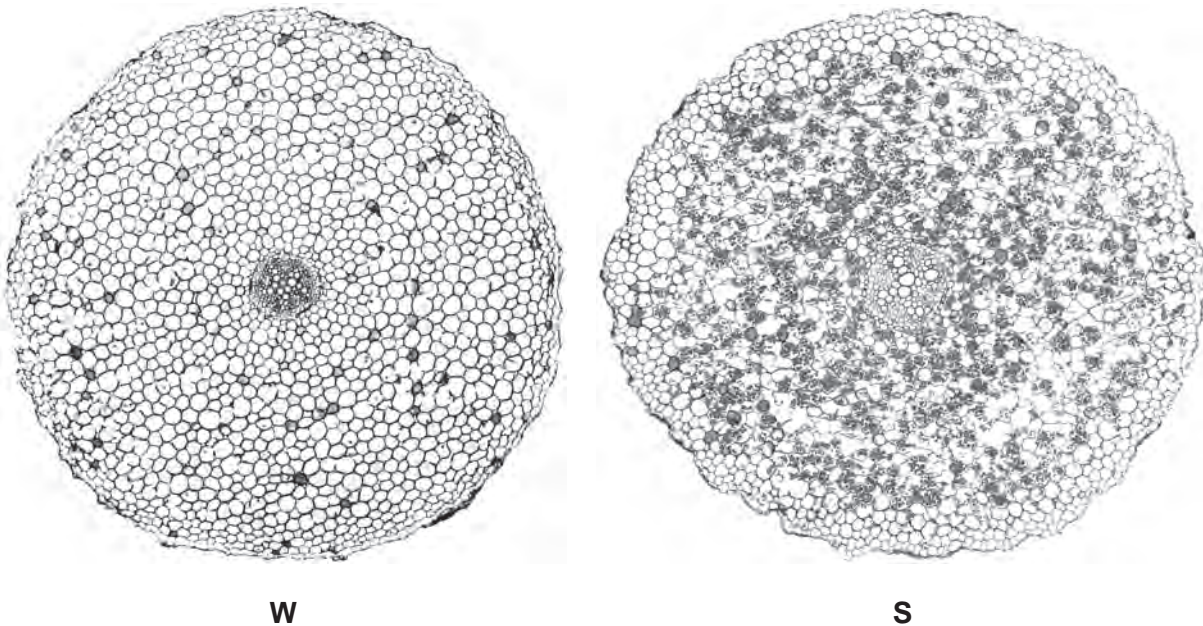


Fig. 1.2

(b) Suggest why there are few starch grains in the cells of **W** compared with a large number of starch grains in the cells of **S**.

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(c) Describe how enzymes in root cells synthesise starch.

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(d) As temperature is increased, for example from 10 °C to 30 °C, enzyme activity increases.

Explain how increasing temperature affects enzyme activity.

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[Total: 10]

- 2 Enzymes are biological catalysts. Fig. 3.1 shows how the enzyme, sucrase, breaks down a molecule of sucrose.

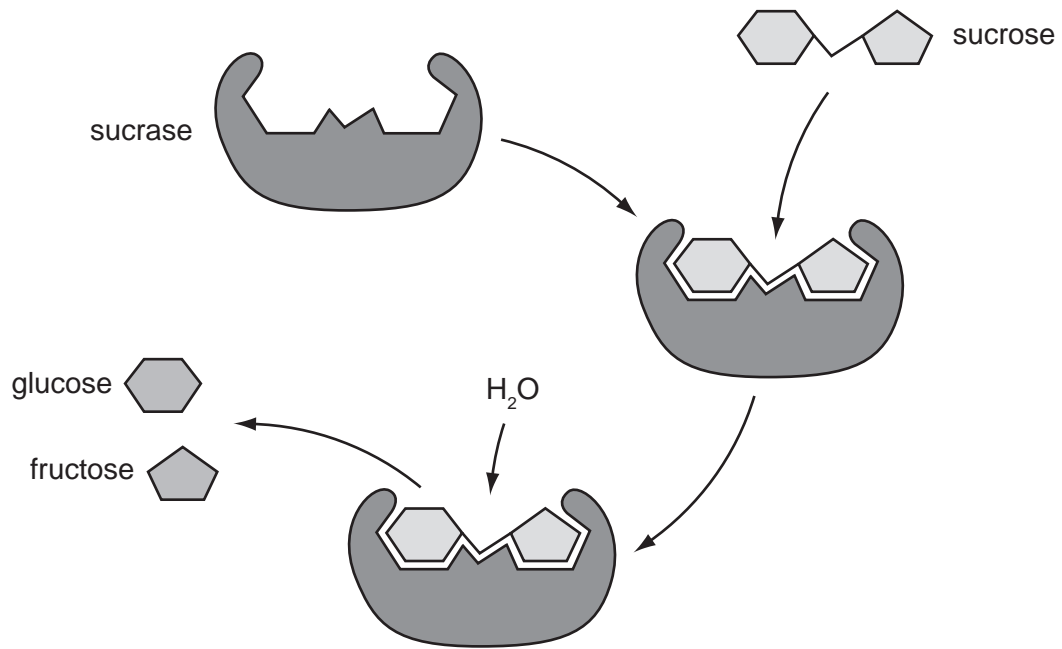


Fig. 3.1

- (a) Describe how sucrase catalyses the breakdown of sucrose. You should refer to Fig. 3.1 in your answer.

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- (b) Three enzymes, **P**, **Q** and **R**, were extracted from different regions of the alimentary canal of a mammal. The effect of pH on the activity of the enzymes was investigated at 40 °C. The results are shown in Fig. 3.2.

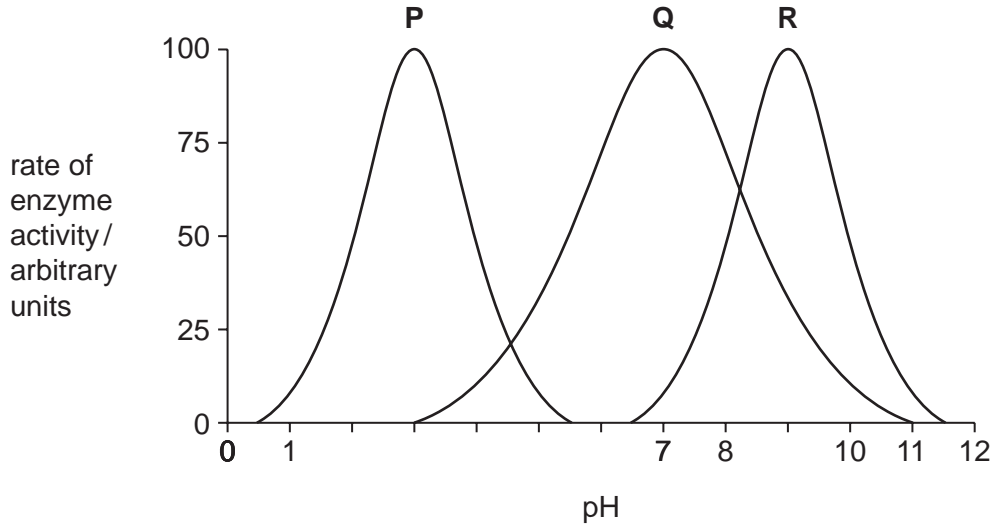


Fig. 3.2

- (i) Explain why the investigation was carried out at 40 °C.

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- (ii) Using information in Fig. 3.2, describe the effects of increasing pH on the rate of activity of enzyme **Q**.

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(iii) Enzymes increase the rate of breakdown of different types of food substances in digestion.

Name enzymes **P**, **Q** and **R**.

P

Q

R [3]

(c) Some baby foods are manufactured by pre-digesting foodstuffs containing carbohydrates, fats and proteins with enzymes.

Describe the roles of different types of enzymes in preparing these baby foods.

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[Total: 15]

- 3 (a) Fig. 3.1 shows the activity of an enzyme produced by bacteria that live in very hot water.

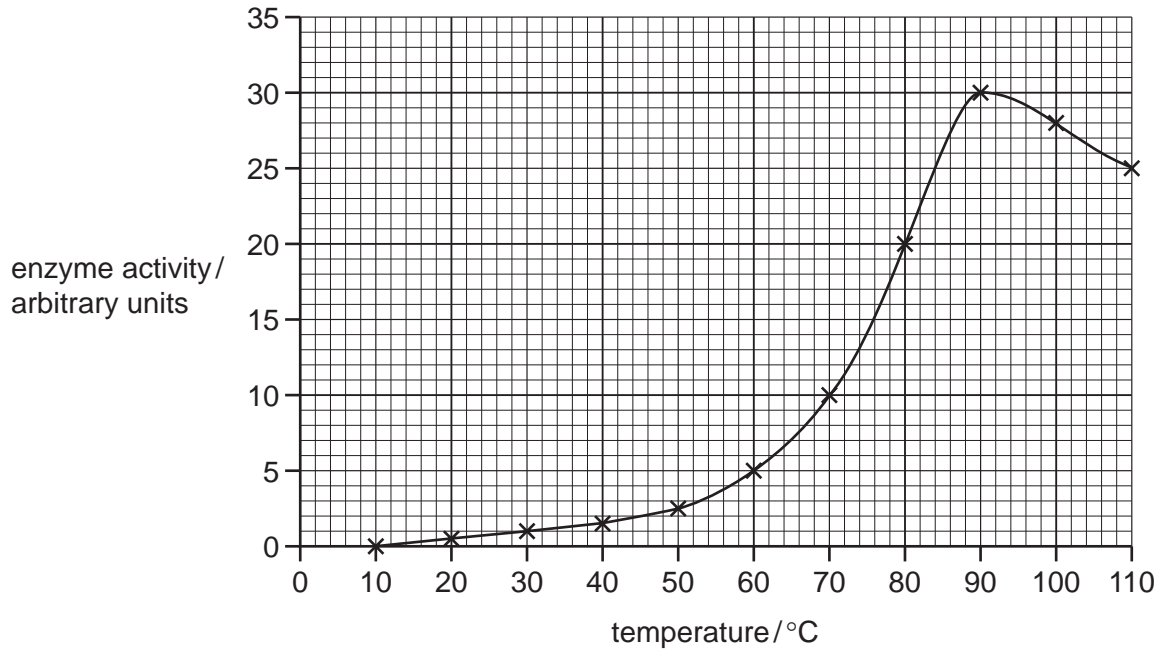


Fig. 3.1

Using the information in Fig. 3.1, describe the effect of increasing temperature on the activity of the enzyme.

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[3]

Enzymes extracted from bacteria are used in biological washing powders.

- (b) Describe how bacteria are used to produce enzymes for biological washing powders.

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(c) Food and blood stains on clothes may contain proteins and fats.

Explain how enzymes in biological washing powders act to remove food and blood stains from clothes.

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(d) When blood clots, an enzyme is activated to change a protein from one form into another.

Describe the process of blood clotting.

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[Total: 14]

4 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) State the term used to describe the removal of waste products of metabolism.

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(ii) Define the term *enzyme*.

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..... [2]

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

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) State the independent (input) variable in this investigation.

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

1.

2. [2]

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

Table 3.1

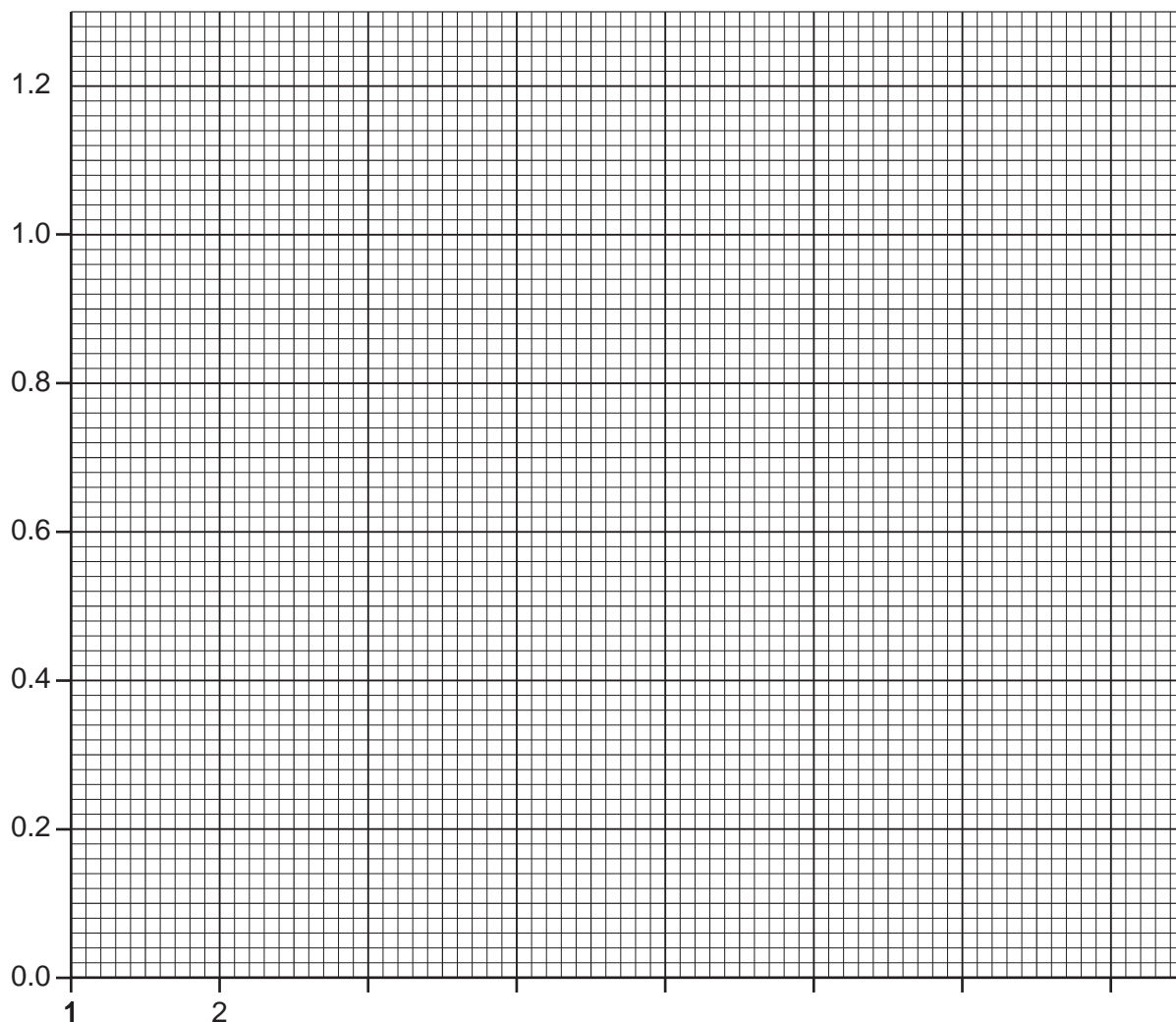
pH	time to collect 10 cm ³ oxygen / min	rate of oxygen production / cm ³ min ⁻¹
4	20.	0.50
5	12.	0.80
6	10.	1.00
7	13.	0.74
8	17.	

(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.



[4]

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

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..... [2]

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

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..... [3]

[Total: 17]