

Enzymes

Question Paper

| | |
|------------|--------------------------------------|
| Level | O Level |
| Subject | Biology |
| Exam Board | Cambridge International Examinations |
| Topic | Enzymes |
| Sub Topic | |
| Booklet | Question Paper |

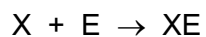
Time Allowed: 38 minutes

Score: /31

Percentage: /100

- 1 X and Y are the reactants in a chemical reaction for which E is the enzyme. The product is Z.

The first three stages in the reaction are shown.



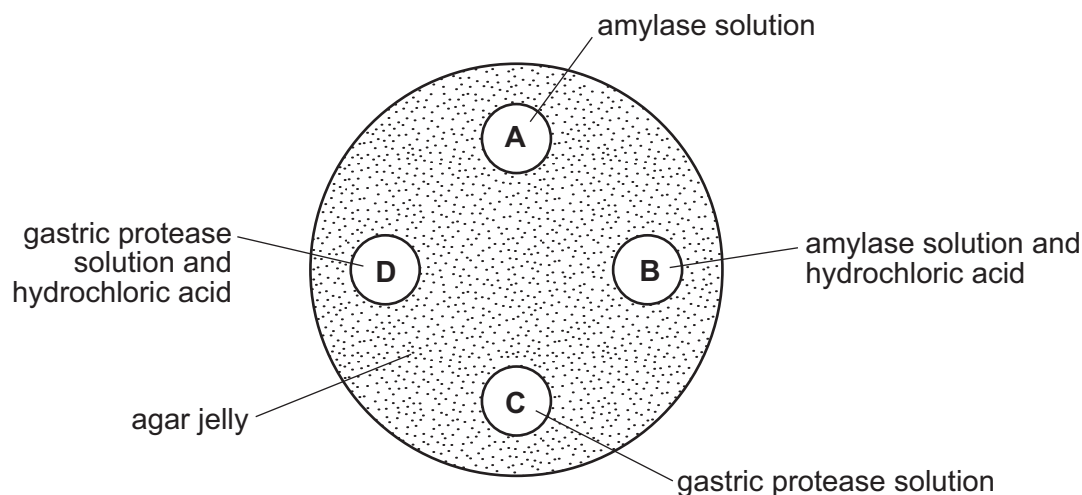
What is the fourth, and final, stage of this reaction?

- A** $X + Y + E \rightarrow Z$
- B** $X + YE \rightarrow Z$
- C** $Y + ZE \rightarrow YZ + E$
- D** $ZE \rightarrow Z + E$
- 2 Amylase solution is tested with Benedict's solution, biuret solution and iodine solution.
- Which colours are obtained?

| | Benedict's solution | biuret solution | iodine solution |
|----------|---------------------|-----------------|-----------------|
| A | blue | blue | blue-black |
| B | blue | blue | brown |
| C | blue | purple | brown |
| D | red | purple | blue-black |

- 3 A dish is filled with agar jelly containing starch. Four holes are cut in the jelly and each hole is filled as shown.

After 30 minutes, which hole will be surrounded by the largest area without starch?

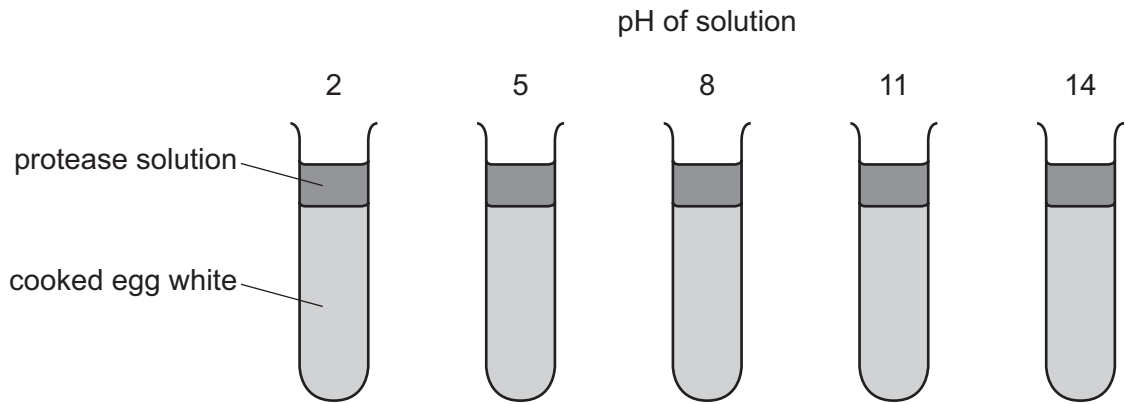


- 4 Some organisms live at the bottom of the seas where it is very dark. To synthesise glucose, they use energy from chemicals in the very hot water that comes out of volcanoes.

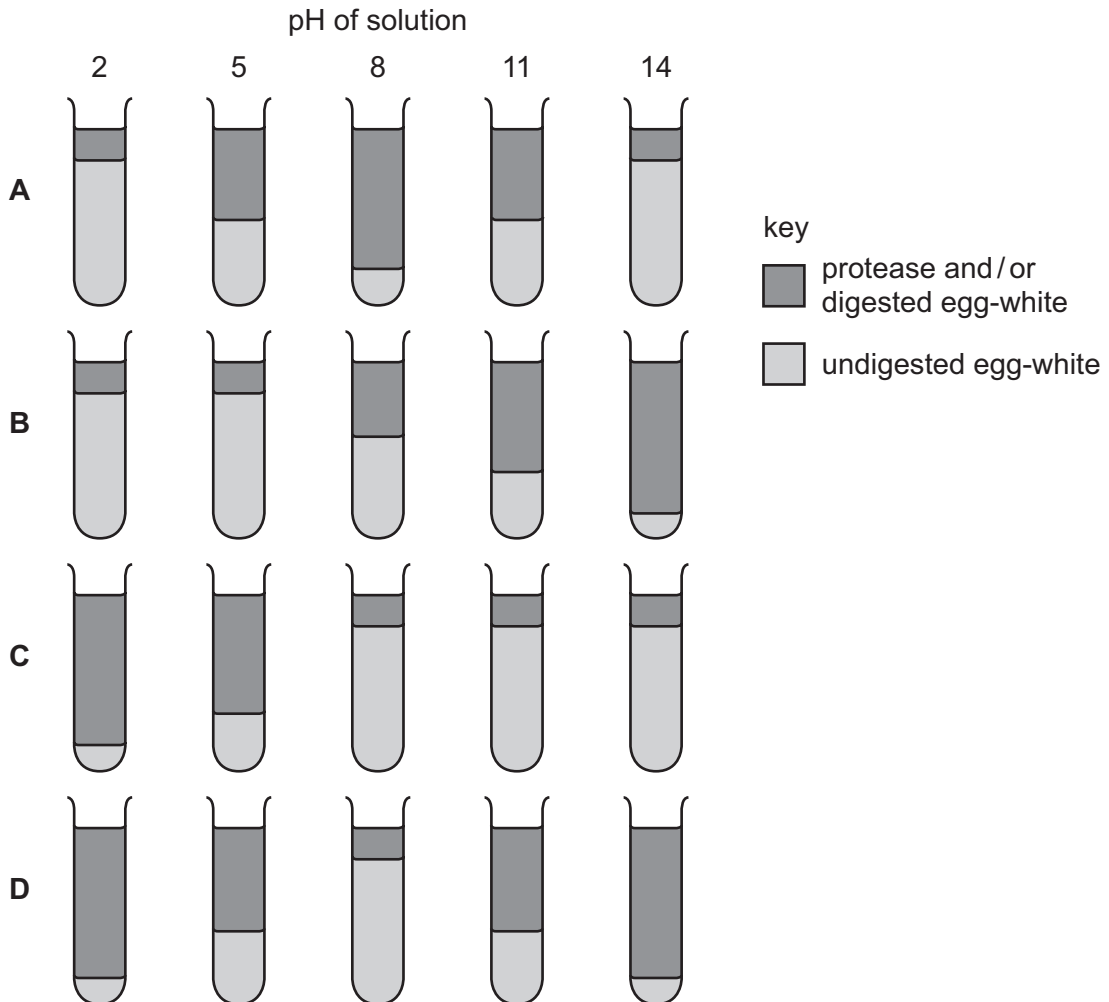
What is a distinguishing feature of these organisms?

- A** Their enzymes are easily denatured by heat.
- B** They do not need carbon dioxide.
- C** They do not need to be green.
- D** They obtain energy only as carnivores.

- 5 Five tubes containing cooked egg-white are set up as shown. Protease solutions of different pH are added to each tube.



Which diagram shows the results of this experiment for a protease from the stomach?

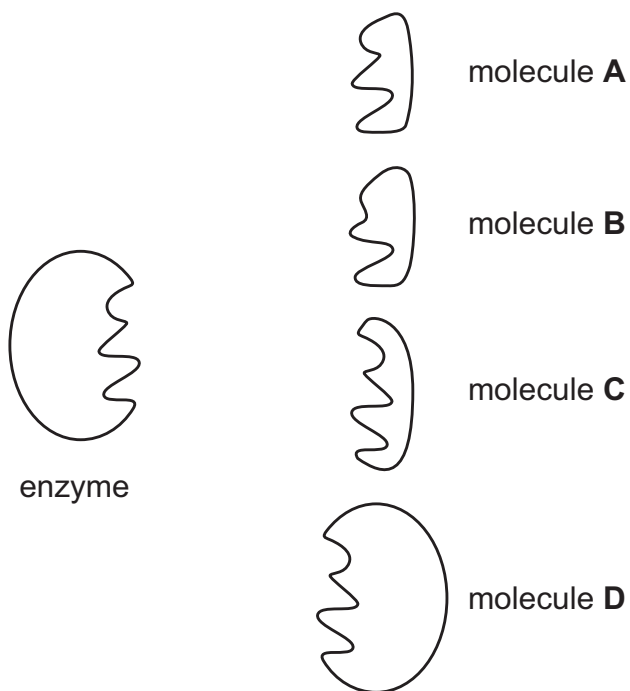


6 What is the enzyme that controls a reaction in which both the enzyme and the substrate can denature at high temperatures?

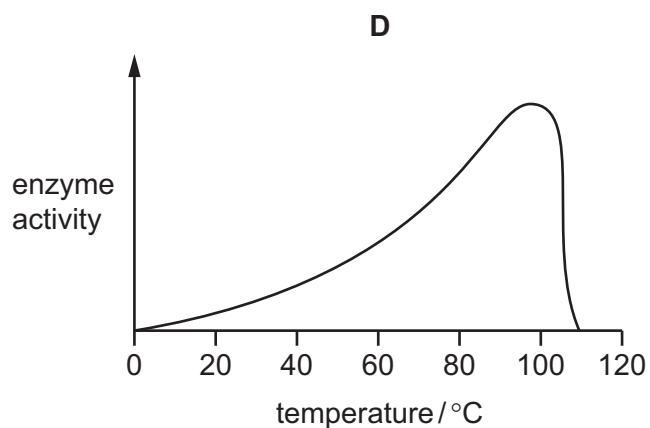
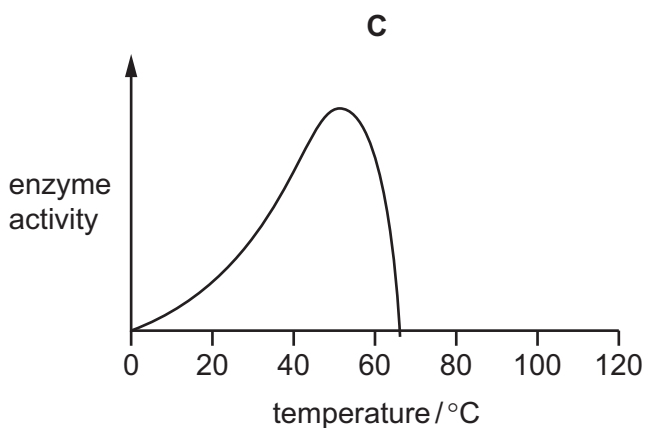
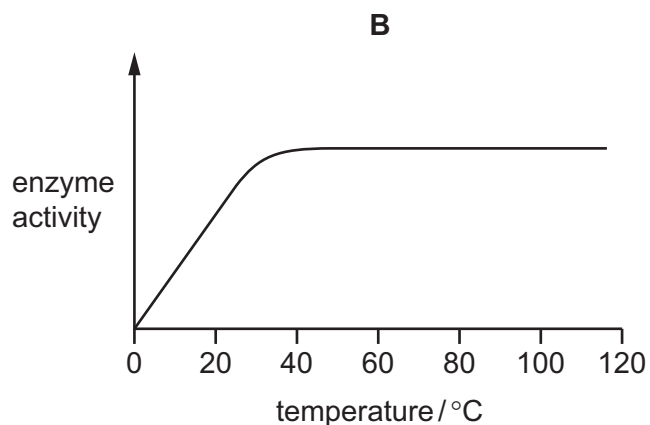
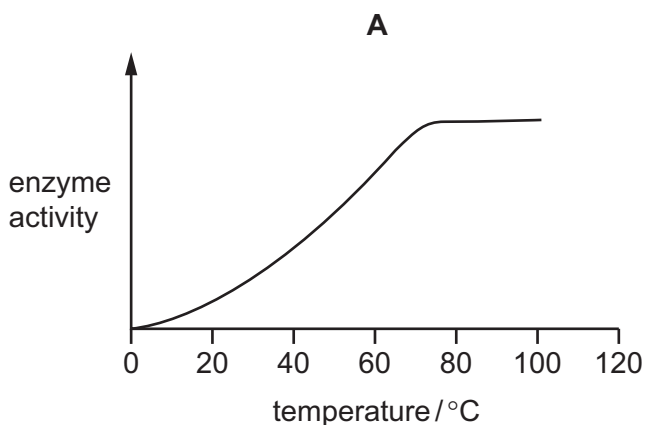
- A amylase
- B insulin
- C lipase
- D protease

7 The diagram represents an enzyme and four molecules, **A**, **B**, **C** and **D**.

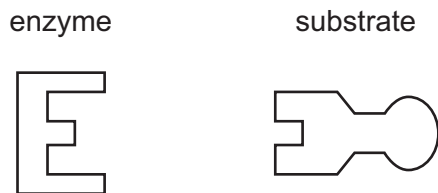
Which molecule is the substrate of this enzyme?



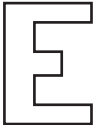
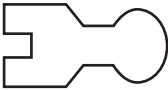
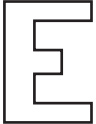
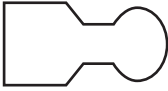




- 8 A bacterium lives in hot springs at temperatures of 75 °C to 85 °C. Which graph represents the activity of enzymes found in these bacteria?



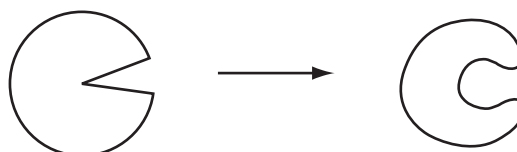
9 The diagram represents the 'lock and key' mechanism of an enzyme that works best at pH 7.



What shows the enzyme and its substrate at pH 13?

| | enzyme | substrate |
|---|---|---|
| A |  |  |
| B |  |  |
| C |  |  |
| D |  |  |

10 The diagram represents how an enzyme molecule changes in shape.



What explains this change?

- A It has been cooled to 5 °C.
- B It has been heated to 70 °C.
- C It has been placed in a concentrated salt solution.
- D It has been placed in a dilute salt solution.

11 Which statements are correct for all enzymes?

- 1 They are proteins.
- 2 They are secreted into the alimentary canal.
- 3 They speed up biochemical reactions.
- 4 None of them work at low pH.

- A** 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

12 In an enzyme action, where is the active site and where are the lock and the key?

| | active site | key | lock |
|----------|------------------|------------------|------------------|
| A | on the enzyme | on the substrate | on the enzyme |
| B | on the enzyme | on the enzyme | on the substrate |
| C | on the substrate | on the enzyme | on the substrate |
| D | on the substrate | on the substrate | on the enzyme |

13 Starch is digested to maltose by the enzyme amylase.

According to the 'lock and key' hypothesis, which is the 'key' and which is the 'lock'?

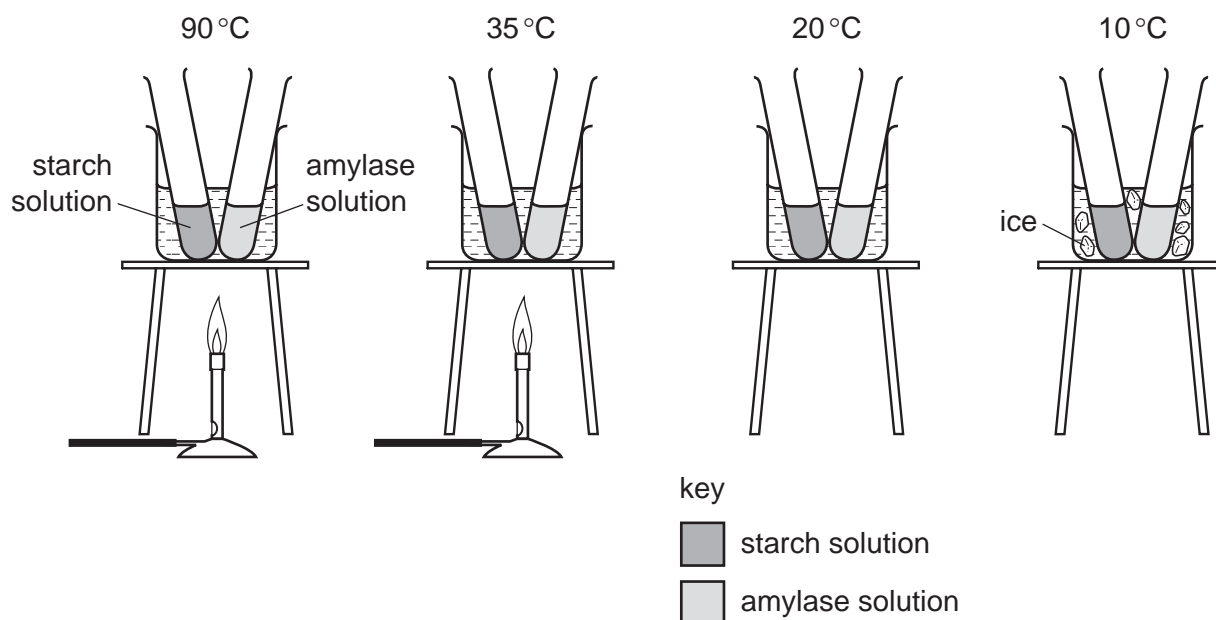
| | 'key' | 'lock' |
|----------|---------|---------|
| A | amylase | maltose |
| B | amylase | starch |
| C | starch | amylase |
| D | starch | maltose |

14 According to the lock and key hypothesis, which is the lock and which is the key for the enzyme lipase?

| | key | lock |
|----------|-------------|-------------|
| A | fatty acids | lipids |
| B | lipase | lipids |
| C | lipase | fatty acids |
| D | lipids | lipase |

15 The diagram shows an experiment on amylase.

Each beaker contains water at the temperature shown.



After five minutes, each test-tube of amylase is poured into the test-tube of starch solution in the same beaker.

After leaving the tubes for 5 minutes, samples of the mixture are tested with iodine solution and are then tested again at 5 minute intervals.

Which results are expected?

| | 90°C | 35°C | 20°C | 10°C |
|----------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| A | blue-black after 30 minutes | goes yellow-brown immediately | goes yellow-brown after 5 minutes | blue-black after 30 minutes |
| B | blue-black after 30 minutes | goes yellow-brown after 5 minutes | goes yellow-brown immediately | blue-black after 30 minutes |
| C | goes yellow-brown immediately | goes yellow-brown after 5 minutes | goes yellow-brown after 5 minutes | blue-black after 30 minutes |
| D | goes yellow-brown after 5 minutes | blue-black after 30 minutes | blue-black after 30 minutes | goes yellow-brown after 5 minutes |

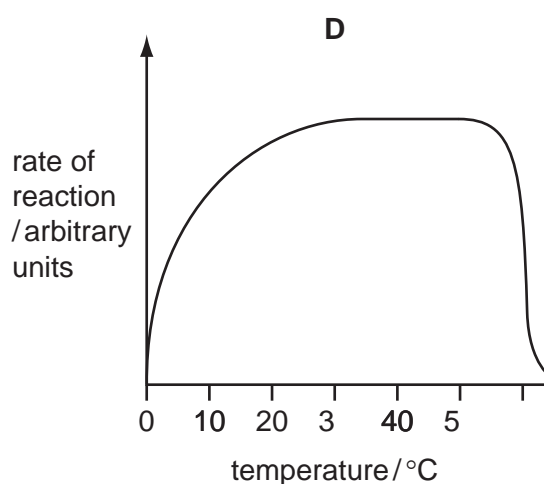
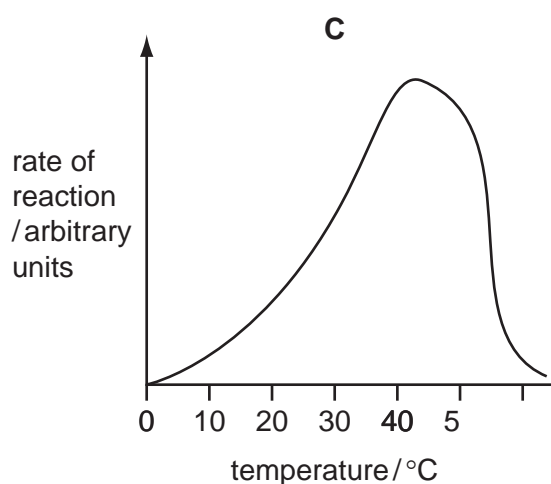
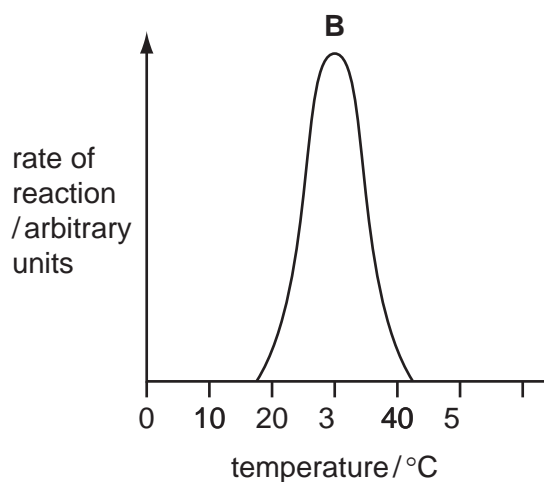
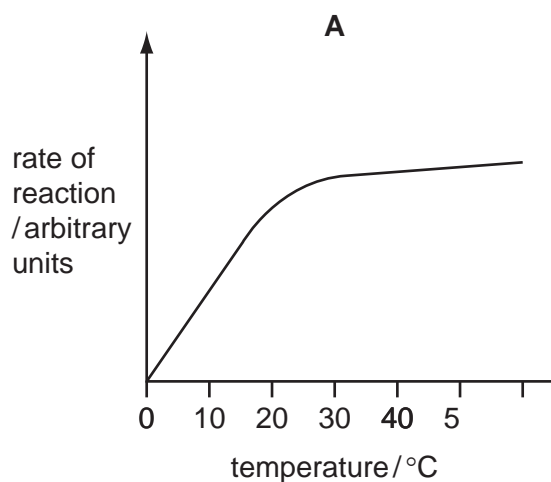
- 16 Cubes of hard-boiled egg white are placed in test-tubes containing 5 cm³ of water. Other substances are added to each tube as shown in the chart. The tubes are left for eight hours and then tested for amino acids.

| tube | solution added | results of test for amino acids |
|------|----------------------|---------------------------------|
| 1 | pepsin | absent |
| 2 | pepsin + alkali | absent |
| 3 | none | absent |
| 4 | pepsin + acid | large amounts |
| 5 | boiled pepsin + acid | traces |
| 6 | acid | traces |
| 7 | alkali | absent |

Which tubes show that pepsin is an enzyme?

- A** 1 and 6 **B** 2 and 7 **C** 4 and 5 **D** 5 and 6

17 Which graph shows the effect of temperature on enzyme-controlled reactions?

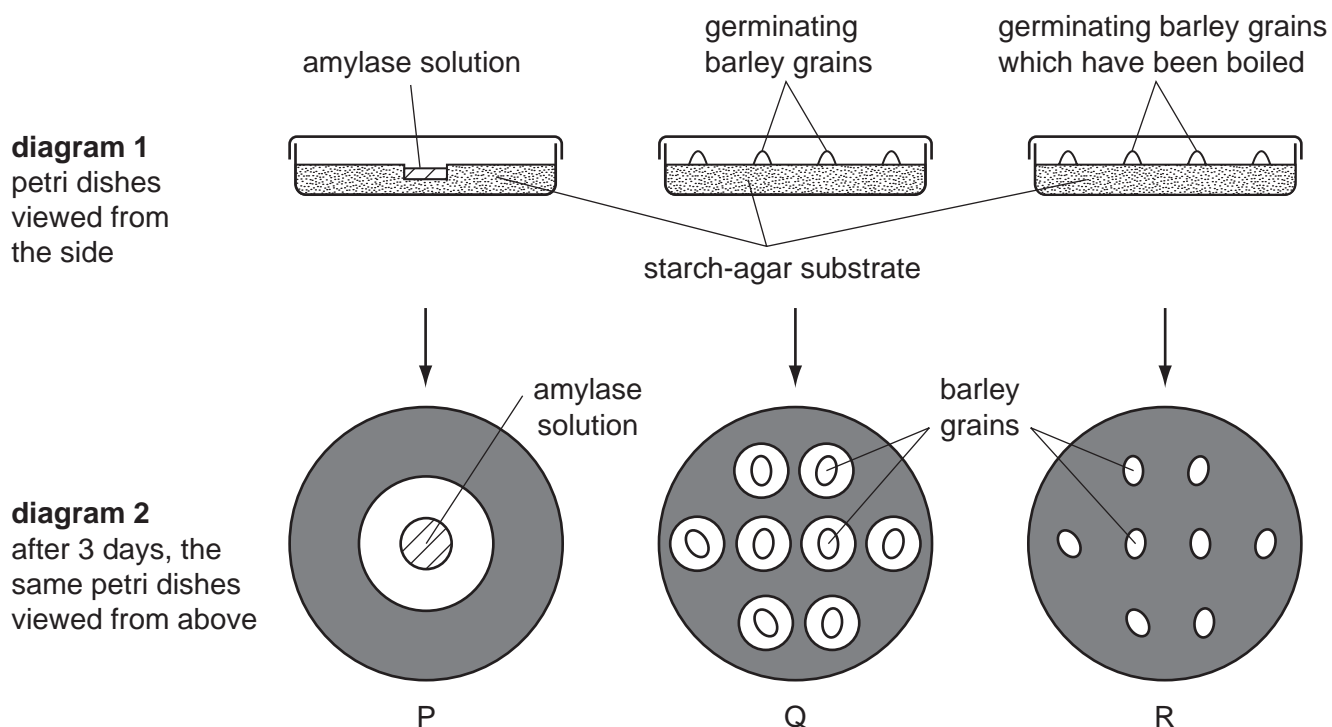


18 Protease breaks down proteins into amino acids.

In the 'lock and key' hypothesis, what is the lock and what is the key?

| | lock | key |
|----------|------------|------------|
| A | amino acid | protease |
| B | protease | amino acid |
| C | protease | protein |
| D | protein | protease |

19 In an experiment to investigate the **effects of heat** on germinating barley grains, three petri dishes were set up as shown in diagram 1 and left for 3 days. A solution of iodine in potassium iodide was then added to the starch-agar substrate. The results are shown in diagram 2, in which the shaded areas went blue/black, indicating the presence of starch.



Which is the **best** explanation of the results?

- A Amylase is produced by barley grains that have been boiled.
- B Amylase from barley grains is denatured when they are boiled.
- C Germinating grains prevent iodine from staining starch blue/black.
- D Starch from the substrate is used by the grains as an energy source.

20 Enzyme action can be explained by the lock and key hypothesis.

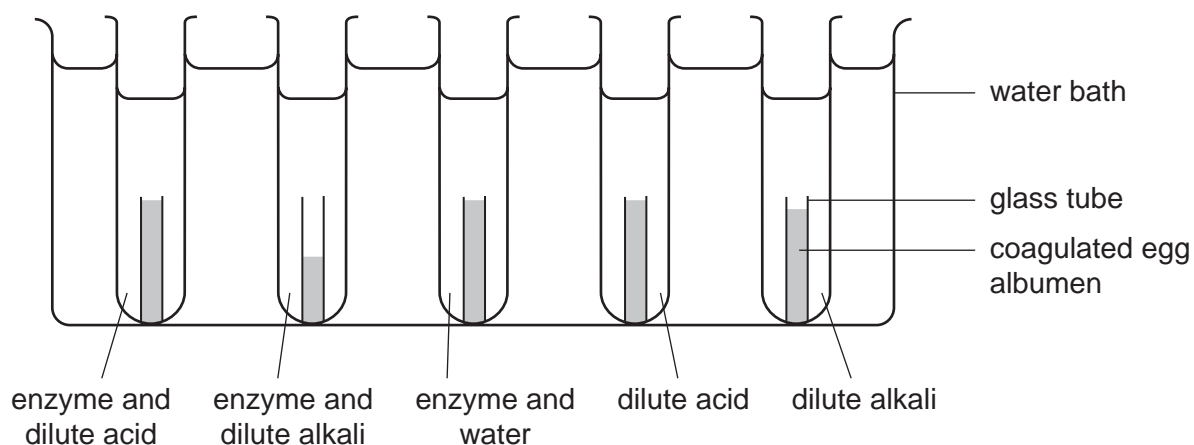
Where is the active site and which acts as the lock or key?

| | active site | lock/key |
|----------|------------------|--------------------------|
| A | on the enzyme | substrate acts as a key |
| B | on the enzyme | substrate acts as a lock |
| C | on the substrate | enzyme acts as a key |
| D | on the substrate | enzyme acts as a lock |

21 What is produced as a result of digestion by a protease?

- A amino acids
- B fatty acids
- C glucose
- D glycerol

22 An experiment was set up to investigate the effect of an enzyme on coagulated egg albumen. The results, after three hours, are shown in the diagram.

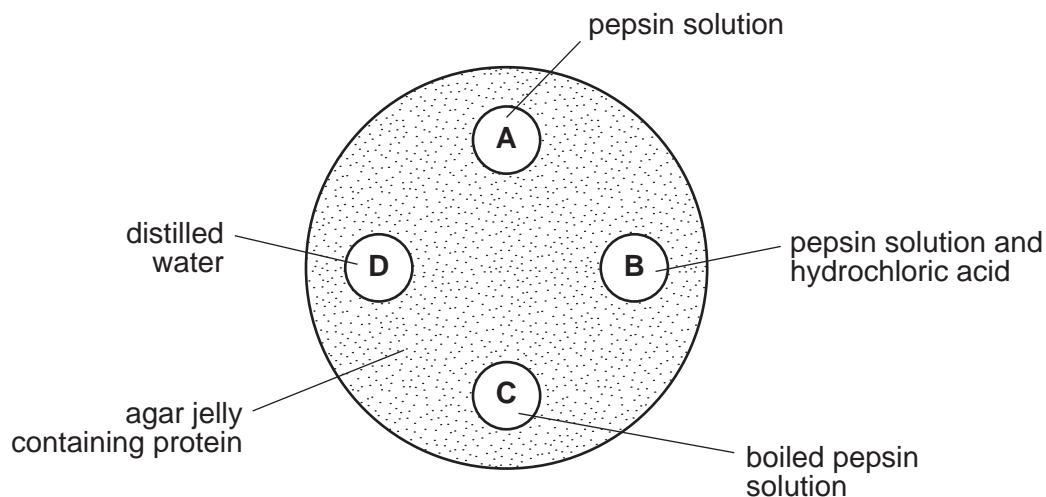


Where in the digestive system is the enzyme produced?

- A liver
- B pancreas
- C salivary glands
- D stomach wall

- 23 A dish is filled with agar jelly containing protein. Four holes are cut in the jelly and each hole is filled as shown. Pepsin is a protease found in the stomach.

After 30 minutes, which hole will be surrounded by the largest area without protein?



- 24 Only two of the following statements accurately describe what happens in the mouth.

- 1 Amylase breaks down large starch molecules into smaller maltose molecules.
- 2 Chewing increases the surface area of food for digestion.
- 3 Saliva emulsifies fats into smaller droplets.
- 4 Teeth break up large insoluble molecules into smaller soluble molecules.

Which statements are correct?

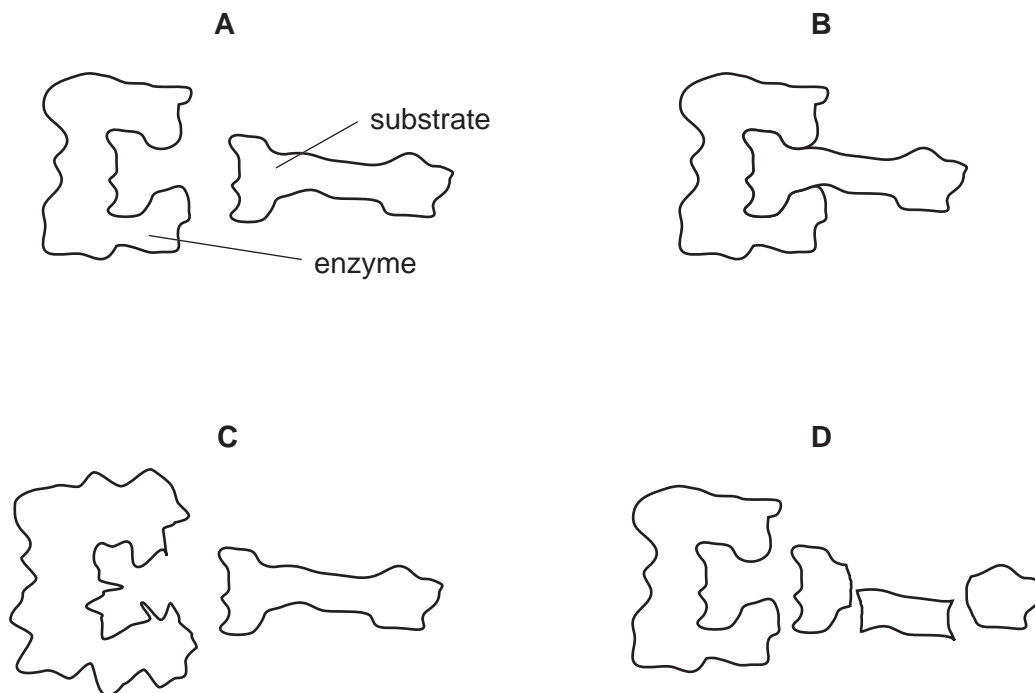
- A** 1 and 2 **B** 2 and 3 **C** 3 and 4 **D** 1 and 4

- 25 Which statement about enzymes is essential to the lock and key hypothesis?

- A Enzyme molecules are catalysts.
- B Enzyme molecules can be damaged by high pH values.
- C Enzyme molecules can be damaged by high temperatures.
- D Enzyme molecules each have a distinct shape.

26 The diagrams represent an enzyme molecule and its substrate.

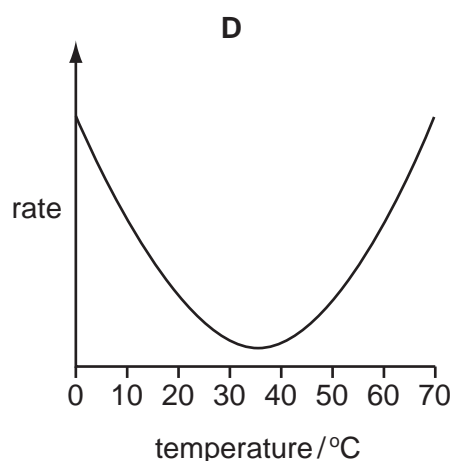
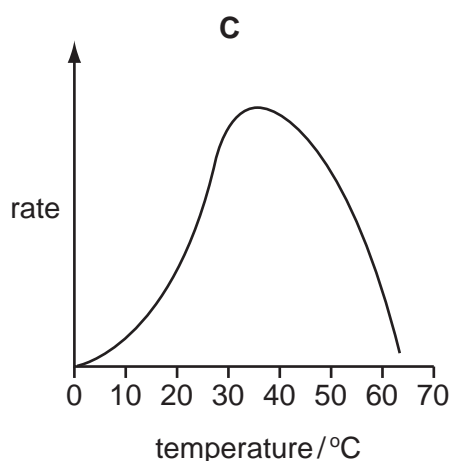
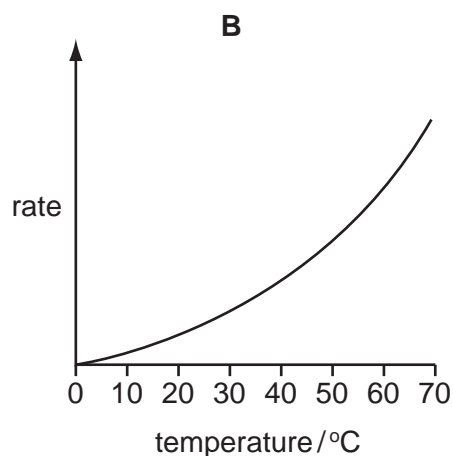
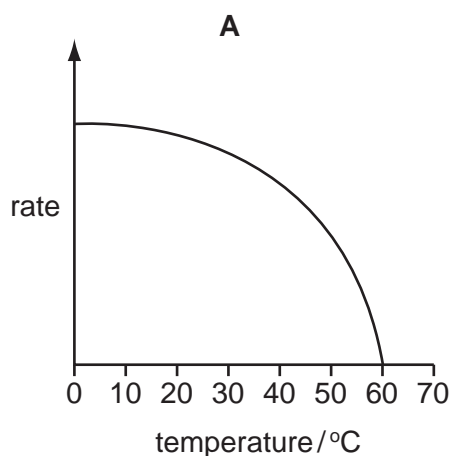
Which diagram shows these molecules after they are heated to 100°C?



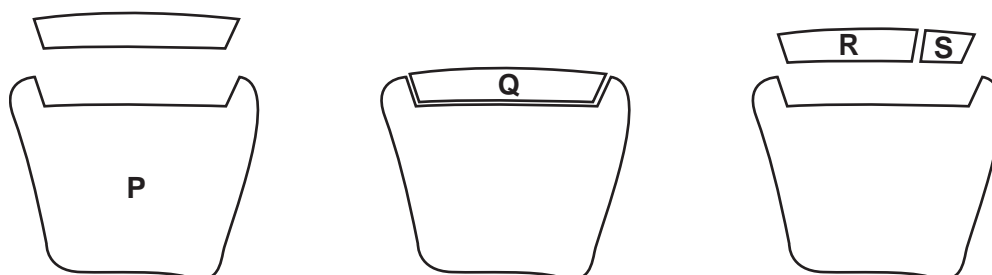
27 Which chemical test shows the presence of an enzyme in a biological washing powder?

- A Benedict's
- B biuret
- C ethanol emulsion
- D iodine solution

28 Which graph shows how an enzyme catalysed reaction in the alimentary canal varies with temperature?



29 The diagram represents stages in the breakdown of starch to maltose by the enzyme amylase.

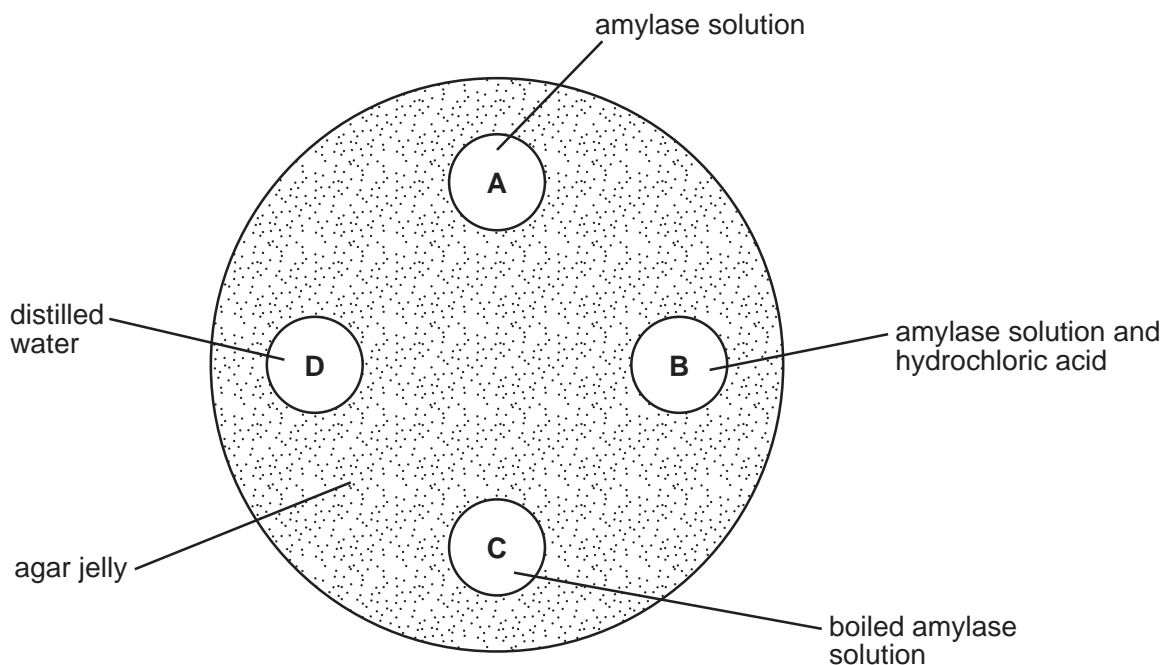


Which are the correct labels?

| | amylase | maltose | starch |
|----------|----------|----------|----------|
| A | P | S | Q |
| B | Q | R | S |
| C | R | Q | P |
| D | S | P | R |

- 30 A dish is filled with agar jelly containing starch. Four holes are cut in the jelly and each hole is filled with the different substances shown.

Which hole will be surrounded by the largest area without starch after 30 minutes?



- 31 The graph shows the effect of temperature on a chemical reaction which is controlled by enzymes.

At which point are most product molecules being released?

