

5.1 Enzymes

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS temperature 温度 • rate 速率 • enzymes 酶 • catalyst 催化剂 • substrate 底物

Objective

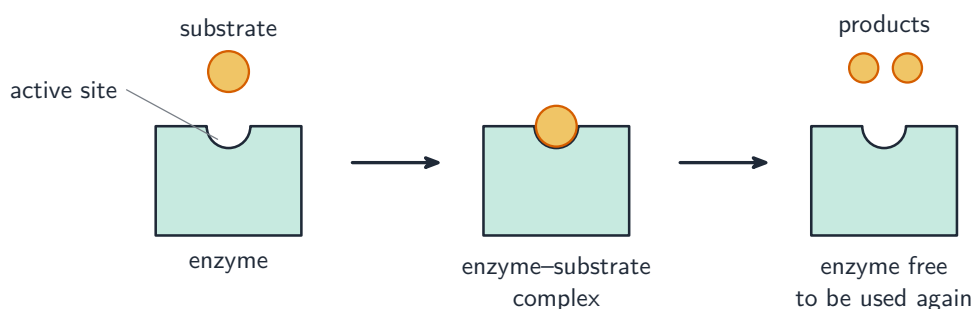
Build the skills to answer exam questions on **enzymes** 酶 — what they are, the **active site** 活性位点 and lock-and-key model, and the effects of **temperature** 温度 and **pH**.

You must be able to:

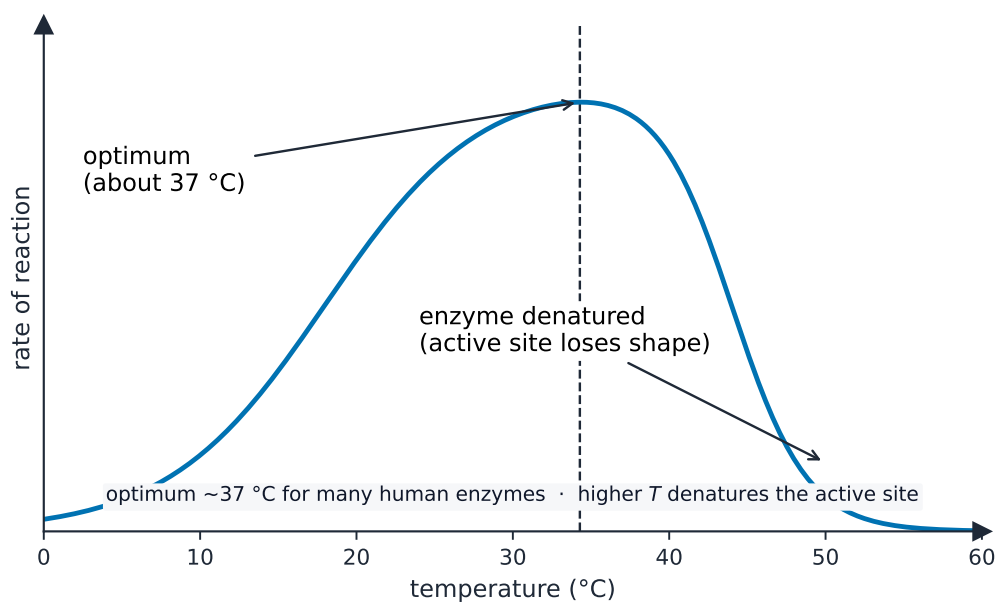
- describe enzymes as biological catalysts (proteins, not used up)
- explain enzyme action with the active site/substrate (specificity)
- explain the effect of temperature and pH, including denaturation

1 Worked examples

■ Lock-and-key and temperature



The substrate fits the active site (complementary shape); each enzyme is specific to one substrate



Above the optimum the active site loses its shape — the enzyme is denatured (permanent)

2 Practice

2.1 Define a catalyst.

[1]

2.2 State the type of molecule that all enzymes are made of.

[1]

3 Exam-style questions

3.1 Above its optimum temperature, an enzyme's rate falls because the enzyme is: [1]

- A used up
- B denatured (active site changes shape)
- C killed
- D diluted

3.2 An enzyme has a specific substrate.

(a) Explain, using the lock-and-key model, why an enzyme is specific.

[2]

(b) Explain why a very low pH reduces the enzyme's activity. [2]

3.3 Explain why enzyme activity increases as the temperature rises from 10 °C to 37 °C. [2]

Solutions

2.1 a substance that speeds up a reaction but is not used up (changed) by it.

2.2 protein.

3.1 B. The active site changes shape — the enzyme is denatured.

3.2 (a) the active site has a shape complementary to one substrate; only that substrate fits, so the enzyme works on only one reaction.

(b) the wrong pH changes the shape of the active site; so the substrate no longer fits and the enzyme is denatured.

3.3 the molecules gain kinetic energy and move faster; so enzyme and substrate collide more often (giving more successful reactions).