

Exercise walk-through

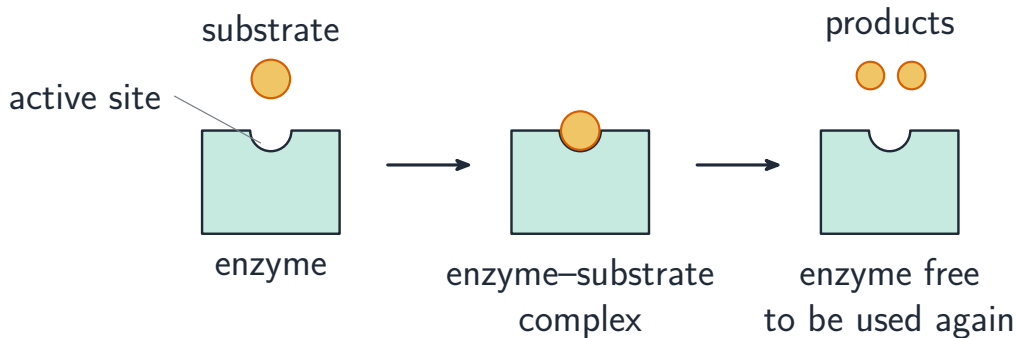
Enzymes ■ 5.1

eXercise

You must be able to

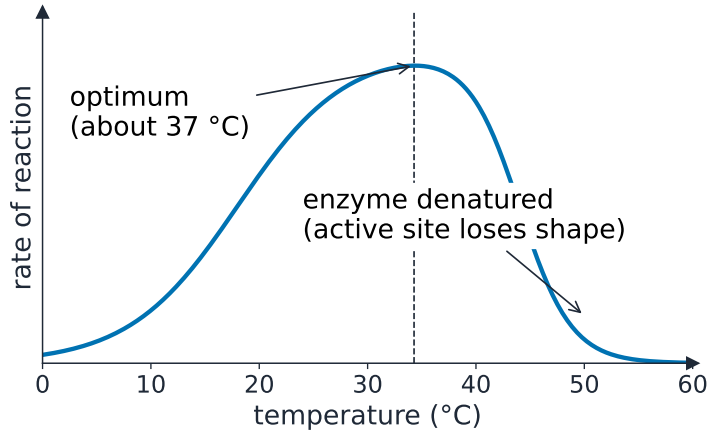
- describe enzymes as biological catalysts (proteins, not used up)
- explain enzyme action with the active site/substrate (specificity)
- explain the effect of temperature and pH, including denaturation

Method — Lock-and-key and temperature



Substrate fitting the active site, then leaving as products

Method — Lock-and-key and temperature



A graph: rate peaks at ~37 °C then falls as the enzyme denatures

Practice 2.1 ■ 1 mark

Define a catalyst.

Solution 2.1

Worked steps

a substance that speeds up a reaction but is not used up (changed) by it **B1**.

Practice 2.2 ■ 1 mark

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

Solution 2.2

Worked steps

protein **B1**.

Exam-style 3.1 ■ 1 mark

Above its optimum temperature, an enzyme's rate falls because the enzyme is:

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

Solution 3.1

Method: Lock-and-key and temperature

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

Worked steps

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

Exam-style 3.2 ■ 2 marks

An enzyme has a specific substrate.

- (a) Explain, using the lock-and-key model, why an enzyme is specific.
- (b) Explain why a very low pH reduces the enzyme's activity.

Solution 3.2

Method: Lock-and-key and temperature

Worked steps

- (a) the active site has a shape complementary to one substrate **M1**; only that substrate fits, so the enzyme works on only one reaction **A1**.
- (b) the wrong pH changes the shape of the active site **M1**; so the substrate no longer fits and the enzyme is denatured **A1**.

Exam-style 3.3 ■ 2 marks

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

Solution 3.3

Method: Lock-and-key and temperature

Worked steps

the molecules gain kinetic energy and move faster **M1**; so enzyme and substrate collide more often (giving more successful reactions) **A1**.