Full Higher Separate content. ★ = Higher Tier. ◆ = Separate Science only.

Q1. Explain the lock and key model of enzyme action.

[3 marks]

Q2. Explain the effect of temperature on enzyme activity. Refer to both low and high temperatures in your answer.

[4 marks]

Q3. Explain why enzymes are described as specific catalysts.

[3 marks]

★ HIGHER TIER

Q4. ★ Describe the induced fit model of enzyme action. Explain how it improves on the lock and key model.

[3 marks]

Total: 13 marks

Q1 (3 marks)

Explain the lock and key model of enzyme action.

- Enzyme has a specific active site [1]
- Substrate has complementary shape — fits into active site forming enzyme-substrate complex [1]
- Reaction occurs → products released → enzyme unchanged and reusable [1]

Q2 (4 marks)

Explain the effect of temperature on enzyme activity. Refer to both low and high temperatu…

- Low temperature: low kinetic energy → few enzyme-substrate collisions → slow rate [1]
- Increasing temperature → more kinetic energy → more frequent collisions → faster rate up to optimum [1]
- Above optimum: bonds holding enzyme shape break → active site permanently changes shape (denaturation) [1]
- Denatured enzyme cannot catalyse reaction — rate falls to zero [1]

Q3 (3 marks)

Explain why enzymes are described as specific catalysts.

- Each enzyme has a uniquely shaped active site [1]
- Only one specific substrate (with complementary shape) can fit into the active site [1]
- Enzyme catalyses only one type of reaction — e.g. amylase only digests starch, not proteins [1]

Q4 (3 marks) [★ HT]

★ Describe the induced fit model of enzyme action. Explain how it improves on the lock and…

- Induced fit: active site is NOT rigid — it changes shape slightly when substrate enters [1]
- The site moulds around the substrate to catalyse the reaction more precisely [1]
- More accurate than lock and key because enzymes are flexible proteins not rigid structures; explains why some related molecules can also bind to the active site [1]