*This is the **Higher Combined** version — includes Higher Tier content. Some Separate-only details are omitted.*

Enzymes are biological catalysts essential for controlling the rates of chemical reactions in cells.

Required Practical: Investigating effect of temperature or pH on enzyme activity.

- Enzymes are proteins with a specific active site. Substrate binds → enzyme-substrate complex → products released
- ★ **HT** Induced fit model: active site changes shape slightly to accommodate the substrate
- Optimum temperature for human enzymes: ~37°C. Above optimum: denaturation (irreversible)
- Each enzyme has an optimum pH. Extreme pH denatures the enzyme
- Amylase: starch→sugars (mouth, pancreas). Protease: proteins→amino acids. Lipase: fats→fatty acids+glycerol

Key Terms

Active site	Specific region of enzyme where substrate binds
Denaturation	Irreversible change in enzyme shape — active site destroyed
Induced fit	Active site changes shape to fit substrate more precisely

■ **Exam Tip:** Denaturation is PERMANENT — cooling a denatured enzyme does not restore activity. At low temperatures, enzymes are just slow — NOT denatured.