

Edexcel (B) Biology A-level

1.5 - Enzymes

Flashcards

This work by [PMT Education](https://www.pmt.education) is licensed under [CC BY-NC-ND 4.0](https://creativecommons.org/licenses/by-nc-nd/4.0/)



Describe the structure of enzymes.



Describe the structure of enzymes.

Globular proteins

Specific tertiary structure determines shape of **active site**, complementary to **specific substrate**.



Explain the function of enzymes.



Explain the function of enzymes.

Biological catalysts for intra & extracellular reactions.

Formation of **enzyme-substrate (ES) complexes** lowers **activation energy** of metabolic reactions.



Explain the induced fit model of enzyme action.



Explain the induced fit model of enzyme action.

Shape of active site is not directly complementary to substrate & is flexible.

Conformational change enables ES complexes to form.

This puts strain on substrate bonds, lowering activation energy.



Name 5 factors that affect the rate of enzyme-controlled reactions.



Name 5 factors that affect the rate of enzyme-controlled reactions.

- enzyme concentration
- substrate concentration
- concentration of inhibitors
- pH
- temperature



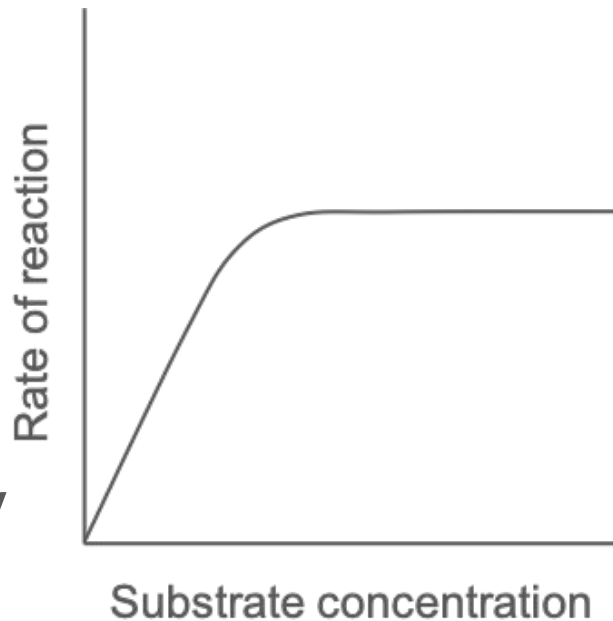
How does substrate concentration affect rate of reaction?



How does substrate concentration affect rate of reaction?

Given that enzyme concentration is fixed, rate increases proportionally to substrate concentration.

Rate levels off when maximum number of ES complexes form at any given time.



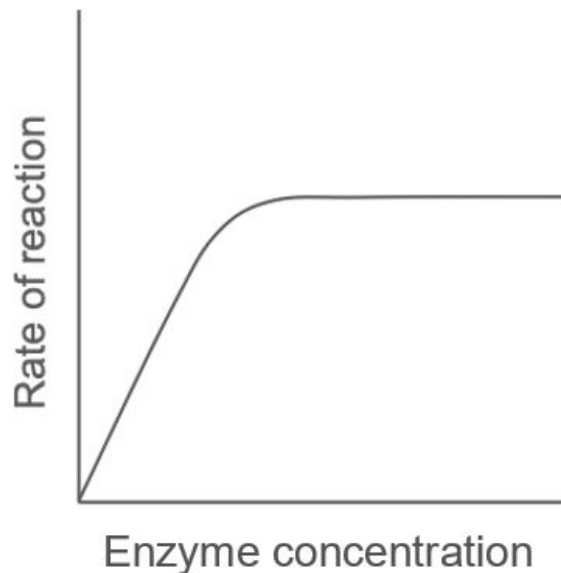
How does enzyme concentration affect rate of reaction?



How does enzyme concentration affect rate of reaction?

Given that substrate is in excess, rate increases proportionally to enzyme concentration

Rate levels off when maximum number of ES complexes form at any given time.



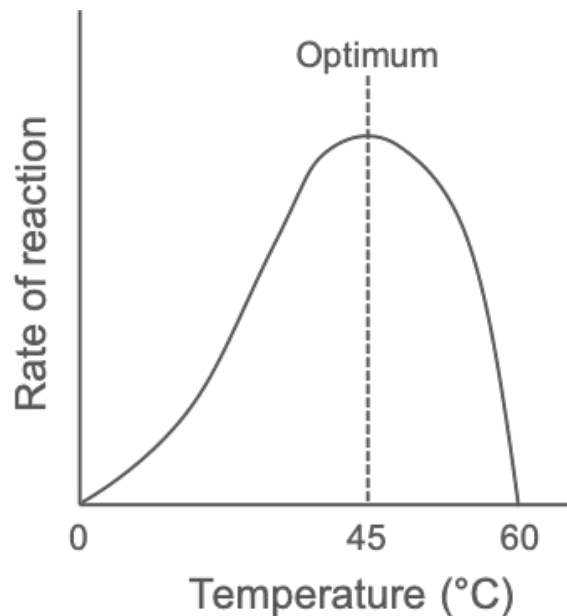
How does temperature affect rate of reaction?



How does temperature affect rate of reaction?

Rate increases as kinetic energy increases & peaks at optimum temperature.

Above optimum, ionic & H-bonds in 3° structure break = active site no longer complementary to substrate (denaturation).



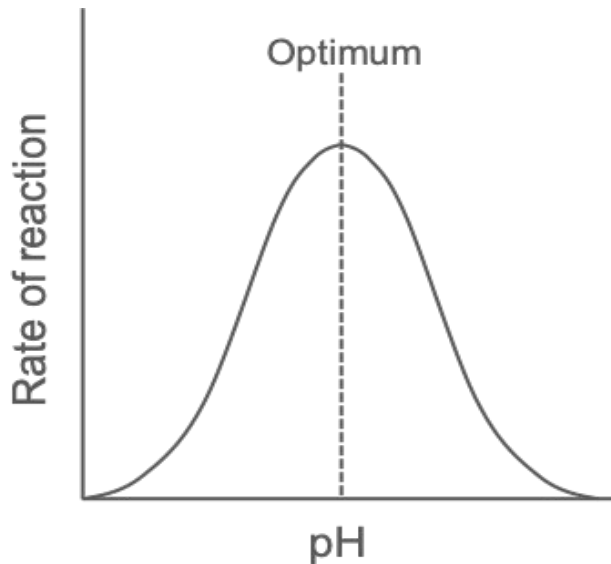
How does pH affect rate of reaction?



How does pH affect rate of reaction?

Enzymes have a narrow optimum pH range.

Outside range, H^+ / OH^- ions interact with H-bonds & ionic bonds in 3° structure = denaturation.



How do competitive inhibitors work?



How do competitive inhibitors work?

Bind to active site since they have similar shape to substrate. Temporarily prevent ES complexes from forming until released.

Increasing substrate concentration decreases their effect.



How do non-competitive inhibitors work?



How do non-competitive inhibitors work?

Bind at allosteric binding site.

Trigger conformational change of active site.

Increasing substrate concentration has no impact on their effect.



What is end-product inhibition?



What is end-product inhibition?

One of the products of a reaction acts as a competitive or non-competitive inhibitor for an enzyme involved in the pathway.
Prevents further formation of products.



Outline how to calculate initial rate from a graph.



Outline how to calculate initial rate from a graph.

Calculate gradient of tangent at $t=0$



Why is it advantageous to calculate initial rate?



Why is it advantageous to calculate initial rate?

Represents maximum rate of reaction before concentration of reactants decreases & end-product inhibition.

