Edexcel Biology GCSE

Topics 1.7 to 1.14B - Enzymes

Flashcards

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What are enzymes?

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What are enzymes?

Biological catalysts that increase the rate of a chemical reaction without being permanently altered themselves

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What is an advantage of enzymes in the body?

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What is an advantage of enzymes in the body?

They enable cellular reactions to take place at lower temperatures

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What is the active site of an enzyme?

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What is the active site of an enzyme?

The region of an enzyme to which a substrate molecule binds and the reaction takes place

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Why are enzymes described as having a ‘high specificity’ for their substrate?

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Why are enzymes described as having a ‘high specificity’ for their substrate?

Only substrates with a specific, complementary shape can fit into an enzyme’s active site.

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Describe the ‘lock and key’ model

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Describe the ‘lock and key’ model

1. Substrate collides with the active site of an enzyme
2. Substrate binds, enzyme-substrate complex forms
3. Substrate converted to products
4. Products released from the active site which is now free to bind to another substrate

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What factors affect the rate of an enzyme-controlled reaction?

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What factors affect the rate of an enzyme-controlled reaction?

- Temperature
- pH
- Substrate concentration

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Explain how increasing temperature initially affects the rate of an enzyme-controlled reaction

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Explain how increasing temperature initially affects the rate of an enzyme controlled reaction

- As temperature increases molecules have more KE
- Movement of molecules increases
- Probability of a successful collision increases
- More enzyme-substrate complexes form
- Rate of reaction increases

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Explain how increasing temperature above the optimum affects the rate of an enzyme-controlled reaction

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Explain how increasing temperature above the optimum affects the rate of an enzyme controlled reaction

- Temperature increases above the optimum
- Increased vibrations break bonds in enzyme's structure
- Active site changes shape, enzyme is denatured
- No more enzyme-substrate complexes can form
- Rate of reaction decreases

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Draw a graph to show the effect of increasing temperature on the rate of an enzyme-catalysed reaction.

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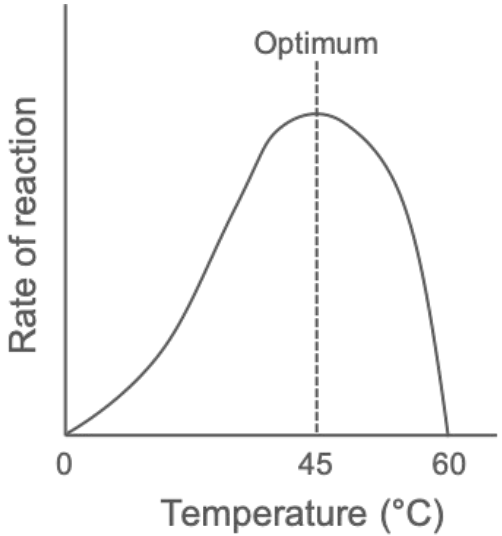
Draw a graph to show the effect of increasing temperature on the rate of an enzyme-catalysed reaction.



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Explain how pH affects the rate of an enzyme-controlled reaction

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Explain how pH affects the rate of an enzyme controlled reaction

- Enzymes have an optimum pH
- pH shifts from the optimum
- Bonds in the enzyme's structure are altered
- Active site changes shape, enzyme is denatured
- Rate of reaction decreases

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Draw a graph to show the effect of increasing pH on the rate of an enzyme-catalysed reaction

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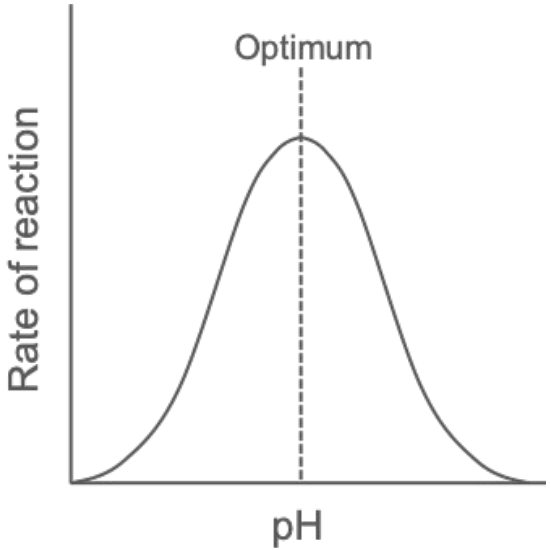
Draw a graph to show the effect of increasing pH on the rate of an enzyme-catalysed reaction



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Explain how the substrate concentration affects the rate of an enzyme-controlled reaction

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Explain how the substrate-concentration affects the rate of an enzyme-controlled reaction

- Substrate concentration increases
- Number of substrate molecules in the same volume increases
- Probability of a successful collision increases
- More enzyme-substrate complexes form
- Rate of reaction increases
- Once all active sites become full, the rate of reaction plateaus

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Draw a graph to show the effect of increasing substrate concentration on the rate of an enzyme-catalysed reaction

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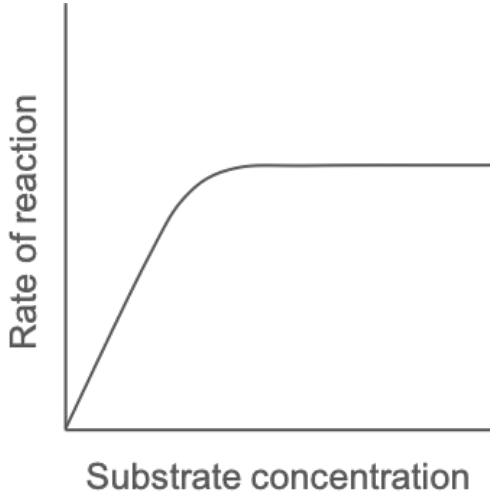
Draw a graph to show the effect of increasing substrate concentration on the rate of an enzyme-catalysed reaction



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How can the rate of an enzyme-controlled reaction be calculated when given a value for time?

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How can the rate of an enzyme-controlled reaction be calculated when given a value for time?

$$\text{rate} = \frac{1}{\text{time}}$$

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What are the units for rate?

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What are the units for rate?

s^{-1}

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Why must large organic molecules be broken down into smaller, simpler molecules in the body?

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Why must large organic molecules be broken down into smaller, simpler molecules in the body?

- Large molecules are too big to be absorbed across the surface of the gut wall
- ∴ large molecules are broken down into smaller molecules for absorption into the bloodstream

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Give an example of the breakdown of large molecules into smaller molecules in plants

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Give an example of the breakdown of large molecules into smaller molecules in plants

Starch is broken down by enzymes into simpler sugars which are respired to release energy.

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What type of molecules are proteins and carbohydrates?

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What type of molecules are proteins and carbohydrates?

Polymers

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What are the monomers of carbohydrates?

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What are the monomers of carbohydrates?

Simple sugars

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Which group of enzymes catalyses the breakdown of carbohydrates?

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Which group of enzymes catalyses the breakdown of carbohydrates?

Carbohydrases

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Which type of carbohydrase catalyses the breakdown of starch?

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Which type of carbohydrase catalyses the breakdown of starch?

Amylase

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What are the monomers of proteins?

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What are the monomers of proteins?

Amino acids

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Which type of enzyme catalyses the breakdown of proteins?

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Which type of enzyme catalyses the breakdown of proteins?

Proteases

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What is the function of lipases?

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What is the function of lipases?

Enzymes which catalyse the breakdown of lipids into fatty acids and glycerol

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Why are small molecules synthesised into larger organic molecules in the body?

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Why are small molecules synthesised into larger organic molecules in the body?

Large molecules are used for **storage** (e.g. glycogen) or are used to **build structures** (e.g. organelles).

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Which enzyme catalyses the formation of glycogen from glucose?

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Which enzyme catalyses the formation of glycogen from glucose?

Glycogen synthase

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How can the amount of energy contained in food be measured? (biology only)

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How can the amount of energy contained in food be measured? (biology only)

Measured using calorimetry

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What is calorimetry? (biology only)

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What is calorimetry? (biology only)

A method of measuring the heat transfer during a chemical reaction

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Describe the method used to measure the amount of energy in a sample of food (biology only)

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Describe the method used to measure the amount of energy in a sample of food (biology only)

1. Add a set volume of water to a boiling tube, record initial temperature
2. Record the mass of a small sample of food (e.g. bean)
3. Stick the sample onto a mounted needle
4. Using a bunsen burner light the food sample
5. Hold the sample under the boiling tube until it burns up
6. Record the maximum temperature reached by the water
7. Record the final mass of the food sample

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How can the amount of energy in the food sample be calculated?
(biology only)

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How can the amount of energy in the food sample be calculated? (biology only)

$$\text{Energy in food (J)} = \text{Mass of water (g)} \times \text{Temperature change of water (°C)} \times 4.2$$

$$\text{Energy (J/g)} = \frac{\text{Energy in food (J)}}{\text{Mass of food burnt (g)}}$$

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