**Topic 2.5 Enzymes**

**Essential Idea: Enzymes control the metabolism of the cell.**

**Statements & Objectives:**

**2.5.U1 Enzymes have an active site to which specific substrates bind.**

State the relationship between enzyme substrate and enzyme product.

**(State**: Give a specific name, value or other brief answer without explanation or calculation)

Explain the relationship between enzyme structure and enzyme specificity, including the role of the active site.​

(**Explain**: Give a detailed account including reasons or causes)

**2.5.U2 Enzyme catalysis involves molecular motion and the collision of substrates with the active site**

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Outline the three stages of enzyme activity.

​**(Outline**: Give a brief account or summary)

Explain the role of random collisions in the binding of the substrate with the enzyme active site.

(**Explain**: Give a detailed account including reasons or causes)

Describe the induced fit model of enzyme action.​

**(Describe**: Give a detailed account)

**2.5.U3 Temperature, pH and substrate concentration affect the rate of activity of enzymes.**

Explain how temperature affects the rate of enzyme activity.

(**Explain**: Give a detailed account including reasons or causes)

Draw a graph of depicting the effect of temperature on the rate of enzyme activity.

(**Draw:** Represent by means of pencil lines.)

Explain how pH affects the rate of enzyme activity.

(**Explain**: Give a detailed account including reasons or causes)

Draw a graph of depicting the effect of pH on the rate of enzyme activity.

(**Draw:** Represent by means of pencil lines.)

Identify the optimum temperature or pH for enzyme activity on a graph.

(**Identify:** Find an answer from a given number of possibilities)

Explain how substrate concentration affects the rate of enzyme activity.

(**Explain**: Give a detailed account including reasons or causes)

Draw a graph of depicting the effect of substrate concentration on the rate of enzyme activity.​

(**Draw:** Represent by means of pencil lines.)

**2.5.U4 Enzymes are denatured.**

State the effect of denaturation on enzyme structure and function.

**(State**: Give a specific name, value or other brief answer without explanation or calculation)

**2.5.U5 Immobilized enzymes are widely used in industry.**

List industries that use commercially useful enzymes.

**(List**: Give a sequence of brief answers with no explanation.)

Explain how and why industrial enzymes are often immobilized.

(**Explain**: Give a detailed account including reasons or causes)

**2.5.A1 Methods of production of lactose-free milk and its advantages**.

State the source of the lactase enzyme used in food processing.

**(State**: Give a specific name, value or other brief answer without explanation or calculation)

State the reaction catalyzed by lactase.

**(State**: Give a specific name, value or other brief answer without explanation or calculation)

Outline four reasons for using lactase in food processing.​

​**(Outline**: Give a brief account or summary)

**2.5.S1 Design of experiments to test the effect of temperature, pH, and substrate concentration on the activity of enzymes.**

Identify and manipulated, responding and controlled variables in descriptions of experiments testing the activity of enzymes.

(**Identify:** Find an answer from a given number of possibilities)

**2.5.S2 Experimental investigation of a factor affecting enzyme activity. (Practical 3)**

Describe three techniques for measuring the activity of an example enzyme.

**(Describe**: Give a detailed account)

**2.5.NOS Experimental design-accurate, quantitative measurements in enzyme experiments require replicates to ensure reliability.**

Define quantitative and qualitative.

**(Define**: Give the precise meaning of a word, phrase, or physical quantity.)

Determine measurement uncertainty of a measurement tool.

(**Determine:** Find the only possible answer.)

Explain the need for repeated measurements (multiple trials) in experimental design.

(**Explain**: Give a detailed account including reasons or causes)

Explain the need to controlled variables in experimental design.

(**Explain**: Give a detailed account including reasons or causes)

**Key Terms**

Enzyme

globular shape

​catalyst

active site

amino acid

​denature

substrate

covalent bond

immobilized

denaturation

lactose

lactase

​enzyme specificity