Observation of Enzyme Activity

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Outline

- What are enzymes
- Different examples of enzymes
- Main features of enzymes
- Experimental Work: Enzyme Activity
- Materials
- Procedure
- Expected Results

Objectives

By the end of this lab, students should be able to:

Define enzymes and explain their biological importance

Describe the main characteristics of enzymes

Observe and explain enzyme activity in a laboratory experiment

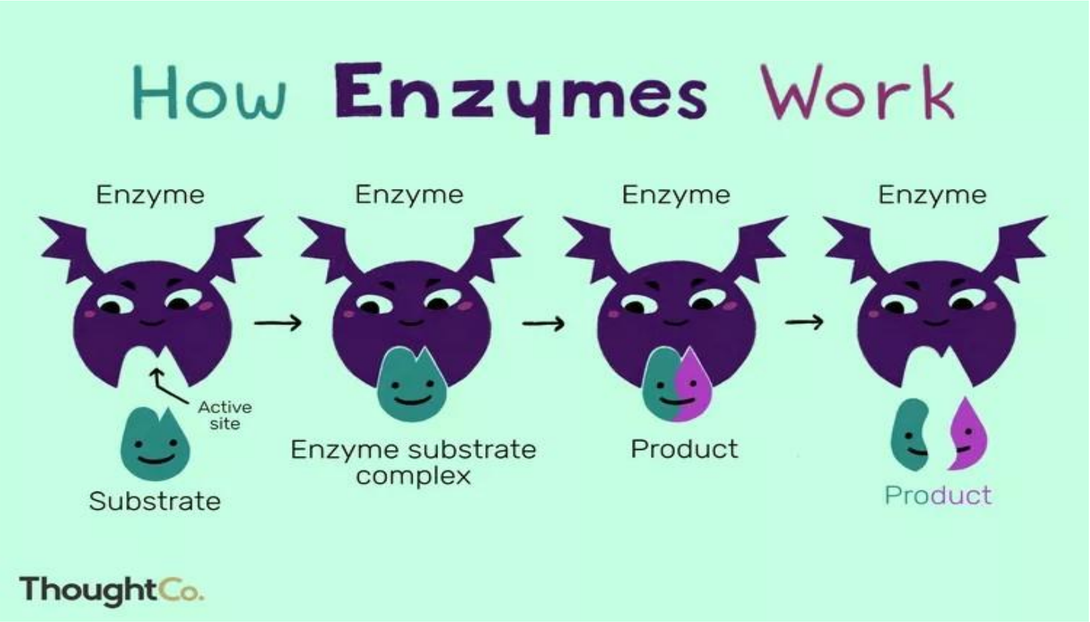
❖ What are enzymes?

- Are biological catalysts, usually proteins, that speed up chemical reactions without being consumed.

- Enzymes:
- **Do not change** the **final products**
- **Do not change** reaction **equilibrium**
- **Only reduce** activation energy

❖ How Enzymes Work?

- They work by binding to a specific substrate at the active site to form an enzyme–substrate complex.



❖ Examples of Digestive Enzymes:

- Break down food into absorbable molecules.

Enzyme	Reaction	Site
Amylase	Starch → maltose	Saliva, pancreas
Pepsin	Proteins → peptides	Stomach
Trypsin	Proteins → peptides	Small intestine
Lipase	Triglycerides → fatty acids + glycerol	Pancreas
Lactase	Lactose → glucose + galactose	Intestine

❖ Main features:

1. **Highly specific**

Each enzyme acts on only one specific substrate or a very small group of related substrates.

2. **Reusable**

Enzymes are not used up during the reaction.

One enzyme molecule can catalyze the same reaction many times.

❖ Main features:

3. Work best under optimum conditions

Each enzyme has specific conditions where it works most efficiently.

4. Sensitive to environmental changes

Small changes in temperature, pH, or chemicals can affect enzyme activity.

❖ Laboratory Experimental Work: Enzyme Activity

➢ Demonstration of enzyme activity using catalase.

- **Aim**: To demonstrate enzyme activity and investigate how enzymes catalyze biochemical reactions using catalase as a model enzyme.

➢ Principle: Enzymes are biological catalysts that speed up chemical reactions without being consumed.

- Catalase is an enzyme widely found in living cells.

- It protects cells from oxidative damage by breaking down hydrogen peroxide into harmless substances

$$2H_2O_2 \rightarrow 2H_2O + O_2 \uparrow$$

- The release of oxygen gas (seen as bubbles) is direct evidence of enzyme activity.

- The rate and amount of bubbling reflect the level of catalase activity.

❖ Materials Required:

- Fresh potato, yeast, or liver extract (source of catalase)
- 3% hydrogen peroxide solution
- Test tubes
- Test tube rack
- Measuring cylinder or graduated pipette
- Dropper
- Mortar and pestle/blender (for extract preparation)
- Filter paper or gauze
- Beaker
- Stopwatch

❖ Procedure:

1. Preparation of enzyme extract:

1. Cut fresh potato/liver into small pieces.
2. Grind with a small amount of distilled water.

Enzyme activity test :

1. Label two test tubes:

- Test
- Control

2. Add 2 mL enzyme extract to the Test tube.

3. Add 2 mL distilled water to the Control tube.

4. Add 2 mL hydrogen peroxide to both tubes.

5. Observe immediately.

6. Record the intensity of bubble formation.

❑ Observation:

Tube	Contents	Observation
Test	Enzyme + H_2O_2	Vigorous bubbling
Control	Water + H_2O_2	Little or no bubbling

❖ Expected Results:

- The test tube will show rapid bubble formation due to oxygen release.
- The control tube will show little or no reaction.
- This confirms the presence and activity of catalase.

➢ Conclusion: Catalase is an active biological enzyme that accelerates the breakdown of hydrogen peroxide into water and oxygen.

➢ The visible evolution of gas confirms enzyme-catalyzed reactions.

References

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Thanks