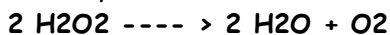

BioChemistry: Catalase Lab

Introduction

A catalyst speeds up chemical reactions without getting used up itself. Enzymes are catalysts made up of proteins, and have the suffix "ase." Catalase is an enzyme found in plant and animal tissues. Its purpose is to destroy toxic substances in cells. In this lab, we will use catalase from potatoes and determine the effect of temperature and pH on the action of this enzyme. The substrate of the enzyme will be 3% hydrogen peroxide (H₂O₂). Hydrogen peroxide is considered toxic to cells, and is destroyed by the enzyme catalase. Catalase works by:



If you wrote this equation in words, it would say...

hydrogen peroxide → broken down by Catalase enzyme → makes water & oxygen gas.

The oxygen gas creates the bubbles you see when using hydrogen peroxide! The volume of bubbles tells us how much work the enzyme is doing. By measuring the volume of bubbles in this lab, we can determine whether or not the enzyme catalase is at work.

Prelab questions:

1. Catalase is made of which major macromolecules? _____
2. What are the two controls in this lab? _____
3. What will we measure to determine the activity of Catalase? _____

Purpose: After reading the background and lab procedures, complete the following...

The purpose of this lab is to: _____

We will do this by: _____

Hypothesis: A hypothesis is a prediction about what you expect to happen. Today, you will be making two hypotheses. Read the lab procedures before answering the questions:

1. What do you predict will happen to the amount of bubbles catalase can make in an acid, neutral or basic solution?

2. What do you predict will happen to the amount of bubbles catalase can make in a hot, room temperature or cold solution?

3. What evidence will prove your hypothesis correct?

Procedure

Part 1: Temperature

1. Find 3 test tubes and label them hot, cold and room temp.
2. Place 3 ml of potato catalase into each test tube.
3. Place the test tube labeled hot in the hot water bath for 3 minutes.
4. Place the test tube labeled cold in the cold water/ ice bath for 3 minutes and the test tube labeled room temperature leave in the test tube rack.
5. *NOTE: To save time, put the hot and cold test tubes in their baths at the same time, wait the required 3 minutes, and take them out.*
6. Remove the hot and cold tubes from their baths; add 3ml of H₂O₂ to the hot, cold and room temperature tubes.
7. Wait 1 minute and record the height of the bubbles in each tube in mm. Record.
8. Measure the radius of the test tube and record in table 1 in mm.

Part 2: pH

9. Find 3 test tubes and label them acid, base, and water.
10. Place 3 ml of potato catalase into each test tube.
11. Add 10 drops of 1 M HCl to the tube labeled acid. 10 drops of 1M NaOH to the tube labeled base and 10 drops of water to the tube labeled water. Mix contents by swirling.
12. Wait 3 minutes then add 3 ml of H₂O₂ each tube.
13. Wait 1 minute for reaction to occur, then measure the height of the bubbles in mm. Record in table 2

Data Tables:

Give each data table and appropriate title.

Table 1: _____

	Height of Bubbles in mm	Radius of test tube in mm	Reaction height volume ($h \times \pi r^2$)
Room Temp			
Cold			
Hot			

Table 2: _____

	Height of Bubbles in mm	Radius of test tube in mm	Reaction height volume ($h \times \pi r^2$)
Water			
Acid: HCL			
Base: NaOH			

Catalase Lab Analysis Questions

1. Which test tubes had the greatest reaction height? The smallest? What were their measurements?
2. What effect did **heat** have on the activity of the enzyme? What effect did **cold** have? **Room** temperature?
3. What type of biological molecule are enzymes?
4. Describe how an enzyme works and its importance to all living organisms.
5. What effect did lowering the pH have on the activity of the enzyme? Raising the pH?
6. What were the controls in this experiment?

Conclusion: Write the conclusion in your lab notebook as the last part of the lab.

A scientific conclusion is an objective discussion of the results. By the end of the year, you will be expected to write your own conclusions. For the first few labs, please complete these sentence prompts to write your conclusion.

- Our lab group achieved the purpose of this lab by
- My first hypothesis was
- This hypothesis was proved correct/ incorrect because....
- My second hypothesis was...
- This hypothesis was proved correct/ incorrect because....
- The speed, or reaction rate, of an enzyme depends on....
- This was proved by our results because
- The purpose of the control was....
- The main ideas we explored in this lab were.....