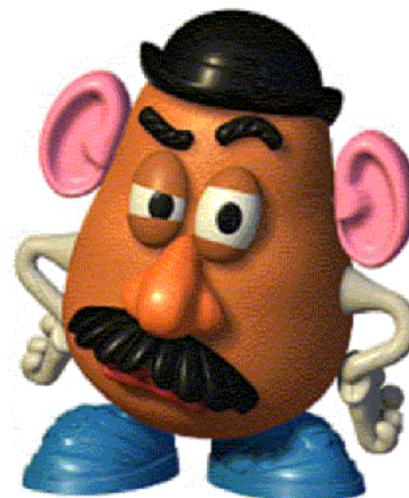


## Potato Catalase Enzyme Lab

INTRODUCTION: What would happen to your cells if they made a poisonous chemical? You might think that they would die. In fact, your cells are always making poisonous chemicals. They do not die because your cells use enzymes to break down these poisonous chemicals into harmless substances. Enzymes are proteins that speed up the rate of reactions that would otherwise happen more slowly. The enzyme is not altered by the reaction. You have hundreds of different enzymes in each of your cells.

Each of these enzymes is responsible for one particular reaction that occurs in the cell. In this lab, you will study an enzyme that is found in the cells of many living tissues. The name of the enzyme is catalase; it speeds up a reaction which breaks down hydrogen peroxide, a toxic chemical, into 2 harmless substances--water and oxygen.



**The reaction is:  $2 \text{H}_2\text{O}_2 (\text{l}) \rightarrow 2 \text{H}_2\text{O} (\text{l}) + \text{O}_2 (\text{g})$**

This reaction is important to cells because hydrogen peroxide ( $\text{H}_2\text{O}_2$ ) is produced as a byproduct of many normal cellular reactions. If the cells did not break down the hydrogen peroxide, they would be poisoned and die. In this lab, you will study the catalase found in potato cells.

### *PART A - Observe Normal Catalase Reaction*

1. Use the mortar and pestle to mash up a piece of uncooked potato.
2. Place 2 ml of the 3% hydrogen peroxide solution into a clean test tube.
3. Place a small piece of the smashed up potato into the test tube. Push it into the hydrogen peroxide with a stirring rod. Observe the bubbles.
4. Throughout this investigation you will estimate the rate of the reaction (how rapidly the solution bubbles) on a scale of 0-5 (0=no reaction, 1=slow, ..... 5= very fast). Assume that the reaction in step 2 proceeded at a rate of "4" and fill this data into the data table.
5. Measure the height of the bubbles in cm and record it in the data table.

### *PART B- What is the Effect of Temperature on Catalase Activity?*

1. Put some of the potato into the bottom of a clean test tube and cover it with a small amount of water. Place this test tube in a boiling water bath for 3 minutes.
2. Remove the test tube from the hot water bath, allow it to air cool, then pour out the water. Add 2 ml of hydrogen peroxide. CAUTION: Use a test-tube holder for hot test tubes. Record your data in the data table.
3. Put some potato into the bottom of a clean test tube. Submerge the test tube in the ice bath for 3 minutes.
4. After 3 minutes, place 2ml of hydrogen peroxide into the test tube and observe the reaction. Record your data into the data table.

## Data Table

| Reaction conditions | Reaction Rate (1-5) | Height of Bubbles (cm) |
|---------------------|---------------------|------------------------|
| Room Temp           |                     |                        |
| Hot                 |                     |                        |
| Cold                |                     |                        |

## Lab Analysis

1) According to the chemical equation in the intro, what gas is being released during the catalase reaction?

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2) Rank the reactions in order from strongest to weakest. \_\_\_\_\_

3) According to your rankings, at what temperature does the catalase enzyme function the best? How do you know? \_\_\_\_\_

4) Describe what boiling the potato must have done to the catalase enzyme by making a diagram of what denaturing of an enzyme is.

5) Thought question: How can this experiment apply to the real world of enzymes and how they function?

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