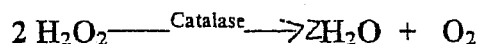


## ENZYME LAB



**Problem:** How does the reaction rate of an enzyme change when: 1) the enzyme concentration is doubled and the substrate concentration is not changed; 2) the substrate concentration is decreased by one-half and the enzyme concentration is not changed; 3) the enzyme is boiled; 4) the enzyme has been acted upon by a strong acid?

**Hypothesis:**

### Materials:

Pan, rubber tube, glass bend for water displacement  
Flask  
100 mL graduated cylinder  
50 mL graduated cylinder or calibrated medicine cups  
Turnip or potato  
Water  
Hydrogen peroxide  
Graph paper  
Watch with second hand

### Procedure:

#### Part I – Control

1. Place 300 mL of water in a blender and add a medium turnip or potato (sliced). Blend for 30 seconds. Strain through cheesecloth or paper towels. Collect the fluid in a beaker and place the beaker on ice. The fluid contains the enzyme catalase.
1. Fill a container  $\frac{3}{4}$  full of water and submerge a 100 mL graduated cylinder in the water.
2. In a medicine cup combine 10 mL of water and 10 mL of hydrogen peroxide.
3. In a second medicine cup collect 10 mL of the enzyme solution.
4. Place the rubber tubing into the submerged graduated cylinder, and keeping the mouth of the graduated cylinder under the water, invert the cylinder (make sure the cylinder is full of water – no air pockets at the top).
5. Pour the hydrogen peroxide and catalase solutions into the flask, stopper and swirl the flask.
6. Begin timing when the first bubble of gas appears in the cylinder.
7. Collect the data in the chart below.

Slope = Change in Y/Change in X

Time Interval (min)	Slope	Reaction Rate (mL/min)
0 - 3		
4 - 7		
8 - 11		
12 - 14		

What is the relationship between slope and the reaction rate?

Why did the reaction rate decrease?

What is happening in the flask when the reaction rate is "0"?

Now that a baseline has been established through a controlled experiment, each experimental group should choose one variable from the problem to change and compare the graph and the reaction rates to the results of the controlled experiment.

**Note:** Catalase solution may be frozen. If this lab cannot be completed in one class period, freeze half of the catalase solution for the second day lab. Each fresh batch of catalase solution will have a different enzyme concentration.