

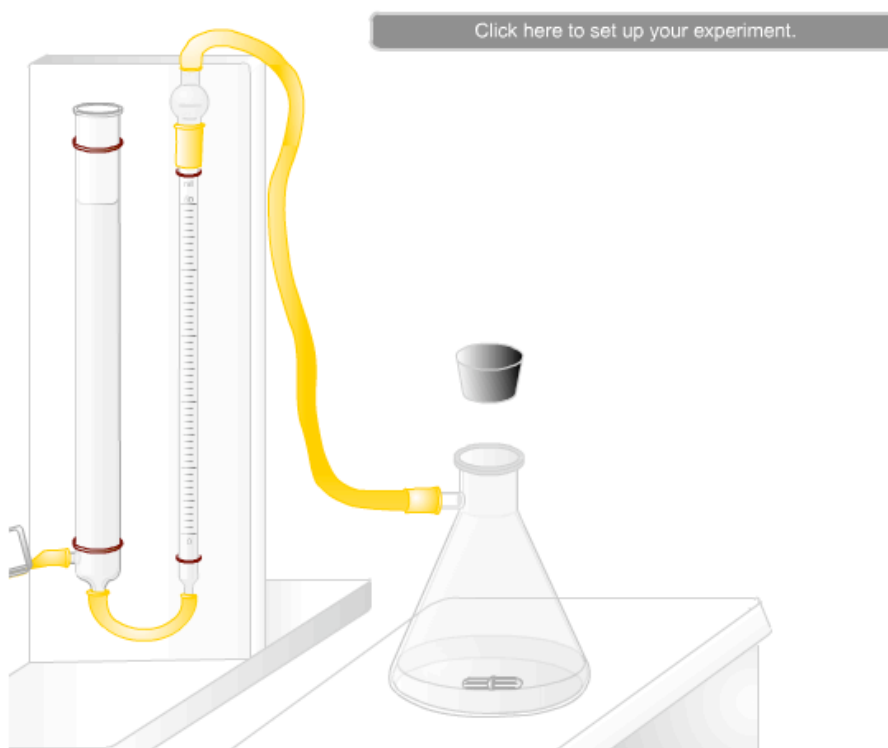
Decomposition of H₂O₂

Name _____ Lab Section _____

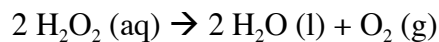
Problem Statement: How do catalysts influence the rate of a chemical reaction?

I. Data Collection:

- A. Go to <http://cheminfo.chem.ou.edu/~mra/home.html> and open the Decomposition of H₂O₂ Simulation. Your screen should look like the figure.



The apparatus is used to study the decomposition of hydrogen peroxide:



A flask is attached to a gas-measuring device that monitors the generation of oxygen gas. The rate at which oxygen gas is produced by the chemical reaction is a measure of the rate of the chemical reaction. Click on the gray rectangle to set up the reaction conditions. You will be asked to specify the amount of 3% H₂O₂, what potential catalyst you will try, and the amount of catalyst. Radio buttons control the amounts. Water is automatically added to make all of the solutions have equal total volumes. When you click on the start button, a magnified view of the graduated gas-measuring device allows you to see how

much gas is being collected over time. You can also click onto graphs that plot the generation of O_2 gas or the consumption of H_2O_2 solution. Try this out to see how this works.

- B. Reset the apparatus. Measure the rate of the dissociation of 5.0 mL of uncatalyzed H_2O_2 .

To do this click on the set up rectangle, choose 5 mL of H_2O_2 , choose 0.5 M KI, and choose 0 mL.

You have several options for timing the reaction: (1) Use a stopwatch to time how long it takes for a specified amount of O_2 gas to be produced. Express this as an average rate (in mL per second). Click on the start button and start the stopwatch at zero gas and stop the stopwatch at the specified volume. (2) Use the O_2 plot to see how long it takes to generate a specified amount of O_2 gas. Click on the Plot O_2 button to view the graph. Use the graph to determine the average rate by determining the slope of a straight line drawn between zero and the specified volume of gas. Record your data in the following table.

	Rate with KI (mL/sec)		Rate with KCl (mL/sec)		Rate with $FeCl_3$ (mL/sec)	
	0 mL	2mL	0 mL	2mL	0 mL	2mL
5 mL H_2O_2						
10 mL H_2O_2						

- C. Repeat the experiment for all of the conditions specified in the above table and record your results. Sketch the plot for the generation of O_2 when 2 mL of KI is added to 5 mL of H_2O_2 .

II. Data Analysis and Interpretation

- A. Use the plot from section I. C. to describe what happens to the rate of this reaction as the reaction proceeds.
- B. Relate the change in $[\text{H}_2\text{O}_2]$ to the change in average rate. How are they related? Are the changes directly proportional?
- C. Which of the substances you added to H_2O_2 acted as a catalyst? Which was the best catalyst? What ion (ions) was (were) responsible for the catalytic effect? How did you eliminate other ions?