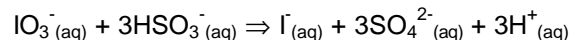


PRE-LAB DISCUSSION

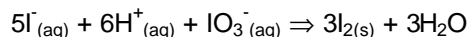
The rate of a chemical reaction is the time required for a change of some properties such as concentration, color, volume, pressure, conductivity, etc. Increasing the temperature of a system raises the average kinetic energy of the particles of the system. This result in more effective collisions per unit time. At constant temperature, increasing the concentration of one or more of the reactants increases the number of particles present and hence, the number of collisions. All these affect the rate of the reaction.

In this experiment you will learn how color change may be used to determine the rate of the reaction. You will also study the effect of concentration change and temperature on reaction rates.

The experiment will be performed by mixing the two solutions labeled A and B. Solution A is a dilute solution of potassium iodate, KIO_3 . Solution B contains starch and hydrogen sulfite, HSO_3^- . When solution A and B are mixed, the following reactions occur:



When the hydrogen sulfite, $\text{HSO}_3^- (\text{aq})$, are consumed, the iodide ions, $\text{I}^- (\text{aq})$, react with the remaining iodate ions, $\text{IO}_3^- (\text{aq})$, to produce iodine, $\text{I}_2 (\text{s})$. The following reaction occurs:



The molecular iodine, I_2 , forms a blue substance with the starch. The appearance of blue color indicates that the reaction has proceeded to this point. The reaction between iodine and starch is very complex; therefore, it is not necessary to mention it at this level.

PURPOSE

To show how the rate of a particular reaction may be measured and to study the effect of changing condition of concentrations on the rate.

EQUIPMENT

two test tubes
400mL beaker
ring stand

two 10mL graduated cylinders
thermometer
wire gauze

watch
burner
distilled water

MATERIALS

600mL of solution A (4.3g KIO_3 / liter)

1L solution of B (0.2g $\text{Na}_2\text{S}_2\text{O}_5$ + 4g starch + 5mL H_2SO_4)

PROCEDURE

The Effect of Concentration on the Reaction Rate

1. Measure 10mL of solution A and place it into a test tube labeled A.
2. Measure 10mL of solution b and place it into another test tube labeled B.
3. Use a watch with seconds, record the time to the nearest seconds you pour solution a into solution B and pour them back and forth two or three times to obtain a homogeneous mixture. You should start recording the time when the solutions are mixed.
4. Watch the solution and stop recording the time when the blue color appears.
5. Wash the graduated cylinders and test tubes you used. Measure 9mL of solution A and pour it into test tube A and add 1mL of water to the same test tube. Measure 10mL of solution B and add it into the test tube B. Repeat the procedure in step 3 to determine the reaction rate.
6. Continue the experiment by diluting solution A as described below.

Trial number	Contents of test tube A		Contents of test tube B	Time (s)
	Solution A	Water	Solution B	
1	10mL	-	10mL	
2	9mL	1mL	10mL	
3	8mL	2mL	10mL	
4	7mL	3mL	10mL	
5	6mL	4mL	10mL	
6	5mL	5mL	10mL	
7	4mL	6mL	10mL	
8	3mL	7mL	10mL	
9	2mL	8mL	10mL	
10	1mL	9mL	10mL	

CALCULATIONS AND QUESTIONS

The Effect of Concentration on the Reaction Rate

1. Calculate the initial concentration of KIO_3 in each of the mixtures of A plus B.
2. Why is it important to keep the total volume of the solution in 10mL?
3. Plot a graph of the concentration-time data with time on the ordinate and the concentration of KIO_3 on the abscissa. Use the data of your group.
4. Interpret your graph in terms of the relationship between concentration and reaction time.
5. What is the relationship between the time of the reaction and the rate of the reaction?