Rates of Reaction: Iodination of Acetone

Determining the rate of the reaction by using time and concentration data from various trials.

Introduction:

The rate at which a chemical reaction occurs depends on several factors: the nature of the reaction, the concentrations of the reactants, the temperature, and the presence of possible catalysts. In this experiment you will study the kinetics of the reaction between iodine and acetone in acid solution: $CH_3COCH_3 + I_2 \rightarrow CH_3CCH_2I + H^+ + I^-$

For this reaction, you will determine the rate of the reaction with respect to iodine concentration to calculate Average Rate of this reaction. Since the concentrations of acetone and HCl are much higher than that of I_2, the concentrations of acetone and HCl will change very little. Thus the rate will be determined by the time needed for iodine to be used up. Iodine has color so you can easily follow changes in iodine concentration visually. The average rate can be calculated using rate = $-\Delta[I_2]/\Delta t$ since the values for iodine completely disappears this will calculate the average rate of reaction.

Equipment/Materials:

4.0 M acetone solution	0.0050 M iodine solution	125 mL Erlenmeyer flasks	watch or other timing device
1.0 M HCl solution	10 mL graduated cylinders	100 mL beakers	

1. **Procedure**: *Be sure to use the correct pipet tip for each liquid*
2. For Trial 1, pipet the appropriate amount of acetone, HCl, and water. DON'T ADD THE IODINE YET!
3. Simultaneously add the iodine and start the stopwatch; swirl the flask at a consistent rate. Stop the stopwatch when the color disappears and record the time for Run 1.
4. Rinse and dry the flask. Repeat the procedure for the remaining Trials and Runs.

Data and Calculations:

Trial	Vol. Acetone	Vol. HCl	Vol. Iodine	Vol. H_2O	Starting [Iodine]	Ending [Iodine]	Start time	Ending Time 1st Run	Ending Time 2nd Run	Average Ending Time
1	5 mL	5 mL	4 mL	6 mL	0.0001M	0 M	0 sec			
2	5 mL	5 mL	6 mL	4 mL	0.0015M	0 M	0 sec			
3	5 mL	5 mL	8 mL	2 mL	0.002M	0 M	0 sec			
4	5 mL	5 mL	10 mL	0 mL	0.0025M	0 M	0 sec			

Trial	Average Reaction Rate Rate = $-\Delta[I_2] / \Delta$(average time)	Questions Use full sentences! Write answers on p.
1		1) How did the rate change from Trial 1-4? 2) How does the rate of the reaction relate to the concentration of iodine? 3) Explain the general rule of how the concentrations of reactants affect the rate. 4) Why is it important to keep the total liquid volume of the reaction the same? If you look, we made the total liquid volume always equal to 20mL. 5) Why did we use a negative sign in front of the rate equation? 6) Why was the temperature kept the same in each trial? 7) How would you redesign the lab to check how temperature changes the rate instead of concentration?
2		
3		
4		