

Rates of Chemical Reaction

Objective: Observe how concentration and temperature affect the rate of reaction.
Rate of reaction is the change in concentration of a reaction over a period of time.

$$\text{Rate} = \frac{\text{Change in concentration in M}}{\text{Time in minutes or seconds}}$$

Reaction:

- $\text{IO}_3^- + 3\text{HSO}_3^- \rightarrow \text{I}^- + 3\text{SO}_4^{2-} + 3\text{H}^+$
- $\text{IO}_3^- + 5\text{I}^- \rightarrow 5\text{H}^+ + 3\text{I}_2 + 3\text{H}_2\text{O}$
- $\text{I}_2 + \text{starch indicator} \rightarrow \text{a dark blue iodine/starch complex}$

An excess of iodate solution, IO_3^- is added to bisulfite solution, 3HSO_3^- to form the iodide ion. When all the Bisulfite ions is reacted, the iodate will reduce the iodide ions to I_2 , iodine which in turn forms a dark blue complex with the starch indicator. The blue color change indicates the completion of the reaction.

Procedure:

- Work in pairs (no more). Check out a timer if needed.

Part I. Initial Trial

- You will conduct three identical trials of the iodine clock reaction.
- Fill a 100 mL beaker to the 80 mL mark line with the Sodium Bisulfite solution. Make sure you label the beaker. Fill another 100 mL beaker with the Potassium Iodate solution. Cover both beaker with a watch glass. This is all that you will need for the experiment.
- Make sure that your glassware is clean and dry. Designate one of the graduated cylinder for the sodium bisulfite solution and the other for the potassium iodate solution. If the same solution is used in the graduated cylinder each time there is no need to wash the graduated cylinder for the different trial.
- Remember to add the starch indicator.
- Mix the solution once with a stir rod after both solutions are added together.
- Time the reaction starting from the addition of the two solutions to appearance of the blue color. If mixed well, the whole solution should turn blue.

Part II Reaction Rate and Concentration

- This is very similar to the trial one. The difference is that the Potassium Iodate solution is varied between trials #4 and #5.

Part III Reaction Rate and Temperature

- You will use the same measurements of reactants used in Part I.
- You will conduct the experiment at temperatures of 45°C and 0°C . Make sure that you check the exact temperature of your reaction.
- A water bath set at 45°C will be set up. You don't need to heat your own water bath

