

The Chemical Clock Experiment

(a.k.a the iodine clock reaction)

Lab 1

Purpose:

To investigate the effects of reactant concentration on the reaction time of the iodine clock reaction and to understand the principles of chemical kinetics, reaction rates, and the methodical approach to scientific experimentation.

Materials:

- Safety goggles
- Lab gloves
- 2 conical flasks
- Graduated cylinders
- Pipettes
- Small beakers (at least 8)
- Stopwatch
- Sodium metabisulfite ($\text{Na}_2\text{S}_2\text{O}_5$) powder
- Potassium iodate (KIO_3) powder
- Distilled water
- Lab coat or apron (optional, for protection)

Procedure:

1. Prepare Sodium Metabisulfite Solution:
 - Measure 200 ml of water into a conical flask.
 - Dissolve sodium metabisulfite powder in water, stirring with a pipette until fully dissolved.
 - Add wheat powder, stirring until completely dissolved.
2. Prepare Potassium Iodate Solution:
 - In another conical flask, measure 200 ml of water.
 - Dissolve potassium iodate powder in water, stirring until fully dissolved.
3. Prepare Beaker Solutions:
 - For sodium metabisulfite: Create four beakers with varying concentrations by diluting with 0, 4, 8, and 12 ml of water.
 - For potassium iodate: Prepare four beakers without altering the concentration.
4. Conduct the Reaction and Record Times:
 - Simultaneously add potassium iodate solution to each sodium metabisulfite solution.
 - Use a stopwatch to measure the time until color change occurs.
 - Record the times in a table for analysis.

What You Should Have Learned:

- The importance of precise measurement and timing in conducting scientific experiments.
- The role of concentration in affecting the rate of chemical reactions.
- The concept of reaction rates and chemical kinetics in chemistry.

Check Your Knowledge:

- How does changing the concentration of sodium metabisulfite affect the reaction time?
- Why is it important to control the concentration of potassium iodate across all experiments?
- Explain the scientific principle behind the iodine clock reaction's sudden color change.
- How could you modify this experiment to explore the effect of temperature on the reaction rate?
- Why is it necessary to wear safety equipment during this experiment?