Iodine Clock Reaction

Purpose

To illustrate a time-delayed reaction, which leads to the exploration of several factors which affect reaction rate.

Materials

- Soluble starch
- Potassium iodate, KIO_3
- Sodium hydrogen sulfite (sodium bisulfite), $NaHSO_3$
- Sulfuric acid, H_2SO_4 (1.0 M)
- (2) 1-L Erlenmeyer flasks
- (2) 400-mL beakers
- 1 ea. 25-mL and 100-mL graduated cylinders
- Distilled water
- Stirring rod
- Electronic balance
- Timer (optional)

Safety

- Read the SDS sheets for all chemicals before using them.
- Wear safety glasses and gloves.

Procedure

1. Prepare Solution A in a 1-L Erlenmeyer flask (Flask A) containing 0.9 L of water.
2. Add 2 g of potassium iodate to Flask A. Stir.
3. Add distilled water to Flask A to make a total volume of 1 L.
4. Prepare Solution B in a 1-L Erlenmeyer flask (Flask B) containing 0.9 L of boiling water.
5. While stirring, slowly add 4.0 g of soluble starch to Flask B.
6. Add 0.8 g of sodium bisulfite to Flask B. Stir.
7. Add 10.0 mL of 1.0 M sulfuric acid to Flask B. Stir.
8. Add distilled water to Flask B to make a total volume of 1 L.
9. Allow Flask B to return to room temperature.
10. Pour 100 mL of Solution A in a 400-mL beaker (Beaker A).
11. Pour 100 mL of Solution B in a second 400-mL beaker (Beaker B).
12. Pour the solution in Beaker B into Beaker A, and mix.
13. Start the timer (optional).

Results

- Upon mixing the two reactants, the resulting solution turns dark blue after a set amount of time.

Follow-up Teaching Notes

- Time the reaction just prior to the demonstration so you can say a "magic word" to activate the reaction.
- Prepare the solution no earlier than the day before you plan to do the demonstration.

Connections

- Rates of reaction.

Extensions

- Allow students to investigate the effect of concentration on rate of reaction by diluting a known amount of Solution B with a known amount of water.
- Allow students to investigate the effect of temperature on rate of reaction by heating and cooling the contents of Beaker A and Beaker B.

Disposal/Clean-up

- The solutions can be disposed of down the drain. Consult local regulations before any disposal activity.