Voltaic Cells

OBJECTIVES

- ***Construct*** **a Cu-Zn voltaic cell.**
- ***Design*** **and construct two other voltaic cells.**
- ***Measure*** **the potential of the voltaic cells.**
- ***Evaluate*** **cells by comparing the measured cell voltages with the voltages calculated from standard reduction potentials.**

MATERIALS

- **0.5 M $Al_2(SO_4)_3$, 75 mL**
- **0.5 M $CuSO_4$, 75 mL**
- **0.5 M $ZnSO_4$, 75 mL**
- **Aluminum strip, 1 cm × 8 cm**
- **Copper strip, 1 cm × 8 cm**
- **Zinc strip, 1 cm × 8 cm**
- **Distilled water**
- **100 mL graduated cylinder**
- **Emery cloth**
- **150 mL beakers, 3**
- **Salt bridge**
- **Voltmeter**
- **Wires with alligator clips, 2**

BACKGROUND

In voltaic cells, oxidation and reduction half-reactions take place in separate half-cells, which can consist of a metal electrode immersed in a solution of its metal ions. The electrical potential, or voltage, that develops between the electrodes is a measure of the combined reducing strength of one reactant and oxidizing strength of the other reactant.

SAFETY

For review of safety, please see **Safety in the Chemistry Laboratory** in the front of your book.

PREPARATION

1. Follow your teacher's instructions to create the data table that you will use to record your data for three voltaic cells.
2. Remove any oxide coating from strips of aluminum, copper, and zinc by rubbing them with an emery cloth. Keep the metal strips dry until you are ready to use them.
3. Label three 150 mL beakers "$Al_2(SO_4)_3$," "$CuSO_4$," and "$ZnSO_4$."

PROCEDURE

1. Pour 75 mL of 0.5 M $ZnSO_4$ into the $ZnSO_4$ beaker and 75 mL of 0.5 M $CuSO_4$ into the $CuSO_4$ beaker.
2. Place one end of the salt bridge into the $CuSO_4$ solution and the other end into the $ZnSO_4$ solution.
3. Place a zinc strip into the zinc solution and a copper strip into the copper solution.