

Electromagnetic Induction

OBJECTIVES

- **Detect** an induced current using a galvanometer.
- **Determine** the relationship between the magnetic field of a magnet and the current induced in a conductor.
- **Determine** what factors affect the direction and magnitude of an induced current.

MATERIALS LIST

- galvanometer
- insulated connecting wires
- momentary contact switch
- pair of bar magnets or a large horseshoe magnet
- power supply
- rheostat ($10\ \Omega$) or potentiometer
- student primary and secondary coil set with iron core

In this laboratory, you will use a magnet, a conductor, and a galvanometer to explore electromagnets and the principle of self-induction.

SAFETY



- **Never close a circuit until it has been approved by your teacher. Never rewire or adjust any element of a closed circuit. Never work with electricity near water; be sure the floor and all work surfaces are dry.**
- **If the pointer on any kind of meter moves off scale, open the circuit immediately by opening the switch.**
- **Do not attempt this exercise with any batteries, electrical devices, or magnets other than those provided by your teacher for this purpose.**

PROCEDURE

Preparation

1. Read the entire lab, and plan what measurements you will take.
2. If you are not using a datasheet provided by your teacher, prepare an observation table in your lab notebook with three wide columns. Label the columns *Sketch of Setup*, *Experiment*, and *Observations*. For each part of the lab, you will sketch the apparatus and label the poles of the magnet, write a brief description, and record your observations.

Induction with a Permanent Magnet

3. Connect the ends of the smaller coil to the galvanometer. Hold the magnet still and move the coil quickly over the north pole of the magnet, as shown in **Figure 1**. Remove the coil quickly. Observe the galvanometer.
4. Repeat, moving the coil more slowly. Observe the galvanometer.
5. Turn the magnet over, and repeat steps 3 and 4, moving the coil over the south pole of the magnet. Observe the galvanometer.
6. Hold the coil stationary, and quickly move the north pole of the magnet in and out of the coil. Repeat slowly. Turn the magnet, and repeat this step using the south pole. Observe the galvanometer.