

## Skills Practice Lab

## Magnetic Field of a Conducting Wire

## OBJECTIVES

- **Use** a compass to explore the direction of the magnetic field of a current-carrying wire.
- **Analyze** the relationship between the direction of the magnetic field of a conducting wire and the direction of the current in the wire.

## MATERIALS LIST

- 1  $\Omega$  resistor
- compass
- galvanometer
- insulated connecting wires and bare copper wire
- multimeter or dc ammeter
- power supply
- switch

In this lab, you will study the magnetic field that occurs around a current-carrying wire. You will construct a circuit with a current-carrying wire and use a magnetic compass needle to investigate the relationship between the magnetic field and the current in the wire. You will be able to determine the magnitude and direction of the magnetic field surrounding the wire.

## 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.**
- **Wire coils may heat up rapidly during this experiment. If heating occurs, open the switch immediately and handle the equipment with a hot mitt. Allow all equipment to cool before storing it.**

## PROCEDURE

## Preparation

1. Read the entire lab procedure, and plan the steps you will take.
2. If you are not using a datasheet provided by your teacher, prepare a data table in your lab notebook with four columns and nine rows. In the first row, label the columns *Turns*, *Current (A)*, *Current Direction*, and *Compass Reading*. In the first column, label the second through ninth rows *One, One, Two, Two, Three, Three, Four, and Four*.

## Magnetic Field of a Current-Carrying Wire

3. Wrap the wire once around the galvanometer. Place the large compass on the stand of the galvanometer so that the compass needle is parallel to and directly below the wire, as shown in **Figure 1**. (**Figure 1** shows multiple wire windings, not only one.) Turn the galvanometer until the turn of wire is in the north-to-south plane, as indicated by the compass needle.