ADVANCED TOPICS

See "Superconductors and BCS Theory" in **Appendix J: Advanced Topics** to learn more about superconducting materials.

Potentiometers have variable resistance

A *potentiometer* is a special type of resistor that has a fixed contact on one end and an adjustable, sliding contact that allows the user to tap off different potential differences. The sliding contact is frequently mounted on a rotating shaft, and the resistance is adjusted by rotating a knob. Potentiometers (frequently called *pots* for short) have many applications. In fact, most of the knobs on everyday items, such as volume controller on a stereo, are potentiometers. Potentiometers may also be mounted linearly. One example is a dimmer switch to control the light output of a light fixture. The joystick on your video game controller uses two potentiometers, one for motion in the x direction and one for motion in the y direction, to tell the computer the movements that you make when playing a game.

SECTION REVIEW

1. Can the direction of conventional current ever be opposite the direction of charge movement? If so, when?
2. The charge that passes through the filament of a certain light bulb in 5.00 s is 3.0 C.
   a. What is the current in the light bulb?
   b. How many electrons pass through the filament of the light bulb in a time interval of 1.0 min?
3. How much current would a 10.2 Ω toaster oven draw when connected to a 120 V outlet?
4. An ammeter registers 2.5 A of current in a wire that is connected to a 9.0 V battery. What is the wire's resistance?
5. In a particular diode, the current triples when the applied potential difference is doubled. What can you conclude about the diode?
6. What is the function of resistors in a circuit board? What is the function of diodes in a circuit board?
7. Calculate the current in a 75 Ω resistor when a potential difference of 115 V is placed across it. What will the current be if the resistor is replaced with a 47 Ω resistor?
8. **Critical Thinking** In a conductor that carries a current, which is less, the drift speed of an electron or the average speed of the electron between collisions? Explain your answer.
9. **Critical Thinking** You have only one type of wire. If you are connecting a battery to a light bulb with this wire, how could you decrease the current in the wire?