ELECTRIC CIRCUITS

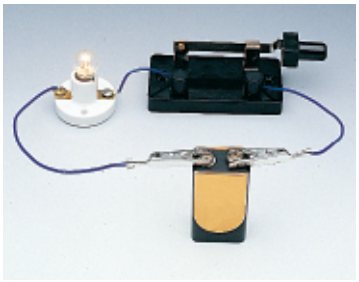

Figure 2
When all electrical components are connected, charges can move freely in a circuit. The movement of charges in a circuit can be halted by opening the switch.

electric circuit

a set of electrical components connected such that they provide one or more complete paths for the movement of charges

Think about how you get the bulb in **Figure 2** to light up. Will the bulb stay lit if the switch is opened? Is there any way to light the bulb without connecting the wires to the battery?

The filament of the light bulb acts as a resistor. When a wire connects the terminals of the battery to the light bulb, as shown in **Figure 2,** charges built up on one terminal of the battery have a path to follow to reach the opposite charges on the other terminal. Because there are charges moving through the wire, a current exists. This current causes the filament to heat up and glow.

Together, the bulb, battery, switch, and wire form an **electric circuit.** An electric circuit is a path through which charges can flow. A schematic diagram for a circuit is sometimes called a *circuit diagram.*

Any element or group of elements in a circuit that dissipates energy is called a *load.* A simple circuit consists of a source of potential difference and electrical energy, such as a battery, and a load, such as a bulb or group of bulbs. Because the connecting wire and switch have negligible resistance, we will not consider these elements as part of the load.

In **Figure 2,** the path from one battery terminal to the other is complete, a potential difference exists, and electrons move from one terminal to the other. In other words, there is a closed-loop path for electrons to follow. This is called a *closed circuit.* The switch in the circuit in **Figure 2** must be closed in order for a steady current to exist.

Without a complete path, there is no charge flow and therefore no current. This situation is an *open circuit.* If the switch in **Figure 2** were open, as shown in **Table 1,** the circuit would be open, the current would be zero, and the bulb would not light up.

Why it Matters

Conceptual Challenge

1. Bird on a Wire Why is it possible for a bird to be perched on a high-voltage wire without being electrocuted? (Hint: Consider the potential difference between the bird's two feet.)

2. Parachutist on a Wire Suppose a parachutist lands on a high-voltage wire and grabs the wire in preparation to be rescued. Will the parachutist be electrocuted? If the wire breaks, why should the parachutist let go of the wire as it falls to the ground? (Hint: First consider the potential difference between the parachutist's two hands holding the wire. Then consider the potential difference between the wire and the ground.)