

Electricity ▪ *Section Summary***Electric Current****Guide for Reading**

- How is an electric current produced?
- How are conductors different from insulators?
- What causes electric charges to flow in a circuit?
- How does resistance affect current?

When electric charges are made to flow through a wire or similar material, they produce an electric current. **Electric current** is the continuous flow of electric charges through a material. The amount of charge that passes through the wire in a unit of time is the rate of electric current. The unit for rate of current is the ampere (amp or A). The number of amps describes the amount of charge flowing past a given point each second. **To produce electric current, charges must flow continuously from one place to another.** Current requires an **electric circuit**, which is a complete, unbroken path through which electric charges can flow.

Electric charges do not flow easily through every material. **A conductor transfers electric charge well. An insulator does not transfer electric charge well.** Metals, such as silver, copper, aluminum, and iron, are good conductors. A **conductor** is a material through which charge can easily flow. As electrons flow through a conductor, they form an electric current. Conductors are used to carry electric charge. A material through which charges cannot flow easily is called an **insulator**. Rubber, glass, sand, plastic, and wood are good insulators.

Charges in an electric circuit flow because of a difference in electrical potential energy. The difference in electrical potential energy between two places in a circuit is called the potential difference, or **voltage**. The unit of measure of voltage is the volt (V). **Voltage causes a current in an electric circuit.** You can think of voltage as the amount of force pushing an electric current. An electric circuit also requires a source of energy, such as a battery, to maintain a voltage. A **voltage source** is a device that creates a potential difference in an electric circuit.

The amount of current in a circuit also depends on the resistance of the material through which it travels. **Resistance** is the measure of how difficult it is for charges to flow through a material. **The greater the resistance, the less current there is for a given voltage.** The unit of measure of resistance is the ohm (Ω). There are four factors that determine the resistance of a wire, or any object. The first is the material from which the wire is made. Insulators have high resistance, and conductors have low resistance. The second factor is length. Long wires have more resistance than short wires. The third factor is diameter. Thin wires have more resistance than thick wires. The fourth factor is the temperature of the wire. The electrical resistance of most materials increases as temperature increases.