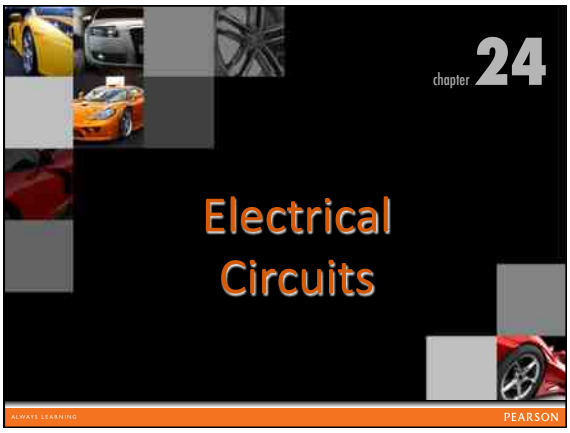

FIGURE 24.1 All complete circuits must have a power source, a power path, protection (fuse), an electrical load (light bulb in this case), and a return path back to the power source.

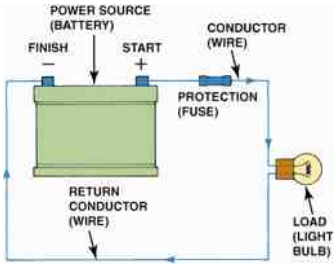

FIGURE 24.2 The return path back to the battery can be any electrical conductor, such as a copper wire or the metal frame or body of the vehicle.

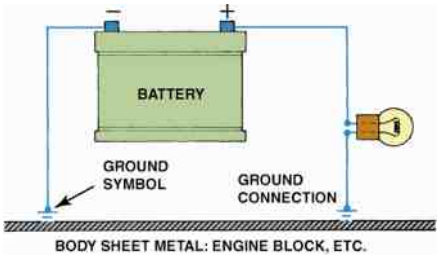

FIGURE 24.3 An electrical switch opens the circuit and no current flows. The switch could also be on the return (ground) path wire

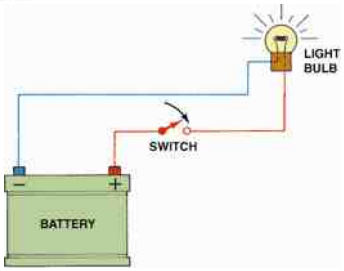

FIGURE 24.4 Examples of common causes of open circuits. Some of these causes are often difficult to find.

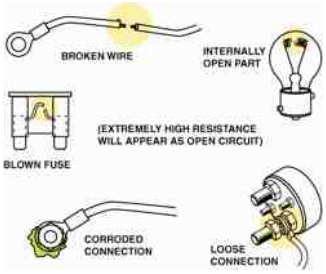

FIGURE 24.5 A short circuit permits electrical current to bypass some or all of the resistance in the circuit.

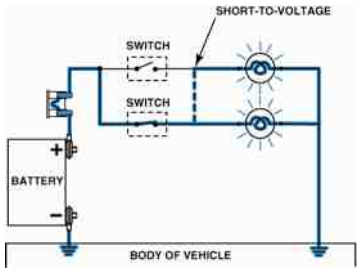

FIGURE 24.6 A fuse or circuit breaker opens the circuit to prevent possible overheating damage in the event of a short circuit.

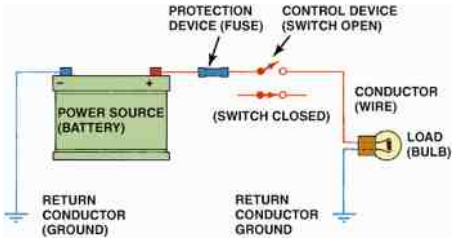

FIGURE 24.7 A short-to-ground affects the power side of the circuit. Current flows directly to the ground return, bypassing some or all of the electrical loads in the circuit. There is no current in the circuit past the short. A short-to-ground will also cause the fuse to blow.

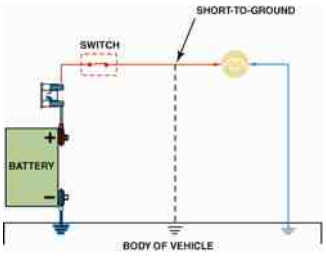

FIGURE 24.8 To calculate one unit of electricity when the other two are known, simply use your finger and cover the unit you do not know. For example, if both voltage (E) and resistance (R) are known, cover the letter I (amperes). Note that the letter E is above the letter R, so divide the resistor's value into the voltage to determine the current in the circuit.

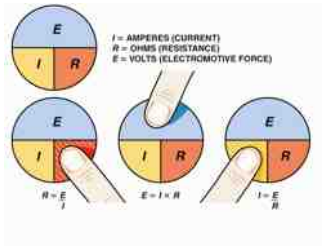

FIGURE 24.9 Electrical flow through a circuit is similar to water flowing over a waterwheel. The more the water (amperes in electricity), the greater the amount of work (waterwheel). The amount of water remains constant, yet the pressure (voltage in electricity) drops as the current flows through the circuit.

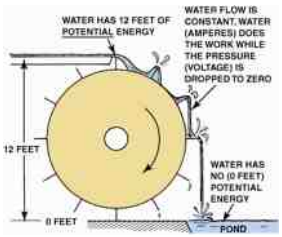

CHART 24.1 Ohm's law relationship with the three units of electricity.

VOLTAGE	RESISTANCE	AMPERAGE
Up	Down	Up
Up	Same	Up
Up	Up	Same
Same	Down	Up
Same	Same	Same
Same	Up	Down
Down	Up	Down
Down	Same	Down

CHART 24–1
Ohm's law relationship with the three units of electricity.