

Name: _____

Skill Sheet 8-A

Ohm's Law



Building and testing series circuits has helped you understand the relationship between voltage, resistance, and current. You know that if the voltage (energy) in a circuit increases, so does the current (flow of charges). You also understand that if the resistance increases, the current flow decreases. A German physicist, Georg S. Ohm, developed this mathematical relationship, which is present in most circuits. This relationship is known as Ohm's law:

$$\text{Current (amps)} = \frac{\text{Voltage (volts)}}{\text{Resistance (ohms, } \Omega)}$$

This skill sheet will provide you with an opportunity to test your knowledge of Ohm's law.

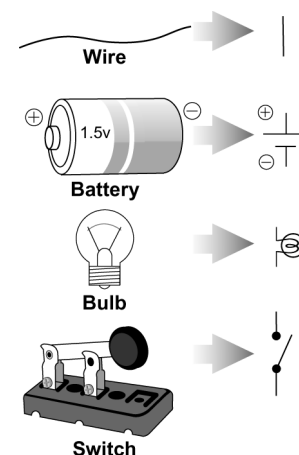
1. Using Ohm's Law to understand circuits

To work through this skill sheet, you will need the symbols used to depict circuits in diagrams. The symbols that are most commonly used for circuit diagrams are provided to the right.

All of the circuits discussed in this skill sheet are **series** circuits. This means the current has only one path through the circuit. Later you will learn about another kind of circuit in which the current has more than one possible path. This type of circuit is called a **parallel** circuit.

Note: For convenience, the symbol for battery is used to represent one *or more* batteries. The batteries you have used to build circuits are 1.5 volt batteries. Dividing the total voltage by 1.5 volts will tell you the number of batteries present in the circuit.

For example, the total voltage in the second diagram on the right is 6 volts. Divide 6 volts by 1.5 volts to find the number of batteries in the circuit. $6 \div 1.5 = 4$. There are four batteries in the circuit.



$$1.5 \text{ V } \frac{+}{-} = \text{[Battery Symbol]}$$

$$6 \text{ V } \frac{+}{-} = \text{[Four Batteries in Series Symbol]}$$

2. Solving problems

In this section, you will find some problems based on diagrams and others without diagrams. In all cases, you should show your work.

1. If a toaster produces 12 ohms of resistance in a 120-volt circuit, what is the amount of current in the circuit?

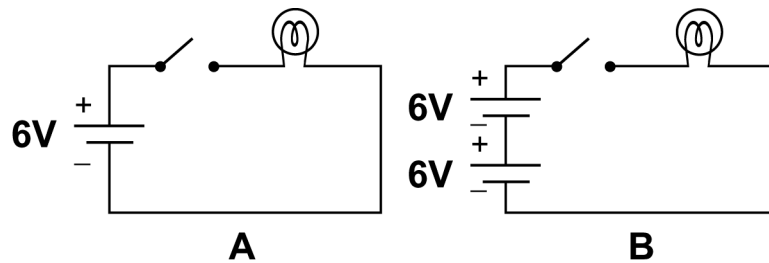
2. What is the voltage of a circuit with 15 amps of current and toaster with 8 ohms of resistance?

3. What is the current in a circuit containing two 1.5-volt batteries and a 6 ohm light bulb?

4. What is the resistance of a circuit in which a 9-volt battery produces a current of 3 amps?

5. You have a large flashlight that takes 4 D-cell batteries. If the current in the flashlight is 2 amps, what is the resistance of the light bulb? (Hint: A D-cell battery has 1.5 volts.)

6. Use the diagram below to answer the following problems.



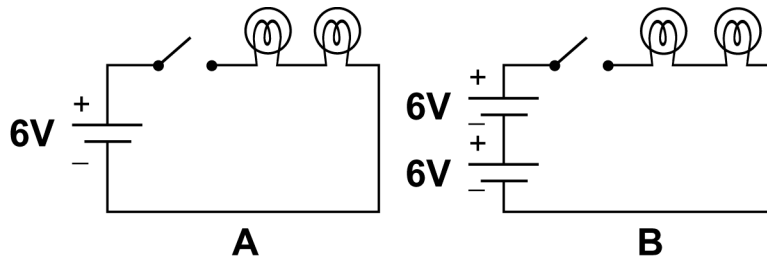
a. What is the total voltage in each circuit?

b. How much current would be measured in each circuit if the light bulb has a resistance of 6 ohms?

c. How much current would be measured in each circuit if the light bulb has a resistance of 12 ohms?

d. What would happen to the brightness of the bulb if voltage is increased?

7. Use the diagram below to answer the following problems.



a. How much current would be measured in each circuit if each light bulb has a resistance of 6 ohms?

b. How much current would be measured in each circuit if each light bulb has a resistance of 12 ohms?

c. What happens to the brightness of each bulb as you add bulbs to a series circuit? (Hint: Compare these diagrams to the diagrams in question 6 above.)

8. What happens to the current in a series circuit as the number of batteries increases?

9. What happens to the current in a series circuit as the number of bulbs increases?

10. What happens to the current in a circuit as the voltage increases?

11. What happens to the current in a circuit as the resistance increases?
