Electricity

I. Testing Concepts

Directions: Match the definition in Column II with its meaning when used in a circuit diagram in Column I by writing the letter of the correct symbol in the blank on the left.

<table>
<thead>
<tr>
<th>Column I</th>
<th>Column II</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. open circuit</td>
<td>a. how much power an appliance uses</td>
</tr>
<tr>
<td>2. fuse</td>
<td>b. individual batteries</td>
</tr>
<tr>
<td>3. resistance</td>
<td>c. a small piece of wire that melts</td>
</tr>
<tr>
<td>4. circuit breaker</td>
<td>d. a piece of metal that bends</td>
</tr>
<tr>
<td>5. dry cell</td>
<td>e. tendency of a material to oppose the flow of electrons</td>
</tr>
<tr>
<td></td>
<td>f. no current flows in this circuit</td>
</tr>
</tbody>
</table>

Directions: For each of the following write the letter of the term or phrase that best completes the sentence.

6. A circuit that has two or more separate branches for current is a(n) _______.
   a. parallel circuit  b. series circuit  c. circuit diagram  d. electron circuit

7. The statement that current is equal to the voltage difference divided by the resistance is known as _______.

8. A static discharge differs from an electric current in that a static discharge _______.
   a. is a flow of electrons  b. lasts for only a fraction of a second  c. results because a force is exerted on the electrons  d. involves the movement of ions as well as electrons

9. Electric charge that has accumulated on an object is referred to as _______.
   a. current electricity  b. circuit electricity  c. static electricity  d. current circuit

10. Resistance is measured in a unit called the _______.
    a. ampere  b. ohm  c. volt  d. coulomb

11. The rate at which an electrical device converts energy from one form to another is called _______.
    a. electric energy  b. electric resistance  c. electric power  d. voltage regulation

12. A path that allows only one route for a current is called a _______.
    a. series current  b. parallel current  c. parallel circuit  d. series circuit
13. Which of the following is the correct relationship among power, current, and voltage?
   a. \( P = \frac{I}{V} \)  
   b. \( V = P \times I \)  
   c. \( P = I \times V \)  
   d. \( \Omega = P \times I \)  

14. A television that requires an average of 0.40 ampere of current is operated on a 120-volt service for 5.0 hours. How much energy is used?
   a. 1.5 kWh  
   b. 0.15 kWh  
   c. 0.24 kWh  
   d. 0.67 kWh  

15. One source of constant electric current is a ______.
   a. switch  
   b. transformer  
   c. dry cell  
   d. coulomb  

16. A material through which electrons do not move easily is a(n) ______.
   a. transformer  
   b. insulator  
   c. conductor  
   d. fuse  

17. Lightning is ______.
   a. a large discharge of static electricity  
   b. a buildup of neutrons  
   c. a low-voltage electric current  
   d. harmless  

18. The voltage ______ as current moves through a circuit.
   a. remains the same  
   b. varies  
   c. doubles  
   d. increases  

19. Which of the following is a device designed to open an overloaded circuit and prevent overheating?
   a. transformer  
   b. magnet  
   c. resistor  
   d. circuit breaker  

II. Understanding Concepts

Skill: Making and Using Tables

Directions: Complete the table below by supplying the missing information.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Unit</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>ohm</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td>kWh</td>
</tr>
<tr>
<td>3. electrical power</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. voltage difference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>amperes</td>
</tr>
</tbody>
</table>
Skill: Observing and Inferring

Figure 1

Figure 2

Metal
Insulator
Metal
Glass
Gold leaves

Directions: Use the diagrams to answer the following questions.

6. What is the name of the instrument shown in the diagrams?

7. Describe the appearance of the leaves in Figure 1.

8. Describe the appearance of the leaves in Figure 2.

9. What inference can you make about the electrical conditions of the combs in Figures 1 and 2?

Skill: Hypothesizing

10. Use what you know about charges and the way an electroscope works to write a hypothesis stating how the leaves of the electroscope in Figure 1 could be made to be like the leaves of the electroscope in Figure 2.
Chapter Test (continued)

III. Applying Concepts

Directions: Solve the following problems.

1. a. If the reading on an electric meter in December was 2345 kilowatt-hours and the reading in January was 3456 kilowatt-hours, how much electrical energy was used in the one-month period between the December and January readings?

   b. If the family who owns this house used 999 kilowatt-hours of electrical energy in the period between the November and December readings, how much more energy did they use in the following one-month period?

   c. If electricity costs $0.10 per kilowatt-hour, how much was the electric bill in January?

2. If a current flowing through a lightbulb is 0.75 ampere and the voltage difference across the lightbulb is 120 volts, how much resistance does the lightbulb have?

3. If an air conditioner uses 1800 watts of power when plugged into a wall socket that operates at a voltage of 210 volts, what is the current flowing through the air conditioner?

IV. Writing Skills

Directions: Answer the following questions using complete sentences.

1. Suppose you have purchased a string of lights. You want to find out if the lights are wired in series or in parallel. How could you quickly determine how the lights have been wired?

2. What causes lightning?
Chapter Test (page 37)

I. Testing Concepts
1. f (7/3)
2. c (7/3)
3. e (7/3)
4. d (7/3)
5. b (7/3)
6. a (7/3)
7. a (6/2)
8. b (4/2)
9. c (1/1)
10. b (6/2)
11. c (9/3)
12. d (7/3)
13. c (9/3)
14. c (9/3)
15. c (5/2)
16. b (2/1)
17. a (1/1)
18. b (6/2)
19. d (8/3)

II. Understanding Concepts
1. resistance, $\Omega$ (6/2)
2. electrical energy, kilowatt-hour (9/3)
3. watt or kilowatt, W or kW (9/3)
4. volts, V (6/2)
5. electric current, A (6/2)
6. an electroscope (3/1)
7. The leaves are spread apart. (3/1)
8. The leaves are hanging straight down. (3/1)
9. The comb in Figure 1 has an electrical charge. The comb in Figure 2 is neutral. (3/1)
10. The electroscope in Figure 1 could be touched with an oppositely charged object. This would cancel the charges in the leaves and make them resemble the leaves in Figure 2. (3/1)

III. Applying Concepts
1. a. 3456 kWh $- 2345$ kWh $= 1,111$ kWh (9/3)
b. 1111 kWh $- 999$ kWh $= 12$ kWh (9/3)
c. 1111 kWh $\times$ $\$0.10/kWh = \$111.10$ (9/3)
2. $I = \frac{V}{R}$, $R = 120$ V/0.75 A $= 160$ $\Omega$, 0.75A $= 120$ V (9/3)
3. $P = I \times V$, $I = 1800$ W/210 V $= 8.57$ A, $1800$ W $= I \times 210$ V (9/3)

IV. Writing Skills
1. Remove one bulb from the string of lights while the current is running through the string. If the remaining bulbs go out, the string is wired in series. If the remaining bulbs remain lit, the string is wired in parallel. (7/3)

2. Lightning is a large static charge—a transfer of charge through the air between two objects because of a buildup of static electricity. As the electric charges move through the air, they collide with atoms and molecules. These collisions cause the atoms and molecules in air to emit light. (1/1)