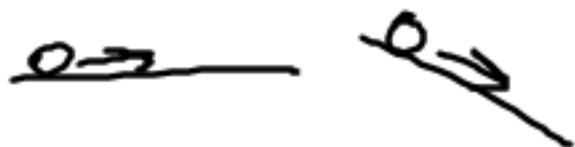


Day 6—Ohm's Law and Electric Circuits

I. Electricity

1. Discuss vocabulary



- a. Voltage(potential difference)(V)-the difference in potential between 2 pts. (diff in # of electron)
 - i. Measured in volts(V)
- b. Resistance(R)-tendency to oppose flow of electricity.
 - i. Measured in ohms(Ω)
- c. Current(I)-rate of flow of electrons
 - i. Measured in amps(A)

Voltage determines whether
electricity will or will not flow!!!

Resistance determines how
much current will flow!!

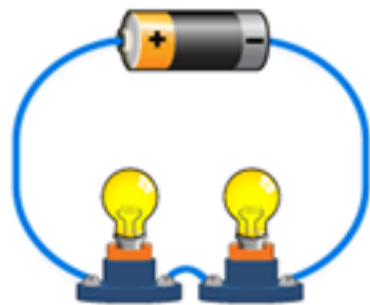
$$\uparrow R = \downarrow I$$

- a. Electrical Power(P)-rate at which electrical energy is converted to other forms of energy
 - i. Measured in watts(W)
- b. Series Circuit-circuit with only one path for electricity to flow
- c. Parallel Circuit-circuit with more than one path for electricity to flow

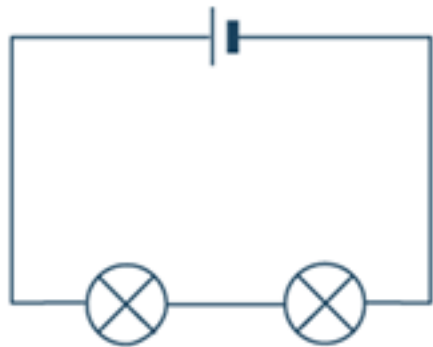
What is an Electric Circuit?

- An Electric Circuit is a closed path through which electricity flows.

They can be shown as an actual picture..



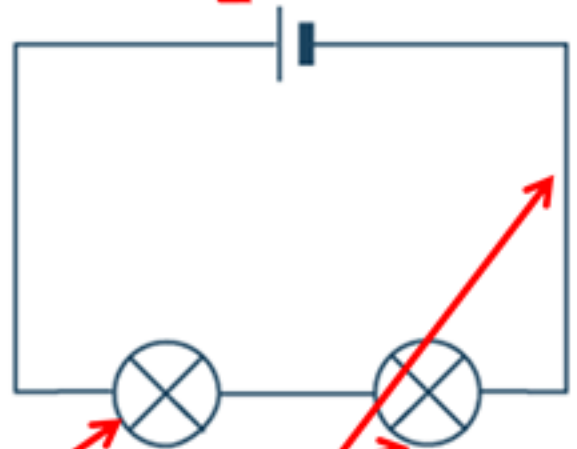
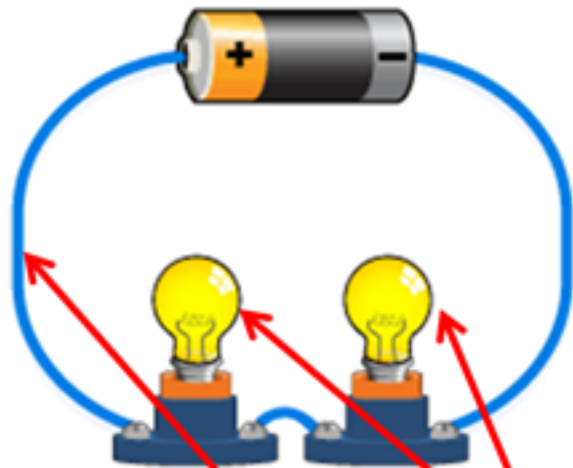
...or they can be shown as a schematic diagram!



Electric Circuits

- There are 3 parts to any Electric Circuit:
 1. Energy Source
 2. Energy Conductor
 3. Energy Receiver

Energy Source

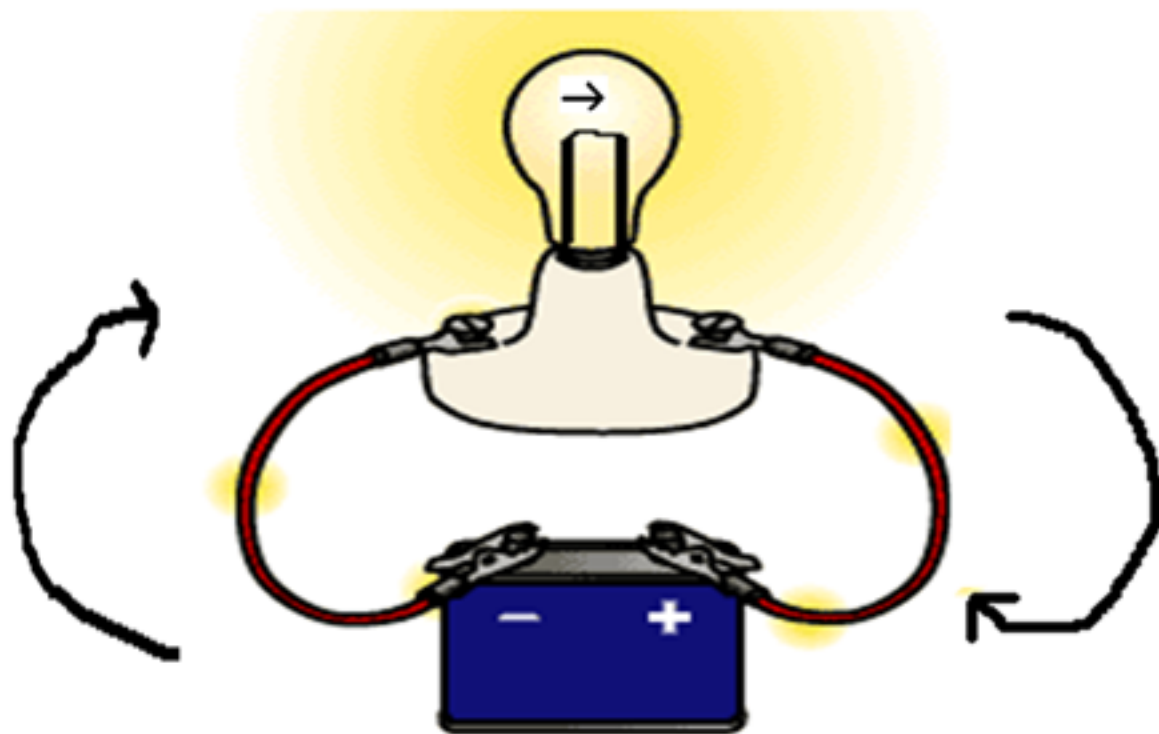


Energy Receiver(resistance)

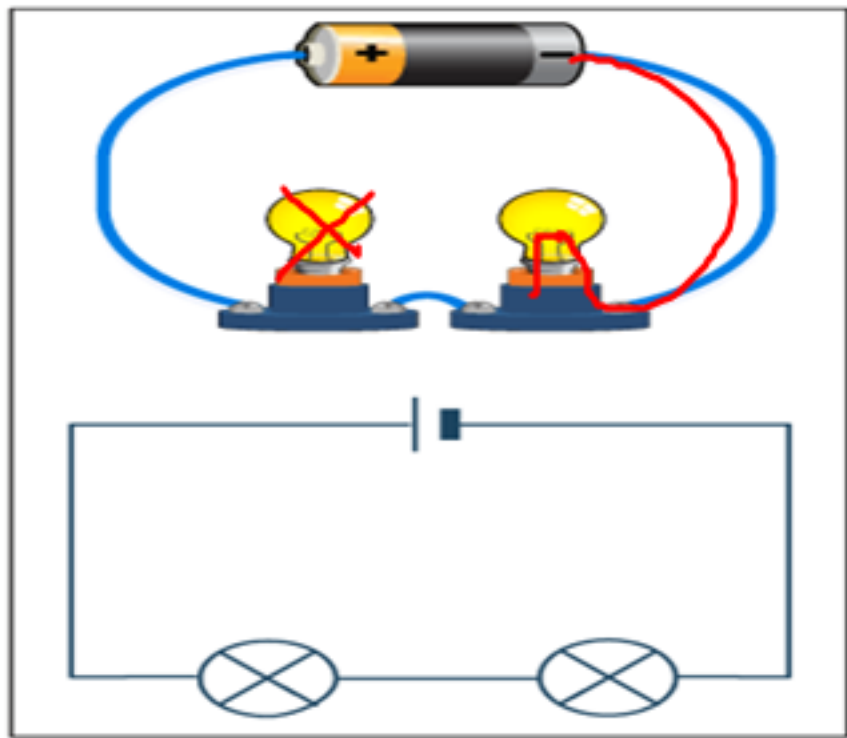
Energy Conductor

In order to work properly, electricity has to get :

- 1. To the device
- 2. Through the device
- 3. And back to the other side of the battery(or outlet)

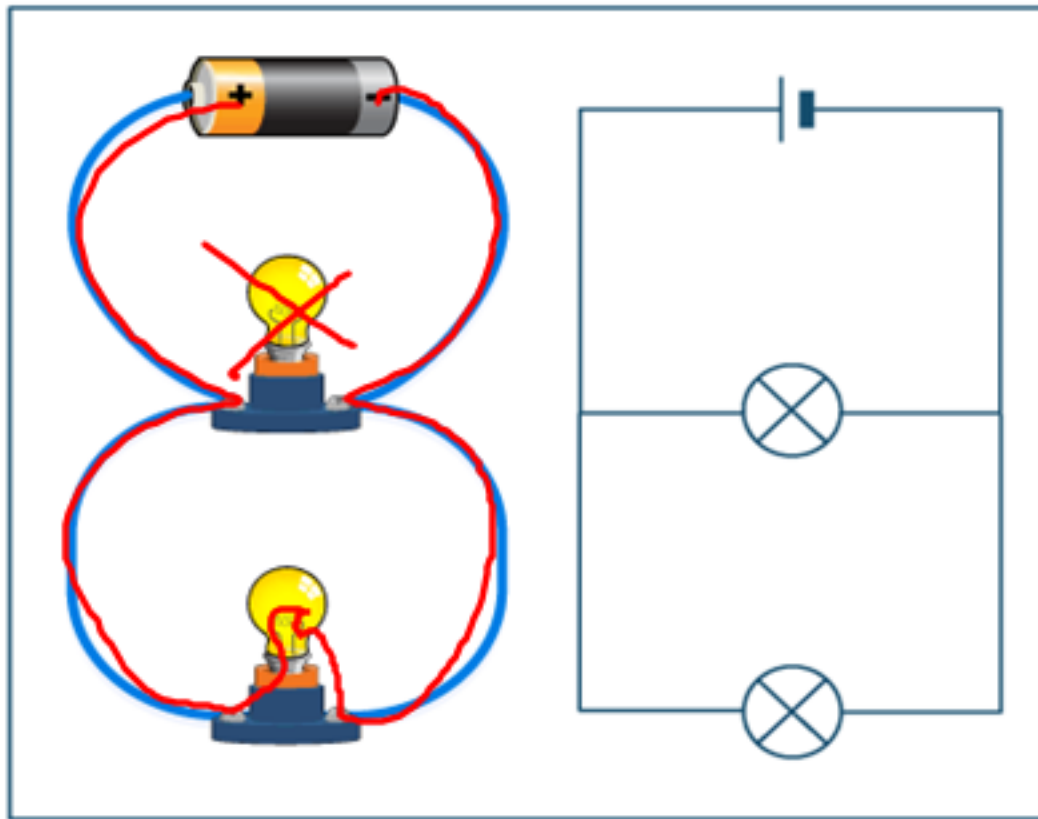


Series Circuit:



1. Only one path for the electricity to flow!!
2. If one device goes out, they all go out!!

Parallel Circuit:



1. More than one path for the electricity to flow!!
2. If one device goes out, the rest remain lit!!

Ohm's Law and Power Examples:

$$V = IR$$

$$P = VI$$

___ 1. A 10 V battery is connected to a 5 ohm resistor. What current will flow through the circuit?

a) .5 A

b) 2 A

c) 15 A

d) 50 A

$$\frac{V}{I/R}$$

$$V = 10V$$

$$R = 5\Omega$$

$$I =$$

$$\frac{V}{R} = \frac{10}{5}$$

___ 2. A current of 3 A flows through a 9 ohm resistor. What is the voltage drop across the circuit?

a) 3 V

b) 3 V

c) 12 V

d) 27 V

$$I = 3 \text{ A}$$

$$R = 9 \Omega$$

$$V = ?$$

$$V = IR$$

$$= 3(9)$$

$$V =$$

___ 3. A 9 V battery is connected to a circuit through which 4 A of current flows. What is the power consumed by the circuit?

a) 2.25 W

b) 5 W

c) 28 W

d) 36 W

$$V = 9V$$

$$I = 4A$$

$$P = ?$$

$$P = VI$$

$$= 9(4)$$

$$P = 36W$$

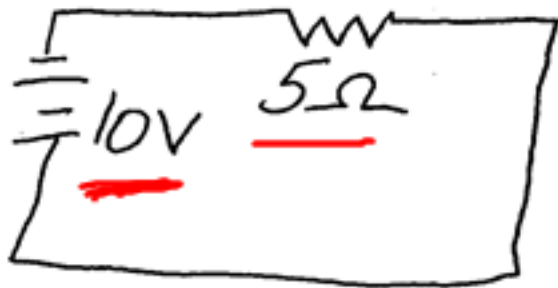
___ 4. A 12 V battery is connected to a 4 ohm resistor. What is the power consumed by the circuit?

- a) 48 W b) 36 W c) 24 W d) 18 W

I $\left\{ \begin{array}{l} V = 12 \text{ V} \\ R = 4 \Omega \\ P = ? \end{array} \right.$

$P = VI$
 $P = 12(3)$
 $P = 36 \text{ W}$

$V = IR$
 $I = \frac{V}{R} = \frac{12}{4}$
 $I = 3 \text{ A}$



1. What current flows through the circuit?
- a) .5 A b) 2 A c) 10 A d) 50 A

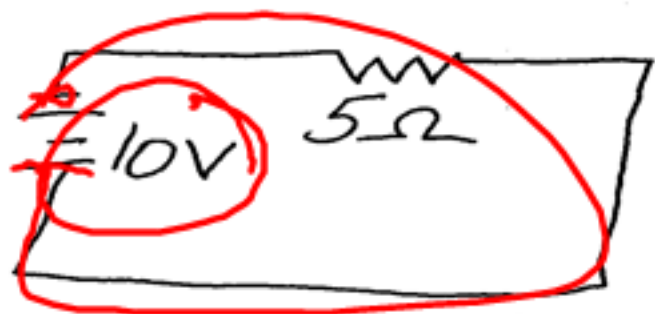
$$V = 10V$$

$$R = 5\Omega$$

$$I = ?$$

$$V = IR$$

$$I = \frac{V}{R} = \frac{10}{5} = 2A$$



2. What is the potential difference across the circuit?

a) 5 V

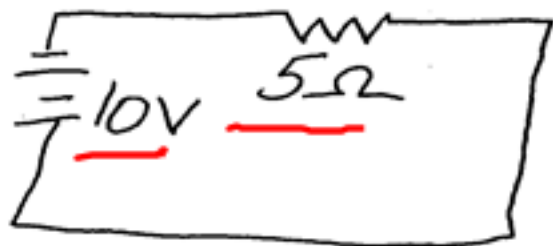
b) 10 V

c) 20 V

d) 50 V

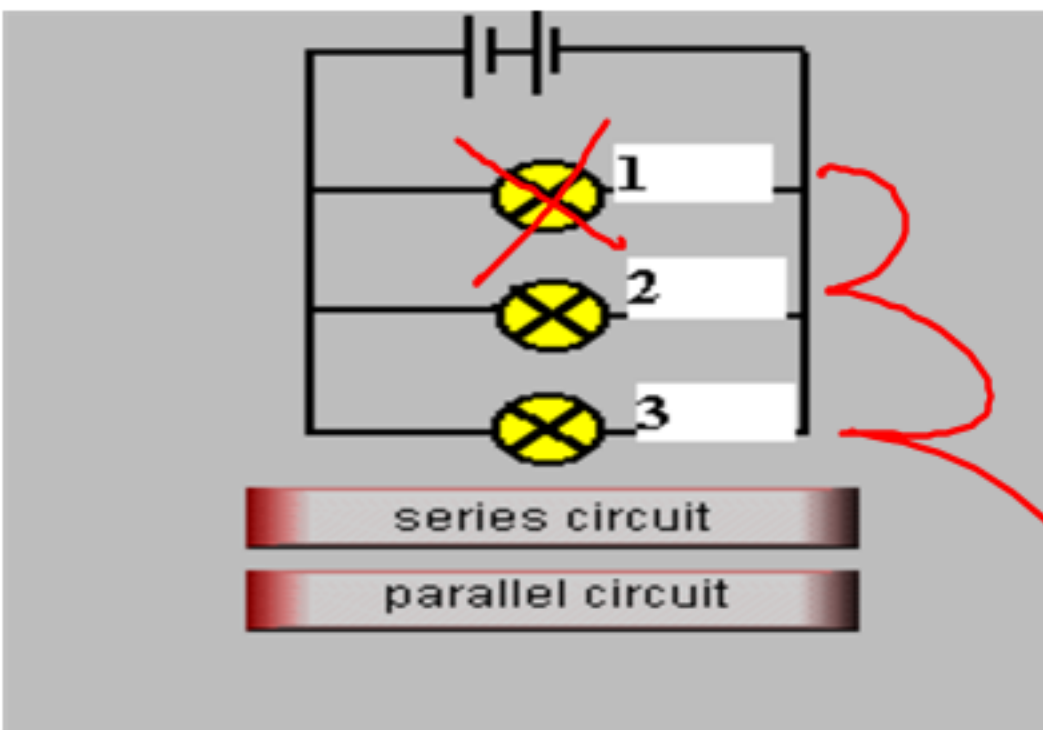


$V = 10V$
 $R = 5\Omega$
 $I = ?$



$$\frac{V}{I/R}$$

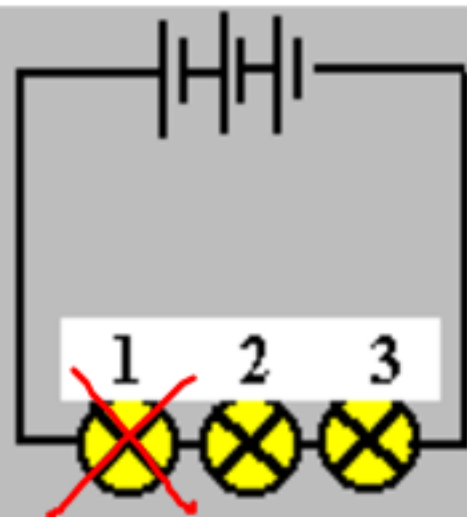
3. What current flows through the 5 ohm resistor?
- a) .5 A b) 2 A c) 10 A d) 50 A



Is the above circuit series, or parallel?

If Bulb 1 burns out, what will happen with bulbs 2 and 3?

STAY Lit



series circuit

parallel circuit

Is the above circuit series, or parallel?

If Bulb 1 burns out, what will happen with bulbs 2 and 3?

Go out!

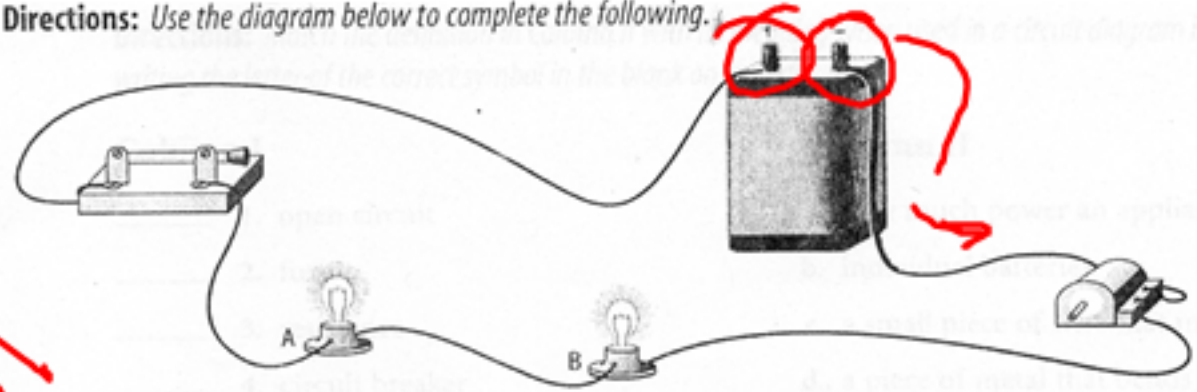
Column I

1. allows electrons to move through it easily
2. closed path through which electrons flow
3. accumulation of electric charges on an object
4. circuit with more than one path
5. tendency of a material to oppose electron flow
6. does not allow electricity to move through it easily
7. push that causes charges to move
8. Surrounds electric charge and exerts force on other charges.
9. rate at which electrical energy is changed to another energy form
10. flow of electrons through a conductor
11. circuit with only one path
12. unit of electrical energy
13. Current is equal to the voltage difference of a circuit divided by its resistance.
14. car battery
15. metal rod that directs lightning to Earth
16. device that detects electric charges
17. flashlight

Column II

- a. wet cell
- b. voltage difference
- c. parallel circuit
- d. resistance
- e. lightning rod
- f. circuit
- g. static electricity
- h. dry cell
- i. Ohm's law
- j. conductor
- k. electric field
- l. electric power
- m. kilowatt hour
- n. ~~electric power~~ *electrostatic*
- o. electric current
- p. insulator
- q. series

Directions: Use the diagram below to complete the following.



A
B
C
D

1. Will the voltage in this circuit be greater at A or B? Why?

B - tests there 1st

2. What causes current to flow from one terminal of the battery to the other?

Potential

3. If the battery is a 9-volt battery and the resistance in the circuit is 18 ohms, how much current is flowing through the circuit?

$$\frac{9}{18} = 0.5A$$

Directions: Answer the following questions on the lines provided.

4. What is the function of circuit breakers and fuses?

Protect from overloading

$V = IR$

Assessment

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.

Column I

F 1. open circuit

C 2. fuse

R 3. resistance

D 4. circuit breaker

B 5. dry cell

Column II

a. how much power an appliance uses

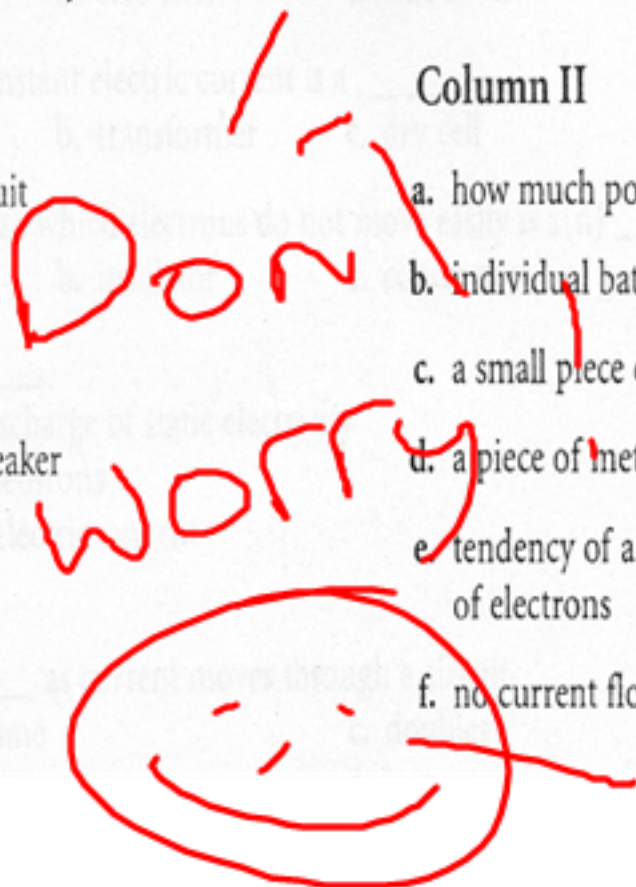
b. individual batteries

c. a small piece of wire that melts

d. a piece of metal that bends

e. tendency of a material to oppose the flow of electrons

f. no current flows in this circuit



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

A

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

A

7. The statement, current is equal to the voltage difference divided by the resistance, is known as _____.
a. Ohm's law c. Einstein's equation
b. Newton's law d. Faraday's law

B

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

C

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

B

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

C

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

D

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

- C 13. Which of the following is the correct relationship among power, current, and voltage?
a. $P = I/V$ 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
- C 15. One source of constant electric current is a _____.
a. switch b. transformer c. dry cell d. coulomb
- B 16. A material through which electrons do not move easily is a(n) _____.
a. transformer b. insulator c. conductor d. fuse
- A 17. Lightning is _____.
a. a very 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
- D 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

Skill: Making and Using Tables

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

Measurement	Unit	Symbol
1. Resistance	ohm	Ω
2. Energy	kilowatt hour	kWh
3. electrical power	Watts	W or kW
4. voltage difference	Volts	V
5. Current	amperes	A