

Unit 13 Study Guide Electricity & Magnetism

Vocabulary Matching:

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|---------------------------------|---|
| <u>O</u> 1. Alternating Current | A. The property of slowing the flow of electrons |
| <u>J</u> 2. Direct Current | B. The rate at which energy is used or generated, measured in Watts |
| <u>K</u> 3. Circuit | C. The measure of the flow of electrons, measured in Amps |
| <u>E</u> 4. Circuit Breaker | D. Negative particles that create electric current |
| <u>G</u> 5. Closed Circuit | E. A resettable device that protects circuits from being overloaded |
| <u>M</u> 6. Open Circuit | F. An electric current around an iron rod that acts like a magnet |
| <u>C</u> 7. Current | G. Connected circuit in which electrons flow uninterrupted |
| <u>F</u> 8. Electromagnet | H. A device that can control the flow of electrons in a circuit |
| <u>D</u> 9. Electrons | I. Circuit in a single pathway |
| <u>L</u> 10. Generator | J. Current in only one direction, as in batteries |
| <u>P</u> 11. Parallel Circuit | K. Pathway for electrons to flow |
| <u>I</u> 12. Series Circuit | L. Moving magnets around a wire that make electricity |
| <u>B</u> 13. Power | M. Disconnected circuit in which electron flow is interrupted |
| <u>A</u> 14. Resistance | N. Electrical potential, measured in Volts |
| <u>H</u> 15. Switch | O. Current of electron flow that reverses direction alternately |
| <u>N</u> 16. Voltage | P. Circuit with multiple, independent pathways |

Basic Understanding (Fill-in-the-Blank):

circuit	filament	not
closed	interrupted	parallel
electron		

17. A light bulb will operate because it completes the circuit. A light bulb is also an example of a resistor. It produces light by heating a filament due to the friction of the electron flow.
18. If a circuit is open, any lights in the circuit will not come on because the pathway for the electrons is interrupted.
19. Outlets in a house are usually connected as parallel circuits. This way not every electrical appliance has to be on at once. 1 light can still light up in a parallel circuit when others have been disconnected because each light has its own closed pathway to the energy source.

20. Which analogy is the best for describing the flow of electrons that make up an electrical current.

- a. Marbles rolling through a tube
- b.** Paperclips all shifting one over at the same time
- c. A train going around a circular train track

21. Label each item as something that uses DC or AC.



DC



AC



AC



DC



AC

Basic Understanding (Fill-in-the-Blank):

bulb

electrons

fuse

circuit breaker

fire

negative

22. In a circuit, electrons flow from the negative terminal of a battery, through a wire, to a load, such as a light bulb. To complete the circuit the electrons flow toward the positive terminal of the battery.

23. Fuses and circuit breakers are designed to keep a house or appliance from becoming overloaded with electric current which could become a fire hazard. A fuse must be replaced once it has burned out. However, a circuit breaker can be reset.

Fill-in-the-Blank:

changes

good

terminals

direct

resistor

wet-cell

electrons

24. A wet-cell battery has lead plates and liquid sulfuric acid inside and is the type used in cars.

25. Alternating current gets its name because the flow of electrical current changes direction.

26. Batteries give out a direct current since the electrons flow in only 1 direction.

27. The positive and negative ends of a battery are called terminals.

28. An insulator is a material that inhibits the flow of electrons.

29. An insulator is a type of resistor.

30. Metals make good conductors.

amps

ohms

trip

current

opposite

31. According to Ohm's law, if voltage is increased then current will increase.

32. Current is measured in amps.

33. Ω represents the unit called ohms, the unit of resistance.

34. Opposite charges attract to each other.

35. Too many appliances on one circuit that exceed the load limit cause the breaker to trip.

Name: _____

Period: _____

Hollis-Active Physical Science

Formulas:
OHM's LAW

36. Write Ohm's Law $I = \frac{E}{R}$

37. What does Ohm's Law calculate? ELECTRICAL CURRENT (I)

38. What do each of these variables represent: I CURRENT E VOLTAGE
R RESISTANCE

39. What are the units for Current? Amp (A) Voltage? VOLTS (V)
Resistance? OHM (Ω)

40. What happens to current if resistance increases? CURRENT DECREASES

41. What is the current produced with a 9-Volt battery through a resistance of 100ohms?

$$I = \frac{E}{R}$$
$$E = 9V$$
$$R = 100\Omega$$

$$I = \frac{9V}{100\Omega}$$
$$I = .09A$$

JOULE's LAW

42. Write Joule's Law?

$$P = IE$$

43. What does Joule's Law calculate? POWER (LOAD LIMIT)

What are the units for Power? WATTS (W)

44. What is the voltage and circuit breaker rating for a "typical" household circuit?

120 V 15 or 20 A

45. What is the load limit for the household circuit in #44?

$$P = IE$$
$$I = 15A \text{ or } 20A$$
$$E = 120V$$
$$P = (15A)(120V) = 1800W$$
$$- \text{OR} -$$
$$P = (20A)(120V) = 2400W$$

46. Can you run a 1200W coffee pot and a 500W freezer at the same time on that circuit? YES

$$1200 + 500 = 1700W$$

47. How many 40 watt light bulbs will blow the fuse of a "typical" household circuit?

$$20A = \frac{2400W}{40W} = 60 \text{ Bulbs}$$
$$- \text{OR} -$$
$$15A = \frac{1800W}{40W} = 45 \text{ Bulbs}$$

61 will blow

46 will blow

48. A 6-Volt battery produces a current of 0.5 amps. What is the power in the circuit?

$$P = IE$$
$$(0.5A)(6V)$$
$$P = 3W$$

Diagrams:

49. Which type of circuit is shown to the right?

PARALLEL

50. Which light will be on? A

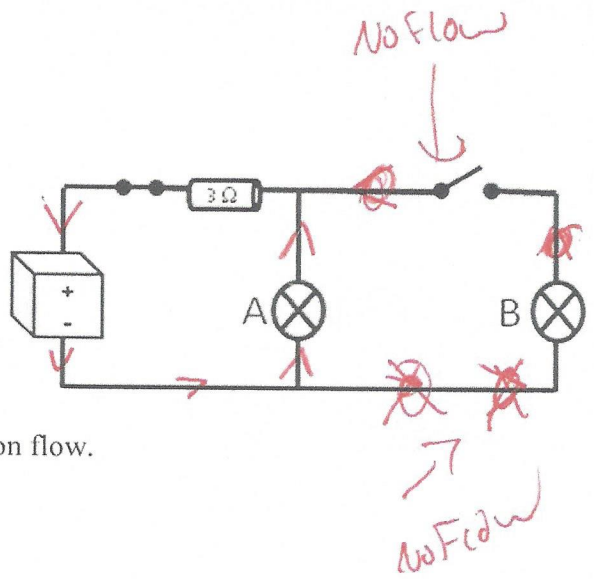
51. What is the device labeled "3Ω"? RESISTOR

52. What does the resistor do? SLOW ELECTRON FLOW

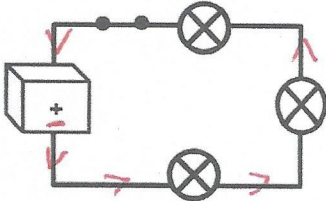
53. Draw arrows indicating the direction of the electron flow.

54. What can you do to make light B come on?

CLOSE THE SWITCH



55. What type of circuit is the one shown below? SERIES



56. Draw arrows indicating the direction of the electron flow.

57. Will these lights be on or off? ON

58. Use **Ohm's Law** for the following questions:

- How much current does a headlight with a 20-volt battery and a resistance of 4 ohms use?

$$I = \frac{E}{R}$$

$$\frac{20V}{4\Omega} = 5 \text{ Amps}$$

- What is the voltage of an 8-amp circuit with a resistance of 3 ohms?

$$8 \text{ Amps} (3\Omega) = 24V$$

- What is the resistance of an electric iron that takes 12 amps at 132 volts to heat up?

$$\frac{132V}{12 \text{ amps}} = 11\Omega$$

59. Use **Joules Law** to complete the following equations:

- How much power in watts does a light bulb have when it has 1.5 amps of current flowing through it from a 120 volt household circuit?

$$(1.5A)(120V) = 180W$$

- How much power does a dishwasher use on a 120 volt circuit if it has a current of 20 amps?

$$120(20) = 2400W$$

- How much power does a light bulb have when it has a 10-amp current flowing through it from a 110 volt circuit?

$$10(110) = 1,100W$$



$$E = IR$$

$$R = \frac{E}{I}$$

$$P = IE$$

