Chapter 7: Electricity Study Guide

1. Identify the charge on:
   a. Protons ____________ positive (+) ____________
   b. Neutrons ____________ neutral (0) ____________
   c. Electrons ____________ negative (-) ____________

2. How does an atom become charged?
   From the transfer of electrons from one object to another. An object that has more electrons than protons is negatively charged and an item that is positively charged has more protons than electrons.

3. What is static electricity?
   The build-up of electrical charge.

4. Identify the behavior between:
   a. Two positive charges ____________ repel ____________
   b. Two negative charges ____________ repel ____________
   c. One positive and one negative charge ____________ attract ____________

5. Identify the 3 ways that charge can be transferred and an example of each:

<table>
<thead>
<tr>
<th></th>
<th>Conduction</th>
<th>Induction</th>
<th>Static discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>Shuffling your feet on carpet</td>
</tr>
<tr>
<td>2</td>
<td>Conduction</td>
<td></td>
<td>Holding a negatively charged balloon by your sleeve</td>
</tr>
<tr>
<td>3</td>
<td>Static discharge</td>
<td></td>
<td>Lightning, being “shocked” by a metal object</td>
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6. What instrument is used to detect electric charge?
   Electrometer

7. What is a conductor?
   Any object that allows electrons to move freely through it

8. List two examples of conductors.
   Any type of metal

9. What is an insulator?
   Any object that does not allow for electrons to move freely through it
10. List two examples of insulators.
   Plastic, glass, wood, rubber, fabric... etc

11. What is electric current?
   The flow of charges through a wire or a conductor

12. What is the unit for electric current?
   Amperes

13. What is voltage difference?
   The difference in the amount of charge from one place to another

14. What is the unit for voltage difference?
   Volts

15. What is a circuit?
   A closed path that electricity can move through

16. What is resistance?
   The tendency of a material to resist the flow of electrons... creates heat and light.

17. What is the unit for resistance?
   Ohms (Ω)

18. List the 3 ways to increase resistance.
   Make a wire thinner, make a wire longer, or increase the temperature of a wire

19. What is Ohm’s Law?
   Shows the relationship between current, voltage difference, and resistance:
   \[ I = \frac{V}{R} \]

20. Explain how a light bulb produces light (same way it produces heat!).
   Electrons are passed through a wire in the light bulb and then hit a resistor (the filament) and create heat and light as electrons hit off of the gas in the light bulb.
21. What is a series circuit?
   A circuit in which there is only one way for electrons to flow

22. What is a parallel circuit?
   A circuit that has multiple branches of wires for electrons to flow

23. Explain why holiday lights are an example of a series circuit.
   If one light bulb is removed from the circuit, electricity cannot flow through to the next light bulb.

24. Why do houses have electric fuses and circuit breakers?
   Houses have electric fuses and circuit breakers as safety measures. They protect wires in the house from overheating and potentially causing a fire or ruining electronics.

*Solve the following problems using Ohm’s Law.*

25. Find the voltage in a circuit that has a current of 5 amps and a resistance of 30 Ω.
   \[ V = I \times R \]
   \[ V = 5A \times 30 \, \Omega \]
   \[ V = 150 \, V \]

26. Find the current in a 12 V circuit with a resistance of 20 Ω.
   \[ I = \frac{V}{R} \]
   \[ I = \frac{12V}{20 \, \Omega} \]
   \[ I = 0.6 \, A \]

27. Find the resistance in a flashlight powered by a 9 V battery that has a current of 5 amps when turned on.
   \[ R = \frac{V}{I} \]
   \[ R = \frac{9V}{5A} \]
   \[ R = 1.8 \, \Omega \]

28. A car battery provides 12 V to a circuit. If the resistance of the wire is 2 Ω, how much current is flowing through the wire?
   \[ I = \frac{V}{R} \]
   \[ I = \frac{12V}{2 \, \Omega} \]
   \[ I = 6 \, A \]

29. If you double the resistance of the wire in #28, how much current is now flowing through the wire?
   \[ I = \frac{V}{R} \]
   \[ I = \frac{12V}{4 \, \Omega} \]
   \[ I = 3 \, A \]  
   Half as much current as in #28!