Name: _____

Class: _____

Due Date: _____

48 – Circuits: Current, Resistance, Resistivity, Ohm's Law

Understandings

- Current
- Resistance
- Resistivity
- Ohm's law
- Electromotive force
- Ammeter
- Voltmeter

Answer the following questions. The solutions to this worksheet can be found on the YouTube channel Go Physics Go.

1. C: Define *electric current I* and state its equation and units. Do not confuse *current I* with *impulse* $\vec{J}$!

2. C: What is the relationship in magnitude and direction between *electron flow* and *current* in a conductor?

3. C: Define resistance. Give the units of *resistance* Ω.

4. C: What is the resistance of an ideal wire?

5. C: Define *resistor*. Do resistors increase or decrease the current in a circuit? Why is it necessary to have a resistor in a circuit?

6. C: Define *resistivity* ρ. Do not confuse resistivity ρ with density ρ!

7. C: What is the *resistance* of a non-ideal wire directly proportional to?

8. C: What is the resistance of a non-ideal wire inversely proportional to?

9. E: A piece of wire 40.0 cm long is measured to have a resistance of 7.20 Ω. What will be the resistance of an otherwise identical wire which has a length of 120. cm?

10. E: A piece of wire, which has a diameter of 0.500 mm, is measured to have a resistance of 8.40 Ω. What will be the resistance of an otherwise identical wire which has a diameter of 0.250 mm?

11. C: Define *Ohm's Law*. Draw a *current vs. voltage* graph of a resistor obeying Ohm's law.

12. C: What does a *thermistor* do? Draw a *resistance vs. temperature* graph of a thermistor.

13. C: What does a *light-dependent resistor* (LDR) do?

14. C: What does a *potentiometer* do?

15. C: Define *non-ohmic*. Draw a *current vs. voltage* graph of an Ohmic resistor and a non-Ohmic resistor.

16. C: Give three versions of the equation for *electrical power.*

17. E: A current of 0.870 Amperes flows through a certain light bulb when it is attached to a 115. Volt power supply. How much power does this light bulb dissipate?

18. E: A 25.0 Ω resistor is connected to a 5.70 Volt battery with negligible internal resistance.

    a. What will be the current flowing through the resistor?

b. How much power will be dissipated in this resistor?

19.E: A certain light bulb is designed to dissipate 5.00 W of power when attached to a 12.0 V source. What is the resistance of the light bulb filament?

20.E: A 25.0 Ω resistor and a 75.0 Ω resistor are connected in series across a 12.0 V source. How much power will be consumed by the 25.0 Ω resistor?

21.E: A 55.0 Ω resistor is attached to a 12.0 V power supply. This resistor is then immersed in a Styrofoam cup containing 25.0 g of water initially at a temperature of 22.5°C for a period of 150. s.

a. How much power is being delivered to the resistor?

b. How much energy will be delivered to the water during these 150. s?

c. What will be the final temperature of the water?

22.C: Define *electromotive force emf*. What are its units?

23. C: What does an *ammeter* do? Draw its symbol. What is a characteristic of an *ideal ammeter*? How/Where do we insert an *ammeter* in a circuit?

24. C: What does a *voltmeter* do? Draw its symbol. What is a characteristic of an *ideal voltmeter*? How/Where do we insert a *voltmeter* in a circuit?