Honors Physics Reading Homework for 9-6-18

These questions relate to an online textbook "College Physics" on the Open Stax website. You can find the textbook by Googling "Open Stax," or by going directly to the URLs provided, which connect to the pages where each question is on.

Please answer question on this page or on another page.

I wrote some notes that are not questions. Please pay attention to these, but you don't need to answer them:

From Chapter 20: Electric Current, Resistance, and Ohm's Law
https://cnx.org/contents/Ax2o07Ul@13.5:En9j99Z_@5/Introduction-to-Electric-Current-Resistance-and-Ohm-s-Law

Chapter 20.1: Current
https://cnx.org/contents/Ax2o07Ul@13.5:3ct4v3c5@7/Current

1. All physics quantities have a mathematical definition. What formula is the mathematical definition for electric current?

2. The units we always want to use in physics class are called SI units. What is the SI unit for current? What is the SI unit for current?

3. Current is caused by moving electrons, which have a negative charge. However, when analyzing current, we always use a concept called "Conventional Current." What is the direction of conventional current.

Vocab note
If I say something is "on the order of 10^5, it is probably some number from 1×10^5 to 9.9×10^5.

4. What speed does the *electric signal* travel?

5. What speed do the actual electrons move?

6. True or false: the path of an electron appears random.

7. What term gives you the "average velocity of free charges?"

Some of the "conceptual questions" at the end of the section are similar to questions that Mr. Kuncik might put onto a quiz. So, take some time to think about them. {But you don't need to write the answers as part of your homework.}

Can a wire carry a current and still be neutral – that is, have a total **net** charge of zero? Explain.

Why isn't a bird sitting on a high-voltage power line electrocuted? Contrast this with the situation in which a large bird hits two wires simultaneously with its wings.

Chapter 20.2: Ohm's Law: Resistance and Simple Circuits
https://cnx.org/contents/Ax2o07Ul@13.5:yLmi-MuP@7/Ohm-s-Law-Resistance-and-Simple-Circuits

The textbook says these phrase:
"The current in a metal wire is directly proportional to the voltage applied."
"Resistance is defined as inversely proportional to current."

Using proportionality relationships is a different way of comprehending physics formulas. As we become more adept with using physics formulas, we will begin to think about them using proportionality, and then using proportionality to experimentally prove a formula is true.

8. What happens to the current if the voltage becomes greater?

9. What happens to the current if the resistance becomes greater?

Chapter 20.4: Electric Power and Energy:
https://cnx.org/contents/Ax2o07Ul@13.5:RJsc91ku@8/Electric-Power-and-Energy

The textbook says "power is the rate of energy use of energy conversion." This is an important concept to know about power!

10. Which has more resistance, a 60 Watt light bulb or a 25 watt light bulb how do you know?

11. What is the formula for electric power?

12. What is the equation for the amount of energy used by a circuit?

13. How much energy is used y a circuit with a power of 50 Watts that is on for a time of 4 seconds? [The SI unit for energy is *Joules*.]

Problem exercise:
What is the power of a 1.00×10^{2} MV lightning volt, having a current of 2.00×10^{-4} A?
[This is one of the questions at the end of the chapter. "MV" means "megavolt," which is equal to 10^{6} volts.]

Chapter 21: Introduction to Circuits and DC Instruments
https://cnx.org/contents/Ax2o07Ul@13.5:E74qWTpP@7/Introduction-to-Circuits-and-DC-Instruments

DC: Direct Current: The electric current moves in a single direction.
AC: Alternating Current: The electric current continually changes direction.

Current from a battery is direct current. Current from a wall outlet is alternating current. We learn about direct current first.

Chapter 21.1: Resistors in Series and Parallel
https://cnx.org/contents/Ax2o07Ul@13.5:FLqArfdc@7/Resistors-in-Series-and-Parallel

What is the point of a resistor in a circuit? [It's in the first sentence!]

This chapter walks through a method of mathematically solving circuits in series and parallel. The problems they use are identical to those with tables of values that we used. The method they use is more complicated, but accomplishes the same goal. You should look over how they did it.

14. What is the rule for adding resistors in series?

15. What is the rule of adding resistors in parallel?

16. Suppose the voltage of a battery is 12.0 V and the resistances **in series** are R_1 = 2.00 Ohms, R_2 = 6.00 Ohms, and R_3 = 18.0 Ohms.
a) What is the total resistance?
b) Find the current.
c) Calculate the voltage drop in each resistor.
d) Calculate the power dissipated by each resistor.
e) Find the power output of the source (the total power output).

17. Suppose the voltage of a battery is 12.0 V and the resistances **in parallel** are R_1 = 2.00 Ohms, R_2 = 6.00 Ohms, and R_3 = 18.0 Ohms.
a) What is the total resistance?
b) Find the current.
c) Calculate the voltage drop in each resistor.
d) Calculate the power dissipated by each resistor.
e) Find the power output of the source (the total power output).

The "Combinations of Series and Parallel" is the next thing we will take on!