

**NOTE:** Use engineering format for problems 2 through 6. Since the answers are given, you should put effort into developing a concise, organized and accurate analysis leading up to the final value. This is an individual assignment. You must *complete* the assignment on your own. You may discuss the problems and solution techniques with other class members. You may not copy the work of other students, exchange of PowerPoint slides, or share the finished work of others.

1. Send the instructor an email message using your PSU email address. Briefly describe how or where you obtained your Arduino experimenter's kit. Additionally, list the tools in the general toolkit, such as tool bag, dial caliper, etc.. that you have obtained so far.
2. Estimate the number of copper atoms in an 8 gage (or gauge) wire that is two feet long? Hint: You may need to find the size of the wire on the Internet and look at a periodic table of elements. When looking for gage, you may find that some people spell it as gauge and denote the size as 8 AWG where AWG stands for American Wire Gage. **Answer =  $4.33 \times 10^{23}$  atoms**
3. What is the current through a conductor that carries a charge of 13,129 C (coulombs) across it in 9 minutes? **Answer = 24.3 A**
4. A lamp is plugged into 10 volt DC power source. An ammeter attached to the circuit indicates a current of 2 amps. Using this information, how many ohms of resistance does the lamp provide? **Answer =  $5\Omega$**
5. Three incandescent light bulbs have electrical resistances of  $1\Omega$ ,  $3\Omega$  and  $330\Omega$  respectively. Consider three circuits, with one of the light bulbs and one alkaline AA battery for each circuit. For each light bulb:
  - (a) How much current flows through the filament?
  - (b) How much power is dissipated?**Answer:  $I_1 = 1.5A$ ,  $P_1 = 2.25W$ ;  $I_2 = 0.5A$ ,  $P_2 = 0.75W$ ;  $I_3 = 4.5mA$ ,  $P_3 = 6.8mW$**
6. An ideal voltage source of 12 volts is attached to a set of four resistors with  $R_1=2\Omega$ ,  $R_2=4\Omega$ ,  $R_3=4\Omega$  and  $R_4=1\Omega$  as shown below.

- (a) Find the equivalent resistance of the circuit diagram.
- (b) Draw the equivalent circuit diagram (using standard symbols for the voltage source and the resistor).
- (c) Compute the current leaving the power source. **Answer = 2.4A**

