

Physics 115 – Section 201  
Homework #3  
Due February 19, 2007

*Remember that we are not looking for just the right answers but the right process of reasoning. We are more interested in seeing if you can start with a set of ideas/assumptions and use them in a very rational manner to predict or analyze a circuit. Please be clear about the ideas but do not write just to fill space.*

Essay 1, 10 points

In class we have been experimenting with circuits with different numbers of bulbs and batteries. We saw how the brightness of the bulb depends on the number of the batteries and bulbs as well as on the manner in which they are connected.

(a) In this problem, I want you to think of a circuit such that one of the bulbs would be brighter than another. The circuit can have any number of batteries and bulbs. Keep in mind that circuits can be in series and also in parallel. Draw the circuit showing all the connections properly, and rank the bulbs in terms of brightness.

(b) We have also discussed some important properties of current in class. Refer to your notebook to recall the properties of current in circuit and batteries that we are learning. Then use the ideas to explain why in the circuit that you have drawn one bulb is brighter than the other. Be careful in your reasoning. Support the claims that you make with the things that you have learned on previous days. If one bulb is brighter than the other you could immediately tell something about the relative sizes of current in the two bulbs. We want to understand how the particular combination of bulbs and batteries that you have drawn would lead to that particular distribution of flow in the circuit.

Essay 2, 10 points

(a) Consider that you have been provided with two batteries and one bulb and as many wires as you like. Draw the different series or parallel circuits that you can draw with the bulb and two batteries. Try to draw circuits that are actually different from one another, meaning that the new circuit can not be made simply by taking the old circuit and moving wires around without disconnecting them.

(b) Now rank the brightness of the bulbs in these circuits. Explain (using the rules/ideas you have learned about current in the circuit) why this is the case. If you are using a particular idea about current, explicitly write it down and explain how that helps you figure out the relative brightness of the bulbs.

Problem 1, 10 points

A ream of typing paper (500 sheets) is measured to be 2.5 cm thick. Give an equation which describes the thickness  $t$  of a stack of  $n$  sheets of paper. Make a graph of your result, with  $t$  on the y-axis and  $n$  on the x-axis. What do the number or numbers in your equation tell you about one sheet of paper?