Name:

Physics 589 – Electricity – Sonnenfeld

HARDWARE LAB: DC Circuits: [About 90 minutes]

1 Writeup

Your writeup should include answers to all the questions that are asked in this guide, and an explanation where it is requested. You DO NOT need to do anything beyond what is requested specifically, nor do you need write a formal lab report.

2 Build a one light-bulb circuit

Assemble the circuit. Pull a light bulb, an adjustable power supply and two wires w/ alligator clips out of your kit. Make a circuit to light the lightbulb. Did you make any mistakes before you got it to work? What?

Measure the voltage of the power supply Put the meter probes on the +6 and *common* terminals of the supply. Set the supply to 6 V

Measure the current in the circuit To measure current in a real DC circuit, you can't just lay the meter over the wires. You have to put it in SERIES with the branch of the circuit you are trying to measure. (You also can't give the current a choice ... it MUST go through the meter)

Calculate and record the resistance of your lightbulb Use Ohm's law (V=IR) to calculate the resistance of the light bulb. What is it? Record this value as R_{hot}

Measure resistance of bulb out of the circuit Take your bulb out of the circuit and measure and record the resistance using the resistance function of your multi-meter. You will probably notice that the resistance if MUCH lower than the value you got in circuit. Record this value as R_{cold}.

Calculate the temperature of the filament The resistivity of metals increases with temperature, and tungsten in a light-bulb gets quite hot (that's why it glows). You can calculate the temperature of your filament (in Kelvin) is $T_W = 298\ K + \frac{R_{hot}-R_{cold}}{4.5\times10^{-3}R_{cold}}$ What is it?

3 Build a two light-bulb series circuit

Add a second lightbulb in series Add a second lightbulb to your original circuit. Predict what the current will be before the first light bulb, between the bulbs, and after the second bulb. Measure the current on the wire in at least two places. Were your predictions right? Lightbulbs do NOT perfectly follow Ohms law. Could this cause any errors?

Measure the voltage across each lightbulb separately Do they add up to the original battery voltage?

4 Build a combination parallel/series circuit

Build a circuit with one bulb in series with a parallel combination of two bulbs and one bulb There will be three different currents at different parts of the circuit. Find them, measure them, record them.

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