

## Raw Data Sheet

Student Name: \_\_\_\_\_

Team members:

1.- \_\_\_\_\_ 2.- \_\_\_\_\_

3.- \_\_\_\_\_ 4.- \_\_\_\_\_

Instructor: \_\_\_\_\_

### Analysis

Note: Show all your work, including all calculations!

#### Common resistor

1. Obtain three resistors of nominal values 1, 5 and 10 K Ohms. Using the Digital Multimeter (DMM) measure the actual resistance of each resistor and record them.
2. Use the DMM to set the power supply to about 1 V (do not believe the gauge in the power supply). Connect the power supply to the 1 K Ohm resistor. Connect the DMM in parallel with the resistor to measure the voltage across it and record the voltage.
3. Turn off the power supply but do not change its settings. Set the DMM to measure current and connect it in series with the resistor. Turn on the power supply and measure the current flowing through the resistor. Record it.
4. Repeat your measurements for power supply voltages between 1 and 12 V with 2 V increments. Collect the same kind of data for another of the three resistors. Organize the data for each resistor in a table that includes headings and units. (At this point of the course, not including units leads to significant loss of points.) You should have six pairs of measurements per resistor.

5. Make a voltage vs. current plot for each resistor. Find a linear fit for each of your resistors. The slope of this line is your experimental resistance value. Compare this value to the value measured for the corresponding resistor.

## Resistors in Series

1. Set the power supply to  $10\text{V} \pm 0.01\text{V}$ . Connect the power supply to the array of 3 resistors in series. Measure the voltage at the terminals of the power supply. Measure the voltage across each resistor.
2. Set the DMM to measure Direct Current in mA. Look at figure 1 and insert the DMM in series in location A to measure the current flowing from the power supply into R1. Similarly, measure the current flowing from R1 into R2 (location B), from R2 into R3 (location C), and from R3 back into the power supply (location D).
3. Construct a table with headings that include units for each resistor. Include a column for the actual value measured of each resistor, a column for the voltage across and another column for current flowing through each resistor.

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- Use Ohm's Law to calculate the resistance of each resistor from your voltage and current measurements. Compare with your resistance measurements.
  - Calculate the equivalent resistance of the three resistors in series.
  - Use Ohm's Law to determine the equivalent resistance and compare with your calculated value from question 5. (Note that here you need the input voltage and current coming out of the power supply.)

### Resistors in parallel

- Refer to figure 2. Connect the three resistors in parallel. Set the power supply to only  $5V \pm 0.01V$  and then connect it to the circuit. Measure the loaded value of the voltage across the terminals of the power supply. Also, measure the voltage across each resistor (X,Y,Z).



## Questions

1. According to your graphs for Section 10.3, which resistor conducts more electricity per unit volt? Explain why?
2. Examine the value of the currents flowing through the circuit for resistors in series and determine if the electric charge could be accumulating in any of the resistors.
3. Based on your data for resistors in parallel, determine if it takes the same energy to transport a given amount of charge through any of the resistors.