Union College Spring 2019

Physics 121

**Lab #2: Current, voltage, and resistance**

**Introduction:**

Electric current, *I*, is the rate of flow of electrons in an electric conductor. In SI units *I* is measured in Amperes (A). The voltage difference across a conductor, measured in volts (*V*) in the SI system, is responsible for the flow of current while the conductor’s resistance, *R*, measured in Ohms (), inhibits the flow, similar to mechanical friction.

**Objective:**

You will measure the values of resistance using a voltmeter and ammeter and compare your measured values with 1) the values quoted by the manufacturer and 2) the resistances that you measure using an ohmmeter.

**Method:**

Your lab instructor will show you how to use a multi-meter that can function as a voltmeter, an ammeter, or an ohmmeter. Your instructor will also show you how to connect the variable power supply and a carbon resistor to your breadboard to form a simple circuit.

1. Read and record in an Excel table the manufacturer’s listed values of resistance of the two resistors.

2. Measure and record the resistances using an ohm-meter. (Remember to list the units.)

3. Make a circuit with one of the resistors and the power supply and set up the yellow meter to measure voltage across the resistor and the gray meter to measure current. Wait for your instructor to examine your circuit before continuing.

4. Turn on the power supply and with 5 different voltage settings on the power supply, measure (and record) the voltage across the resistor, VR, and the current, IR, through it. (Remember the units.)

5. Replace the resistor with the other one and repeat the measurements.

6. With the data for each resistor, make a plot of VR versus IR.

7. On each plot, fit a linear trendline, with “display equation on chart,” to obtain the values of the slope and intercept .

8. Use Excel to calculate the *linear regression* values of slope and intercept along with their calculated standard error. Indicate these values in your data table.

Results:

Compare the 3 measurements of resistance for each resistor:

1st resistor:

i) Resistance, R, from linear regression: R = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ii) from ohmmeter: R = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

iii) from manufacturer: R = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2nd resistor:

i) Resistance, R, from linear regression: R = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ii) from ohmmeter: R = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

iii) from manufacturer: R = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Briefly, explain the significance of these results:

Discuss what “resistance” is and how it relates to the voltage difference across the resistor and the current through the resistor.

In the Results Section, turn in your Excel Data Table, the two graphs, and discuss the answers to these questions.