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Physics 133, Section ML

Lab Room Hasbrouck 212

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# Confirming Ohm's Law and the Observing Variables Involved

**Abstract:**

In this experiment we use Ohm's law to compare the how the variables voltage, current, and resistance react in response to changes. We use this law while changing the number of carbon resistors as a series and as parallel then compare the answers to calculated values.

**Questions and Answers:**

1. State the equation for Ohm's law. What do the variables *V*, *I*, and *R* stand for, and what are the units of each? Of the units listed, which one is equivalent to coulomb/second? (1 point)

The equation for Ohm's law is R=V/I. V stands for voltage, R stands for resistance, and I stands for the current that flows through the resistor. The units for V is Joules per Coulomb (J/C), the units for R is Volts/Amps, and the units for I is C/s, also called Amps (A). Of the units listed, I is equivalent to coulomb/second.

2. From Part 3.1.1 (Voltage Source): Produce a graph of output voltage $V_{out}$ as a function of the sliding contact position x, measured from the bottom end of the slide wire resistor. Verify that the data points fall on a straight line rather than a curve (don't actually compute the slope). Did the current change while you varied the sliding contact position x? (Hint: Your current meter was

switched off during this part, but this question can be answered using Ohm's law and your graph.) (2 points)

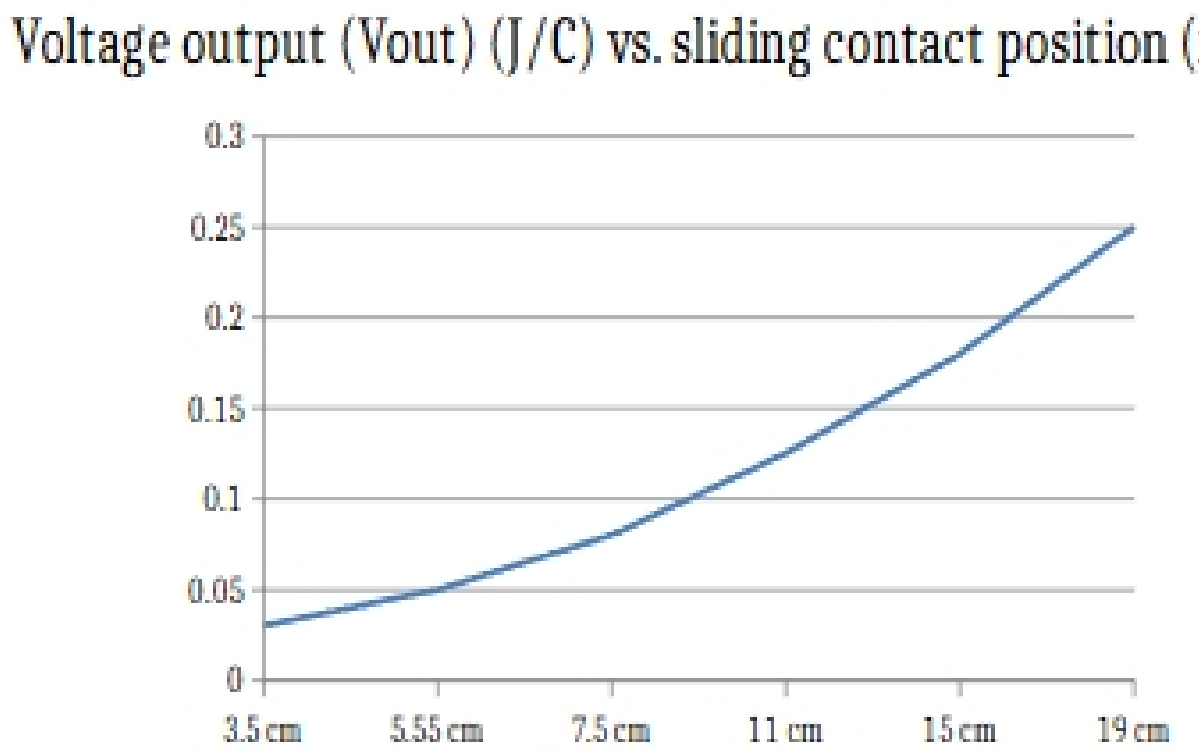


Figure 1. Vout vs. X

The data points fall on a (relatively) straight line. The slight deviation may have been due to errors in measurement using the ruler. The voltage increases with the increase in sliding contact position (as seen on the graph). The current increased as the voltage increased because they are directly proportional to each other and inversely proportional to the resistance (Ohm's law; R=V/I). If the resistance did not change but the voltage increased, this would mean that the current would have to increase as well.

3. From part 3.1.2 (Ohm's law): Produce a graph of voltage V as a function of current I. Compute the slope, which will give the resistance R (in ohms) of the resistor itself (recall in-lab question 1). Does your value for R fall within the manufacturer's expectations? (1.5 points)

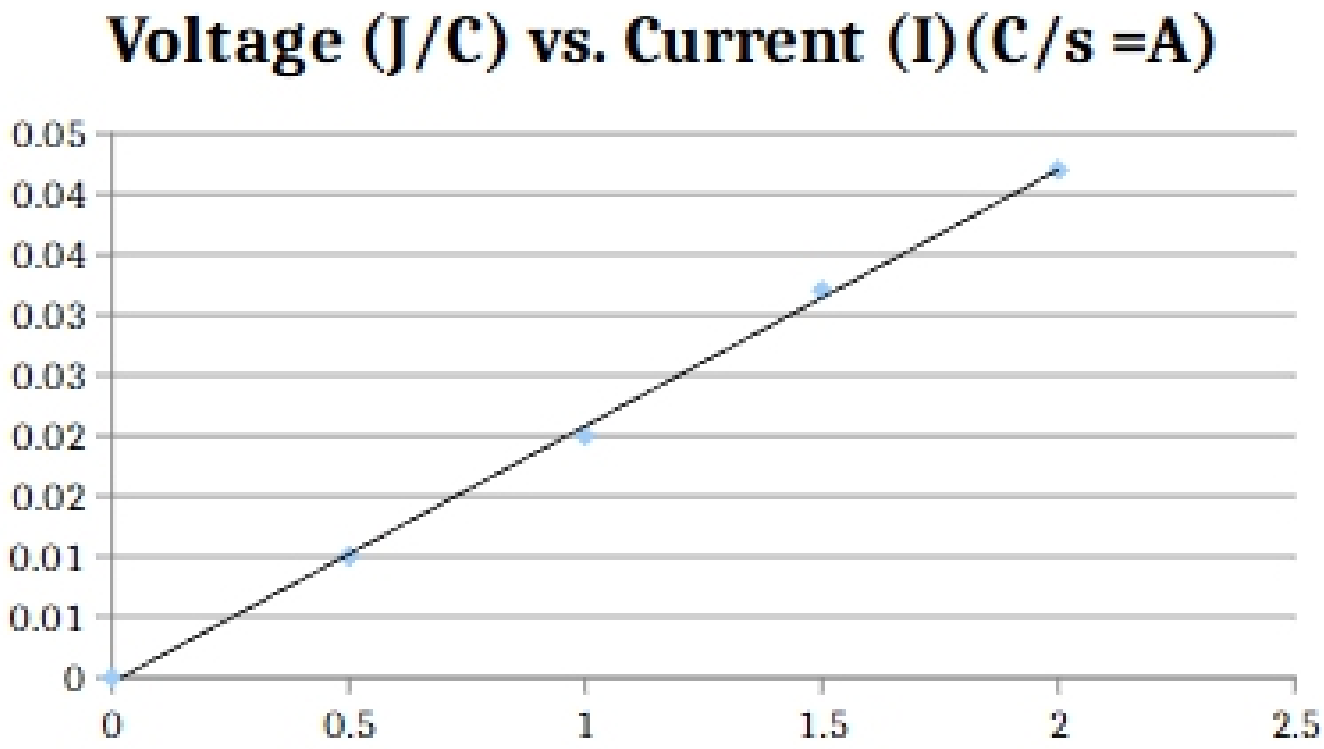


Figure 2. Voltage vs. Current

The slope of the graph is 0.0212 ohms. This is the resistance R (in ohms). This value falls in line within the manufacturer's expectations.

4. From part 3.1.5 (resistors in series/parallel): Using color code, write the value of each resistor used in this part of the experiment (recall in lab question 1). From this, compute the total resistance $R_{tot}$ (i) resistors in series, and (ii) resistors in parallel. You will need to use the following two equations for computing total resistance: (2 points)

$$R_{series} = R_1 + R_2$$

$$1/ R_{parallel} = 1/R_1 + 1/R_2$$