name_____

ID# _____

Experiment 2

Ohm's Law and Kirchhoff's Rules

Resistor values:

R_1 _____ R_2 _____

R_3 _____

Voltages:

V_{ps} _____

V_1 _____ V_2 _____

V_3 _____ V_4 _____

Currents:

I_1 _____ I_2 _____

I_3 _____

I_{eq} _____

Equations and sample calculations:

Analysis

1. For each of the resistors in the top branch of the circuit (R_1 and R_2), divide the voltage across the resistor by the resistance of the resistor and compare the result to the measured current. What law have you verified?

2. What does the sum of V_1 and V_2 equal? What about the sum of V_3 and V_4? What law does this verify?

3. Add I_2 and I_3. How does the sum compare to I_1? What law does this result verify?

4. Show the R_{eq} calculations.

5. Divide V_{ps} by R_{eq}. How does the result compare to I_{eq}?

(10 points for the data and analysis)

In many problems you can neglect the resistance of the wires but you often cannot neglect this in the real world. Why do some high current appliances, such as space heaters, come with warnings against using extension cords? If you must use an extension cord, what kind should you use? What happens if you plug too many appliances into a single extension cord? What can be the consequence of ignoring these warnings?

What happens when a voltage is applied across a very low resistance? This can happen when, for example, the cord on an appliance frays so that the insulation is rubbed off. Why is this dangerous?

Questions

1. A voltmeter has very high resistance so that it will draw negligible current when it is placed in parallel with a resistor. An ammeter has very low resistance so that little voltage appears across it when it is wired in series in a circuit. A voltmeter wired in series will give you wrong results in an experiment, but wiring an ammeter in parallel can destroy the meter. Explain why. (Hint: Use the equations for equivalent resistances. Let the ammeter resistance equal zero, and let the voltmeter resistance equal infinity. Find the equivalent resistances and calculate the current in each circuit.) **(4 points)**

2. The units for *I*, *V*, and *R* are amperes, volts, and ohms. What basic units are these made of? Write out the units for $I = \frac{V}{R}$ and show that they work out. **(3 points)**

3. Draw a circuit that you could build to make a toaster. **(3 points)**