Ohm's Law Lab

PSI Physics

Name:_____

Objectives:

- Determine the relationship between current and voltage
- Reproduce Ohm's Law

Background: Ohm's law states that if the temperature of a resistor remains constant, the electric current (I) flowing in a circuit is directly proportional to the applied voltage (V) and inversely proportional to the resistance (R) of the circuit.

$$I = \frac{V}{R} \quad \text{or} \quad R = \frac{V}{I} \quad \text{or} \quad V = IR$$

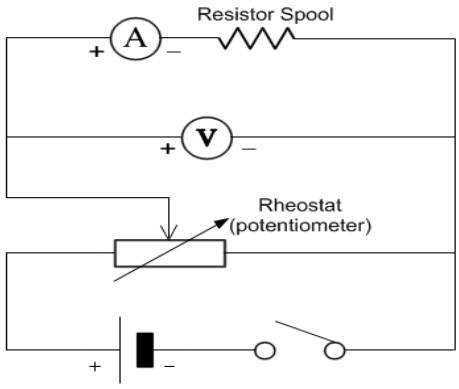
Materials:

- Source of direct current (0 to 6 V)
- One voltmeter or a multi-meter set as a voltmeter
- One ammeter or a multi-meter set as a ammeter
- Connecting wires
- Resistance spools
- Knife switch
- Rheostat / Potentiometer

Procedure:

1. Study the scale on the meters until you can read the numbers properly.

2. Construct the circuit as shown in the diagram below.



Note:

a) Connect the ammeter in series and the voltmeter in parallel.
b) Connect the ammeter and voltmeter with corresponding polarity.
c) The arrow on the potentiometer diagram indicates the connection to the sliding piece.

3. Leave the knife switch open until your instructor has checked your circuit and given you permission to close it.

You will perform the following for three different resistances on the resistance spool.

4. Slowly move the slider across the potentiometer until the ammeter registers a small current at a mark on the ammeter.

5. For this position, measure and record this current and voltage.

6. Increment the current seven times recording both the current and voltage in the table below.

Data Collection:

Table 1: In this table, you will record the values for the voltage (V) across three (3) different resistors, as well as the value of current (I) that flows through the resistors.

R_1		R_2		R_3	
I (amps)	V (volts)	I (amps)	V (volts)	I (amps)	V (volts)

Data Analysis:

Calculate the resistance for each of the three experiments:

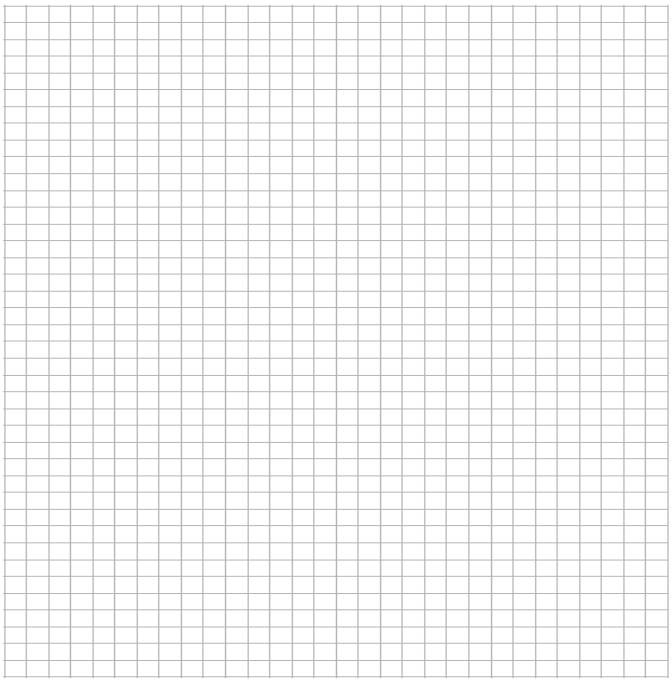
1. Sketch the graph of V vs. I.

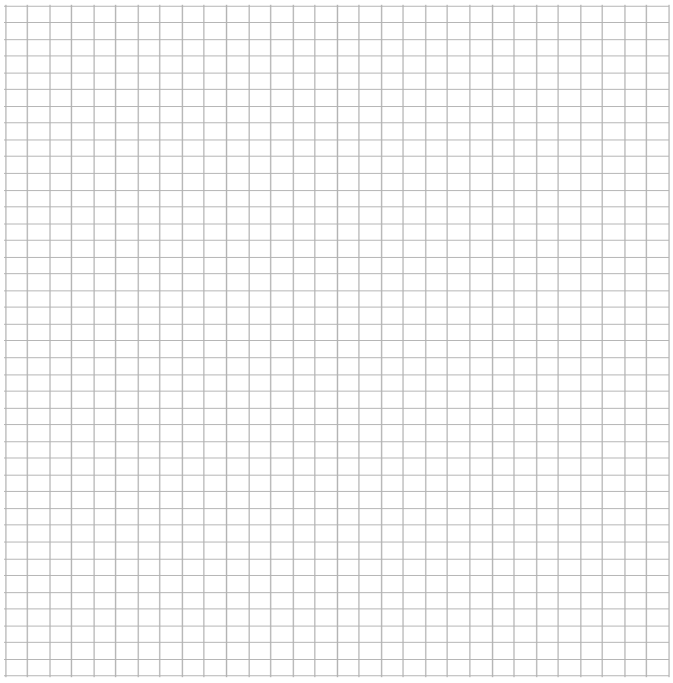
2. The resistance is the slope of the line of the graph V vs. I

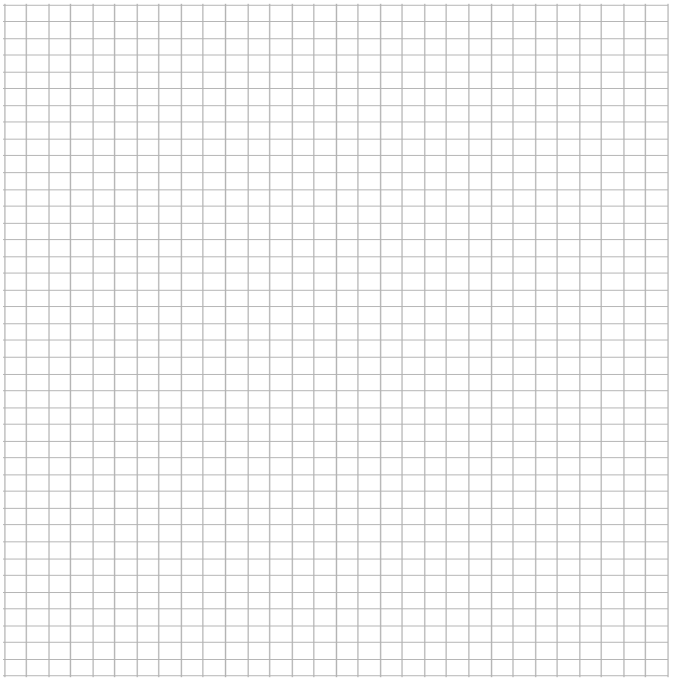
Graphs:

Make sure all 3 graphs have the following:

- A Title, e.g. “Voltage vs Current for Resistor #1”
- Axes Labels with quantity and units
- A best-fit line - Do not connect points!







Conclusion: Answer the following questions based on what you learned and your results from this lab.

1. Did the slope of your graphs match the values for each resistor? If not, give some possible reasons why.

2. The current that flows through a resistor is _____ proportional to the applied voltage and _____ proportional to the resistance of the resistor.

3. While measuring the resistance of a resistor (by the use of a voltmeter and an ammeter), the voltmeter is always placed in _____ with the resistor. The ammeter is always placed in _____ with the resistor.

4. If the voltage across a resistance is increased, the current flowing through the resistance will _____.

5. When the resistance of a circuit is increased, the current flowing in the circuit will_____.

Application:

1. A 60-watt light bulb has a voltage of 120 volts applied across it and a current of 0.5 amperes flows through the bulb. What is the resistance of the light bulb?

2. What current will flow through a 120-ohm resistor if the voltage applied to it is 12 volts?

3. A resistance of 60 ohms allows 0.4 amperes of current to flow when it is connected across a battery. What is the voltage of the battery?