

OHM'S LAW

Objective

To study the relationship between the electrical current flowing through a circuit element and the voltage applied.

Equipment

Power supply, 10 ohm resistor, 50 ohm resistor, automotive bulb, 2-multimeters and their manual.

The Multimeter

The multimeter can be used as an ammeter, a voltmeter or an ohmmeter. Two modes are available on the instrument:

- DC (direct current): $\overline{\text{---}}$
- AC (alternative current): \sim

We will use a DC current in this lab.

The Ammeter

The ammeter measures the electric current. This instrument has to be **in series**. Most of the ammeters used for this lab have two measurement ranges: 10A, and 400mA or 300 mA. It is important to choose the proper range for your measurement. If you are not sure about the range, choose the maximum range available. Once you have a value, choose the range accordingly to this value:

- **The current should not exceed the range!**
- The lower range tolerated by the instrument will give you the best measurement in terms of significant figures and uncertainty.

Observe the multimeters available. Choose one of them as an ammeter: What are the ranges available on your ammeter and its corresponding resolution?

Range:		
Resolution:		

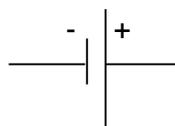
Electronic symbol



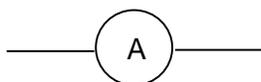
Bulb



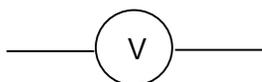
Resistor



DC Voltage Source



Ammeter



Voltmeter



connector

Procedure

Never exceed the power rating of the resistors ($P=IV$)

Step 1: Record the power rating of the two resistors. For each resistor, find the maximum current that can be used if your maximum voltage is 8V.

10 Ohm Resistor

Step 2: Make a schematic diagram of the circuit used in this experiment. Use the proper notation to indicate each component.

Step 3: Make sure the power supply is off. Connect the 10-Ohm resistor to the power supply with the ammeter in series and the voltmeter in parallel with it. **Do not connect an ammeter to the power supply without a resistor in series or you will destroy it!**

Step 4: Before the power supply is turned on, **have your instructor inspect the circuit.** Record the voltage drop across and current through the resistor in ten steps. Turn off the power supply before starting the next circuit.

Note: To record your data, refer to the section VI "Significant figure"

(via the link [Data Analysis, Uncertainty, and Graphing How-To](#) of the 200 Level Physics Laboratories website)

50 Ohm Resistor

Step 5: Make sure the power supply is off. Replace the 10-Ohm resistor with the 50-Ohm resistor. **Have your instructor inspect the circuit.** Repeat the measurement. Turn off the power supply before starting the next circuit.

Automotive Bulb

Step 6: Replace the resistor with the automotive lamp and repeat the measurement. Do not exceed 1.0 A and 8.0 V at any time.

Graphs and Diagrams:

1. Plot the voltage drop across the 10 Ohm resistor versus the current through it.

Refer to the table VII.I of the section "graphing data" (via the link [Data Analysis, Uncertainty, and Graphing How-To](#) of the 200 Level Physics Laboratories website)

2. Plot the voltage drop across the 50 Ohm resistor versus the current through it.

3. Plot the voltage drop across the light bulb versus the current through it.

Questions and Calculations:

1. Describe the data plotted in graphs 1 and 2. Do these resistors obey Ohm's law? What is the characteristic of the graphs that indicates whether or not Ohm's law is obeyed?

2. **From graphs 1 and 2** find the resistance of each of the two resistors and compare to the accepted values. To compare your results, refer to the section "comparing results" of "Precision and Accuracy" (via the link [Data Analysis, Uncertainty, and Graphing How-To](#) of the 200 Level Physics Laboratories website)

3. Describe graph 3. Does the light bulb obey Ohm's law? **Explain.**

Last name: First name:

Step 4:

Voltage Unit:	Current Unit:

Step 5:

Voltage Unit:	Current Unit:

Last name: First name:

Step 6:

Voltage Unit:	Current Unit: