Ohm's Law

Developed for the CSU Physics Van Program by:

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Warm-up Activity

A. Obtain a battery, 2 wires, a multimeter, and a light bulb. Connect them together so that the bulb is lit. *Have your instructor check your circuit before you take any measurements!*

B. What is the voltage across the battery?

C. What is the current through the bulb?

D. How do the current and voltage relate to each other in this experiment?

Voltage and Current

A. Obtain a resistor and some additional batteries and wires from your instructor.

B. Replace the bulb in the circuit you connected above with the resistor.

C. Measure and record the voltage and current through the resistor in the table below.

D. Add additional batteries to the circuit in series, one at a time. Record the voltage and current through the resistor each time you add a battery.

Number of Batteries	***Voltage***	***Current***

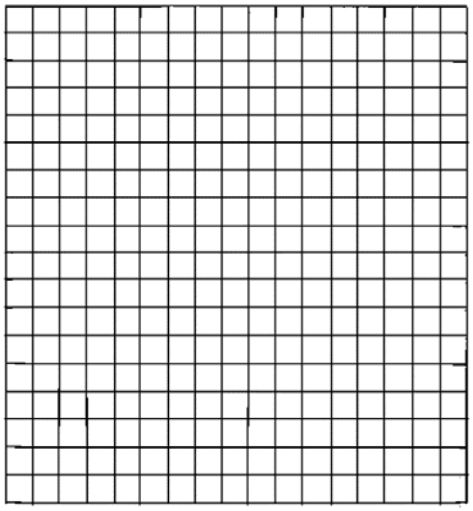
E. How does adding batteries affect the voltage? How does it affect the current?

F. How do the current and voltage relate to each other in this experiment?

Graphing Voltage and Current

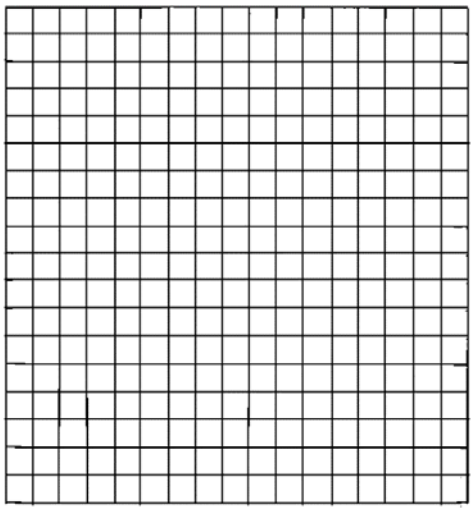
A. Often in science a useful way to analyze data from an experiment is to graph it. In this experiment what was you independent variable? What was your dependant variable?

B. Create a graph of the data you collected above with your independent variable on the x-axis and your dependant variable on the y-axis.



C. What is the slope of your graph? What physical significance does this slope have? (Remember the slope of a position vs. time graph gives velocity. . . is something similar happening here?)

D. Sometimes it can be useful to look at a graph in a different way. Re-graph your data so that your independent variable is on the y-axis and your dependant variable is on the x-axis.



E. What is the slope of this new graph?

F. What physical significance does the slope of this graph have?

Developing a Rule

A. Use your multimeter to measure the resistance of your resistor. How does this quantity compare to the slope of your graphs above?

B. For the second graph you created above write out the equation in the graph in slope-intercept formant (y=mx+b).

What is the physical significance of your y-intercept (b in the equation). What should the value be (Hint: What is the current when there is zero voltage?)

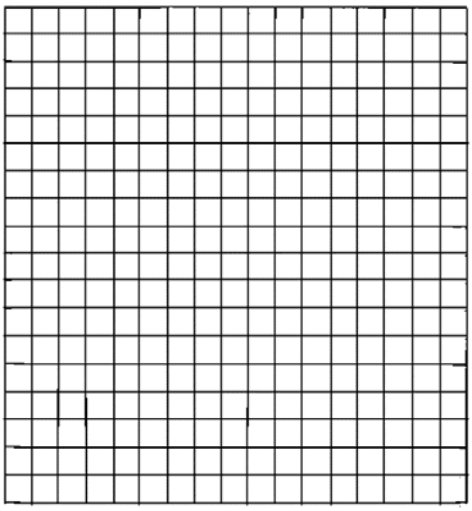
C. Using the equation you developed above substitute the variables VOLTAGE, CURRENT, and RESISTANCE into your equation. Once you have finished ask your instructor look at your equation.

Extending the Rule

A. Repeat the experiment you did above (measuring voltage and current as you add more batteries), however, this time substitute a light bulb for the resistor. Record your data in the table below. ***Do not use more than 4 batteries***.

Number of Batteries	*Voltage*	*Current*

B. Graph the results below, as you saw above voltage should be graphed on the y-axis and current on the x-axis.



C. This graph is noticeably different from the graph produced by the resistor above. Why is this graph curved?

D. What does the curve of this graph tell you about the resistance of the light bulb as voltage is increased?

Challenge Questions

A. What would happen to the current in a circuit if the voltage were doubled (assuming a constant resistance)?

B. What would happen to the current in a circuit if the resistance were halved (assuming a constant voltage)?

C. A 6.2 Volt battery is connected to a 19 Ohm resistor, what current will flow in the circuit?

Equipment
Basic Circuits Kit (includes 2 batteries, 5 alligator clip wires, 5 bulbs , 2 sockets, switch)
Extra Batteries (4-6 additional)
1 Resistor (value must be between 300-800 Ohms)
Multimeter