Elementary Circuit Lab

This lab is designed to give you hands-on opportunity to wire electrical circuits that utilize a DC power supply, resistors in the form of light bulbs, possibly a rheostat (sometimes called a potentiometer, this is a variable resistor) and digital multimeters that will be used both to read current through a branch (when used in this capacity, the meter is called an ammeter) and voltage differences across elements (when used in this capacity, the meter is called a voltmeter). You will additionally have the opportunity to make observations about how current and voltage act in series and parallel circuits.

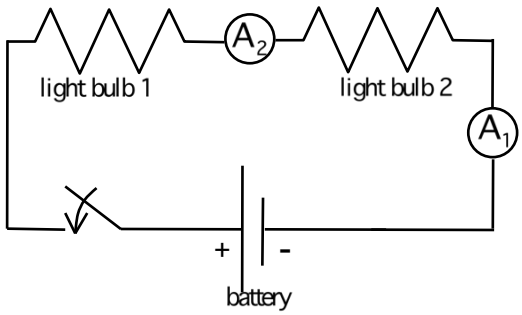
Equipment required: You will need:

--one 4-battery power pack;
--2 light bulbs;
--3 digital meters;
--one stand of wires;
--a rheostat;
--6 alligator clips

Circuit 1:

1.) (Note: Read *Parts a* and *b* before making your final connection.) Wire the circuit shown to the right. Once wired and the final connection is made:

a.) Observe and record the initial ammeter readings. This needs to be done as soon as the circuit is activated.



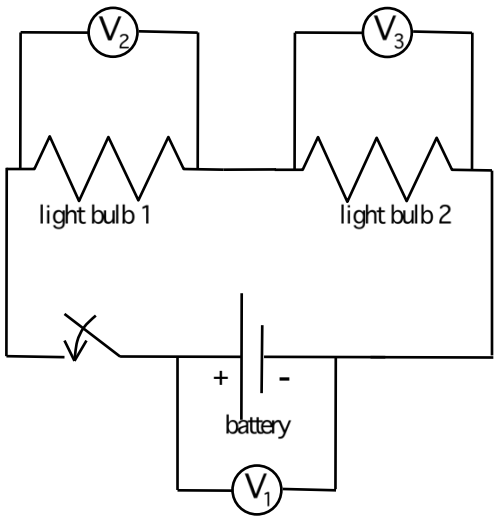
b.) After 2 minutes, again record the current values measured by the two ammeters.

c.) You should have noticed that the initial readings and the readings after 2 minutes were different. Why would you have expected that to be the case? That is, what must have been going on inside the light bulbs that would have effected this observation?

d.) Were the ammeter readings the same? If so, what can you say about that observation?

2.) Re-wire the circuit shown to the right. Once wired and the final connection is made:

a.) How does the sum of the voltages across the two light bulbs compare to the voltage across the power supply? Is this a surprise? Briefly explain.

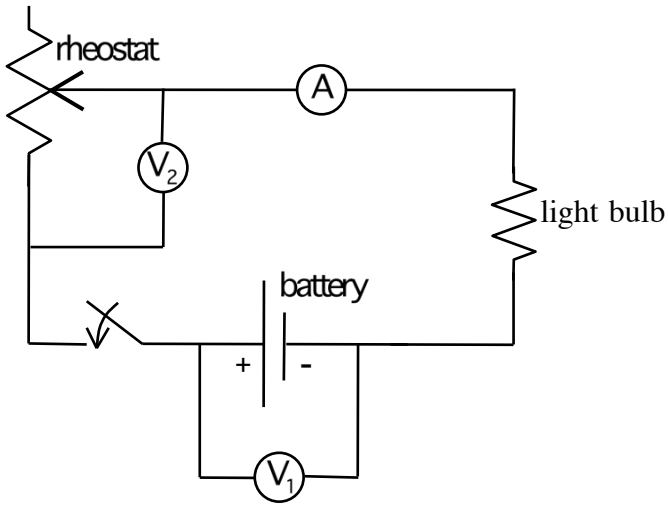


b.) What would have happened if you had mistakenly set one of the meters up as an ammeter (don't do it—this is theoretical)?

Circuit 2:

3.) Wire the circuit to the right. Once wired, rotate the central nob of the rheostat. When you do:

a.) Briefly, what happens to the voltage across the rheostat?



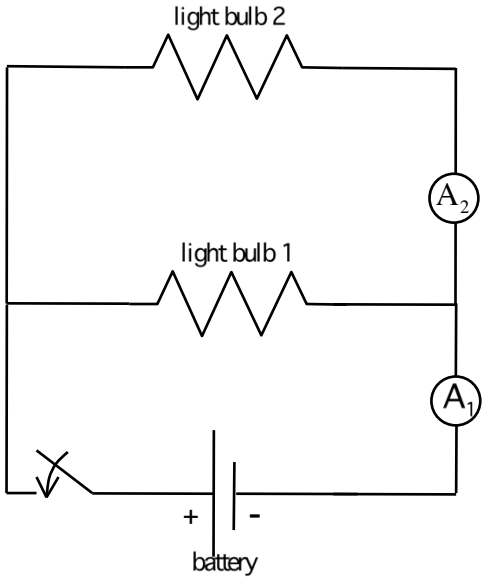
b.) Briefly, what happens to the current through the branch?

c.) Briefly, what happens to the brightness of the light bulb?

d.) What happens to the voltage across the battery. This is tricky. Explain why you have observed what you've observed.

e.) In short, what do rheostats do in a circuit (how do they act)?

Circuit 3:

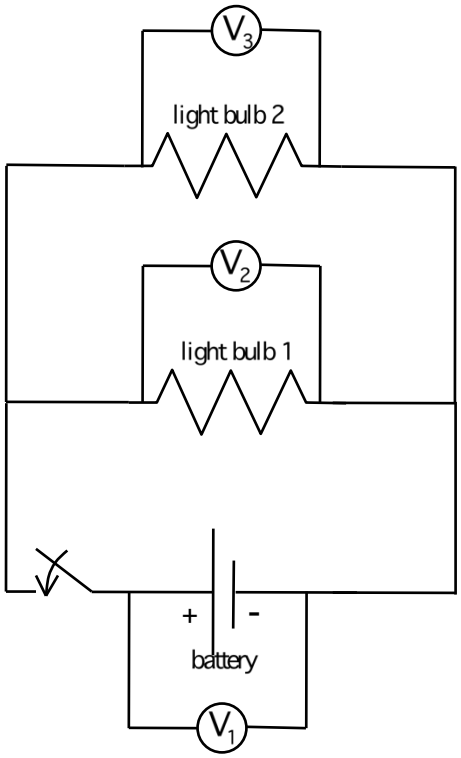


4.) Wire the circuit to the right.

a.) What do your ammeters read?

b.) From what you know about the circuit, what would you expect light bulb #1's current to be?

c.) Briefly, what would have happened if you had mistakenly set the #1 meter up as a voltmeter?



5.) Wire the circuit to the right.

a.) How do the voltages across the light bulbs compare to the voltage across the power supply. Is this what you expected? Comment briefly.

6.) When I took data, I got a battery voltage of 5.6 volts and meter readings of $V_2 = 5.20$ volts and $V_3 = 5.23$ volts.

a.) Why was the battery voltage more than the other two?

b.) Why weren't the two bulb voltages exactly the same?