Virtual Circuits Lab

Physical Science and Technology

In this lab you will explore with virtual circuits using the PhET *Circuit Construction Kit - DC Only* found at:
http://phet.colorado.edu/new/simulations/sims.php?sim=Circuit_Construction_Kit_DC_Only

1. Open up the applet. Experiment with dragging different components into the work space. To delete a component just click on it and hit delete. Once you feel comfortable with how the applet works, create a circuit. For now, limit your circuit to **only one loop, with one light bulb and no resistors or switches**. Keep the "Lifelike" box checked in Visual settings and make sure that the blue circles are moving in your circuit. Pretend that the silver end of the battery is the positive terminal and the black end is the negative terminal.
    a. Draw the circuit that you created as it appears in the lifelike setting.
    b. What do the moving blue circles represent?
    c. There are many ways to create a circuit but what are the **TWO** characteristics of a circuit that always must be present in order for current to flow? **(Hint – what do you need to do in order to make the blue circles move?)**

2. Use your notes to answer the following questions:
    a. What is the unit of current?
    b. What is Ohm's Law?
    c. What is voltage?

3. Under the tools option, select Non-Contact Ammeter and move the crosshairs over a junction in your circuit. You will use this tool to measure current. Move the Ammeter around the loop of your circuit while current is flowing.
    a. What is the current in your loop?
    b. Does the current change at different points in your loop? **Explain why your response makes sense.**

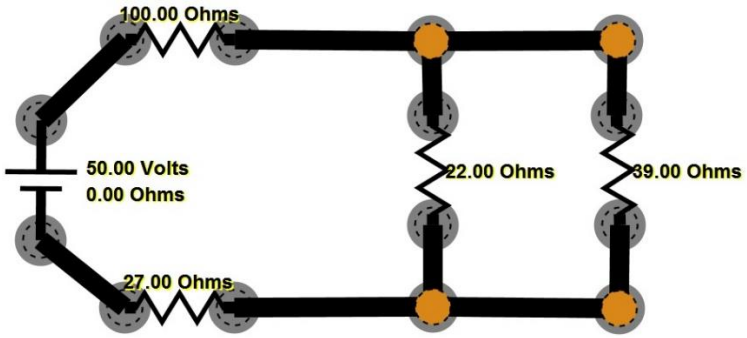
4. Investigate the resistance of the light bulb by measuring it and changing it.
    a. What is resistance?
    b. What is the resistance of your light bulb? (To find out, right-click on the light bulb.)
    c. Add a resistor to your circuit. (You might need to right-click on the resistor and lower its resistance to keep current flowing.) How does this change the brightness of your light bulb? **Why?**

5. Click the voltmeter box and then position the two probes over the battery. Don't worry if your voltages appear negative (this is due to the difference between real current – the flow of electrons – and "conventional current" – the flow of theoretical positive particles).
    a. What is the voltage across your battery?
    b. What is the voltage across the light bulb?
    c. What is the voltage across your resistor?

6. Right-click on the battery to change its voltage and the resistor and light bulb to change their resistance. Record the voltage, current and resistance of the light bulb in the table below – then check your observations with Ohm's Law. Repeat your measurements twice with different voltages and resistances.

	Test 1	Test 2	Test 3
Voltage (V)			
Current (I)			
Resistance (R)			
V=IR (calculate)			

7. Now make a parallel circuit, similar to the one we created in class using the breadboards. The simulation doesn't allow resistance values as large as we used, so instead you should use the following values (50 Volts, 100 Ohms, 22 and 39 Ohms, and 27 Ohms):



   a. What is the voltage across your battery?
   b. What is the voltage across the light bulb?
   c. What is the voltage across your resistor?

8. Use the tools in the simulator to measure the following values for each resistor. Compare these measurements to the measurements you made with your breadboards last week. What are the similarities and differences

	Voltage (V)	Current (I)	Resistance (R)
100 Ohm			
22 Ohm			
39 Ohm			
27 Ohm			