Parallel and Series Circuits Lab

Go to the following address to download the applet:
http://phet.colorado.edu/en/simulation/circuit-construction-kit-dc

You must have Java 6 on your computer (Mac's won't run Java). If you do not have the correct version of Java on your computer, you can download it for free from
http://www.java.com/en/download/index.jsp

You are going to build 2 series circuits, 2 parallel circuits and one combination circuit and measure the current through and voltage across each resistor. Read the following introduction before you begin constructing any of these circuits.

Wires – you can change the length and orientation of the wires by clicking and dragging on the yellow circles on the ends of them. The little circles that are in the wire are the electrons. They will not move until you have a complete loop from one side of the battery to the other. Notice the speed that the electrons move, faster = higher current.

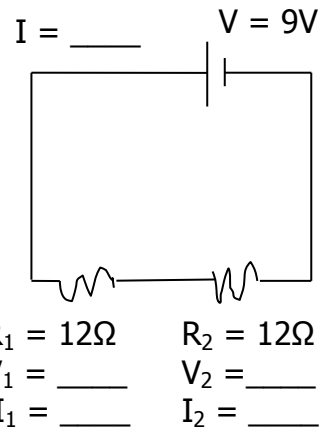
Resistors – you can change the resistance of the resistors by right clicking on them and opening the dialogue box. Notice that when you change the resistance, the color bands on the resistor change colors to correspond to the resistance shown. You can show the value on the picture by right clicking and selecting "show value." The default is 10 ohms, so you'll have to change it to the correct value.

Battery – You can change the voltage of the battery by right clicking on it and selecting "Change Voltage". You can also show the voltage the by selecting, "show value". Don't worry about changing the internal resistance of the battery. Leave it at zero ohms. The default voltage is 9 V

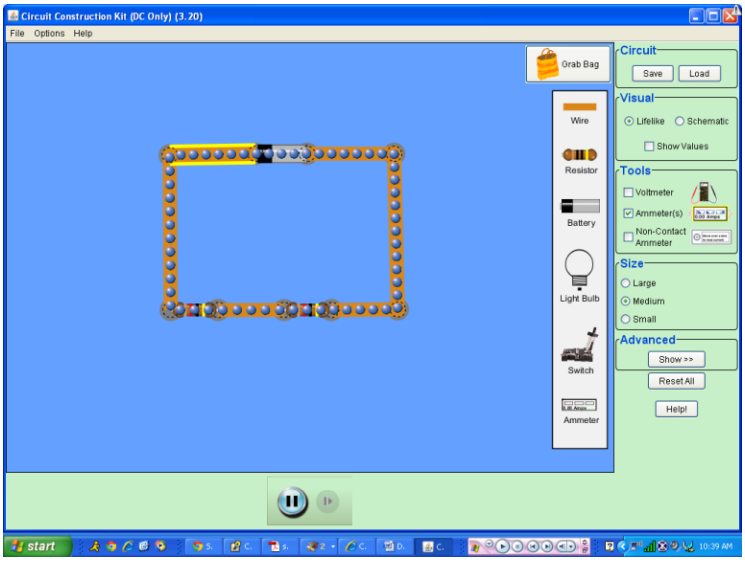
Voltmeter – To use the voltmeter to find the voltage drop, you need to click on the "voltmeter" box on the right. It will place a voltmeter on the board. You then need to drag the voltmeter to the position that you want to use it. You can drag the red and black leads so that they touch either side of the part of the resistor you want to measure. Make sure that the voltage reading is positive. If it is negative, you hooked them up backwards and need to switch them.

Ammeter – To use the ammeter, again, check the box next to "Non-Contact Ammeter". Drag the ammeter from the box scroll over the wires in the circuit. The current in that section of the circuit will show up in the display.

Series Circuit: Construct the following series circuit:



The screen should look like this:

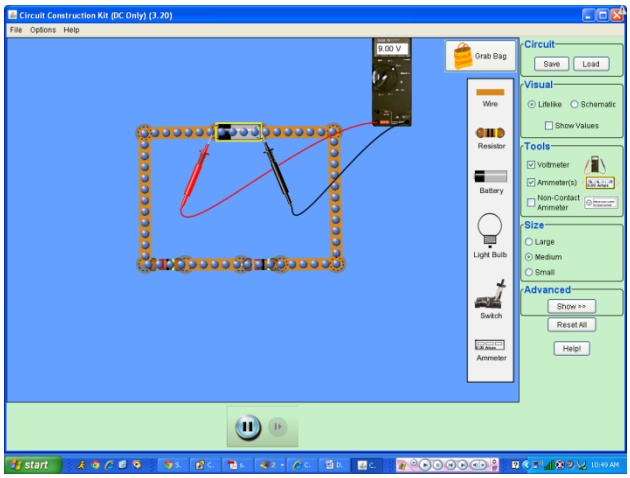


What color are the bands on the resistor?

Use the voltmeter to measure the voltage across the battery and each resistor.

It will look like the diagram at right when you measure the voltage across the battery.

Record your results in the blanks on the schematic diagram above.



Is there a relationship in the values for these voltages in series?

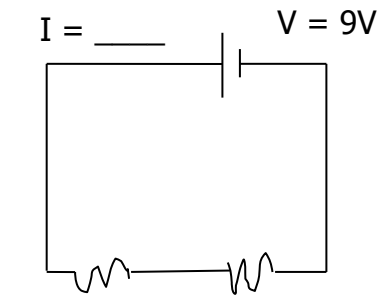
Use the non-contact ammeter to measure the current in the battery and in each of the resistors. Record the results above.

Is there a relationship among the values for the amount of current in each component?

Watch the flow of electrons through each component of the circuit. You will be asked questions referring back to this idea later in the packet.

Construct the second series circuit. It will have a 12 Ω and a 24 Ω resistor.

What do the color bands for the 24 Ω resistor look like?



R_1 = 12Ω R_2 = 24Ω
V_1 = _____ V_2 =_____
I_1 = _____ I_2 = _____

How does the flow of electrons through this circuit compare to the last one?

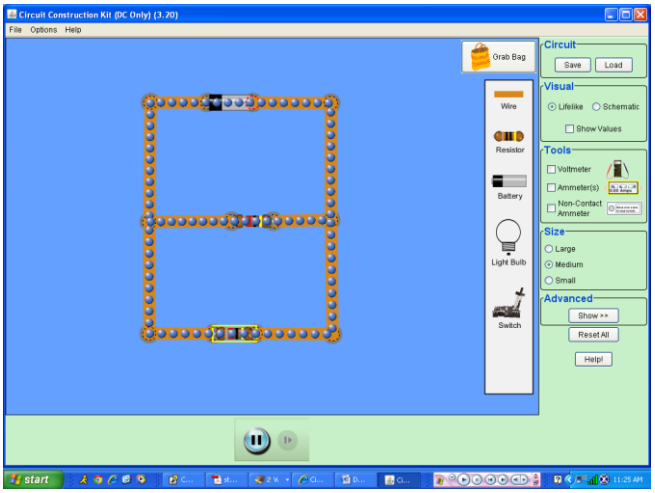
Record the voltage and current for each component in the schematic diagram.

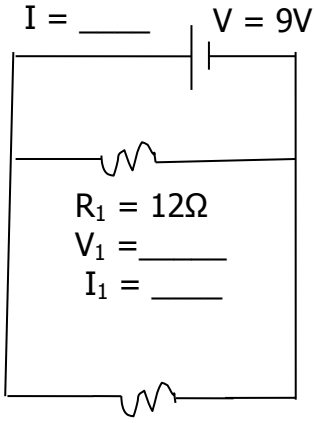
How does the voltage across the 12 Ω resistor compare to that from the battery and the 24 Ω resistor?

How does the current through the 12 Ω resistor compare to that from the battery And the 24 Ω resistor?

Now you will construct a parallel circuit with two 12 Ω resistors according the diagram:

It will look like this on the screen:





R_1 = 12Ω
V_1 =_____
I_1 = _____

R_2 = 12Ω
V_2 = _____
I_2 = _____

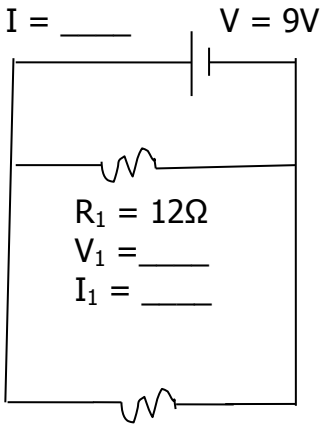
Measure and record the voltage and current in each component.

Is there a relationship in the values for these voltages for a circuit in parallel?

Is there a relationship among the values for the amount of current in each component?

How does the motion of the electrons in the wires <u>from the battery</u> compare to that of the first series circuit?

How does the motion of the electrons through the resistors compare to those from the battery?



$R_2 = 24\Omega$
V_2 = ____
I_2 = ____

Now, construct a second parallel circuit with a 12 Ω and a 24Ω resistor as shown in the diagram.

Record the voltages and currents through each part.

How does the voltage across the 12 Ω resistor compare to that from the battery and the 24 Ω resistor?

How does the current through the 12 Ω resistor compare to that from the battery and the 24 Ω resistor?

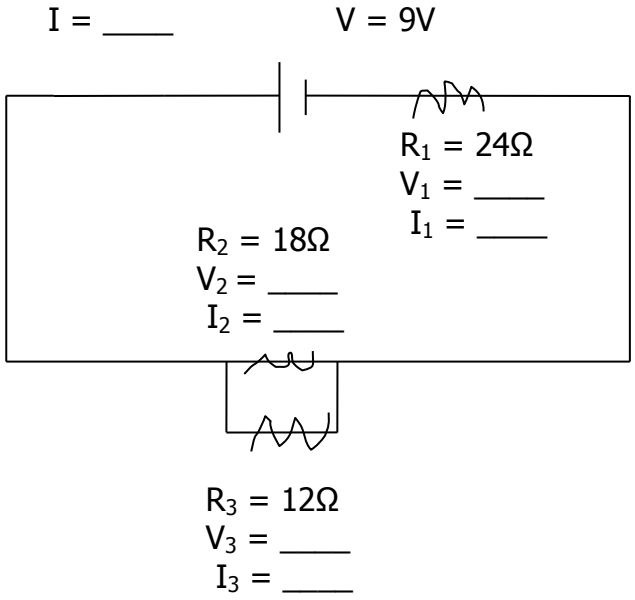
Name: _____ **Date:** _____ **Hour:** ___

Turn in THIS PART ONLY.

1. Create a combination circuit using two 12 Ω resistors in parallel with each other and in series with a 24Ω resistor.

2. Record the voltages and the currents.

3. ***Draw what the screen looks like ***



Explain your answers to the following questions. The explanation is what will be graded, so be as complete as possible, using information from the previous circuits to support your answer.

4. How are the currents similar/different through each resistor?

5. How are the voltages similar/different through each resistor?