

Purpose:

In this lab you will be making, both, series and parallel circuits using an online source. You will then to take readings for current and voltage at various points in these circuits. Using these measurements, we will identify the relationships between parallel and series circuits in terms of current and voltage.

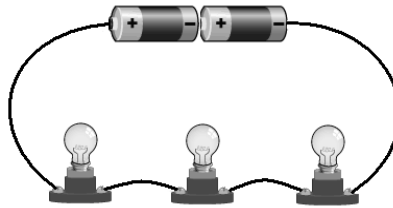
Website:

Go to <http://phet.colorado.edu/> Under "how to run simulations" click "online". Click "Physics" → "electricity, magnets and circuits". Scroll through the simulations until you find "circuit construction kit (DC only)"

Procedure:

Part 1:

1. Construct the following circuit, *including a switch in the proper location*:



a) What type of circuit is this? _____

b) Draw the schematic diagram for the above circuit:

2. You will measure the *current* using the ammeter.

To measure *current*, the ammeter must be wired in _____

3. Take a *current* reading next to each of the 3 different bulbs in the circuit.

a) Record the readings in the table below:

Bulb #	Current Reading
1.	
2.	
3.	

b) What do you notice about the readings?

4. You will be using the voltmeter to measure *voltage rise* and *voltage drop*.

a) To measure *voltage*, the voltmeter must be wired in _____

b) Voltage rise is measured across the _____ and voltage drop is measured across the _____.

5. Measure the *voltage rise* of your circuit:

$$V_{\text{rise}} = \underline{\hspace{2cm}}$$

6. Measure the *voltage drop* of each of the three bulbs. Record your readings in the table below, and add them together.

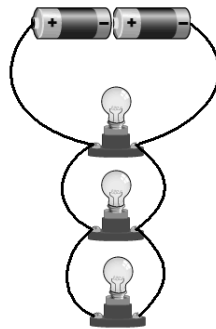
Bulb #	Voltage Reading
1.	
2.	
3.	
Total:	

Part 1 Questions:

1. How many paths are there for the current to flow?
2. Explain what happens when if one bulb is disconnected.
3. How does the *voltage rise* compare with your *total voltage drop* measure across each of the three resistors (lights)?
4. What can you tell about the *current* flowing at any point in the circuit?
5. Re-draw the circuit with an ammeter measuring current after the switch and two voltmeters – one measuring voltage rise, and the other measuring voltage drop across one of the bulbs. Use correct schematic symbols.

Part 2:

1. Construct the following circuit, *including a switch in the proper location*:



a) What type of circuit is this? _____

b) Draw the schematic diagram for the above circuit:

2. You will use the ammeter to measure *current*.

To measure *current*, the ammeter must be wired in _____

3. Put the ammeter in the circuit to measure the *total current*.
4. Disconnect the second and third bulbs.
5. Leaving your ammeter in place, take a current reading while **only one bulb** is on. Record the current in the table on the next page.

6. Do the same, but with **2 bulbs** on, and then with **3 bulbs** on.

a) Record the current readings in the table below:

# of bulbs on	Current Reading
1.	
2.	
3.	

b) What do you notice about the readings?

7. You will be using the voltmeter to measure *voltage rise* and *voltage drop*.

a) To measure *voltage*, the voltmeter must be wired in _____

b) Voltage rise is measured across the _____ and voltage drop is measured across the _____.

8. Measure the *voltage rise* of your circuit:

$$V_{\text{rise}} = \underline{\hspace{2cm}}$$

9. Measure the *voltage drop* of each of the three bulbs. Record your readings in the table below:

Bulb #	Voltage Reading
1.	
2.	
3.	

Part 2 Questions:

1. How many paths are there for the current to flow?
2. Explain what happens when one or more bulbs are disconnected.
3. How does the *voltage rise* compare with the *voltage drop* measured across each of the three resistors (lights)?
4. As you add bulbs to the circuit, what can be said about the *current*? Why does this happen?
5. a) What did you notice about the brightness of the bulbs in this circuit compared to the first circuit?

b) Explain why this happens, in terms of current *AND* voltage.
6. Re-draw the circuit with an ammeter measuring current after the switch and two voltmeters – one measuring voltage rise, and the other measuring voltage drop across one of the bulbs. Use correct schematic symbols.

Follow-Up Questions:

Using the data you have collected, you will now write a set of "rules" for each type of circuit. **Use full sentences in your rules!**

Series Circuits:

Write a rule that states how the following are observed in ALL series circuits:

- a) Number of pathways.

- b) What happens when a path is broken.

- c) The current throughout the circuit.

- d) How the voltage drops compare to the voltage rise.

Parallel Circuits:

Write a rule that states how the following are observed in ALL parallel circuits:

- e) Number of pathways.

- f) What happens when a path is broken.

- g) How current changes when loads are added.

- h) How the voltage drops compare to the voltage rise.