

Purpose:

In this lab you will be making, both, series and parallel circuits. You will then be using a millimeter to take readings 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.

Apparatus:

- 4 wires with the ends stripped
- 3 bulbs (1.5 volt)
- 2 cells (1.5 volt) with holders
- 2 alligator clip wires (one black one red)
- 3 bulb holders (black ones)
- 1 multimeter

Procedure:

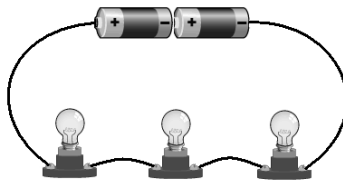
Note: Use the alligator clip wires to connect from the cells – Red to positive and black to negative.



Anytime you see  you must stop what you are doing, and have me check your circuit before moving on.

Part 1:

1. Construct the following circuit:



- a) What type of circuit is this? _____
- b) Draw the schematic diagram for the above circuit:

2. Set up the multimeter to measure *current*.
 - a) To measure *current*, the ammeter must be wired in _____
 - b) Re-draw the schematic diagram with the ammeter in the correct spot to measure the *total current*:



Before you move to step 3, you must show me how you will measure the current in your circuit.

3. Take a *current* reading at 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. Remove the multimeter from the circuit, and now set it up to measure *voltage*.
 - a) To measure *voltage*, the voltmeter must be wired in _____
 - b) Re-draw the schematic diagram with the voltmeter in the correct spot to measure the *voltage rise*, **AND** the *voltage drop* of *one* bulb:



Before you move to step 5, you must show me how you will measure the voltage rise and drop in your circuit.

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

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

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

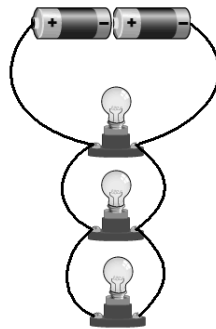
Bulb #	Voltage Reading
1.	
2.	
3.	
Add	

Part 1 Questions:

1. How many paths are there for the current to flow?
2. Explain what happens when one bulb is unscrewed.
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?

Part 2:

1. Construct the following circuit:



a) What type of circuit is this? _____

b) Draw the schematic diagram for the above circuit:

2. Set up the multimeter to measure *current*.

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

b) Re-draw the schematic diagram with the ammeter in the correct spot to measure the *total current*:



Before you move to step 3, you must show me how you will measure the current in your circuit.

3. Put the ammeter in the circuit to measure the *total current*.
4. Unscrew 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 below.
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. Remove the multimeter from the circuit, and now set it up to measure **voltage**.
 - a) To measure *voltage*, the voltmeter must be wired in _____
 - b) Re-draw the schematic diagram with the voltmeter in the correct spot to measure the *voltage rise*, **AND** the *voltage drop* of *one* bulb:



Before you move to step 8, you must show me how you will measure the voltage rise and drop in your circuit.

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

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

9. Measure the *voltage drop* of all 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 bulb is unscrewed.
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*?
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.

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.