

Mark

FHS Science 10 Circuit Exploration

using PheT Circuit Construction Kit (CCK)

Name: _____

Purpose: To investigate circuits connected in series and parallel.

Apparatus: PheT Virtual Circuit Construction Kit (CCK) accessed at https://phet.colorado.edu/sims/html/circuit-construction-kit-dc/latest/circuit-construction-kit-dc_en.html
This can be linked DIRECTLY from my website.

Part I. Exploring Voltage

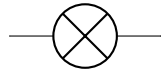
The following are standard symbols in a circuit diagram:



Resistor



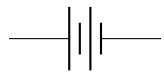
Voltmeter



Light bulb



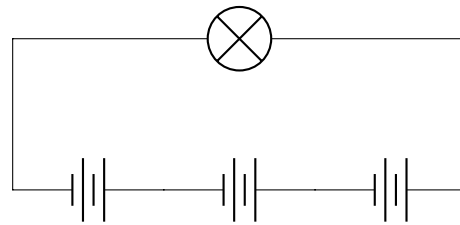
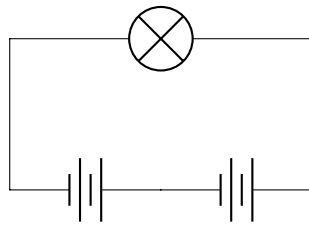
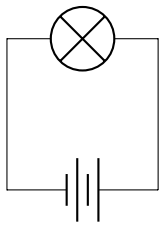
Ammeter



Battery

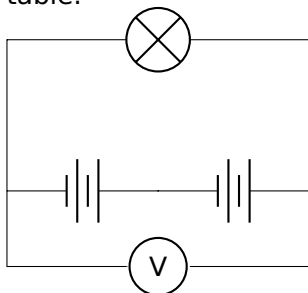
The long vertical line on the battery represents the positive terminal (cathode) of the battery. Straight lines represent connecting wires.

1. On the PheT site, select the Lab option (not Intro)
2. Connect the following three circuits using batteries and light bulbs:



3. Describe what happens to the brightness of the lightbulb as the number of batteries increases.

4. Use the voltmeter to measure the voltage across the batteries in **each** circuit by connecting it to the each end of the line of batteries, as shown below. Record your values in the table.



| # of Batteries | Voltage Measured (V) | Current Measured (A) |
|----------------|----------------------|----------------------|
| 1 | | |
| 2 | | |
| 3 | | |

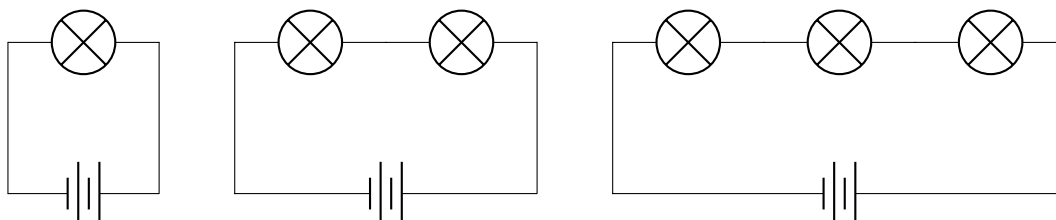
5. Now use the first ammeter (the one with the loop) to measure the current in the circuit by putting the loop over any part of the wire. Record your measurements in the table above.

6. What is the relationship between the number of batteries and the voltage?

7. What is the relationship between the voltage in the circuit and the current in the circuit?

Part II. Series Circuits

1. Clear the workbench by pressing the round orange arrow in the bottom right of your screen
2. Connect the following three circuits using battery and light bulbs:



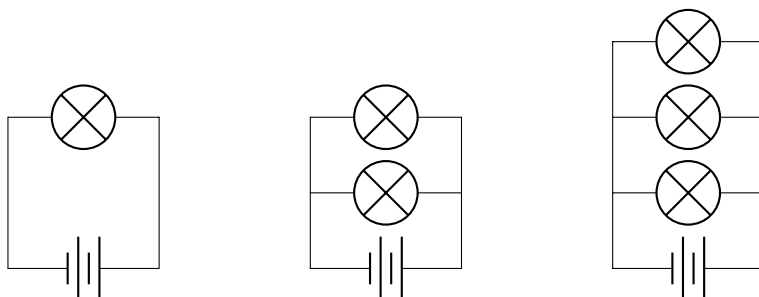
3. Describe what happens to the brightness of the lightbulb as the number of lightbulbs increases.
4. Use the voltmeter to measure the voltage across each lightbulb in **each** circuit by connecting it to the either side of each light bulb. The battery voltage is the same as in the first circuit in part I. Record your values in the table.

| # of Lamps | Lamp Voltage Measured (V) | | | Battery Voltage Measured (V) |
|------------|---------------------------|--------|--------|------------------------------|
| | Lamp 1 | Lamp 2 | Lamp 3 | |
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |

5. How does the brightness of the lightbulb relate to the voltage across the light bulb?
6. How does the battery voltage compare to the sum of the voltages of the light bulbs in each circuit?

Part III. Parallel Circuits

1. Clear the workbench by pressing the round orange arrow in the bottom right of your screen
2. Connect the following three circuits using battery and light bulbs (Make sure you have connections between vertical wires and horizontal wires):



3. Describe what happens to the brightness of the lightbulb as the number of lightbulbs increases.
4. Use the voltmeter to measure the voltage across each lightbulb in **each** circuit by connecting it to the either side of each light bulb. Record your values in the table.

| # of Lamps | Lamp Voltage Measured (V) | | | Current from the Battery (A) |
|------------|---------------------------|--------|--------|------------------------------|
| | Lamp 1 | Lamp 2 | Lamp 3 | |
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |

5. Using the ammeter, measure the current in each branch of the circuit by putting it beside a lamp ON A HORIZONTAL WIRE. What do you notice?
6. Now measure the TOTAL current from the battery by putting it near the battery. Record the values in the table. What do you notice?