

Direct Current Circuits Lab

Series Circuits

1. Measure the voltage of each battery using a multimeter. Make sure the multimeter is in DC voltage mode.

Battery 1 _____

Battery 2 _____

Battery 3 _____

2. Connect the negative terminal of battery 1 to the positive of battery 2. Measure the voltage of this combination by touching the positive terminal of battery 1 and the negative terminal of battery 2.

Voltage _____

What is the relationship of this voltage to the voltages of the individual batteries?

3. Now connect the negative terminal of battery 2 to the positive of battery 3. Leave the first two batteries connected. Measure the voltage of this combination by touching the positive terminal of battery 1 and the negative terminal of battery 3.

Voltage _____

What is the relationship of this voltage to the voltages of the individual batteries?

Connecting the batteries by connecting positive to negative ends is called a **series** connection.

4. Measure the resistance of each light bulb. Make sure the meter is in resistance mode.

Bulb 1 _____

Bulb 2 _____

Bulb 3 _____

5. Connect two bulbs together with a connector and measure the resistance of the combination.

Resistance _____

What is the relationship of this resistance to the resistances of the individual bulbs?

6. Connect the third bulb to the 2nd bulb with another connector. Leave the first two bulbs connected. Measure the resistance.

Resistance _____

What is the relationship of this resistance to the resistances of the individual bulbs?

Connecting the bulbs in this way is called a **series combination**.

7. Connect battery 1 to bulb 1 by connecting the positive end of the battery to the bulb. Now connect the other end of the bulb to the negative end of the battery. Does the bulb light up? _____

How bright is the bulb?

Draw a circuit diagram.

8. Make a series combination of batteries 1 and 2 and connect to bulb 1. Does the bulb light up? _____

How bright is the bulb?

Draw a circuit diagram.

9. Make a series combination of bulbs 1 and 2 and connect to the series combination of batteries 1 and 2. Does the bulb light up? _____

How bright is the bulb?

Draw a circuit diagram.

Go back to your series circuit and while the bulbs are burning disconnect one of the wires connecting the bulbs. What happens?

What is the disadvantage of this combination?

10. What really causes the bulbs to give off light? (voltage, resistance, current)

Using Ohm's Law, explain the relative brightness of the bulbs in experiments #8 and #9..

Parallel Circuits

1. Connect the positive end of battery 1 to the positive end of battery 2. Do the same with the negative ends of battery 1 and battery 2. Measure the voltage of this combination touching the positive lead of the multimeter anywhere on an exposed part of the wire connecting the positive ends and the negative lead of the multimeter anywhere on an exposed part of the wire connecting the negative ends.

Voltage _____

How does this compare with the series combination?

Connecting the batteries in this way is called a **parallel combination**.

2. Use the combination above and add a connector from the positive end of battery 2 to battery 3. Do the same for the negative ends. Measure the voltage of this combination by touching the positive lead of the multimeter anywhere on an exposed part of the wire connecting the positive ends and the negative lead of the multimeter anywhere on an exposed part of the wires connecting the negative ends.

Voltage _____

How does this compare with the series combination?

3. Connect lamps 1 and 2 by using two connectors. One connector connects one lead from each of the lamps. Another connector connects the other lead from the two lamps. Measure the resistance of this combination by touching the positive lead of the multimeter anywhere on an exposed part of one wire and by touching the negative lead anywhere on an exposed part of the other wire.

Resistance _____

How does this compare with the series combination?

Connecting the lamps in this way is called a **parallel combination**.

4. Connect lamps 1, 2, and 3 by using four connectors. Use the combination above and connect each of the existing wires to opposite sides of the third lamp with another wire. Measure the resistance of this combination by touching the positive lead of the multimeter anywhere on an exposed part of a continuous wire and by touching the negative lead of the multimeter anywhere on an exposed part of the other continuous wire combination.

Resistance _____

How does this compare with the series combination?

5. Connect batteries 1 and 2 in series and connect bulbs 1 and 2 in parallel. Connect the series combination of the batteries to the parallel combination of the bulbs. Make sure you have a complete circuit. Do the bulbs light up? _____

How bright are the bulbs compared to the series combination of bulbs? (If in doubt go back and wire the series combination and test it again.)

Draw a circuit diagram.

Compare the resistances of the series and parallel combinations. Use Ohm's law and explain why the bulbs are brighter in one combination than the other.

Go back to your parallel circuit and while the bulbs are burning disconnect one of the wires connecting the bulbs. What happens?

What is the advantage of this combination?

How is your home wired?