

Science 9 – Ohm’s Law Lab

An electrical circuit is a path through which electrical current flows. Simple circuits can include components such as electrical sources, loads such as light bulbs, switches, conducting wires, data collection instruments such as voltmeters or ammeters, and resistors.

We have already learned about some different values that can be measured in a circuit.

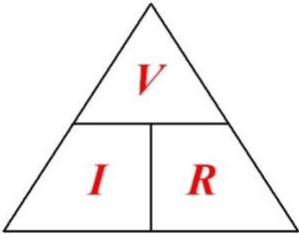
Remember:

Voltage (V) = the “push” that moves the electrons through the circuit

Current (I) = how many electrons are flowing through the circuit

Resistance (R) = anything that slows the electrons down

Ohm’s Law is a mathematical formula that shows the relationship between voltage, current and resistance.

$$V = I R$$

$$I = \frac{V}{R}$$
$$R = \frac{V}{I}$$

If we know two of the values, we can calculate the third.

Set-Up

For this lab, you will need physical components to build a circuit as well as a PhET circuit simulator.

Get your computer ready:

1. Go to the website <https://phet.colorado.edu/>
2. Go to the **Simulations** drop down menu and choose **Physics**.
3. Scroll down to the simulation "**Circuit Construction Kit: DC**" and click.
4. Click the **Play** button.
5. Click the **Lab** button.
6. Turn on the **Values** button.
7. Adjust the voltage of the batteries to **1.5 V**.

Each station has the components needed for this lab.

Each station should have:

- Batteries and battery sleeves
- Wires
- Resistors
- Light bulbs
- Ammeter and Voltmeter

When using the ammeter and voltmeter, ensure that the wire is connected to the correct terminal (+ or -). The ammeter needs to be added into the circuit using wires. The voltmeter reads the voltage by placing the wires on either side of the battery terminals.

1. Build a circuit containing one battery and one lightbulb on the PhET simulation. Draw the circuit diagram that you built and label the voltage and resistance of your circuit. Calculate the current using Ohm's Law. ** Do not forget to change the voltage of your battery **

V =

I =

R =

2. Build the same circuit using the physical components given. Use the ammeter and voltmeter to determine voltage and amps of said circuit. Write down the values.

V =

I =

3. Why do you think the values are different from the ones on the PhET simulation?

4. Calculate the resistance of your physical circuit using Ohm's Law.

V =

I =

R =

5. Now create a circuit containing two lightbulbs and one battery on the PhET simulation. Draw the circuit diagram that you built and label the voltage and resistance of your circuit. Calculate the current using Ohm's Law. ** Do not forget to change the voltage of your battery **

V =

I =

R =

6. Build the same circuit using the physical components given. Use the ammeter and voltmeter to determine voltage and amps of said circuit. Write down the values.

V =

I =

7. Calculate the current of your physical circuit using Ohm's Law.

V =

I =

R =

8. Add a second battery to your simulated circuit.

Does the brightness of the bulbs change? Why do you think this is?

9. Add a second battery to your physical circuit.

Does the brightness of the bulbs change?

10. Is there any relationship between the resistance of the load (the brightness) and the voltage of the battery? Hint: $V = I \times R$