Al- Mustaqbal University

College of Science

Criminal Evidence Department

First Stage

Lecture one: Ohm's Law

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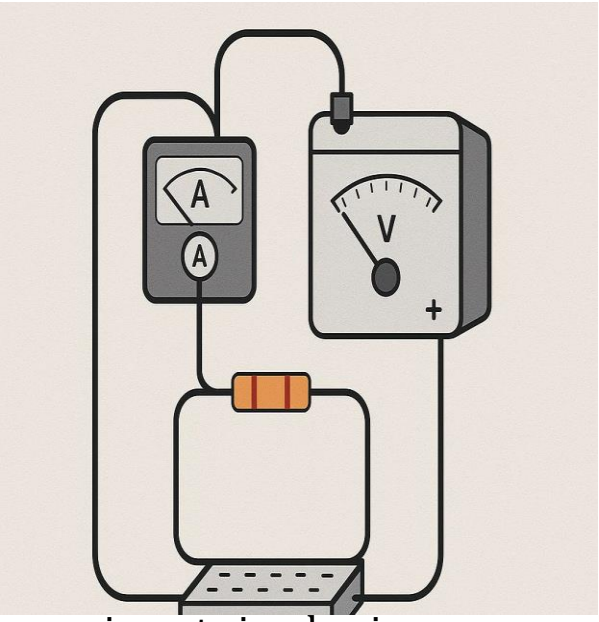
Aim of the Experiment

- To verify Ohm’s Law experimentally.

- To find the relationship between current and voltage for a fixed resistor.



Tools and Equipment Used

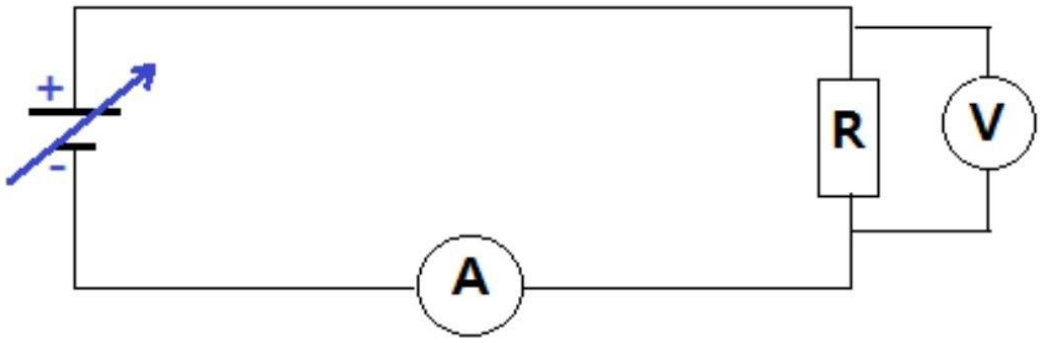
- DC Power Supply (Battery or DC Source)
- Resistor
- Voltmeter
- Ammeter
- Connecting Wires
- Breadboard (optional)

Theory

Ohm’s Law experiment is one of the basic experiments in physics labs. It aims to study the relationship between the electric current passing through a circuit and the voltage across its components. This experiment helps students understand how to measure voltage and current using standard lab instruments.

Ohm's law text:

"The electric current passing through a conductor is directly proportional to the voltage across it, provided the temperature remains constant."



Ohm's Law is defined by the equation:

$$V = I \times R$$

Where:
V: Voltage across the resistor (Volts) (V)
I: Electric current (Amperes) (A)
R: Resistance (Ohms) (Ω)

If the resistance is constant, the current increases linearly with the voltage.

Experimental Procedure

1. Set up the circuit: Connect the resistor to the power source using wires on a breadboard or directly.

2. Connect the ammeter: Place the ammeter in series with the resistor to measure the current.

3. Connect the voltmeter: Place the voltmeter in parallel with the resistor to measure the voltage.

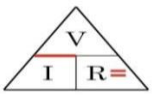
4. Turn on the power supply: Start with a low voltage and record the readings of voltage and current.

5. Repeat the experiment: Gradually increase the voltage and take multiple readings of both current and voltage.

6. Create a data table: Record the corresponding values of V and I.
7. Plot the graph: Plot voltage (V) on the y-axis and current (I) on the x-axis.
8. Analyze the results: If the graph is a straight line through the origin, Ohm's Law is verified.

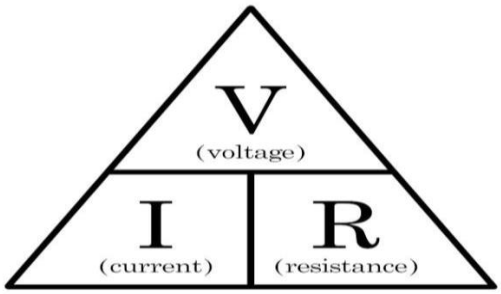
Mathematical Relations and Calculations

$$I = V \div R$$



$$R = V \div I$$

$$V = I \times R$$

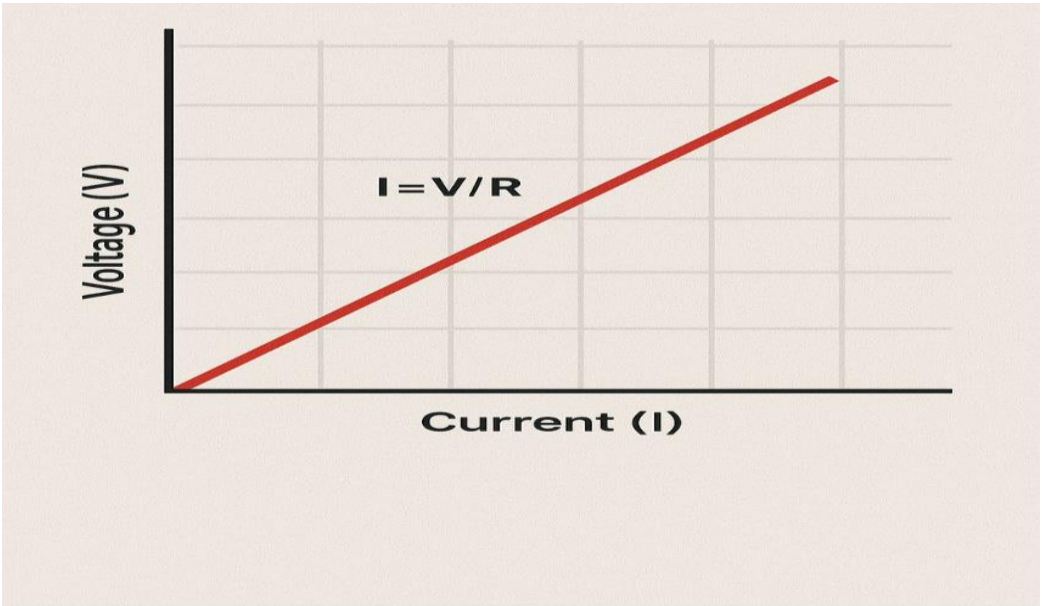


- To calculate resistance: R = V / I
- To calculate current: I = V / R
- To calculate voltage: V = I × R

Voltage (V)	Current (A)	Resistance (R)
1	0.15	
2	0.36	
3	0.51	
4	0.77	
5	0.99	

- A graph is plotted between voltage and current. A straight line indicates a direct proportionality, confirming Ohm's Law.

R(Ω)= Slope



1. What does Ohm’s Law describe?

A- The relationship between power and resistance

B- The relationship between voltage, current, and resistance

C- The relationship between charge and time

D- The relationship between energy and power

2. Ohm’s Law is mathematically expressed as:

A- $R = I \times V$ B- $V = I \times R$ C- $I = R \times V$ D- $V = R / I$

3. The SI unit of electric current is:

A- Volt

B- Ohm

C- Ampere

D- Watt

4. Which instrument is used to measure electric current?

A- Voltmeter

B- Ammeter

C- Ohmmeter

D- Galvanometer

5. The voltmeter should be connected in the circuit:

A- In series with the resistor

B- In parallel with the resistor

C- In series with the power supply

D- Outside the circuit

6. If the resistance is constant, increasing the voltage will:

A- Decrease the current

B- Keep the current constant

C- Increase the current linearly

D- Stop the current

7. The SI unit of resistance is:

A- Ampere **B- Volt** **C- Watt** **D- Ohm**

8. In an Ohm's Law experiment, the ammeter is connected:

A- In parallel with the resistor

B- In series with the resistor

C- Across the power supply

D- Across the voltmeter

9. A straight-line V–I graph passing through the origin indicates:

A- Non-ohmic behavior

B- High resistance

C- Verification of Ohm's Law

D- Zero current

10. Resistance can be calculated using the formula:

A- $R = I / V$

B- $R = V \times I$

C- $R = V / I$

D- $R = I^2 \times V$