

University of Hillah

Department of Anesthesia Techniques

The first stage

Medical physics laboratory



Experiment. Ohm's Law

Ms.c Muntazer Ahmed

Aim of the Experiment:

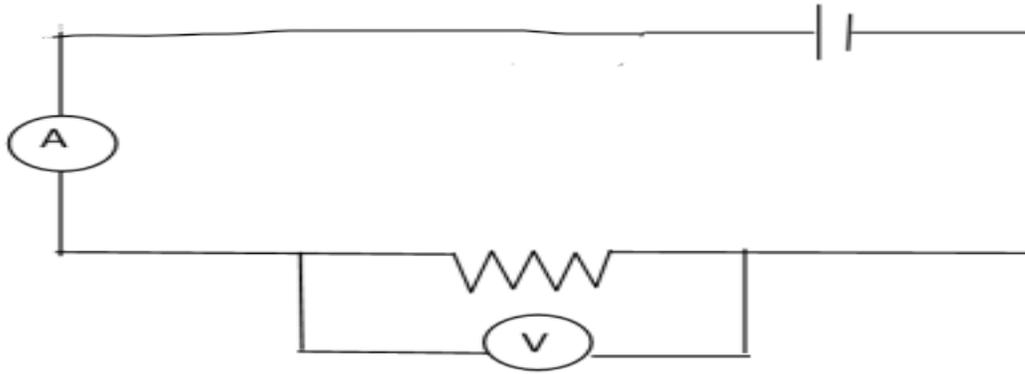
To verify Ohm's Law, which states that the current flowing through a conductor is directly proportional to the voltage applied across it .

Tools Used in the Experiment:

- ❖ **Power supply:** Provides a controllable source of voltage for the circuit.
- ❖ **Resistor:** A component with a known resistance value used to create a circuit.
- ❖ **Ammeter:** Measures the current flowing through the circuit.
- ❖ **Voltmeter:** Measures the voltage across the resistor.
- ❖ **Connecting wires:** Used to connect the components and form the circuit.

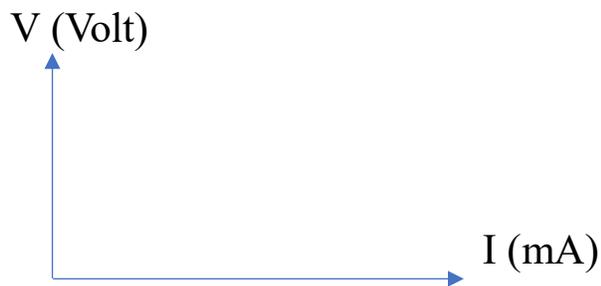
Procedure

- ***-Set up the circuit by connecting the power supply, resistor, ammeter, and voltmeter in series.***
- ***-Ensure the circuit is properly connected and secure.***
- ***-Adjust the power supply to set a specific voltage.***
- ***-Measure the current flowing through the circuit using the ammeter.***
- ***-Measure the voltage across the resistor using the voltmeter.***
- ***-Repeat the measurements for different voltage values, maintaining the same resistance.***
- ***-Record the current and voltage values for each measurement.***
- ***-Plot a graph of current versus voltage.***
- ***-Analyze the graph to determine if the data follows a linear relationship, indicating the verification of Ohm's Law.***



I (mA)	V(Volt)

$$Slope = \frac{\Delta y}{\Delta x} = \frac{\Delta V}{\Delta I} = R$$



Theory :

Ohm's Law states: that the current flowing through a conductor between two points is directly proportional to the voltage across the two points, given a constant temperature. In simple terms, it describes how current (I) in a circuit is related to voltage (V) and resistance (R).

Mathematical Definition:

Mathematically, Ohm's Law is expressed as:

$$I=V/R$$

Where:

(V) represents the voltage measured in volts (V),

(I) represents the current measured in amperes (A),

(R) represents the resistance measured in ohms (Ω)

-Voltage (V) is the electrical potential difference between two points in a circuit. It is measured in volts and represents the force that drives the flow of electrical current.

-Current (I) It is measured in amperes and represents the quantity of charge passing through a given point in the circuit per unit time.

-Resistance (R) is the opposition to the flow of electric current in a circuit. It is measured in ohms

-Relationship between Voltage, Current, and Resistance:

According to Ohm's Law, the voltage across a circuit is directly proportional to the current flowing through it, given a constant resistance.

In other words, as the voltage increases, the current through the circuit increases proportionally, provided the resistance remains constant.

- If the graph shows a linear relationship between current and voltage, it verifies Ohm's Law. Any deviations from linearity would indicate non-Ohmic behavior, **suggesting factors such as temperature, non-linear resistance, or other circuit elements affecting.**

Medical Applications of Ohm's Law

- Electrocardiography (ECG)
- Electrosurgery
- Implantable Devices
- Transcutaneous Electrical Nerve Stimulation (TENS)
- Electroencephalography (EEG)

Discussion :

Q1/ If a circuit has a voltage of 12 volts and a current of 2 amperes, what is the resistance?

Q2/ How does an increase in resistance affect the current in a circuit, according to Ohm's Law?

Q3/ How does the resistance of a material affect its ability to conduct electricity?

Q4/ What is the expected relationship between voltage and current in an Ohm's Law experiment?

Q5/ What are some possible sources of error in an Ohm's Law experiment?