

# 10<sup>th</sup> Class

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## ➤ Ohm's Law:

### 1. Definition:

- Ohm's Law states that the current flowing through a conductor between two points is directly proportional to the voltage across the two points, provided the temperature remains constant.

### 2. Mathematical Expression:

- $V=I \times R$
- Where  $V$  is the voltage (potential difference),  $I$  is the current, and  $R$  is the resistance of the conductor.

### 3. Relationship:

- The potential difference across a conductor is directly proportional to the current passing through it.
- The resistance of the conductor determines how much current will flow for a given potential difference.

## ❖ Components of Ohm's Law:

### 1. Voltage (V):

- Voltage, also known as potential difference, is the electrical potential energy per unit charge measured in volts (V).
- It represents the driving force that pushes electric charges through a circuit.

### 2. Current (I):

- Current is the flow of electric charge measured in amperes (A).
- It represents the rate of flow of electric charges through a conductor.

### 3. Resistance (R):

- Resistance is the opposition to the flow of electric current measured in ohms ( $\Omega$ ).
- It depends on the material, length, cross-sectional area, and temperature of the conductor.

## ❖ Practical Applications:

### 1. Circuit Analysis:

- Ohm's Law is fundamental for analyzing electric circuits and predicting the behavior of components such as resistors, conductors, and batteries.

### 2. Designing Circuits:

- Engineers use Ohm's Law to design circuits with specific voltage, current, and resistance requirements.

- It helps in selecting appropriate components to achieve desired circuit behavior.

### 3. **Electrical Safety:**

- Understanding Ohm's Law is crucial for ensuring electrical safety.
- It helps in calculating safe operating conditions for electrical devices and preventing overloads or short circuits.

## ❖ **Limitations:**

### 1. **Temperature Dependence:**

- Ohm's Law assumes that the temperature of the conductor remains constant.
- In reality, the resistance of most conductors changes with temperature, affecting the accuracy of Ohm's Law under varying conditions.

### 2. **Non-Ohmic Materials:**

- Some materials do not obey Ohm's Law under all conditions.
- Semiconductors, diodes, and light bulbs are examples of devices with non-linear current-voltage characteristics.

Understanding Ohm's Law is essential for anyone working with electricity, including students, engineers, and technicians. It provides a foundational understanding of how electric circuits behave and enables the design and analysis of various electrical systems and devices.