

Physics — Electricity

Chapter: Electricity

Key Definitions

- **Electric Current:** The flow of electric charge in a circuit. It is measured in amperes (A).
- **Voltage (Potential Difference):** The work done to move a unit charge from one point to another in an electric field. It is measured in volts (V).
- **Resistance:** The opposition to the flow of electric current. It is measured in ohms (Ω).
- **Ohm's Law:** The relationship between voltage (V), current (I), and resistance (R) in a circuit, defined as:

$$V = I \times R$$

- **Circuit:** A closed loop that allows electric current to flow.
- **Conductor:** A material that allows electric current to pass through it easily (e.g., copper).
- **Insulator:** A material that does not allow electric current to pass through it easily (e.g., rubber).

Important Formulas

1. Ohm's Law:

$$V = I \times R$$

2. Power in Electrical Circuits:

$$P = V \times I$$

Where (P) is power in watts (W), (V) is voltage in volts (V), and (I) is current in amperes (A).

3. Resistance in Series:

$$R_{total} = R_1 + R_2 + R_3 + \dots$$

4. Resistance in Parallel:

$$\frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$$

5. Energy Consumption:

$$E = P \times t$$

Where (E) is energy in joules (J), (P) is power in watts (W), and (t) is time in seconds (s).

Diagrams

- **Series Circuit:** A circuit where components are connected end-to-end, so there is only one path for current to flow.
- **Parallel Circuit:** A circuit where components are connected across common points, providing multiple paths for current.

Summary Table

Quantity	Symbol	Unit
Current	I	Amperes (A)
Voltage	V	Volts (V)
Resistance	R	Ohms (Ω)
Power	P	Watts (W)
Energy	E	Joules (J)

Key Takeaways

- Electric current is the flow of charge, and it requires a closed circuit.
- Ohm's Law is fundamental in understanding the relationship between voltage, current, and resistance.
- Power and energy calculations are crucial for understanding electrical consumption.
- The arrangement of resistors in series and parallel affects the total resistance in a circuit.