

Physics — Electricity

Chapter: Electricity

Key Definitions

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

$$V = I \times R$$

- **Power:** The rate at which electrical energy is consumed or converted into another form of energy. Measured in watts (W). The formula for power is:

$$P = V \times I$$

Important Formulas

1. Ohm's Law:

$$V = I \times R$$

2. Power:

$$P = V \times I$$

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, (P) is power in watts, and (t) is time in seconds.

Diagrams

- **Circuit Diagram:** A simple circuit consists of a battery, a resistor, and a switch. The battery provides voltage, the resistor limits current, and the switch controls the flow of current.
- **Series Circuit:** In a series circuit, components are connected end-to-end, so the same current flows through all components.
- **Parallel Circuit:** In a parallel circuit, components are connected across the same voltage source, allowing multiple paths for current to flow.

Summary Tables

Comparison of Series and Parallel Circuits

Feature	Series Circuit	Parallel Circuit
Current	Same through all components	Divided among components
Voltage	Divided among components	Same across all components
Total Resistance	Sum of individual resistances	Reciprocal of the sum of inverses
Failure of Component	Breaks the entire circuit	Only affects the failed component

Key Takeaways

- Electric current is the flow of charge, and it requires a closed circuit to flow.
- Voltage is the driving force that pushes current through a circuit.
- Resistance determines how much current will flow for a given voltage.
- Ohm's Law is fundamental for understanding the relationship between voltage, current, and resistance.
- Power calculations are essential for determining energy consumption in electrical devices.