

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 to move a unit charge from one point to another. 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, given by the formula:

$$V = I \times R$$

- **Circuit:** A closed loop through which electric current can flow.
- **Series Circuit:** A circuit in which components are connected end-to-end, so that the current flows through each component in turn.
- **Parallel Circuit:** A circuit in which components are connected across common points or junctions, providing multiple paths for the current.

Important Formulas

1. **Ohm's Law:**

$$V = I \times R$$

2. **Power in an Electric Circuit:**

$$P = V \times I$$

where (P) is power in Watts (W).

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) and (t) is time in seconds (s).

Diagrams

- **Series Circuit:**
- Components are connected in a single path.

- If one component fails, the entire circuit stops working.
- **Parallel Circuit:**
 - Components are connected across the same voltage source.
 - If one component fails, the others can still function.

Summary Table

Concept	Series Circuit	Parallel Circuit
Current	Same through all components	Divides among components
Voltage	Total voltage is the sum of voltages across components	Same across all components
Resistance	Total resistance increases	Total resistance decreases
Failure	If one component fails, the circuit stops	If one component fails, others continue

Key Takeaways

- Electric current is the flow of charge, driven by voltage and opposed by resistance.
- Ohm's Law is fundamental for understanding the relationship between voltage, current, and resistance.
- The configuration of a circuit (series vs. parallel) affects how current and voltage behave.
- Understanding power and energy consumption is essential for practical applications in electricity.