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:
  $$
  V = I \times R
  $$
- **Power**: The rate at which electrical energy is consumed or converted. It is measured in watts (W) and is given by:
  $$
  P = V \times I
  $$

Important Formulas

1. **Ohm's Law**:
   $$
   V = I \times R
   $$
2. **Power in terms of current and resistance**:
   $$
   P = I^2 \times R
   $$
3. **Power in terms of voltage and resistance**:
   $$
   P = \frac{V^2}{R}
   $$
4. **Total Resistance in Series**:
   $$
   R_{total} = R_1 + R_2 + R_3 + \ldots
   $$

5. **Total Resistance in Parallel**:
   $$
   \frac{1}{R_{total}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots
   $$

Diagrams

1. **Series Circuit**:
   - Components are connected end-to-end.
   - Current is the same through all components.
   - Total voltage is the sum of individual voltages.
2. **Parallel Circuit**:
   - Components are connected across the same voltage source.
   - Voltage is the same across all components.
   - Total current is the sum of individual currents.

Summary Table

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

Key Takeaways

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