

Ohm's Law and Resistance

Chapter 11: Electricity · Topic 2

Key Concept

For resistors connected in series, total resistance is the sum of individual resistances ($R = R_1 + R_2 + \dots$), and the same current flows through each; for resistors connected in parallel, the reciprocal of total resistance equals the sum of reciprocals of individual resistances ($1/R = 1/R_1 + 1/R_2 + \dots$), with voltage being the same across each parallel branch. Materials like copper have low resistance (good conductors), while materials like rubber have very high resistance (insulators), and this property determines their appropriate electrical uses.

Quick Revision Notes

- Ohm's Law: $V = IR$ (Voltage = Current $\times$ Resistance), at constant temperature.
- Resistance depends on material, length, cross-sectional area, and temperature.
- Series resistors: $R = R_1 + R_2 + \dots$ (add directly). Parallel resistors: $1/R = 1/R_1 + 1/R_2 + \dots$
- Low-resistance materials (copper) are good conductors; high-resistance materials (rubber) are insulators.

Practice Questions

- 1 Calculate the resistance of a circuit with 12V and 3A of current.
- 2 Explain how total resistance is calculated differently for series versus parallel circuits.
- 3 Why is copper commonly used for electrical wiring, while rubber is used for insulation?