

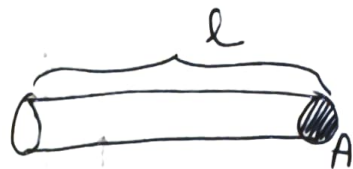
* Factors on which resistance depend \rightarrow

① Length of the conductor, l

$$R \propto l \quad \text{--- } \textcircled{i}$$

② Cross-sectional Area, A

$$R \propto \frac{1}{A} \quad \text{--- (ii)}$$



③ Nature of the conductor

④ Temperature of the conductor

Combining eqⁿ ① and ② we get —

$$R \propto \frac{l}{A}$$

$$\Rightarrow R = \rho \frac{l}{A}$$

$$\Rightarrow \rho = \frac{RA}{l}$$

ρ is known as resistivity of the material
unit of Resistivity is ohm m ~~ohm m~~

* Any material that has some resistance is called a resistor. The symbol used for resistor in a circuit is 'resistor' and fixed resistor 'resistor' for variable resistor.

✓ Resistivity of a substance is defined as the resistance of a conductor of that substance having unit length and unit area of cross section.

$$\text{When } l = 1, A = 1 \quad \underline{\rho = R}$$

Conductance and Conductivity

✓ The conductance of a conductor is how easy electric charge flow through it. It is equal to the reciprocal of its resistance and is denoted by G .

$$\text{Conductance} = \frac{1}{\text{Resistance}}$$

$$\text{or } G = \frac{1}{R}$$

SI unit : mho or ohm^{-1} or Siemens (S).

✓ The conductivity of a substance is the reciprocal of resistivity and it is denoted by σ . Thus,

$$\text{Conductivity} = \frac{1}{\text{Resistivity}}$$

$$\Rightarrow \sigma = \frac{1}{\rho}$$

SI unit : $\text{ohm}^{-1} \text{m}^{-1}$ or mho m^{-1} or S m^{-1}

✗ Resistance of a metallic conductor increases with rise in temperature.

✗ Resistivity also increases with temperature.

$$\begin{array}{l} R_t = R_0(1 + \alpha t) \\ \text{and } \rho_t = \rho_0(1 + \alpha t) \end{array} \left| \begin{array}{l} \text{where } t \rightarrow \text{temp}^{\circ} \\ \alpha \rightarrow \text{Temp}^{\circ} \text{ coefficient} \\ \text{of resistance} \end{array} \right.$$

Order of resistivity

Metal < Alloy < Insulator.

- * Silver is the Best conductor of electricity.
- * Resistivity does not depend upon length, shape and area of crosssection. It only depends upon the nature of the material.

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