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Class ⇒ B.Sc. (Part-I) Subsidary
 Subject ⇒ Chemistry
 Chapter ⇒ Ionic Equilibrium
 Topic ⇒ Conductance, Specific Conductance.

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Conductance

The ease with which electricity flows through a solution is called the conductance of the soln.

The reciprocal of the electrical resistance is called the conductance.

It is usually represented by C . Thus

$$C = \frac{1}{R}$$

units ⇒ It is expressed in the unit called reciprocal ohm (ohm^{-1} or n^{-1})

In SI system, the unit of conductance is Siemen (S).

$$(1\text{ S} = 1\text{ n}^{-1})$$

Specific Conductance

It is found that resistance (R) of a conductor is

(i) directly proportional to its length (l)

(ii) Inversely proportional to its area of cross-section (a)

$$\text{i.e. } R \propto \frac{l}{a}$$

$$\text{or } R = \rho \frac{l}{a} \quad \text{--- } ①$$

Where ρ is a constant of proportionality, called

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specific Resistance or Resistivity. Its value depends upon the material of the conductor.

The reciprocal of resistivity is known as specific conductivity or simply conductivity.

It is denoted by K . Thus, if K is the specific conductivity and C is the conductance of the solution, then

$$R = \frac{l}{C} \quad \text{and} \quad \rho = \frac{1}{K}$$

Substituting the values of R and ρ in eqn. (1)

$$\frac{1}{C} = \frac{1}{K} \times \frac{1}{l}$$

$$K = C \times l$$

NOW if $l = 1\text{ cm}$ and $C = 182\text{ cm}^2$, then

Hence, specific conductivity of a solution is defined as the conductance of a solution of 1 cm length and having 1 cm^2 as the area of cross-section.

Alternatively, the conductance of one centimeter cube of the solution of the electrolyte is called specific conductance.

If the volume of the soln. is $V\text{ cm}^3$, the specific conductivity of such a soln. at this dilution V is written as K_V .

Units \Rightarrow Resistivity or Specific resistance (ρ),

$$\rho = R \frac{q}{l} = \Omega \cdot \text{m} \cdot (\text{cm})^2 \cdot \text{cm} = \Omega \cdot \text{m} \cdot \text{cm} \text{ or } \Omega \cdot \text{m} \cdot \text{mm}$$

SI unit

$$\text{specific conductivity } K = \frac{1}{\rho} = \frac{1}{\Omega \cdot \text{m}} = \frac{1}{\Omega \cdot \text{cm}}$$

$$= \Omega^{-1} \cdot \text{cm}^{-1} \text{ or } \text{s}^{-1} \cdot \text{cm}^{-1} \text{ or } \text{S} \cdot \text{cm}^{-1} \text{ or }$$

$\text{S} \cdot \text{cm}^{-1}$ in S.I. unit.