

ELECTRO CHEMISTRY

Types of Conductivity

1. Specific Conductance (κ) => (kappa)
2. Equivalent Conductance (Λ) => (Lambda)
3. Molar Conductance (Λ_m or μ)

1. Specific Conductance:

$$\kappa = L \times \frac{l}{A}$$

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

L = Conductance of Solution
 l = Distance between electrodes
 A = Area of surface of Electrode

Unit of κ , CGI: mho.cm^{-1} or $\Omega^{-1}\text{cm}^{-1}$. SI: Sm^{-1}

2. Equivalent Conductance:

$$\Lambda = \kappa \times \frac{1000 \text{ cm}^3}{C} = \kappa \times V$$

C = Gram Equivalent Mass/Liter

Here, $C = \frac{\text{equivalent mass}}{\text{Volume in Liter}}$

And, $\text{equivalent mass} = \frac{\text{Atomic mass in gram}}{\text{Charge of cation}}$

Example: Equivalent Mass of Na_2CO_3 is (106/2), because cation Na^+ has a positive charge of 2.

Unit of Equivalent conductance(Λ) $\Omega^{-1} \text{ cm}^{-1} \cdot (\text{g. eqv})^{-1}$ or in SI: $\text{S.m}^2.(\text{g. Eqv})^{-1}$

3. Molar Conductance:

$$\Lambda_m = \kappa \times V = \kappa \times \frac{1000 \text{ cm}^3}{M}$$

M = Moles of Electrolyte

$$\text{Cell Constant} = \frac{l}{A}$$

Faraday's First law of Electrolysis:

$$W = ZQ$$

$$Q = I \times t$$

$$W = ZIt$$

$$Z = \frac{W}{Q} = \frac{\text{atomic mass in gram}}{\text{valency} \times 96473}$$

Z = Electrochemical equivalent
 $Z = W/Q$

* Nernst Equation of Electric Cell Potential

$$E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{RT}{nF} \ln Q$$

$$E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{0.0592 \text{ V}}{n} \times \log Q$$

Here, E_{cell} = Potential of Battery or Cell in a nonstandard Temperature

E_{cell}° = Potential of Battery or Cell in a Standard Temperature

R = Ideal Gas Constant

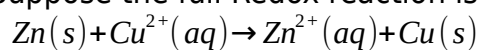
T = Temperature in Kelvin Scale

F = Faraday's Constant Charge

$$Q = \text{Ratio of Product Ion(s) and Reactant ion(s)} = \frac{[\text{Product ion}]^x}{[\text{Reactant ion}]^y}$$

Example of Q:

Suppose the full Redox reaction is following:

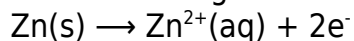


$$\text{then, } Q = \frac{[\text{Z}^{2+}]}{[\text{Cu}^{2+}]}$$

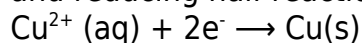
n = Change of Charges;

for example :

if half oxidizing reaction is



and reducing half reaction is:



then, n = 2