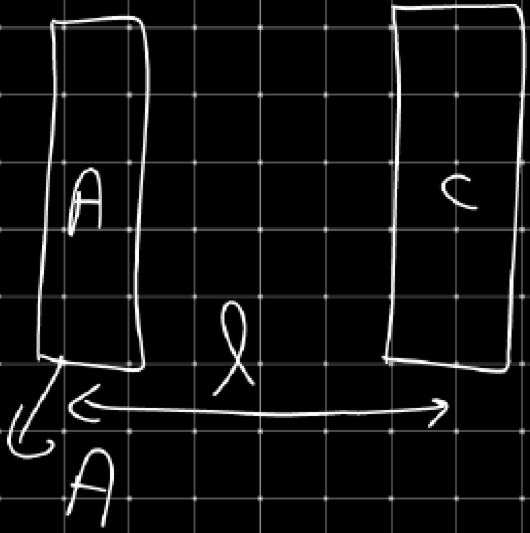
(3) Specific resistance/Resistivity (ρ) :

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

l = distance b/w two electrode

A = area of cross section of electrode



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

ρ = resistivity

Unit : $\rho = \Omega \frac{cm^2}{cm} \Rightarrow \boxed{\rho \Rightarrow \Omega \cdot cm}$

If $A = 1 cm^2$, $l = 1 cm$

$\Rightarrow V = A \cdot l = 1 cm^3 = 1 ml$

$\boxed{\rho = R}$ In $1 cm^3$/1ml electrolytic sol^n resistance offered resistivity.

(4) Specific Conductance/Conductivity : (κ)

It is reciprocal of specific resistance/resistivity

$$\kappa = \frac{1}{\rho} \Rightarrow \kappa = \frac{1 \cdot l}{R \cdot A}$$

$$\left\{ G = \frac{1}{R} \right\}$$

$$\boxed{\kappa = G \cdot G^*}$$

$$\left\{ \text{Cell Constant } (G^*) = \frac{l}{A} \right\}$$

Unit of Cell constant (G^*) $= \frac{Cm}{Cm^2} = Cm^{-1}$ *

Unit of Specific conductance/Conductivity

$(K) = \frac{1}{R} \cdot G^*$

$\rightarrow \Omega^{-1} \cdot Cm^{-1}$

OR

mho . Cm^{-1}

OR

S . Cm^{-1}

If $A = 1\,cm^2$, $l = 1\,cm$

$V = A \cdot l = 1\,cm^3$

$$\left\{ K = \frac{1}{R} \cdot \frac{l}{A} \right.$$

$K = G \cdot \frac{1}{1}$ | $k = G$

In $1\,cm^3$ electrolytic soln.

Conductance offered specific conductance/Conductivity.

(5) **Molar Conductance (Λ_m / λ_m):**

Total conducting power of all the ions produced by in 1 mole of electrolyte in given volume of solution is k/a molar conductance of electrolytic soln.

$$\Lambda_m = k \cdot V_{(ml)}$$

Here-
$V_{(ml)} \Rightarrow$ Volume of soln containing 1 mole of electrolyte.

let molarity of soln is 'M' mol/L

$\because$ M mol of electrolyte present in 1L/1000ml soln.

$\therefore$ 1 mol electrolyte present = $\frac{1000}{M}$ ml soln.

$$V = \frac{1000}{M} \text{ ml}$$

then, $$\Lambda_m = \frac{K \cdot 1000}{M}$$ **

Unit :- $\Omega^{-1} cm^2 mol^{-1}$ / $mho\, cm^2 mol^{-1}$

Unit of Λ_m

$$\frac{\Omega^{-1} \cdot cm^{-1} \cdot ml}{mol}$$

$$\frac{\Omega^{-1} cm^{-1} cm^3}{mol}$$

(6) Equivalent Conductance ($\Lambda_{eq.}$ / λ_{eq}) :-

Total Conducting power of all the ions produced by 1 gram equivalent of electrolyte in given volume of solution.

$$\Lambda_{eq} = \kappa \cdot V_{(ml)}$$

let Normality of sol^n is "N" gm eq/ltr

$\because$ N gm equivalent of electrolyte present in 1L/1000ml sol^n

$\therefore$ 1 gm-equivalent — " — $= \frac{1000}{N}$ ml

$$V = \frac{1000}{N} \text{ ml}$$

$$\Lambda_{eq} = \frac{K \cdot 1000}{N}$$

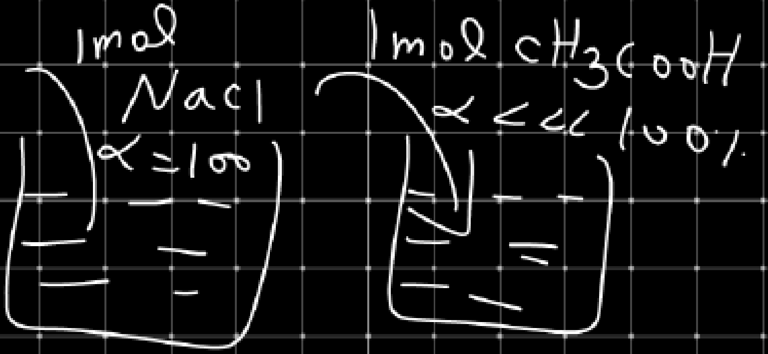
** Unit of Λ_{eq}

$\Omega^{-1} cm^2 eq^{-1}$

or mho $cm^2 eq^{-1}$

or $S\ cm^2 eq^{-1}$

Factors affecting electrolyte conductance :



(1) Nature of electrolyte :

Conductance of strong electrolyte is more then weak electrolyte.

(2) Inter ionic force of attraction (I.I.F.A.)

I.I.F.A ⇑ mobility of ions ⇓ Conductance ⇓

(3) Viscosity of medium :

Viscosity of medium ⇑ I.I.F.A. ⇑ mobility of ions ⇓ Conductance ⇓

(4) Temp. :

T↑ K.E.↑

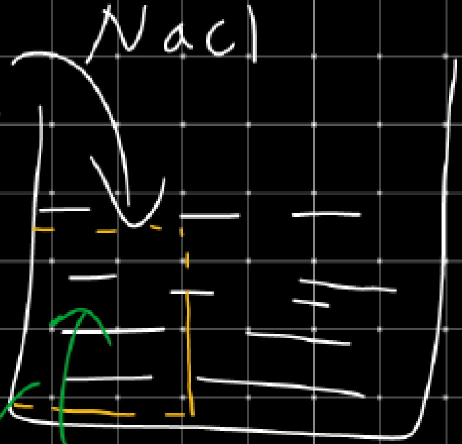
I.I.F.A.↓ mobility of ions ↑

Conductance ↑

T ∝ K.E.↑

T = 300K → 50 ions

T↑ = 600K → 100 ions



(5) Solvation | Hydration :