The S.I unit of equivalent conductance is $S.m^2/equivalent$

From equ^n ① we can write

$$\Lambda_{eq} = \frac{\kappa \times 1000}{N} \quad \left(N = \text{Normality of the solution}\right)$$

or $$\Lambda_{eq} = \frac{\kappa \times 1000}{C}$$

where c is the concen^n in gm equivalent per Litre (or Normality).

Molar conductivity (Λ_m).

Molar conductivity of a solution at a given concen^n is the conductance of volume V of a solution containing one mole of electrolyte kept between two electrodes of unit cross-sectional area and a distance of unit length

$$\Lambda_m = \kappa \times V \quad \text{or} \quad \Lambda_m = \kappa \times \frac{1000}{C} \quad \text{or} \quad \Lambda_m = \kappa \times \frac{1000}{M}$$

where κ is specific conductance, [M = molarity of the solution]

V is the volume of the solution containing one mole of the electrolyte. C is the molar concentration (No of mole of electrolyte dissolved per litre i.e the molarity).

Variation of conductance with dilution.

The specific conductance (κ) of a electrolytic solution decreases with dilution. for both weak and strong electrolytes, as the number of ions (charge carrying particles) ~~decreases~~ per unit cube decreases.

Molar conductivity and equivalent conductivity both increases with dilution, in case of both the electrolytes (weak and strong). However, strong and weak electrolytes show different behaviour with regard to the variation of conductance with $\sqrt{c}$ [where c is the concentration].

The increase in molar conductivity on dilution is due to the fact that it is equal.

$$\Lambda_m = \kappa \times V$$

On dilution, κ decreases, but the volume containing one mole of electrolyte (v) increases. The increase in volume on dilution is much more than the decrease of conductivity κ. As a result molar conductivity increases with dilution

Equivalent Conductivity also increases with dilution, because of increase in volume containing one gram equivalent of the electrolyte.

Variation of molar conductivity for strong electrolyte :-

Conductance of a solution increases with the increase of charge carrying Particles (ions) and the ~~molar~~ mobility of ions. For strong electrolytes, there is no increase in the number of ions on dilution as strong electrolytes are completely ionised at all concentration. However, in case of strong electrolytes, there are strong forces of attraction between the ions of opposite charges (cations and anions), as a result the conducting ability of the ions is less in concentrated solution. With dilution, the ions become far apart from one another and interionic forces decreases. Ions can move freely, their mobility increases and thus the molar conductivity increases

In case of strong electrolytes the molar conductivity increases slowly with dilution and there is a tendency for molar conductivity to approach a certain value. The molar conductivity, when the concentration approaches zero, ~~is~~ taken (i.e at Infinite dilution) is called molar conductivity at Infinite dilution. It is denoted by Λ_m^0. It is also called the limiting value of molar conductivity.

$$\Lambda_m = \Lambda_m^0 \text{, when } C \to 0.$$

When Λ_m is plotted against $\sqrt{C}$, we get a straight line. The plot can be extrapolated to zero concen^n. The intercept gives the value of Λ_m^0.

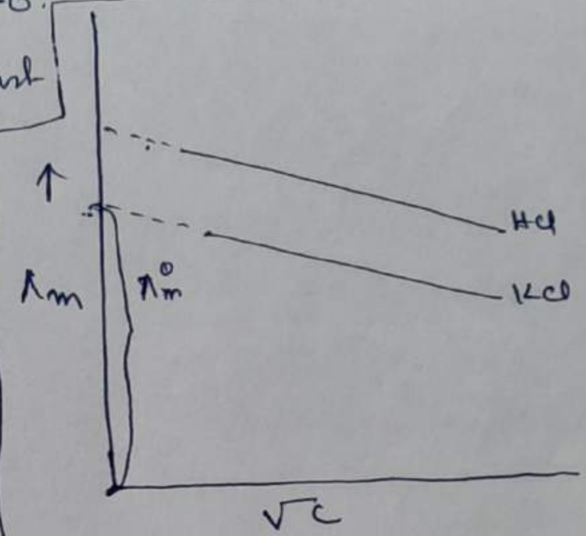


Fig I - Variation of molar conductance with dilution for Strong electrolyte

The relation between Λ_m and Λ_m^0 can be given as

$$\Lambda_m = \Lambda_m^0 - A\sqrt{C}.$$

Where A is a constant equal to the slope of the value. For a given solution the value of A depends on the type of electrolyte at a particular temperature.

Variation of molar conductance for weak electrolytes :—

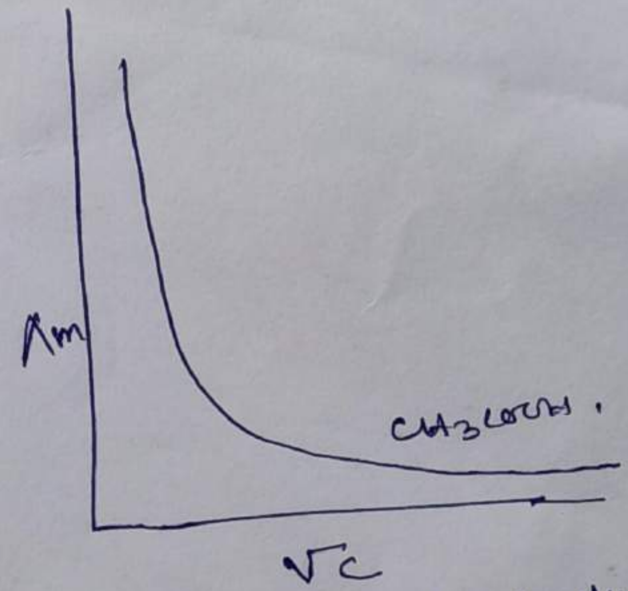
The weak electrolyte dissociate to a lesser extent, as compared to strong electrolytes. Their degree of ionisation is (α) is very low, (around 5 %). With dilution dissociation increases, no of ions increases, and as a result Λ_m increases.

With dilution, the ions become far apart from one another and interionic forces decrease. So, in this case both the factors are responsible for the increase of molar conductivity.

The variation of Λ_m with $\sqrt{C}$ is very large and thus we can not obtain molar conductance at infinite dilution Λ_m^0. The behaviour of weak electrolyte CH_3COOH.

is shown in the figure.

The limiting value of molar conductance (Λ_m^0) cannot be calculated from the graph as the extrapolation of the curve cannot be done.



variation of molar conductance with dilution for weak electrolyte.