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cl988 \Rightarrow B.Sc. (Hons.) Part - II

Subject \Rightarrow Chemistry

Chapter \Rightarrow Conductance

Topic \Rightarrow Effect of dilution on various types of conductance and their measurement.

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Effect of dilution on specific Conductance

The specific conductance decreases with dilution. This is due to the fact that the number of current carrying particles i.e. ions per ml of the solution become less. Of course on dilution, the degree of dissociation also increases but the number of ions per ml is decreased to such an extent that even complete dissociation does not produce as many ions per ml as were present before dilution.

Effect of dilution on Equivalent and Molar Conductance

The equivalent conductance and molar conductance increases with dilution and finally attains a maximum value at infinite dilution. This is due to the fact that this value is product of specific conductance and the volume V of the solution containing 1 gm equivalent or 1 mole of the electrolyte. Decreasing value of specific conductance is more than compensated by increasing value of V and therefore, the value of Λ_V increasing with dilution.

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Measurement of specific conductance

Specific Conductance (K) is related to the conductance (C) by the expression

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

Thus, the specific conductance of a solution can be determined by measuring its conductance and the distance (l) between the electrodes and the area of cross-section (a) of each of the electrodes. However, for a particular cell, l/a is constant and this constant is called cell constant. The value of cell constant is generally written on the cell. It can also be determined experimentally.

$$\text{Cell Constant} = \frac{\text{Conductance}}{l/a}$$

∴ Specific Conductance (K) = Conductance \times Cell Constant

Thus, the cell constant of any particular cell can be found by measuring the conductance of a solution whose specific conductivity is known.

The solution usually taken for this purpose is N/50 KCl soln. whose specific conductivity at 298 K has been determined accurately to be 0.002765 $\Omega^{-1} \text{cm}^{-1}$.

Having determined the value of cell constant the specific conductivity of the given solution can be determined by measuring its conductance and multiplying the value with the cell constant.

Measurement of Equivalent conductance

Equivalent conductance (Λ_{eq}) is related to the specific conductance (K) by the equation,

$$\Lambda_{eq} = K \times \frac{1000}{C_{eq}}$$

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Where Λ_{eq} is the concentration of the solution in gm equivalents per litre i.e. the normality of the solution.

Thus, knowing the normality of the soln and the specific conductivity (K), Λ_{eq} can be calculated.

Measurement of Molar Conductance

The molar conductance is related to the specific conductance according to the relation

$$\Lambda_m = K \times \frac{1000}{c}$$

Where c is the molar concentration.

Thus, knowing molar concentration c and the specific conductance K , Λ_m can be calculated.

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