(3) Solvent extraction techniques :-

The distribution of a solute between two immiscible solvent is the basic process of extraction. Since, and Organic Compound is more soluble in non-polar solvents. So, when an aquous solution of Organic compound is shaken with Organic solvent such as ether, a large fraction of Compound passes in to etherial layer.

Let 'a' gram of the solute is dissolved in 'V_1' ml of water and it is shaken with 'V_2' ml of Organic solvents. of the weight of the solute is 'w_1' in aquous layer after first extraction, the amount extracted will be equal to —

$$a = a - w_1.$$

Since,

$$a = \frac{V_1}{V_2}$$

from distribution law —

$$K = \frac{C_1}{C_2}$$

or

$$K = \frac{a - w_1}{V_2} \Big/ \frac{w_1}{V_1}$$

or

$$\frac{a - w_1}{V_2} = K \cdot \frac{w_1}{V_1}$$

or

$$\frac{a}{w_1} - 1 = K \cdot \frac{V_2}{V_1}$$

or

$$\frac{a}{w_1} = \frac{K \cdot V_2}{V_1} + 1$$

$$\frac{a}{w_1} = \frac{KV_2 + V_1}{V_1}$$

$$w_1 = a\left(\frac{V_1}{KV_2 + V_1}\right) \quad \text{——— (1)}$$

In the 2nd extraction, the weight of solute 'w_2' is left in the aquous layer. then,

$$w_2 = w_1\left(\frac{V_1}{KV_2 + V_1}\right)^2 \quad \text{——— (2)}$$

Similarly, after n^{th} extraction, the weight w_n of the solute left in equous layer, then –

$$w_n = a\left(\frac{V_1}{KV_2 + V_1}\right)^n \quad \text{——— (3)}$$

Since, K, V_1 & a are Constant. the amount of solute left after n^{th} extraction with V_2 ml of the extracting solvent every time will depends upon the value of n & V_2. Better efficiency can be achieved by keeping 'n' large & V_2 small.

* Another application of distribution law :–

(4). In calculating the solubility of a solute in a solvent.

(5) In predicting distribution Indicators.

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