

* Application of Distribution law :-

(10)

(1) Study of Complexes :-

Study of $KI + I_2 \rightleftharpoons KI_3$ Solution.

This is very important application of distribution law.

This complex reaction is studied as follows -

Some I_2 is added to a known eq. solution of KI and a reaction mixture is shaken with CCl_4 . The I_2 in the two layers is accurately titrated by means of sodium-thio sulphate solution. The concentration of I_2 in two solvent is known. The total I_2 present after the reaction is subtracted from the amount of I_2 taken. The difference gives the I_2 combined with KI to form KI_3 . Similarly, the amounts of KI , I_2 & KI_3 in a given volume of solution can be obtained and the concentrations are calculated as follows :-

Calculation :-

Let, c_1 = Concentration of I_2 in CCl_4 layer.

c_2 = Concentration of free I_2 in KI solution
(calculated from $c_2 = c_1/K$) = $[I_2]$

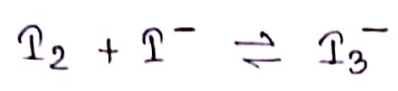
Again, let c_3 = Concentration of I_2 in KI solution

then, $c_3 - c_2$ = Concentration of Combined $I_2 = [I_3^-]$

If c_4 is the concentration of KI solution, so, that

$c_4 - (c_3 - c_2)$ = Concentration of KI in solution
= $[I^-]$

At equilibrium -



$$K = \frac{[I_3^-]}{[I_2][I^-]}$$

$$K = \frac{c_3 - c_2}{c_2 \times [c_4 - (c_3 - c_2)]}$$

(2) Determination of molecular state of solute in different solvent :-

We can determine the molecular state of solute in different solvent. If solvent molecules dissociates, associates and combine with solvent molecules. They may be determine by following relations -

	<u>Solvent - I</u>	<u>Solvent - II</u>	<u>Relationship</u>
(1)	Normal	(1) Normal	$K = c_1/c_2$
(2)	Normal	(2) Dissociation	$K = \frac{c_1}{c_2(1-\alpha)}$
(3)	Normal	(3) Association	$K = \frac{c_1}{n\sqrt{c_2}}$
(4)	Normal	(4) chemical combination with solvent	$\frac{K}{1+K_2} = \frac{c_1}{c_c + c_2}$