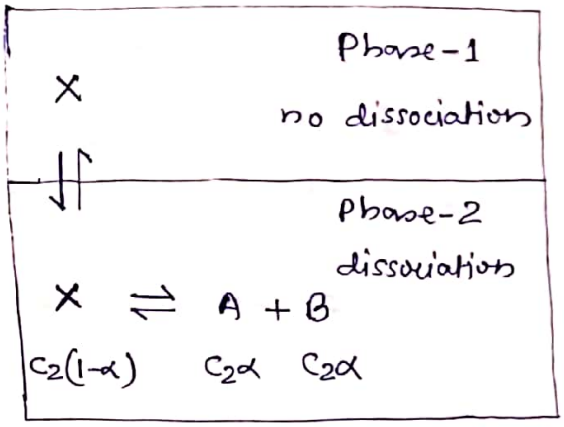
* Modification of distribution law for dissociation :-

When the solute remains as such in Phase-1 but dissociate in Phase-2.

Let the solute remains as such in Phase-1 and its concentration is C_1.

The solute with concentration C_2 in Phase-2, dissociates as-



$$X \rightleftharpoons A + B$$

Initial	C_2 mol/L	0	0
After dissociation	$C_2 - C_2\alpha$ $C_2(1-\alpha)$	$C_2\alpha$	$C_2\alpha$

Where, 'α' is the degree of dissociation of the solute.

Now, the dissociation constant is given by —

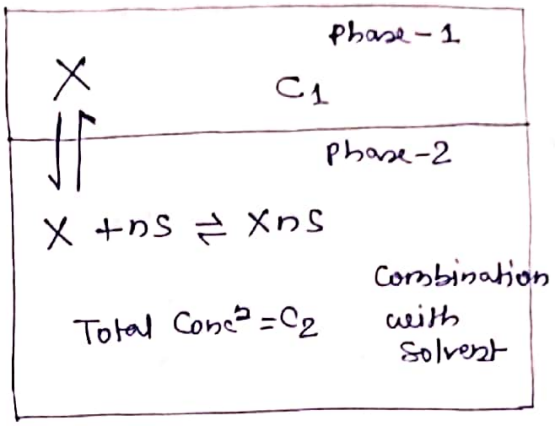
$$K = \frac{C_1}{C_2 - C_2\alpha}$$

$$\boxed{K = \frac{C_1}{C_2(1-\alpha)}}$$

*. When solute combinds with one of the Solvents i.e. chemical change :—

Let the solute molecule 'x' combinds with the solvent in phase-2. If 'n' mole of the solvent 'S' combinds with each of the solute molecule as—

$$X + nS \rightleftharpoons XnS \quad \text{—(1)}$$



Let, C_1 is the Concentration of the distributed solute in Phase-1.

C_2 is the Concentration of the distributed solute in phase-2.

C_S is the Concentration of solvent molecules and C_c is the Concentration of the Compound molecules.

Now, At equilibrium, on applying the law of mass action —

$$K_1 = \frac{[XnS]}{[X]\,[S]^n}$$

$$K_1 = \frac{C_c}{C_2\,(C_S)^n}$$

Since, the Concentration of solvent is large in dilute solution. Hence, C_S may be taken as Constant.

$$K_1 = \frac{C_c}{C_2 \times \text{Constant}}$$

$$\frac{K_1}{\text{Constant}} = \frac{C_c}{C_2} = K_2$$

Adding plus one (+1) Both sides —

$$\frac{c_c}{c_2} + 1 = K_2 + 1$$

$$\frac{c_c + c_2}{c_2} = 1 + K_2 \quad \text{——— (2)}$$

from, distribution law –

$$K = \frac{c_1}{c_2} \quad \text{——— (3)}$$

on dividing eqⁿ – (3) by eqⁿ – (2)

$$\boxed{\frac{c_1}{c_c + c_2} = \frac{K}{1 + K_2}}$$

$c_c + c_2$ gives the concentration of distributed solute in phase – 2.

Thus, when the solute molecules combinds with solvent molecules, there is a change only in the numerical value of constant. The fundamental equation of distribution law remains the same.