Ionic Equilibria

Solubility Product $\Rightarrow$ when saturated solution of sparingly soluble salt exists in equilibrium with dissociated ions as

$$A_x B_y \, (s) \xrightarrow{\; aq. \;} xA^{+y}_{(aq)} + yB^{-x}_{(aq)}$$

If initially a mole/litre 0 0
                added

at Equilibrium $a-s$ xs ys

where s = solubility of salt

Applying Ostwald dilution law
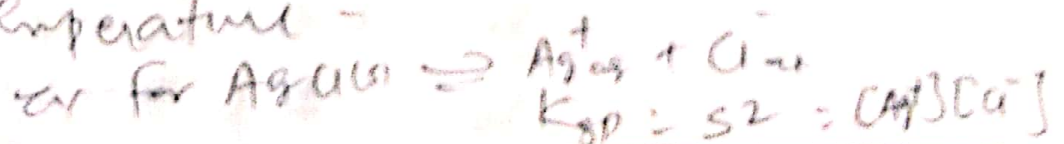
$$K = \frac{[A^{+y}]^x [B^{-x}]^y}{[A_x B_y]} =$$

Activity of solid is taken as Unity by Convention

Hence $K[A_x B_y] = K_{sp} = [A^{+y}]^x [B^{-x}]^y$

$$K_{sp} = (xs)^x (ys)^y$$
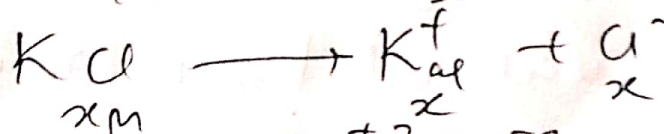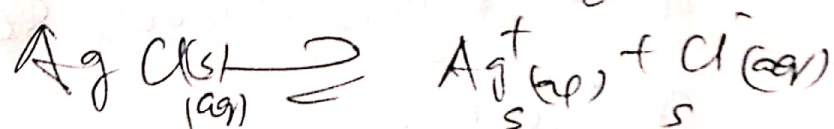
— K_{sp} is known as solubility Product of salt.

— The value of K_{sp} is constant at a given temperature —

or for $AgCl \rightleftharpoons Ag^+_{(aq)} + Cl^-_{(aq)}$

$$K_{sp} = s^2 = [Ag][Cl]$$

Common ion effect $\Rightarrow$ If weak

Electrolyte partially dissociate in aqueous Solution an Exists in Equilibrium with its dissociated ion and salt having common ion is added Then The dissociation of weak ~~salt~~ Electrolyte (Acid) is suppressed & further no dissociation of Electrolyte taken place : Thus The Suppression of the dissociation of a weak acid or a weak base on the addition of its own ions is Called common ion Effect

Ex - when KCl is added to aq. Saturated Solution of AgCl The solubility of AgCl decreases due to Common ion Effect

$$Ag\,Cl_{(s)(aq)} \rightleftharpoons Ag^+_{(aq)} + Cl^-_{(aq)}$$
$$\underset{s}{} \quad \underset{s}{}$$

$$KCl \longrightarrow \underset{x}{K^+_{aq}} + \underset{x}{Cl^-}$$
$$xM$$

$$Ksp = [Ag^+][Cl^-]$$
$$Ksp = s(x+s) \Rightarrow \boxed{s = \frac{Ksp}{x}}$$
$$\therefore s \ll x$$