Chapter Summary: Solubility Equilibria

Solubility Product (K_{sp}): is a value that indicates how much of the salt is present in the solution at a particular temperature.
For example: $A_2B \rightleftharpoons 2A^+ + B^{2-}$

$K_{sp} = [A^+]^2[B^{2-}]$

Common ion effect: shift of equilibrium when a salt is added.

Solubility Quotient (Q_{ip}): determines if precipitation will occur (similar to Q_c in equilibrium chapter)
$Q_{ip} > K_{sp}$ = precipitation occurs
$Q_{ip} = K_{sp}$ = saturation of solution
$Q_{ip} < K_{sp}$ = precipitation will not occur

(In general very small value of K_{sp} indicates complete precipitation)

Factors affecting solubility: common ion effect and pH, complex ion formation

Effect of pH on solubility: pH of a solution will affect solubility if the conjugate ion (acid or base) is acidic or basic. E.g. Cl^- is very weak conjugate base (CB) and is not considered basic, whereas HCO_3^- is weak CB whose solubility is affected by the pH.

Complex Ions: a complex ion is polyatomic anion or cation consisting of central metal ion and is associated with other groups called ligands. Common ligands are anions Cl^- and OH^- and molecules NH_3 and H_2O.

When ammonium hydroxide is added to a solution of copper (II) ions it forms a complex $[Cu(NH_3)_4]^{2+}$. In such a solution it is not necessary that all copper ions are ligated. The degree to which an ion will form ligands is calculated by K_f (formation constant) and since this process of ligand formation in reversible, K_f is calculated like the equilibrium constant. If an ion is capable of forming ligands then its solubility will increase.

Selective/Fractional Precipitation: can be done by calculating the amount of ion needed for precipitation.

Qualitative Inorganic Analysis: separation of a mixture of cations on the basis of their solubility in different conditions (acidic, basic, complex ion formation).