Equilibirium

- **Equilibirium Equation** $K_c = \frac{[C][D]}{[A][B]}$ — K_c = Equilibirium constant
- **Equilibirium constant for a general reaction** $K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}$
- **Equilibirium constant for the reverse reaction in the inverse reactions** $K'_c = \frac{1}{K_c}$
- **Equilibirium constant in gaseous state** $K_p = \frac{[C]^c[D]^d}{[A]^a[B]^b}(RT)^{\Delta n}$ OR $K_p = K_c(RT)^{\Delta n}$
- **Reaction quotient** $Q_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}$
- **Relation between Equilibirium constant K, Reaction quotient Q and Gibbs Energy G**

$$\Delta G = \Delta G^\ominus + RT\ln Q$$

$$\Delta G^\ominus = -RT\ln K$$

$$K = e^{-\Delta G^\ominus/RT}$$

ΔG = Standard Gibbs Energy

$$pH = -\log a_{H^+} = -\log\{[H^+]/\text{Mol L}^{-1}\}$$

Acid Solution has $pH < 7$
Basic Solution has $pH > 7$
Neutral Solution has $pH = 7$

- **Relation between K_a and K_b** $K_a \times K_b = K_\omega$

K_a = Capacity of acid
K_b = Capacity of base
K_w = ionic product of water

- **Hendesson - hall Equation**

$$pH = pK_a + \log\frac{[\text{Conjugate base}, A^-]}{[\text{acid}, HA]}$$

$\frac{[A^-]}{[HA]}$ = Ratio of conjugate base (cation) and solution in acid