Equilibirium

Equilibirium Equation

$$K_c = \frac{[C][D]}{[A][B]}$$

K_c = Equilibirium constant

Equilibirium constant for a general reaction

$$K_c = \frac{[C]^f[D]^d}{[A]^a[B]^b}$$

Equilibirium constant for the reverse reaction in the inverse reactions

$$K'_c = \frac{1}{K_c}$$

Equilibirium constant in gaseous state

$$K_p = \frac{[C]^f[D]^d}{[A]^a[B]^b}(RT)^{\Delta n}$$ OR $$K_p = K_c (RT)^{\Delta n}$$

Reaction quotient

$$Q_c = \frac{[C]^f[D]^d}{[A]^a[B]^b}$$

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

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

Acid Solution has $p^H < 7$
Basic Solution has $p^H > 7$
Neutral Solution has $p^H = 7$

Relation between K_a and K_b

$$K_a \times K_b = K_w$$

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

Hendesson - hall Equation

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

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