Some Basic concepts of chemistry

- ⇒ 1 mole = 6.02×10^{23} particles = 1g. atom or 1 g molecule
- ⇒ $N_A = 6.02 \times 10^{23}$
- ⇒ 1 a.m.u = $\frac{1}{6.02 \times 10^{23}}$ g
- ⇒ Equivalent mass = $\frac{\text{atomic mass}}{\text{Valence factor}}$
- ⇒ Average atomic mass = $\frac{\text{Isolopic mass(A)} \times \text{percentage} + \text{isotopic mass(B)} \times \text{percentage}}{100}$
- ⇒ Molarity (M) = $\frac{n_{solute}}{\text{Vol. of solution (L)}}$
- ⇒ Molarity (m) = $\frac{n_{solute}}{\text{mass of solvent (kg)}}$
- ⇒ Normality (N) = $\frac{\text{no. of gram equivalents}}{\text{vol. of solution(L)}}$
- ⇒ Mole fraction $X_A = \frac{n_A}{n_A + n_B}$
- ⇒ Atomic mass = Equivalent mass × Valency
- ⇒ Dilution formula : $M_1V_1 = M_2V_2$

Atomic Structure

- ⇒ $E = h\nu = \frac{hc}{\lambda}$
- ⇒ $h\nu = h\nu_0 + K.E$ (Photoelectric effect)
- ⇒ $r_n = \frac{n^2}{z} \times a_0$ (a_0 = 52.9 m)
- ⇒ $E_n = -\frac{z^2}{n^2} \times 2.18 \times 10^{-18} J$
- ⇒ $\bar{v} = R_H \times z^2 \left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$
- ⇒ de–Broglie equation $\lambda = \frac{h}{mV}$

⇒ Heisenberg uncertainity principle : $\Delta x > \Delta p \geq \frac{h}{4\pi}$

⇒ Number of orbitals in a shell = n^2

⇒ Number of electrons in a shell = $2n^2$

⇒ Number of radial nodes = $(n - l - 1)$

Chemical Bonding

⇒ $H = \frac{1}{2}[V + X - C + A]$

(H = number of Hybrid orbitals)

⇒ Bond order = $\frac{1}{2}[N_b - N_a]$

States of matter

⇒ Boyle's law : $P_1V_1 = P_2V_2$

⇒ Charles law : $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

⇒ Ideal gas equation : PV = nRT

Dalton's law : ⇒ $P_{Total} = P_1 + P_2 + P_3 + ...$

⇒ $d_{gas} = \frac{PM}{RT}$

Graham's Law ⇒ $\frac{r_1}{r_2} = \sqrt{\frac{M_2}{M_1}}$

⇒ Vander waal's equation : $\left(P + \frac{an^2}{v^2}\right)(v - nb) = nRT$

⇒ $C_P - C_V = nRT$

⇒ Kinetic gas equation : $PV = \frac{1}{3}Mu^2$

Chemical Thermodynamics

⇒ $\Delta U = q_v$, $\Delta H = q_p$

⇒ $\Delta H = \Delta U + \Delta n_g RT$

⇒ $C = \frac{q}{\Delta T}$ (C = Heat capacity)

⇒ $\Delta U = q + w$ (First law)

⇒ $\Delta H = \sum \Delta_f H^0_{(Products)} - \sum \Delta_f H^0_{(reactants)}$

⇒ $\Delta G = \Delta H - T\Delta S$

⇒ $\Delta G° = -RT \ln K$

Equilibrium

⇒ $K_{eq} = \frac{K_f}{K_b}$

⇒ $K_P = K_C(RT)^{\Delta n}$

⇒ $K_w = [H^+] [OH^-]$

⇒ $pH = -\log [H^+]$

⇒ pKw = pH + pOH

⇒ $Ka = C\alpha^2$

⇒ $K_w = K_a \times K_b$

⇒ $K_{sp} = [A^{r+}]_x [B^{-x}]^y$

Solid State

⇒ Density = $\frac{Z \times M}{a^3 \times N_0}$ g/cm³

⇒ Packing fraction : Simple cubic = $\frac{\pi}{6}$, FCC = $\frac{\sqrt{2}\pi}{6}$, BCC = $\frac{\sqrt{3}\pi}{8}$

⇒ Bragg's equation $d = n\lambda \sin\theta$

Solution

⇒ Henry's law $X_{(g)} = K_H.P$

⇒ Raoult's law : v.p. of solution = $x_A P_A^0 + X_B P_B^0$

⇒ Relative lowering of V.P. : $\frac{P_A^0 - P_S}{P_A^0} = X_{solute}$

⇒ $\Delta T_b = i\, k_b m$

⇒ $\Delta T_f = i\, k_f m$

⇒ $\pi = CRT$

⇒ $i = \frac{\text{no. of particle of solute in solution}}{\text{no. of particles of pure solute}}$

Electrochemistry

⇒ $E^0_{cell} = E^0_{cathode} - E^0_{anode}$

⇒ $\Delta G° = -nF\, E^0_{cell}$

⇒ $E^0_{cell} = E^0_{cell} - \frac{0.059}{n}\log Q$

⇒ $\wedge_{eq} = k \times \frac{1000}{\text{Normality}}$

⇒ $\wedge_m = k \times \frac{1000}{\text{Molarity}}$

⇒ $\lambda^0_m = n_+\lambda^0_+ + n_-\lambda^\circ_-$

⇒ $W = ZIt$

⇒ $\frac{W_1}{W_2} = \frac{E_1}{E_2}$

Chemical Kinetics

⇒ Rate = $K[A]^x [B]^y$

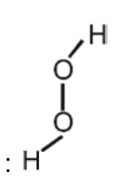
⇒ $K = \frac{2.303}{t}\log\frac{[A_0]}{[A_t]}$

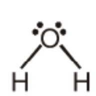
⇒ $t_{\frac{1}{2}} = \frac{0.693}{k}$

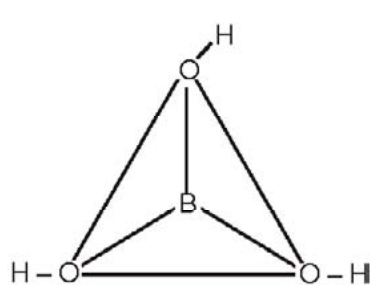
⇒ $k = Ae^{-Ea/RT}$

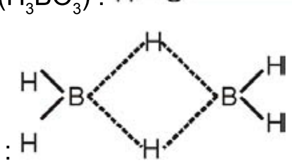
⇒ Temperature coefficient = $\frac{K_{T+10}}{K_T}$

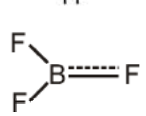
Important Structureal formula

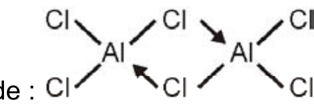
⇒ Hydrogen peroxide : H_2O_2 : 

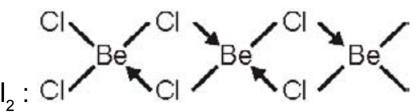
⇒ Water : 

⇒ Orthoboric acid (H_3BO_3) : 

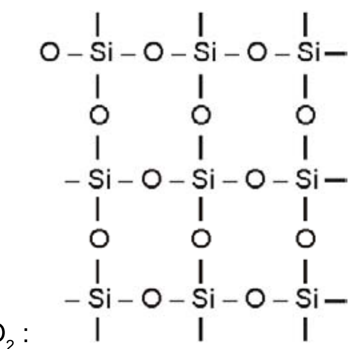
⇒ Diborane (B_2H_6) : 

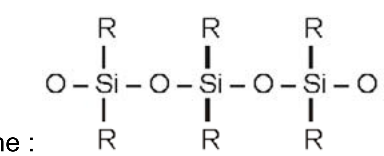
⇒ Boron triflouride (BF_3) : 

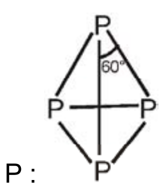
⇒ Aluminium Chloride : 

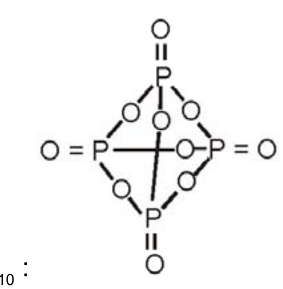
⇒ Berrilium Chloride : $BeCl_2$: 

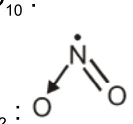
⇒ CO : :C≡O:, CO_2 : O = C = O

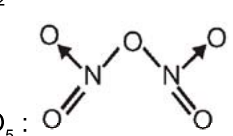
⇒ SiO_2 : 

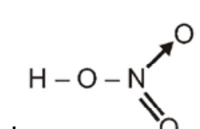
⇒ Linear Silicone : 

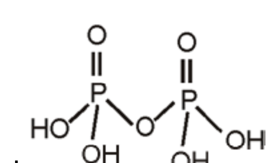
⇒ Yellow P : 

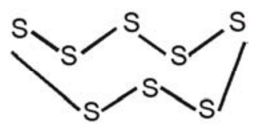
⇒ P_4O_{10} : 

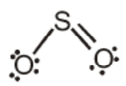
⇒ NO_2 : 

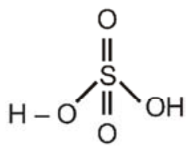
⇒ N_2O_5 : 

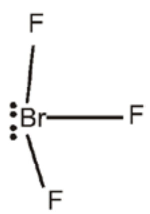
⇒ HNO_3 : 

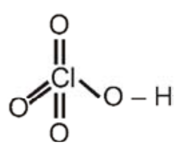
⇒ $H_4P_2O_7$: 

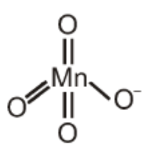
⇒ 

⇒ SO_2 : 

⇒ H_2SO_4 : 

⇒ BrF_3 : 

⇒ $HClO_4$: 

⇒ MnO_4^- : 

⇒ $Cr_2O_7^{2-}$: