D. B. College Jaynagar Lect-2

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Chemical equilibrium

7. Catalyst doesnot affect eq^m Constand eq^m

8. Catalyst only change time of reac^n to attain eq^m.

+ve catalyst : time ↓ to attain eq^m

-ve Catalyst : time ↑ to attain eq^m

Active Mass :-

Conc^n in terms of Molarity or pressure

$$\text{Active Mass} = \frac{\text{mol}}{\text{Lit}} = \frac{n}{V}$$

or [ ]

gases[Active Mass] = [Pr.]

Active mass of solid & Pure liq = 1 (always)

Ques 8g He, 8.4g N_2 & 128g SO_2 is present in 2L Container Find active mass of each gas?

$$[He] = \frac{8/4}{2} = \frac{2}{2} = 1$$

$$[N_2] = \frac{8.4/28}{2} = \frac{8.4}{28\times2} = \frac{\cancel{84}^{\cancel{21}\,3}}{\cancel{56}_{\cancel{14}\,2}\times10} = \frac{3}{20}$$

$$= 0.1$$

$$[SO_2] = \frac{128/64}{2} = \frac{2}{2} = 1$$

Law of Mass Action :—

It states that rate of reacn is directly Proportional to the active mass of reactant raised to power equal stiochiometric Cofficient in a balanced chemical reacn

$$\boxed{r \propto \left[\begin{matrix}\text{attive mass of}\\ \text{reacting sub}\end{matrix}\right]^n}$$

$A \longrightarrow B + C$

$r \propto [A]$

$A + B \longrightarrow C + D$

$r \propto [A][B]$

$2A + 3B \longrightarrow C$

$r \propto [A]^2[B]^3$

Application of Law of Mass Action :-

$$A + B \rightleftharpoons C + D$$

$r_f \propto [A][B]$ $\qquad$ $r_b \propto [C][D]$

$r_f = K_f[A][B]$ $\qquad$ $r_b = K_b[C][D]$

$$r_f = r_b$$

$$K_f[A][B] = K_b[C][D]$$

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

Eq^m Const. $\leftarrow \boxed{K = \frac{[C][D]}{[A][B]}}$

Eq^m Const. $\leftarrow \boxed{K = \frac{K_f}{K_b}}$

K

Conc^n $\qquad$ Pressure

$$m_1A + m_2B \longrightarrow n_1C + n_2D$$

$K_c = \frac{[C]^{n_1}[D]^{n_2}}{[A]^{m_1}[B]^{m_2}}$ $\qquad$ $K_p = \frac{[P_C]^{n_1}[P_D]^{n_2}}{[P_A]^{m_1}[P_B]^{m_2}}$

unit $(mol\, l^{-1})^{\Delta n_g}$ $(atm)^{\Delta n_g}$

Δn_g = Sum of stiochiometric Cofficient of products − Sum of stiochiometric Cofficient of reactant

Relation b/w K_P & K_C

$$PV = nRT$$

$$P = \frac{n}{V} RT$$

$$P = CRT$$

$$K_p = \frac{([C]RT)^{n_1} . ([D]RT)^{n_2}}{([A]RT)^{m_1} . ([B]RT)^{m_2}}$$

$$K_p = \frac{[C]^{n_1} [D]^{n_2}}{[A]^{m_1} [B]^{m_2}} . (RT)^{(n_1+n_2)-(m_1+m_2)}$$

$\downarrow$

$$\boxed{K_p = K_c (RT)^{\Delta n_g}}$$

$R = 0.0821\ atm\, L\, mol^{-1} K^{-1}$