

Daily Tutorial Sheet - 14

Level-3

153.(B) $\ln k = \frac{\Delta S_r^\circ}{R} - \frac{\Delta H_r^\circ}{RT}$

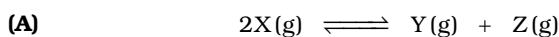
$$\log K = \frac{\Delta S_r^\circ}{2.303R} - \frac{\Delta H_r^\circ}{2.303R} \cdot \frac{1}{T}$$

Comparing with $y = C + mx$

Slope $m = -\frac{\Delta H_r^\circ}{2.303R}$ So $-\frac{\Delta H_r^\circ}{2.303R} = 1 \Rightarrow \Delta H_r^\circ = -2.303R$

154.(A-P) (B-S) (C-Q) (D-R)

Let's take 1 mole reactant dissolve in 1 litre solution

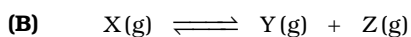


$$1 \qquad \qquad 0 \qquad 0$$

At equim. $1 - \alpha \qquad \qquad \frac{\alpha}{2} \qquad \frac{\alpha}{2}$

$$K_c = \frac{\frac{\alpha}{2} \cdot \frac{\alpha}{2}}{(1 - \alpha)^2}$$

$$K_c = \frac{\alpha^2}{4} \Rightarrow 2\sqrt{K_c}$$



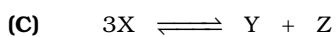
$$1 \qquad \qquad 0 \qquad 0$$

$$1 - \alpha \qquad \qquad \alpha \qquad \alpha$$

$$K_c = \frac{\alpha \cdot \alpha}{(1 - \alpha)} \cdot V$$

If $V = 1 \text{ litre}$

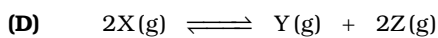
$$\alpha = \sqrt{K_c}$$



$$1 \qquad \qquad 0 \qquad 0$$

$$1 - \alpha \qquad \qquad \frac{\alpha}{3} \qquad \frac{\alpha}{3}$$

$$K_c = \frac{\alpha^2 \cdot V}{9 \cdot (1 - \alpha)^3} \Rightarrow \alpha = 3\sqrt{K_c}$$



$$1 \qquad \qquad 0 \qquad 0$$

$$1 - \alpha \qquad \qquad \frac{\alpha}{2} \qquad \alpha$$

$$K_c = \frac{\frac{\alpha}{2} \cdot \alpha^2}{(1 - \alpha)^2} \Rightarrow K_c = \frac{\alpha^3}{2} \Rightarrow \alpha = (2K_c)^{1/3}$$

155. [A-P] [B-R] [C-S] [D-G]

(A) $\frac{K_{T+10}}{K_T} = 2$ it means value of equilibrium constant increases with rise in temperature that is true for endothermic reaction.

(B) $\frac{K_{T+10}}{K_T} = \frac{1}{2}$ is true for exothermic reaction

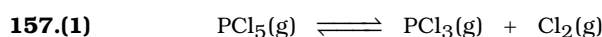
(C) $A(g) + B(g) \rightleftharpoons C(g)$ is affected by change in pressure & volume.

(D) $X(s) + Y(g) \rightleftharpoons Z(g)$

Since number of moles of gaseous reactant and gaseous product are same in reactant & product side therefore, there will be no change in equilibrium by change in pressure or volume.

156. [A-R] [B-G] [C-P] [D-S]

Generally on increasing pressure equilibrium shift in the direction where number of moles in reactant or product side are lesser.

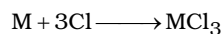
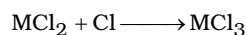
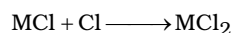
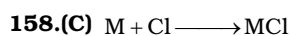


At equim. 2 2 2

Total moles at equilibrium = 6

Using $PV = nRT$ we can calculate total volume

$$K_c = \frac{[PCl_3][Cl_2]}{[PCl_5]} \Rightarrow K_p = K_c (RT)^{\Delta ng}$$



$$\beta_1 = \frac{[MCl]}{[M][Cl]}; \quad \beta_2 = \frac{[MCl_2]}{[MCl][Cl]}; \quad \beta_3 = \frac{[MCl_3]}{[MCl_2][Cl]}$$

$$\therefore K = \frac{[MCl_3]}{[M][Cl]^3} = \beta_1 \beta_2 \beta_3$$

$$\log K = \log \beta_1 + \log \beta_2 + \log \beta_3$$