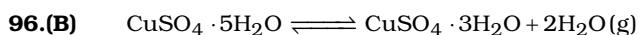
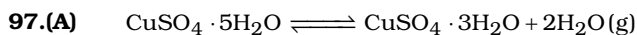


**Daily Tutorial Sheet-8**

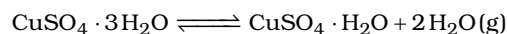
**Level-2**



$$p_{\text{H}_2\text{O}} = 7.8 \text{ mm} \Rightarrow K_p = (p_{\text{H}_2\text{O}})^2 = (7.8)^2 = 60.84$$



$$K_p = 60.84$$



$$K'_p = (p_{\text{H}_2\text{O}})^2 = (5.6)^2 = 31.56 \quad p_{\text{H}_2\text{O}} = 5.6 \text{ mm}$$

$$\text{The ratio } \frac{K_p}{K'_p} = \frac{60.84}{31.36} = 1.9$$

**98.(B)** Dehydration of  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  is favourable at low humidity in air, high temperature and it decreases with increasing partial pressure of water vapours i.e.,  $p_{\text{H}_2\text{O}}$ .



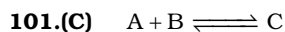
$$K_p = \frac{p_C \cdot p_D}{p_A^2 \cdot p_B} = \frac{\frac{n_C RT}{V} \cdot \frac{n_D RT}{V}}{\left(\frac{n_A RT}{V}\right)^2 \cdot \left(\frac{n_B RT}{V}\right)} = \frac{n_C n_D}{n_A^2 n_B} \cdot \frac{V}{RT}$$



Moles	$\text{N}_2$	$\text{H}_2$	$\text{NH}_3$
Initial	0.2	0.6	0
At equilibrium	$0.2 - x$	$0.6 - 3x$	$2x$

$$\text{Also : } 0.4 = \frac{x}{0.2} \Rightarrow x = 0.08$$

$$\text{Ratio} = \frac{V_f}{V_i} = \frac{(n_{\text{Total}})_f}{(n_{\text{Total}})_i} = \frac{0.8 - 2x}{0.8} = 1 - \frac{x}{0.4} = 1 - \frac{0.08}{0.40} = \frac{4}{5}$$



$$\text{Given : } \frac{dx}{dt} = (2 \times 10^3)[\text{A}][\text{B}] - (1 \times 10^2)[\text{C}]$$

where x is the amount of 'A' dissociated

At equilibrium :  $\frac{dx}{dt} = 0$  (since no change in the concentration of any reactant or product with respect to time)

$$\Rightarrow \frac{dx}{dt} = (2 \times 10^3)[\text{A}][\text{B}] - (1 \times 10^2)[\text{C}] = 0$$

$$\Rightarrow \text{Equilibrium constant } (K_{\text{eq}}) = \frac{[\text{C}]}{[\text{A}][\text{B}]} = \frac{2 \times 10^3}{1 \times 10^2} = 20$$

**102.(C)** Consider the equation :  $2\text{Ag}^+(\text{aq}) + \text{Cu}(\text{s}) \rightleftharpoons \text{Cu}^{2+}(\text{aq}) + 2\text{Ag}(\text{s})$

At equilibrium :  $[\text{Cu}^{2+}] = x\text{M}$ ;  $[\text{Ag}^+] = y\text{M}$

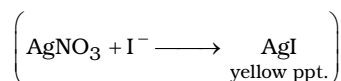
$$K_{\text{eq}} = K_c = \frac{[\text{Cu}^{2+}]}{[\text{Ag}^+]^2} = \frac{x}{y^2}$$

**103.(A)**  $\text{I}_2 + \text{I}^- \rightleftharpoons \text{I}_3^-$

Moles at  $t = 0$       1      0.5      0

Moles at  $t = t_{\text{eq}}$     $1 - x$     $0.5 - x$     $x$

Excess  $\text{AgNO}_3$  gives 0.25 mol of yellow ppt.



$$\Rightarrow 0.5 - x = 0.25 \quad \Rightarrow x = 0.25$$

$$\Rightarrow K_c = \frac{[\text{I}_3^-]}{[\text{I}_2][\text{I}^-]} = \frac{x/V}{\left(\frac{1-x}{V}\right)\left(\frac{0.5-x}{V}\right)} = \frac{0.25/1}{\left(\frac{0.75}{1}\right)\left(\frac{0.25}{1}\right)} = 1.33 \quad (V = 1.0\text{L})$$

**104.(D)**  $\text{X}(\text{g}) + \text{water} \rightleftharpoons \text{X}(\text{aq}) + \text{heat}$

- Exothermic reactions are favoured at low temperature (As per Le Chatelier's Principle)
- Since there is a decrease in volume in the forward direction, it will be favoured at high pressure.

**105.(D)** Given :  $K_c < 2$  for  $\text{PCl}_5(\text{g}) \rightleftharpoons \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g})$

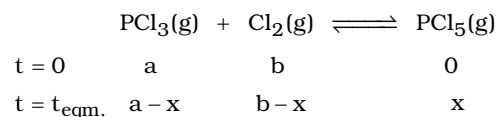
**(A)** From graph, find the value of  $K_c$ .

$$K_c = \left( \frac{[\text{PCl}_3][\text{Cl}_2]}{[\text{PCl}_5]} \right)_{\text{Eq}} = \frac{4 \times 6}{2} > 2$$

(A) is incorrect

**(B)** Incorrect : Since the concentration of both  $\text{PCl}_3(\text{g})$  and  $\text{Cl}_2(\text{g})$  will either increase or decrease. Here it is increasing for  $\text{Cl}_2(\text{g})$  and decreasing for  $\text{PCl}_3(\text{g})$ .

**(C)** Note that (from graph) the initial concentration of  $\text{PCl}_5$  is zero. So the equilibrium is established as follows.



**(D)** Obviously this should be the correct choice

However let us check it. Find  $K_c$ .

$$K_c = \left( \frac{[\text{PCl}_3][\text{Cl}_2]}{[\text{PCl}_5]} \right)_{\text{Eqm}} = \frac{2 \times 4}{6} < 2$$