

Daily Tutorial Sheet-1

JEE Main (Archive)

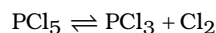
1.(D) Equilibrium constant of a given reversible reaction depends only on temperature.

2.(A) K_p for a given reversible reaction depends only on temperature.

3.(0.33) Total moles of gases at equilibrium $= \frac{pV}{RT} = \frac{2.05 \times 100}{0.082 \times 500} = 5.0$

Out of this 5 moles, 1.0 mole is for $N_2(g)$ and remaining 4 moles

For PCl_5 and its dissociation products.



$$3 - x \quad \quad x \quad \quad x$$

$$3 + x = 4 \Rightarrow x = 1$$

$$\text{Degree of dissociation} = \frac{1}{3} = 0.33$$

4.(D) $KNO_3(aq) + NaCl(aq) \longrightarrow KCl(aq) + NaNO_3(aq)$ is example of reversible reaction.

5.(D) $SO_2Cl_2(g) \rightleftharpoons SO_2(g) + Cl_2(g)$

Adding inert gas at constant volume will not affect partial pressure of reactant or products, hence will not affect equilibrium amount of either reactant or products.

6.(B) $N_2O_4(g) \rightleftharpoons 2NO_2(g)$

$t = 0$ 1 mole

$t = eq.$ 0.8 mole 0.4 mole

$$\frac{P_1}{n_1 T_1} = \frac{P_2}{n_2 T_2} \Rightarrow \frac{1}{1 \times 300} = \frac{P_2}{1.2 \times 600} \Rightarrow P_2 = 2.4 \text{ atm}$$

7.(D) Adding reactant will drive the reaction in forward direction in order to restore equilibrium. Therefore, addition of $CO(g)$ will increase the equilibrium amount of CO_2 .

8.(A) Both temperature and pressure will change the equilibrium amount of $X_3Y(g)$. Temperature changes the value of equilibrium constant.

9.(D) Increases as the conc. of products increases.

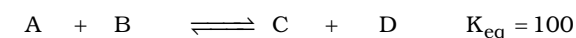
10.(A) Increase in volume means decrease in pressure, on decreasing pressure equilibrium shift in the direction where moles are larger.

11.(B) $x = 1 - \left(1 + \frac{1}{2}\right) = \frac{-1}{2}$

12.(B) Calculate K_{eq} by $\Delta G^\circ = -RT \ln K_{eq}$

Since $Q > K_{eq} \Rightarrow$ reverse direction

13.(B) Initially at equilibrium

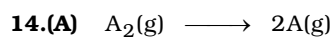


$$1 \quad 1 \quad 1 \quad 1 \quad Q = 1$$

$$(1-x) \quad (1-x) \quad 1+x \quad 1+x$$

$$K_{eq} = \frac{[C][D]}{[A][B]} = \frac{(1+x)(1+x)}{(1-x)(1-x)} = \frac{(1+x)^2}{(1-x)^2} \Rightarrow 10 = \frac{1+x}{1-x}$$

On solving $x = \frac{9}{11} \Rightarrow [D] = 1.818$

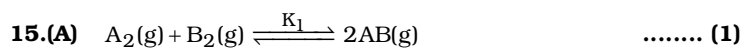


$$\begin{array}{ccc} 1 & & 0 \\ 0.8 & & 0.4 \end{array}$$

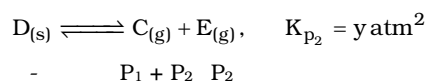
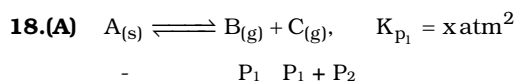
Total moles = 1.2

$$p_{A_2} = \frac{0.8}{1.2} \cdot p_{\text{total}} \quad p_A = \frac{0.4}{0.1} \cdot p_{\text{total}}$$

$$K_p = \frac{p_A^2}{p_{A_2}} \Rightarrow \Delta G^\circ = -RT \ln K_p$$



2



$$K_{p_1} = P_1(P_1 + P_2) = x$$

$$K_{p_2} = P_2(P_1 + P_2) = y$$

$$\therefore K_{p_1} + K_{p_2} = (P_1 + P_2)^2 = x + y$$

$$\Rightarrow P_1 + P_2 = \sqrt{x + y} \Rightarrow 2(P_1 + P_2) = 2\sqrt{x + y}$$

$$\therefore P_{\text{total}} = P_B + P_C + P_E = 2(P_1 + P_2) = 2\sqrt{x + y}$$



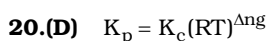
Initial conc., $a \quad 1.5a \quad 0 \quad 0$

At equilibrium, $a - x \quad 1.5a - 2x \quad 2x \quad x$

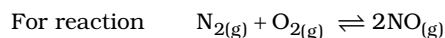
At equilibrium,

$$\Rightarrow a - x = 1.5a - 2x \Rightarrow 0.5a = x$$

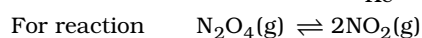
$$\Rightarrow a = 2x \Rightarrow K_c = \frac{(2x)^2 \times x}{(a - x)(1.5a - 2x)^2} = \frac{4x^3}{x \times x^2} = 4$$



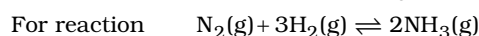
$$\frac{K_p}{K_c} = (RT)^{\Delta n_g}$$



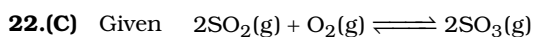
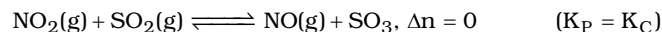
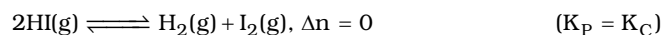
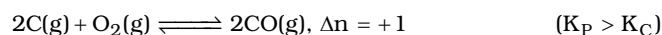
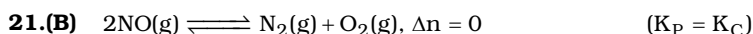
$$\Delta n_g = 0 \text{ hence } \frac{K_p}{K_c} = 1$$



$$\Delta n_g = 1 \text{ hence } \frac{K_p}{K_c} = (24.62)^1 \text{ dm}^3 \text{ atm mol}^{-1}$$

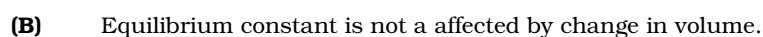
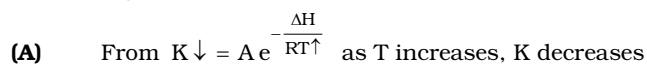


$$\Delta n_g = -2 \text{ hence } \frac{K_p}{K_c} = (24.62)^{-2} = 1.65 \times 10^{-3} \text{ dm}^{-6} \text{ atm}^{-2} \text{ mol}^2$$



$$\Delta H = -57.2 \text{ kJ/mol}$$

$$K_c = 1.7 \times 10^{16}$$



(C) Although K_c is large but it doesn't mean reaction go for completion.

(D) Equilibrium will shift in forward direction as pressure increases.

Hence (C) is incorrect.

$$\mathbf{23.(C)} \quad K_{eq} = \frac{[SO_3]^2}{[SO_2]^2 [O_2]} \quad \dots(1)$$

$$K_1 = \frac{[SO_2]}{[O_2]} = 10^{52}$$

$$K_2 = \frac{[SO_3]^2}{[O_2]^3} = 10^{129} \quad \dots(2)$$

$$K_1^2 = \frac{[SO_2]^2}{[O_2]^2} = 10^{104} \quad \dots(3)$$

$$K_{eq} = \frac{K_2}{(K_1)^2} = \frac{10^{129}}{10^{104}} = 10^{25}$$

$$\mathbf{24.(A)} \quad K_{eq} = \frac{[P]}{[R]} = \frac{11}{6} = 1.83 \approx 2$$