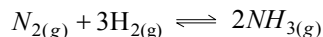


91. Consider the reaction : $N_2 + 3H_2 \rightarrow 2NH_3$ carried out at constant temperature and pressure. If ΔH and ΔU are the enthalpy and internal energy changes for the reaction, which of the following expressions is true?

- 1) $\Delta H > \Delta U$ 2) $\Delta H < \Delta U$ 3) $\Delta H = \Delta U$ 4) $\Delta H = 0$

Ans. (2)

For the reaction



$$\Delta n = -2$$

$$\Delta H = \Delta v + \Delta n RT$$

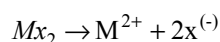
$$\Delta H < \Delta v \quad \therefore \Delta n = -2$$

92. The solubility product of a salt having general formula MX_2 , in water : 4×10^{-12} . The concentration of M^{2+} ions in the aqueous solution of the salt is

- 1) $4.0 \times 10^{-10} M$ 2) $1.6 \times 10^{-4} M$ 3) $1.0 \times 10^{-4} M$ 4) $2.0 \times 10^{-6} M$

Ans. (3)

Let 'S' be the solubility of salt in mol. Lt^{-1}



$$s \quad s \quad 2s$$

$$K_{sp} = [M^{2+}][x^{(-)}]^2$$

$$S \cdot (2S)^2$$

$$K_{sp} = 4S^3 = 4 \times 10^{-12}$$

$$[M^{2+}] = S = 10^{-4} M$$

93. Benzene and toluene form nearly ideal solutions. At $20^\circ C$, the vapour pressure of benzene is 75 torr and that of toluene is 22 torr. The partial vapour pressure of benzene at $20^\circ C$ for a solution containing 78 g of benzene and 46 g of toluene in torr is

- 1) 53.5 2) 37.5 3) 25 4) 50

Ans. (4)

$$\text{Moles of benzene} = \frac{78}{78} = 1$$

$$\text{Moles of Toluene} = \frac{46}{92} = 0.5$$

$$\text{Mole fraction of Benzene } X_B = \frac{1}{1+0.5}$$

$$X_B = \frac{2}{3}$$

$$\text{Partial Vapour pressure of benzene, } P_B = P_B^0 \times X_B$$

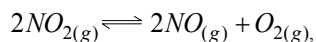
$$P = 75 \times \frac{2}{3} = 50 \text{ torr.}$$

94. Which one of the following statements is NOT true about the effect of an increase in temperature on the distribution of molecular speeds in a gas?

- 1) The area under the distribution curve remains the same as under the lower temperature
 2) The distribution becomes broader
 3) The fraction of the molecules with the most probable speed increases
 4) The most probable speed increases

Ans. (3)

95. For the reaction



$$(K_c = 1.8 \times 10^{-6} \text{ at } 184^\circ \text{ C})$$

$$(R = 0.0831 \text{ kJ / (mol.K)})$$

When K_p and K_c are compared at 184° C it is found that

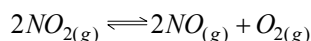
- 1) Whether K_p is greater than, less than or equal to K_c depends upon the total gas pressure
- 2) $K_p = K_c$
- 3) K_p is less than K_c
- 4) K_p is greater than K_c

Ans. (4)

K_p & K_c are related

$$\text{as, } K_p = K_c (RT)^{\Delta n}$$

for the reaction,



$$\Delta n = 1$$

$$\therefore K_p = K_c (RT)^1$$

$$\therefore K_p > K_c$$

96. The exothermic formation of ClF_3 is represented by the equation :



Which of the following will increase the quantity of ClF_3 in an equilibrium mixture of Cl_2 , F_2 and ClF_3 ?

- 1) Adding F_2
- 2) Increasing the volume of the container
- 3) Removing Cl_2
- 4) Increasing the temperature

Ans. (1)

Increase in the concentration of reactants at equilibrium will shift the equilibrium products side.

97. Hydrogen ion concentration in mol/L in a solution of $\text{pH} = 5.4$ will be :

- 1) 3.98×10^{-6}
- 2) 3.68×10^{-6}
- 3) 3.88×10^6
- 4) 3.98×10^8

Ans. (1)

$$[H^+] = 10^{-\text{pH}}$$

$$= 10^{-5.4}$$

$$= 10^{-5} \times 10^{-0.4}$$

$$= 10^{-6} \times 10^{0.6}$$

$$= (\text{antilog } 0.6) \times 10^{-6}$$

$$= 3.98 \times 10^{-6} \text{ M}$$

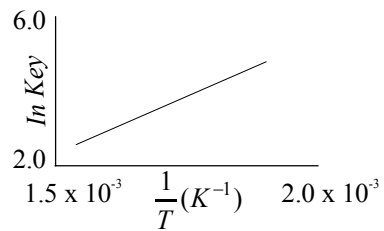
98. A reaction involving two different reactants can never be

- 1) bimolecular reaction
- 2) second order reaction
- 3) first order reaction
- 4) unimolecular reaction

Ans. (4)

The molecularity of such reaction can't be less than 2

105. A schematic plot of $\ln K_{eq}$ versus inverse of temperature for a reaction is shown below



The reaction must be

- 1) highly spontaneous at ordinary temperature
- 2) one with negligible enthalpy change
- 3) endothermic
- 4) exothermic

Ans. (4)

$$\ln \frac{k_2}{k_1} = \frac{\Delta H}{R} \left[\frac{1}{T_1} - \frac{1}{T_2} \right]$$

$$\ln \frac{6}{2} = \frac{\Delta H}{R} [1.5 \times 10^{-3} - 2 \times 10^{-3}]$$

ΔH of reaction comes out to be -ve. Hence reaction is exothermic \therefore (4)