

PART B - CHEMISTRY

- 46.
- c) It can never proceed to completion**

In a reversible reaction some amount of the reactants remains unconverted into products.

- 47.
- b) $\text{AgNO}_3 + \text{NaCl} \rightleftharpoons \text{AgCl} + \text{NaNO}_3$**

Double decomposition reactions or precipitation reactions are not reversible.

- 48.
- b) Few drops of water is present along with air in a balloon, temperature of balloon is constant**

Equilibrium can be achieved only in closed vessel.

- 49.
- b) Molar concentration of reactants**

According to law of mass-action, "at a given temperature, the rate of a reaction at a particular instant is proportional to the product of the active masses of the reactants at that instant raised to powers which are numerically equal to the numbers of their respective molecules in the stoichiometric equation describing the reaction".

- 50.
- d) 0.25**

$$[\text{HI}] = \frac{64 \text{ gm}}{128 \times 2 \text{ litre}}$$

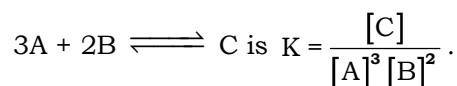
$$= 0.25$$

- 51.
- a) greater is the concentration of the substances involved in a reaction, lower is the speed of the reaction**

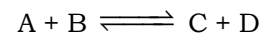
As we increase the concentration of substance, then speed of the reaction increases.

- 52.
- d) $\frac{[\text{C}]}{[\text{A}]^3 [\text{B}]^2}$**

Equilibrium constant for the reaction,



- 53.
- c) 1**



Initial conc. 4, 4 0 0

After T time conc. (4-2) (4-2) 2 2

$$\text{Equilibrium constant} = \frac{[\text{C}][\text{D}]}{[\text{A}][\text{B}]} = \frac{2 \times 2}{2 \times 2} = 1$$

- 54.
- a) $K = 10^3$**

Those reaction which have more value of K proceeds towards completion.

- 55.
- c) Does not depend on the initial concentrations**

Equilibrium constant is independent of original concentration of reactant.

- 56.
- d) $\text{COCl}_{2(g)} \rightleftharpoons \text{CO}_{(g)} + \text{Cl}_{2(g)}$**

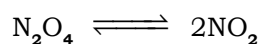
$\Delta n = 1$ for this change

So the equilibrium constant depends on the unit of concentration.

- 57.
- c) 1×10^{-5}**

$$K = \frac{[\text{NO}_2]^2}{[\text{N}_2\text{O}_4]} = \frac{\left[2 \times \frac{10^{-3}}{2}\right]^2}{\left[\frac{2}{2}\right]} = \frac{10^{-6}}{10^{-1}} = 10^{-5}$$

- 58.
- d) $(1 + \alpha)$**



1 0

(1- α) 2 α

total mole at equilibrium = (1- α) + 2 α
= 1 + α

- 59.
- b) 0.06 mole**

$$K_c = \frac{[\text{HI}]^2}{[\text{H}_2][\text{I}_2]}; 64 = \frac{x^2}{0.03 \times 0.03}$$

$$x^2 = 64 \times 9 \times 10^{-4}$$

$$x = 8 \times 3 \times 10^{-2} = 0.24$$

x is the amount of HI at equilibrium
amount of I₂ at equilibrium will be
0.30 - 0.24 = 0.06

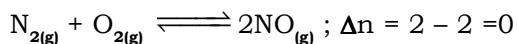
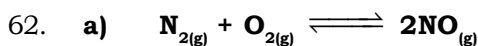
60. c) **1.125 × 10⁻³**

$$K_c = \frac{K_f}{K_b}$$

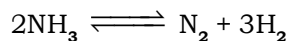
$$K_f = K_c \times K_b = 1.5 \times 7.5 \times 10^{-4} \\ = 1.125 \times 10^{-3}$$

61. c) **0.016**

$$K = \frac{[H_2]^2 [S_2]}{[H_2S]^2} = \frac{[0.10]^2 [0.4]}{[0.5]^2} = 0.016$$

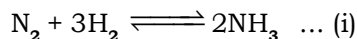


63. d) **27/16 mol² litre⁻²**



Initial concentration	2	0	0
At equilibrium concentration	1	1/2	3/2

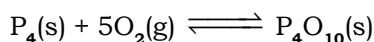
64. c) **1,1,2**



at t = 0 56gm 8gm 0gm
= 2mole 4mole 0mole
at equilibrium 2-1 4-3 34gm
= 1 mole = 1mole = 2mole

According to equation (i) w2 mole of ammonia are present and to produce 2 mole of NH₃, we need 1 mole of N₂ and 3 mole of H₂ hence 2-1 = 1 mole of N₂ and 4 - 3 = 1 mole of H₂ are present at equilibrium in vessel.

65. d) **K_c = 1/[O₂]⁵**

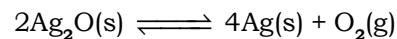


$$K_c = \frac{[P_4O_{10}(s)]}{[P_4(s)][O_2(g)]^5}$$

We know that concentration of a solid component is always taken as unity

$$K_c = \frac{1}{[O_2]^5}$$

66. a) **K_p**



For this reaction, K_p = P_{O₂} ⇌ (AgO₂O and Ag are in solid state)

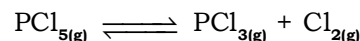
67. d) **Increasing temperature favours forward reaction**

68. a) **Remain constant**

On doubling P and volume with constant T, the equilibrium constant (K) will remain constant.

Pressure will never affect the value of K. It may result in the shifting of equilibrium but not the equilibrium constant value. Temperature always changes K because on adding heat to a system in state of equilibrium will always alter the forward reaction rate differently than the reverse reaction rate. Also by doubling the volume, the concentrations of both reactants and product evenly become half. Therefore, overall there is no change in equilibrium constant value(K).

69. b) **4.5**



3	3	2	(Initially)
(3 - x)	(3 + x)	(2 + x)	(At equilibrium)

Given that, (3 - x) = 1.5; ∴ x = 1.5;
Therefore no. of moles of PCl_{3(g)} present is = 3 + 1.5 = 4.5

70. a) **More PCl₅ will be produced**

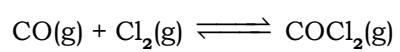
$$Q_p = \frac{pPCl_3 \times pPCl_2}{pPCl_5} = \frac{1atm \times 1atm}{1atm} = 1$$

Since Q_p > K_p, the equilibrium shifts towards left.

71. **b)** $K_p = K_c(RT)^{\Delta n}$
72. **d)** **The temperature**
73. **c)** $2SO_2 + O_2 \rightleftharpoons 2SO_3$
 $K_p = K_c(RT)^{\Delta n}$
 $\Delta n = -1$ for reaction $2SO_2 + O_2 \rightleftharpoons 2SO_3$. So for this reaction K_p is less than K_c .
74. **d)** 1.72×10^{-4}
 $2NOCl_{(g)} = 2NO_{(g)} + Cl_{2(g)}$
 $K_p = K_c(RT)^{\Delta n}$
 $K_p = 3 \times 10^{-6}(0.0821 \times 700)$
 $= 172.41 \times 10^{-6}$
 $= 1.72 \times 10^{-4}$
75. **b)** $< 1.2 \times 10^{-2}$
 $K_p = K_c(RT)^{\Delta n}$; Δn
 So K_c will be less than K_p .
76. **d)** **Does not affect equilibrium constant of reaction**
 Catalyst does not affect equilibrium constant.
77. **b)** **100.0**
 $XY_2 = XY + Y$
 Initial pressure of $XY_2 = 600$ mm Hg
 $XY_2 = XY + Y$

Initial	600	0	0
At equilibrium	$600 - P$	P	P

 Total = $600 + P = 800$
 $P = 200$
 $K = \frac{200 \times 200}{400} = 100.0$
78. **b)** $M \rightleftharpoons N$; $K = 10$
 For a reaction, $K_c = \frac{[\text{Product}]}{[\text{Reactant}]}$
 Hence,
 If $K_c > 1$, then $[\text{Product}] > [\text{Reactant}]$
79. **b)** **Zero**
80. **a)** **More cis-2-pentene is formed**
 Equilibrium shifts backward by Le chatelier's principle.
81. **a)** **High temperature**
 $N_2 + O_2 \rightleftharpoons 2NO$; Q cal
 The above reaction is endothermic so for higher production of NO, and the temperature should be high.
82. **c)** $PCl_5 \rightleftharpoons PCl_3 + Cl_2$
 At low pressure, reaction proceeds where volume is increasing. This is the favourable condition for the reaction.
 $PCl_5 \rightleftharpoons PCl_3 + Cl_2$
83. **a)** **More water will form**
 $Ice \rightleftharpoons Water$
 More volume less volume
 On increasing pressure, equilibrium shifts forward.
84. **c)** **Endothermic**
85. **a)** **Temperature and pressure**
 Factors affecting equilibrium are pressure, temperature and concentration of product or reactant
86. **d)** **Shift in equilibrium position on changing value of a constant**
87. **b)** **Half**
88. **b)** $Fe_{(s)} + S_{(s)} \rightleftharpoons FeS_{(s)}$
 Le chatelier principle is not applicable to solid-solid equilibrium
89. **a)** **Does not change**
 In that type of reaction the state of equilibrium is not effected by change in volume (hence pressure) of the reaction mixture.

90. c) **1/RT**

$$\Delta n = 1 - 2 = -1$$

$$K_p = K_c[\text{RT}]^{\Delta n}; \quad \therefore \frac{K_p}{K_c} = [\text{RT}]^{-1} = \frac{1}{\text{RT}}$$