QB365 Question Bank Software Study Materials

Physical and Chemical Equilibrium 50 Important 1 Marks Questions With Answers (Book Back and Creative)

11th Standard

Chemistry

Total Marks : 50

Multiple Choice Question

50 x 1 = 50

1) If K_b and K_f for a reversible reactions are 0.8 x 10^{-5} and 1.6 x 10^{-4} respectively, the value of the equilibrium constant is _____

(a) 20 (b) 0.2 x 10^{-4} (c) 0.05 (d) none of these

2) At a given temperature and pressure, the equilibrium constant values for the equilibria

$3A_2 + B_2 + 2C \overset{K_1}{\rightleftharpoons} 2A_3BC$ and

$A_3BC \overset{K_2}{\rightleftharpoons} 3/2\,[A_2] + \frac{1}{2}B_2 + C$

The relation between K_1 and K_2 is _____

(a) $K_1 = \frac{1}{\sqrt{K_2}}$ **(b)** $K_2 = K_1^{-1/2}$ (c) $K_1^2 = 2K_2$ (d) $\frac{K_1}{2} = K_2$

3) The equilibrium constant for a reaction at room temperature is K_1 and that at 700 K is K_2. If $K_1 > K_2$, then _____

(a) The forward reaction is exothermic (b) The forward reaction is endothermic

(c) The reaction does not attain equilibrium (d) The reverse reaction is exothermic

4) The formation of ammonia from $N_2(g)$ and $H_2(g)$ is a reversible reaction

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ + Heat

What is the effect of increase of temperature on this equilibrium reaction _____

(a) equilibrium is unaltered (b) formation of ammonia is favoured **(c) equilibrium is shifted to the left**

(d) reaction rate does not change

5) Solubility of carbon dioxide gas in cold water can be increased by _____

(a) increase in pressure (b) decrease in pressure (c) increase in volume (d) none of these

6) Which one of the following is incorrect statement?

(a) for a system at equilibrium, Q is always less than the equilibrium constant

(b) equilibrium can be attained from either side of the reaction

(c) presence of catalyst affects both the forward reaction and reverse reaction to the same extent

(d) Equilibrium constant varied with temperature

7) K_1 and K_2 are the equilibrium constants for the reactions respectively.

$N_2(g) + O_2(g) \overset{K_1}{\rightleftharpoons} 2NO(g)$

$2NO(g) + O_2(g) \overset{K_2}{\rightleftharpoons} 2NO_2(g)$

What is the equilibrium constant for the reaction $NO_2(g) \rightleftharpoons \frac{1}{2}N_2(g) + O_2(g)$

(a) $\frac{1}{\sqrt{K_1K_2}}$ (b) $(K_1 = K_2)^{1/2}$ (c) $\frac{1}{2K_1K_2}$ (d) $\left(\frac{1}{K_1K_2}\right)^{3/2}$

8) In the equilibrium,

$2A(g) \rightleftharpoons 2B(g) + C_2(g)$

the equilibrium concentrations of A, B and C_2 at 400 K are 1×10^{-4} M, 2.0×10^{-3} M, 1.5×10^{-4} M respectively. The value of K_C for the equilibrium at 400 K is _____

(a) 0.06 (b) 0.09 (c) 0.62 (d) 3 x 10^{-2}

9) An equilibrium constant of 3.2×10^{-6} for a reaction means, the equilibrium is _____

(a) largely towards forward direction **(b) largely towards reverse direction** (c) never established (d) none of these

10) $\frac{K_c}{K_p}$ for the reaction,

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ is _____

(a) $\frac{1}{RT}$ (b) $\sqrt{RT}$ (c) RT **(d) $(RT)^2$**

11) For the reaction AB (g) ⇌ A(g) + B(g), at equilibrium, AB is 20% dissociated at a total pressure of P, The equilibrium constant K_P is related to the total pressure by the expression _____

(a) $P = 24\ K_P$ (b) $P = 8\ K_P$ (c) $24\ P = K_P$ (d) none of these

12) In which of the following equilibrium, K_P and K_C are not equal ?

(a) $2\ NO(g) \rightleftharpoons N_2(g) + O_2(g)$ (b) $SO_2\ (g) + NO_2 \rightleftharpoons SO_3(g) + NO(g)$ (c) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$ **(d) $PCl_5\ (g) \rightleftharpoons PCl_3(g) + Cl_2(g)$**

13) If x is the fraction of PCl_5 dissociated at equilibrium in the reaction

$PCl_5 \rightleftharpoons PCl_3 + Cl_2$

then starting with 0.5 mole of PCl_5, the total number of moles of reactants and products at equilibrium is _____

(a) 0.5 - x **(b) x + 0.5** (c) 2x + 0.5 (d) x + 1

14) The values of K_{P1} and K_{P2} for the reactions

$X \rightleftharpoons Y + Z$

$A \rightleftharpoons 2B$ are in the ratio 9 : 1 if degree of dissociation and initial concentration of X and A be equal then total pressure at equilibrium P_1 and P_2 are in the ratio _____

(a) 36 : 1 (b) 1 : 1 (c) 3 : 1 (d) 1 : 9

15) In the reaction,

$Fe(OH)_3\ (s) \rightleftharpoons Fe^{3+}(aq) + 3OH^-(aq)$,

if the concentration of OH^- ions is decreased by ¼ times, then the equilibrium concentration of Fe^{3+} will

(a) not changed (b) also decreased by ¼ times (c) increase by 4 times **(d) increase by 64 times**

16) Consider the reaction where $K_P = 0.5$ at a particular temperature

$PCl_5(g) \rightleftharpoons PCl_3\ (g) + Cl_2\ (g)$

if the three gases are mixed in a container so that the partial pressure of each gas is initially 1 atm, then which one of the following is true _____

(a) more PCl_3 will be produced (b) more Cl_2 will be produced **(c) more PCl_5 will be produced** (d) none of these

17) Equimolar concentrations of H_2 and I_2 are heated to equilibrium in a 1 litre flask. What percentage of initial concentration of H_2 has reacted at equilibrium if rate constant for both forward and reverse reactions are equal _____

(a) 33% (b) 66% (c) $(33)^2\%$ (d) 16.5%

18) In a chemical equilibrium, the rate constant for the forward reaction is 2.5×10^2 and the equilibrium constant is 50. The rate constant for the reverse reaction is _____

(a) 11.5 **(b) 5** (c) 2×10^2 (d) 2×10^{-3}

19) Which of the following is not a general characteristic of equilibrium involving physical process _____

(a) Equilibrium is possible only in a closed system at a given temperature

(b) The opposing processes occur at the same rate and there is a dynamic but stable condition

(c) All the physical processes stop at equilibrium (d) All measurable properties of the system remains constant

20) For the formation of Two moles of $SO_3(g)$ from SO_2 and O_2, the equilibrium constant is K_1. The equilibrium constant for the dissociation of one mole of SO_3 into SO_2 and O_2 is _____

(a) $1/K_1$ (b) K_1^2 **(c)** $(\frac{1}{K_1})^{1/2}$ (d) $\frac{K_1}{2}$

21) Match the equilibria with the corresponding conditions,

i) Liquid ⇌ Vapour	1) melting point

ii) Solid ⇌ Liquid	2) Saturated solution
iii) Solid ⇌ Vapour	3) Boiling point
iv) Solute (s) ⇌ Solute (Solution)	4) Sublimation point
	5) Unsaturated solution

(a)

(i)	(ii)	(iii)	(iv)
1	2	3	4

(b)

(i)	**(ii)**	**(iii)**	**(iv)**
3	**1**	**4**	**2**

(c)

(i)	(ii)	(iii)	(iv)
2	1	3	4

(d)

(i)	(ii)	(iii)	(iv)
3	2	4	5

22) Consider the following reversible reaction at equilibrium, A + B ⇌ C, If the concentration of the reactants A and B are doubled, then the equilibrium constant will _____

(a) be doubled (b) become one fourth (c) be halved **(d) remain the same**

23) $[Co(H_2O)_6]^{2+}$ (aq) (pink) + $4Cl^-$ (aq) ⇌ $[CoCl_4]^{2-}$ (aq) (blue) + 6 H_2O (l)

In the above reaction at equilibrium, the reaction mixture is blue in colour at room temperature. On cooling this mixture, it becomes pink in colour. On the basis of this information, which one of the following is true?

(a) ΔH > 0 for the forward reaction (b) ΔH = 0 for the reverse reaction (c) ΔH < 0 for the forward reaction

(d) Sign of the ΔH cannot be predicted based on this information

24) The equilibrium constants of the following reactions are:

$N_2 + 3H_2 \rightleftharpoons 2NH_3$: K_1

$N_2 + O_2 \rightleftharpoons 2NO$: K_2

$H_2 + ½O_2 \rightleftharpoons H_2O$: K_3

The equilibrium constant (K) for the reaction ;

$2NH_3 + 5/2O_2 \overset{K}{\rightleftharpoons} 2NO + 3H_2O$, will be

(a) $K_2^3 \frac{K_3}{K_1}$ (b) $K_1 \frac{K_3^3}{K_2}$ **(c)** $K_2 \frac{K_3^3}{K_1}$ (d) $K_2 \frac{K_3}{K_1}$

25) A 20 litre container at 400 K contains CO_2 (g) at pressure 0.4 atm and an excess of SrO (neglect the volume of solid SrO). The volume of the container is now decreased by moving the movable piston fitted in the container. The maximum volume of the container, when pressure of CO_2 attains its maximum value will be: Given that: $SrCO_3$ (S) ⇌ SrO (S) + CO_2(g)

KP = 1.6 atm

(a) 2 litre **(b) 5 litre** (c) 10 litre (d) 4 litre

26) K_p is how many times equal to Kc for the given reaction?

$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$

(a) $\frac{1}{R^2T^2}$ (b) R^2T^2 (c) $\frac{R}{T}$ (d) RT

27) In which of the following equilibrium, change in pressure will not affect the equilibrium?

(a) $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$ **(b)** $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$ (c) $PCI_{5(g)} \rightleftharpoons PCI_{3(g)} + CI_{2(g)}$

(d) $N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$

28) The favourable conditions for melting of ice is _____

(a) Low pressure **(b) High pressure** (c) Low temperature (d) Absence of catalyst

29) The oxidation of SO_2 and O_2 to SO_3 is an exothermic reaction. The yield of SO_3 will be maximum if _____

(a) Temperature and pressure both are increased **(b) Temperature decreased, pressure increased**

(c) Temperature increased, pressure constant (d) Temperature and pressure both decreased

30) The value of equilibrium constant of the reaction,

$HI_{(g)} \rightleftharpoons \frac{1}{2}H_{2(g)} + \frac{1}{2}I_{2(g)}$ is 8.0. The equilibrium constant of the reaction; $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$

(a) $\frac{1}{8}$ (b) $\frac{1}{16}$ (c) 16 **(d)** $\frac{1}{64}$

31) Which one of the following is an example of chemical equilibrium?

(a) $2NO(g) + G_2(g) \rightleftharpoons 2NO_2(g)$ (b) $I_2(s) \rightleftharpoons I_2(g)$ (c) $H_2O(s) \rightleftharpoons H_2O(1)$ (d) $NH_2Cl(s) \rightleftharpoons NH_4Cl(g)$

32) Which of the following is an example of heterogeneous equilibrium?

(a) Synthesis of HI (b) Dissociation of PCl_5 (c) Acid hydrolysis of ester **(d) Decomposition of limestone**

33) In the reaction, $2NH_3(g) \rightleftharpoons N_2(g) + 3H_2(g)$

(a) $K_p = K_c$ (b) K_pc **(c) $K_p > K_c$** (d) $K_p = \frac{1}{K_c}$

34) Find the Q value of the reaction $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$ at an instant where concentration of H_2,$I_2$and HI are found to be 0.2 mol L^{-1}, 0.2 mol L^{-1},and 0.6 mol L^{-1} respectively.

(a) 48 **(b) 9** (c) 0.9 (d) 90

35) Among the following reactions which one has $K_p = K_c$?

(a) $N_2O_4 \rightleftharpoons 2NO_2(g)$ (b) $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ **(c) $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$** (d) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

36) Which one of the following equation is not correct?

(a) $\Delta G^o = - RTlnK$ (b) $\Delta G^o = \Delta H^o - T\Delta S^o$ (c) $-RTlnK = \Delta H^o - T\Delta S^o$ **(d) ln k = $\frac{\Delta H^o}{T} - \frac{\Delta S^o}{R}$**

37) What would be the value of Δn_g for the reaction $NH_4CI(s) \rightleftharpoons NH_2(g) + HCI(g)$?

(a) 1 (b) 0.5 **(c) 2** (d) 1.5

38) For the reaction $PCI_5(g) \rightleftharpoons PCI_3(g) + CI_2(g)$ the forward reaction at constant temperature is favoured by _____.

(a) introducing an inert gas at constant volume (b) introducing $PCl_3(g)$ at constant volume

(c) introducing $PCI_5(g)$ at constant volume (d) introducing $Cl_2(g)$at constant volume

39) Ammonia manufacture by Haber's process is an example for this equilibrium _____.

(a) liquid - liquid (b) solid - solid (c) solid - gas **(d) gas - phase**

40) Which one of the following is an example of liquid phase equilibrium?

(a) Ammonia manufacture (b) Decomposition of calcium carbonate **(c) Esterification reaction**

(d) H_2SO_4 manufacture

41) $CaCO_3 \rightleftharpoons CaO + CO_2$ is an example of which equilibrium?

(a) Helerogeneous equilibrium (b) Homogeneous equilibrium (c) Liquid phase equilibrium

(d) Solid - Solid equilibrium

42) Rate of evaporation = Rate of condensation is an example for _____.

(a) liquid - vapour equilibrium (b) liquid - solid equilibrium (c) solid - vapour equilibrium

(d) liquid - liquid equilibrium

43) Forward reactions takes place, when _____.

(a) $Q_c c$ (b) $Q > K_c$ (c) $Q > K_c$ (d) $K_c = 1/Q$

44) For $N_2 + 3H_2 \rightleftharpoons 2NH_3$ for this reaction _____.

(a) $K_p > K_c$ **(b) $K_p < k_c$** (c) $K_p = K_c$ (d) $K_p \leq K_c$

45) At a certain temperature, the following reaction $\underset{(g)}{NO} + 1/2\underset{(g)}{O_2} \rightleftharpoons \underset{(g)}{NO_2}$ $\underset{(g)}{NO_2} + \underset{(g)}{NO} \rightleftharpoons \underset{(g)}{N_2O_3}$ have equilibrium constants K_1 and K_2 respectively. The equilibrium constant for the reaction $2\underset{(g)}{NO} + 1/2\underset{(g)}{O_2} \rightleftharpoons \underset{(g)}{N_2O_3}$ at the same temperature would be ____.

(a) K_1+K_2 (b) K_1/K_2 **(c) K_2/K_1** (d) $K_1 K_2$

46) If α is the degree of dissociation of N_2O_4 in the reaction $N_2O_4 \rightleftharpoons 2NO_2$ then at equilibrium, the total no.of. moles of N_2O_4 and NO_2 present is _____.

(a) 2 (b) 1-α (c) $(1-\alpha)^2$ **(d) 1+α**

47) For the reaction at 800K $\underset{(g)}{N_2} + \underset{(g)}{3H_2} \rightleftharpoons \underset{(g)}{2NH_3}$ the ratio of K_p and K_c is ____.

(a) 2.3×10^{-4} (b) 3.2×10^{-6} (c) 2.3×10^{4} (d) 3.2×10^{6}

48) For the equilibrium system $\underset{(g)}{2HCl_2} \rightleftharpoons \underset{(g)}{H_2} + \underset{(g)}{Cl_2}$ the equilibrium constant is 1.0×10^{-5}. what is the concentration of HCl if the equilibrium concentration of H_2 and cl_2 are 1.2×10^{-3} m and 1.2×10^{-4}m respectively.

(a) 12×10^{-4} m (b) 12×10^{-3} m **(c) 12×10^{-2} m** (d) 12×10^{-1} m

49) The Oxidation of SO_2 by O_2 to SO_3 is an exothermic reaction the yield of SO_3 will be maximum if, _____.

(a) temperature is increased and pressure is kept constant **(b) temperature is decreased and pressure is increased**

(c) both T & P are increased (d) both T & P are decreased

50) The equilibrium constant (K_2) for the reaction $\underset{(g)}{N_2} + \underset{(g)}{O_2} \rightleftharpoons \underset{(g)}{2NO}$ at temperature "T" is 4×10^{-4}. The value of K_c for the reaction $\underset{(g)}{NO} \rightleftharpoons \frac{1}{2}\underset{(g)}{N_2} + \frac{1}{2}\underset{(g)}{O_2}$ at the same temperature _____.

(a) 50.0 (b) 0.02 (c) $2.5 \times 10^{+2}$ (d) 4×10^{-4}