Exercise # 1

Q.1 In the chemical reaction : $N_2 + 3H_2 \rightleftharpoons 2NH_3$

at equilibrium point, state whether

[1] Equal volumes of N_2 and H_2 are reacting

[2] Equal masses of N_2 and H_2 are reacting

[3] The reaction has stopped

[4] The same amount of ammonia is formed as is decomposed into N_2 and H_2

Q.2 In A + B $\rightleftharpoons$ C. The unit of equilibrium constant is :

[1] Litre mole^{-1} [2] Mole litre [3] Mole litre^{-1} [4] No unit

Q.3 For the homogeneous reaction : $4NH_3 + 5O_2 \rightleftharpoons 4NO + 6H_2O$

the equilibrium constant K_c, has the units of :

[1] Conc.$^{+10}$ [2] Conc.$^{+1}$ [3] Conc.$^{-1}$ [4] It is dimension less

Q.4 A reversible chemical reaction having two reactants, is in equilibrium. If the concentrations of the reactants are doubled then the equilibrium constant will :

[1] Be doubled [2] Be halved [3] Become one fourth [4] Remain the same

Q.5 (I) $N_2 + O_2 \rightleftharpoons 2NO$ (II) $\frac{1}{2}N_2 + \frac{1}{2}O_2 \rightleftharpoons NO$

If K_1 and K_2 are equilibrium constants for reactions (I) and (II) respectively, then the relation between K_1 and K_2 is

[1] $K_1 = K_2$ [2] $K_2 = \sqrt{K_1}$ [3] $K_1 = 2K$ [4] $K_1 = \frac{1}{2}K_2$

Q.6 For the gas phase reaction : $C_2H_4 + H_2 \rightleftharpoons C_2H_6$ (ΔH = – 32.7 k cal)

carried out in a vessel, the equilibrium concentration of C_2H_4 can be increased by :

(a) Increasing the temperature (b) Decreasing the pressure

(c) Removing some H_2 (d) Adding some C_2H_6

Correct answer is :

[1] a, c, d [2] a, b, c [3] a, b [4] a, b, c, d

Q.7 An example of a reversible reaction is :

[1] $Pb(NO_3)_2$ (aq) + 2NaCl (aq) = $PbCl_2$ (s) + $2NaNO_3$ (aq)

[2] $AgNO_3$ (aq) + NaCl (aq) = AgCl (s) + $NaNO_3$ (aq)

[3] 2Na (s) + H_2O (l) = 2NaOH (aq) + H_2 (aq)

[4] KNO_3 (aq) + NaCl (aq) = KCl (aq) + $NaNO_3$ (aq)

Q.8 The vapour density of PCl_5 is 104.16 but when heated to 230º C its vapour density is reduced to 62. The degree of dissociation of PCl_5 at this temperature will be :

[1] 6.8% [2] 68% [3] 46% [4] 64%

Q.9 According to Le Chatelier's principle adding heat to a solid and liquid in equilibrium will cause the :

[1] Amount of solid to decrease [2] Amount of liquid to decrease

[3] Temperature of rise [4] Temperature to fall

Q.10 For reaction : $PCl_3(g) + Cl_2(g) \rightleftharpoons PCl_5(g)$

the value of K_c at 250º C is 26. The value of K_p at this temperature will be :

[1] 0.61 [2] 0.57 [3] 0.83 [4] 0.46

Q.11 CO and Cl_2 are allowed to interact in a 500 ml flask to form $COCl_2$

At equilibrium, concentrations of CO, Cl_2 and $COCl_2$ are found 0.1, 0.1 and 0.3 gm moles

respectively. The equilibrium constant will be :

[1] 30 [2] 3 [3] 15 [4] 0.3

Q.12 Which of the following oxides of nitrogen will be most stable one :

[1] $2NO_2\,(g) \rightleftharpoons 2O_2\,(g) + N_2\,(g)$; $K = 6.7 \times 10^{16}$ mol litre^{-1}

[2] $2NO\,(g) \rightleftharpoons N_2\,(g) + O_2\,(g)$; $K = 2.2 \times 10^{30}$

[3] $2N_2O_5\,(g) \rightleftharpoons 2N_2\,(g) + 5O_2\,(g)$; $K = 1.2 \times 10^{34}$ mol^5 litre^{-5}

[4] $2NO_2\,(g) \rightleftharpoons 2N_2\,(g) + O_2\,(g)$; $K = 3.5 \times 10^{33}$ Mol litre^{-1}

Q.13 HI was heated in a sealed tube at 440ºC till the equilibrium was reached. HI was found to be 22% decomposed. The equilibrium constant for dissociation is :

[1] 0.282 [2] 0.0796 [3] 0.0199 [4] 1.99

Q.14 2 moles of PCl_5 were heated in a closed vessel of 2 litre capacity. At equilibrium, 40% of PCl_5 dissociated into PCl_3 and Cl_2. The value of equilibrium constant is :

[1] 0.267 [2] 0.53 [3] 2.63 [4] 5.3

Q.15 If the equilibrium constant of the reaction $2HI \rightleftharpoons H_2 + I_2$ is 0.25, the equilibrium constant for the reaction : $H_2 + I_2 \rightleftharpoons 2HI$ would be

[1] 1.0 [2] 2.0 [3] 3.0 [4] 4.0

Q.16 Oxidation of SO_2 by O_2 to SO_3 is an exothermic reaction. The yield of SO_3 will be maximum if :

[1] Temperature is increased and pressure is kept constant

[2] Temperature is reduced and pressure is increased

[3] Both temperature and pressure are increased

[4] Both temperature and pressure are reduced

Q.17 The equilibrium constant for equilibria : $SO_2(g) + \frac{1}{2} O_2(g) \rightleftharpoons SO_3(g)$

and $2SO_3 \rightleftharpoons 2SO_2(g) + O_2\,(g)$

are K_1 and K_2 respectively. The relationship between K_1 and K_2 is :

[1] $K_2 = K_1$ [2] $K_2 = K_1^2$ [3] $K_2 = 1/K_1$ [4] $K_2 = 1/K_1^2$

Q.18 The rate at which a substance reacts depends on its :

[1] Atomic weight [2] Molecular weight [3] Equivalent weight [4] Active mass

Q.19 The equilibrium which remains unaffected by pressure change is :

[1] $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$ [2] $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$

[3] $2O_3(g) \rightleftharpoons 3O_2(g)$ [4] $2NO_2(g) \rightleftharpoons N_2O_4(g)$

Q.20 Le Chatelier's principle is applicable only to :

[1] Reaction under equilibrium [2] Reaction without equilibrium

[3] Ionization of electrolytes [4] None of these

Q.21 At 298 K, the equilibrium between N_2O_4 and NO_2 may be represented by the following equation $N_2O_4(g) \rightleftharpoons 2NO_2(g)$. If the total pressure of the equilibrium mixture is P and the degree of dissociation of $N_2O_4(g)$ at 298 K is x, which one of the following is the pressure of $N_2O_4(g)$ under this condition :

[1] $\frac{(1-x)\times P}{(1+x)}$ [2] $\frac{2x\times P}{(1+x)}$ [3] $\frac{2x\times P}{(1-x)}$ [4] $\frac{2\times P}{3}$

Q.22 For the reaction : $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$

the forward reaction at a constant temperature is favoured by :

[1] Introducing an inert gas at constant volume

[2] Introducing chlorine gas at constant volume

[3] Introducing an inert gas at constant pressure

[4] None of these

Q.23 One mole of SO_3 was placed in one litre vessel at a certain temperature. The following equilibrium was established $2SO_3 \rightleftharpoons 2SO_2 + O_2$. At equilibrium 0.6 moles of SO_2 were formed. The equilibrium constant of the reaction will be :

[1] 0.36 [2] 0.45 [3] 0.54 [4] 0.675

Q.24 Raising the temperature of a reversible chemical reaction :

[1] Favours the forward rate only [2] Favours the backward rate only

[3] Favours both the forward and backward rate [4] Favours neither the forward nor the backward rates

Q.25 The equilibrium constant for the reaction $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$ is 49. If the equation of the reaction is written as $\frac{1}{2}H_2 + \frac{1}{2}I_2(g) \rightleftharpoons HI(g)$ then :

[1] The value of equilibrium constant would change

[2] The value of equilibrium constant would remain the same

[3] Mole fraction of hydrogen reacted would change

[4] Mole fraction of HI formed will change

Q.26 ''If a system at equilibrium is subjected to a change in any one of the factors such as temperature, pressure or concentration, the system adjusts itself in such a way as to annual the effect of that change''. This is called :

[1] Avogadro's hypothesis [2] Gay Lussac's law

[3] Boyle's law [4] Le Chatelier's principle

Q.27 For the reaction : $2SO_3 \rightleftharpoons 2SO_2 + O_2$ the equilibrium constant expression is :

[1] $K_c = \frac{2[SO_2]\times[O_2]}{2[SO_3]}$ [2] $K_c = \frac{[SO_2]\times[O_2]}{[SO_3]}$ [3] $K_c = \frac{[SO_3]^2}{[SO_2]^2\times[O_2]}$ [4] $K_c = \frac{[SO_2]^2\times[O_2]}{[SO_3]^2}$

Q.28 Which of the following reactions will be favoured at low pressure :

[1] $H_2 + I_2 \rightleftharpoons 2HI$ [2] $N_2 + 3H_2 \rightleftharpoons 2NH_3$

[3] $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ [4] $N_2 + O_2 \rightleftharpoons 2NO$

Q.29 $CH_3COOH + C_2H_5OH \rightleftharpoons CH_3COOC_2H_5 + H_2O$ $(K_C = 4)$

In the above reaction one mole each of acetic acid and alcohol are heated in the presence of a little conc. H_2SO_4. On equilibrium being attained :

[1] One mole of ethyl acetate is formed

[2] 2 moles of ethyl acetate are formed

[3] 1/3 moles of ethyl acetate is formed

[4] 2/3 moles of ethyl acetate is formed

Q.30 When a catalyst is added to a system in equilibrium :

[1] The equilibrium concentrations are increased

[2] There is no effect on equilibrium concentrations

[3] The equilibrium concentrations are decreased

[4] The rate of forward reaction increase and that of backward reaction decreases

Q.31 Suppose the reaction : $PCl_5(s) \rightleftharpoons PCl_3(g) + Cl_2(g)$ is at equilibrium in a closed vessel. At a constant temperature on addition of PCl_5, what will be effect on equilibrium concentration of Cl_2 (g) :

[1] Will be decreased

[2] Will be increased

[3] Will remain unaffected

[4] Can not be predicated without the value of K_p

Q.32 Equilibrium concentrations of HI, I_2 and H_2 is 0.7, 0.1 and 0.1 moles/litre. Calculate equilibrium constant for reaction $I_2 + H_2 \rightleftharpoons 2HI$ is

[1] 0.36 [2] 36 [3] 49 [4] 0.49

Q.33 Which of the following will shift the reaction $PCl_3 + Cl_2 \rightleftharpoons PCl_5$ to the left side :

[1] Addition of PCl_5 [2] Increase in pressure

[3] Decrease in temperature [4] Catalyst

Q.34 In which of the following equilibria the value of K_p is less than K_c :

[1] $H_2 + I_2 \rightleftharpoons 2HI$ [2] $N_2 + 3H_2 \rightleftharpoons 2NH_3$

[3] $N_2 + O_2 \rightleftharpoons 2NO$ [4] $CO + H_2O \rightleftharpoons CO_2 + H_2$

Q.35 An equilibrium mixture for the reaction : $2H_2S\,(g) \rightleftharpoons 2H_2\,(g) + S_2(g)$ has 0.5 mole H_2S, 0.1 mole of H_2 and 0.4 mole S_2 in a one litre vessel. The equilibrium constant of this reaction is given by :

[1] 0.004 mole $litre^{-1}$ [2] 0.08 mole $litre^{-1}$ [3] 0.016 mole $litre^{-1}$ [4] 0.160 mole $litre^{-1}$

Q.36 What will be the rate of decomposition of a gas at a particular temperature, if concentration of the gas is 0.05 mole/litre ? Rate constant of decomposition of gas at this temperature is $10^{-4}\ min^{-1}$.

[1] 5×10^{-6} [2] 1×10^{-4} [3] 5×10^{-4} [4] 2×10^{-6}

Q.37 If the concentration of reactants and products is doubled, then the equilibrium constant (K_c) will be :

[1] $2K_c$ [2] $K_c/2$ [3] $K_c/4$ [4] unchanged

Q.38 0.96 gram hydrogen iodide is heated at 400ºC till equilibrium is established. 14.0 ml of N/10 $Na_2S_2O_3$ solution is needed to neutralize iodine obtained from this reaction, then calculate the percent amount of dissociation of HI :

[1] 28% [2] 18.6% [3] 20% [4] 62.3%

Answer Key

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	4	1	2	4	2	4	4	2	1	1	3	1	3	1	4	2	4	4	1	1
Qus.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38		
Ans.	1	3	4	3	1	4	4	3	4	2	3	3	1	2	3	1	4	2		

Exercise # 2

Q.1 HI was heated in a closed tube at 440°C till equilibrium is obtained. At this temperature 22% of HI was dissociated. The equilibrium constant for this dissociation will be

[1] 0.282 [2] 0.0796 [3] 0.0199 [4] 1.99

Q.2 When 20 g of $CaCO_3$ were put into 10 litre flask and heated to 800 °C, 35% of $CaCO_3$ remained unreacted at equilibrium. K_p for decomposition of $CaCO_3$ is

[1] 1.145atm [2] 0.145 atm [3] 2.145 atm [4] 3.145 atm

Q.3 A quantity of PCl_5 was heated in a 10 litre vessel at 250°C, $PCl_5(g) + Cl_2(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$. At equilibrium the vessel contains 0.1 mole of PCl_5, 0.20 mole of PCl_3 and 0.2 mole of Cl_2. The equilibrium constant of the reaction is

[1] 0.02 [2] 0.05 [3] 0.04 [4] 0.025

Q.4 The equilibrium $SO_2Cl_2(g) \rightleftharpoons SO_2(g) + Cl_2(g)$ is attained at 25°C in a closed container and inert gas helium is introduced. Which of the following statement(s) is/are correct

1. Concentrations of SO_2, Cl_2 and $SO_2\ Cl_2$ change
2. More chlorine is formed
3. Concentration of SO_2 is reduced
4. More SO_2Cl_2 is formed

Correct answer is:

[1] 1,2,3 [2] 2,3,4 [3] 3,4 [4] None

Q.5 Which of the following is wrong

Reaction	Degree of dissociation	Reaction	Degree of dissociation
[1] $PCl_5 \rightleftharpoons PCl_3 + Cl_2$	$\frac{D-d}{d}$	[2] $N_2O_4 \rightleftharpoons 2NO_2$	$\frac{M_t - M_o}{2d}$
[3] $H_2 + I_2 \rightleftharpoons 2HI$	$\frac{\sqrt{K}}{\sqrt{K}+2}$	[4] $A + B \rightleftharpoons C + D$	$\frac{\sqrt{K}}{2+\sqrt{K}}$

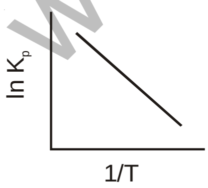
Q.6 For the reaction [1] and [2]

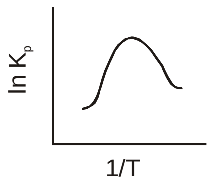
[1] $A \rightleftharpoons B + C$ [2] $D \rightleftharpoons 2E$ given $K_{p1} : K_{p2} :: 9 : 1$

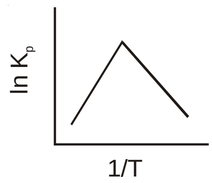
If the degree of dissociation of A and D would be same then the total pressure at equilibria [1] and [2] are in the ratio

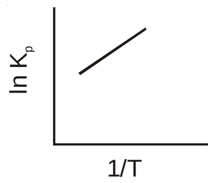
[1] 3 : 1 [2] 36 : 1 [3] 1 : 1 [4] 0.5 : 1

Q.7 Which of the following graphs represents an exothermic reaction

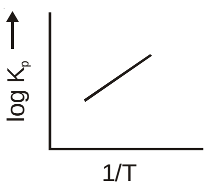
[1] 

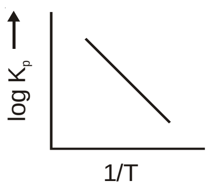
[2] 

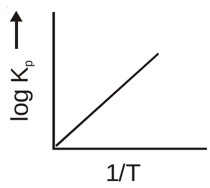
[3] 

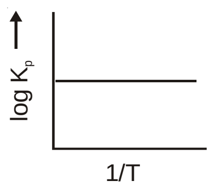
[4] 

Q.8 For the reaction $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$; $\Delta H = +ve$ which of the following plot is correct

[1] 

[2] 

[3] 

[4] 

Q.9 Some gaseous equilibrium have following relation in equilibrium constants

$CO + H_2O \overset{K}{\rightleftharpoons} CO_2 + H_2$; $CO + O_2 \overset{K_1}{\rightleftharpoons} CO_2$; $H_2 + O_2 \overset{K_2}{\rightleftharpoons} H_2O$

[1] $K = K_1K_2$ [2] $K = (K_1K_2)^2$ [3] $K = (K_1K_2)^{-1/2}$ [4] $K = K_1/ K_2$

Q.10 Effect of temperature on equilibrium constant is given by $\log K_2 - \log K_1 = \frac{-\Delta H}{2.303R}\left[\frac{1}{T_2} - \frac{1}{T_1}\right]$. Then for a endothermic reaction the false statement is

[1] $\left[\frac{1}{T_2} - \frac{1}{T_1}\right]$ = positive [2] $\log K_2 > \log K_1$ [3] ΔH = positive [4] $K_2 > K_1$

Q.11 For the reaction : $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$, the degree of dissociation (α) of HI(g) is related to equilibrium constant K_p by the expression

[1] $\frac{1+2\sqrt{K_P}}{2}$ [2] $\sqrt{\frac{1+2K_P}{2}}$ [3] $\sqrt{\frac{2K_P}{1+2K_P}}$ [4] $\frac{2\sqrt{K_P}}{1+2\sqrt{K_P}}$

Q.12

List X	**List Y**
(A) $A \rightleftharpoons B$ heat	(i) Equilibrium constant
(B) r_b/r_f	(ii) Adaptation of low temp.
(C) r_f/r_b	(iii) (Equilibrium constant)$^{-1}$
(D) $2A(g) + B(g) \rightleftharpoons C(g)$	(iv) $A(g) + B(g) \rightleftharpoons C(g) + D(g)$
(E) No effect of pressure	(v) $\Delta n < 0$

Correct match list X and Y

[1] A–(ii), B–(iii), C–(i), D–(v), E –(iv) [2] A–(iii), B–(ii), C–(i), D–(v) , E –(iv)

[3] A–(iv), B–(iii), C –(i), D–(v), E–(ii) [4] None of these

Q.13 $aA + bB \rightleftharpoons cC + dD$, ΔH = QKJ. If the higher yield of product is obtained by the increase in pressure and decrease in temp. then

[1] (c+d) > (a+b) and Q positive [2] (c+d) > (a+b) and Q negative

[3] (c+d) < (a+b) and Q negative [4] (c+d) < (a+b) and Q positive

Q.14 When heating PCl_5 then it decompose PCl_3 and Cl_2 in form of gas, The density of gas mixture is 70.2 and 57.9 at 200°C and 250°C. The degree of dissociation of PCl_5 at 200°C and 250°C if

[1] 48.50% & 80% [2] 60% & 70% [3] 70% & 80% [4] 80% & 90%

Q.15 If $\log kp_2 - \log kp_1 = x\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$ then value of x is

[1] $\Delta H°/2.303R$ [2] ΔH^o [3] $\frac{1}{2.303K}$ [4] None of these

Q.16 Series of equal reaction Represent by general equation E + F = G +H. In this equation each reaction of series reached at equilibrium and their equilibrium constant are follows which of the following reaction equilibrium established too late

[1] $K_C = 2 \times 10^5$ [2] $K_C = 85$ [3] $K_c = 0.010$ [4] $K_c = 7 \times 10^8$

Q.17 Equilibrium constant in condition of there reversible equation ; $Cu^{+2} + 4NH_3 \underset{K_{-1}}{\overset{K_1}{\rightleftharpoons}} Cu(NH_3)_4^{+2}$

[1] k_1k_{-1} [2] k_1/k_{-1} [3] k_{-1} / k_1 [4] $(k_{-1})^2$

Q.18 In a gaseous mixture moles of A, B and C are 'a' 'b' and 'c' if total volume is V litre and mole fraction of A, B and C are X_A , X_B and X_C then which of the following relation is incorrect.

[1] $X_A = \frac{a}{a+b+c}$ [2] $X_B = \frac{b}{a+b+c}$ [3] $X_C = \frac{c}{a+b+c}$ [4] $X_A + X_B = 1 + X_c$

Q.19 $X_2 + Y_2 \rightleftharpoons 2XY$ reaction was studied at a certain temperature. In the beginning 1 mole of X_2 was taken in a one litre flask and 2 moles of Y_2 was taken in another 2 litre flask. What is the equilibrium concentration of X_2 and Y_2 (Given equilibrium concentration of [XY] = 0.6 moles/lit.

[1] $\left(\frac{1}{3}-0.3\right).\left(\frac{2}{3}-0.3\right)$ [2] $\left(\frac{1}{3}-0.6\right).\left(\frac{2}{3}-0.6\right)$ [3] (1–0.3), (2–0.3) [4] (1–0.6), (2–0.6)

Q.20 Reaction is – $2SO_2 + O_2 \rightleftharpoons 2SO_3$

For the formation of one ton of SO_3, what, would be the quantity of O_2 required

[1] 0.20 Ton [2] 0.02 ton [3] 2.0 Ton [4] 0.002 Ton

Q.21 For reaction

$aA \rightleftharpoons \ell L + mM$. In condition of suddenly volume increase degree of dissociation a is decrease it represent that.

[1] $a < (\ell + m)$ [2] $a = (\ell + m)$ [3] $a = (\ell - m)$ [4] $a > (\ell + m)$

Q.22 XY_2 dissociates as $XY_2(g) \rightleftharpoons XY(g) + Y(g)$

Initial pressure of XY_2 is 600 mm Hg. At equilibrium the total pressure is 800 mm Hg. Calculate the value of K_p. It is assumed that the volume of the system remains unchanged

[1] 100 [2] 400 [3] 200 [4] 50

Q.23 In a .25 litre tube occur dissociation of NO. Its initial mole is 4. If its degree of dissociation is 10%.The K_p for Rxn $2NO \rightleftharpoons N_2 + O_2$

[1] $\frac{1}{(18)^2}$ [2] $\frac{1}{(8)^2}$ [3] $\frac{1}{16}$ [4] $\frac{1}{32}$

Q.24 The equilibrium constant for the reaction $N_2 + O_2 \rightleftharpoons 2NO$ is 0.0842 at 3500K. The fraction of equilibrium mixture of N_2 and O_2 converted into NO is

[1] 12.66% [2] 17.2% [3] 15.9% [4] 16.0%

Q.25 The vapour density of PCl_5 is 104 but when heated to 230°C, its V.D. is reduced to 52. The degree of dissociation of PCl_5 at this temperature will be

[1] 6.8% [2] 100% [3] 46% [4] 64%

Q.26 The value K for $H_2(g) + CO_2(g) \rightleftharpoons H_2O(g) + CO(g)$ is 1.80 at 1000°C. If 1.0 mole of each H_2 and CO_2 are placed in 1 litre flask, the final equilibrium concentration of CO at 1000°C will be

[1] 0.295 M [2] 0.385 M [3] 0.572M [4] 0.473 M

Q.27 The decomposition of N_2O_4 to NO_2 is carried out at 280°C. When equilibrium is reached, 0.2 mol of N_2O_4 and 2×10^{-3} mol of NO_2 are present in 2 litres solution. The K_c for the reaction $N_2O_4 \rightleftharpoons 2NO_2$ is

[1] 1×10^{-2} [2] 1×10^{-5} [3] 2×10^{-3} [4] 2×10^{-5}

Q.28 If K_p for a reaction A (g) + 2 B (g) $\rightleftharpoons$ 3C (g) + D (g) is 0.05 atm at 1000 K. Its K_c in terms of R will be

[1] 20000 R [2] 0.02 R [3] 5×10^{-5} R [4] $\frac{5\times10^{-5}}{R}$

Q.29 An equilibrium mixture for the reaction 2 H_2S (g) $\rightleftharpoons$ $2H_2$ (g) + S_2 (g) had one mole of hydrogen sulphide 0.2 mole of H_2 and 0.8 mole of S_2 in a 2 litre vessel. The value of K_c in mole litre^{-1} is

[1] 0.004 [2] 0.016 [3] 0.080 [4] 0.160

Q.30 K_1 and K_2 are equilibrium constant for reactions [1] and [2]

N_2 (g) + O_2 (g) $\rightleftharpoons$ 2NO (g) .... [1]

NO (g) $\rightleftharpoons$ $\frac{1}{2}$ N_2 (g) + $\frac{1}{2}$ O_2 (g) .... [2]

Then

[1] $K_1 = \left(\frac{1}{K_2}\right)^2$ [2] $K_1 = K_2^2$ [3] $K_1 = \frac{1}{K_2}$ [4] $K_1 = (K_2)^0$

Q.31 The equilibrium constant for the reaction

Zn (s) + Cu^{2+} (aq) $\rightleftharpoons$ Zn^{2+} (aq) + Cu (s) + and Cu (s) 2 Ag^+ (aq) $\rightleftharpoons$ Cu^{2+} (aq) + 2Ag (s) are K_1 and K_2 respectively. Then the equilibrium constant for the reaction

Zn (s) + 2 Ag^+ (aq) $\rightleftharpoons$ Zn^{2+} (aq) + 2 Ag (s) will be

[1] $K_1 + K_2$ [2] $K_1 \times K_2$ [3] K_1 / K_2 [4] $K_1 - K_2$

Q.32 For an equilibrium change involving gaseous phase, the forward reaction is firs order while the reverse reaction is second order. The unit of K_p for the forward equilibrium is

[1] Atm [2] Atm^2 [3] Atm^{-1} [4] Atm^{-2}

Q.33 Ammonia forms complexes with Ag^+ according to the following reactions

(i) $Ag[H_2O]_2$ + NH_3(aq) $\rightleftharpoons$ $[Ag[NH_3]\,[H_2O\ (aq)]^+$ + $H_2O(\ell)$

(ii) $[Ag(NH_3)(H_2O)\ (aq)]^+$ + NH_3(aq) $\rightleftharpoons$ Ag $(NH_3)_2^+$ (aq) + $H_2O(\ell)$

The equilibrium constants of equilibrium (i) and (ii) are 2.0×10^3 and 8.3×10^3 respectively. Equilibrium constant of the following reaction $[Ag(H_2O)_2(aq)^+$ + $2NH_3$(aq) $\rightleftharpoons$ $Ag(NH_3)_2^+$ + $2H_2O$ (ℓ) will be -

[1] 4.15 [2] 2.0×10^3 [3] 8.3×10^3 [4] 16.6×10^6

Q.34 Two is the equilibrium constant for the reaction A_2 + B_2 $\rightleftharpoons$ 2AB at a given temperature. What is the degree of dissociation for A_2 or B_2^-

[1] 0.2 [2] 0.5 [3] $\frac{1}{1+\sqrt{2}}$ [4] $\frac{\sqrt{2}}{1+\sqrt{2}}$

Q.35 At temperature, T, a compound AB_2(g) dissociates according to the reaction $2AB_2$(g) $\rightleftharpoons$ 2AB(g) + B_2(g) with a degree of dissociation x, which is small compared with unity, the expression for kp, in terms of x and the total pressure, P is -

[1] $\frac{Px^3}{2}$ [2] $\frac{Px^2}{2}$ [3] $\frac{Px^3}{3}$ [4] $\frac{Px^2}{2}$

Q.36 For the equilibrium $CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$ which of the following expressions is correct

[1] $K_p = [CaO]\,[CO_2] / [CaCO_3]$ [2] $K_p = [P_{CaO} \times P_{CO2}] / P_{CaCO3}$

[3] $K_p = P_{CO_2}$ [4] All of these

Q.37 One mole of the N_2 is mixed with 3 moles of H_2 in a litre container. If 50% of H_2 is converted into ammonia by the reaction. $N_2\,(g) + 3H_2\,(g) \rightleftharpoons 2NH_3\,(g)$, then the total number of moles of gas a the equilibrium are

[1] 1.5 [2] 4.5 [3] 3.0 [4] 6.0

Q.38 For the system $A(g) + 2B\,(g) \rightleftharpoons C\,(g)$, the equilibrium concentration are

$A = 0.06$ mol L^{-1} ; $B = 0.12$ mol L^{-1} ; $C = 0.216$ mol L^{-1} . The Keq of the reaction is

[1] 250 [2] 416 [3] 4×10^{-3} [4] 125

Q.39 If K_1 represent the equilibrium constant for reaction $H_2 + I_2 \rightleftharpoons 2HI$ & K_2 for ½ $I_2 \rightleftharpoons HI$, the relation between K_1 & K_2 would be

[1] $K_1 \times K_2 = 1$ [2] $\sqrt{K_1} \times K_2 = 1$ [3] $\sqrt{K_1} = K_2$ [4] $\sqrt{K_1} = \sqrt{K_2}$

Q.40 In a Bodenstein experiment, one mol H_2 and two mol I_2 are taken initially in a one litre flask. If at equilibrium 0.5 mol H_2 are present, the equilibrium concentrations of I_2 and HI in mol l^{-1} are

[1] 0.5 , 1.0 (20 1.0, 0.5 [3] 1.5 , 1.0 [4] 1.5 , 0.5

Q.41 The reaction : $CH_3COOH + C_2H_5OH \rightleftharpoons CH_3COOC_2H_5 + H_2O$ is studied in a 2ℓ vessel by taking initially a mol acetic acid and b mole ethanol. At equilibria, x mol each of ester and water are formed. The value of K for this reaction is equal to

[1] $\dfrac{4x^2}{(a-x)(b-x)}$ [2] $\dfrac{x^2}{(a-x)(b-x)}$ [3] $\dfrac{2x^2}{(a-x)(b-x)}$ [4] $\dfrac{x^2}{2(a-x)(b-x)}$

Q.42 At a total equilibrium pressure of 1.0 atmosphere, the degree of dissociation of phosgene is 0.2 $COCl_2(g) \rightleftharpoons CO\,(g) + Cl_2\,(g)$

Now the same equilibrium is established at the same temperature in presence of N_2 gas at a partial pressure of 0.4 atm. in a total pressure of 1.0 atm. The new degree of dissociation, α , is –

[1] $\alpha < 0.2$ [2] $\alpha > 0.2$ [3] $\alpha = 0.2$ [4] $\alpha = 0$

Q.43 In the study of the reaction

$Cl_2 + PCl_3 \rightleftharpoons PCl_5$

partial pressures of Cl_2, PCl_3 and PCl_5 at equilibrium are 0.1, 0.1 and 0.2 atm respectively at 250°C. At the same temperature, in another experiment on the same reaction, at equilibrium the partial pressures of PCl_3 and Cl_2 are half those in the first experiment. The partial pressure of the PCl_5 at equilibrium in the second experiment is

[1] One–fourth of the first [2] Half of the first [3] One–eight of the first [4] One–third of the first

Q.44 At a given temperature the following reaction is allowed to reach equilibrium in a vessel of volume V_1 litre. The degree of dissociation is α_1 . If by keeping the temperature fixed the volume of the reaction vessel is doubled (assuming the degrees of dissociation to be small) the new degree of dissociation shall be

$PCl_5 \rightleftharpoons PCl_3 + Cl_2$

[1] $2\alpha_1$ [2] $\sqrt{\dfrac{\alpha_1}{2}}$ [3] $\sqrt{2\alpha_1}$ [4] $\sqrt{2}\,.\,\alpha_1$

Q.45 For the general reaction

A $\rightleftharpoons$ nB

the degree of dissociation is measured from vapour density measurements. If the degree of dissociation, the observed and theoretical vapour densities be α, d_0 and d_t respectively, then

[1] $\alpha = \frac{d_O - d_t}{d_t(n+1)}$ [2] $\alpha = \frac{d_O - d_t}{d_t}$ [3] $\alpha = \frac{(d_O - d_t)(n-1)}{d_t}$ [4] $\alpha = \frac{d_O - d_t}{d_O(n-1)}$

Q.46 The correct expression for equilibrium constant K_c, for the reaction

$H_2(g) + \frac{1}{2}O_2(g0 \rightleftharpoons H_2O$ (g) is

[1] $[H_2O] / [H_2] [\frac{1}{2} O_2]$ [2] $P_{H_2O} / P_{O_2}^{1/2} . P_{H_2}$ [3] $[H_2O] / [H_2] [O_2]^{1/2}$ [4] $P_{H_2O} / \frac{1}{2}P_{O_2} . P_{H_2}$

Q.47 The reversible reaction

$Cu(NH_3)_4^{2+} + SO_3^{2-} \rightleftharpoons Cu(NH_3)_3SO_3 + NH_3$

is at equilibrium. What would not happen if ammonia is added –

[1] $[SO_3^{2-}]$ would increase [2] $[Cu(NH_3)_3 SO_3]$ would increase

[3] The value of equilibrium constant would not change [4] $[Cu(NH_3)_3^{2+}]$ would increase

Q.48 For the irreversible reaction $I_2 + 2S_2O_3^{2-} \longrightarrow 2I^- + S_4O_6^{2-}$ the correct statement is

[1] Addition of potassium iodide would lead to depending of the violet colour

[2] Addition of $BaCl_2$ will make the reaction faster due to removal of I^- as BaI_2

[3] The number of moles of tetrathiosulphate formed at the end of the reaction would be equal to half the moles of thiosulphate reacted

[4] None of these

Q.49 At a certain temperature, K_C for

$SO_2(g) + NO_2(g) \rightleftharpoons SO_3(g) + NO(g)$ is 16

If we take one mole each of all the four gases, what will be equilibrium concentration of NO_2 and NO respectively

[1] 0.4, 1.6 [2] 0.6 , 0.6 [3] 0.6, 0.4 [4] 0.4 , 0.4

Q.50 The reaction between thiocyanate and ferric ion is represented by the reaction

$SCN^-(aq) + Fe^{+3}(aq) \rightleftharpoons [Fe(SCN)]^{-2}$

Colourless yellow deep red

Addition of thiocyanate ion to the equilibrium mixture will make

[1] The solution more deep red [2] The solution colourless

[3] The solution yellow [4] The concentration of the complex ion to decrease

Answer Key

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	3	1	3	4	4	2	4	2	4	1	4	1	3	1	1	3	2	4	1	1
Qus.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	4	1	1	1	2	3	2	4	2	1	2	1	4	3	1	3	3	1	3	3
Qus.	41	42	43	44	45	46	47	48	49	50										
Ans.	2	2	1	4	2	3	2	3	1	1										

Exercise # 3

Q.1 The relation between equilibrium constant K_p and K_c is – **[IIT-1994 ; MP PMT-1994; CPMT-1997]**

[1] $K_c = K_p (RT)^{\Delta n}$ [2] $K_p = K_c (RT)^{\Delta n}$ [3] $K_p = \left(\frac{K_c}{RT}\right)^{\Delta n}$ [4] $K_p - K_c = (RT)^{\Delta n}$

Q.2 Which of the following conditions is favourable for the production of ammonia by Haber's process **[MP PMT–1994]**

[1] High concentration of reactants [2] Low temperature and high pressure

[3] Continuous removal of ammonia [4] All the above

Q.3 In which of the following reaction, the value of K_p will be equal to K_C **[MP PMT-1995]**

[1] $H_2 + I_2 \rightleftharpoons 2HI$ [2] $PCl_5 \rightleftharpoons PCl_3 + Cl_2$

[3] $2NH_3 \rightleftharpoons N_2 + 3H_2$ [4] $2SO_2 + O_2 \rightleftharpoons 2SO_3$

Q.4 Which of the following reactions proceeds at low pressure

[MP PET-1985 ; CPMT–1984; MP PMT–1995 ; Raj. PMT–1997]

[1] $N_2 + 3H_2 \rightleftharpoons 2NH_3$ [2] $H_2 + I_2 \rightleftharpoons 2HI$

[3] $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ [4] $N_2 + O_2 \rightleftharpoons 2NO$

Q.5 In which of the following reaction $K_p > K_c$ **[AFMC-1995]**

[1] $N_2 + 3H_2 \rightleftharpoons 2NH_3$ [2] $H_2 + I_2 \rightleftharpoons 2HI$

[3] $PCl_3 + Cl_2 \rightleftharpoons PCl_5$ [4] $2SO_3 \rightleftharpoons O_2 + 2SO_2$

Q.6 The standard state Gibb's free energy change for the isomerization reaction

cis-2-pentene $\rightleftharpoons$ trans–2–pentene is – 3.67 kJ mol^{-1} at 400 K. If more trans-2-pen-tene is added to the reaction vessel

[1] More cis–2–pentene is formed [2] Equilibrium shifts in the forward direction

[3] Equilibrium remains unaltered [4] More trans-2-pentene is produced

Q.7 For the reaction $PCl_5 (g) \rightleftharpoons PCl_3 (g) + Cl_2 (g)$ **[MP PET-1996]**

[1] $K_p = K_c$ [2] $K_p = K_c (RT)^{-1}$ [3] $K_p = K_c (RT)$ [4] $K_p = K_c (RT)^2$

Q.8 The equilibrium constant of the reaction $H_2(g) + I_2 (g) \rightleftharpoons 2HI (g)$ is 64. If the volume of the container is reduced to one fourth of its original volume, the volume of the equilibrium constant will be **[MP PET-1996]**

[1] 16 [2] 32 [3] 64 [4] 128

Q.9 For the following gaseous reaction $H_2 + I_2 \rightleftharpoons 2HI$, the equilibrium constant **[MP PMT-1996]**

[1] $K_p > K_c$ [2] $K_p < K_c$ [3] $K_p = K_c$ [4] $K_p = 1/K_c$

Q.10 According to Le–chatelier's principle, which of the following factors influence a chemical system

[1] Concentration only [2] Pressure only **[MP PMT-1996]**

[3] Temperature only [4] Concentration, pressure and temperature

Q.11 In $N_2 + 3H_2 \rightleftharpoons 2NH_3$ reversible reaction, increase in pressure will favour **[D.PMT-1996]**

[1] Reaction in forward direction
[2] Reaction in reverse direction
[3] Will not exert any effect
[4] In backward and forward direction equally

Q.12 In which of the following system, doubling the volume of the container cause a shift to the right **[AIIMS-1996]**

[1] $H_2(g) + Cl_2(g) \rightleftharpoons 2HCl(g)$
[2] $2CO(g) + O_2(g) \rightleftharpoons 2CO_2(g)$
[3] $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
[4] $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$

Q.13 $2NO_2 \rightleftharpoons 2NO + O_2$; $K = 1.6 \times 10^{-12}$, $NO + 1/2\, O_2 \rightleftharpoons NO_2$; $K' =$ **[CPMT-1996]**

[1] $K' = \frac{1}{K^2}$
[2] $K' = \frac{1}{K}$
[3] $K' = \frac{1}{\sqrt{K}}$
[4] None of these

Q.14 The equilibrium constant for the reaction $N_2 + 3H_2 \rightleftharpoons 2NH_3$ is K, then the equilibrium constant for the equilibrium $NH_3 \rightleftharpoons \frac{1}{2}N_2 + \frac{3}{2}H_2$ is – **[CBSE-1996]**

[1] 1/K
[2] $1/K^2$
[3] $\sqrt{K}$
[4] $\sqrt{1/K}$

Q.15 Which of the following is not favourable for SO_3 formation $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$; $\Delta H = -45.0$ kcal **[MP PET-1997]**

[1] High pressure
[2] High temperature
[3] Decreasing SO_3 concentration
[4] Increasing reactant concentration

Q.16 For which one of the following reactions $K_p = K_c$ **[MP PET-1997]**

[1] $N_2 + 3H_2 \rightleftharpoons 2NH_3$
[2] $N_2 + O_2 \rightleftharpoons 2NO$
[3] $PCl_5 \rightleftharpoons PCl_3 + Cl_2$
[4] $2SO_3 \rightleftharpoons 2SO_2 + O_2$

Q.17 The equilibrium constant for the reversible reaction, $N_2 + 3H_2 \rightleftharpoons 2NH_3$ is K and for the reaction $1/2\, N_2 + 3/2\, H_2 \rightleftharpoons NH_3$ the equilibrium constant is K'. K and K' will be related as - **[MP PET-1997]**

[1] K = K'
[2] $K' = \sqrt{K}$
[3] $K = \sqrt{K'}$
[4] K × K' = 1

Q.18 What would happen to a reversible reaction at equilibrium when an inert gas is added while the volume remains unchanged **[MP PMT-1997]**

[1] More of the product will be formed
[2] Less of the product will be formed
[3] More of the reactant will be formed
[4] It remains unaffected

Q.19 The rate at which substances react depends on their **[MP PMT-1997]**

[1] Atomic weight
[2] Molecular weight
[3] Equivalent weight
[4] Active mass

Q.20 Which statement for equilibrium constant is true for the reaction $A + B \rightleftharpoons C$ **[CPMT-1997]**

[1] Not changes with temperature
[2] Changes when catalyst is added
[3] Both 1 & 2
[4] Changes with temperature

Q.21 If concentration of reactants is increased by 'x', then K becomes **[AFMC-1997]**

[1] In (K/x)
[2] K/x
[3] K + x
[4] K

Q.22 In which of the following case K_p is less than K_c **[AFMC-1997]**

[1] $PCl_5 \rightleftharpoons PCl_3 + Cl_2$

[2] $H_2 + Cl_2 \rightleftharpoons 2HCl$

[3] $2SO_2 + O_2 \rightleftharpoons 2SO_3$

[4] All of these

Q.23 For the reaction $CO(g) + \frac{1}{2} O_2(g) \rightleftharpoons CO_2(g)$; $\frac{K_p}{K_c}$ is equivalent to – **[MP PET/PMT-1998]**

[1] 1 [2] RT [3] $\frac{1}{\sqrt{RT}}$ [4] $(RT)^{1/2}$

Q.24 Formation of SO_3 takes place according to the reaction $2SO_2 + O_2 \rightleftharpoons 2SO_3$; $\Delta H = -45.2$ kcal.

Which of the following factors favours the formation of SO_3

[1] Increase in temperature [2] Increase in pressure [3] Removal of oxygen [4] Increase in volume

Q.25 For the reaction $CO(g) + H_2O(g) \rightleftharpoons CO_2(g) + H_2(g)$ at a given temperature, the equilibrium amount of CO_2 (g) can be increased by **[IIT-1998]**

[1] Adding a suitable catalyst

[2] Adding an inert gas

[3] Decreasing the volume of the container

[4] Increasing the amount of CO(g)

Q.26 In a 500 ml capacity vessel CO and Cl_2 are mixed to for $COCl_2$. At equilibrium, it contains 0.2 moles of $COCl_2$ and 0.1 mole of each of CO and Cl_2. The equilibrium constant K_c for the reaction $CO + Cl_2 \rightleftharpoons COCl_2$ is **[CBSE-1998]**

[1] 5 [2] 10 [3] 15 [4] 20

Q.27 In the reaction $4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(\ell)$ when 1 mole of ammonia and 1 mole of O_2 are made to react to completion **[CBSE-1998]**

[1] 1.0 mole of H_2O is produced

[2] 1.0 mole of NO will be produced

[3] All the oxygen will be consumed

[4] All the ammonia will be consumed

Q.28 A reaction is $A + B \rightarrow C + D$. Initially we start with equal concentration of A and B. At equilibrium we find the moles of C is two times of A. What is the equilibrium constant of the reaction **[CBSE-1998]**

[1] 4 [2] 2 [3] 1/4 [4] 1/2

Q.29 If a mixture containing 3 moles of hydrogen and 1 mole of nitrogen is converted completely into ammonia, the ratio of initial and final volumes at the same temperature and pressure would be **[Karnataka CET-1998]**

[1] 2 : 1 [2] 1 : 2 [3] 3 : 1 [4] 1 : 3

Q.30 An equilibrium mixture of the reaction $2H_2S(g) \rightleftharpoons 2H_2(g) + S_2(g)$ had 0.5 mole H_2S, 0.10 mole H_2 and 0.4 mole S_2 in one litre vessel. The value of equilibrium constant (K) in mole litre^{-1} is **[AIIMS-1998]**

[1] 0.004 [2] 0.008 [3] 0.016 [4] 0.160

Q.31 For the following chemical reaction $2X + Y \rightleftharpoons Z$, the expression of equilibrium constant will be **[MP PMT-1999]**

[1] $K_c = \frac{[X]^2[Y]}{[Z]}$ [2] $K_c = \frac{[X]\,[Y]^2}{[Z]}$ [3] $K_c = \frac{[Z]}{[X]^2\,[Y]}$ [4] $K_c = \frac{[Z]}{[X]\,[Y]^2}$

Q.32 For the chemical reaction $3X(g) + Y(g) \rightleftharpoons X_3Y(g)$, the amount of X_3Y at equilibrium is affected by - **[IIT-1999]**

[1] Temperature and pressure

[2] Temperature only

[3] Pressure only

[4] Temperature, pressure and catalyst

Q.33 Consider the imaginary equilibrium : $4A + 5B \rightleftharpoons 4X + 6Y$ **[RPMT-2000]**

The equilibrium constant K_c has the unit

[1] Mole^2 litre^{-2} [2] Litre mole^{-1} [3] Mole litre^{-1} [4] Litre^2 mole^{-2}

Q.34 Two moles of PCl_5 were heated in a closed vessel of 2 litre capacity. At equilibrium 40% of PCl_5 was dissociated into PCl_3 and Cl_2. The value of equilibrium constant **[RPMT-2000]**

[1] 0.267 [2] 0.53 [3] 2.67 [4] 5.3

Q.35 Relationship between, K_p and K_c for gaseous equilibrium is **[RPMT-2000]**

[1] $K_p = (K_c)^{\Delta n} RT$ [2] $K_p = K_c(RT)^{\Delta n}$ [3] $K_c = (K_p)^{\Delta n} RT$ [4] $K_c = K_p (RT)^{\Delta n}$

Q.36 If X is the degree of dissociation for the reaction $N_2O_4 \rightleftharpoons 2NO_2$. What are the total number of moles at equilibrium **[RPMT-20001]**

[1] 1 [2] 2 [3] 1 + X [4] $(1 - X)^2$

Q.37 For a reversible reaction forward and backward rate constant respectively are 2.5×10^{-4} and 7.5×10^{-4} . What is the value of equilibrium constant **[RPMT-2001]**

[1] 3 [2] 1/3 [3] 1 [4] None

Q.38 In which of the following equilibrium, change in the volume of the system does not alter the number of moles

[1] $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$ [2] $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$ **[AIEEE-2002]**

[3] $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ [4] $SO_2Cl_2 \rightleftharpoons SO_2(g) + Cl_2(g)$

Q.39 For the reaction $CO(g) + \frac{1}{2}O_2(g) \rightleftharpoons CO_2(g)$, K_p/K_c is **[AIEEE-2002]**

[1] RT [2] $(RT)^{-1}$ [3] $(RT)^{-1/2}$ [4] $(RT)^{1/2}$

Q.40 If the equilibrium constant for the reaction **[RPMT-2002]**

$N_2 + 3H_2 \rightleftharpoons 2NH_3$, is K then the equilibrium , constant for the reaction

$2N_2 + 6H_2 \rightleftharpoons 4NH_3$, would be equal to

[1] K^2 [2] $\sqrt{K}$ [3] $\frac{1}{\sqrt{K}}$ [4] $\frac{1}{K^2}$

Q.41 The reaction quotient (Q) for the reaction **[CBSE-PMT-2003]**

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ is given by $Q = \frac{[NH_3]^2}{[N_2][H_2]^3}$. The reaction will proceed from right to left if

[1] $Q < K_c$ [2] $Q > K_c$ [3] Q = 0 [4] $Q = K_c$

Q.42 The following equilibria are given **[CBSE-PMT-2003]**

$N_2 + 3H_2 \rightleftharpoons 2NH_3$ .... K_1 $N_2 + O_2 \rightleftharpoons 2NO$ .... K_2

$H_2 + \frac{1}{2}O_2 \rightleftharpoons H_2O$ .... K_3

The equilibrium constant of the reaction $2NH_3 + \frac{5}{2}O_2 \rightleftharpoons 2NO + 3H_2O$, in terms of K_1 . K_2 and K_3 is **[CBSE-PMT-2003]**

[1] $K_1 \ K_2 / K_3$ [2] $K_1 K_3^2/K_2$ [3] $K_2 K_3^3 / K_1$ [4] $K_1 K_2 K_3$

Q.43 For the reaction equilibrium $N_2O_4(g) \rightleftharpoons 2NO_2(g)$ the concentrations of N_2O_4 and NO_2 at equilibrium are 4.8×10^{-2} and 1.2×10^{-2} mol L^{-1} respectively. The value of K_c for the reaction is **[AIEEE-2003]**

[1] 3×10^3 mol L^{-1} [2] 3.3×10^2 mole L^{-1} [3] 3×10^{-1} mol L^{-1} [4] 3×10^{-3} mol L^{-1}

Q.44 What is the equilibrium expression for the reaction $P_4(s) + 5O_2 \rightleftharpoons P_4O_{10}(s)$? **[AIEEE-2004]**

[1] $K_C = 1/[O_2]^5$ [2] $K_C = [P_4O_{10}]/5[P_4][O_2]$ [3] $K_C = [O_2]^5$ [4] $K_C = [P_4O_{10}]/[P_4][O_2]^5$

Q.45 For the reaction $CO(g) + Cl_2(g) \rightleftharpoons COCl_2(g)$ the K_P/K_c is equal to: **[AIEEE-2004]**

[1] 1.0 [2] RT [3] $\sqrt{RT}$ [4] 1/RT

Q.46 The equilibrium constant for the reaction $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$ at the temperature T is 4×10^{-4}. The value of K_c for the reaction $NO(g) \rightleftharpoons \frac{1}{2}N_2(g) + \frac{1}{2}O_2(g)$ at the same temperature is **[AIEEE-2004]**

[1] 0.02 [2] 50 [3] 4×10^{-4} [4] 2.5×10^2

Q.47 For the reaction **[AIEEE 2005]**

$2NO_2(g) \rightleftharpoons 2NO(g) + O_2(g)$ ($K_c = 1.8 \times 10^{-6}$ at 184ºC) (R = 0.0831 kJ/(mol.K))

When K_p and K_c are compared at 184ºC 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

Q.48 The exothermic formation of ClF_3 is represented by the equation **[AIEEE 2005]**

$Cl_2(g) + 3F_2(g) \rightleftharpoons 2ClF_3(g)$; $\Delta H = -329$ kJ

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

Q.49 The equilibrium constant for the reaction $SO_3(g) \rightleftharpoons SO_2(g) + \frac{1}{2}O_2(g)$ is $K_c = 4.9 \times 10^{-2}$. The value of K_c for the reaction $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ will be - **[AIEEE - 2006]**

[1] 2.40×10^{-3} [2] 9.8×10^{-2} [3] 4.9×10^{-2} [4] 416

Q.50 Phosphorus pentachloride dissociates as follows, in a closed reaction vessel, $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$, If total pressure at equilibrium of the reaction mixture is P and degree of dissocition of PCl_5 is x, the partial pressure of PCl_3 will be - **[AIEEE - 2006]**

[1] $\left(\frac{2x}{1-x}\right)P$ [2] $\left(\frac{x}{x-1}\right)P$ [3], $\left(\frac{x}{1-x}\right)P$ [4] $\left(\frac{x}{x+1}\right)P$

Q.51 For the reaction $CH_4(g) + 2O_2(g) \rightleftharpoons CO_2(g) + 2H_2O(\ell)$, $\Delta_rH = -170.8$ kJ mol^{-1}, which of the following statements is not true ? **[CPMT - 2006]**

[1] The equilibrium constant for the reaction is given by $K_P = \frac{[CO_2]}{[CH_4][O_2]}$

[2] Addition of $CH_4(g)$ or $O_2(g)$ at equilibrium will cause a shift to the right

[3] The reaction is exothermic

[4] At equilibrium the concentration of $CO_2(g)$ and $H_2O(\ell)$ are not equal

Q.52 A mixture of ethyl alcohol and propyl alcohol has a vapour pressure of 290 mm at 300 K. The vapour pressure of propyl alcohol is 200 mm. If the mole fractionof ethyl alcohol is 0.6, its vapour pressure (in mm) at the same temperature will be

[1] 700 [2] 360 [3] 350 [4] 300 **[AIEEE - 2007]**

Answer Key

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	2	4	1	3	4	1	3	3	3	4	1	4	3	4	2	2	2	4	4	4
Qus.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	4	3	3	2	4	2	3	1	1	3	3	1	3	1	2	3	2	1	3	1
Qus.	41	42	43	44	45	46	47	48	49	50	51	52								
Ans.	2	3	4	1	4	2	4	1	4	4	1	3								