Delight classes

CHEMICAL EQUILIBRIUM

1	Given , $X(g) \rightleftharpoons nY(g);$ If degree of dissociation is α then K_C of the reaction in a vessel of 1 Liter is 1) $\frac{n\alpha^n}{1-\alpha}$ 2) $\frac{n\alpha}{1-\alpha}$ 3) $\frac{(n\alpha)^n}{1+\alpha}$ 4) $\frac{(n\alpha)^n}{1-\alpha}$
2	For the reaction $A(g)+3B(g) \rightleftharpoons 2C(g)$ at 27^0C, 2 moles of A , 4 moles of B and 6 moles of C are present in 2 litre vessel. If K_c for the reaction is 1.2, the reaction will proceed in 1) forward direction 2) backward reaction 3) neither direction 4) none of these
3	At 527^0C, the reaction given below has $K_c = 4$ $NH_3(g) \rightleftharpoons \frac{1}{2}N_2(g)+\frac{3}{2}H_2(g)$ What is the K_p for the reaction? $N_2(g)+3H_2(g) \rightleftharpoons 2NH_3(g)$ 1) $16\times(800R)^2$ 2) $\left(\frac{800R}{4}\right)^{-2}$ 3) $\left(\frac{1}{4\times 800R}\right)^2$ 4) None of these 2)
4	For the equilibrium $SO_2Cl_2(g) \rightleftharpoons SO_2(g)+Cl_2(g)$ what is the temperature at which $\frac{K_p(atm)}{K_c(M)}=3$ 1) 0.027 K 2) 0.36 K 3) 36.54 K 4) 273 K
5	For the reaction $CO(g)+Cl_2(g) \rightleftharpoons COCl_2(g)$ the value of $\frac{K_c}{K_p}$ is equal to 1) $\sqrt{RT}$ 2) RT 3) $\frac{1}{RT}$ 4) 1.0
6	For the reaction $2NO_2(g)+\frac{1}{2}O_2(g) \rightleftharpoons N_2O_5(g)$, if the equilibrium constant is K_p, then the equilibrium constant for the reaction $2N_2O_5(g) \rightleftharpoons 4NO_2(g)+O_2(g)$ would be 1) K_p^2 2) $\frac{2}{K_p}$ 3) $\frac{1}{K_p^2}$ 4) $\frac{1}{\sqrt{K_p}}$

7	Consider the following gaseous equilibria given below I) $N_2 + 3H_2 \rightleftharpoons 2NH_3$; Eqm. Constant = K_1 II) $N_2 + O_2 \rightleftharpoons 2NO$; Eqm. Constant = K_2 III) $H_2 + \frac{1}{2}O_2 \rightleftharpoons H_2O$; Eqm constant = K_3 The equilibrium constant for the reaction $2NH_3 + \frac{5}{2}O_2 \rightleftharpoons 2NO + 3H_2O$; in terms of K_1, K_2 and K_3 will be 1) $K_1K_2K_3$ 2) $\frac{K_1K_2}{K_3}$ 3) $\frac{K_1K_3^2}{K_2}$ 4) $\frac{K_2K_3^3}{K_1}$
8	In the reaction $X(g) + Y(g) \rightleftharpoons 2Z(g)$, 2 mole of X, 1 mole of Y and 1 mole of Z are placed in a 10 litre vessel and allowed to reach equilibrium. If final concentration of Z is 0.2 M, then K_c for the given reaction is 1) 1.60 2) $\frac{80}{3}$ 3) $\frac{16}{3}$ 4) None of these
9	For the reaction $2A(g) \rightleftharpoons B(g) + 3C(g)$ at a given temperature $K_c = 16$. What must be the volume of the flask, if a mixture of 2 mole each of A, B and C exist in equilibrium? 1) $\frac{1}{4}$ 2) $\frac{1}{2}$ 3) 1 4) None of these
10	When heated, ammonium carbamate decomposes as follows $NH_4COONH_2(s) \rightleftharpoons 2NH_3(g) + CO_2(g)$ At a certain temperature, the equilibrium pressure of the system is 0.318 atm. K_p for the reaction is 1) 0.128 2) 0.426 3) 4.76×10^{-3} 4) None of these
11	The equilibrium constant K_p for the reaction $H_2(g) + CO_2(g) \rightleftharpoons H_2O(g) + CO(g)$ Is 4.0 at $1660^0 C$. Initially 0.80 mole H_2 and 0.80 mole CO_2 are injected into a 5.0 litre flask. What is the equilibrium concentration of $CO_2(g)$? 1) 0.533 M 2) 0.0534 M 3) 0.535 M 4) None of these
12	The equilibrium constant for the reaction $CO(g) + H_2O(g) \rightleftharpoons CO_2(g) + H_2(g)$ is 5. How many moles of CO_2 must be added to 1 litre container already containing 3 moles each of CO and H_2O to make 2M equilibrium concentration of CO? 1) 15 2) 19 3) 5 4) 20
13	At $27^0 C$ and 1 atm pressure, N_2O_4 is 20% dissociation in 1 litrs container into NO_2. According to following equation $N_2O_4 \rightleftharpoons 2NO_2$, What is K_C 1)0.2 M 2)0.4 M 3) 0.8 M 4) 0.1 M

14	Determine the value of equilibrium constant (K_c) for the reaction $A_2(g)+B_2(g)\rightleftharpoons 2AB(g)$ If 10 moles of A_2 ; 15 moles of B_2 and 5 moles of AB are placed in a 2 litre vessel and allowed to come to equilibrium. The final concentration of AB is 7.5M 1) 4.5 2) 1.5 3) 0.6 4) None of these
15	Cu^{2+} ions react with Fe^{2+} ions according to the following reaction $Cu^{2+}+2Fe^{2+}\rightleftharpoons Cu+2Fe^{3+}$ At equilibrium, the concentration of Cu^{2+} ions is not changed by addition of 1) Cu^{2+} 2) Fe^{2+} 3) Cu 4) Fe^{3+}
16	$AB_3(g)$ is dissociates as $AB_3(g)\rightleftharpoons AB_2(g)+\frac{1}{2}B_2(g)$ When the initial pressure of AB_3 is 800 torr and the total pressure developed at equilibrium is 900 torr. What fraction of $AB_3(g)$ is dissociated? 1) 10%2) 20% 3) 25% 4) 30%
17	At 1000 K, a sample of pure NO_2 gas decomposes as $2NO_2(g)\rightleftharpoons 2NO(g)+O_2(g)$ The equilibrium constant K_p is 156.25 at,. Analysis shows that the partial pressure of O_2 is 0.25 atm at equilibrium. The partial pressure of NO_2 at equilibrium is 1) 0.01 2) 0.02 3) 0.04 4) None of these
18	For the dissociation reaction $N_2O_4(g)\rightleftharpoons 2NO_2(g)$, the degree of dissociation (α) in terms of K_p and total equilibrium pressure P is 1) $\alpha=\sqrt{\frac{4P+K_p}{K_p}}$ 2) $\alpha=\sqrt{\frac{K_p}{4P+K_p}}$ 3) $\alpha=\sqrt{\frac{K_p}{4P}}$ 4) None of these
19	The vapour pressure of mercury is 0.002 mm Hg at 27^0C, K_c for the process $Hg(l)\rightleftharpoons Hg(g)$ **is** 1) 0.002 M 2) 8.12×10^{-5} M 3) 6.48×10^{-5} M 4) 1.068×10^{-7} M
20	K_p has the value of $10^{-6}\ atm^3$ and $10^{-4}\ atm^3$ at 298K and 323 K respectively for the reaction $CuSO_4.3H_2O(s)\rightleftharpoons CuSO_4(s)+3H_2O(g)$ Δ_rH^0 for the reaction is 1) 7.7 kl/ mol 2) -147.41 kJ/mol 3) 147.41 kJ/mol 4) None of these
21	The most stable oxides of nitrogen will be 1) $2NO_2(g)\rightleftharpoons N_4(g)+2O_2(g);\ K=6.7\times10^{16}mol\,L^{-1}$ 2) $2N_2O_5(g)\rightleftharpoons 2N_2(g)+5O_2(g);\ K=1.2\times10^{24}mol^5\,L^{-5}$ 3) $2NO(g)\rightleftharpoons N_2(g)+O_2(g);\ K=2.2\times10^{30}$ 4) $2N_2O(g)\rightleftharpoons 2N_2(g)+O_2(g);\ K=3.5\times10^{33}mol\ \ L^{-1}$

22 The following equilibrium constants were determined at 1120 K:

$$2CO(g) \rightleftharpoons C(s) + CO_2(g); \quad K_{p1} = 10^{-14}\ atm^{-1}$$

$$CO(g) + Cl_2(g) \rightleftharpoons COCl_2(g); \quad K_{p2} = 6\times10^{-3}\ atm^{-1}$$

What is the equilibrium constant K_c for the following reaction at 1120 K

$$C(s) + CO_2(g) + 2Cl_2(g) \rightleftharpoons 2COCl_2(g)$$

1) $3.31\times10^{11}\,M^{-1}$ 2) $5.5\times10^{10}\,M^{-1}$ 3) $5.51\times10^{6}\,M^{-1}$ 4) None of these

23 One mole of $N_2(g)$ is mixed with 2 moles of $H_2(g)$ in a 4 litre vessel. If 50% of $N_2(g)$ is converted to $NH_3(g)$ by the following reaction:

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

What will be the value of K_c for the following equilibrium?

$$NH_3(g) \rightleftharpoons \frac{1}{2}N_2(g) + \frac{3}{2}H_2(g)$$

1) 256   2) 16   3) $\frac{1}{16}$ 4) None of these

24 Consider the reaction ,whose $K_c = 33$,

$SO_2(g) + NO_2(g) \rightleftharpoons SO_3(g) + NO(g)$ If 0.1 mol each of SO_2 and NO_2 at are placed in 1 L container, What is the concentration of SO_3 at equilibrium?

1) 0.003 M   2) 0.015 M   3) 0.085 M   4) 0.097 M

25 Consider the partial decomposition of A as

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

At equilibrium 700 mL gaseous misture contains 100 mL of gas C at 10 atm and 300K. What is the value of K_p for the reaction?

1) $\frac{40}{7}$ 2) $\frac{1}{28}$ 3) $\frac{10}{28}$ 4) $\frac{28}{10}$

26 What concentration of CO_2 be in equilibrium with 0.025 M CO at 120^0 for the reaction

$FeO(s) + CO(g) \rightleftharpoons Fe(s) + CO_2(g)$ If the value of $K_C = 5.0$?

1) 0.125 M   2) 0.0125 M   3) 1.25 M   4) 12.5 M

27 For the reaction, $2A + B \rightleftharpoons 3C$ equilibrium constant is K. If the concentration of A is increased by 2 times, the new equilibrium constant will be

1) $2K$ 2) $\frac{K}{2}$ 3) $4K$ 4) K

28 Two moles of PCl_5 are heated in a closed vessel of 2 litre capacity . When the equilibrium is attained 40% of it has been found to dissociated .What is the value of K_C in mol/ dm^3

1) 0.532   2) 0.266   3) 0.133   4) 0.174

29	One mole of SO_3 was placed In a two litre vessel at a certain temperature. The following equilibrium was established in the vessel $2SO_3(g) \rightleftharpoons 2SO_2(g)+O_2(g)$ The equilibrium mixture reacted with 0.2 mole $KMnO_4$ in acidic medium. Hence K_c is 1) 0.50 2) 0.25 3) 0.125 4) None of these
30	**Two solid compounds X and Y dissociates at a certain temperature as follows** $X(s) \rightleftharpoons A(g)+2B(g); K_{p1}=9\times10^{-3}\ atm^3$ $Y(s) \rightleftharpoons 2B(g)+C(g); K_{p2}=4.5\times10^{-3}\ atm^3$ **The total pressure of gases over a mixture of X and Y is** 1) 4.5 atm 2) 0.45 atm 3) 0.6 atm 4) None of these
31	**1 mol of N_2 is mixed with 3 mol of H_2 in a litre containter .If 50% of N_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 at the equilibrium are** 1) 1.5 2) 4.5 3) 3.0 4) 6.0
32	47. Which one of the following is not a reversible reaction 1) $2HI \rightleftharpoons H_{2(g)}+I_{2(g)}$ 2) $PCl_{5(g)} \rightleftharpoons PCl_{3(g)}+Cl_{2(g)}$ 3) $2KClO_{3(s)} \rightleftharpoons 2KCl_{(s)}+3O_{2(g)}$ 4) $N_{2(g)}+3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$
33	8.50g of NH_3 is present in 250 ml volume. Its active mass is 1) 1.0 Mole L^{-1} 2) 0.5 Mole L^{-1} 3) 1.5 Mole L^{-1} 4) 2.0 Mole L^{-1}
34	What is the equilibrium constant expression for thereaction, $P_{4(s)}+5O_{2(g)} \rightleftharpoons P_4O_{10(s)}$? 1) $K_C=\frac{[P_4O_{10}]}{[P_4][O_2]^5}$ 2) $K_C=\frac{[P_4O_{10}]}{5[P_4][O_2]}$ 3) $K_C=[O_2]^5$ 4) $K_C=\frac{1}{[O_2]^5}$
35	Equilibrium constant for the reaction, $2NO_{(g)}+Cl_{2(g)} \rightleftharpoons 2NOCl_{(g)}$ is correctly given by the expression 1) $K=\frac{[NOCl]^2}{[NO]^2[Cl_2]}$ 2) $K=\frac{[2NoCl]}{[2No][Cl_2]}$ 3) $K=\frac{[NO]^2+[Cl_2]}{[NOCl]}$ 4) $K=\frac{[NO]^2[Cl^2]}{[NOCl]^2}$

36	For the reaction $AB_{(g)} \rightleftharpoons A_{(g)} + B_{(g)}$, AB is 33% dissociated at a total pressure of P, therefore P is related to K_p by one of the following option? 1) P= K_p 2) P =3K_p 3) P =4 K_p 4)P=8K_p
37	For a system, A+2B$\rightleftharpoons$C, the equilibrium concentration are [A] =0.06, [B]=0.12 & [C]=0.216. the K_c for the reaction is 1) 125 2) 415 3) 4×10^{-3} 4) 250
38	The equilibrium concentration of x, y & yx_2 are 4, 2 & 2 respectively for the equilibrium $2x + y \rightleftharpoons yx_2$. The value of equilibrium constant, K_c is 1) 0.625 2)6.25 3) 0.0625 4) 62.5
39	For the reaction, $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$ the equilibrium constant K_p changes with 1) Total pressure 2) Catalyst 3) The amounts of H_2& I_2 taken 4) Temperature .
40	3.1 mol of $FeCl_3$ and 3.2 mol of NH_4SCN are added to one litre of water. At equilibrium, 3.0 mol of Fe SCN^{+2} are formed. The equilibrium constant K_C of the reaction $Fe^{+3} + SCN^- \rightleftharpoons FeSCN^{+2}$ will be 1) 6.66×10^{-3} 2) 0.30 3) 3.30 4) 150
41	The equilibrium constant for the given reaction is 100. $N_{2(g)} + 2O_{2(g)} \rightleftharpoons 2NO_{2(g)}$ What is the equilibrium constant for the reaction given below $NO_2(g) \rightleftharpoons \frac{1}{2}N_{2(g)} + O_{2(g)}$ 1) 10 2) 1 3) 0.1 4) 0.01
42	In which of the following reactions K_p is less than K_C? 1) $N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$ 2) $2HI_{(g)} \rightleftharpoons H_{2(g)} + I_{2(g)}$ 3) $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$ 4) $PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$

43	Equilibrium constant depends on 1) The actual quantities of reactants and products 2) The presence of a catalyst 3) Temperature 4) The presence of inert material
44	15 moles of H_2 and 5.2 moles of I_2 are mixed and allowed to attain equilibrium at 500^0C. At equilibrium the concentration of HI is found to be 10 moles. The equilibrium constant for the formation of HI is 1)50 2)15 3)100 4) 25
45	If different quantities of methanol and acetic acid are used in the following reversible reaction at constant temperature. $H_3CCOOH_{(l)} + CH_3OH_{(l)} \rightleftharpoons H_3C\,COOH_{(l)} + H_2O_{(l)}$ Equilibrium constant will have values which will be? 1) Different in all cases 2) Same in all cases 3) Higher in cases where higher concentrations of ethanol is used 4) Higher in cases where higher concentration of acetic acid is used
46	The unit of equilibrium constant, K_c for the reaction $A + B \rightleftharpoons C$ would be 1) Mol^{-1} L 2) Mol L^{-1} 3) mol L 4) no unit
47	The units of K_p in the following reaction are $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$ 1) atm 2) atm^{-2} 3) atm^2 4) atm^{-1}
48	In a general reaction, $A + B \rightleftharpoons AB$, which value of equilibrium constant most favours the production of AB? 1) 9.0×10^{-3} 2) 3.5×10^{-3} 3) 4.0×10^{-7} 4) 4.0×10^{-12}
49	During thermal dissociation of a gas, the vapour density 1) Remains the same 2) Increases 3) Decreases 4) Increases in some cases and decreases in others .

50	The vapour density fully dissociated NH_4Cl would be 1) Less than half of the vapour density of pure NH_4Cl 2) Double of the vapour density of pure NH_4Cl 3) Half of the vapour density of pure NH_4Cl 4) One third of the vapour density of pure NH_4Cl
51	In lime kilns, the following reversible reaction, $CaCO_{3(s)} \rightleftharpoons CaO_{(s)} + CO_{2(g)}$ proceeds completion because of 1) High temperature 2) CO_2 escapes 3) Low temperature 4) Molecular mass of CaO is less than that of $CaCO_3$
52	For the reaction, $C_{(s)} + CO_{2(g)} \rightleftharpoons 2Co(g)$. The partial pressure of CO_2& CO are 2.0 & 4.0 atm respectively, at equilibrium. The value of K_p of the reaction is 1) 0.5 2) 4.0 3) 32.0 4) 8.0
53	Lechatelier's principle is applicable to 1) Only homogeneous chemical reversible reactions 2) Only heterogeneous chemical reversible reactions 3) Only physical equilibrium 4) All systems, chemical or physical , in equilibrium
54	For the following reaction at 250^0C, the value of K_c is 26. Then the value of K_p at the same temperature will be $PCl_{3(g)} + Cl_{2(g)} \rightleftharpoons PCl_{5(g)}$ 1) 0.57 2) 0.61 3) 0.83 4)0.91
55	Manufacture of SO_3, $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)} + X\,cal$, most favourable conditions of temperature and pressure for greater yield of SO_3 are 1) Low temperature and low pressure 2) High temperature and low pressure 3) High temperature and low pressure 4) Low temperature and high pressure
56	In the reaction $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)} \Delta H = -93.6kJ$, the yield of ammonia does not increase when 1) Pressure is increased 2) Pressure is decreased 3) Temperature is lowered 4) Volume of the reaction vessel is decreased

57	In an exothermic reaction, a 10^0C rise in temperature will 1) Decrease the value of equilibrium constant 2) Double the value of equilibrium constant 3) Not produce any change in equilibrium constant 4) Produce some increase in equilibrium constant
58	If K_p for a reaction, 0.05 atm at 1000k, its K_c in terms of R will be 1) 20000 R 2) 0.02 R 3) 5×10^{-5} 4) $\frac{5\times10^{-5}}{R}$
59	XY_2 dissociates as $XY_{2(g)} \rightleftharpoons XY_{(g)} + Y_{(g)}$. Initial pressure of XY_2 is 600mm hg. The total pressure at equilibrium is 800mm hg. Assuming volume of system to remain constant, the value of K_p is 1) 50 2) 100 3) 200 4) 400
60	Which of the following reaction will be favoured at low pressure? 1) $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$ 2) $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$ 3) $PCl_{5(g)} \rightleftharpoons PCl_3 + Cl_{2(g)}$ 4) $N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$
61	K_p/K_c for the reaction, $CO_{(g)} + \frac{1}{2}O_{2(g)} \rightleftharpoons CO_{2(g)}$ is 1) RT 2) $\frac{1}{\sqrt{RT}}$ 3) $\sqrt{RT}$ 4) 1
62	For the reactions, $A \rightleftharpoons B, K_C = 1;\ \ B \rightleftharpoons C, K_C = 3$ $C \rightleftharpoons D, K_C = 5$ K_c for the reaction $A \rightleftharpoons D$ is 1) 15 2) 5 3) 3 4) 1
63	The equilibrium constant of the reaction , $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$ iiis 50. If the volume of the container is reduced to one half of its original value, the equilibrium constant will be 1) 25 2) 50 3) 75 4) 10

64	In gaseous equilibrium the correct relation between K_c& K_p is 1) $K_c = K_p(RT)^{\Delta n}$ 2) $K_p = K_c(RT)^{\Delta n}$ 3) $\frac{K_C}{RT} = (K_p)^{\Delta n}$ 4) $\frac{K_p}{RT} = (K_c)^{\Delta n}$
65	In which of the following equilibrium K_c& K_p are not equal? 1) $2NO_{(g)} \rightleftharpoons N_{2(g)} + O_{2(g)}$ 2) $SO_{2(g)} + NO_{2(g)} \rightleftharpoons SO_{3(g)} + NO_{(g)}$ 3) $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$ 4) $2C_{(s)} + O_{2(g)} \rightleftharpoons 2CO_{2(g)}$
66	The reaction quotient Q for $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$ is given by $Q = \frac{[NH_3]^2}{[N_2][H_3]^3}$. The reaction will proceed in backward direction when 1) $Q = K_c$ 2) $Q < K_c$ 3) $Q > K_c$ 4) $A = 0$
67	For the reaction $PCl_{3(g)} + Cl_{2(g)} \rightleftharpoons PCl_{5(g)}$. The value K_p at 250^0C is 0.61 atm^{-1}. The value of K_c at this temperature will be 1) 15 $(mol/L)^{-1}$ 2) 26 $(mol/L)^{-1}$ 3) 35$(mol/L)^{-1}$ 4) 52 $(mol/L)^{-1}$
68	Consider the reaction, $CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$ in a closed container at equilibrium. What would be the effect of addition of $CaCO_3$ on the equilibrium concentration of CO_2? 1) Increases 2) Unpredictable 3) Decreases 4) Remains unaffected
69	Ka_1, Ka_2 and Ka_3 are the respective ionisation constants for the following reactions. $H_2S \rightleftharpoons H^+ + HS^-$ $HS^- \rightleftharpoons H^+ + S^{2-}$ $H_2S \rightleftharpoons 2H^+ + S^{2-}$ The correct relationship between Ka_1,Ka_2 and Ka_3 is 1) $Ka_3 = Ka_1 \times Ka_2$ 2) $Ka_3 = Ka_1 + Ka_2$ 3) $Ka_3 = Ka_1 - Ka_2$ 4) $Ka_3 = Ka_1 / Ka_2$

70	One mole each of 'A' and 'B' and 3 mole each of 'C' and 'D' are placed in 1-L flask, if equilibrium constant is 2.25 for $A+B \rightleftharpoons C+D$, equilibrium concentrations of 'A' and 'C' will be in the ratio of 1) 3 : 2 2) 1 : 2 3) 2 : 3 4) 2 : 1
71	In the reaction $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$ at equilibrium 2 moles of SO_2, 1 mole of O_2, 2 moles of SO_3 are present in 1litre vessel. To have 3moles of SO_3 at equilibrium additional moles of dioxygen required under similar experimental conditions is 1) 0.5 2) 9 3) 4.5 4) 8.5
72	In the process $I_2 + I^- \rightleftharpoons I_3^-$ (in aqueous medium), initially there are 2 mole I_2 and 2 mole I^-. But at equilibrium due to addition of $AgNO_{3(aq)}$, 1.75 moles of yellow ppt is obtained. K_C for the process is ($V_{flask} = 1dm^3$) nearly 1) 0.08 2) 0.02 3) 0.16 4) 0.12
73	A 2 litre vessel contains 2 moles of H_2 and 4 moles of HI. 50% of the reaction has completed for the attainment of equilibrium. The value of K_C for the reaction $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$ is 1) 0.75 2) 1.33 3) 2.45 4) 0.54
74	$NH_4HS(s) \rightleftharpoons NH_3(g) + H_2S(g)$ The equilibrium pressure at 25°C is 0.660 atm. What is K_p for the reaction? 1) 0.109 2) 0.218 3) 1.89 4) 2.18
75	At a certain temperature, only 50% HI is dissociated at equilibrium in the following reaction: $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$ The equilibrium constant for this reaction is 1) 0.25 2) 1.0 3) 3.0 4) 0.5
76	For reaction, $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$, the value of K_C at 250^0C is 26. The value of K_P at this temperature will be 1) 0.014 2) 0.83 3) 0.57 4) 0.46

KEY

1	Ans-4 **Sol:** $x \Leftrightarrow ny$ $1-\alpha \quad n\alpha$ $K_C = \dfrac{(n\alpha)^n}{1-\alpha}$
2	Ans-1 **Sol:** $Q_C = \dfrac{\left(\frac{6}{2}\right)^2}{\left(\frac{2}{3}\right)\left(\frac{4}{3}\right)^3} = \dfrac{9}{8}$ $Q_C < K_C$ so reaction will proceed in forward direction
3	Ans-3 **Sol:** $K_p = (\dfrac{1}{K_C RT})^2 = (\dfrac{1}{4\times R\times 800})^2$
4	Ans-3 **Sol:** $\dfrac{K_p}{K_C} = 3 = R\times T = 0.0821T$
5	Ans-2 **Sol:** $\dfrac{K_p}{K_C} = RT[(\Delta n = 1)]$
6	Ans-3 **Sol:** $K = \dfrac{1}{K_p{}^2}$
7	Ans-4 **Sol:** **Relation between constants**
8	Ans-3 **Sol:** $x + y \rightleftharpoons 2Z$ $0.2-x \quad 0.1-x \quad 0.1+2x$

9	Ans-2 **Sol:** $K_c = \frac{n_B n_C^3}{n_A^2} \times \frac{1}{V^2}$ $16 = \frac{2\times 2^3}{2^2 \times V^2} \Rightarrow V = \frac{1}{2}$
10	Ans-3 **Sol:** $P_{total} = 3P$ $\Rightarrow P = \frac{0.318}{3} = 0.106$ $\therefore K_p = 4P^3 = 4.76\times 10^{-3}$
11	Ans-2 **Sol:** $H_2(g) + CO_2(g) \rightleftharpoons H_2O + CO(g)$ Moles of eqm 0.8-x 0.8-x x x Conc. at eqm $\frac{0.8-x}{5}\left(\frac{0.8-x}{5}\right)\left(\frac{x}{5}\right)\left(\frac{x}{5}\right)$ $\therefore \Delta n_g = 0$ $\therefore K_c = \frac{\left(\frac{x}{5}\right)^2}{\left(\frac{0.8-x}{5}\right)^2}$ $2 = \frac{x}{0.8-x}$ $x = 0.533$ $[CO_2(g)] = \frac{0.8-0.533}{5}$ $0.267 \div 5 = 0.0534$
12	Ans-2 **Sol:** $CO + H_2O \rightleftharpoons CO_2 + H_2$ initial conc. 3 3 x 0 At eqm 2 2 $(x+1)$ 1 $5 = \frac{(x+1)}{4} = 20 = x+1$ $x = 19$

13	Ans-1 **Sol:** $N_2O_4 \rightleftharpoons 2NO_2$ $1-X \quad\quad 2X$ $0.8 \quad\quad 0.4$ $K_C = \frac{0.4\times0.4}{0.8}$
14	Ans-1 **Sol:** $A_2(g)+B_2(g) \rightleftharpoons 2AB(g)$ $initial\ conc \quad 10/2 \quad 15/2 \quad 5/2$ $At\ eqm \quad 5-x \quad 7.5-x \quad 2.5+2x$ $\therefore 2.5+2x=7.5$ $\Rightarrow x=2.5$ $K_C=\frac{(7.5)^2}{2.5\times5}=4.5$
15	Ans-3 **Sol:** Solid does not effect $P_{Cl_2} = P_{PCl_3}$ $\Rightarrow 2\times0.40 = 0.80\,atm$ $P_{PCl_5} = 2\times0.2 = 0.40\,atm$ $\therefore K_P = \frac{P_{PCl_3}.P_{Cl_2}}{P_{PCl_5}}$ $= \frac{0.80\times0.80}{0.40}$ $=1.6\ atm$
16	Ans-3 **Sol:** $AB_3(g) \rightleftharpoons AB_2(g)+\frac{1}{2}B_2(g)$ $At\ eqm \quad 800-x \quad x \quad x/2$ $800-x+x+\frac{x}{2}=900 \Rightarrow x=200$ $\%Dissociated=\frac{200}{800}\times100=25$
17	Ans-2 **Sol:** $K_p = 156.27 = \frac{P_{NO}{}^2\times0.25}{P_{NO2}{}^2}$

18	Ans-2 **Sol:** $N_2O_4 \rightleftharpoons 2NO_2$ $1-\alpha \quad 2\alpha$ $K_p = \dfrac{(\frac{2\alpha}{1+\alpha} \times P)^2}{(\frac{1-\alpha}{1+\alpha} \times P)}$
19	Ans-4 **Sol:** $K_c = \dfrac{K_p}{RT} = \dfrac{0.002/760}{0.0821 \times 300}$
20	Ans-3 **Sol:** $\log \dfrac{K_2}{K_1} = \dfrac{\Delta H}{2.303R} \times \dfrac{T_2 - T_1}{T_1 \times T_2}$
21	Ans-1 **Sol:** **Less K more stable**
22	Ans-1 **Sol:** Relation between constants
23	Ans-3 **Sol:** $N_2 + 3H_2 \rightleftharpoons 2NH_3$ At .eq.st $0.125 \quad 0.125 \quad 0.25$ $K_C = \dfrac{(0.25)^2}{(0.125)(0.125)^3} = 256$
24	Ans-3 **Sol:** $SO_2 + NO_2 \rightleftharpoons SO_3 + NO$ $0.1 \quad 0.1 \quad 0 \quad 0$ $0.1-x \quad 0.1-x \quad x \quad x$ $33 = \dfrac{x^2}{(0.1-x)^2}$
25	Ans-3 **Sol:** (c) ∵ Initially only A is present so at eqm B and C should be present in 2:1 $2A(g) \rightleftharpoons 2B(g) + C(g)$ At eqm 400mL 200mL 100mL For ideal gases volume % = mole % $K_P = \dfrac{(\frac{200}{700} X10)^2 (\frac{100}{700} X10)}{(\frac{400}{700} X10)^2} = \dfrac{10}{28}$ =0.133 atm

26	Ans-1 **Sol:** $K_C = 5 = \frac{[CO_2]}{[CO]}$
27	Ans-4 **Sol:** K is constant
28	Ans-2 Sol: $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ $\frac{2-0.8}{2} \quad \frac{0.8}{2} \quad \frac{0.8}{2}$
29	Ans-3 **Sol:** $2SO_3(g) \rightleftharpoons 2SO_2(g) + O_2(g)$ Moles at eqm $1-2x \quad 2x \quad x$ Only $SO_2(O.\text{No} = 4)$ Will be oxidined so equivalent of SO_2=equivalent of $KMnO_4$ $2x \times 2 = 0.2 \times 5$ $\Rightarrow \quad 2x = 0.5$ $K_0 = \frac{[\frac{0.5}{2}]^2[\frac{0.25}{2}]}{[\frac{0.5}{2}]} = 0.125$
30	Ans-2 **Sol:** relation between K
31	Ans-3 **Sol:** 1-x+3-3x+2x
32	Ans-3 Sol: $2KClO_{3(s)} \rightleftharpoons 2KCl_{(s)} + 3O_{2(g)}$ decomposition reaction in open vessel irreversible reaction
33	Ans-4 Sol: NH_3 active mass = $\frac{8.5}{17} \times \frac{1000}{250} = 2ML^{-1}$.
34	Ans-4 Sol: Solid and liquid concentration is taken as unity
35	Ans-1 Sol: $K_C = \frac{[\text{Product}]}{[\text{Reactant}]} = \frac{[NaCl]^2}{[NO]^2[Cl_2]}$.

36	ANS-4 Sol: $AB_{(g)} \rightleftharpoons A_{(g)} + B_{(g)}$ $1 \quad 0 \quad 0$ $1-\frac{1}{3} \quad \frac{1}{3} \quad \frac{1}{3}$ $P_{(AB)} = \frac{2/3}{4/3} \times P = \frac{P}{2} \quad P_{(A)} = P_{(B)} = \frac{1/3}{4/3} \times P = \frac{P}{4}$ $K_p = \frac{P/4 \times P/4}{P/2} = \frac{P}{8}$ $P = 8K_P$
37	ANS-4 Sol: $K_C = \frac{[C]}{[A][B]^2} = \frac{0.216}{[0.06][0.12]^2} = \frac{0.216}{0.864\times10^{-3}}$ $= 250$
38	ANS-3 Sol: $K_C = \frac{2}{(4)^2 \times 2} = \frac{2}{32} = 0.0625$
39	ANS-4 Sol: Temperature changes, pressure changes then K_P also changes.
40	ANS-4 Sol: $Fe^{+3} + SCN^{\ominus} \rightleftharpoons FeSCN^{+2}$ t_{inital} 3.1 3.2 0 $t_{eq} \quad \frac{0.1}{1} \quad \frac{0.2}{1} \quad \frac{3}{1}$ $K_C = \frac{[FeSCN^{+2}]}{[Fe^{+3}][SCN^{-}]} = \frac{3}{0.1\times0.2} = 150$
41	ANS-3 Sol: $K_C = \frac{1}{\sqrt{K_{C_1}}} = \frac{1}{\sqrt{100}} = \frac{1}{10} = 0.1$
42	ANS-3 Sol: $K_P = K_C(RT)^{\Delta n}$ $\Delta n = 2-3 = -1$ $K_P = K_C(RT)^{-1}$ $K_P.RT = K_C$ $\therefore K_P < K_C$
43	ANS-3 Sol: Temperature

44	ANS-1 Sol: $H_2 + I_2 \rightleftharpoons 2HI$ 15 5.2 0 15-5 5.2-5 10 $K_C = \frac{100}{10 \times 0.2} = 50$
45	ANS-2 Sol: K_C value remains same but it varies with temperature.
46	ANS-1 Sol: $K_c = \frac{mol/L}{mol/L \times mol/L} = mol^{-1}L$
47	ANS-2 Sol: $K_p = \frac{(atm)^2}{atm \times (atm)^3} = atm^{-2}$
48	ANS-1 Sol: K_c value should nearer to 10^{-3}favoursfor product formation
49	ANS-3 Sol: Vapour density decreases in thermal dissociation.
50	ANS-3 Sol: For 100% dissociation density is reduces too half of the initial value
51	ANS-2 Sol: In open vessel decomposition reactions are irreversible
52	ANS-4 Sol: $K_p = \frac{(P_{CO})^2}{(P_{CO_2})} = \frac{(4)^2}{2} = \frac{16}{2} = 8$
53	ANS-4 Sol: All type of systems which are may be physical or chemical equilibrium
54	ANS-2 Sol: $K_p = K_c(RT)^1$ $K_p = 26 \times 0.0821 \times 523$ $= \frac{260.08}{0.0821} = 0.6$

55	ANS-2 Sol: Low temperature and high pressure
56	ANS-2 Sol: Pressure is decreased
57	ANS-1 Sol: Decrease the value of K_c
58	ANS-4 Sol: $K_p = K_c(RT)^1 \quad \Delta n = 4-3=1$ $K_c = \frac{K_p}{RT} = \frac{0.05}{R\times1000} = \frac{5\times10^{-5}}{R}$
59	ANS-1 Sol: $XY_{2(g)} \rightleftharpoons XY_{(g)} + Y_{(g)}$ 600-X X X 600+X=800 or X =200 $K_p = \frac{200\times200}{400} = \frac{40000}{400}$
60	ANS-3 Sol: $P\alpha\frac{1}{V}$
61	ANS-2 Sol: $\Delta n = 1-1\frac{1}{2} = -\frac{1}{2}$ $K_p = K_c(RT)^{-\frac{1}{2}}$ $\frac{K_p}{K_c} = \frac{1}{\sqrt{RT}}$
62	ANS-1 Sol: $\frac{[B]}{[A]} = 1; \frac{[C]}{[B]} = 3; \frac{[D]}{[C]} = 5$ $\frac{[D]}{[A]} = \frac{[B]}{[A]}\times\frac{[C]}{[B]}\times\frac{[D]}{[C]}$ $=1\times3\times5$ $=15$
63	ANS-2 Sol: K_c value does not vary with any factor but varies with temperature

64	ANS-2 Sol: $K_p = K_c(RT)^{\Delta n}$
65	ANS-1 Sol: $\text{Log}\frac{K_p^1}{K_p} = \frac{-\Delta H}{2.303R}\left[\frac{1}{T_2} - \frac{1}{T_1}\right]$ $\Delta H = -Ve$ hence T_2 is higher than T_1 So, $\text{Log}K_p^1 - \log K_p = -Ve$ $\text{Log}K_p > \text{Log}K_p^1$ Or $K_p > K_p^1$
66	ANS-3 Sol: $Q_c > K_c$ reaction proceeds backward direction
67	ANS-2 Sol: $PCl_{3(g)} + Cl_{2(g)} \longrightarrow PCl_{5(g)}$ $\Delta n = -1$ $K_p = 0.61\,\text{atm}^{-1}$ $K_c = K_p(RT)^{-\Delta n} = 0.61(0.0821 \times 523)$ $= 26\,\text{mol / litre}$
68	ANS-4 Sol: $K_p = P_{CO_2} = \text{constant}$
69	ANS-1 **Sol:** $H_2S \rightleftharpoons H^+ + HS^-$ $HS^- \rightleftharpoons H^+ + S^{2-}$ $H_2S \rightleftharpoons 2H^+ + S^{2-}$ when equilibriums are added resultant equilibrium constant is equal to product of K_{eq} of added equations

70	ANS-3 Sol: $A+B \rightleftharpoons C+D$ $1 \quad 1 \quad 3 \quad 3$ $1-x \quad 1-x \quad 3+x \quad 3+x$ $K_e=\frac{[C][D]}{[A][B]}$ $K_e=\frac{(3+x)^2}{(1-x)^2}=2.25=(1.5)^2$ $\frac{3+x}{1-x}=1.5$ $3+x=1.5-1.5x$ $2.5x=-1.5$ $x=\frac{-1.5}{2.5}=\frac{-3}{5}$ $\frac{[A]}{[C]}=\frac{1-x}{3+x}=\frac{1+\frac{3}{5}}{3-\frac{3}{5}}=\frac{8}{12}=\frac{2}{3}$
71	ANS-4 Sol: $2SO_2+O_2 \rightleftharpoons 2SO_3$ $2 \quad 1 \quad 2$ $\Rightarrow K_C=\frac{[SO_3]^2}{[SO_2]^2[O_2]}=\frac{4}{4}=1$ $2-2x \quad 1-x \quad 2+2x$ $1 \quad y \quad 3$ $K_C=\frac{3^2}{1^2\times y}=1$ $y=9$ $\therefore$ additional O_2 required $y-x=9-0.5=8.5$
72	ANS-1 Sol: $I_2 + I^- \rightleftharpoons I_3^-$ $2 \quad 2 \quad 0$ $2-x \quad 2-x \quad x$ $1.75 \quad 1.75 \quad 0.25$ $k_C=\frac{0.25}{1.75\times1.75}=0.08$

73	ANS-2 Sol: $H_2 + I_2 \rightleftharpoons 2\,HI$ $2 \quad\quad 0 \quad\quad 4$ $2+x \quad x \quad\quad 4-2x$ $3 \quad\quad 1 \quad\quad 4-2=2$ $K_C = \frac{2\times 2}{3} = 1.33$
74	ANS-1 Sol: $NH_4HS \rightleftharpoons NH_3 + H_2S$ $(s) \quad\quad (g) \quad (g)$ $P_t = P_{NH_3} + P_{H_2S} = 0.66$ $\therefore P_{NH_3} = P_{H_2S} = 0.33$ $Kp = P_{NH_3}.P_{H_2S} = 0.33\times 0.33$ $= 0.109$
75	ANS-1 Sol: $2\,HI \rightleftharpoons H_2 + I_2$ $1 \quad\quad 0 \quad 0$ $1-2x \quad x \quad x$ $1-0.5 \quad 0.25 \quad 0.25$ $K_C = \frac{0.25\times 0.25}{0.5\times 0.5} = 0.25$
76	ANS-1 Sol: $N_2 + 3\,H_2 \rightleftharpoons 2\,NH_3$ $K_p = K_C.(RT)^{\Delta n}$ $= 26(0.0821\times 523)^{-2}$ $= 0.014$