Law of equilibrium and Equilibrium constant

41. When 3 mole of *A* and 1 mole of *B* are mixed in 1 *litre* vessel the following reaction takes place $A_{(g)} + B_{(g)} \rightleftharpoons 2C_{(g)}$. 1.5 moles of *C* are formed. The equilibrium constant for the reaction is

(a) 0.12 (b) 0.25
(c) 0.50 (d) 4.0

42. A 1 *M* solution of glucose reaches dissociation equilibrium according to equation given below $6HCHO \rightleftharpoons C_6H_{12}O_6$. What is the concentration of *HCHO* at equilibrium if equilibrium constant is 6×10^{22}

(a) $1.6 \times 10^{-8} M$
(b) $3.2 \times 10^{-6} M$
(c) $3.2 \times 10^{-4} M$
(d) $1.6 \times 10^{-4} M$

43. Equilibrium concentration of HI, I_2 and H_2 is $0.7, 0.1$ and $0.1M$ respectively. The equilibrium constant for the reaction $I_2 + H_2 \rightleftharpoons 2HI$ is

(a) 36 (b) 49
(c) 0.49 (d) 0.36

44. For the equilibrium $N_2 + 3H_2 \rightleftharpoons 2NH_3, K_c$ at 1000*K* is 2.37×10^{-3}. If at equilibrium $[N_2] = 2M, [H_2] = 3M$, the concentration of NH_3 is

(a) 0.00358 *M* (b) 0.0358 *M*
(c) 0.358 *M* (d) 3.58 *M*

45. In the reaction, $A + B \rightleftharpoons 2C$, at equilibrium, the concentration of *A* and *B* is $0.20 moll^{-1}$ each and that of *C* was found to be $0.60 moll^{-1}$. The equilibrium constant of the reaction is

(a) 2.4 (b) 18
(c) 4.8 (d) 9

46. 15 moles of H_2 and 5.2 moles of I_2 are mixed and allowed to attain equilibrium at 500^oC. At equilibrium, the concentration of HI is found to be 10 moles. The equilibrium constant for the formation of HI is

(a) 50 (b) 15
(c) 100 (d) 25

47. In a chemical reaction equilibrium is established when

(a) Opposing reaction ceases
(b) Concentration of reactants and products are equal
(c) Velocity of opposing reaction is the same as that of forward reaction
(d) Reaction ceases to generate heat

48. For the reaction $H_2 + I_2 = 2HI$,the equilibrium concentration of H_2, I_2 and HI are 8.0, 3.0 and 28.0 *mol per litre* respectively, the equilibrium constant of the reaction is

(a) 30.66 (b) 32.66
(c) 34.66 (d) 36.66

49. Change in volume of the system does not alter the number of moles in which of the following equilibrium

(a) $N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$
(b) $PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$
(c) $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$
(d) $SO_2Cl_{2(g)} \rightleftharpoons SO_{2(g)} + Cl_{2(g)}$

50. The rate of forward reaction is two times that of reverse reaction at a given temperature and identical concentration. $K_{\text{equilibrium}}$ is

(a) 2.5 (b) 2.0
(c) 0.5 (d) 1.5

51. Write the equilibrium constant *K* for

$CH_3COOH + H_2O = H_3O^+ + CH_3COO^-$

(a) $K = \frac{[H_3O^+][H_2O]}{[CH_3COO^-][CH_3COOH]}$

(b) $K = \frac{[H_3O^+][CH_3COO^-]}{[H_2O][CH_3COOH]}$

(c) $K = \frac{[H_3O^+][H_2O]}{[CH_3COOH][CH_3COO^-]}$

(d) $K = \frac{[H_2O][CH_3COO^-]}{[H_2O][CH_3COOH]}$

52. The equilibrium constant (K_c) for the reaction $\mathrm{HA} + B \rightleftharpoons \mathrm{BH}^+ + A^-$ is 100. If the rate constant for the forward reaction is $10^{5,}$ then rate constant for the backward reaction is

(a) 10^7 (b) 10^3
(c) 10^{-3} (d) 10^{-5}

53. 9.2 *grams* of $N_2O_{4(g)}$ is taken in a closed one litre vessel and heated till the following equilibrium is reached $N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$.
At equilibrium, 50% $N_2O_{4(g)}$ is dissociated. What is the equilibrium constant (in *mol litre*$^{-1}$) (Molecular weight of $N_2O_4 = 92$)

(a) 0.1 (b) 0.4
(c) 0.2 (d) 2

54. Two moles of NH_3 when put into a previously evacuated vessel (one *litre*), partially dissociate into N_2 and H_2. If at equilibrium one mole of NH_3 is present, the equilibrium constant is

(a) 3/4 $mol^2 litre^{-2}$
(b) 27/64 $mol^2 litre^{-2}$
(c) 27/32 $mol^2 litre^{-2}$
(d) 27/1 $mol^2 litre^{-2}$

55. In a reaction, reactant '*A*' decomposes 10% in 1 *hour*, 20% on 2 *hour* and 30% in 3 *hour*. The unit of rate constant of this reaction is
(a) sec^{-1}
(b) $mollitre^{-1}sec^{-1}$
(c) $litremol^{-1}sec^{-1}$
(d) $litre^2mol^{-2}sec^{-1}$

56. In the reaction $PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$.
The equilibrium concentrations of PCl_5 and PCl_3 are 0.4 and 0.2 *mole/litre* respectively. If the value of K_c is 0.5 what is the concentration of Cl_2 in *moles/litre*
(a) 2.0 (b) 1.5
(c) 1.0 (d) 0.5

57. In Haber process 30 *litres* of dihydrogen and 30 *litres* of dinitrogen were taken for reaction which yielded only 50% of the expected product. What will be the composition of gaseous mixture under the aforesaid condition in the end
(a) 20 *litres* ammonia, 25 *litres* nitrogen, 15 *litres* hydrogen
(b) 20 *litres* ammonia, 20 *litres* nitrogen, 20 *litres* hydrogen
(c) 10 *litres* ammonia, 25 *litres* nitrogen, 15 *litres* hydrogen
(d) 20 *litres* ammonia, 10 *litres* nitrogen, 30 *litres* hydrogen

58. For the reaction equilibrium $N_2O_4 \rightleftharpoons 2NO_{2(g)}$, the concentrations of N_2O_4 and NO_2 at equilibrium are 4.8×10^{-2} and $1.2 \times 10^{-2} mollitre^{-1}$ respectively. The value of K_c for the reaction is
(a) $3.3 \times 10^2 mollitre^{-1}$
(b) $3 \times 10^{-1} mollitre^{-1}$
(c) $3 \times 10^{-3} mollitre^{-1}$
(d) $3 \times 10^3 mollitre^{-1}$

59. 3.2 moles of hydrogen iodide were heated in a sealed bulb at 444^oC till the equilibrium state was reached. Its degree of dissociation at this temperature was found to be 22%. The number of moles of hydrogen iodide present at equilibrium are
(a) 2.496 (b) 1.87
(c) 2 (d) 4

60. 56 *g* of nitrogen and 8 *g* hydrogen gas are heated in a closed vessel. At equilibrium 34 *g* of ammonia are present. The equilibrium number of moles of nitrogen, hydrogen and ammonia are respectively
(a) 1,2,2 (b) 2,2,1
(c) 1,1,2 (d) 2,1,2