Law of equilibrium and Equilibrium constant

61. The reaction, $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$ is carried out in a $1\ dm^3$ vessel and $2\ dm^3$ vessel separately. The ratio of the reaction velocities will be

(a) $1:8$ (b) $1:4$
(c) $4:1$ (d) $8:1$

62. The compound *A* and *B* are mixed in equimolar proportion to form the products, $A + B \rightleftharpoons C + D$. At equilibrium, one third of *A* and *B* are consumed. The equilibrium constant for the reaction is

(a) 0.5 (b) 4.0
(c) 2.5 (d) 0.25

63. Calculate the partial pressure of carbon monoxide from the following

$$\boldsymbol{CaCO_{3(s)} \xrightarrow{\Delta} CaO_{(s)} + CO_2 \uparrow};$$

$K_p = 8 \times 10^{-2}$

$CO_{2(g)} + C_{(s)} \rightarrow 2CO_{(g)}$; $K_p = 2$

(a) 0.2 (b) 0.4
(c) 1.6 (d) 4

64. The equilibrium constant for the reaction $N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$ at 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

(a) 4×10^{-4} (b) 50
(c) 2.5×10^2 (d) 0.02

65. What is the equilibrium expression for the reaction $P_{4(s)} + 5O_{2(g)} \rightleftharpoons P_4O_{10(s)}$

(a) $K_c = [O_2]^5$
(b) $K_c = [P_4O_{10}]/5[P_4][O_2]$
(c) $K_c = [P_4O_{10}]/[P_4][O_2]^5$
(d) $K_c = 1/[O_2]^5$

66. In the reaction, $H_2 + I_2 \rightleftharpoons 2HI$. In a 2 litre flask 0.4 moles of each H_2 and I_2 are taken. At equilibrium 0.5 moles of HI are formed. What will be the value of equilibrium constant, K_c

(a) 20.2 (b) 25.4
(c) 0.284 (d) 11.1

67. Ammonia carbonate when heated to 200°C gives a mixture of NH_3 and CO_2 vapour with a density of 13.0. What is the degree of dissociation of ammonium carbonate

(a) $3/2$
(b) $1/2$
(c) 2
(d) 1
(e) $5/2$

68. 2 mol of N_2 is mixed with 6 mol of H_2 in a closed vessel of one litre capacity. If 50% of N_2 is converted into NH_3 at equilibrium, the value of K_c for the reaction $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$ is

(a) $4/27$ (b) $27/4$

(c) $1/27$ (d) 24

(e) 9

69. For a reaction $H_2 + I_2 \rightleftharpoons 2HI$ at 721*K*, the value of equilibrium constant is 50. If 0.5 mols each of H_2 and I_2 is added to the system the value of equilibrium constant will be

(a) 40 (b) 60

(c) 50 (d) 30

70. What is the effect of halving the pressure by doubling the volume on the following system at 500°*C*

$H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$

(a) Shift to product side

(b) Shift to product formation

(c) Liquefaction of *HI*

(d) No effect

71. When $NaNO_3$ is heated in a closed vessel, O_2 is liberated and $NaNO_2$ is left behind. At equilibrium

(a) Addition of $NaNO_3$ favours forward reaction

(b) Addition of $NaNO_2$ favours reverse reaction

(c) Increasing pressure favours reverse reaction

(d) Increasing temperature favours forward reaction

72. For the reaction : $H_{2(g)} + CO_{2(g)} \rightleftharpoons CO_{(g)} + H_2O_{(g)}$, if the initial concentration of $[H_2] = [CO_2]$ and x moles/litre of hydrogen is consumed at equilibrium, the correct expression of K_p is

(a) $\frac{x^2}{(1-x)^2}$ (b) $\frac{(1+x)^2}{(1-x)^2}$

(c) $\frac{x^2}{(2+x)^2}$ (d) $\frac{x^2}{1-x^2}$

73. 0.6 mole of NH_3 in a reaction vessel of $2dm^3$ capacity was brought to equilibrium. The vessel was then found to contain 0.15 mole of H_2 formed by the reaction

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

Which of the following statements is true

(a) 0.15 mole of the original NH_3 had dissociated at equilibrium

(b) 0.55 mole of ammonia is left in the vessel

(c) At equilibrium the vessel contained 0.45 mole of N_2

(d) The concentration of NH_3 at equilibrium is 0.25 mole per dm^3

74. 5 moles of SO_2 and 5 moles of O_2 are allowed to react to form SO_3 in a closed vessel. At the equilibrium stage 60% of SO_2 is used up. The total number of moles of SO_2, O_2 and SO_3 in the vessel now is

(a) 10.0 (b) 8.5

(c) 10.5 (d) 3.9