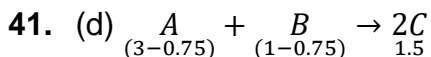
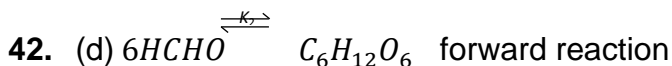


Law of equilibrium and Equilibrium constant

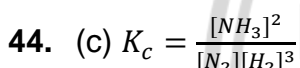
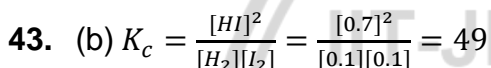


$$K = \frac{[C]^2}{[A][B]} = \frac{(1.5)^2}{2.25 \times 0.25} = \frac{2.25}{2.25 \times 0.25} = 4.0.$$



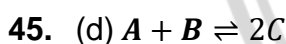
$$K_2 = \left[\frac{1}{K_1} \right]^{1/6}; K_2 = \left[\frac{1}{6 \times 10^{22}} \right]^{1/6}$$

$$K_2 = 1.6 \times 10^{-4} M$$

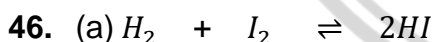


$$2.37 \times 10^{-3} = \frac{x^2}{[2][3]^3} = x^2 = 0.12798$$

$$x = 0.358 M.$$

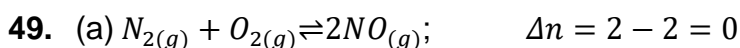
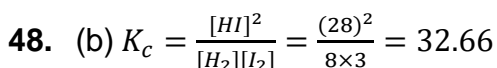


$$K_c = \frac{[C]^2}{[A][B]} = \frac{[0.6]^2}{[0.2][0.2]} = 9$$



$$\begin{array}{ccc} 15 & 5.2 & 0 \\ (15-5) & (5.2-5) & 10 \end{array}$$

$$K_c = \frac{[HI]^2}{[H_2][I_2]} = \frac{10 \times 10}{10 \times 0.2} = 50$$



50. (b) The rate of forward reaction is two times that of reverse reaction at a given temperature and identical concentration $K_{\text{equilibrium}}$ is 2 because the reaction is

reversible. So $K = \frac{K_1}{K_2} = \frac{2}{1} = 2$.

52. (b) $K_c = \frac{K_f}{K_b} \therefore K_b = \frac{K_f}{K_c} = \frac{10^5}{100} = 10^3$

53. (c) $K_c = \frac{[NO_2]^2}{[N_2O_4]} = \frac{4 \times (0.05)^2}{0.05} = 4 \times 0.05 = 0.2$

54. (d) $\text{initial} \quad 2NH_3 \rightleftharpoons N_2 + 3H_2; K = \frac{[N_2][H_2]^3}{[NH_3]^2} = \frac{1 \times 3^3}{1} = 27$
at equil. $\frac{2}{1} \quad \frac{0}{1} \quad \frac{0}{3}$

56. (c) $K_c = \frac{[PCl_3][Cl_2]}{[PCl_5]} = \frac{0.2 \times x}{0.4} = 0.5, x = 1$

57. (c) $N_2 + 3H_2 \rightleftharpoons 2NH_3$
 $\begin{matrix} 30 & 30 & 0 \\ 30-x & 30-3x & 2x \end{matrix}$
 $2x = 10; x = \frac{10}{2} = 5$

$N_2 = 30 - 5 = 25 \text{ litre}$

$H_2 = 30 - 3 \times 5 = 15 \text{ litre}$

$NH_3 = 2 \times 5 = 10 \text{ litre}$

58. (c) $K = \frac{[NO_2]^2}{[N_2O_4]} = \frac{[1.2 \times 10^{-2}]^2}{[4.8 \times 10^{-2}]} = 0.3 \times 10^{-2} = 3 \times 10^{-3}$

59. (a) $\frac{22}{100} \times 3.2 = 0.704$

\therefore at equil. moles of HI = $3.2 - 0.704 = 2.496$

60. (c) $N_2 + 3H_2 \rightleftharpoons 2NH_3 \quad \dots (i)$

at $t = 0$ 56 gm 8 gm 0 gm

$= 2 \text{ mole}$ 4 mole 0 mole

at equilibrium $2 - 1$ $4 - 3$ 34 gm

$= 1 \text{ mole} = 1 \text{ mole} = 2 \text{ mole}$

According to eq. (i) 2 mole of ammonia are present & to produce 2 mole of NH_3 , we need 1 mole of N_2 and 3 mole of H_2 hence $2 - 1 = 1$ mole of N_2 and $4 - 3 = 1$ mole of H_2 are present at equilibrium in vessel.

