Q1 - 2024 (04 Apr Shift 2)

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 given below is $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ is :

(1) 4.9

(2) 49

(3) 41.6

(4) 416

Q2 - 2024 (05 Apr Shift 1)

The following reaction occurs in the Blast furnance where iron ore is reduced to iron metal

$Fe_2O_{3(s)} + 3CO_{(g)} \rightleftharpoons Fe_{(l)} + 3CO_{2(g)}$

Using the Le-chatelier's principle, predict which one of the following will not disturb the equilibrium.

(1) Addition of CO_2

(2) Removal of CO_2

(3) Addition of Fe_2O_3

(4) Removal of CO

Q3 - 2024 (06 Apr Shift 1)

At $-20^{\circ}C$ and 1 atm pressure, a cylinder is filled with equal number of H_2, I_2 and HI molecules for the reaction

$H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$, the K_p for the process is $x \times 10^{-1}$.

x = _____

[Given : $R = 0.082\ L\ atm\ K^{-1}\ mol^{-1}$]

(1) 0.01

(2) 10

(3) 2

(4) 1

Q4 - 2024 (06 Apr Shift 2)

The ratio $\frac{K_P}{K_C}$ for the reaction : $CO_{(g)} + \frac{1}{2}O_{2(g)} \rightleftharpoons CO_{2(g)}$ is :

(1) $\frac{1}{\sqrt{RT}}$

(2) $(RT)^{1/2}$

(3) RT

(4) 1

Q5 - 2024 (08 Apr Shift 1)

For the given hypothetical reactions, the equilibrium constants are as follows :

$X \rightleftharpoons Y; K_1 = 1.0$
$Y \rightleftharpoons Z; K_2 = 2.0$
$Z \rightleftharpoons W; K_3 = 4.0$

The equilibrium constant for the reaction $X \rightleftharpoons W$ is

(1) 6.0

(2) 12.0

(3) 7.0

(4) 8.0

Q6 - 2024 (08 Apr Shift 2)

The equilibrium $Cr_2O_7^{2-} \rightleftharpoons 2CrO_4^{2-}$ is shifted to the right in :

(1) an acidic medium

(2) a basic medium

(3) a neutral medium

(4) a weakly acidic medium

Answer Key

Q1 (4) **Q2** (3) **Q3** (2) **Q4** (1)

Q5 (4) **Q6** (2)

Q1

$$K_C' = \left(\frac{1}{K_C}\right)^2 = \left(\frac{1}{4.9 \times 10^{-2}}\right)^2$$

$$K_C' = 416.49$$

Q2

When solid added no effect on equilibrium.

Q3

$\Delta n_g = 0$ $\quad K_p = \frac{(n_{HI})^2}{n_{H_2} n_{I_2}} \left(\frac{P_T}{n_T}\right)^{\Delta n_g}$

$n_{HI} = n_{H_2} = n_{I_2}$ $\quad$ so $K_P = 1$

$1 = x \times 10^{-1}$ $\quad x = 10$

Q4

$$CO(g) + \frac{1}{2}O_2(g) \rightleftharpoons CO_2(g)$$

$$\Delta n_g = 1 - \left(1 + \frac{1}{2}\right) = -\frac{1}{2}$$

$$\frac{K_p}{K_C} = (RT)^{\Delta n_g} = \frac{1}{\sqrt{RT}}$$

Q5

$X \rightleftharpoons Y \quad k_1 = 1$

$Y \rightleftharpoons Z \quad k_2 = 2$

$Z \rightleftharpoons \omega \quad k_3 = 4$

$X \rightleftharpoons \omega \quad k_1 \cdot k_2 \cdot k_3$

$k = 1 \times 2 \times 4$

$k = 8$

Q6

$$Cr_2O_7^{2-} \overset{OH^-}{\rightleftharpoons} 2HrO_4^{2-}$$