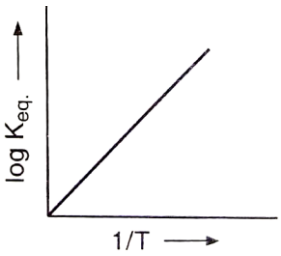
Single Correct Answer Type:

1. For the hypothetical reactions, the equilibrium constant (K) values are given
$A \rightleftharpoons B; K_1 = 2;\ B \rightleftharpoons C;\ K_2 = 4;\ C \rightleftharpoons D;\ K_3 = 3$
The equilibrium constant (K) for the reaction $A \rightleftharpoons D$ is;
(A) 24 (B) 6 (C) 2.7 (D) 12

2. If, in the reaction $N_2O_4(g) \rightleftharpoons 2NO_2(g)$, x is that part of N_2O_4 which dissociates, then the number of molecules at equilibrium will be:
(A) 1 (B) 3 (C) $(1+x)$ (D) $(1+x)^2$

3. A schematic plot of $\ln K_{eq}$. vs inverse of temperature for a reaction is shown in the figure. The reaction must be:
(A) exothermic
(B) endothermic
(C) one with negligible enthalpy change
(D) highly spontaneous at ordinary temperature



4. Given:
$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g); K_1$
$N_2(g) + O_2(g) \rightleftharpoons 2NO(g); K_2$
$H_2(g) + \frac{1}{2}O_2(g) \rightleftharpoons H_2O(g); K_3$
The equilibrium constant for
$2NH_3(g) + \frac{5}{2}O_2(g) \rightleftharpoons 2NO(g) + 3H_2O(g)$
will be:
(A) $K_1K_2K_3$ (B) $\frac{K_1K_2}{K_3}$ (C) $\frac{K_1K_3^2}{K_2}$ (D) $\frac{K_2K_3^3}{K_1}$

5. What is the equation for the equilibrium constant (K_c) for the following reaction?
$\frac{1}{2}A(g) + \frac{1}{3}B(g) \overset{TK}{\rightleftharpoons} \frac{2}{3}C(g)$
(A) $K_c = \frac{[A]^{1/2}[B]^{1/3}}{[C]^{3/2}}$ (B) $K_c = \frac{[C]^{3/2}}{[A]^2[B]^3}$ (C) $K_c = \frac{[C]^{2/3}}{[A]^{1/2}[B]^{1/3}}$ (D) $K_c = \frac{[C]^{2/3}}{[A]^{1/2} + [B]^{1/3}}$

6. For the reaction, $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$, the value of K_c at 800° C is 0.1. When the equilibrium concentrations of both the reactants is 0.5 mol, what is the value of K_p at the same temperature?
(A) 0.5 (B) 0.1 (C) 0.01 (D) 0.025

7. $A(g) + 3B(g) \rightleftharpoons 4C(g)$, initial concentration of A is equal to that of B. The equilibrium concentrations of A and C are equal. K_c of the reaction will be:
(A) 0.08 (B) 0.8 (C) 8 (D) 80

8. For a hypothetical reaction:
$4A(g) + 5B(g) \rightleftharpoons 4P(g) + 6Q(g)$
The equilibrium constant K_c has units
(A) mol L^{-1} (B) mol^{-1} L (C) $\left(mol\ L^{-i}\right)^{-2}$ (D) Unitless

9. Starting with 1 mol of O_2; 2 mol of SO_2, the equilibrium for the formation of $SO_3(g)$ was established at a certain temperature. If V is the volume of the vessel and 2x is the number of moles of SO_3 present, the equilibrium constant will be:

(A) $\frac{x^2V}{(1-x)^3}$ (B) $\frac{4x^2}{(2-x)(1-x)}$ (C) $\frac{(1-x)^3}{2V}$ (D) $\frac{x^2}{(2-x)(1-x)}$

10. For the reaction, $H_2(g)+I_2(g) \rightleftharpoons 2HI(g)$; $K = 47.6$, if the initial number of moles of each reactant and product is 1 mole, then at equilibrium:

(A) $[I_2]=[H_2]; [I_2]>[HI]$ (B) $[I_2]<[H_2]; [I_2]=[HI]$

(C) $[I_2]=[H_2]; [I_2]<[HI]$ (D) $[I_2]>[H_2]; [I_2]=[HI]$

11. Consider the following reversible reaction at equilibrium

$2H_2O(g) \rightleftharpoons 2H_2(g)+O_2(g); \Delta H = +24.7$ kJ

Which one of the following changes in conditions will lead to maximum decomposition of $H_2O(g)$?

(A) Increasing both temperature and pressure
(B) Decreasing temperature and increasing pressure
(C) Increasing temperature and decreasing pressure
(D) Increasing pressure at constant temperature

12. The exothermic formation of ClF_3 is represented by the equation

$Cl_2(g)+3F_2(g) \rightleftharpoons 2ClF_3(g); \Delta H = -329$ kJ

Which of the following will increase the quantity of ClF_3 in an equilibrium mixture of Cl_2, F_2 and ClF_3?

(A) Increasing the temperature (B) Removing Cl_2

(C) Increasing the volume of the container (D) Adding F_2

13. Which of the following reactions will be favoured at low pressure?

(A) $N_2(g)+O_2(g) \rightleftharpoons 2NO(g)$ (B) $H_2(g)+I_2(g) \rightleftharpoons 2HI(g)$

(C) $PCl_5(g) \rightleftharpoons PCl_3(g)+Cl_2(g)$ (D) $N_2(g)+3H_2(g) \rightleftharpoons 2NH_3(g)$

14. At constant pressure, the addition of argon to

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

will:

(A) shift the equilibrium in forward direction (B) shift the equilibrium in backward direction
(C) not effect the equilibrium (D) stop the reaction

15. The equilibrium reaction that is not influenced by volume change at constant temperature is:

(A) $H_2(g)+I_2(g) \rightleftharpoons 2HI(g)$ (B) $N_2(g)+3H_2(g) \rightleftharpoons 2NH_3(g)$

(C) $N_2O_4(g) \rightleftharpoons 2NO_2(g)$ (D) $2NO(g)+O_2(g) \rightleftharpoons 2NO_2(g)$

16. $N_2(g)+3H_2(g) \rightleftharpoons 2NH_3(g)+\text{Heat}$

What is the effect of the increase of temperature on the equilibrium of the reaction?

(A) equilibrium is unaltered (B) Reaction rate does not change
(C) Equilibrium is shifted to the left (D) Equilibrium is shifted to the right

17. At equilibrium:

$N_2O_4(g) \rightleftharpoons 2NO_2(g)$

The observed molecular weight of N_2O_4 is 80 g mol^{-1} at 350 K. The percentage dissociation of $N_2O_4(g)$ at 350 K is

(A) 10% (B) 15% (C) 20% (D) 18%

18. The vapour density of PCl_5 is 104.25 but when heated to $230^\circ C$, its vapour density is reduced to 62. The degree of dissociation of PCl_5 at this temperature will be:

(A) 6.8% (B) 68% (C) 46% (D) 64%

19. 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:

(A) $P = K_P$ (B) $P = 3K_P$ (C) $P = 4K_P$ (D) $P = 8K_P$

20. 3.1 mole of $FeCl_3$ and 3.2 mole of NH_4SCN are added to one litre of water. At equilibrium, 3.0 mol of $FeSCN^{2+}$ are formed. The equilibrium constant K_c of the reaction:

$Fe^{3+} + SCN^- \rightleftharpoons FeSCN^{2+}$

will be:

(A) 6.66×10^{-3} (B) 0.30 (C) 3.30 (D) 150

Numerical Based:

21. If the reaction $A \rightleftharpoons B$, has $\Delta G^\circ = 0$, then its equilibrium constant will be equal to:

22. Consider the following reaction

$A + B \rightleftharpoons E$ $K_c = 6$

$2B + C \rightleftharpoons 2D$ $K_c = 4$

What will be the equilibrium constant (K_c) for the following reaction?

$A + D \rightleftharpoons E + C$

23. For the equilibrium of the reaction:

$NH_4Cl(s) \rightleftharpoons NH_3(g) + HCl(g)$ $K_p = 81\,atm^2$;

Total pressure at equilibrium will be x times the pressure of NH_3.

The value of x will be:

24. Mixing 4 moles of A with 4 moles of B forms 2 moles of C at equilibrium, according to the following reaction:

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

The value of equilibrium constant is

25. SO_2Cl_2 and Cl_2 are introduced into a 3 L vessel. Partial pressure of SO_2Cl_2 and Cl_2 at equilibrium are 1 atm and 2 atm respectively. The value of K_p for the following reaction is 10.

$SO_2Cl_2(g) \rightleftharpoons SO_2(g) + Cl_2(g)$

The total pressure in atm at equilibrium would be:

KEY

1.	A	2.	C	3.	A	4.	D	5.	C
6.	B	7.	C	8.	A	9.	A	10.	C
11.	C	12.	D	13.	C	14.	B	15.	A
16.	C	17.	B	18.	B	19.	D	20.	D
21.	1	22.	3	23.	2	24.	1	25.	8