NEET ANSWER KEY & SOLUTIONS

SUBJECT :- CHEMISTRY
CLASS :- 11th **PAPER CODE :- CWT-6**
CHAPTER :- CHEMICAL EQUILIBRIUM

ANSWER KEY

1.	(A)	**2.**	(D)	**3.**	(A)	**4.**	(B)	**5.**	(B)	**6.**	(C)	**7.**	(A)
8.	(A)	**9.**	(C)	**10.**	(D)	**11.**	(C)	**12.**	(B)	**13.**	(A)	**14.**	(B)
15.	(A)	**16.**	(C)	**17.**	(B)	**18.**	(C)	**19.**	(A)	**20.**	(D)	**21.**	(C)
22.	(B)	**23.**	(A)	**24.**	(A)	**25.**	(A)	**26.**	(A)	**27.**	(B)	**28.**	(A)
29.	(B)	**30.**	(A)	**31.**	(A)	**32.**	(D)	**33.**	(B)	**34.**	(B)	**35.**	(D)
36.	(A)	**37.**	(A)	**38.**	(B)	**39.**	(A)	**40.**	(D)	**41.**	(B)	**42.**	(B)
43.	(D)	**44.**	(D)	**45.**	(B)	**46.**	(B)	**47.**	(B)	**48.**	(D)	**49.**	(A)
50.	(A)												

SOLUTIONS

SECTION-A

1. (A)

Sol. At equilibrium all properties solution (i.e. chemical composition of eq. mixture) becomes constant.

2. (D)

Sol. At equilibrium rates of backward and forward reactions become equal.

3. (A)

4. (B)

Sol. Molar conc. = $\dfrac{\text{no. of molar (mole) } O_2}{\text{volume (in l itre)}}$

$= \dfrac{869}{329} \times 2 = 1.5$ mol/litre

5. (B)

Sol. Forward reaction rate (r_f) [A] [B] = K_1 [A] [B]

Backward reaction rate (r_f) = K_b [C] [D] = K_2 [C] [D]

At equilibrium, $r_f = r_b$

$\therefore$ K_1 [A] [B] = K_2 [C] [D]

The concentration of reactents & products at equilibrium are related by

$K = \dfrac{K_1}{K_2} = \dfrac{[C]\quad[D]}{[A]\quad[B]}$

$\therefore \quad K(K_c) = \dfrac{K_1}{K_2}$

6. (C)

Sol. $K_C = \dfrac{[Z]^2}{[X]^2 \quad [Y]^2}$

7. (A)

Sol. $N_2 + O_2 \rightleftharpoons 2NO$

$K_p = \dfrac{P^2_{NO}}{P_{N_2}.P_{O_2}}$ ..... (i)

$2NO \rightleftharpoons N_2 + O_2$

$K'_p = \dfrac{P_{N_2}.P_{O_2}}{P^2_{NO}}$ ..... (ii)

From equation (i) and (ii), we have

8. (A)

Sol. $K_1 = \dfrac{(SO_3)}{(SO_2)(O_2)^{1/2}}$

$K_2 = \dfrac{(SO_2)^4(O_2)^2}{(SO_3)^4} = \dfrac{1}{(K_1)^4}$

$\Rightarrow \quad K_2 = \dfrac{1}{(K_1)^4}$

9. (C)

Sol. Equilibrium const. is temp. dependent only.

10. (D)

Sol. $N_2OH_{(g)} \rightleftharpoons 2NO_{2(g)}$

$\Delta n = 2 - 1 = 1$, $K_P = K_C$ (given)

We know, $K_P = K_C\,(RT)^{\Delta n}$

$1 = RT$, $T = \dfrac{1}{.0821} = 12.19$ K

11. (C)

Sol. for $K_p = K_c$, $\Delta n = 0$

only option (C) with satisfy this condition.

12. (B)

Sol. For this reaction, $K_C = \dfrac{[X]^4 \quad [Y]^6}{[A]^4 \quad [B]^5}$

So the unit of $K_C = \left[\dfrac{\text{mole}}{\text{litre}}\right]^{(4+6)-(4+5)}$ = mole litre^{-1}

13. (A)

Sol. $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$

	PCl_5	PCl_3	Cl_2
t=0	1	0	0
$t=t_{eq}$	1 – x	x	x

Total moles = 1 + x

Given $\frac{1-x}{1+x} = 0.4$

$x = \frac{3}{7}$

$x_{PCl_3} = \frac{\frac{3}{7}}{1+\frac{3}{7}} = 0.3.$

14. (B)

Sol. $A + B \rightleftharpoons C + D$

	A	B	C	D
t = 0	4	4	0	0
$t = t_{eq}$	4 – 2	4 – 2	2	2

$K_C = \frac{2\times 2}{2\times 2} = 1$

15. (A)

Sol. $2P(g) + Q(g) \rightleftharpoons 3R(g) + S(g)$

t = 0 2 2 0

x/2

t = teq 2 – x 2 – x/2 3/2 x

x/2

from above, at equilibrium 2 – x < 2 – x/2

∴ [P] < [Q] at equilibrium

16. (C)

Sol. $A + B \rightleftharpoons C + D$

	A	B	C	D
Initial	1	1	0	0
At equili.	(1 – x)	(1 – x)	x	x

∴ $K_c = \frac{[C]\ [D]}{[A]\ [B]} = 9$

∴ $\frac{x.\,x}{(1-x)^2} = 9$

or $x^2 = 9 + 9x^2 - 18x$

or $8x^2 - 18x + 9 = 0$

∴ $x = \frac{3}{2}$ or $\frac{3}{4}$

Hence, among the given options, the option (C) i.e., 0.75 is correct.

17. (B)

Sol. $N_2 + 3H_2 \rightleftharpoons 2NH_3$

	N_2	$3H_2$	$2NH_3$
t = 0	1 mole	2 mole	0
t = eq	1–x	2–3x	2x = 0.8 x = 0.4

mole of N_2 = 0.6

mole of H_2 = 0.8

18. (C)

Sol. $K_p = \frac{P'PCl_3 \times P'Cl_2}{P'PCl_5}$

$= \frac{\frac{b}{(a+b+c)}.P \times \frac{c}{(a+b+c)} \times P}{\frac{a}{(a+b+c)}P}$

$K_p = \frac{bc.P}{a\ \ (a+b+c)}$

19. (A)

Sol. P_{C_2} = 2.80 – (0.80 + 0.40) = 1.60 atm,

$k_p = \frac{P_{C_2}^2}{P_{A_2} \times P_{B_2}^3} = \frac{(1.60)^2}{0.80 \times (0.40)^3} = 50$

20. (D)

Sol. $Q_C = \frac{[C]\ [D]}{[A]\ [B]}, < K_C$

∴ Q_C with time

21. (C)

Sol. When Q > K_C, the reaction will proceed in backward direction to attain equilibrium.

22. (B)

Sol. $N_2 + 3H_2 \rightleftharpoons 2NH_3$, $K_P = 4.28 \times 10^{-5}$ atm^{-2}

Reaction Quotient, $Q_P = \frac{P_{NH_3}^2}{P_{N_2}(PH_2)^3} = \frac{3^2}{1\times(2)^3} = \frac{9}{8}$

$Q_P > K_P$, ∴ Reaction will go Backward.

23. (A)

Sol. $Q = \frac{[C]^3}{[A]^2[B]} = \frac{(3/3)^3}{(2/3)^2(1/3)} = 6.75$

$Q < K_C$

The reaction will proceed in forward direction to attain equilibrium.

24. (A)

Sol. $2CO_2 \rightleftharpoons 2CO + O_2$

	$2CO_2$	$2CO$	O_2
t =0	2	0	0
$t = t_{eq.}$	$2 - 2\times\frac{40}{100}$	$2\times\frac{40}{100}$	$\frac{40}{100}$

Total moles at equilibrium = $n_{CO_2} + n_{O_2} + n_{CO}$

$= 2 - 2\times\frac{40}{100} + 2\times\frac{40}{100} + \frac{40}{100} = 2.4$

25. (A)

Sol. $2NO \rightleftharpoons N_2 + O_2$ $\alpha = 10\%$

t = 0 4 – .4 .2 .2

3.6 0.2 0.2

$\Delta n = 0,$

$\therefore K_P = K_C,$ $K_C = \frac{(.2/V)^2}{(3.6/V)^2} = \frac{4}{36 \times 36}$

26. (A)

Sol. $x \propto \sqrt{V}$ or $x \propto \sqrt{16}$ Thus, 4 times

27. (B)

Sol. $NH_4HS(s) \rightleftharpoons NH_3(g) + H_2S(g)$

P P

2P = 1.2

P = 0.6

$K_p = P^2 = (0.6)^2 = 0.36\ atm^2$

28. (A)

Sol. Gibbs equation $\Delta G = \Delta G^o - RT \ln K$

at equilibrium $\Delta G = 0$

$-\Delta G^o = RT \ln K$

29. (B)

Sol. At equilibrium $\Delta G = 0$

Given $\Delta G^0 = 0$

Gibbs equation $\Delta G = \Delta G^o - RT \ln K$

$0 = 0 - RT\ln K$

$\Rightarrow K = e^0 = 1$

30. (A)

Sol. From equation it is given $T_2 > T_1$

$\therefore \left[\frac{1}{T_2} - \frac{1}{T_1}\right] = \frac{T_1 - T_2}{T_1 \ T_2}$ = negative value

31. (A)

Sol. $T\uparrow\ K_c \uparrow \Rightarrow$ Endothermic

32. (D)

Sol. On adding any reactant equilibrium shifts in forward direction, so amount of product increases.

33. (B)

Sol. On adding inert gas at constant pressure effect on equilibrium will be similar to as if volume of container has been increased.

34. (B)

Sol. For constant volume, reaction quotient (Q) will remain constant.

For constant pressure, reaction quotient (Q) will remain constant when $\Delta n_g = 0$.

35. (D)

Sol. Since inert gas addition has no effect at const. volume.

SECTION-B

36. (A)

Sol. For given reactions Δng = +ve, ΔH = –ve, high temperature & low pressure favours forward reaction which increases number of moles.

37. (A)

Sol. According to $K_P = \frac{P_{PCl_3\ (g)} \times P_{Cl_2\ (g)}}{P_{PCl_5\ (g)}}$

$= \frac{(n_{PCl_3\ (g)})_{eq.} \times (n_{Cl_2\ (g)})_{eq.}}{V \times (n_{PCl_5\ (g)})_{eq.}}$

and on adding inert gas at constant pressure effect on equilibrium will be similar to as if volume of container has been increased.

38. (B)

Sol. Number of moles will remain unchanged but due to decreased volume pressure will get increased and also the concentrations.

39. (A)

Sol. $H_2 \xrightarrow[2000°C]{Electricarc} 2H - 104.5$ kcal

hydrogen molecule atomic hydrogen

The reaction is endothermic. For endothermic reaction increase in temperature shift the equilibrium in forward direction. To proceed forward the pressure must be low because for the above reaction, increase of pressure will favoured backward reaction. So, for maximum yield the conditions are high temperature and low pressure.

40. (D)

Sol. Solublity of gas is favourable at high pressure and this process is exothermic hence solubility will be more at low temperature.

41. (B)

Sol. For any physical equilibrium on increasing pressure equilibrium shifts in the direction of higher density.

42. (B)

Sol. $N_2 + 3H_2 \rightleftharpoons 2NH_3,$

equilibrium constant = K

$K = \frac{[NH_3]^2}{[N_2]\ [H_2]^3}$

$2N_2 + 6H_2 \rightleftharpoons 4NH_3$

equilibrium constant = K'

$K' = \frac{[NH_3]^4}{[N_2]^2\ [H_2]^6} = K^2$

[from equation (1)].

43. (D)

Sol. $2NH_3 \rightleftharpoons N_2 + 3H_2$ $\quad K_1' = \frac{1}{K_1}$

$N_2 + O_2 \rightleftharpoons 2NO$ $\quad K_2' = K_2$

$3 \times (H_2 + \frac{1}{2}O_2 \rightleftharpoons H_2O)$ $\quad K_3' = (K_3)^3$

$2NH_3 + \frac{5}{2}O_2 \rightleftharpoons 2NO + 3H_2O$ $\quad K_4 = \frac{K_2 \times (K_3)^3}{K_1}$

44. (D)

Sol. For pure solids & pure liquids, although they have their own active masses but they remain const, during a chemical change.

K_C & K_P are equilibrium const. in terms of concentration & partical pressures.

All options are correct.

45. (B)

Sol. $VD_{Minorobs} = \frac{D}{1 \times (n-1)d}$

$VD_{obs} = 62$, $VD_{TH^2} = 104.16$, $n = 2$

$\alpha = 68\%$

46. (B)

Sol. (A) $2NH_{3(g)} \rightleftharpoons N_{2(g)} + 3H_{2(g)}$

ΔH= +ve

on P increase $\Rightarrow$ backward

on T increase $\Rightarrow$ forward

on V increase $\Rightarrow$ forward

on addition of inert gas at constant P $\Rightarrow$ V will increase = forward

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

ΔH = +ve

on P increase or V increase $\Rightarrow$ no effect

on T increase $\Rightarrow$ forward

(C) $2(CH_3COOH)_{(g)} \rightleftharpoons (CH_3COOH)_{2(g)}$ ΔH = –ve

on P increase $\Rightarrow$ forward

on T increase $\Rightarrow$ backward

on V increase $\Rightarrow$ backward

on introduction of inert gas at constant pressure $\Rightarrow$ volume will increase = backward

47. (B)

Sol. By definitions.

48. (D)

Sol. Value of equilibrium constant is not dependent on concentration of any species.

49. (A)

50. (A)