JEE MAIN ANSWER KEY & SOLUTIONS

SUBJECT :- CHEMISTRY
CLASS :- 12th
CHAPTER :- SOLUTION

PAPER CODE :- CWT-1

ANSWER KEY

1.	(D)	**2.**	(D)	**3.**	(C)	**4.**	(B)	**5.**	(B)	**6.**	(C)	**7.**	(D)
8.	(C)	**9.**	(D)	**10.**	(D)	**11.**	(C)	**12.**	(B)	**13.**	(A)	**14.**	(B)
15.	(D)	**16.**	(C)	**17.**	(B)	**18.**	(A)	**19.**	(B)	**20.**	(D)	**21.**	280
22.	220	**23.**	90	**24.**	6840	**25.**	2022	**26.**	4	**27.**	2	**28.**	4
29.	5	**30.**	3										

SOLUTIONS

1. (D)

Sol. Let n_B be the mole of B present in 10 mol of the mixture that has been vaporized

$$\therefore\ y_B = \frac{n_B}{10}\ ;\ x_B = \frac{10-n_B}{10}\ ;\quad y_B$$

$$= \frac{P_B^o \cdot x_B}{P} \Rightarrow \frac{n_B}{10} = \frac{P_B^o\left(\frac{10-n_B}{10}\right)}{P}$$

$$\frac{n_B}{10} = \frac{P_B^o}{P} - \frac{P_B^o n_B}{10P} \Rightarrow \frac{n_B}{10} = \frac{P_B^o}{P+P_B^o}$$

....(1)

$$\&\quad P = P_A^o + (P_B^o - P_A^o)x_B \quad \therefore\ x_B$$

$$= \frac{P-P_A^o}{P_B^o-P_A^o} \Rightarrow \frac{10-n_B}{10} = \frac{P-P_A^o}{P_B^o-P_A^o}$$

$$\therefore\ \frac{n_B}{10} = \frac{P_B^o-P}{P_B^o-P_A^o} \quad ....(2)$$

from (1) and (2)

$$\frac{P_B^o}{P+P_B^o} = \frac{P_B^o-P}{P_B^o-P_A^o} \Rightarrow P = \sqrt{P_A^o \cdot P_B^o} =$$

$\sqrt{200\times100}$ = 141.4 mm Hg Ans.]

2. (D)

Sol. $\Delta T_b = iK_b m$

$$= 1 \times K_b \times \frac{1000}{(1200-180)}$$

$= 0.98\ K_b$]

3. (C)

Sol. $Y_A = \frac{P_A}{P} \Rightarrow \frac{P_A^\circ X_A}{P}\ ;\ Y_B = \frac{P_B^\circ X_B}{P}\ ;\ \frac{Y_A}{Y_B} =$

$\frac{P_A^\circ}{P_B^\circ} \times \frac{X_A}{X_B}\ ;\quad \therefore\ \frac{Y_A}{Y_B} > \frac{X_A}{X_B}$]

4. (B)

Sol. $\Delta T_f = K_f \cdot m \cdot i$

$0.2046 = 1.86 \times 0.1\ (1 + \alpha)$

$\alpha = 0.1$

$HCOOH(aq) \rightleftharpoons H^+(aq) + OH^-(aq)$

$$K_a = \frac{C\alpha^2}{(1-\alpha)} = \frac{0.1 \times (0.1)^2}{0.9} = \frac{1}{9} \times 10^{-2}$$

$$K_h = \frac{K_W}{K_a} = \frac{10^{-14}}{\frac{1}{9} \times 10^{-2}} \Rightarrow 9 \times 10^{-12}\ \text{Ans.}$$]

5. (B)

Sol. **Benzene more volatile than toluene**

Hence from figure

Statement (C) is correct

$X_{toluene} = 0.7$ and $Y_{toluene} = 0.4$

$\Rightarrow X_{benzene} = 0.3$ and $Y_{toluene} = 0.4$

Statement (D) is correct because

$X_{benzene} = 0.7\ \{Y_{benzene} > 0.7\}$

$\Rightarrow\ Y_{toluene}$ necessarily < 0.3

Statement (A) is correct

$X_{benzene} = 0.5\ \&\ Y_{toluene} = 0.20$

Statement (B) :

$X_{toluene} = 0.3 \Rightarrow X_{benzene} = 0.7$

$\Rightarrow Y_{benzene}$ must be > 0.7]

6. (C)

Sol. $T_b - T_f = 105$

$(100 + \Delta T_b) - (-\Delta T_f) = 105$

$\Delta T_b + \Delta T_f = 5$

$(k_b + k_f)\ m = 5$

$2.37\ m = 5\ ;\quad m = 2.1$

$$2.1 = \frac{\left(\frac{w}{342}\right)}{0.1}\ ;\quad w = 71.82\ g$$

$w \simeq 72$ Ans.]

7. (D)

Sol. Solution : Colligative property]

8. (C)

Sol. $\pi = \frac{C}{M_w} \times 1000 \times R \times 300$

Slope = $\frac{R \times 300}{M_w} \times 1000$ = 5×10^{-3}]

9. (D)

Sol. $2H_2O(g) + 2Cl_2(g) \rightleftharpoons 4HCl(g) + O_2(g)$

At equilibrium 0.5 1–2x 1 + 4x 1 + x

$K_p = \frac{P^4_{HCl}.P_{O_2}}{P^2_{H_2O}.P^2_{Cl_2}} \Rightarrow \frac{(1+4x)^4(1+x)}{(0.5)^2(1-2x)^2}$

$\because$ K_p is very high so we can assume that almost Cl_2 will convert into products, so $2x \approx 1$

Let partial pressure of Cl_2 at equilibrium is y

$6 \times 10^8 = \frac{(3)^4(1.5)}{(0.5)^2 \times y^2} \Rightarrow y = 9 \times 10^{-4}$ atm

Ans.]

10. (D)

Sol. $2A \longrightarrow A_2$

Let the initial number of mole is 1 1 – 0.4 0.2

After dimerisation 0.6 0.2

total no. of moles = 0.6 + 0.2 = 0.8

mole fraction of dimer = $\frac{\text{No. of moles of dimer}}{\text{Total No. of moles}}$

$= \frac{0.2}{0.8} = 0.25$]

11. (C)

Sol. Normal boiling point = 100°C at 1 atm

Standard boiling point at 1 bar 1 bar < 1 atm

as P $\downarrow$ Boiling point $\downarrow$

$\therefore$ less than 100°C]

12. (B)

Sol. 0.3 M $K_2Fe[Fe(CN)_6]$ will give maximum number of ions in the solution.]

13. (A)

Sol. $\Delta T_f = K_f \times m$

$0.093 = 1.86 \times \frac{1}{M} \times \frac{1000}{100}$

M = 200]

14. (B)

Sol. $P_S = \frac{1}{3} \times 100 + 50 \times \frac{2}{3} = \frac{200}{3}$

$X_B = \frac{100/3}{200/3} = \frac{1}{2}$ **Ans.**]

15. (D)

Sol. P = CRT

$\left(\frac{38}{760}\right) = \frac{1.9}{0.2 \times M} \times 0.0821 \times 300 \times 1$

$M = \frac{1.9 \times 0.0821 \times 300}{38 \times 0.2} \times 760 \approx 61575$ gm/mole Ans

16. (C)

Sol. Surface tension decreases on increasing temperature.

17. (B)

Sol. For system ionsisting of two immisible liquids

$P_{solution} = P^o_{H_2O} + P^o_{n-butylchloride}$ = 1 atm = 760 mm

$P^o_{n-butylchloride}$ = 760 – 570 = 190 mm of Hg

Also In vapour state

$\frac{n_{(H_2O)}}{n_{(n-butylchloride)}} = \frac{P^o_{H_2O}}{P^o_{n-butylchloride}} = \frac{570}{190}$

$\frac{w_{H_2O}/18}{w_{n-butyl\,chloride}/92.5} = 3$

$\frac{w_{H_2O}}{w_{n-butylchloride}} = \frac{3 \times 18}{92.5} = \frac{0.58}{1}$

18. (A)

Sol. Methanol and acetone show positive deviation from Raoult's law.]

19. (B)

Sol. $\pi_g = \pi_{Al_2(SO_4)_3}$

$Al_2(SO_4)_{3\,(aq)} \rightleftharpoons 2Al^{3+}_{(aq)} + 3SO_4^{2-}{}_{(aq)}$

$1 - \alpha$ 2α 3α

0.01 RT = (1 + 4α) (0.003) RT

α = 0.5833

% dissociation = 58.33]

20. (D)

21. 280

Sol. $\Delta T_b = K_b m \Rightarrow 1 = 0.5 \times \frac{0.5}{x} \times 1000$

x = 250

Solution = 250 + 30 = 280 gm

22. 220

Sol. P = $P_A^o x_A + P_B^o x_B \Rightarrow 100\left(\frac{2}{5}\right) + 300 \times \left(\frac{3}{5}\right)$

$\Rightarrow$ 220 torr Ans.]

23. 90

Sol. P = $P_A^o x_A + P_B^o x_B$

$600 = P_A^o\left(\frac{3}{3+2}\right) + P_B^o\left(\frac{2}{2+3}\right)$; $3P_A^o + 2P_B^o = 3000$

& 630

= $P_A^o\left(\frac{4.5}{4.5+2+0.5}\right) + P_B^o\left(\frac{2}{4.5+2+0.5}\right)$;

$4.5P_A^o + 2P_B^o = 4410$

$1.5P_A^o = 1410$; $P_A^o = 940$ & $P_B^o = 90$ Ans.]

24. 6840

Sol. $T_b - T_f = 105$
$(100 + \Delta T_b) - (-\Delta T_f) = 105$
$\Delta T_b + \Delta T_f = 5$
$(k_b + k_f)$ m = 5
2.5 m = 5 ; m = 2
$2 = \frac{\left(\frac{w}{342}\right)}{0.1}$; w = 68.4]

25. 2022

Sol. $\frac{P_A^0 - 20}{P_A^0} = \frac{6 \times 18}{M_B \times 180}$ .... (1)

$\frac{P_A^0 - 20.02}{P_A^0} = \frac{6}{M_B \times 11}$ ... (2)

$\frac{P_A^0 - 20}{P_A^0 - 20.02} = \frac{11}{10}$

$P_A^0 = 20.22$
Answer = 20.22 × 100 = 2022]

26. 4

Sol. (1), (2), (9), (10) Follow Raoult's law

27. 2

Sol. Since solubility of gas inside liquid = S_{max} = mol / L
= will remain constant here

$\therefore \frac{n_1}{V_1} = \frac{n_2}{V_2}$

$\Rightarrow \frac{4}{1} = \frac{V_{(g)}}{1/2} \Rightarrow V_{(g)} = \frac{1}{2} \times 4$ = 2 ml

28. 4

Sol. At boiling point, P_T = 760 torr

$\therefore 760 = P_A^o X_A + P_B^o X_B$
$760 = 700\, X_A + 800\,(1 - X_A)$
$\Rightarrow X_A = 0.4$

$\therefore Y_A = \frac{P_A}{P_{Total}} = \frac{0.4 \times 700}{760} = \frac{280}{760}$

$\therefore$ Moles of A in vapour phase = $\frac{28}{76} \times 10 = 3.68$

≈ 4 Ans.

29. 5

Sol. $\pi_1 = \frac{n}{V_1}RT_1$; $\pi_2 = \frac{n}{V_2}RT_2$

$\frac{500}{105.3} = \frac{V_2}{V_1} \times \frac{283}{298}$

$\frac{V_2}{V_1} \simeq \frac{283}{298} \Rightarrow \frac{V_2}{V_1} \simeq 5$ **Ans**

30. 3

Sol. $\Delta T_b = iK_b m$
0.744 = i × 1.86 × 0.1
I = 4
$K_3[Fe(CN)_6] \longrightarrow 3K^+ + [Fe(CN)_6]^{3-}$