

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

SOLUTIONS

1. (D)

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

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

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

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

....(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)

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

$$\sqrt{200 \times 100} = 141.4 \text{ mm Hg Ans.}]$$

2. (D)

Sol. $\Delta T_b = iK_b m$

$$= 1 \times K_b \times \frac{1000}{(1200 - 180)} \\ = 0.98 K_b \quad]$$

3. (C)

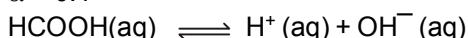
Sol. $Y_A = \frac{P_A}{P} \Rightarrow \frac{P_A^o X_A}{P} ; \quad Y_B = \frac{P_B^o X_B}{P} ; \quad \frac{Y_A}{Y_B} = \frac{\frac{P_A^o}{P} \times \frac{X_A}{X_B}}{\frac{P_B^o}{P} \times \frac{X_A}{X_B}} ; \quad \therefore \frac{Y_A}{Y_B} > \frac{X_A}{X_B} \quad]$

4. (B)

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

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

$$\alpha = 0.1$$



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

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

5. (B)

Benzene more volatile than toluene

Hence from figure

Statement (C) is correct

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

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

Statement (D) is correct because

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

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

Statement (A) is correct

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

Statement (B) :

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

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

6. (C)

$$T_b - T_f = 105$$

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

$$\Delta T_b + \Delta T_f = 5$$

$$(k_b + k_f) m = 5$$

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

$$2.1 = \frac{\left(\frac{w}{342}\right)}{0.1}$$

$$w \approx 72 \text{ Ans. }]$$

7. (D)

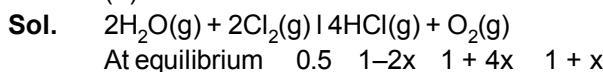
Solution : Colligative property]

8. (C)

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

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

9. (D)



$$K_p = \frac{P_{\text{HCl}}^4 P_{\text{O}_2}}{P_{\text{H}_2\text{O}}^2 P_{\text{Cl}_2}^2} \Rightarrow \frac{(1+4x)^4 (1+x)}{(0.5)^2 (1-2x)^2}$$

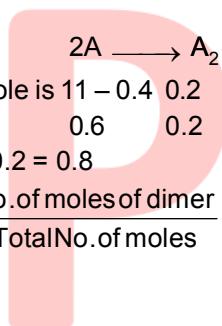
$\therefore K_p$ is very high so we can assume that almost Cl_2 will convert into products, so $2x \approx 1$
Let partial pressure of Cl_2 at equilibrium is y

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

Ans.]

10. (D)

Sol.



11. (C)

Sol. Normal boiling point = 100°C at 1 atm
Standard boiling point at 1 bar 1 bar < 1 atm
as P ↓ Boiling point ↓
 \therefore less than 100°C]

12. (B)

Sol. 0.3 M $\text{K}_2\text{Fe}[\text{Fe}(\text{CN})_6]$ will give maximum number of ions in the solution.]

13. (A)

$$\text{Sol. } \Delta T_f = K_f \times m$$

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

M = 200]

14. (B)

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

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

15. (D)
Sol. $P = CRT$

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

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

Ans

16. (C)
Sol. Surface tension decreases on increasing temperature.

17. (B)
Sol. For system consisting of two immiscible liquids

$$P_{\text{solution}} = P_{\text{H}_2\text{O}}^o + P_{\text{n-butylchloride}}^o = 1 \text{ atm} = 760 \text{ mm}$$

$$P_{\text{n-butylchloride}}^o = 760 - 570 = 190 \text{ mm of Hg}$$

Also In vapour state

$$\frac{n_{(\text{H}_2\text{O})}}{n_{(\text{n-butylchloride})}} = \frac{P_{\text{H}_2\text{O}}^o}{P_{\text{n-butylchloride}}^o} = \frac{570}{190}$$

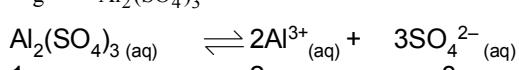
$$\frac{w_{\text{H}_2\text{O}}/18}{w_{\text{n-butylchloride}}/92.5} = 3$$

$$\frac{w_{\text{H}_2\text{O}}}{w_{\text{n-butylchloride}}} = \frac{3 \times 18}{92.5} = \frac{0.58}{1}$$

18. (A)
Sol. Methanol and acetone show positive deviation from Raoult's law.]

19. (B)

$$\text{Sol. } \pi_g = \pi_{\text{Al}_2(\text{SO}_4)_3}$$



$$1-\alpha \quad \quad \quad 2\alpha \quad \quad \quad 3\alpha$$

$$0.01 RT = (1 + 4\alpha)(0.003) RT$$

$$\alpha = 0.5833$$

$$\% \text{ dissociation} = 58.33 \text{ }]$$

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. $P = P_A^0 x_A + P_B^0 x_B \Rightarrow 100 \left(\frac{2}{5} \right) + 300 \times \left(\frac{3}{5} \right)$
 $\Rightarrow 220 \text{ torr Ans.}]$

23. 90

Sol. $P = P_A^0 x_A + P_B^0 x_B$
 $600 = P_A^0 \left(\frac{3}{3+2} \right) + P_B^0 \left(\frac{2}{2+3} \right); 3P_A^0 + 2P_B^0 = 3000$
& 630
 $= P_A^0 \left(\frac{4.5}{4.5+2+0.5} \right) + P_B^0 \left(\frac{2}{4.5+2+0.5} \right);$
 $4.5P_A^0 + 2P_B^0 = 4410$
 $1.5P_A^0 = 1410; P_A^0 = 940 \text{ & } P_B^0 = 90 \text{ Ans.}]$

24. 6840

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

25. 2022

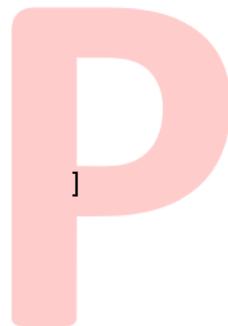
Sol. $\frac{P_A^0 - 20}{P_A^0} = \frac{6 \times 18}{M_B \times 180} \dots (1)$

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

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

$$P_A^0 = 20.22$$

$$\text{Answer} = 20.22 \times 100 = 2022]$$



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

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

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

28. 4

Sol. At boiling point, $P_T = 760 \text{ torr}$

$$\therefore 760 = P_A^0 X_A + P_B^0 X_B$$

$$760 = 700 X_A + 800 (1-X_A)$$

$$\Rightarrow X_A = 0.4$$

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

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

$\approx 4 \text{ Ans.}$

29. 5

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

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

$$\frac{V_2}{V_1} \cong \frac{283}{298} \Rightarrow \frac{V_2}{V_1} \cong 5 \text{ Ans}$$

30. 3

Sol. $\Delta T_b = i K_b m$

$$0.744 = i \times 1.86 \times 0.1$$

$$i = 4$$

