Mastering Chemistry With Ravi Arora

DPP - Daily Practice Problems

Chapter-wise Sheets

Date : [ ]   Start Time : [ ]   End Time : [ ]

CHEMISTRY CC16

SYLLABUS : Solutions

Max. Marks : 120   **Marking Scheme :** + 4 for correct & (–1) for incorrect   **Time : 60 min.**

INSTRUCTIONS : This Daily Practice Problem Sheet contains 30 MCQ's. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.

1. The solubility of a solid in a liquid is significantly affected by temperature changes.

    Solute + Solvent $\rightleftharpoons$ Solution.

    The system being in a dynamic equilibrium must follow Le-chatelier's principle. Considering the Le-chatelier's principle which of the following is correct?

    (a) $\Delta H_{sol} > 0$; solubility $\uparrow$; temperature $\downarrow$

    (b) $\Delta H_{sol} < 0$; solubility $\downarrow$; temperature $\uparrow$

    (c) $\Delta H_{sol} > 0$; solubility $\downarrow$; temperature $\uparrow$

    (d) $\Delta H_{sol} < 0$; solubility $\uparrow$; temperature $\uparrow$

2. The vapour pressure of a solution of the liquids A ($p^\circ = 80$ mm Hg and $x_A = 0.4$) and B ($p^\circ = 120$ mm Hg and $x_B = 0.6$) is found to be 100 mm Hg. It shows that the solution exhibits

    (a) positive deviation from ideal behaviour

    (b) negative deviation from ideal behaviour

    (c) ideal behaviour

    (d) positive deviation for lower conc. and negative for higher conc.

RESPONSE GRID	1. ⓐⓑⓒⓓ 2. ⓐⓑⓒⓓ

Space for Rough Work

3. Plot of $\dfrac{1}{x_A}$ Vs $\dfrac{1}{y_A}$ (x_A mole fraction of A in liquid state and y_A in vapour state) is linear whose slope and intercept respectively are given

(a) p_B^o / p_A^o , $\dfrac{p_B^o - p_A^o}{p_B^o}$

(b) $p_A^o - p_B^o$, $\dfrac{p_A^o - p_B^o}{p_B^o}$

(c) $p_B^o - p_A^o$, $\dfrac{p_B^o - p_A^o}{p_B^o}$

(d) p_B^o / p_A^o , $\dfrac{p_A^o - p_B^o}{p_B^o}$

4. Coolent used in car radiator is aqueous solution of ethylene glycol. In order to prevent the solution from freezing at $-0.3\,°C$. How much ethylene glycol must be added to 5 kg of water ? ($K_f = 1.86$ K kg mol^{-1})

(a) 50 kg   (b) 50 g

(c) 45 g   (d) 40 g

5. A solution contains non-volatile solute of molecular mass M_2. Which of the following can be used to calculate the molecular mass of solute in terms of osmotic pressure ?

(a) $M_2 = \left(\dfrac{m_2}{\pi}\right) VRT$ (b) $M_2 = \left(\dfrac{m_2}{V}\right)\dfrac{RT}{\pi}$

(c) $M_2 = \left(\dfrac{m_2}{V}\right)\pi RT$ (d) $M_2 = \left(\dfrac{m_2}{V}\right)\dfrac{\pi}{RT}$

6. Henry's law constant of oxygen is 1.4×10^{-3} mol. lit^{-1}. atm^{-1} at 298 K. How much of oxygen is dissolved in 100 ml at 298 K when the partial pressure of oxygen is 0.5 atm?

(a) 1.4 g   (b) 3.2 g

(c) 22.4 mg   (d) 2.24 mg

7. What is the degree of dissociation of sodium chloride, if the molar mass determined by a cryoscopic method was found to be 31.80 g mol^{-1} [Atomic mass Na = 23 g mol^{-1} Cl = 35.5 g mol^{-1}] ?

(a) 0.58   (b) 0.73

(c) 0.83   (d) 0.92

8. A solution containing components A and B follows Raoult's law when

(a) A – B attraction force is greater than A – A and B – B

(b) A – B attraction force is less than A – A and B – B

(c) A – B attraction force remains same as A–A and B –B

(d) Volume of solution is different from sum of volume of solute and solvent

9. Two 1-litre flask A and B are connected to each other by a valve which is closed. Flask A has benzene in equilibrium with its vapours at 30°C. The flask B, is evacuated, and the valve is opened. Which of the following is true. If temperature is kept constant.'

(a) Some of the benzene molecules would move to flask B from flask A.

(b) Vapour pressure will be half the initial value.

(c) The vapour pressure remains unchanged

(d) Some more of the liquid benzene in flask A would evaporate.

10. For a solution of two liquids A and B it was proved that $P_S = x_A (p°_A - p°_B) + p°_B$. The resulting solution will be

(a) Non -ideal   (b) ideal

(c) semi-ideal   (d) None of these

11. A 0.0020 m aqueous solution of an ionic compound $Co(NH_3)_5(NO_2)Cl$ freezes at -0.00732 °C. Number of moles of ions which 1 mol of ionic compound produces on being dissolved in water will be ($K_f = -1.86$°C/m)

(a) 3   (b) 4

(c) 1   (d) 2

12. A solution of urea (mol. mass 56 g mol^{-1}) boils at 100.18°C at the atmospheric pressure. If K_f and K_b for water are 1.86 and 0.512 K kg mol^{-1} respectively, the above solution will freeze at

(a) 0.654°C   (b) -0.654°C
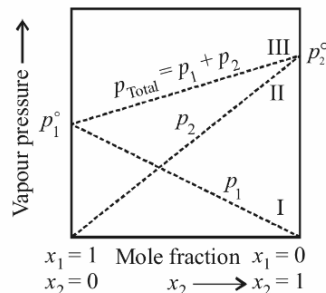
(c) 6.54°C   (d) -6.54°C

RESPONSE GRID	3. ⓐⓑⓒⓓ	4. ⓐⓑⓒⓓ	5. ⓐⓑⓒⓓ	6. ⓐⓑⓒⓓ	7. ⓐⓑⓒⓓ
	8. ⓐⓑⓒⓓ	9. ⓐⓑⓒⓓ	10. ⓐⓑⓒⓓ	11. ⓐⓑⓒⓓ	12. ⓐⓑⓒⓓ

Space for Rough Work

13. In mixture A and B components show -ve deviation as
  (a) $\Delta V_{mix} > 0$
  (b) $\Delta H_{mix} < 0$
  (c) $A - B$ interaction is weaker than $A - A$ and $B - B$ interaction
  (d) $A - B$ interaction is stronger than $A - A$ and $B - B$ interaction.

14. All form ideal solution except
  (a) C_6H_6 and $C_6H_5 CH_3$
  (b) C_2H_6 and C_2H_5I
  (c) C_6H_5Cl and C_6H_5Br
  (d) $C_2H_5 I$ and $C_2H_5 OH$.

15. A binary liquid solution is prepared by mixing n-heptane and ethanol. Which one of the following statements is correct regarding the behaviour of the solution?
  (a) The solution is non-ideal, showing – ve deviation from Raoult's Law.
  (b) The solution is non-ideal, showing + ve deviation from Raoult's Law.
  (c) n-heptane shows + ve deviation while ethanol shows – ve deviation from Raoult's Law.
  (d) The solution formed is an ideal solution.

16. We have three aqueous solutions of NaCl labelled as 'A', 'B' and 'C' with concentrations 0.1M, 0.01M and 0.001M, respectively. The value of van't Hoff factor for these solutions will be in the order _____.
  (a) $i_A < i_B < i_C$
  (b) $i_A > i_B > i_C$
  (c) $i_A = i_B = i_C$
  (d) $i_A < i_B > i_C$

17. During depression of freezing point in a solution the following are in equilibrium
  (a) liquid solvent, solid solvent
  (b) liquid solvent, solid solute
  (c) liquid solute, solid solute
  (d) liquid solute, solid solvent

18. A plot of p_1 or p_2 vs the mole fractions x_1 and x_2 is given as.

In this figure, lines I and II pass through the point for which.
  (a) $x_1 \neq 1; x_2 = 1$
  (b) $x_1 = x_2 \neq 1$
  (c) $x_1 = 1; x_2 \neq 1$
  (d) $x_1 = x_2 = 1$

19. Which of the following modes of expressing concentration is independent of temperature?
  (a) Molarity
  (b) Molality
  (c) Formality
  (d) Normality

20. How many grams of concentrated nitric acid solution should be used to prepare 250 mL of 2.0M HNO_3 ? The concentrated acid is 70% HNO_3
  (a) 90.0 g conc. HNO_3
  (b) 70.0 g conc. HNO_3
  (c) 54.0 g conc. HNO_3
  (d) 45.0 g conc. HNO_3

21. Which among the following will show maximum osmotic pressure?
  (a) 1 M NaCl
  (b) 1 M $MgCl_2$
  (c) 1 M $(NH_4)_3PO_4$
  (d) 1 M Na_2SO_4

22. The boiling point of 0.2 mol kg^{-1} solution of X in water is greater than equimolal solution of Y in water. Which one of the following statements is true in this case ?
  (a) Molecular mass of X is greater than the molecular mass of Y.
  (b) Molecular mass of X is less than the molecular mass of Y.
  (c) Y is undergoing dissociation in water while X undergoes no change.
  (d) X is undergoing dissociation in water.

| **RESPONSE** | 13. ⓐⓑⓒⓓ | 14. ⓐⓑⓒⓓ | 15. ⓐⓑⓒⓓ | 16. ⓐⓑⓒⓓ | 17. ⓐⓑⓒⓓ |
| **GRID** | 18. ⓐⓑⓒⓓ | 19. ⓐⓑⓒⓓ | 20. ⓐⓑⓒⓓ | 21. ⓐⓑⓒⓓ | 22. ⓐⓑⓒⓓ |

Space for Rough Work

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23. Which of the following 0.10 m aqueous solutions will have the lowest freezing point ?
    (a) $Al_2(SO_4)_3$ (b) $C_6H_{12}O_6$
    (c)   KCl   (d) $C_{12}H_{22}O_{11}$

24. If sodium sulphate is considered to be completely dissociated into cations and anions in aqueous solution, the change in freezing point of water (ΔT_f), when 0.01 mol of sodium sulphate is dissolved in 1 kg of water, is (K_f= 1.86 K kg mol^{-1})
    (a)   0.372 K   (b)   0.0558 K
    (c)   0.0744 K   (d)   0.0186 K

25. Which one of the following salts will have the same value of van't Hoff factor (i) as that of $K_4[Fe(CN)_6]$.
    (a) $Al_2(SO_4)_3$ (b)   NaCl
    (c) $Al(NO_3)_3$ (d) Na_2SO_4.

26. Mole fraction of the solute in a 1.00 molal aqueous solution is :
    (a)   0.1770   (b)   0.0177
    (c)   0.0344   (d)   1.7700

27. 25.3 g of sodium carbonate, Na_2CO_3 is dissolved in enough water to make 250 mL of solution. If sodium carbonate dissociates completely, molar concentration of sodium ions, Na^+ and carbonate ions, CO_3^{2-} are respectively (Molar mass of Na_2CO_3 = 106 g mol^{-1})
    (a)   0.955 M and 1.910 M
    (b)   1.910 M and 0.955 M
    (c)   1.90 M and 1.910 M
    (d)   0.477 M and 0.477 M

28. Azeotropic mixture of HCl and H_2O has
    (a)   48% HCl   (b)   22.2% HCl
    (c)   36% HCl   (d)   20.2% HCl

29. Freezing point of an aqueous solution is $-$ 0.186°C. If the values of K_b and K_f of water are respectively 0.52 K kg mol^{-1} and 1.86 K kg mol^{-1}, then the elevation of boiling point of the solution in K is
    (a)   0.52   (b)   1.04
    (c)   1.34   (d)   0.052

30. Which of the following statements, regarding the mole fraction (x) of a component in solution, is incorrect?
    (a) $0 \le x \le 1$
    (b) $x \le 1$
    (c)   x is always non-negative
    (d) $-2 \le x \le 2$

RESPONSE GRID	23. (a)(b)(c)(d)	24. (a)(b)(c)(d)	25. (a)(b)(c)(d)	26. (a)(b)(c)(d)	27. (a)(b)(c)(d)
	28. (a)(b)(c)(d)	29. (a)(b)(c)(d)	30. (a)(b)(c)(d)		

DAILY PRACTICE PROBLEM DPP CHAPTERWISE 16 - CHEMISTRY

Total Questions	30	Total Marks	120
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	35	Qualifying Score	50
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			