



CHEMISTRY

BOOKS - A N EXCEL PUBLICATION

SOLUTIONS

Question Bank

1. Calculate the mass percentage of benzene (C_6H_6) and carbon tetrachloride (Cl_4) if 22g of benzene is dissolved in 122g of Cl_4



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2. Calculate the mole fraction of benzene in solution containing 30 % by mass in Cl_4



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3. Calculate the molarity the following solution
 $30\text{gCo}(\text{NO}_3)_{2.6}\text{H}_2\text{O}$ in 4.3L of solution



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4. Calculate the molarity of the following solution $30\text{mL } 0.5\text{M } H_2SO_4$ diluted to 500mL



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5. Calculate the mass urea (H_2NCONH_2) required to be dissolved in 2.5 kg of water to form a 0.25 molal aqueous solution.



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6. When N_2 gas is passed through water at 293 K, how many moles of N_2 would dissolve in one litre water ? Assume that N_2 exert a partial pressure of 0.987 bar. K_H for N_2 at 293 K is 76.48 kilobar.



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7. The solubility of H_2S gas in water at STP is 195m. Calculate its Henry's law constant at STP





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8. Henry's law constant for CO_2 in water is $1.67 \times 10^8 Pa$ at 298K. Calculate the quantity of CO_2 in 500mL soda water when packed under 2.5 atm CO_2 pressure at 298K.



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9. The vapour pressure of pure liquids A and B are 450 and 700mm Hg respectively at 350K. Find out the composition of the liquid mixture

if total vapour pressure observed is 600mm Hg.



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10. Vapour pressure of pure water at 298 K is 23.8mmHg. 50g of urea is dissolved in 850g of water. Calculate the vapour pressure of water for this solution and its relative lowering.



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11. Boiling point of water at 750mm Hg is $99.63^{\circ}C$ How much sucrose is to be added to 500g of water such that it boils at $100^{\circ}C$ K_b (water) = $0.52K\ kg\ mol^{-1}$



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12. Calculate the mass ascorbic acid (Vitamin C, $C_6H_8O_6$) to be dissolved in 75g of acetic acid to lower its melting point by $1.5^{\circ}C$. $K_f = 3.9\ K\ kg/mol$





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13. Calculated the osmotic pressure in pascals exerted by a solution prepared by dissolving 1.0g of polymer of molar mass 185000 in 450 mL of water at $37^{\circ} C$.



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14. Colligative properties are properties of solutions which depend on the number of solute particles irrespective of their nature.

Name the four important colligative properties



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15. Colligative properties are properties of solutions which depend on the number of solute particles irrespective of their nature.

What happens to the colligative properties when ethanoic acid is treated with benzene ?



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16. Mr. Raju has determined the molecular masses of different solutes in different solvents by osmotic pressure measurements and present them in the following table.

Please help him to complete the table

Solute	Solvent	Theoretical Molecular Mass	Experimental Molecular Mass
$NaCl$	Water	A	A/2
Benzoic acid	Benzene	B	...
Urea	Water	C	...
Acetic acid	Benzene	D	...
$CaCl_2$	Water	E	...
Glucose	Water	F	...
$Al_2(SO_4)_3$	Water	G	...



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17. What is the significant of van't Hoff factor ?



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18. Elevation of boiling point is a colligative property. What is colligative properties ?



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19. Colligative properties can be used to determine the molecular mass of solutes in

solutions. For determining the molecular mass of polymers, osmotic pressure is preferred to other properties. Why ?



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20. For intravenous injections, only solutions with freezing point depression equal to that of 0.9% NaCl solution is used Why ?



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21. Relative lowering of vapour pressure, elevation of boiling point, depression of freezing point and osmotic pressure are important colligative properties of dilute solutions. Relative lowering of vapour pressure of an aqueous dilute solution of glucose is 0.018. What is the mole fraction of glucose in the solution ?



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22. An aqueous solution of a non-volatile solute boils at 373.053K. Find its freezing point.

For water, $K_b = 0.52 \text{K kg mol}^{-1}$, $K_f = 1.86 \text{K kg mol}^{-1}$

Boiling point = 373K, freezing point of water = 273K



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23. Vapour pressure of a solution is different from that of pure solvent. Name the law which helps us to determine partial vapour pressure of a volatile component.

State the above law.



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24. Vapour pressure of chloroform ($CHCl_3$) and dichloro methane (CH_2Cl_2) at 298K are 200 mm and 415 mm of Hg respectively.

Calculated the vapour pressure of solution prepared by mixing 24g of chloroform and 17g of dichloro methane at 298K

[At. Mass: H-1, C-12, Cl-35.5]



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25. Colligative properties are properties of solution which depends on the number of solute particles in the solution. Write the name of four important colligative properties.



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26. Colligative properties are properties of solution which depends on the number of solute particles in the solution. The value of van't Hoff factor, 'i', for aqueous KCl solution is close to 2, while the value of 'i' for ethanoic acid in benzene is nearly 0.5. Give reasons



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27. Elevation of boiling point is a colligative property. What is colligative properties ?



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28. The boiling point of benzene is 353.23K. When 1.80g of a non-volatile solute was dissolved in 90g of benzene, the boiling point is raised to 354.11K. Calculate the molar mass of the solute k_b for benzene is 2.53K kg mol^{-1}



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29. Liquid solutions can be classified as ideal and non-ideal solution on the basis of Rault's law. State Rault's law.



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30. Liquid solutions can be classified as ideal and non-ideal solution on the basis of Rault's law. What are ideal solutions ?



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31. Liquid solutions can be classified as ideal and non-ideal solution on the basis of Rault's law. Write two properties of and ideal solution



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32. Liquid solutions can be classified as ideal and non-ideal solution on the basis of Rault's law. What type of deviation is shown by a mixture of chloroform and acetone ? Give reason.



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33. Osmotic pressure is a colligative property and it is proportional to the molarity of solution. What is osmotic pressure ?



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34. Molecular mass of NaCl determine by osmotic pressure measurement is found to be half of the actual value. Account for it .



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35. Calculate the osmotic pressure exerted by a solution prepared by dissolving 1.5g of a polymer of molar mass 185000 in 500mL of water at $37^{\circ}C$ ($R = 0.0821 \text{ L atm } K^{-1} \text{ mol}^{-1}$)



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36. Molarity (M), molality (m), and mole (x) are some methods for expressing concentration of solutions. Which of these are temperature independent ?



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37. Define mole fraction.



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38. A mixture contain 3.2g methanol (molecular mass =32 u) and 4.6 g ethanol (molecular mass =46 u) Find the mole fraction of each component.



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39. Among the following which is not a colligative property ? a) Osmotic pressure b) Elevation of boiling point c) Vapour of boiling point d) Depression in freezing point

A. Osmotic pressure

B. Elevation of boiling point

C. Vapour of boiling point

D. Depression in freezing point

Answer:



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40. 200cm^3 of aqueous solution of a protein contain 1.26g of protein. The osmotic pressure of solution at 300K is found to be 8.3×10^{-2} bar. Calculate the molar mass of protein, ($R=0.083 \text{ l bar } K^{-1} \text{ mol}^{-1}$)



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41. What is the significant of van't Hoff factor ?



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42. Osmotic pressure is a colligative property

What is osmotic pressure ?



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43. 1.00g of a non-electrolyte solute dissolved in 50g of benzene lowered by 0.40K. The freezing point depression constant of benzene is $5.12Kkg/mol$. Find the molar mass of solute.



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44. Number of moles of the solute per kilogram of the solvent is

A. Mole fraction

B. Molality

C. Molarity

D. molar mass

Answer: B



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45. The extent to which a solute is dissociated or associated can be expressed by Van't Hoff factor. Substantiate the statement.



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46. The vapour pressure of pure benzene at a certain temperature is 0.850 bar. A non-volatile, non-electrolyte solid weighing 0.5g when added to 39g of benzene (molar mass

78g mol^{-1}), vapour pressure becomes 0.845 bar. What is the molar mass of the solid substance ?



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47. Osmotic pressure is a colligative property

What is osmotic pressure ?



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48. 1.00g of a non-electrolyte solute dissolved in 50g of benzene lowered the freezing point of benzene by 0.40K. Freezing point depression constant of benzene is $5.12K\text{g}/\text{mol}$. Find the molar mass of solute. .



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49. State Henry's law.



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50. Write any two applications of Henry's law.



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51. 1000cm^3 of an aqueous solution of a protein contain 1.26gm of the protein. The osmotic pressure of such a solution at 300 K is found to be 2.57×10^{-3} bar. Calculated molar mass of the protein ($R = 0.083\text{L bar mol}^{-1}\text{K}^{-1}$)



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52. The mole fraction of water in a mixture containing equal number of moles of water and ethanol is

A. 1

B. 0.5

C. 2

D. 0.25

Answer: B



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53. The following are the vapour pressure curves answer the following questions

What do the curves A and B indicates ?

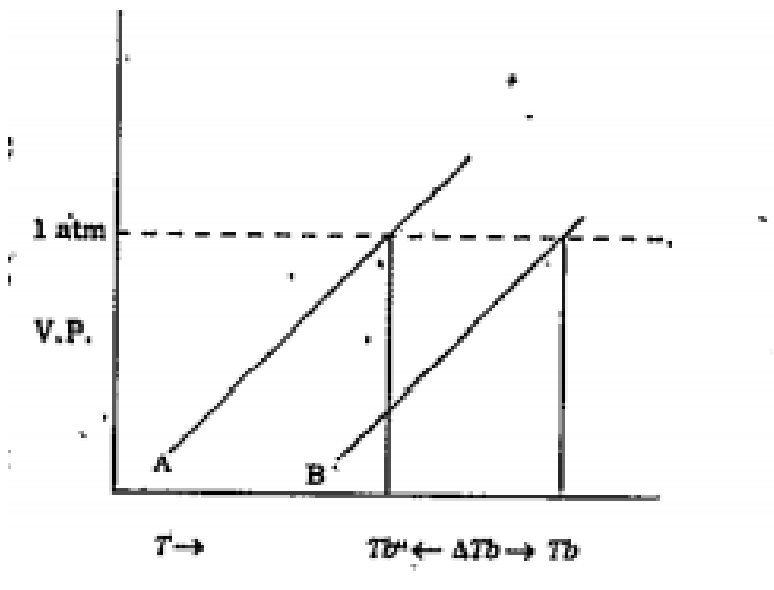


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54. The following are the vapour pressure curves answer the following questions

Explain why the value of T_B is greater than

that of T_B° .



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55. Mixing of acetone and chloroform occurs with reduction in volume and is exothermic

process. What change will occur in vapour pressure? Explain your answer.



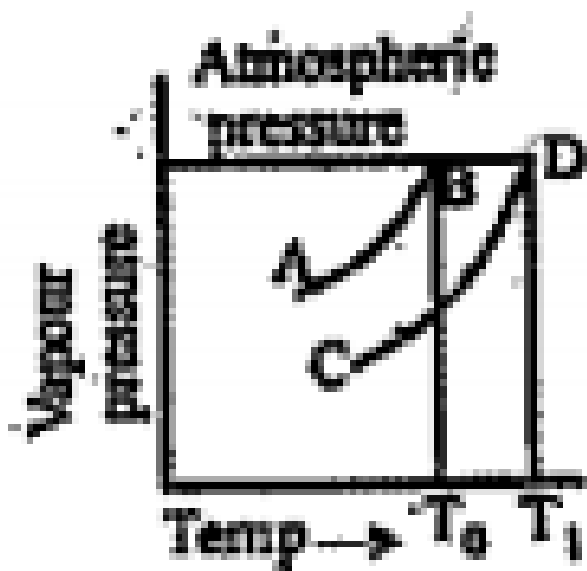
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56. Rectified spirit is a mixture of alcohol and water which behaves like pure liquid and boils at constant temperature. What name can be given to such a mixture?



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57. Graphical representation of solution and a solvent for boiling of 0.1 molal solution of non-volatile compound 'A' is given below : identify the curve for solvent and the curve for solution from the figure



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58. Will elevation in boiling point be same for a 0.1 M NaCl solution and 0.1 M sucrose solution. Give reason.



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59. Solutions exhibit certain colligative properties such as elevation in boiling point, depression in freezing point, osmotic pressure. 10g of an organic substance is dissolved in two litres of water at 280 K. Find

out the molar mass of the substance if
osmotic pressure of the solution is 0.6
atmospheres



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60. solutions exhibit certain colligative properties such as elevation in boiling point, depression in freezing point, and osmotic pressure. Ethylene glycol is added to radiator in vehicles. Which colligative property of water is involved in doing this? Explain.



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61. The value of molecular mass determined by colligative properties are sometimes incorrect. Explain how these abnormalities occur in the case of benzoic acid in benzene and KCl in water ?



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62. The value of molecular mass determined by colligative properties are sometimes incorrect.

What is Van't Hoff factor ?



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63. Out of the following solutions which has the lowest freezing point ? Give reasons

A. 1M glucose

B. 1M NaCl

C. 1M $AlCl_3$

D.

Answer:



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64. Explain why the molecular masses of some substances determined with the help of colligative properties are lower than actual values.



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65. To get hard boiled eggs, common salt is added to water during boiling. Give reasons.



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66. Which is the colligative property, osmosis or osmotic pressure ? Suggest application of reverse osmosis.



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67. Account for the following NaCl is used to remove ice from road in cold countries .



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68. Account for the following Ethylene glycol is added to radiator in automobiles.



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