CHEMISTRY

BOOKS - R G PUBLICATION

SOLUTION

Exercise

1. Why does the molality of a solution remain unchanged with temperature?

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2. What is an ideal solution?

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3. Mention a method used for desalination of sea water.

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4. Which of the following concentration of solution depends on temperature?

A. molality

B. molarity

C. mass%

D. mole fraction

Answer:

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5. Give the definition of solubility of a substance.

6. A solution of sucrose (molecular mass 342 u) is prepared by dissolving 6.84g in 100g of water at 298K. Calculate the boiling point of the solution. (K_b for water, $0.52Kmol^{-1}$)

7. A solution of sucrose (molecular mass 342 u) is prepared by dissolving 6.84g in 100g of water at 298K. Calculate the freezing point of the solution (K_f for water, $1.86 K Kgmol^{-1}$).

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8. A solution of sucrose (molecular mass 342 u) is prepared by dissolving 6.84g in 100g of water at 298K. Calculate the osmotic pressure

of the solution at 298K (Density of water at $298K + 1gmL^{-1}$).

9. Boiling point of water at 750mm Hg is $99.63°C$. How much sucrose is to be added to 500g of water such that it boils at $100°C$? Molal elevation constant for water is $0.52Kkgmol^{-1}$.

10. 2.5gm ethanoic acid (CH_3COOH) is dissolved in 75g benzene. Calculate the molality of the solution. (molecular mass of $CH_3COOH = 60u$)

11. 0.52g of glucose $(C_6H_{12}O_6)$ is dissolved in 80.2g of water calculate the boiling point of the solution. (K_b for water is $0.52 Kkgmol^{-1}$).

12. Define osmotic pressure. How can molar mass of a substance be determined from the measurement of osmotic pressure of a solution?

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13. Calculate the molarity of a solution containing 1g of NaOH in 250 mL of water.

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14. What is meant by positive deviation from Raoult's law? Explain why this deviation is observed.

15. State Henry's law and mention its two important applications.

16. $2000 cm^3$ of an aqueous solution of a protein contains 1.26 g of the protein. The osmotic pressure of such a solution at 300K is found to be 2.57 ...10^{-3} bar. Calculate the molar mass of the protein.

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17. State Rault's law for solution of volatile liquid. Taking suitable examples explain the

meaning of positive and negative deviation from Rault's law.

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18. Mention a method used for desalination of sea water.

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19. What are azeotropes?

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20. State Henry's law. At the same temperature, hydrogen gas is more soluble in water than helium gas. Which one of them will have higher value of K_H?

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21. Urea $[NH_2)_2CO]$ forms an ideal solution in water. Calculate the vapour pressure of an aqueous solution containing 5% by mass of

urea at 298K. At 298K, vapour pressure of water is 23.75 mm Hg.

22. The vapour pressures fo pure liquids A and B are 450 mm Hg and 700 mm Hg respectively at 350K. If the total vapour pressure of the mixture of the two liquids at 350K is 600mm Hg, Calculate the more fractions of the two components in the solution. Also, calcuate the

partial pressures of the two components in the vapour phase.

23. How do osmotic pressure depend upon the temperature and atmosphere?

24. Calculate molarity of a solution containing 11.7g NaCl in 2.0L solution.

25. State Henry's law.

At the same temperature, CO_2 gas is more soluble in water then O_2 gas. Which one of them will have higher value of K_H?

26. Calculate the mass of a non-volatile solute of molar mass $40 gmol^{-1}$ which when disolved

in 114g octane to reduce it vapour presure to 80%.

27. With the help of Raoult's law show that total vapour pressure of a binary liquid solution varies linearly with the mole fraction of a component.

28. 1.8g of glucose $(C_6H_{12}O_6)$ is dissolved in 100g of water in a beaker. At what temperature will water in the solution boil at 1.013 bar? Given boiling point of pure water at 1.013 bar is 373.15K and K_b for water is 0.052K mol^(-1)`.

29. What is the sum of the mole fractions of all the components in a two component system?

A. Not fixed

B. less than one

C. exactly one

D. more than one

Answer:

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30. Calculate the molarity of a solution containing 1g of NaOH in 250 mL of water.

A. 0.1M

B. 1M

C. 0.01 M

D. 0.001 M

Answer:

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31. Ideal solution is formed when its components.

A. Have only zero heat of mixing

B. Volume change is zero

C. Have both zero heat of mixing as well as

zero volume change

D. Can be converted into ideal gas

Answer:

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32. An azeotropic solution of two liquids has boiling point lower than either of them when it.

A. Shows a negtive deviation from Raoult's law

B. Show no deviation from Raolt's law

C. Shows positive deviation from Raolt's law

D. Is saturated

Answer:

33. Find out the solution producing maximum

elevation of b.p.

A. 0.1 M Glucose

B. 0.2 M Sucrose (0.2 M)

C. 0.1 M $BaCl_2$

D. 0.1 M$MgSO_4$

Answer:

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34. Give the definition of solubility of a substance.

A. Maxium amount of substance disolved in specified amount of solvent at any temperature

B. Any amount of substance dissovled in any amount of solvent at specified temperature.

C. Maximum amount of substance dissolved in a specified amount of solvent at specified temperature.

D. None of the above

Answer:

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35. If the solubility of a solid in a liquid is endothermic then the solubility will be increased if

A. Temperature is increased

B. Temperature is decreased

C. Pressure is increased

D. Temperature & presssure is decreased

Answer:

36. Which has the highest freezing poiont at one atmosphere

    A. 0.1 M NaCl solution

    B. 0.1 M sugar solution

    C. 0.1 M $BaCl_2$ solution

    D. 0.1 M $FeCl_3$ solution

Answer:

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37. The osmotic pressures of equimolar solutions of $BaCl_2$, NaCl and sucrose will be the order

A. $Sucrose > NaCl > $ BaCl_2`

B. $Sucrose > BaCl_2 > NaCl$

C. $NaCl > BaCl_2 > Sucrose$

D. $BaCl_2 > NaCl > Sucrose$

Answer:

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38. When glycerine is added to a litre of water which of the following phenomenon will occur?

A. Water evaporates more easily.

B. The temperture of water increases

C. The freezing point of water is increased

D. The viscosity of water is lowered

Answer:

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39. The correct expression of Van't Hoff factor is

A. Calculated osmotic pressure/ observed osmotic pressure

B. Observed molecular mass/calculated molecular mass

C. Calculated boiling point/observed boiling point.

D. Observed colligative property/calculated colligative propety

Answer:

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40. Benzoic acid under goes dimenization in benzene solution, the Van't Hoff factor related to the degree of associatioin 'x' of the acid as.

A. I = (1-x)

B. i=(1+x)

C. $i = \left(1 - \dfrac{x}{2}\right)$

D. $I = \left(1 + \dfrac{x}{2}\right)$

Answer:

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41. Explain the following terms

Ebullioscopic constant

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42. What is Vant Hoff factor?

43. Explain the following terms

Reverse Osmosis

44. Which of the following isomers is more volatile and why o-nitrophenol or p-

nitrophenol?

45. 2 mol ethanol is dissolved in 3 mol water. Calculate the mole fraction of water in the solution.

46. Calculate the mass of NaCl in 5 molal solution.

47. Is there any effect of pressure on solubility of solid in liquid.

48. State Henry's law and mention its two important applications.

49. H_2S, a toxic gas with rotten egg like smell, is used for the qualitative analysis. If the solubility of H_2S in water at STP is 0.195 m, calculate Henry's law constant.

50. State Rault's law for solution of volatile liquid. Taking suitable examples explain the meaning of positive and negative deviation from Rault's law.

51. Decrease in vapour pressure of water by adding 5 mol sucrose or 5 mol urea to one kg of water is same why?

52. What type of deviation from ideal behaviour exist between acetone and chloroform?

53. The liquids from azeotrope cannot be seperated from each other why?

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54. What is meant by "Relative lowering of Vapour pressure".

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55. What would be volume of the mixture if 100 ml of a liquid 'A' was mixed with 25ml of a liquid 'B' to give a non-ideal solution?

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56. What is Vant Hoff factor?

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57. What are isotonic Solutions?

58. A raw mango becomes pickle when placed in salt solution. What phenomenone is associated with it?

59. State the condition resulting in reverse osmosis.

60. Explain why Aquatic species are more comfortable in cold water rather than in warm water.

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61. Give an example of antifreezing agent with chemical formula.

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62. What role does the moelcular interaction play in a solution of alcohol and water.

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63. Define homogeneous mixture.

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64. Which unit of concentraction is temperature dependent & why?

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65. Calculate molality of 2.5 g of ethanoic acid

in 25g of benzene

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66. Write the factors responsible for solubility

of a solid in liquid.

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67. The solubility of a gas in liquid is affected by pressure. Which law is associated with it ? Write the mathematical expression of the law.

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68. When soda water bottle is suddenly opened, effervescenece is produced. Why?

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69. Henry's law constant for CO_2 in water is 1.67×10^8 Pa at 298 K. Calculate the quantity of CO_2 in 500mL of soda water when packed under 2.5 atm CO_2 pressue at 298K.
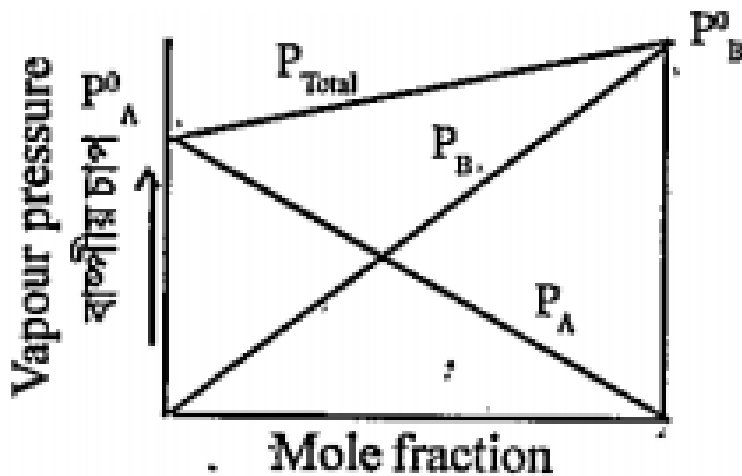
70. Climber at high altitude feels very tired. Why?

71. A plot is obtained for two volatile liquids A & B as follows. From the plot answer the following.
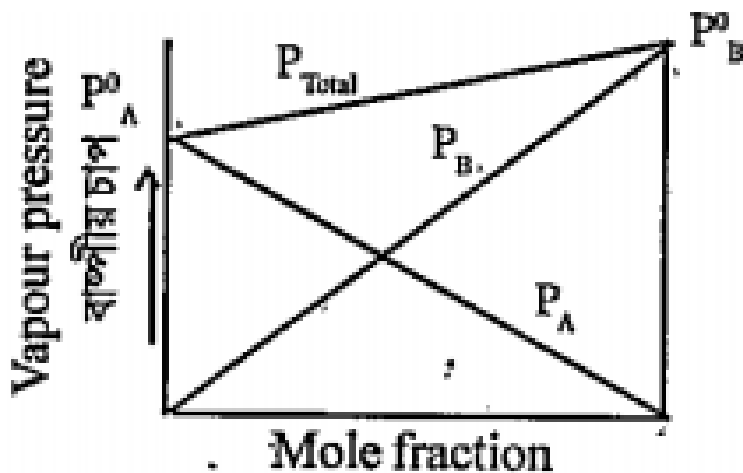

Which of the liquids have higher boiling point?

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72. A plot is obtained for two volatile liquids A & B as follows. From the plot answer the following.
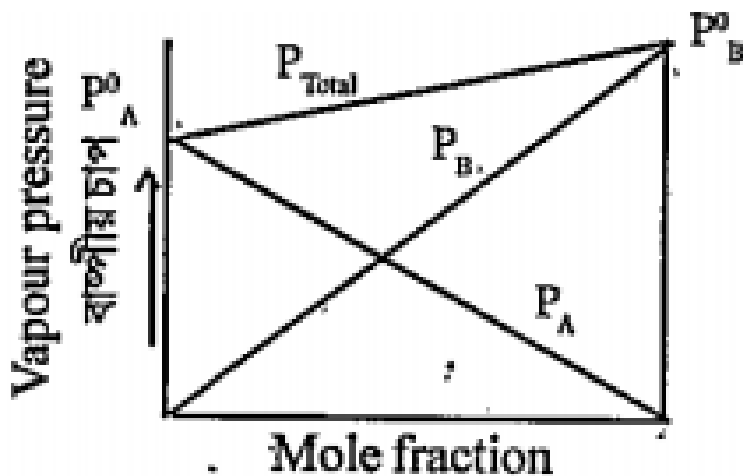

What is the total pressure of the solution phase?

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73. A plot is obtained for two volatile liquids A & B as follows. From the plot answer the following.

What is the mol fraction of vapour phase of componant A over the solution?

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74. Solution of two volatile liquids A and B obey Roalt's law. At certain temperature, it is found that when the toal pressure above a solution is 0.53 bar. The mol fraction. A in the vapour is 0.45 & other liquid is 0.65. What are the vapour pressures of the two pure liquids at the given temperature?

75. The density of lake water is found to be 1.25 g mL^{-1} and contains $90gNa^{+}$ ions per

Kg water. Calculate the molality of Na^+ in the lake

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76. Explain when a non volatile solute is added to a liquid solvent, the vapur pressure of the solution decreases.

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77. Write three necessary conditoins for an ideal solution.,

78. Calculate the mass of a non-volatile solute of molar mass 40 which should be dissolved in 114g octane to reduce its vapour pressure to 60%

79. What is colligative property? Show that this property is proportional to the mole fraction of the solid solute.

80. Define Ebulliscopic constant (K_b). Write its S.I. unit. Between water & ethanol which has higher k_b value?

A. `

B.

C.

D.

Answer:

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81. 2g of a non-electrolyte solute dissolved in 100g of benzene lowered the freezing point of benzene by 0.40 K. find the molar mass of the solute.

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82. Suppose you are required to determine the molecular mass of a protein molecule. Which colligative property is suitable for this purpose? Write the necessary equation for the determination of molecular mass.

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83. Explain hypertonic and hypotonic solution?

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84. A 1.2% solution of NaCl is isotonic with 7.2% solution of glucose. Calculate Van't Hoff factor of NaCl solution.

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85. A fresh carrot becomes dry in dry season . Why?

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86. What is reverse osmosis? Discuss one of its application?

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87. Show that for dimerisation of benzoic acid in benzene solution, degree of association, = 2(1-i) where I = Van't Hoff factor.

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88. Calculate Van't Hoff factor 'i' for 0.001 molal

NaCl solution.

89. In a cold climate water gets forzen causing

damage to the radiator of a car. Ethylene

glycol is used as an antifreezing agent for the

purpose. Calculate the amount of ehtylene

glycol to be added to 4kg of water to prevent

it from freezing at $-6°C$(K_f

f or $water = 1.85K$mol^(-1)`kg)

90. Suggest the most important type of

intermolecular interaction in the following

pair.

n-hexane and n-octane

91. Suggest the most important type of intermolecular attractive interaction in the following pair

$NaClO_4$ and $H2O$

92. Suggest the most important type of intermolecular attractive interaction in the following pair

Methanol and acetone

93. Suggest the most important type of intermolecular attractive interaction in the following pair

Phenol and aniline

94. What concentration of nitrogen should be present in a glass of water at room temperature at $25°C$, a total pressure of 1

atm and mole fraction on nitrogen in air of 0.78 [K_H for nitrogen = $8.42 \times 10^{-7} M/mmHg$].

95. On mixing liquid X and liquid Y, volume of the resulting solution decreases, what type of deviation from Raoult's law is shown by the resulting solution? What change in temperature would you observe after mixing liquids X and Y.

96. Assuming complete dissociation, calculate the expected freezing point of a solution prepared by dissolving 6g of $Na_2SO_4.10H\_2O$~ in 0.1 kg of water (k_f for water= 1.86)

97. A solution containing 15g urea (molar mass = 60g/mol) per litre of solution in water is isotonic with the solution of glucose (molar

masss $180g/mol$) in water calculate the mass of glucose present in one litre of its solution,.

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98. Write one similarity and one dissimilarity between Raoult's law and Henrey's law.

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99. A 5% solution (by mass) of canesugar in water has freezing point of 271K. Calculate the

freezing point of a 5% glucose in water if freezing point of pure water is 273.15K.

100. 18g of glucose is dissolved in 1kg of water in a container. At what temperature the solution will boil? (K_b for water = 0.52, boiling point of water = 373.15K)

101. A 1 molal aquous solution of trichloroacetic acid (CCl_3COOH) is heated to its boiling point. The solution has the boiling point of $100.18°C$. Determine the Van't Hoff factor for the acid (k_b for water = 0.512)

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102. Differentiate between molarity and molality of a solution. What is the effect of

temperature on the units of above strength?

103. Calculate the amount of NaCl which must be added to one kilogram of water so that the freezing point of water is depressed by 3K (Given K_f= 1.86KKg mol^{-1})

104. 0.01M solution of KCl and $BaCl_2$ are prepared in water. The freezing points of KCl is found to be $-2°C$. What freezing point would you expect for $BaCl_2$ solution assuming both KCl and $BaCl_2$ to be completely ionised?

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105. At a certain temeperature, the vapur pressure of CH_3OH and C_2H_5OH solution is represented by P = 119x+135. Where x is the

mole fraction of CH_3OH. What are the vapur pressure of the pure components at this temperature?

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106. Which aqueous solution has higher concentration 1 molar or 1 molal solution of the same solute? Give reason.

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107. After removing the outershell of two eggs in dil. HCl one is plced in distilled water and the other is placed in a saturated solution of NaCl. What will you observe and why?

108. If N_2 gas is bubbled through water at 293K how many milliomoles of N_2 would be dissoved in 1 litre of water? Assume that N_2 exert sa partial pressure of 0.987 bar. Given

that Henrey's law constant for N_2 at 293K is

76.48K bar.

109. A solution containing 30 g of non-volatile

solute exactly in 90g of water has a vapour

presure of 2.8K Pa at 298K. Further 10g of

water is added to this solution. The new

vapour pressure becomes 2.9K Pa at 298K.

Calculate 298K. The molar mass of the solute

110. A solution containing 30 g of non-volatile solute exactly in 90g of water has a vapour presure of 2.8K Pa at 298K. Further 10g of water is added to this solution. The new vapour pressure becomes 2.9K Pa at 298K. Calculate Vapour presure of water at 298K

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111. Explain why a solution of chloroform and aceton shows negative deviation from Raoult's

law?

112. Non ideal solution exhibit either positive or negative deviations from Raoult's law. What are these deviations and why are they caused? Explain with one example for each type.

113. Calculate the depression in freezing point of water when 20g of $CH_3CH_2CHClCOOH$ is added to 500g of water. (Given $Ka = 1.4 \times 10^{-3} K_f = 1.86$)