



CHEMISTRY

BOOKS - JEEVITH PUBLICATIONS CHEMISTRY (KANNADA ENGLISH)

SOLUTIONS

Subjective Type Question

1. What is Binary Solution?



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2. What is saturated solution?



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3. Define the term molarity.



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4. how does molarity changes with temperature?



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5. Define molality.



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6. Define mole fraction.



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7. State Henry's law. Give its mathematical form.



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8. Give the relation between solubility of gas in liquid and Henry's constant.



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9. At given temperature and pressure nitrogen gas is more soluble in water than helium gas. Which one of them has higher K_H value.



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10. K_H (Henry's constant) value of H_2 and O_2 69.16 k bar, 34.84 k bar respectively at 293K. Which one of them is highly soluble in water.



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11. Give three applications of Henry's law.



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12. Name the law behind the dissolution of CO_2 gas in soft drinks under high pressure.



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13. What happens to the solubility of gas in liquid with the increase in temperature? Give reason.



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14. What is the effect of increase in pressure on the solubility of a gas in a liquid.



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15. How solubility of gas in liquid varies with (i) temperature (ii) pressure.



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16. Aquatic animals are more comfortable in cold water rather in warm water. Give reason.



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17. Two liquids A and B boil $145^{\circ}C$ and $190^{\circ}C$ respectively. Which of them has a higher vapour pressure at $80^{\circ}C$?



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18. State Raoult's law of liquid mixtures.



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19. What are ideal solutions?



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20. Give two characteristics of an ideal solution.



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21. Give three examples for an ideal solutions.



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22. What are non-ideal solutions ? Give two characteristics.



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23. What is meant by non-ideal solution showing the positive deviation from Raoult's law?



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24. What is meant by non-ideal solution showing the positive deviation from Raoult's law?



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25. Give examples for non-ideal solution showing +ve deviation from Raoult's law.



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26. Give examples for non-ideal solution showing negative deviation from Raoult's law.



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27. Mention the enthalpy of mixing (Δ_{mix}) value to form an ideal solution.



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28. On mixing equal volumes of acetone and ethanol, what type of deviation from Raoult's law is expected?



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29. Mention the differences between ideal and non-ideal solutions.



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30. What is azeotropic mixture? Give example



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31. What is minimum boiling azeotrope? Give example.



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32. What is maximum boiling azeotrope? Give example.



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33. Components of a non-ideal binary solution cannot be completely separated by fractional distillation why?



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34. What type of non-ideal solution shows minimum boiling azeotrope?



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35. What type of non-ideal solution shows maximum boiling azeotrope?



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36. 10 ml of liquid A is mixed with 10ml of liquid B, the volume of the resultant solution is 19.9 ml. what type of deviation expected from Raoult's law.



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37. What are colligative properties?



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38. Name four colligative properties.



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39. On what factor the value of colligative property depends?



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40. State Roul't's law of solutions containing non-volatile solute. Give its mathematical expression for the law.



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41. Give equation to calculate molar mass of a solute using relative lowering of vapour pressure.



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42. What happens to vapour pressure of water if a table spoon of sugar is added to it?



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43. Among sea water and river water which has high vapour pressure.



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44. Name two factors on which vapour pressure of a solvent depends.



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45. Explain the elevation in boiling point of solution.



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46. Give equation to calculate molar mass of a solute based on elevation in boiling point temperature.



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47. Explain the depression in freezing point of solution.



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48. Give equation to calculate molar mass of a solute based on depression in freezing point temperature.



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49. Give the unit for molal boiling point elevation constant and molal freezing point depression constant.



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50. Define osmosis.



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51. What is osmotic pressure?



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52. Give the relation between osmotic pressure and concentration of a solution.



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53. Give equation to calculate molecular mass of a solute using osmotic pressure method.



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54. Give three advantages of determination of molecular mass by osmotic pressure method compared to other colligative methods.



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55. What advantage the osmotic pressure method has over the other colligative methods for the determination of molecular mass of macro molecules?



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56. What are isotonic solutions? Give example.



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57. What is hypertonic solution? Give example.



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58. What is hypotonic solution? Give solution.



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59. What is reverse osmosis? Mention one of its practical utility.



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60. What will happen's if pressure greater than osmotic pressure is applied on the solution separated by semipermeable membrane from the solvent.



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61. Explain the proces of desalination of sea water.



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62. What is van't Hoff factor?



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63. Under what conditions van't Hoff factor i is

(i) Greater than 1

(ii) Less than 1

(iii) equal to 1.



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64. What does the Van't Hoff factor for a solute in a solvent account for ?



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65. Van't Hoff factor for a solution is more than one. what is the conclusion drawn from it ?



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66. What is the van't Hoff factor of a completely ionised aqueous solution of

(i) NaCl

(ii) KCl

(iii) $MgSO_4$

(iv) K_2SO_4 .



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67. What should be the ratio of concentration of acetic acid to sodium acetate while preparing an acid buffer mixture with $\text{pH} = 5.7$?

(K_a for acetic acid is 1.8×10^{-5})



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Problem Section

1. The vapour pressure of pure benzene at certain temperature is 0.850 bars. A non-volatile, non-electrolyte solid weighing 0.5 grams when added to 39 grams of benzene (molar mass 78grams), vapour pressure of the solution becomes 0.845 bars. What is the molar mass of the solid substance?



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2. 5.8 g of non - volatile, non - electrolyte solute was dissolved in 100 g of carbon disulphide (CS_2). The vapour pressure of the solution was found to be 190 mm of Hg. Calculate molar mass of the solute. Given : Vapour of pure CS_2 is 195 mm of Hg and molar mass of CS_2 is $76g/mol$.



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3. Vapour pressure of benzene is 200 mm of Hg. When 2 gram of a non-volatile solute dissolved in 78 gram benzene, benzene has vapour pressure of 195 mm of Hg. Calculate the molar mass of the solute. [Molar mass of benzene is 78 g/mol^{-1}]



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4. Aqueous solution of 3% non-volatile solute exerts a pressure of 1 bar at the boiling point

of the solvent. Calculate the molar mass of solute.



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5. On dissolving 2.34g of non-electrolyte solute in 40g of benzene, the boiling point of solution was higher than benzene by 0.81K. K_b value for benzene is $2.53 \text{ K kg mol}^{-1}$. Calculate the molar mass of solute. [Molar mass of benzene is 78 g mol^{-1}]



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6. The boiling point of benzene is 353.23 K when 1.80 g of a non-volatile, non-ionising solute was dissolved in 90 g of benzene, the boiling point is raised to 354.11 K. Calculate the molar mass of solute.

[Given K_b for benzene = 2.53 K kg mol^{-1}]



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7. A solute containing 0.564g of solute in 36.8g of acetone boils at $56.46^{\circ}C$. Calculate the

molar mass of solute if the boiling point of acetone is $56.30^{\circ}C$. [K_b for acetone $1.92K\text{ kg. mol}^{-1}$]



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8. Chloroform boils at $61.7^{\circ}C$ and the solution of 6.21g of an organic compound is dissolved in 24g of chloroform boils at $68.04^{\circ}C$. What would be the molar mass of compound if K_b value is $3.63\text{ K kg mol}^{-1}$.



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9. A solution containing 18g of non - volatile non - electrolyte solute is dissolved in 200g of water freezes at 272.07K. Calculate the molecular mass of solute. Given $K_f = 1.86\text{kg/mol}$ and freezing point of water = 273K



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10. 1.0 g of non - electrolyte solute dissolved in 50 g of benzene lowered the freezing point of

benzene by 0.4 K. Find the molar mass of the solute. [Given : Freezing point depression constant of benzene = 5.12 K. kg mol].



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11. 15 g of an unknown molecular substance was dissolved in 450 g of water. The resulting solution freezes at -0.34°C . what is molar mass of the substance ?

$(K_f \text{ for water} = 1.86\text{kg mol}^{-1})$



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12. 5% solution of a substance in water has freezing point 269.06K. Calculate molar mass of solute. Freezing point of pure water 273.15K.

$$[K_f = 14K \cdot kg \cdot mol^{-1}].$$



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13. 200cm^3 of an aqueous solution of a protein contains 1.26 g of protein. The osmotic pressure of such a solution at 300 K is found to be 2.57×10^{-3} bar. Calculate the molar

mass of the protein.

$$(R = 0.083 \text{ L bar mol}^{-1} \text{K}^{-1})$$



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14. 300 cm^3 of an aqueous solution of a protein contains 2.12 g of the protein, the protein, osmotic pressure of such a solution at 300 K is found to be 3.89×10^{-3} bar.

Calculate the molar mass of the protein.

$$(R = 0.0823 \text{ L bar mol}^{-1} \text{K}^{-1})$$



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15. 3 gram of non-volatile solute in a 1000 cm^3 of water shows an osmotic pressure of 2 bar at 300K. Calculate the molar mass of the solute ($R = 0.0853 \text{ L bar K}^{-1} \text{ mol}^{-1}$).



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16. Osmotic pressure of a solution containing 7 g of a protein present in deciliter of a solution is 3.3×10^{-2} bar at 37°C . Calculate the molar mass of protein.



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17. The vapour pressure of ethyl alcohol at 298K is 40mm of Hg. Its mole fraction in a solution with methyl alcohol is 0.80. what is its vapour pressure in solution. If the mixture obeys Raoult's law.



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18. Vapour pressure of chloroform and dichloroethane at 298K are 200 mm Hg and 415 mm Hg respectively. If the mole fraction of chloroform is 0.312. calculate vapour pressure of the solution.



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19. If 1.71 g of sugar (molar mass=342) is dissolved in 500 cm^3 of a solution at 300K. What will be its osmotic pressure?





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20. Vapour pressure of water at 293K is 17.535 mm Hg. Calculate the vapour pressure of water at 293K when 25 g of glucose is dissolved in 450g water.



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21. A 4% solution of non-volatile solute is isotonic with 0.702% urea solution Calculate

the molar mass of the non-volatile solute.

(Molar mass of urea = 60 g mol^{-1})



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