CHEMISTRY

BOOKS - UNIVERSAL BOOK DEPOT 1960 CHEMISTRY (HINGLISH)

SOLUTION

ORDINARY THINKING OBJECTIVE QUESTIONS (Solubility)

1. Which among the following gas will greatly deviate from Henry's law in water ?

A. H_2

B. N_2

C. CH_4

D. CO_2

Answer: D

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2. Which one of the following gases has the lowest value of Henry law constant ?

A. N_2

B. He

C. H_2

D. CO_2

Answer: D

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3. The statement "The mass of a gas dissolved in a given mass of a solvent at any temperature is proportional to the pressure of the gas above the solvent " is

A. Dalton's Law of Partial Pressures

B. Law of Mass Action

C. Henry's Law

D. None of these

Answer: C

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4. Henry's law constants for aqueous solution of CO, O_2, CO_2 and C_2H_2 gases are respectively at $25^\circ C$ as $58 \times 10^3, 43 \times 10^3, 1.61 \times 10^3$ and 1.34×10^3. The solubility of these gases decreases in the order

A. $CO > O_2 > CO_2 > C_2H_2$

B. $O_2 > CO_2 > CO > C_2H_2$

C. $C_2H_2 > CO_2 > O_2 > CO$

D. $O_2 > CO_2 > C_2H_2 > CO$

Answer: C

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5. Which compound would be least soluble in water?

A. He

B. O_2

C. NH_3

D. CO_2

Answer: A

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6. The solubility of a gas in water depends upon

A. Nautre of the gas

B. Temperature

C. Pressure of the gas

D. All of the above

Answer: D

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7. Which of the following is not an example of buffer solution ?

A. Air

B. Brass

C. Amalgam

D. Benzene in water

Answer: D

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8. The solubility of a gas in liquid increases with

A. Raoult's law

B. Henry's law

C. Dalton's law of partial pressure

D. Van't Hoff factor

Answer: B

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9. Which is CORRECT about Heny's law?

A. The gas in contact with the liquid should behave as an ideal gas

B. There should not be any chemical interaction between the gas and liquid

C. The pressure applied should be high

D. All of these

Answer: D

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10. Which of the following is not correct for D_2O

A. Boiling point is higher than H_2O

B. D_2O reacts slowly than H_2O

C. Viscosity is higher than H_2O at 25°

D. Solubility of NaCl in it is more than H_2O

Answer: D

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11. The statement "If 0.003 moles of a gas are dissolved in 900 g of water under a pressure of 1 atmosphere , 0.006 moles will be dissolved under a pressure of 2 atmosphere " illustrates

A. Dalton's Law of Partial Pressures

B. Graham's law

C. Raoult's law

D. Henry's law

Answer: D

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ORDINARY THINKING OBJECTIVE QUESTIONS (Methods of expressing concentration of solution)

1. Molarity is expressed as

A. Gram/litre

B. Moles/litre

C. Litre/mole

D. Moles/1000 gms

Answer: B

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2. Which is behaviest

A. 25 gm of mercury

B. 2 moles of water

C. 2 moles of carbon dioxide

D. 4 gm atoms of oxygen

Answer: C

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3. When 7.1 gm Na_2SO_4 (molecular mass 142) dissolves in 100 ml H_2O ,the molarity of the solution is

A. 2.0 M

B. 1.0 M

C. 0.5 M

D. 0.05 M

Answer: C

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4. The volume strength of $1 \cdot 5$ N H_2O_2 solution is

A. 4.8

B. 5.2

C. 8.8

D. 8.4

Answer: C

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5. How many grams of a dibasic acid (Mol. Wt. =200) should be present in 100 ml of its aqueous solution to give decinormal strength

A. 1g

B. 2g

C. 10g

D. 20g

Answer: A

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6. The molarity of a solution having 18g of glucose dissolved in 500 g of water is

A. 1m

B. 0.5 m

C. 0.2 m

D. 2 m

Answer: C

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7. What is molarity of a solution of HCl which contains 49% by weight of solute and specific gravity is 1.41

A. 15.25

B. 16.75

C. 18.92

D. 20.08

Answer: C

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8. Which one of the following has maximum number of molecules ?

A. 16 gm of O_2

B. 16 gm of NO_2

C. 7 gm of N_2

D. 2 gm of H_2

Answer: D

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9. The number of atoms in 4.25 g of NH_3 is approximately

A. 0.5×10^{23}

B. 1.5×10^{23}

C. 3.5×10^{23}

D. 2.5×10^{23}

Answer: B

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10. 2.5 litre of 1 M NaOH solution are mixed with another 3 litre of 0.5 M NaOH solution Then the molarity of the resulting

A. 1.0 M

B. 0.73 M

C. 0.80 M

D. 0.50 M

Answer: B

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11. The mole fraction of the solute in one molal aqueous solution is:

A. 0.027

B. 0.036

C. 0.018

D. 0.009

Answer: C

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12. Concentrated aqueous solution of sulphuric acid is 98% by mass and has density of 1.80g mL^{-1}. What is the volume of acid required to make one liter $0.1MH_2SO_4$ solution ?

A. 11.10 mL

B. 16.65 mL

C. 22.20 mL

D. 5.55 mL

Answer: D

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13. How many grams of concentrated nitric acid solution should be used to prepare $250 mL$ of $2.0 M HNO_3$? The concentrated acid is $70\ \% \ HNO_3$:

A. 54.0 conc. HNO_3

B. 45.0 conc. HNO_3

C. 90.0 conc. HNO_3

D. 70.0 conc. HNO_3

Answer: B

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14. An excess of $AgNO_3$ is added to $100mL$ of a $0.01M$ solution of dichlorotetraaquachromium(III) chloride The number of moles of $AgCI$ precipitated would be .

A. 0.01

B. 0.001

C. 0.002

D. 0.003

Answer: B

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15. In an experiment it is shown that $10mL$ of $0.05M$ solution of chloride required $10mL$ of $0.1M$ solution of $AgNO_3$, which of the following will

be the formula of the chloride (X stands for the symbol of the element other than chlorine):

A. X_2Cl_2

B. XCl_2

C. XCl_4

D. X_2Cl

Answer: B

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16. What is the normlity of a 1 M solution of H_3PO_4?

A. 0.5 N

B. 1.0 N

C. 2.0 N

D. 3.0 N

Answer: D

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17. Normality of 2M sulphuric acid is

A. 2 N

B. 4 N

C. N/2

D. N/4

Answer: B

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18. An aqueous solution of glucose is 10% in strength ,The volume in which 1g mole of it dissolved will be

A. 18 litre

B. 9 litre

C. 0.9 litre

D. 1.8 litre

Answer: D

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19. A 500 g toothpaste sample has 0.2 g fluoride concentration. What is the concentration of F^{Θ} in ppm ?

A. 250

B. 200

C. 400

D. 1000

Answer: C

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20. What will be the molarity of a solution containing 5g of sodium hydroxide in$250ml$ solution?

A. 0.5

B. 1.0

C. 2.0

D. 0.1

Answer: A

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21. What is the molarity of H_2SO_4 solution that has a density 1.84 g/c c at 35°C and contains 98% by weight?

A. 4.18 M

B. 8.14 M

C. 18.4 M

D. 18 M

Answer: C

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22. Normal level of haemoglobin per 100 ml of blood in a woman is

A. 8 mg

B. 80 mg

C. 200 mg

D. 800 mg

Answer: B

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23. In a solution of 7.8 gm benzene C_6H_6 and 46.0 gm toluene $(C_6H_5CH_3)$, the mole fraction of benzene in this solution is

A. $1/6$

B. $1/5$

C. $1/2$

D. $1/3$

Answer: A

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24. Molecular weight of urea is 60. A solution of urea containing 6 g urea in one litre is

A. 1 molar

B. 1.5 molar

C. 0.1 molar

D. 0.01 molar

Answer: C

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25. What are the units of mole fraction ?

A. Moles/litre

B. Moles/litre^2

C. Moles-litre

D. Dimensionless

Answer: D

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26. Molarity of a solution prepared by dissolving 75.5g of pure KOH in 540 ml solution is

A. 3.05 M

B. 1.35 M

C. 2.50 M

D. 4.50 M

Answer: C

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27. 10 mL of concentrated H_2SO_4 (18M) is diluted to one litre. The approximate strength of the dilute acid is-

A. 0.18 N

B. 0.09 N

C. 0.36 N

D. 1800 N

Answer: C

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28. The molarity of pure water is

A. 55.6

B. 5.56

C. 100

D. 18

Answer: A

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29. The normality of 10% (weight /volume) acetic acid is

A. 1 N

B. 10 N

C. 1.7 N

D. 0.83 N

Answer: C

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30. What weight of ferrous ammonium sulphate is needed to prepare 100 ml of 0.1 normal solution (mol. wt. 392)

A. 39.2 gm

B. 3.92 gm

C. 1.96 gm

D. 19.6 gm

Answer: B

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31. 1000 gram aqueous solution of $CaCO_3$ contains 10 gram of carbonate. Concentration of solution is:

A. 10 ppm

B. 100 ppm

C. 1000 ppm

D. 10000 ppm

Answer: D

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32. $1.0g$ of pure calcium carbonate was found to require $50mL$ of dilute HCl for complete reactions. The strength of the HCl solution is given by:

A. 4 N

B. 2 N

C. 0.4 N

D. 0.2 N

Answer: C

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33. If 18 g of glucose is present in 1000 g of solvent, the solution is said to be

A. 1 molal

B. 1.2 molal

C. 0.5 molal

D. 0.1 molal

Answer: D

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34. The amount of $KMnO_4$ required to prepare 100mL of a $0.1N$ solution in an acidic medium is :

A. 1.58 gm

B. 3.16 gm

C. 0.52 gm

D. 0.31 gm

Answer: A

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35. When 6 gm urea dissolve in 180 gm H_2O. The mole fraction of urea is [Mol. Wt. of urea = 60]

A. $\frac{10}{10.1}$

B. $\frac{10.1}{10}$

C. $\frac{10.1}{0.1}$

D. $\frac{0.1}{10.1}$

Answer: D

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36. How many grams of H_2SO_4 are present in 0.25 g mole of H_2SO_4 ?

A. 24.5

B. 2.45

C. 0.25

D. 0.245

Answer: A

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37. To 5.85 gm of NaCl one kg of water is added to prepare a solution. What is the strength of NaCl in this solution (mol. wt. Of NaCl = 58.5)

A. 0.1 Normal

B. 0.1 Molal

C. 0.1 Molar

D. 0.1 Formal

Answer: B

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38. The total number of gm-molecules of SO_2Cl_2 in 13.5 g of sulphuryl chloride is

A. 0.1

B. 0.2

C. 0.3

D. 0.4

Answer: A

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39. One gm equivalent of substance present in :-

A. It shows molar concentration

B. It shows molal concentration

C. It shows normality

D. It shows strength gm/gm

Answer: B

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40. The volume of water to be added to $100cm^3$ of 0.5 NH_2SO_4 to get decinormal concentration is

A. $400cm^3$

B. $500cm^3$

C. $450cm^3$

D. $100cm^3$

Answer: A

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41. Which of the following solutions has the highest pH?

A. 8 gm of KOH/litre

B. N phosphoric acid

C. 6 gm of NaOH/100 ml

D. $0.5MH_2SO_4$

Answer: C

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42. What volume of 0.8M solution contains 0.1 mol of the solute ?

A. 100 ml

B. 125 ml

C. 500 ml

D. 62.5 ml

Answer: B

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43. The molarity of a solution of Na_2O_3having$10.6g / 500ml$of solution is

A. 0.2 M

B. 2 M

C. 20 M

D. 0.02 M

Answer: A

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44. If 5.85g of $NaCl$are dissolved in$90g$ of water,the moles fraction of $NaCl$ is

A. 0.1

B. 0.2

C. 0.3

D. 0.0196

Answer: D

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45. When $1.80g$ glucose dissolved in $90 g of H_2O$,the mole fraction of glucose is

A. 0.00399

B. 0.00199

C. 0.0199

D. 0.998

Answer: B

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46. If 5.85g of $NaCl$(molecular weight58.5)is dissolved in water and the solution is made up to 0.5litre , the molarity of the solution will be

A. 0.2

B. 0.4

C. 1.0

D. 0.1

Answer: A

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47. To prepare a solution of concentration of 0.03 g/ml. of $AgNO_3$. What amount of $AgNO_3$ should be added in 60mL of solution?

A. 1.8

B. 0.8

C. 0.18

D. None of these

Answer: A

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48. A5 molar solution of $H_2SO_4$is diluted from 1litre to 10litres. What is the normality of the solution?

A. 0.25 N

B. 1 N

C. 2 N

D. 7 N

Answer: B

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49. Units of molarity are

A. Mole per litre

B. Mole per kilogram

C. Per mole per litre

D. Mole litre

Answer: B

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50. The molarity of a 0.2 N Na_2CO_3 solution will be :

A. 0.05 M

B. 0.2 M

C. 0.1 M

D. 0.4 M

Answer: C

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51. The volumes of $4NHCI$ and $10NHCI$ required to make 1 litre of $6NHCI$ are

A. 0.75 litre of 10 N HCl and 0.25 litre of 4 N HCl

B. 0.25 litre of 4 N HCl and 0.75 litre of 10 N HCl

C. 0.67 litre of 4 N HCl and 0.33 litre of 10 N HCl

D. 0.50 litre of 4 N HCl and 0.50 litre of 10 N HCl

Answer: C

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52. The weight of pure $NaOH$ required to prepare $250 cm^3$ of $0.1 N$ solution is

A. 4 g

B. 1 g

C. 2 g

D. 10 g

Answer: B

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53. 200 ml of water is added of 500 ml of 0.2 M solution. What is the molarity of this diluted solution?

A. 0.5010 M

B. 0.2897 M

C. 0.7093 M

D. 0.1428 M

Answer: D

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54. A mixture of ethane and ethene occupies 41 L at atm and 500 K. The mixture reacts compeletly with 10/3 mole of oxygen to produce CO_2 and water. The mole fraction of ethane and ethene in the mixture are (R=0.0821L atm $K^{-1}mol^{-1}$ respectively

A. $0.50, 0.50$

B. $0.75, 0.25$

C. $0.67, 0.33$

D. $0.25, 0.75$

Answer: C

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55. A 5.2 molal aqueous of methyl alcohol, CH_3OH, is supplied. What is the molefraction of methyl alcohol in the solution ?

A. 0.100

B. 0.190

C. 0.086

D. 0.050

Answer: C

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56. How many moles of water are present in 180 g of water

A. 1 mole

B. 18 mole

C. 10 mole

D. 100 mole

Answer: C

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57. $25mLHNO_3$. If the volumes are mixed with $75mL$ of $4.0MHNO_3$. If the volumes are additive, the molarity of the final mixture would be:

A. 3.25 M

B. 4.0 M

C. 3.75 M

D. 3.50 M

Answer: C

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58. 20 g of hydrogen is present in 5 litre vessel. The molar concentration of hydrogen is

A. 4

B. 1

C. 3

D. 2

Answer: D

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59. The amount of anhydrous Na_2CO_3 present in 250 ml of 0.25 M solution is

A. 6.225 g

B. 66.25 g

C. 6.0 g

D. 6.625 g

Answer: D

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60. Which statement is true for solution of 0.020 M H_2SO_4 ?

A. 2 litre of the solution contains 0.020 mole of SO_4^{2-}

B. 2 litre of the solution contains 0.080 mole of H_3O^+

C. 1 litre of the solution contains 0.020 mole H_3O^+

D. None of these

Answer: B

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61. 1 Molar solution contains

A. 1000g of solute

B. 1000g of solvent

C. 1 litre of solvent

D. 1 litre of solution

Answer: D

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62. How much water is to be added to dilute $10mL$ of $10NHCl$ to make it decinormal?

A. 990 ml

B. 1000 ml

C. 1010 ml

D. 100 ml

Answer: A

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63. If 20 mL of 0.4 N NaOH solution completely neutralises 40 mL of a dibasic acid, the molarity of the acid solution is :

A. 0.1 M

B. 0.2 M

C. 0.3 M

D. 0.4 M

Answer: A

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64. Molarity of 4% NaOH solution is

A. 0.1 M

B. 0.5 M

C. 0.01 M

D. 1.0 M

Answer: D

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65. The molarity of a solution containing $5.0g$ of NaOH in 250 mL solution is :

A. 0.1 M

B. 1 M

C. 0.01 M

D. 0.001 M

Answer: A

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66. 0.8g of H_2SO_4 is present in 2 litres of a solution. The molarity of the solution is

A. 0.1 M

B. 0.04 M

C. 0.2 M

D. 0.01 M

Answer: B

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67. The mass of oxalic acid crystals $(H_2C_2O_4.2H_2O)$ required to prepare 50 mL of a 0.2 N solution is:

A. 126 g

B. 12.6 g

C. 63 g

D. 6.3 g

Answer: D

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68. The mole fraction of water in $20\,\%\,(wt.\,/wt.\,)$ aqueous solution of H_2O_2 is:

A. $\frac{77}{68}$

B. $\frac{68}{77}$

C. $\frac{20}{80}$

D. $\frac{80}{20}$

Answer: B

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69. 10.6 gram of a substance of molecular weight 106 was dissolved in 100ml . 10 ml of this solution was pipetted out into a 1000ml flask and made up to the mark with distilled water. The molarity of the resulting solution is

A. 1.0 M

B. $10^{-2}M$

C. $10^{-3}M$

D. $10^{-4}M$

Answer: B

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70. 3.65grams of HCl dissolved in 16.2g of water. The mole fraction of HCl in the resulting solution is

A. 0.4

B. 0.3

C. 0.2

D. 0.1

Answer: D

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71. NaClO solution reacts with H_2SO_3 as, $NaClO + H_2SO_3 \rightarrow NaCl + H_2SO_4$. A solution of NaClO used in the above reaction contained 15g of NaClO per litre. The normality of the solution would be

A. 0.8

B. 0.6

C. 0.2

D. 0.4

Answer: D

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72. The degree of hardness of water is usually expressed in terms of

A. ppm by weight of $MgSO_4$

B. g//L of $CaCO_3$ and $MgCO_3$ present

C. ppm by weight of $CaCO_3$ irrespective of whether it is actually present

D. ppm of $CaCO_3$ actually in water

Answer: C

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73. Hydrolic acid solution A and B have concentration of 0.5 N and 0.1N respectively. The volume of solutions A and B required to make 2 litres of 0.2 N hydrochloric are

A. 0.5 L of A + 1.5 L of B

B. 1.5 L of A + 0.5 L of B

C. 1.0 L of A + 1.0 L of B

D. 0.75 L of A + 1.25 L of B

Answer: A

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74. The density of $3M$ sodium of thiosulphate solution $(Na_2S_2O_3)$ is $1.25gmL^{-1}$. Calculate

a. The precentage by weight of sodium thiosulphate.

b. The mole fraction of sodium thiosulphate.

c. The molalities of $Na^{\oplus}$ and $S_2O_3^{2-}$ ions.

A. $12.64\ \%$

B. $37.92\ \%$

C. $0.87\ \%$

D. $63.21\ \%$

Answer: B

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75. The normality of 10 lit. volume hydrogen peroxide is

A. 0.176

B. 3.52

C. 1.78

D. 0.88

Answer: C

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76. The normality of a solution of sodium hydroxide 100 ml of which contains 4 grams of NAOH is

A. 0.1

B. 40

C. 1.0

D. 0.4

Answer: C

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77. The number of moles of a solute in its solution is 20 and total number of moles are 80. The mole fraction of solute is

A. 2.5

B. 0.25

C. 1

D. 0.75

Answer: B

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78. What weight of hydrated oxalic acid should be added for complete neutralisation of 100 ml of 0.2N - NaOH solution

A. 0.45 g

B. 0.90 g

C. 1.08 g

D. 1.26 g

Answer: D

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79. The number of molecules in 16 g of methane is

A. 3.0×10^{23}

B. 6.02×10^{23}

C. $\frac{16}{6.02} \times 10^{23}$

D. $\frac{16}{3.0} \times 10^{23}$

Answer: B

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80. 20 mL of HCl soution requires 19.85 mL of 0.01 M NaOH solution for complete neutralization . The molarity of HCl solution is ______M.

A. 0.0099

B. 0.099

C. 0.99

D. 9.9

Answer: A

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81. How many grams of NaOH will be required to neutralise 12.2 g benzoic acid ?

A. 12.2 g

B. 16 g

C. 40 g

D. 4 g

Answer: D

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82. 36g water and 828g ethyl alcohol form an ideal solution. The mole fraction of water in it, is

A. 1.0

B. 0.7

C. 0.4

D. 0.1

Answer: D

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83. The molarity of a solution made by mixing 50 ml of conc. H_2SO_4 (18M) with 50 ml of water, is

A. 36 M

B. 18 M

C. 9 M

D. 6 M

Answer: C

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84. 171 g of cane sugar $(C_{12}H_{22}O_{11})$ is dissolved in 1 litre of water. The molarity of the solution is

A. 2.0 M

B. 1.0 M

C. 0.5 M

D. 0.25 M

Answer: C

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85. 2.0 molar solutioin is obtained when 0.5 mole solute is dissolved in

A. 250 ml solvent

B. 250 g solvent

C. 250 ml solution

D. 1000 ml solvent

Answer: c

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86. What will be the normality of a solution containing 4.9 g H_3PO_4 dissolved in 500 ml water ?

A. 0.3

B. 1.0

C. 3.0

D. 0.1

Answer: A

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87. The molarity of 90% H_2SO_4 solution is [density = 1.8 gm/ml]

A. 1.8

B. 48.4

C. 91.83

D. 94.6

Answer: C

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88. The volume strength of H_2O_2 solution is 10. what does it mean:

A. $30\ \%$

B. 3%

C. 1%

D. 10%

Answer: B

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89. How many grams of glucose be dissolved to make one litre solution of $10\%1$ glucose:

A. 100 gm

B. 180 gm

C. 18 gm

D. 1.8 gm

Answer: A

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90. Molarity of H_2SO_4 is $18M$. Its density is $1.8g/cm^3$, hence molality is :

A. 36

B. 200

C. 500

D. 18

Answer: C

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91. On dissolving 1 mole of each of the following acids in 1 litre water, the acid which does not give a solution of strength 1N is -

A. HCl

B. Perchloric acid

C. HNO_3

D. Phosphoric acid

Answer: D

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92. Find the molality fo H_2SO_4 solution whose specific gravity is $1.98 gm L^{-1}$ and 98% (Weight/volume) H_2SO_4.

A. 2 N

B. 19.8 N

C. 39.6 N

D. 98 N

Answer: C

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93. A solution of $Al_2(So_4)_3\{d = 1.253gm/ml\}$ contain $22\,\%$ salt by weight. The molarity , normality and molality of the solution is

A. 0.805 M, 4.83 N, 0.825 m

B. 0.825 M, 48.3 N, 0.805 m

C. 4.83 M, 4.83 N, 4.83 m

D. None

Answer: A

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94. 20 ml of 10 N HCl are mixed with 10 ml of 36 N H_2SO_4 and the mixture is made one litre. Normality of the mixture will be

A. 0.56 N

B. 0.50 N

C. 0.40 N

D. 0.35 N

Answer: A

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95. The equivalent weight of $KMnO_4$ in (a) neutral medium, (b) acidic medium and (c) alkaline medium is $M/..$ (where M is mol.wt. of $KMnO_4$)

A. Molecular weight

B. $\frac{\text{Molecular weight}}{2}$

C. $\frac{\text{Molecular weight}}{3}$

D. $\frac{\text{Molecular weight}}{5}$

Answer: C

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96. In which ratio of volumes 0.4 M HCl and 0.9 M HCl are to be mixed such that the concentration of the resultant solution becomes 0.7 M ?

A. $4:9$

B. $2:3$

C. $3:2$

D. $1:1$

Answer: B

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97. A solution made by dissolving 40 g NaOH 1000 g of H_2O is

A. 1 molar

B. 1 normal

C. 1 molal

D. None of the above

Answer: C

View Text Solution

98. Weight of Urea required 200ml of 2 M solution will be

A. 12 gm

B. 24 gm

C. 20 gm

D. 60 gm

Answer: B

Watch Video Solution

99. How many gram of HCl will be present in 150 ml of its 0.52 M solution

A. 2.84 gm

B. 5.70 gm

C. 8.50 gm

D. 3.65 gm

Answer: A

View Text Solution

100. With 63 gm of oxalic acid how many litres of $\frac{N}{10}$ solution can be prepared

A. 100 litre

B. 10 litre

C. 1 litre

D. 1000 litre

Answer: B

Watch Video Solution

101. For converting a solution if 100 ml KCl of 0.4 M concentration into a solution of KCl 0.05 M concentration. The quantity of water added is

A. 900 ml

B. 700 ml

C. 500 ml

D. 300 ml

Answer: B

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102. 35.4 mL of HCl is required for the neutralization of a solution containing 0.275 g of sodium hydroxide. The normality of hydrochloric acid is

A. 0.97 N

B. 0.142 N

C. 0.194 N

D. 0.244 N

Answer: C

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103. 25 mL of a solution of barium hydroxide on titration with 0.1 molar solution of hydrochloric acid gave a titre value of 35 mL. The molarity of barium hydroxide solution was

A. 0.07

B. 0.14

C. 0.28

D. 0.35

Answer: A

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104. 6.02×10^{23} molecules of urea are present in $100ml$ of its solution. The concentration of urea solution is -

A. 0.02 M

B. 0.01 M

C. 0.001 M

D. 0.1 M

Answer: B

Watch Video Solution

105. To neutralize completely 20 mL of 0.1M aqueous solution of phosphorus acid (H_3PO_3) the volume of $0.1M$ aqueous KOH solution required is

A. 40 mL

B. 20 mL

C. 10 mL

D. 60 mL

Answer: A

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106. Two solutions of a substances (non electrolyte) are mixed in the following manner. 480 ml of $1.5M$ first solution $+520mL$ of $1.2M$ second solution. What is the molarity of the final mixture?

A. 1.20 M

B. 1.50 M

C. 1.344 M

D. 2.70 M

Answer: C

Watch Video Solution

107. Density of $2.05M$ solution of acetic acid in water is $1.02g/mL$. The molality of same solution is:

A. $1.14 mol kg^{-1}$

B. $3.28 mol kg^{-1}$

C. $2.28 mol kg^{-1}$

D. $0.44 mol kg^{-1}$

Answer: C

Watch Video Solution

108. The density of a solution prepared by dissolving 120 g of urea (mol. Mass=60 u) in 1000 g of water is 1.15 g/mL. The molarity if this solution is

A. 0.50 M

B. 1.78 M

C. 1.02 M

D. 2.05 M

Answer: D

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109. 5mL of $NHCI, 20mL$ of $N/2H_2SO_4$ and 30 mL of $N/3HNO_3$ are mixed together and volume made to one litre. The normality of the resulting solution is

A. $\frac{N}{5}$

B. $\frac{N}{10}$

C. $\frac{N}{20}$

D. $\frac{N}{40}$

Answer: D

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110. A certain aqueous solution of $FeCl_3$ (formula mass = 162) has a density of 1.1 g/ml and contains $20.0\,\%\,FeCl_3$. Molar concentration of this solution is

A. 0.028

B. 0.163

C. 1.27

D. 1.47

Answer: C

View Text Solution

111. If 0.50 mol of $CaCl_2$ is mixed with 0.20 mol of Na_3PO_4, the maximum number of moles of $Ca_3(PO_4)_2$ which can be formed, is

A. 0.70

B. 0.50

C. 0.20

D. 0.10

Answer: D

View Text Solution

112. The number of moles present in 2 litre of $0.5 M NaOH$ is:

A. 0.5

B. 0.1

C. 1

D. 2

Answer: C

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113. 25 g of a solute of molar mass $250gmol^{-1}$ is dissolved in 100 ml of water to obtain a solution whose density is $1.25gml^{-1}$. The molarity and molality of the solution are respectively

A. 0.75 and 1

B. 0.8 and 1

C. 1 and 0.8

D. 1 and 0.75

Answer: C

Watch Video Solution

114. 36g of glucose (molar mass = $180g/mol$) is present in 500g of water, the molarity of the solution is

A. 0.2

B. 0.4

C. 0.8

D. 1.0

Answer: B

Watch Video Solution

115. A x molal solution of a compound in benzene has mole fraction of solute equals to 0.2. The value of x is

A. 14

B. 3.2

C. 4

D. 2

Answer: B

Watch Video Solution

116. Which of the following conentration factor is affected by change in temperature?

A. Molarity

B. Molality

C. Mole fraction

D. Weight fraction

Answer: A

Watch Video Solution

117. 40% by weight solution will contain how much mass of the solute in 1 solution, density of the solution is 1.2 g/mL

A. 480 g

B. 48 g

C. 38 g

D. 380 g

Answer: A

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118. Which one is correct

A. Molality changes with temperature

B. Molality does not change with temperature

C. Molarity does not change with temperature

D. Normality does not change with temperature

Answer: B

Watch Video Solution

119. A gas mixture 44g of CO_2 and 14g of N_2, what will be fraction of CO_2 in the mixture

A. $1/5$

B. $1/3$

C. $2/3$

D. $1/4$

Answer: C

Watch Video Solution

120. Which of the following is an extensive property?

A. Molar volume

B. Molarity

C. Number of moles

D. Mole fraction

Answer: A

Watch Video Solution

121. The normality of 2.3 M H_2SO_4 solution is

A. 2.3 N

B. 4.6 N

C. 0.46 N

D. 0.23 N

Answer: B

Watch Video Solution

122. 10 litre solution of urea contains 240g urea. The active mass of urea will be

A. 0.04

B. 0.02

C. 0.4

D. 0.2

Answer: C

Watch Video Solution

123. A solution contains 1.2046×10^{24} hydrochloric acid molecules in one dm^3 of the solution. The strength of the solution is

A. 6 N

B. 2 N

C. 4 N

D. 8 N

Answer: B

Watch Video Solution

124. Molarity of 0.2 N H_2SO_4 is

A. 0.2

B. 0.4

C. 0.6

D. 0.1

Answer: D

Watch Video Solution

125. $10cm^3$ of 0.1N monobasic acid requires $15cm^3$ of sodium hydroxide solution whose normality is

A. 0.066 N

B. 0.66 N

C. 1.5 N

D. 0.15 N

Answer: A

Watch Video Solution

126. Molar solution means 1 mole of solute present in

A. 1000 g of solvent

B. 1 litre of solvent

C. 1 litre of solution

D. 1000 g of solution

Answer: C

Watch Video Solution

127. $2NHCI$ solution will have the same molar concentration as a

A. $4.0NH_2SO_4$

B. $0.5NH_2SO_4$

C. $1NH_2SO_4$

D. $2NH_2SO_4$

Answer: A

Watch Video Solution

128. In a mixture of 1 gm H_2 and 8 gm O_2, the mole fraction of hydrogen is

A. 0.667

B. 0.5

C. 0.33

D. None of these

Answer: A

Watch Video Solution

129. The molarity of pure water is

A. 1

B. 18

C. 55.5

D. None of these

Answer: C

Watch Video Solution

130. If $25ml$ of $NaCl$ solution is diltuted with water to a volume of $500ml$ the new concentration of the solution is

A. 0.167 M

B. 0.0125 M

C. 0.833 M

D. 0.0167 M

Answer: B

Watch Video Solution

131. Calculate the molality of 1 litre solution of 93% $H_2SO_4(\text{weight}/\text{volume})$. The density of solution is 1.84 g mL^{-1}.

A. 10.43

B. 20.36

C. 12.05

D. 14.05

Answer: A

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132. The distribution law is applied for the distribution of basic acid between

A. Water and ethyl alcohol

B. Water and amyl alcohol

C. Water and sulphuric acid

D. Water and liquor ammonia

Answer: B

Watch Video Solution

133. Volume of water needed to mix with 10 mL 10N HNO_3 to get 0.1 N HNO_3 is :

A. 1000 ml

B. 990 ml

C. 1010 ml

D. 10 ml

Answer: B

Watch Video Solution

134. Calculate the mass of sodium carbonate required to prepare 500 ml of a semi- normal solution

A. 13.25 g

B. 26.5 g

C. 53 g

D. 6.125 g

Answer: A

Watch Video Solution

135. How much $K_2Cr_2O_7(M.W. = 294.19)$ is required to prepare one litre of $0.1N$ solution?

A. 2.9424 g

B. 0.4904 g

C. 1.4712 g

D. 0.2452 g

Answer: D

Watch Video Solution

136. The molarity of 0.006 mole of NaCl in 100ml solution is

A. 0.6

B. 0.06

C. 0.066

D. None of these

Answer: B

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137. When the solute is present in trace quantities the following expression is used

A. Gram per million

B. Milligram percent

C. Microgram percent

D. Parts per million

Answer: D

Watch Video Solution

138. When the concentration is expressed as the number of moles of a solute per kg of solvent it is known as

A. Normality

B. Molarity

C. Mole fraction

D. Mass percentage

Answer: B

Watch Video Solution

139. Which of the following should be done in order to prepare 0.40 M NaCl starting with 100 ml of 0.30 M NaCl (Mol. Mass of NaCl = 58.5)?

A. Add 0.585 g NaCl

B. Add 20 ml water

C. Add 0.010ml NaCl

D. Evaporate 10ml water

Answer: A

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140. What will be the value of molality for an aqueous solution of 10% w/W NaOH?

A. 2.778

B. 5

C. 10

D. 2.5

Answer: A

Watch Video Solution

141. IF 10 mL of 0.1 aqueous solution of NaCl is divided into 1000 drops of equal volume , what will be the concentration of one drop ?

A. 0.01 M

B. 0.10 M

C. 0.001 M

D. 0.0001 M

Answer: B

Watch Video Solution

142. When W_B gm solute (molecular mass M_B) dissolves in W_A gm solvent. The molality m of the solution is

A. $\frac{W_B}{W_A} \times \frac{M_B}{1000}$

B. $\frac{W_B}{M_B} \times \frac{1000}{W_A}$

C. $\frac{W_A}{W_B} \times \frac{1000}{M_B}$

D. $\frac{W_A \times M_B}{W_B \times 1000}$

Answer: B

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143. Normality (N) of a solution is equal to

A. $\frac{\text{No. of moles of solute}}{\text{Volume of solution in litre}}$

B. $\frac{\text{No. of gram equivalent of solute}}{\text{Volume of solution in litre}}$

C. $\frac{\text{No. of moles of solute}}{\text{Mass of solvent in kg}}$

D. None of these

Answer: B

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144. 10 grams of a solute is dissolved in 90 grams of a solvent. Its mass percent in solution is

A. 0.01

B. 11.1

C. 10

D. 9

Answer: C

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145. The concentration of an aqueous solution of $0.01 M CH_3OH$ solution is very nearly equal to which of the following

A. $0.01\ \%\ CH_3OH$

B. $0.01 m CH_3OH$

C. $x_{CH_3OH} = 0.01$

D. $0.01NCH_3OH$

Answer: D

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146. A solution contains 25% H_2O, 25% C_2H_5OH and 50% CH_3COOH by mass.The mole fraction of H_2Owould be

A. 0.25

B. 2.5

C. 0.503

D. 5.03

Answer: C

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147. Essential quantity of ammonium sulphate taken for preparation of 1 molar sollution in 2 litres is

A. 132 gm

B. 264 gm

C. 198 gm

D. 212 gm

Answer: B

Watch Video Solution

148. The density $(\text{in} gmL^{-1})$ of a $3.60M$ sulphuric acid solution that is $29\,\%\ H_2SO_4$ (Molar mass $= 98gmol^{-1}$) by mass will be:

A. 1.64

B. 1.88

C. 1.22

D. 1.45

Answer: C

Watch Video Solution

149. Assertion :- One molal aqueous solution of glucose contains 180g of glucose in 1 kg water.

Reason :- Solution containing one mole of solute in 1000g of solvent is called one molal solution.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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150. Assertion :- One molal aqueous solution of urea contains 60g of urea in 1kg (1000 g) water.

Reason :- Solution containing one mole of solute in 1000g solvent is called as one molal solution.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

151. Assertion :- If 100 cc of 0.1N HCl is mixed with 100 cc of 0.2 N HCl, the normality of the final solution will be 0.30.

Reason :- Normalities of similar solutions like HCl can be added.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If asserrion is false but reason is true.

Answer: D

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ORDINARY THINKING OBJECTIVE QUESTIONS (Colligative properties)

1. Which of the following is a colligative property ?

A. Osmotic pressure

B. Boiling point

C. Vapour pressure

D. Freezing point

Answer: A

Watch Video Solution

2. Which is not a colligative property?

A. pH of a buffer solution

B. Boiling point elevation

C. Freezing point depression

D. Vapour pressure

Answer: A

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3. Which is not a colligative property?

A. Refractive index

B. Lowering of vapour pressure

C. Depression of freezing ppoint

D. Elevation of boilling point

Answer: A

Watch Video Solution

4. The colligative properties of a solution depend on

A. Nautre of solute particles present in it

B. Nature of solvent used

C. Number of solute particles present in it

D. Number of moles of solvent only

Answer: C

Watch Video Solution

5. Which of the following is not a colligative property ?

A. Optical activity

B. Elevation in boiling point

C. Osmotic pressure

D. Lowering of vapour pressure

Answer: A

Watch Video Solution

6. Which of the following aqueous solution has the highest boiling point

A. $0.1MKNO_3$

B. $0.1MNa_3PO_4$

C. $0.1MBaCl_2$

D. $0.1MK_2SO_4$

Answer: B

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7. The magnitude of colligative properties in colloidal dispersions is .....than solution

A. Lower

B. Higher

C. Both

D. None

Answer: A

Watch Video Solution

8. For $0.1M$ solution ,the colligative property will follow the order

A. $NaCl > Na_2SO_4 > Na_3PO_4$

B. $NaCl < Na_2SO_4 < Ma_3PO_4$

C. $NaCl > Na_2SO_4 \approx Na_3PO_4$

D. $NaCl < Na_2SO_4 = Na_3PO_4$

Answer: B

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9. Equimolar solutions in the same solvent have-

A. Same boiling point but different freezing point

B. Same freezing point but different boiling point

C. Same boiling and same freezing points

D. Different boilling and different freezing points

Answer: C

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10. What does not change on changing temperature

A. Mole fraction

B. Normality

C. Molality

D. None of these

Answer: A::C

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11. Which has the highest freezing point:

A. $1mK_4[Fe(CN)_6]$ solution

B. $1mC_6H_{12}O_6$ solution

C. 1 m KCl solution

D. 1 m rock salt solution

Answer: B

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12. Colligative properties are used for the determination of ______.

A. Molar Mass

B. Equivalent weight

C. Arrangement of moleculaes

D. Both (a) and (b)

Answer: C

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ORDINARY THINKING OBJECTIVE QUESTIONS (Lowering of vapour pressure)

1. The relative lowering of vapour pressure is equal to the ratio between the number of

A. Solute molecules and solvent molecules

B. Solute molecules and the total molecules in the solution

C. Solvent molecules and the total molecules in the solution

D. Solvent molecules and the total number of ions of the solute

Answer: B

Watch Video Solution

2. How much grams of CH_3OH should be dissolved in water for preparing 150 ml of 2.0 M CH_3OH solution ?

A. 9.6

B. 2.4

C. 9.6×10^3

D. 2.4×10^3

Answer: A

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3. Vapour pressure of CCL_4 at $25^\circ C$ is 143 mmHg 0.05g of a non-volatile solute (mol.wt.=65)is dissolved in $100 ml CCL_4$. find the vapour pressure of the solution (density of $CCL_4 = 158 g / cm^2$)

A. 141.93 mm

B. 94.39 mm

C. 199.34 mm

D. 143.99 mm

Answer: A

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4. The vapour pressure of benzene at a certain temperature is $640 mm$ of Hg A non-volatile and non-electrolyte solid weighing $0.175 g$ is added to $39.08 g$ of benzene .the vapour pressure of the solution is$600 mm$ of Hg.What is the molecular weight of solid substance ?

A. 49.50

B. 59.6

C. 69.5

D. 79.8

Answer: C

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5. The vapour pressure of a solvent decreased by 10 mm of Hg when a non-volatile solute was added to the solvent. The mole fraction of solute in solution is 0.2, what would be the mole fraction of solvent if the decrease in vapour pressure is 20 mm of Hg?

A. 0.8

B. 0.6

C. 0.4

D. 0.2

Answer: B

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6. At 298 K 1.0 g of a non-colatile solute is dissoved in 100 g of acetone (mol mass=58). The vapour pressure of the solution at this temperature is found to be 192.5 mm Hg. Calculate themolar mass of the solute. The vapour pressure of pure acetone at 298 K is found to be 195 mm Hg.

A. 25.24

B. 35.24

C. 45.24

D. 55.24

Answer: C

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7. A solution has $1:4$ mole ratio of pentane to hexane . The vapour pressure of pure hydrocarbons at $20^{\circ}C$are 440 mmHgfor pentane and 120mmHg for hexane .The mole

A. 0.549

B. 0.200

C. 0.786

D. 0.478

Answer: D

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8. The vapour pressure of two liquids 'P' and 'Q' are 80 and 60 torr respectively. The total vapour pressure of solution obtained by mixing 3 mole of P and 2 mol of Q would be

A. 14 torr

B. 20 torr

C. 68 torr

D. 72 torr

Answer: D

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9. An aqueous solution is 1.00 molal in KI. Which change will cause the vapor pressure of the solution to increase?

A. Addition of water

B. Addition of NaCl

C. Addition of Na_2SO_4

D. Addition of 1.00 molal KI

Answer: A

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10. The vapour pressure of chloroform $(CHCl)_3$ and dichlorocethene (CH_2Cl_2) at $298K$ is $200mmHg$ and $415mmHg$, respectively. Calculate

a. The vapour pressure of the solution prepared by mixing $25.5g$ of $CHCl_3$ and $40g$ of $CH_2 \_ Cl(2)$ at $298K$.

b. Mole fractions of each components in vapour phase .

A. 90.92 mm Hg

B. 615.0 mm Hg

C. 347.9 mm Hg

D. 285.5 mm Hg

Answer: A

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11. P_A and P_B are the vapour pressure of pure liquid components ,Aand B respectively of an ideal binary solution,If x_A represents the mole fraction of component A, the total pressure of the solution will be

A. $P_A + X_A(P_B - P_A)$

B. $P_A + X_A(P_A - P_B)$

C. $P_B + X_A(P_B - P_A)$

D. $P_B + X_A(P_A - P_B)$

Answer: D

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12. Which one of the following given below concerning properties of solutions, describe a colligative effect ?

A. Boiling point of pure water decreases by the addition of ethanol

B. Vapour pressure of pure water decreases by the addition of nitric acid

C. Vapour pressure of pure benzene decreases by the addition of naphthalene

D. Boiling point of pure benzene increases by the addition of toluene

Answer: B

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13. Which of the following solution in water ppossesses the lowest vapour pressure

A. 0.1 (M) NaCl

B. $0.1(N)BaCl_2$

C. 0.1 (M) KCl

D. None of these

Answer: B

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14. Lowering of vapour pressure is highest for

A. Urea

B. 0.1 M glucose

C. $0.1 M MgSO_4$

D. $0.1 M BaCl_2$

Answer: D

Watch Video Solution

15. The vapour pressure will be lowest for ______.

A. 0.1 M sugar solution

B. 0.1 M KCl solution

C. $0.1 M Cu(NO_3)_2$ solution

D. $0.1 M AgNO_3$ solution

Answer: C

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16. If at certain temperature, the vapour pressure of pure water is 25 mm Hg and that of a very dilute aqueous urea solution is 24.5 mm Hg, the molality of the solution is

A. 0.02

B. 1.2

C. 1.11

D. 0.08

Answer: C

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17. Pick out the wrong statement (s).

(i) Vapour pressure of a liquid is the measure of the strength of intermolecular attractive forces .

(ii) Surface tension of a liquid acts perpendicular to the surface of the liquid .

(iii) Vapour pressure of all liquids is same at their freezing points .

(iv) Liquids with stronger intermolecular attractive forces are more viscous than those with weaker intermolecular force .

A. 2,3 and 4

B. 2 and 3

C. 1, 2 and 3

D. 3 only

Answer: D

Watch Video Solution

18. The relative lowering of vapour pressure of an aqueous solution containing a non-volatile solute, is 0.0125. The molality of the solution is

A. 0.70

B. 0.50

C. 0.60

D. 0.80

Answer: A

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19. The amount of solute (molar mass 60 g mol^{-1}) that must be added to 180 g of water so that the vapour pressure of water is lowered by 10% is

A. 30 g

B. 60 g

C. 120 g

D. 12 g

Answer: B

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20. The relative lowering of vapour pressure produced by dissolving 71.5 g of a substance in 1000 g of water is 0.00713. The molecular mass of the substance will be:

A. 18.0

B. 342

C. 60

D. 180

Answer: D

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21. Which solution will show the maximum vapour pressure at $300K$?

A. $1MC_{12}H_{22}O_{11}$

B. $1MCH_3COOH$

C. $1MCaCl_2$

D. 1 M NaCl

Answer: A

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22. Which of the following solution has maximum vapour pressure :-

A. HI

B. HBr

C. HCl

D. HF

Answer: C

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23. Vapour pressure of a solution is _____.

A. Directly proportional to the mole fraction of the solvent

B. Inversely proportional to the mole fraction of the solute

C. Inversely proportional to the mole fraction of the solvent

D. Directly proportional to the mole fraction of the solute

Answer: A

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24. When a substance is dissolved in a solvent the vapour pressure of solvent decreases. This brings:

A. An increase in the boiling point of the solution

B. A decrease in the boiling point of solvent

C. The solution having a higher freezing point than the solvent

D. The solution having a lower osmotic pressure than the solvent

Answer: A

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25. The vapour pressure of pure liquid solvent A is $0.80 atm$. When a non-volatile substance B is added to the solvent, its vapour pressure drops to

$0.60 atm$, the mole fraction of component B in the solution is

A. 0.25

B. 0.50

C. 0.75

D. 0.90

Answer: A

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26. State Raoult's law for the solution containing volatile components. What is the similarity .

between Raoult's law and Henry's law ?

A. Boiling is related to

B. Freezing point

C. Osmotic pressure

D. Vapour pressure

Answer: D

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27. The vapour pressure lowering caused by addition of 100 g of sucrose (molecular mass = 342) to 1000 g of wate,if the vapour pressure of pure water at $25^{\circ}C$ is 23.8mm Hg,is

A. 1.25 mm Hg

B. 0.125 mm Hg

C. 1.15 mm Hg

D. 00.12 mm Hg

Answer: B

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28. Benzene and toluene form nearly ideal solution. At $20^{\circ} C$ the vapour pressure of benzene is 75 torr and that of toluene is 22 torr. The partial vapour pressure of benzene at $20^{\circ} C$ for a solution containing 78g of benzene and 46 g of toluene in torr is-

A. 50

B. 25

C. 37.5

D. 53.5

Answer: A

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29. $18g$ of glucose $(C_6H_{12}O_6)$ is added to $178.2g$ of water. The vapour pressure of water for this aqueous solution at $100^{\circ} C$ is-

A. 759.00 Torr

B. 7.60 Torr

C. 76.00 Torr

D. 752.40 Torr

Answer: D

Watch Video Solution

30. A mixture of ethyl alcohol and propyl alcohol has a vapour pressure of 290 mm at 300K. The vapour pressure of propyl alcohol is 200 mm. if the mole fraction of ethyl alcohol is 0.6, its vapour pressure (in mm) at the same temperature will be

A. 350

B. 300

C. 700

D. 360

Answer: A

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Watch Video Solution

31. The vapour pressure of water at 20° is $17.5 mmHg$. If $18g$ of glucose $(C_6H_{12}O_6)$ is added to $178.2g$ of water at $20^{\circ}C$, the vapour pressure of the resulting solution will be

A. 15.750 mm Hg

B. 16.500 mm Hg

C. 17.325 mm Hg

D. 17.65 mm Hg

Answer: C

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32. At $80^{\circ}C$ the vapour pressure of pure liquid 'A' is 520 mm Hg and that of pure liquid 'B' is 1000 mm Hg. If a mixture solution of 'A' and 'B' boils at

$80^{\circ}C$ and 1 atm pressure, the amount of 'A' in the mixture is (1 atm $= 760 mmHg$)

A. 34 mol percent

B. 48 mol percent

C. 50 mol percent

D. 52 mol percent

Answer: C

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33. Two liquids X and Y form an ideal solution. At 300K, vapour pressure of the solution containing 1 mol of X and 3 mol of Y is 550 mm Hg. At the same temperature, if 1 mol of Y is further added to this solution, vapour pressure of the solution increases by 10 mm Hg. Vapour pressure (in mmHg) of X and Y in their pure states will be, respectively

A. 200 and 300

B. 300 and 400

C. 400 and 600

D. 500 and 600

Answer: C

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34. On mixing, heptane and octane form an ideal solution. At $373K$ the vapour pressure of the two liquid components (heptane and octane) are $105kPa$ and kPa respectively. Vapour pressure of the solution obtained by mixing 25.0 of heptane and $35g$ of octane will be (molar mass of heptane $= 100gmol^{-1}$ and of octane $= 114gmol^{-1}$):-

A. 144.5 kPa

B. 72.0 kPa

C. 36.1 kPa

D. 96.2 kPa

Answer: B

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35. An ideal solution was obtained by mixing methanol and ethanol. If the partial vapour pressure of methanol and ethanol are $2.619kPa$ and $4.556kPa$, respectively, the composition of vapour (in terms of mole fraction) will be

A. 0.635 methanol, 0.365 ethanol

B. 0.365 methanol, 0.635 ethanol

C. 0.574 methanol, 0.326 ehtanol

D. 0.173 methanol, 0.827 ethanol

Answer: B

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36. Which of the following is incorrect

A. Relative lowering of vapour pressure is independent

B. The vapour pressure is a colligative property

C. Vapour pressure of a solution is lower than the vapour pressure of the solvent

D. The relative lowering of vapour pressure is directly oroportional to the original pressure

Answer: D

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37. At $25^{\circ}C$, the total pressure of an ideal solution obtained by mixing 3 mole of A and 2 mole of B, is 184 torr. What is the vapour pressure (in torr) of pure B at the same temperature (Vapour pressure of pure A at $25^{\circ}C$ is 200 torr) ?

A. 180

B. 160

C. 16

D. 100

Answer: B

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38. Relative loweringof vapour pressure of a dilute solution is 0.2. What is the mole fraction of non-volatile solute ?

A. 0.8

B. 0.5

C. 0.3

D. 0.2

Answer: D

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39. At 300 K the vapour pressure of two pure liquids, A and B are 100 and 500 mm Hg, respectively. If in a mixture of a and B, the vapoure is 300 mm Hg, the mole fractions of a in the vapour phase, respectively, are -

A. 0.6

B. 0.5

C. 0.8

D. 0.4

Answer: D

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40. Addition of a non-volatile solute in a volatile ideal solvent

A. Increases the vapoure pressure of the solvent Decreases the vapour pressure of the solvent

B. Decreases the vapoure pressure of the solvent

C. Decreases the boililng point of the solvent

D. Increases the freezing point of the solvent

Answer: B

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41. $6g$ of urea (molecular weight $= 60)$ was dissolved in 9.9 moles of water. If the vapour pressure of pure water is P°, the vapour pressure of solution is :

A. $0.10P_o$

B. $1.10P_o$

C. $0.90P_o$

D. $0.99P_o$

Answer: C

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42. An aqueous solution of glucose was prepared by dissolving 18g of glucose in 90g of water. The relative lowering in vapour pressure is

A. 0.02

B. 1

C. 20

D. 180

Answer: A

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43. The mass of glucose that would be dissolved in 50g of water in order to produce the same lowering of vapour pressure as is produced by dissolving 1g of urea in the same quantity of water is :

A. 1 g

B. 3 g

C. 6 g

D. 18 g

Answer: B

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44. Which of the following can be measured by the Ostwald-Walker dynamic method

A. Vapour pressure of the solvent

B. Relative lowering of vapour pressure

C. Lowering of vapour pressure

D. All of these

Answer: B

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45. Vapour pressure of pure A is 70 mm of Hg at $25^\circ C$. If it forms an ideal solution with B in which mole fraction of A is 0.8 and vapour pressure of the solution is 84 mm of Hg at $25^\circ C$, then the vapour pressure of pure B at $25^\circ C$ is

A. 56 mm

B. 70 mm

C. 140 mm

D. 28 mm

Answer: C

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46. The mass of a non-volatile solute of molar mass $40g \quad mol^{-1}$ that should be dissolved in 114 g of octane to lower its vapour pressure by 20% is

A. 10 g

B. 11.4 g

C. 9.8 g

D. 12.8 g

Answer: A

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47. Vapour pressure of pure A = 100 torr, moles = 2. Vapour pressure of pure B = 80 torr, moles = 3. Total vapour pressure of mixture is

A. 440 torr

B. 460 torr

C. 180 torr

D. 88 torr

Answer: D

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48. Vapour pressure increases with increase in

A. Concentration of solution containing non-volatile solute

B. Temperature upto boiling point

C. Temperature upto triple poitn

D. Altitude of the concerned place of boiling

Answer: B

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49. The vapour pressure of water at $20^{\circ} C is 17.54 mm$. When 20g of non - ionic substance is dissolved in 100g of water, the vapour pressure is lowered by $0.30 mm$. What is the molecular mass of the substance ?

A. 210.2

B. 206.88

C. 215.2

D. 200.8

Answer: B

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50. An aqueous solution of methanol in water has vapour pressure

A. Equal to that of water

B. Equal to that of methanol

C. More than that of water

D. Less than that of water

Answer: C

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51. The atmospheric pressure is sum of the ______.

A. Pressure of the biomolecules

B. Vapour pressure of atmospheric constituents

C. Vapour pressure of chemicals and vapour pressure of volatiles

D. Pressure created on to atmospheric molecules

Answer: B

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52. Dry air was passed successively through a solution of 5g of a solute in 180g of water and then through pure water and then through pure water. The loss in weight of solution was $2.5g$ and that of pure solvent $0.04g$. The molecular weight of the solute is:

A. 50

B. 180

C. 100

D. 25

Answer: C

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53. If two substances A and B have $p_A^\circ : p_B^\circ = 1 : 2$ and have mole fraction in solution as 1:2 then mole fraction of A in vapour phase is

A. 0.33

B. 0.25

C. 0.52

D. 0.2

Answer: D

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54. $5cm^3$ of acetone is added to $100cm^3$ of water . Then the vapour pressure of the vapour pressure of the solution ______.

A. It will be equal to the vapour pressure of pure water

B. It will be less than the vapour pressure of pure water

C. It will begreater than the vapour pressure of pure water

D. It will be very large

Answer: B

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55. At 300 K , when a solute is aded to a solvent ,its vapour pressure over mercury reduces from 50 mm to 45 mm . The value of mole fraction of solute wil be ____.

A. 0.005

B. 0.010

C. 0.100

D. 0.900

Answer: C

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56. Among the following substances, the lowest vapour pressure is exerted by

A. Water and ethyl alcohol

B. Mercury

C. Kerosene

D. Rectified spirit

Answer: B

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57. Which solution will have least vapour pressure?

A. 0.1 M KCl solution

B. 0.1M urea solution

C. $0.1MNa_2SO_4$ solution

D. $0.1MK_4Fe(CN)_6$ solution

Answer: D

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58. Assertion :Molar heat of vaporisation of water is greater than benzene.

Reason:Molar heat of vaporisation is the amount of heat required to vaporise one mole of liquid at constant temperature.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

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59. Assertion :- On adding NACl to water its vapour pressure increases.

Reason :- Addition of non-volatile solute increases the vapour pressure.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: D

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60. Assertion :- Ice melts faster at higher ltitude.

Reason :- At high altitude atmospheric pressure is higher.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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61. Assertion :- An increase in surface area increases the rate of evaporation.

Reason :- Stronger the inter-molecular attractive forces, fast is the rate of evaporation at a given temperature.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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62. Assertion :- If a liquid solute more volatile than the solvent is added to the solvent, the vapour pressure of the solution may increase i.e., $p_s > p^\circ$.

Reason :- In the presence of a more volatile liquid solute, only the solute will form vapours and solvent will not.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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ORDINARY THINKING OBJECTIVE QUESTIONS (Ideal and Non -ideal solution)

1. formation of a solution form two components can be considered as

(i) Pure solvent rarr separated solvent molecules, ΔH_1

(ii) Pure solute rarr separated solute molecules, ΔH_2

(iii) separated solvent and solute molecules rarr solution, ΔH_3

Solution so formed will be ideal if

A. $\Delta H_{\text{soln}} = \Delta H_3 - \Delta H_1 - \Delta H_2$

B. $\Delta H_{\text{soln}} = \Delta H_1 + \Delta H_2 + \Delta H_3$

C. $\Delta H_{\text{soln}} = \Delta H_1 - \Delta H_2 - \Delta H_3$

D. $\Delta H_{\text{soln}} = \Delta H_1 - \Delta H_2 - \Delta H_3$

Answer: B

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2. A solution of acetone in ethnol

A. Behaves like a near ideal solution

B. Obeys Raoult's law

C. Shows a negative deviation from Raoult's law

D. Shows a positive deviation from Raoult's law

Answer: D

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3. Which one is not equal to zero for an ideal solution?

A. ΔS_{mix}

B. ΔV_{mix}

C. $\Delta P = P_{\text{observed}} - P_{\text{Raoult}}$

D. ΔH_{mix}

Answer: A

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4. When non-ideal solution was prepared by mixing 30 mL chloroform and 50 mL acetone. The volume of mixture will be

A. $> 80ml$

B. $< 80ml$

C. $= 80ml$

D. $\geq 80ml$

Answer: B

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5. Which of the following cannot be separted from air by the process of fractional distillation?

A. Benzene-toluene

B. Water - ethyl alcohol

C. Water - nitric acid

D. Water - hydrochloric acid

Answer: A

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6. Identify the mixture that shows positive deviations from Raoult's law

A. $CHCl_3 + (CH_3)_2CO$

B. $(CH_3)_2CO + C_6H_5NH_2$

C. $CHCl_3 + C_6H_6$

D. $(CH_3)_2CO + CS_2$

Answer: D

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7. All form ideal solution except

A. C_2H_5Be and C_2H_5I

B. C_6H_5Cl and C_6H_5Cl and C_6H_5Br

C. C_6H_6 and $C_6H_5CH_3$

D. C_2H_5I and C_2H_5OH

Answer: D

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8. An ideal solution is formed when its components same

A. Shows positive deviation from Raoult's law

B. Shows negative deviation from Raoult's law

C. Has no connection with Raoult's law

D. Obeys Raoult's law

Answer: D

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9. Define an ideal solution.

A. It follows Raoult's law

B. $\Delta H_{\text{mix}} = 0$

C. $\Delta V_{\text{mix}} = 0$

D. All of these

Answer: D

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10. One component of a solution follows Raoult's over the entire range $0 \leq x_1 \leq 1$. The second component must follow Raoult's law in the range when x_2 is

A. Close to zero

B. Close to 1

C. $0 \leq x_2 \leq 0.5$

D. $0 \leq x_2 \leq 1$

Answer: D

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11. A mixture of benzene and toluene forms

A. An ideal solution

B. Non-ideal solution

C. Syspension

D. Emulsion

Answer: A

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12. Which of the following shows positive deviation from Raoult's law ?

A. Benzene - Chloroform

B. Benzene - Acetone

C. Benzene - Ethanol

D. Benzene - Carbon tetrachloride

Answer: A

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13. Which of the following does not show negative deviation from Raoult's law

A. Acetone - Chloroform

B. Acetone - Benzene

C. Chloroform - Ether

D. Chloroform - Benzene

Answer: B

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14. Which of the following shows negative deviation from Raoult's law?

A. Ethanol - Acetone

B. Chlorobenzene - Bromobenzene

C. Chloroform - Acetone

D. Benzene - Toluene

Answer: C

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15. Which of the following liquid pairs shows a positive deviation from Raoult's law?

A. Water - nitric acid

B. Benzene - methanol

C. Water - hydrochloric acid

D. Acetone - chloroform

Answer: B

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16. If liquids A and B from an ideal solution

A. The enthalpy of mixing is zero

B. The entropy of mixing is zero

C. The free energy of mixing is zero

D. The free energy as well as the entropy of mixing are each zero

Answer: A

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17. 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 formed is an ideal solution

B. The solution is non-ideal, showing +ve deviation from Raoult's Law

C. The solution is non-ideal, showing -ve deviation from Raoult's Law

D. n-heptane shows + ve deviation while ethanol shows -ve deviation from Raoult's Law

Answer: B

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18. The solution which shows negative or positive deviation by Raoult's law, is called

A. Ideal solution

B. Real solution

C. Non-ideal solution

D. Colloidal solution

Answer: C

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19. Which of the following will form non-ideal solution?

A. Benzene + n-heptane

B. n-hexane + n-heptane

C. Ethyl bromide + ethyl iodide

D. $CCl_4 + CHCl_3$

Answer: D

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20. When ethanol mixes in cyclohexane, cyclohexane reduces the intermolecular forces between ethanol molecule. In this, liquid pair shows

A. Positive deviation by Raoult's law

B. Negative deviation by Raoult's law

C. No deviation by Raoult's law

D. Decrease in volume

Answer: A

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21. Assertion: $CCl_4$and $H_2O$are immiscible .

Reason : CCl_4 is a polar solvent.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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22. Assertion : Azeotropic mixtures are formed only by non - ideal solutions and they may have boiling points either greater than both the components or less than both the compontents.

Reason : The c omposition of the vapour phase is same as that of the liquid phase of an azeotropic mixture.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

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ORDINARY THINKING OBJECTIVE QUESTIONS (Azeotropic mixture)

1. A mixture of two completely miscible non-ideal liquids which distil as such without change in its composition at a constant temperature as though it were a pure liquid. This mixture is known as:

A. Binary liquid mixture

B. Azeotropic mixture

C. Eutectic mixture

D. Ideal mixture

Answer: B

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2. Azeotropic mixtures are

A. Constant temperature boiling mixtures

B. Those which boils at different temperatures

C. Mixture of two solids

D. None of the above

Answer: A

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3. The system that forms maximum boiling azeotrope is CS_2, acetone

A. Carbondisulphide-acetone

B. Benzene - toluene

C. Acetone - chloroform

D. n-hexane - n-heptane

Answer: C

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4. Which will from maximum boiling azeotrope ?

A. $HNO_3 + H_2O$ solution

B. $C_2H_5OH + H_2O$ solution

C. $C_6H_6 + C_6H_5CH_3$ solution

D. None of these

Answer: A

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ORDINARY THINKING OBJECTIVE QUESTIONS (Osmosis and Osmotic pressure of the solution)

1. The solution in which the blood cells remain their normal shape, with regard to the blood, are

A. Isotonic

B. Isomotic

C. Hypertonic

D. Equinormal

Answer: A

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2. The osmotic pressure of a solution is

A. M/10 urea

B. M/10 glucose

C. M/10 HCl

D. $M/10BaCl_2$

Answer: D

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3. If $0.1M$ solution of glucose and $0.1M$ solution of urea are placed on two sides of the semipermeable membrane to equal heights, then it will be be correct to say that

A. There will be no net movement across the membrane

B. Glucose will flow across the membrane into urea solution

C. Urea will flow across the membrane into glucose solution

D. Water will flow from urea solution into glucose solution

Answer: A

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4. The relationship between osmotic pressure at $273K$ when $10g$ glucose (P_1), $10g$ urea (P_2) and $10g$ sucrose (P_3) are dissolved in $250mL$ of water is:

A. $P_1 > P_2 > P_3$

B. $P_3 > P_1 > P_2$

C. $P_2 > P_1 > P_3$

D. $P_2 > P_3 > P_1$

Answer: C

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5. A5% solution of cane sugar (molar mass =342)is isotonic with 1% of a solution of an known solute.The molar mass of unknown solute in g/mol is

A. 60

B. 46.17

C. 120

D. 90

Answer: A

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6. 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?

Here $n_2 =$ mass of solute, V = volume of solution, $\pi =$ osmotic pressure.

A. $Mp = \left(\frac{m}{\pi}\right)VRT$

B. $Mp = \left(\frac{m}{V}\right)\frac{RT}{\pi}$

C. $Mp = \left(\frac{m}{V}\right)\frac{\pi}{RT}$

D. $Mp = \left(\frac{m}{V}\right)\pi RT$

Answer: B

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7. Semipermeable membrane is that which permits the passage of :

A. Solute molecules only

B. Solvent molecules only

C. Solute and solvent molecules both

D. Neither solute no solvent molecules

Answer: B

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8. A solution containing 10 g per dm^3 of urea (molecular mass = 60 g mol^{-1}) is isotonic with a 5% solution of a nonvolatile solute. The molecular mass of this nonvolatile solution is:

A. $350 g mol^{-1}$

B. $200 g mol^{-1}$

C. $250 g mol^{-1}$

D. $300 g mol^{-1}$

Answer: D

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9. 200 mL of an aqueous solution of a protein contains its 1.26g. The osmotic pressure of this solution at 300K is found to be 2.57×10^{-3} bar. The molar mass of protein will be $\left(R = 0.083L\overline{m}ol^{-1}K^{-1}\right)$

A. $31011gmol^{-1}$

B. $61038gmol^{-1}$

C. $51022gmol^{-1}$

D. $122044gmol^{-1}$

Answer: B

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10. The average osomotic pressure of human blood is 7.8 bar at $37^{\circ} C$. What is the concentration of an aqueous $NaCI$ solution that could be used in the blood stream?

A. 0.16 mol/L

B. 0.32 mol/L

C. 0.60 mol/L

D. 0.45 mol/L

Answer: B

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11. At low concentrations, the statement that equimoala solutions under a given set of experimental conditions have equal osmotic pressure is true for

A. All solutions

B. Solutions of non-electrolytes only

C. Solutions of electrolytes only

D. None of these

Answer: B

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12. Twenty grams of a substance were dissolved in 500ml. Of water and the osmotic pressure of the solution was found to be 600mm of mercury at $15^{\circ}\mathrm{C}$. Determine the molecular weight of the substance.

A. 1000

B. 1200

C. 1400

D. 1800

Answer: B

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13. Which of the following colligative property can provide molar mass of proteins (or polymers or colloids) with greatest precision?

A. Relative loweting of vapour pressure

B. Elevation of boiling point

C. Depression in freezing point

D. Osmotic pressure

Answer: D

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14. If O.P. of 1M of the following in water can be measured, which one will show the maximum O.P. ?

A. $AgNO_3$

B. $MgCl_2$

C. $(NH_4)_3PO_4$

D. Na_2SO_4

Answer: C

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15. Osmotic pressure of a solution is

A. Berkeley and Hartley's method

B. Morse's method

C. Pfeffer's method

D. De Vries method

Answer: A

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16. The osmotic pressure of a solution is

A. $P=\frac{RT}{C}$

B. $P=\frac{CT}{R}$

C. $P=\frac{RC}{T}$

D. $\frac{P}{C}=RT$

Answer: D

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17. Two solutions of KNO_3 and CH_3COOH are prepared separately. Molarity of both is $0.1M$ and osmotic pressure are P_1 and P_2 respectively. The correct relationship between the osmotic pressure is :

A. $P_2 > P_1$

B. $P_1 = P_2$

C. $P_1 > P_2$

D. $\frac{P_1}{P_1 + P_2} = \frac{P_2}{P_1 + P_2}$

Answer: C

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18. The passing of solvent particles through semipermeable membrane is called:

A. Electrolysis

B. Electrophoresis

C. Cataphoresis

D. Osmosis

Answer: D

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19. Which inorganic precipitate acts as semipermeable membrane ?

A. Calcium sulphate

B. Barium oxalate

C. Nickel phosphate

D. Copper ferrocyanide

Answer: D

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20. The osmotic pressure of solution increases if :

A. Temperature is decreased

B. Solution concentration is increased

C. Number of solute molecules is increased

D. Volume is increased

Answer: B::C

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21. The osmotic pressure of a 5% $(weight/volume)$ solution of cane sugar at $150^{\circ}C$ is

A. 2.45 atm

B. 5.078 atm

C. 3.4 atm

D. 4 atm

Answer: B

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22. The osmotic pressure of a solution is

A. Directly proportional to the concentration

B. Inversely proportional to the concentration

C. Directly proportional to the square of the concentration

D. Directly proportional to the square of the root of the concentration

Answer: A

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23. The osmotic pressure of a solution containing $0.1 mol$ of solute per litre at $273K$ is

A. $\frac{0.1}{1} \times 0.08205 \times 273$

B. $0.1 \times 1 \times 0.08205 \times 273$

C. $\frac{1}{0.1} \times 0.08205 \times 273$

D. $\frac{0.1}{1} \times \frac{273}{0.08205}$

Answer: A

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24. In equimolar solution of glucose, NaCl and $BaCl_2$, the order of osmotic pressure at same temperature is as follow :

A. Glucose $> NaCl > BaCl_2$

B. $NaCl > BaCl_2 >$ Glucose

C. $BaCl_2 > NaCl >$ Glucose

D. Glucose $> BaCl_2 > NaCl$

Answer: C

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25. Isotonic solutions have same

A. Equal temperature

B. Equal osmotic pressure

C. Equal volume

D. Equal amount of solute

Answer: B

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26. Blood is isotonic with:

A. 0.16 M NaCl

B. Conc. NaCl

C. 50% NaCl

D. 30% NaCl

Answer: A

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27. The osmotic pressure of one molar solution at $27^{\circ} C$ is

A. 2.46 atm

B. 24.6 atm

C. 1.21 atm

D. 12.1 atm

Answer: B

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28. Which of the following pair of solutions can be expected to be isotonic at the same temperature ?

A. 0.2 M urea and 0.2 M NaCl

B. 0.1 M urea and $0.2 M MgCl_2$

C. 0.1 M NaCl and $0.1 M Na_2SO_4$

D. $0.1 M Ca(NO_3)_2$ and $0.1 M Na_2SO_4$

Answer: D

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29. Osmotic pressure of $0.1M$ solution of $NaCl$ and $NaSO_4$ will be

A. Same

B. Osmotic pressure of NaCl solution will be more than Na_2SO_4 solution

C. Osmotic pressure of Na_2SO_4 solution will be more than NaCl

D. Osmotic pressure of $NaSO_4$ will be less than that of NaCl solution

Answer: C

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30. The osmotic pressure in atmosphere of 10% solution of cane sugar at $69^\circ C$ is

A. 724

B. 824

C. 8.21

D. 7.21

Answer: C

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31. Isotonic solutions have same

A. Density

B. Molar concentation

C. Normality

D. None of these

Answer: B

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32. Diffusion of water through selectively permeable membrane is

A. Diffusion

B. Osmosis

C. Active absorption

D. Plasmolysis

Answer: B

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33. The temperature at which 10% aqeous solution $\left(\frac{W}{V}\right)$ of glucose will exhibit the osmotic pressure of 16.4 atm, is : $\left(R = 0.082 \mathrm{dm}^2 \mathrm{atm}\ \mathrm{K}^{-1} \mathrm{mol}^{-1}\right)$

A. $360^\circ C$

B. 180 K

C. 90 K

D. 360 K

Answer: D

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34. At $25^{\circ}C$ aqueous solution of glucose (molecular weight $= 180 gmol^{-1}$) is isotonic with a 2% aqueous solution containing an unknown solute. What is the molecular weight of the unknown solute

A. 60

B. 80

C. 72

D. 63

Answer: C

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35. Which of the following associated with isotonic solutions is not correct

A. They will have the same osmotic pressure

B. They have the same weight concentrations

C. Osmosis does not take place when the two solutions are separated by a semipermeable membrane

D. They will have the same vapour pressure

Answer: B

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36. The value of osmotic pressure of a 0.2 M aqueous solution at 293 K is

A. 8.4 atm

B. 0.48 atm

C. 4.8 atm

D. 4.0 atm

Answer: C

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37. 0.1 M NaCl and 0.05 M $BaCl_2$ solutions are separated by a sami-premeable membrane in a container. For this system, choose the correct answer

A. There is no movement of any solution across the membrane

B. Water flows from $BaCl_2$ solution towards NaCl solution

C. Water flows from NaCl solution towards $BaCl_2$ solution

D. Osmotic pressure of 0.1 M NaCl is lower than the osmotic pressure of $BaCl_2$ (Assume complete dissociation)

Answer: B

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38. Osmotic pressrue of 0.4% urea solution is 1.64 atm and that of 3.42% cane sugar is 2.46 atm. When the above two solutions are mixed, the osmotic pressure of the resulting solution is

A. 1.64 atm

B. 2.46 atm

C. 2.06 atm

D. 0.82 atm

Answer: C

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39. Which statement is incorrect about osmotic pressure(π), volume (V), and temperature (T)?

A. $P \propto \frac{1}{V}$ id T is constant

B. $F \propto T$ is V is constant

C. $P \propto V$ is T is constant

D. PV is constant if T is constant

Answer: C

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40. At the same temperature, following solution will be isotonic

A. 3.24 g of sucrose per litre of water and 0.18 gm glucose per litre of water

B. 3.42 gm of sucrose per litre and 0.18 gm glucose in 0.1 litre water

C. 3.24 gm of surcose per litre of water and 0.585 gm of sodium chloride per litre of water

D. 3.42 gm of sucrose per litre of water and 1.17 gm of sodium chloride per litre of water

Answer: B

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41. If 3g of glucose (molecular mass 180) is dissolved in 60g of water at $15^\circ C$, then the osmotic pressure of this solution will be :

A. 0.34 atm

B. 0.65 atm

C. 6.57 atm

D. 5.57 atm

Answer: C

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42. A solution of urea contains 8.6 g per litre. It is isotonic with 5% solution of a non-volatile solute. The molecular mass of the solute will be :

A. 348.9

B. 34.89

C. 3489

D. 861.2

Answer: A

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43. The osmotic pressure of a dilute solution is given by

A. $P = P_o x$

B. $\pi V = nRT$

C. $\Delta P = P_o N_2$

D. $\frac{\Delta P}{P_o} = \frac{P_o - P}{P_o}$

Answer: B

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44. The osmotic pressure of which solution is maximum (consider that deci-molar solution of each 90% dissociated)

A. Aluminium sulphate

B. Barium chloride

C. Sodium sulphate

D. A mixture of equal volumes of (b) and (c)

Answer: A

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45. Osmotic pressure of a urea solution at $10^{\circ} C$ is 500 mm. Osmotic pressure of the solution become 105.3 mm. When it is diluted and temperature raised to $25^{\circ} C$.The extent of dilution is

A. 6 Times

B. 5 Times

C. 7 Times

D. 4 Times

Answer: B

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46. A 5.25% solution of a substance is isotonic with a 1.5% solution of urea (molar mass $= 60 g mol^{-1}$) in the same solvent. If the densities of both the solutions are assumed to be equal to $1.0 g cm^{-3}$, molar mass of the substance will be:

A. $90.0 g mol^{-1}$

B. $115.0 g mol^{-1}$

C. $1050.0 g mol^{-1}$

D. $210.0 g mol^{-1}$

Answer: D

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47. Two solutions A and B are separated by semipermeable membrane. If liquid flows from A to B, than

A. A is less concentrated than B

B. A is more concentrated than B

C. Both have same concentration

D. None of these

Answer: A

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48. One mole each of urea, glucose and sodium chloride were dissolved in one litre of water. Equal osmotic pressure will be produced by solutions of

A. Glucose and sodium chloride

B. Urea and glucose

C. Sodium chloride and urea

D. None of these

Answer: B

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49. The molar mass of the solute sodium hydrdoxide obtained from the measurement of the osmotic pressure of its aqueous solution at $27^{\circ}C$ is $25 g mol^{-1}$. Therefore its ionization percentage in this solution is

A. 75

B. 60

C. 80

D. 70

Answer: B

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50. For getting accurate value of molar mass of a solute by osmotic pressure measurement

A. The solute must be volatile

B. The solution concentration must be high

C. The solute should undergo dissociation

D. The solute must be non-volatile

Answer: D

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51. Desalination of sea water can be done by

A. Osmosis

B. Reverse osmosis

C. Filtration

D. Diffusion

Answer: B

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52. The osmotic pressure of a solution of benzoic acid dissolved in benzene is less than expected because:

A. Benzene is a non-polar solvent

B. Benzoic acid molecules are assocuated in benzene

C. Benzoic acid molecules are dissociated in benzene

D. Benzoic acid is an organic compound

Answer: B

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53. Solution A contains 7 g/L of $MgCl_2$ and solution B contains 7 g/L of NaCl. At room temperature, the osmotic pressure of :

A. Solution A is greater than B

B. Both have same osmotic pressure

C. Solution B is greater than A

D. Can't determine

Answer: C

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54. Which has minimum osmotic pressure ?

A. 200 mL of 2 M NaCl pressure

B. 200 mL of 1 M glucose solution

C. 200 mL of 2 M urea solution

D. All have same osmotic pressure

Answer: B

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55. If molecular weight of compound is increased then sensitivity is decreased in which of the following methods

A. Elevation in boiling point

B. Viscosity

C. Osmosis

D. Dialysis

Answer: D

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56. At temperature $327^\circ C$ and concentration C, the osmotic pressure of a solution is P. The same solution at concentration C/2 and a temperature $427^\circ C$ of shows osmotic pressure of 2 atm. The value of P will be :

A. $\frac{12}{7}$

B. $\frac{24}{7}$

C. $\frac{6}{5}$

D. $\frac{5}{6}$

Answer: B

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57. When a particular solution have higher osmotic pressure than a given standard solution, it is most appropriately called as ----- with respect to the standard solution

A. Hypotonic

B. Hypertionic

C. Isotonic

D. Pertonic

Answer: B

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58. A solution of sucrose (molar mass = 342 g/mol) is prepared by dissolving 68.4 g of it per litre of solution, what is its osmotic pressure at 273 K?

$\left(R = 0.081 LatmK^{-1}mol^{-1}\right)$

A. 6.02 atm

B. 4.48 atm

C. 4.04 atm

D. 5.32 atm

Answer: B

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59. The osmotic pressure of a dilte solution of a non-volatile solute is

A. Directly proportional to its temperature on the centigrade scale

B. Inversely proportional to its temperature on the Kelvin scale

C. Directly proportional to its temperature on the Kelvin scale

D. Inversely proportional to its temperature on the centigrade scale

Answer: C

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60. As a result osmosis the volume of solution

A. Increases

B. Decreases

C. Remains contant

D. Increases or decreases

Answer: A

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61. What would happen if a thin slice of sugar beet is placed in a concentrated solution of NaCl

A. Sugar beet will lose water from its cells

B. Sugar beet will absorb water from solution

C. Sugar beet will neither absorb nor lose water

D. Sugar beet will dissolve in solution

Answer: A

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62. The concentration in g/L of a solution of cane sugar (Molecular weight = 342) which is isotonic with a solution containing 6 g of urea (Molecular weight = 60) per litre is

A. 3.42

B. 34.2

C. 5.7

D. 19

Answer: B

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63. What is the osmotic pressure of a 0.0020 mol dm^{-3} sucrose $(C_{12}H_{22}O_{11})$ solution at $20^{\circ}C$? (Molar mass contant, $R = 8.314JK^{-1}mol^{-1}. 1dm^3 = 0.001m^3)$

A. 4870 Pa

B. 4.87 Pa

C. 0.00487 Pa

D. 0.33 Pa

Answer: A

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64. Which of the following molecules would diffuse through a cell membrane

A. Frctose

B. Glycogen

C. Haemoglobin

D. Catalase

Answer: A

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65. The solution containing $4.0gm$ of a polyvinyl chloride polymer in 1 litre dioxane was found to have an osmotic pressure 6.0×10^{-4} atmosphere at $300K$,the value of R used is 0.082litre atmosphere $\text{mole}^{-1}K^{-1}$.The molecular mass of the polymer was found to be

A. 3.0×10^2

B. 1.6×10^{-5}

C. 5.6×10^4

D. 6.4×10^2

Answer: B

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66. Assertion: Isotonic solutions do not show phenomenon of osmosis.

Reason: Isotonic solutions have equal osmotic pressure.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

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67. Assertion : If red blood cells were removed from the body and placed in pure water, pressure inside the cells increases.

Reason : The concentration of salt content in the cells increases.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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68. Assertion : Ca^{++} and K^{+} ions are responsible for maintaining proper osmotic pressure balance in the cells of organism.

Reason : Solutions having the same osmotic pressure at same temp are called isotonic solutions.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If asserrion is false but reason is true.

Answer: D

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69. Assertion : Reverse osmosis is used in the desalination of sea water.

Reason : When pressure more than osmotic pressure is applied, pure water is squeezed out of the sea water through membrane.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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ORDINARY THINKING OBJECTIVE QUESTIONS (Elevation in boiling point)

1. When common salt is dissolved in water

A. Melting point of the solution increases

B. Boiling point of the solution increases

C. Boiling point of the solution decreases

D. Both melting point and boiling point decreases

Answer: B

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2. The latent heat of vaporisation of water is $9700 \mathrm{Cal/mole}$ and if the b.p.is $100^\circ C$, ebullioscopic constant of water is

A. $0.513^\circ C$ kg/mol

B. $1.026^\circ C$ kg/mol

C. $10.26^\circ C$ kg/mol

D. $1.832^\circ C$ kg/mol

Answer: A

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3. Which one has the highest boiling point

A. $0.1 N Na_2SO_4$

B. $0.1 N MgSO_4$

C. $0.1 M Al_2(SO_4)_3$

D. $0.1 M BaSO_4$

Answer: C

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4. An aqueous solution containing 1g of urea boils at $100.25^\circ C$. The aqueous solution containing 3g of glucose in the same volume will boil be

A. $100.75^\circ C$

B. $100.5^\circ C$

C. $100.25^\circ C$

D. $100^\circ C$

Answer: C

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5. The boiling point of $0.2 mol kg^{-1}$ solution of X in water is greater than equimolal solution of Y in water. Which of the following statements is true in this case?

A. Molecular mass of X is greater than the molecular of Y

B. Molecular mass of X is less than the moelcular mass of Y

C. Y is undergoing dissociation in water while X undergoes no change

D. X is undergoing dissociation in water

Answer: D

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6. At $100^{\circ} C$ the vapour pressure of a solution of $6.5 g$ of an solute in $100 g$ water is $732 mm$.If $K_b = 0.52$, the boiling point of this solution will be :

A. $101^{\circ} C$

B. $100^{\circ} C$

C. $102^{\circ} C$

D. $103^{\circ} C$

Answer: A

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7. The molal boiling point constant for water is$0.513^{\circ} Ckgmol^{-1}$. When 0.1mole of sugar is dissolved in 200ml of water , the solution boils under a pressure of one atmosphere at

A. $100.513^{\circ} C$

B. $100.0513^{\circ} C$

C. $100.256^{\circ} C$

D. $101.025^{\circ} C$

Answer: C

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8. The molal elevation constant of water $=0.52 K m^{-1}$. The boiling point of $1.0 molal$ aqueous KCl solution (assuming complete dissociation of KCl) should be

A. $100.52^{\circ} C$

B. $101.04^{\circ} C$

C. $99.48^{\circ} C$

D. $98.96^{\circ} C$

Answer: B

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9. 0.15g of a substance dissolved in 15g of a solvent boiled at a temp. higher by $0.216^{\circ} C$ than that of the pure solvent. Find out the molecular weight of the substance (K_b for solvent is $2.16^{\circ} C$)

A. 1.01

B. 10

C. 10.1

D. 100

Answer: D

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10. If for the sucrose solution elevation in boiling point is $0.1^{\circ} C$then what will be the boiling point of NaCl solution for same molal concentration

A. $0.1^{\circ} C$

B. $0.2^\circ C$

C. $0.08^\circ C$

D. $0.01^\circ C$

Answer: B

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11. When 10 of a non-volatile solute is dissolved in 100 g of benzene . It raises boiling point by $1^\circ C$ then moles mass of the solute is _____.

A. 223 g

B. 233 g

C. 243 g

D. 253 g

Answer: D

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12. When a substance is dissolved in a solvent the vapour pressure of solvent decreases. This brings:

A. A decrease in boiling point of solution

B. An increase in boiling point of the solution

C. A decrease in freezing point of the solution

D. An increase in freezing point of the solution

Answer: B

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13. The molal elevation constant is the ratio of the elevation in boiling point to :

A. Molarity

B. Molality does not change with temperature

C. Mole fraction of solute

D. Mole fraction of solvent

Answer: B

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14. Mark the correct relationship between the boiling points of very dilute solutions of $BaCl_2(t_1)$ and $LCl(t_2)$,having the same molarity

A. $t_1 = t_2$

B. $t_1 > t_2$

C. $t_2 > t_1$

D. t_2 is approximately equal to t_1

Answer: B

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15. Elevation in boiling point was $0.52^{\circ} C$ when 6 g of a compound X was dissolved in 100 g of water. Molecular weight of X is (K_b of water is $5.2^{\circ} C$ per 100 g of water)

A. 120

B. 60

C. 180

D. 600

Answer: B

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16. At the higher altitudes the boiling point of water lowers because

A. Atmospheric pressure is low

B. Temperature is low

C. Atmospheric pressure is high

D. None of these

Answer: A

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17. The rise in the boiling point of a solution containing 1.8 g of glucose in 100 g of solvent is $0.1^\circ C$. The molal elevation constant of the liquid is

A. 0.01 K/m

B. 0.1 K/m

C. 1 K/m

D. 10 K/m

Answer: C

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18. If 0.5 g of a solute (molar mass 100 g mol^{-1}) in 25 g of solvent elevates the boiling point by 1 K, the molal boiling point constant of the solvent is

A. 2

B. 8

C. 5

D. 0.5

Answer: C

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

A. $5.8 g mol^{-1}$

B. $0.58 g mol^{-1}$

C. $58 g mol^{-1}$

D. $0.88 g mol^{-1}$

Answer: C

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20. The correct order of increasing boiling of the following aqueous solutions

0.0001 M NaCl (I), 0.0001 M Urea (II), 0.001 M $MgCl_2$ (III), 0.01 M NaCl (IV) is

A. $I < II < III < IV$

B. $IV < III < II < I$

C. $II < I < III < IV$

D. $III < II < IV < I$

Answer: C

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21. Pressure cooker reduces cooking time for food because

A. Heat is more evenly distributed in the cooking space

B. Boiling point of water involved in cooking in increased material

C. The higher pressure inside the cooker crushes the food material

D. Cooking involves chemical changes helped by a rise in temperature

Answer: B

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22. A solution of 1 molal concentration of a solute will have maximum boiling point elevation when the solvent is

A. Ethyl alcohol

B. Acetone

C. Benzene

D. Chloroform

Answer: C

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23. The boiling point of a solution of 0.11 of a substance in 15g of ether was found to be $0.1^{\circ}C$ higher than that of pure ether. The molecular weight of the substance will be $(K_b = 2.16)$:

A. 148

B. 158

C. 168

D. 178

Answer: B

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24. Value of gas constant R is

A. 0.082 litre atm

B. 0.987 cal $mol^{-1}K^{-1}$

C. $8.3Jmol^{-1}K^{-1}$

D. 83 erg $mol^{-1}K^{-1}$

Answer: C

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25. The temperature, at which the vapour pressure of a liquid becomes equal to the atmospheric pressure is known as

A. Freezing point

B. Boiling point

C. Absolute temperature

D. None of these

Answer: B

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26. The elevation in boiling point for one molal solution of a solute in a solvent is called

A. Boiling point constant

B. Molal elevation constant

C. Cryoscopic constant

D. None of these

Answer: B

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27. During the evaporation of liquid

A. The temperature of the liquid

B. The temperature of the liquid will fall

C. May rise or fall depending on the nature

D. The temperature remains unaffected

Answer: B

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28. 58.5 g of NaCl and 180 g of glucose were separately dissolved in 1000 mL of water. Identify the correct statement regarding the elevation of boiling point (bp) of the resulting solutions.

A. NaCl solution will show higher elevation of b.pt.

B. Glucose solution will show higher elevation of b.pt.

C. Both the soltuions will show equal elevation of b.pt.

D. The b.pt. of elevation will be shown by neither of the solutions

Answer: A

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29. Which of the following statement are CORRECT for the boiling point of solvent containing a dissolved solid substance ?

A. Boiling point of the liquid is depressed

B. Boiling point of the liquid is elevated

C. There is no effect on the boiling point

D. The change depends upon the polarity of liquid

Answer: B

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30. 0.01 molar solutions of glucose, phenol and potassium chloride were prepared in water. The boiling points of

A. $Glu\cos esolution = Phenolsolution = Potassiumchl\text{ or }idesolutio$

B. $Potassiumchl\text{ or }idesolution > Glu\cos esolution > Phenolsolutio$

C. $Phenolsolution > Potassiumchl\text{ or }idesolution > Glu\cos esolutio$

D. $Potassiumchl\text{ or }idesolution > Phenolsolution > Glu\cos esolutio$

Answer: D

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31. The boiling point of 0.1 molal aqueous solution of urea is $100.18^\circ C$ at 1 atm. The molal elevation constant of water is

A. 1.8

B. 0.18

C. 18

D. 18.6

Answer: A

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32. Assertion :- Molecular mass of polymers cannot be calculated using boiling point or freezing point method.

Reason : Polymers solutions do not possess a constant boiling point or freezing point.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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33. Assertion (A): Camphor is used as a solvent in the determination of the molecular mass of naphthalene and anthracene.

Reason (R): camphor has high molal elevation constant.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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34. Assertion :- Elevation in boiling point and depression in freezing point are colligative properties.

Reason :- All colligative properties are used for the calculation of molecular masses.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

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ORDINARY THINKING OBJECTIVE QUESTIONS (Depression of freezing point of the solvent)

1. A solution of urea (mol. Mass $60 g mol^{-1}$) boils of $100.18^{\circ} C$ at one one 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. $-6.54^{\circ} C$

B. $6.54^{\circ} C$

C. $0.654^{\circ} C$

D. $-0.654^{\circ} C$

Answer: D

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2. 1.00 g of a non-electrolyte solute (molar mass 250g mol^{-1}) was dissolved in 51.2 g of benzene. If the freezing point depression constant K_f of benzene is 5.12 K kg mol^{-1}, the freezing point of benzene will be lowered by:-

A. 0.5 K

B. 0.2 K

C. 0.4 K

D. 0.3 K

Answer: C

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3. $0.002m$ aqueous solution of an ionic compound $Co(NH_3)_5(NO_2)CI$ freezes at $-0.00732^{\circ}C$.Number of moles of ions which 1 mole of ionic compound produces in water will be $\left(K_f = 1.86^{\circ}C/m\right)$

A. 2

B. 3

C. 4

D. 1

Answer: A

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4. What should be the freezing point of aqueous solution containing $17g$ of $C_2H(5)OH$ is $1000g$ of water (K_f for water =$1.86degkgmol^{-1}$)?

A. $-0.69^{\circ}C$

B. $-0.34^{\circ}C$

C. $0.0^{\circ} C$

D. $0.34^{\circ} C$

Answer: A

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5. Of the following $0.10m$ aqueous solutions,which one will exhibits the largest freezing point depression?

A. $Al_2(SO_4)_3$

B. K_2SO_4

C. KCl

D. $C_6H_{12}O_6$

Answer: A

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6. 0.01 M solution of KCl and $CaCl_2$ are separately prepared in water. The freezing point of KCl is found to be $-2^\circ C$. What is the freezing point of $CaCl_2$ aq. Solution if it is completely ionized?

A. $-3^\circ C$

B. $+3^\circ C$

C. $-2^\circ C$

D. $-4^\circ C$

Answer: A

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7. The freezing point of one molal $NaCl$solution assuming $NaCl$to be 100% dissociated in water is (molal depression constant=1.86)

A. $-1.86^\circ C$

B. $-3.72^\circ C$

C. $+1.86^{\circ}C$

D. $+3.72^{\circ}C$

Answer: B

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8. What is the freezing point of a solution containing $8.1gBr$in $100g$ water assuming the acid to be 90% ionised($K_f$for water =$1.8K\text{mole}^{-1}$)

A. $0.85^{\circ}C$

B. $-3.53^{\circ}C$

C. $0^{\circ}C$

D. $-0.35^{\circ}C$

Answer: B

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9. 0.440 g of a substance dissolved in 22.2 g of benzene lowered the freezing point of benzene by $0.567^\circ C$. The molecular mass of the substance is _____ $(K_f = 5.12 K kg mol^{-1})$

A. 178.9

B. 177.8

C. 176.7

D. 175.6

Answer: A

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10. Heavy water freezes at

A. $0^\circ C$

B. $3.8^\circ C$

C. $38^\circ C$

D. $-0.38^{\circ}C$

Answer: B

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11. The freezing point of a solution prepared from $1.25g$ of non-electrolyte and $20g$ of water is $271.9K$. If the molar depression constant is $1.86Kmol^{-1}$, then molar mass of the solute will be

A. 105.7

B. 106.7

C. 115.3

D. 93.9

Answer: A

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12. The freezing point of a solution containing 4.8 g of a compound in 60 g of benzene is $4.48^{\circ} C$. What is the molar mass of the compound ? $(K_f = 5.1 K m^{-1}$, freezing point of benzene $= 5.5^{\circ} C)$

A. 100

B. 200

C. 300

D. 400

Answer: D

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13. Pure benzene freezes t $5.3^{\circ} C$. A solution of 0.223 g of phenylacetic acid $(C_6H_5CH_2COOH)$ in 4.4 g of benzene $\left(K_f = 5.12 K kg mol^{-1}\right)$ freezes at $4.47^{\circ} C$. From the observation one can conclude that :

A. Phenylacetic acid exists as such in benzene

B. Phenylacetic acid undergoes partial ionization in benzene

C. Phenylacetic acid undergoes complete ionization in benzene

D. Phenylacetic acid dimerizes in benzen

Answer: D

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14. KBr is 80% dissociated in aqueous solution of 0.5M concentration (Given K_f for water $= 1.86 K kg mol^{-1}$). The solution freezes at

A. 271.326 K

B. 272 K

C. 270.5 K

D. 268.5 K

Answer: D

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15. The two isomers X and Y with the formula $Cr(H_2O)_5ClBr$ were taken for experiment on depression in freezing point. It was found that one mole of X gave depression corresponding to 2 moles of particles and one mole of Y gave depression to 3 moles of particles. The structural formulae of X and Y raspectively are

A. $[Cr(H_2O)_5Cl]Br_2$, $[Cr(H_2O)_4Br_2]Cl.\ H_2O$

B. $[Cr(H_2O)_5Cl]Br_2$, $[Cr(H_2O)_3ClBr_2].2H_2O$

C. $[Cr(H_2O)_5Br]BrCl$, $[Cr(H_2O)_4ClBr]Br.\ H_2O$

D. $[Cr(H_2O)_4Br_2]Cl.\ H_2O$, $[Cr(H_2O)_5Cl]Br_2$

Answer: D

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16. Which one of the following statements is FALSE?

A. The correct order of osmotic pressure for 0.01 M aqueous solution of each compound is $BaCl_2 > KCl > CH_3COOH >$ sucrose

B. The osmotic pressure (π) of a solution is given by the equation $\pi = MRT$ where M is the molarity of the solution

C. Raoult's law states that the vapour pressure of a component over a solution is proportional to its mole fraction

D. Two sucrose solutions of same molality prepared in different solvents will have the same freezing point

Answer: D

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17. A solution containing 1.8 g of a compound (empirical formula CH_2O) in 40 g of water is observed to freeze at -0.465°C. The molecules formula of the compound is (K_f of water =1.86kg Kmol^{-1}):

A. $C_2H_4O_2$

B. $C_3H_6O_3$

C. $C_4H_8O_4$

D. $C_6H_{12}O_6$

Answer: D

Watch Video Solution

18. After adding non-volatile solute, freezing point of water decreases to $-0.186^{\circ}C$. Calculate ΔT_b if :

$K_f = 1.86\text{K kg mol}^{-1}$ and $K_b = 0.521\text{K kg mol}^{-1}$

A. 0.521

B. 0.0521

C. 1.86

D. 0.0186

Answer: B

Watch Video Solution

19. 1% solution of Ca$(NO_3)_2$ has freezing point:

A. $0^\circ C$

B. Less than $0^\circ C$

C. Greater than $0^\circ C$

D. None of the above

Answer: B

Watch Video Solution

20. 1.00 gm of a non-electrolyte solute dissolved in 50 gm of benzene lowered the freezing point of benzene by 0.40 K. K_f for benzene is 5.12 kg mol^{-1}. Molecular mass of the solute will be

A. $256 g mol^{-1}$

B. $2.56 gmol^{-1}$

C. $512 \times 10^3 gmol^{-1}$

D. $2.56 \times 10^4 gmol^{-1}$

Answer: A

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21. The freezing point of a 0.01 M aqueous glucose solution at 1 atmosphere is $-0.18^\circ C$. To it, an addition of equal volume of 0.002 M glucose solution will , produced a solution with freezing point of nearly

A. $-0.036^\circ C$

B. $-0.108^\circ C$

C. $-0.216^\circ C$

D. $-0.422^\circ C$

Answer: B

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22. The freezing points of equimolar solutions of glucose KNO_3 and $AlCl_3$ are in order of ____.

A. $AlCl_3 < KNO_3 <$ Glucose

B. Glucose $< KNO_3 < AlCl_3$

C. Glulcose $< AlCl_3 < KNO_3$

D. $AlCl_3 <$ Glucose $< KNO_3$

Answer: A

Watch Video Solution

23. The molal depression constant for water is $1.86^\circ C$. The freezing point of a $0.05 - molal$ solution of a non-electrolyte in water is

A. $-1.86^\circ C$

B. $-0.93^{\circ}C$

C. $-0.093^{\circ}C$

D. $0.93^{\circ}C$

Answer: C

Watch Video Solution

24. By dissolving 5 g substance in 50 g of water, the decrease in freezing point is $1.2^{\circ}C$. The gram molal depression is $1.85^{\circ}C$. The molecular weight of substance is

A. 105.4

B. 118.2

C. 137.2

D. 154.2

Answer: D

Watch Video Solution

25. 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 0.01mole of sodium sulphate is dissoved in 1 kg of water,is $(K_f = 1.86 K kg mol^{-1})$

A. 0.0186 K

B. 0.0372 K

C. 0.0558 K

D. 0.0744 K

Answer: C

Watch Video Solution

26. Ethylene glycol is used as an antifreeze in a cold climate. Mass of ethylene glycol which should be added to 4 kg of water to prevent it from freezing at $-6^{\circ}C$ will be $\left(K_f\right.$ for water $= 1.86 K kg mol^{-1}$, and molar mass of ethylene glycol $= 62 g mol^{-1}\left.\right)$

A. 80.32 g

B. 204.30 g

C. 400.00 g

D. 304.60 g

Answer: A

Watch Video Solution

27. K_f for water is $1.86 K kg mol^{-1}$. IF your automobile radiator holds $1.0 kg$ of water, how many grams of ethylene glycol $(C_2H_6O_2)$ must you add to get the freezing point of the solution lowered to $-2.8^{\circ}C$?

A. 72 g

B. 93 g

C. 39 g

D. 27 g

Answer: B

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28. The amount of urea to be dissolved in 500 cc of water $(K_f = 1.86)$ to produce a depresssion of $0.186^\circ C$ in the freezing point is :

A. 9 g

B. 6 g

C. 3 g

D. 0.3 g

Answer: C

Watch Video Solution

29. What is the effect of the addition of sugar on the boiling and freezing points of water?

A. Both boiling point and freezing point increases

B. Both boiling point and freezing point decreases

C. Boiling point decreases and freezing point decreases

D. Boiling point decreases and freezing point increases

Answer: C

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30. In countries nearer to polar region, the roads are sprinkled with $CaCl_2$. This is

A. To minimise the snow fall

B. To minimise pollution

C. To minimise the accumulation of dust on the road

D. To minimise the wear and tear of the roads

Answer: A

Watch Video Solution

31. The freezing point of water is depressed by $0.37^{\circ} C$ in a 0.01 molal NaCl solution. The freezing point of 0.02 molal solution of urea is depressed by

A. $0.37^{\circ} C$

B. $0.74^{\circ} C$

C. $0.185^{\circ} C$

D. $0^{\circ} C$

Answer: A

Watch Video Solution

32. The measured freezing point depression for a 0.1 m aqueous CH_3COOH solution is $0.19^\circ C$. The acid dissociation constant K_a at this concentration will be (Given K_f, the moala cryoscopic constant = 1.86 K Kg mol^{-1})

A. 4.76×10^{-5}

B. 4×10^{-5}

C. 8×10^{-5}

D. 2×10^{-5}

Answer: B

Watch Video Solution

33. Calculate the molal depression constant of a solvent which has freezing point $16.6^\circ C$ and latent heat of fusion 180.75J g^{-1} :

A. 2.68

B. 3.86

C. 4.68

D. 2.86

Answer: B

Watch Video Solution

34. Calculate the freezing point of a solution that contains 30 g urea in 200 g water. Urea is a non-volatile, nonelectrolytic solid. K_f for $H_2O = 1.86^\circ C/m$

A. $4.65^\circ C$

B. $-4.65^\circ C$

C. $-0.744^\circ C$

D. $+0.744^\circ C$

Answer: A

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35. 20 g of a non-volatile solute is added to 500 g of solvent. Freezing point of solvent $= 5.48^{\circ} C$ and solution $= 4.47^{\circ} C. K_f = 1.93^{\circ} / m.$ Molecular mas of the solute is

A. 72.2

B. 76.4

C. 73.2

D. 70.6

Answer: B

Watch Video Solution

36. What happens to freezing point of benzene when nephthalens is added ?

A. Increases

B. Decreases

C. Reamains unchanged

D. First decreases and then increases

Answer: B

Watch Video Solution

37. Freezing point of urea solution is $-0.06^\circ C$. How much urea (M.W. = 60 g/mole) is required to dissolve in 3 kg water $\left(K_f = 1.5^\circ Ckgmol^{-1}\right)$

A. 3.6 g

B. 2.4 g

C. 7.2 g

D. 6.0 g

Answer: C

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38. When 0.01 mole of sugar is dissolved in 100 g of a solvent the despersion is frezzing point is $0.40^\circ C$. When 0.03 mole of glucose is dissolved in 50 g of the same solvent , the depression in freezing point will be ________.

A. 0.60°

B. 0.80°

C. 1.60°

D. 2.40°

Answer: D

Watch Video Solution

39. Assertion :- The freezing point is the temperature at which solid crystallizzes from solution.

Reason :- The freezing point depression is the difference between that temperature and freezing point of pure solvent.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

Watch Video Solution

40. Assertion (A): The increasing pressure on water decreases its freezing point.

Reason (R):The density of water is maximum at $273K$.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

Watch Video Solution

41. Statement - The water pouch of instant cold pack for treating athletic injuries breakes when squeezed and NH_4NO_3 dissolves lowering the temperature.

Explanation - Addition of non-volatile solute into solvent results into depression of freezing point of solvent.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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42. If molarity of the dilute solutions is doubled ,the value of molal depression constant (K_f) will be:

A. Halved

B. Tripled

C. Unchanged

D. Doubled

Answer: C

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ORDINARY THINKING OBJECTIVE QUESTIONS (Abnormal molecular mass)

1. 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. Na_2SO_4

D. $Al(NO_3)_2$

Answer: A

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2. 0.5 molal aqueous solution of a weak acid (HX) is 20% ionised. If K_f for water is $1.86 K kg mol^{-1}$, the lowering in freezing point of the solution is

A. $-1.12K$

B. 0.56 K

C. 1.12 K

D. $0.56K$

Answer: C

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3. The van't Hoff factor i for a compound which undergoes dissociation in one solvent and association in other solvent is respectively.

A. Greater than one and greater than one

B. Less than one and greater than one

C. Less than one and less than one

D. Greater than one and less than one

Answer: D

Watch Video Solution

4. The freezing point depression constant for water is $-1.86^{\circ} Cm^{-1}$. if $5.00 g Na_2SO_4$ is dissolved in $45.0 g H_2O$,the freezing point is changed by $-3.82^{\circ} C$,Calculate the van't Hoff factor for Na_2SO_4

A. 0.381

B. 2.05

C. 2.63

D. 3.11

Answer: C

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5. A solution containing $10 g per dm^3$ of urea (mol.wt. $= 60 g mol^{-1}$) is isotonic with a 5% (mass//vol.) of a non-volatile solute. The molecular mass of non-volatile solute is:

A. $300 g mol^{-1}$

B. $350 g mol^{-1}$

C. $200 g mol^{-1}$

D. $250 g mol^{-1}$

Answer: A

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6. The correct relationship between the boiling points of very dilute solutions of $AlCl_3(t_1)$ and $CaCl_2(t_2)$, having the same molar concentration, is

A. $t_1 = t_2$

B. $t_1 > t_2$

C. $t_2 > t_1$

D. $t_2 > t_1$

Answer: B

Watch Video Solution

7. Van't Hoff factor of $Ca(NO_3)_2$ is

A. 1

B. 2

C. 3

D. 4

Answer: C

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8. The molecular mass of acetic acid dissolved in water is 60 and when dissolved in benzene it is 120. This difference in behaviour of CH_3COOH is because

A. Water prevents association of acetic acid

B. Acetic acid does not fully dissolve in water

C. Acetic acid fully dissolves in benzene

D. Acetic acid does not ionize in benzene

Answer: B

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9. Four solutions of K_2So_4 with the concentrations 0.1m ,0.001 m, and 0.0001 mare available . The maximum value of colligative property corresponds to :

A. 0.0001 m solution

B. 0.001 m solution

C. 0.01 m solution

D. 0.1 m solution

Answer: A

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10. Dry air was passed successively through a solution of 5 gm of a solute in 80 gm of water and then through pure ware. The loss in weight of solution was 2.50 gm and that of pure solvent 0.04 gm. What is the molecular weight of the solute

A. 70.31

B. 7.143

C. 714.3

D. 80

Answer: A

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11. One mole of a solute A is dissolved in a given volume of solvent. The association of the solute take place as follows: $nA \Leftrightarrow A_n$

If α is the degree of association of A, the van't Hoff factor i is expressed as:

A. $i = 1 - x$

B. $i = 1 + \frac{x}{n}$

C. $i = \frac{1 - x + \frac{x}{n}}{1}$

D. $i = 1$

Answer: C

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12. If α is the degree of dissociation of Na_2SO_4 the van't Hoff's factor (i) used for calculating the molecular mass is

A. $1+\alpha$

B. $1-\alpha$

C. $1+2\alpha$

D. $1-2\alpha$

Answer: C

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13. The degree of dissociation (α) of a weak electrolyte, A_xB_y is related to van't Hoff's factor (i) by the expression:

A. $\alpha=\dfrac{i-1}{(x+y-1)}$

B. $\alpha=\dfrac{i-1}{x+y+1}$

C. $\alpha=\dfrac{x+y-1}{i-1}$

D. $\alpha = \dfrac{x+y+1}{i-1}$

Answer: A

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14. Observe the following observations :

$\pi_{obs} =$ observed colligative property

$\pi_{cal} =$ theoretical colligative property assuming normal behaviour of solute

van't Hoff factor (i) is given by :

A. $i = \pi_{obs} \times \pi_{cal}$

B. $i = \pi_{obs} + \pi_{cal}$

C. $i = \pi_{obs} - \pi_{cal}$

D. $i = \dfrac{\pi_{obs}}{\pi_{cal}}$

Answer: D

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15. If the various terms in the following expressions have usual meanings, the van't Hoff factor 'i' cannot be calculated by which of the following expression ?

A. $\pi V = \sqrt{\text{in}}RT$

B. $\Delta T_f = ik_f . m$

C. $\Delta T_b = ik_b . m$

D. $\dfrac{.^\circ P_{\text{solvent}} - P_{\text{solution}}}{.^\circ P_{\text{solvent}}} = i\left(\dfrac{n}{N+n}\right)$

Answer: A

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16. The Van't Hoff factor calculated from association data is always _______________ than calculated from dissociation date.

A. Less

B. More

C. Same

D. More or less

Answer: A

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17. When benzoic acid dissolve in benzene, the observed molecular mass is

A. 244

B. 61

C. 366

D. 122

Answer: A

Watch Video Solution

18. Which of the following compounds corresponds Van't Hoff factor 'i' to be equal to 2 dilute solution

A. K_2SO_4

B. $NaHSO_4$

C. Sugar

D. $MgSO_4$

Answer: D

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19. The Van't Hoff factor i for a 0.2 molal aqueous solution of urea is

A. 0.2

B. 0.1

C. 1.2

D. 1.0

Answer: D

Watch Video Solution

20. Assertion : Molecular mass of benzoic acid when determined by colligative properties is found high.

Reason : Dimerisation of benzoic acid.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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21. Each question contains STATEMENT-I(Assertion) and STATEMENT-2(Reason).the statement carefully and mark the correct answer accoring to the instrution given below:

STATEMENT - 1 : The molecular mass of acetic acid determined by depression in freezing point method in benzene and water was found to be differrent.

STATEMENT - 2 : Water is polar and benzene is non-polar.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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Critical Thinking (Objective Questions)

1. Normal boiling point of water is $373K$. Vapour pressure of water at $298K$ is $23mm$ enthalpy of vaporisation is $40.656kJmol^{-1}$ if atmopheric pressure becomes $23mm$, the water will boil at:

A. 250 K

B. 294 K

C. 51.6 K

D. 12.5 K

Answer: B

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2. 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 $NaCO_3 = 106 gmol^{-1}$)

A. 0.477 M and 0.477 M

B. 0.955 M and 1.910 M

C. 1.910 M and 0.955 M

D. 1.90 M and 1.910 M

Answer: C

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3. The boiling point fo water $(100^\circ C$ become $100.52^\circ C$, if 3 grams of a nonvolatile solute is dissolved in $200 ml$ of water. The molecular weight of solute is

(K_b for water is $0.6 \mathrm{K.kg\,mol}^{-1}$)

A. $12.2 g mol^{-1}$

B. $15.4 g mol^{-1}$

C. $17.3 g mol^{-1}$

D. $20.4 g mol^{-1}$

Answer: C

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4. $0.6g$ of a solute is dissolved in 0.1 litre of a solvent which develops an osmotic pressure of 1.23 at m at $27^{\circ} C$.The molecular mass of the substance is

A. 149.5g mole^{-1}

B. 120g mole^{-1}

C. 430g mole^{-1}

D. None of these

Answer: B

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5. Calculate the osmotic pressure at $17^{\circ}C$ of an aqueous solution containing $1.75g$ of sucrose per $150mL$ solution.

A. 0.8 atm

B. 0.08 atm

C. 8.1 atm

D. 9.1 atm

Answer: A

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6. A solution is obtained by dissolving $12g$of urea(mol.wt.60)in a litre of water.Another solution is obtained by dissolving $68.4g$ of cane sugar (mol.wt.342)`in a litre of water at are the same temperature .The lowering of vapour pressure in the first solution is

A. same as that of 2^{nd} solution

B. Nearly one-fifth of the 2^{nd} solution

C. Double that of 2^{nd} solution

D. Nearly five times that of 2^{nd} solution

Answer: A

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7. An azeotropic mixture of HCl and water has

A. 84% HCI

B. 22.2% HCI

C. 63% HCI

D. 20.2% HCI

Answer: D

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8. Choose the incorrect statement in the following

A. Surface tension is the force acting per unit length perpendicular to the line drawn on the surface of the liquid

B. Surface tension of a liquid increases with increase in temperature

C. The SI unit of surface tension is Jm^{-2}

D. Viscosity is a measure of resistance for the flow of liquid

Answer: B

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9. When a gas is bubbled through water at 298 K, a very dilute solution of the gas is obtained. Henry's law constant for the gas at 298 K is 100kbar. If the gas exerts a partial pressure of 1 bar, the number of millimoles of the gas dissolved in one litre of water is

A. 0.555

B. 5.55

C. 0.0555

D. 55.5

Answer: A

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10. $K_f of 1, 4 - \text{dioxane is} 4.9 mol^{-1}$ for $1000g$.The depression in freezing point for a$0.001m$ solution in dioxane is

A. 0.0049

B. $4.9 + 0.001$

C. 4.9

D. 0.49

Answer: A

Watch Video Solution

11. How many litres of CO_2 at STP will be formed when $100 ml$ of $0.1 M H_2SO_4$ reacts with excess of Na_2SO_3 ?

A. 22.4

B. 2.24

C. 0.224

D. 5.6

Answer: C

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12. An aqueous solution of a weak monobasic acid containing $0.1g$in 21.7 g of water freezes at$272.813K$.If the value of $K_f$for water is $1.86K/m$,what is the molecular mass of the monobasic acid

A. 50g/mole

B. 46g/mole

C. 55g/mole

D. 60g/mole

Answer: D

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13. 1 atm is

A. $236.7kJkg^{-1}$

B. $333.4kJkg^{-1}$

C. $-333.4kJkg^{-1}$

D. $-236.7kJkg^{-1}$

Answer: C

View Text Solution

14. Ammonia undergoes self dissociation according to the reaction $2NH_{3(l)} \Leftrightarrow NH_{2(am)}^{+} + NH_{2(am)}^{-}$ where am, stands for ammoniated. When 1 mol of NH_4 Cl is dissolved in 1 kg of liquid ammonia, the b.p. at 760 torr is observed as $-32.7^{\circ}C$ (normal boiling b.p. of $NH_{3(l)}$ is $33.4^{\circ}C$). What conclusion is reached about the nature of the solution

A. NH_4 Cl is completely dissociated in NH_3

B. NH_4 Cl is partially dissociated in NH_3

C. NH_4Cl is not dissociated in NH_3

D. Boiling point is not raised

Answer: A

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15. When a cystal of the solute is introduced into a super saturated solution of the solute

A. The solute dissolves

B. The excess solutes crystallizes out

C. The solution becomes unsaturated

D. The solution remains super saturated

Answer: B

Watch Video Solution

16. How many grams of copper will be replaced in 2L of a 1.50 M $CuSO_4$ solution if the latter is made to react with 27.0 of aluminium (Cu=63.5, Al= 27.0)

A. $190.50g$

B. $95.25g$

C. $31.75g$

D. $10.65g$

Answer: B

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17. Boiling point fo chloroform was raised by $0.323K$,when$0.5143g$ of anthrance was dissolved in $35g$of chloroform .Molecular mass of anthracene is

$\left(K_b f \text{ or } CHCl_3 = 3.9 \text{K.kg mol}^{-1}\right)$

A. 79.42g/mol

B. 132.32 g/mol

C. 177.42 g/mol

D. 242.32 g/mol

Answer: C

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18. Normal human blood sugar range is 65-105 mg/dL. Considering density of human blood is 1.06 kg/L, if a patient's sugar level reads 720 ppm, his/her blood sugar at that time is

A. Normal

B. High

C. Low

D. Cannot say

Answer: A

Watch Video Solution

19. The empirical formula of a non-electrolyte is CH_2O. A solution containing 3 g L^{-1} of the compound exerts the same osmotic pressure as that of 0.05 M glucose solution. The molecular formula of the compound is :

A. $C_2H_4O_2$

B. $C_3H_6O_3$

C. $C_5H_{10}O_5$

D. $C_4H_8O_4$

Answer: D

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20. Equal volumes of molar hydrochloric acid and sulphuric acid are neutralized by dil. $NaOH$ solution and x Kcal and y Kcal of heat are liberated respectively. Which of the following is true?

A. x=y

B. x=y/2

C. x=2y

D. None of the above

Answer: B

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21. Equal weight of CH_4 and H_2 are mixed in an empty container at $25^\circ C$. The fraction of the total pressure exerted by H_2 is

A. $1/9$

B. $1/2$

C. $8/9$

D. $16/17$

Answer: C

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22. Surface tension vanishes at

A. Boiling point

B. Critical point

C. Condensation point

D. Triple point

Answer: B

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23. Which values can be obtained from the information represented by the vapour pressure curve of a liquidlt/brgt A. Normal boiling pointlt/brgtB. Normal freezing point lt/brgtC. Enthalpy of vaporization

A. A only

B. A and B only

C. A and C only

D. A, B and C

Answer: C

View Text Solution

24. A solution containing 30 gms of non-volatile solute in exactly 90 gm water has a vapour pressure of 21.85 mm Hg at 25°C. Further 18 gms of water is then added to the solution. The resulting solution has a vapour pressure of 22.15 mm Hg at 25°C. Calculate the molecular weight of the solute

A. 74.2

B. 75.6

C. 67.83

D. 78.7

Answer: C

View Text Solution

25. $1.2$of solution of $NaCl$is isotonic with 7.2 of solution of glucose .Calculate the van't Hoff factor of $NaCl$solution?

A. 2.36

B. 1.5

C. 1.95

D. 1

Answer: C

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26. The boiling point of a solution of $0.0150g$ of a substance in $15.84g$ of ether was found to be $100^{\circ}C$higher than that of pure ether.What is the molecular weight of the substance [Molecular elevation constant of ether per100

A. 144.5

B. 143.18

C. 140.28

D. 146.66

Answer: B

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27. The change of energy on freezing 1.00kg of liquid water at 0° C A0.001 molal solution of [Pt$(NH_3)_4CI_4$] in water had a freezing point depression of 0.0054° C.If K_f for water is 1.80, the correct formulation for the above molecule is

A. $\left[Pt(NH_3)_4CI_3\right]CI$

B. $\left[Pt(NH_3)_4CI_2\right]CI_2$

C. $[Pt(NH_3)_4CI]CI_3$

D. $[Pt(NH_3)_4CI_4]$

Answer: B

View Text Solution

28. In mixture A and B ,components show -ve deviations 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 strong than A-A and B-B interaction

Answer: B::D

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JEE SECTION (Only one choice correct answer)

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

A. Shows negative deviation from Raoult's law

B. Shows no deviation from Raoult's law

C. Shows positive deviation from Raoult's law

D. Is saturated

Answer: C

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2. The azeotropic mixture of water $(B.P. = 100^\circ C)$ and HCl($B.P. = 86^\circ C)$boils at about $120^\circ C$. During fractional distillation of this mixture it is possible to obtain :

A. Pure HCl

B. Pure water

C. Pure water as well as pure HCl

D. Neither HCl nor H_2O in their pure states

Answer: D

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3. According to Raoult's law the relative lowering of vapour pressure for a solution is equal to

A. Mole fraction of the solvent

B. Mole fraction of the solute

C. Weight percentage of a solute

D. Weight percentage of solvent

Answer: B

Watch Video Solution

4. A molal solution is one that contains one mole of a solute in

A. 1000 gm of the solvent

B. One litre of the solvent

C. One litre of the solution

D. 22.4 litres of the solution

Answer: A

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5. Which one of the following modes of expressing concentration of solution is independent of temperature

A. Molarity

B. Molality

C. Formality

D. Normality

Answer: B

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6. Which of the following $0.1M$ aqueous solutions will have the lowest freezing point?

A. Potassium sulphate

B. Sodium chloride

C. Urea

D. Glucose

Answer: A

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7. The freezing point among the following equimolal aqueous solutions will be highest for

A. $C_6H_5NH_3Cl$ (aniline hydrochloride)

B. $Ca(NO_3)_2$

C. $La(NO_3)_3$

D. $C_6H_{12}O_6$ (glucose)

Answer: D

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8. Osmotic pressure of a solution is $0.0821 atm$ at a temperature of 300 K. The concentration in mole/litre will be

A. 0.033

B. 0.066

C. 0.33×10^{-2}

D. 3

Answer: C

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9. The ratio of freezing point depression values of $0.01M$ solutions of urea, common salt, and Na_2SO_4 are

A. $1:1:1$

B. $1:2:1$

C. $1:2:3$

D. $2:2:3$

Answer: C

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10. Increasing the temperature of an aqueous solution wil case

A. Decrease in molality

B. Decrease in molarity

C. Decrease in mole fraction

D. Decrease in % w/w

Answer: B

Watch Video Solution

11. Vapour pressure of a solution of $5g$of non-electrolyte in $100g$water at a particular temperature is$2985N/m^2$.The vapour pressure of pure water is$3000N/m^2$.The molecular weight of the solute is

A. 60

B. 120

C. 180

D. 380

Answer: C

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12. Given that ΔT_f is the depression in freezing point of the solvent in a solution of a non-volatile solute of molarity m,the quantity $\underset{m \to 0}{Lt}\left(\Delta T_f / m\right)$ is equal to ....

A. Zero

B. One

C. Three

D. None of the above

Answer: D

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13. A 0.2 molal aqueous solution of weak acid (HX) is 20% ionised. The freezing point of this solution is (Given, $K_f = 1.86^\circ C m^{-1}$ for water)

A. -0.45

B. -0.90

C. -0.31

D. -0.53

Answer: A

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14. A 0.1 molal aqueous solution of a weak acid is 30% ionized. If K_f for water is $1.86^\circ C / m$, the freezing point of the solution will be.

A. $-0.36^\circ C$

B. $-0.24^\circ C$

C. $-0.18^\circ C$

D. $-0.54^{\circ} C$

Answer: B

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15. The molecular weight of benzoic acid in benzene as determined by depression in freezing point method corresponds to:

A. Ionization of benzoic acid

B. Dimerization of benzoic acid

C. Trimerization of benzoic acid

D. Solvantion of benzoic acid

Answer: B

Watch Video Solution

16. The van't Hoff factor for $0.1 M Ba(NO_3)_2$ solution is 2.74 . The degree of dissociation is :

A. $91.7\ \%$

B. $87\ \%$

C. $100\ \%$

D. $74\ \%$

Answer: B

Watch Video Solution

17. The normality of $0.3 M$ phosphorous acid (H_3PO_3) is

A. 0.1

B. 0.9

C. 0.3

D. 0.6

Answer: D

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18. A 0.6% urea solution would be isotonic with :

A. 0.1 M glucose

B. 0.1 M KCl

C. 0.6% glucose solution

D. 0.6 % KCl solution

Answer: A

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19. The molal freezing point constant of water is $1.86 K m^{-1}$. If $342 g$ of cane sugar $(C_{12}H_{22}O_{11})$ is dissolved in $1000 g$ of water, the solution will freeze at

A. $-1.86^{\circ} C$

B. $1.86^{\circ} C$

C. $-3.92^{\circ} C$

D. $2.43^{\circ} C$

Answer: A

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20. Which of the following solutions in water will have the lowest vapour pressure

A. 0.1 M, NaCl

B. 0.1 M, Sucrose

C. $0.1M, \; BaCl_2$

D. $0.1MNa_3PO_4$

Answer: D

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21. 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

Answer: A

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22. The elevation in boiling point of a solution of 13.44g of $CuCl_2$ (molecular weight =134.4, $k_b = 0.52K\text{molality}^{-1})$ in 1 kg water using the following information will be:

A. 0.16

B. 0.05

C. 0.1

D. 0.2

Answer: A

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23. $75.2g$ of C_6H_5OH (phenol) is dissolved in a solvent of $K_f = 14$. If the depression in freezing point is $7K$, then find the percentage of phenol that dimerises.

A. 50%

B. 75%

C. 25%

D. 99%

Answer: B

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24. When 20 g of naphthoic acid $(C_{11}H_8O_2)$ is dissolved in 50 g of benzene $(K_f = 1.72K\text{kg}mol^{-1})$, a freezing point depression of 2K is observed . The van't Hoff factor (i) is :

A. 0.5

B. 1

C. 2

D. 3

Answer: A

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25. The Henry's law constant fo the solubility of N_2 gas in water at 298 K is 1.0×10^5 atm. The mole fraction of N_2 in air is 0.8. The number of moles of N_2 from air dissolved in 10 moles of water at 298K and 5 atm pressue is

A. 4.0×10^{-4}

B. 5.0×10^{-5}

C. 5.0×10^{-4}

D. 4.0×10^{-6}

Answer: A

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26. Dissolving $120g$ of urea (mol wt $= 60)$ in 1000g of water gave a solution of density 1.15 g/mL. The molarity of the solution is

A. 1.78 M

B. 2.00 M

C. 2.05 M

D. 2.22 M

Answer: C

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27. The freezing point (in $.^{\circ} C$) of a solution containing $0.1g$ of $K_3[Fe(CN)_6]$ (Mol.wt. 329) in 100 g of water $(K_f = 1.86 K kg mol^{-1})$ is

A. -2.3×10^{-2}

B. -5.7×10^{-2}

C. -5.7×10^{-3}

D. -1.2×10^{-2}

Answer: A

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28. For a dilute solution containing 2.5g of a non-volatile non-electrolyte solute in 100g of water, the elevation in boiling point at 1 atm pressure is 2°C. Assuming concentration of solute is much lower than the concentration of solvent, the vapour pressure (mm of Hg) of the solution is (take K_b=0.76 K kg mol^{-1})

A. 724

B. 740

C. 736

D. 718

Answer: A

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29. The molarity of a solution obtained by mixing 800 mL of 0.5 M HCl with 200 mL of 1 M HCl will be

A. 0.8 M

B. 0.6 M

C. 0.4 M

D. 0.2 M

Answer: B

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30. Consider separate solutions of $0.500 M C_2H_5OH(aq)$, $0.100 M Mg_3(PO_4)(aq)$, $0.250 M KBr(aq)$, and $0.125 M Na_3PO_4(aq)$ at $25^\circ C$. Which statement is true about these solutions, assuming all salts to be strong electrolytes?

A. They all have the same osmotic pressure

B. $0.100 M Mg_3(PO_4)_2(aq)$ has the highest osmotic pressure

C. $0.125 M Na_3PO_4(aq)$ has the highest osmotic pressure

D. $0.500 M C_2H_5OH(aq)$ has the highest osmotic pressure

Answer: A

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31. The vapour pressure of acetone at $20^{\circ} C$ is 185 torr. When $1.2g$ of non-volatile substance was dissolved in $100g$ of acetone at $20^{\circ} C$ its vapour pressure was 183 torr. The moalr mass $\left(gmol^{-1}\right)$ of the substance is:

A. 32

B. 64

C. 128

D. 488

Answer: B

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32. 18g of glucose $(C_6H_{12}O_6)$is added to 178.2 g of water. The vapour pressure of water for this aqueous solution at $100^\circ C$is :

A. 76.0

B. 752.4

C. 759.0

D. 7.6

Answer: B

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33. The freezing point of benzene decreases by $0.45^\circ C$ when $0.2g$ of acetic acid is added to $20g$ of benzene. IF acetic acid associates to form a dimer in benzene, percentage association of acetic acid in benzene will be $\left(K_f \text{for benzene} = 5.12 K kg mol^{-1}\right)$

A. 80.4%

B. 74.6%

C. 94.6%

D. 64.6%

Answer: C

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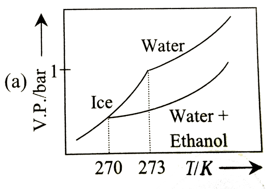
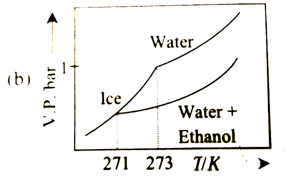
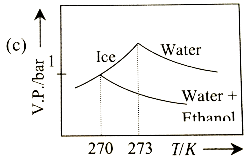
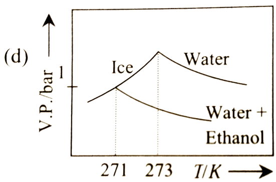
34. Pure water freezes at 273 K and 1 bar. The addition of 34.5 g of ethanol to 500 g of water changes the freezing point of the solution. Use the freezing point depression constant of water as 2 K $kgmol^{-1}$. The figures shown below represent plots of vapour pressure (V.P.) versus temperature (T). [molecular weight of ethanol is$46gmol^{-1}$ Among the following, the option representing change in the freezing point is

A. 

B. 

C. 

D. 

Answer: A

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35. For 1 molal aqueous solution of the following compounds, which one will show the highest freezing point ?

A. $\left[Co(H_2O)_5Cl\right]Cl_2.\ H_2O$

B. $\left[Co(H_2O)_4Cl_2\right]Cl.2H_2O$

C. $\left[Co(H_2O)_3Cl_3\right].3H_2O$

D. $\left[Co(H_2O)_6\right]Cl_3$

Answer: C

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JEE SECTION (More than one choice correct answer)

1. When HgI_2 is added to aqueous solution of KI, which of the following are not correct statements

A. Freezing point is raised

B. Freezing point does not change

C. Freezing point is lowered

D. Boiling point does not change

Answer: B::C::D

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2. Which of the following aqueous solutions are isotonic $(R = 0.082 atm K^{-1} mol^{-1})$

A. 0.01 M glucose

B. $0.01 M NaNO_3$

C. 500 ml solution containing 0.3 g urea

D. 0.04 N HCl

Answer: A::C

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3. In the depression of freezing point experiment, it is found that the:

A. Vapour pressure of the solution is less than that of pure solvent

B. Vapour pressure of the solution is more than that of pure solvent

C. Only solute molecules solidify at the freezing point

D. Only solvent molecules solidify at the solution at room

Answer: A::D

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4. Benzene and naphthalene form an ideal solution at room temperature. For this process,the true statement(s) is (are)

A. ΔG is positive

B. ΔS_{system} is positive

C. $\Delta S_{\text{surroundings}} = 0$

D. $\Delta H = 0$

Answer: B::C::D

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5. Mixture (s) showing positive deviation from Raoult's law at $35^{\circ} C$ is (are)

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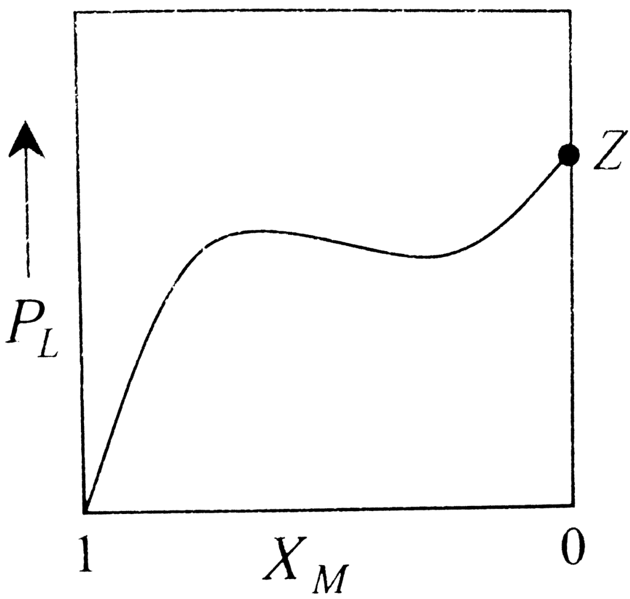
6. For a solution formed by mixing liquids L and M, the vapour pressure of L plotted against the mole fraction of M in solution is shown in the following figure. Here X_L and X_M represent mole fractions of L and M, respectively, in the solution. The correct statement(s) applicable to this system is (are)



A. The point Z represents vapour pressure of pure liquid M and Raoult's law is obeyed from $X_L = 0$ to $X_L = 1$

B. Attractive intermolecular interactions between L-L in pure liquid L and M-M in pure liquid M are stronger than those between L-M when mixed in solution

C. The point Z represents vapour pressure of pure liquid M and Raoult's law is obeyed when $X_L \rightarrow 0$

D. The point Z represents vapour pressure of pure liquid L and Raoult's law is obeyed when $X_L \rightarrow 1$

Answer: B::D

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7. For a non-ideal solution with +-ve deviation

A. $\Delta H_{mix} = -ve$

B. $\Delta V_{mix} = -ve$

C. $\Delta S_{mix} = -ve$

D. $\Delta G_{mix} = -ve$

Answer: A::B::D

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8. The lowering in vapour pressure when a solute is added

A. Will depend upon the nature of the solute

B. Will be the same irrespective of the solvent taken

C. Will be different when different solvent are taken

D. Will depend on the form ideal solution

Answer: A::C::D

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9. Which of the following form/s an ideal solution ?

A. Ethyl bromide and ethyl iodide

B. $CHCl_3$ and acetone

C. Benzene and toluene

D. Ethanol and water

Answer: A::C

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10. Identify the correct statement

A. 1 M NaCl has higher freezing point than 1 M glucose solution

B. 1 M NaCl solution has same boiling point as 1 M KCl solution

C. Molecular weight NaCl will be less than 58.5 in water because it undergoes diffociation

D. $i > 1$ when solute undergoes association

Answer: B::C

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11. K_2HgI_4 is 50% ionised in aqueous solution. Which of following are correct ?

A. n = 7

B. n = 3

C. i = 2

D. i = 4

Answer: B::C

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12. The cryoscopic constant value depends upon

A. The number of particles of the solute in the solution

B. The number of particles of the solvent in the solution

C. The enthalpy of fusion of the solvent

D. The freezing point of the solvent

Answer: C::D

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13. Which of the following increase with increase in temperature

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JEE SECTION (Reasoning type questions)

1. Statement 1 : Entropy of solution is less than entropy of pure solvent.

Statement 2 : The freezing point of water is depressed by the addition of glucose.

A. Statement 1 is true, statement 2 is true, statement 2 is a correct explanation for statement 1

B. Statement 1 is true, statement 2 is true , statement 2 is not a correct explanation for statement 1

C. Statement 1 is true, statement 2 is false

D. Statement 1 is false, statement 2 is true

Answer: D

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2. Statement 1 : Lowering of vapour pressure is directly proportional to the number of species present in the solution.

Statement 2 : The vapour pressure of 0.1M sugar solution is more than 0.1 M KCl solution.

A. Statement 1 is true, statement 2 is true, statement 2 is a correct explanation for statement 2

B. Statement 1 is true, statement 2 is true , statement 2 is not a correct explanation for statement 2

C. Statement 1 is true, statement 2 is false

D. Statement 1 is false, statement 2 is true

Answer: A

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JEE SECTION (Comprehension type questions)

1. Properties such as boiling point, freezing point and vapour pressure of a pure solvent change when solute molecules are added to get homogenous solution. These are called colligative properties. Application of colligative properties are very useful in day-to-day life. One of its example is the use of ethylene glycol and water mixture as anti-freezing liquid in the radiator of automobiles.

A solution M is prepared by mixing ethanol and water. The mole fraction of ethanol in the mixture is 0.9.

Given : Freezing point depression constant of water $\left(K_f^{\text{water}}\right) = 1.86 K\text{mol}^{-1}$

Freezing point depression constant of ethanol $\left(K_f^{\text{ethonal}}\right) = 2.0 Kkg\text{mol}^{-1}$

Boiling point elevation constant of water $\left(K_b^{\text{water}}\right) = 0.52 Kkg\text{mol}^{-1}$

Boiling point elevation constant of ethanol $\left(K_b^{\text{ethonal}}\right) = 1.2 Kkgmol^{-1}$

Standard freezing point of water $= 273K$

Standard freezing point of ethonal $= 155.7K$

Standard boiling point of water $= 373K$

Standard boiling point of ethanol $= 351.5K$

Vapour pressure of pure water $= 32.8 mmHg$

Vapour pressure of pure ethonal $= 40 mmHg$

Molecular weight of water $= 18 g\text{mol}^{-1}$

Molecular weight of ethonal $= 45 g\text{mol}^{-1}$

In answering the following questions, consider the solution to be ideal ideal solutions and solutes to be non-volatile and non-dissociative.

The freezing point of the solution M is :

A. 268.7 K

B. 268.5 K

C. 234.2 K

D. 150.9 K

Answer: D

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Molecular weight of ethonal $= 45 g \text{mol}^{-1}$

In answering the following questions, consider the solution to be ideal ideal solutions and solutes to be non-volatile and non-dissociative.

The freezing point of the solution M is :

A. 39.3 mm Hg

B. 36.0 mm Hg

C. 29.5 mm Hg

D. 28.8 mm Hg

Answer: B

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Molecular weight of ethonal $= 45 g\text{mol}^{-1}$

In answering the following questions, consider the solution to be ideal ideal solutions and solutes to be non-volatile and non-dissociative.

The freezing point of the solution M is :

A. 380.4 K

B. 376.2 K

C. 375.5 K

D. 354.7 K

Answer: B

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4. The value of any colligative property of any electrolyte is determined experimentally, it is found to be higher than the theoretically calculated vallue using the usual expressions. This is because the electrolytes undergo dissociation in the solution. Similarly, in case of some substances association takes place, e.g., acetic acid in benzene and the experimental value of colligative value. The experimentally observed molar masses come out to be different than the theoretical values. These are called abnormal molar masses. In such cases, a correction factor, i, called van't Hoff factor is introduced which is a ratio of observed value of colligative property to calculated value when the solution behaves ideally. Knowing i, the degree of dissociation or association of the solute can be calculated.

Which of the following aqueous solution will have the highest freezing point

A. 0.1 M urea

B. 0.1 M sucrose

C. $0.1 M AlCl_3$

D. $0.1 M K_4[Fe(CN)_6]$

Answer: B

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The van't Hoff factor for $0.1 M Ba(NO_3)_2$ solution is 2.74. The degree of dissociation is

A. $91.3\ \%$

B. $87\ \%$

C. $100\ \%$

D. $74\ \%$

Answer: B

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The boiling point of 0.1 molal $K_4[Fe(CN)_6]$ solution will be (Given K_b for water $= 0.52^\circ \mathrm{C\,kg\,mol}^{-1}$)

A. $100.52^\circ C$

B. $100.104^\circ C$

C. $100.26^\circ C$

D. $102.6^\circ C$

Answer: C

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7. When we add a non-volatile solute to a solvent lowers its vapour pressure. Therefore, the vapour pressure of a solution is lower than that of pure solvent, at the same temperature. A higher temperature is needed to raise the vapour pressure upto one atmosphere pressure, when boiling point is attained. However, b.pt. increases small. For example, 0.1 molal aqueous sucrose solution boils at $100.05^{\circ} C$. Sea water, which is rich in Na^{+} and Cl^{-} ions, freezes about $1^{\circ} C$ lower than freezes pure water. At the freezing point of a pure-solvent, the rates at which two molecule stick together to form the solute is present. Few solvent molecules are in constant with surface of solid. However, the rate at which the solvent molecules leave the surface of solid remains unchanged. That is why temperature is lowered to restore the equilibrium. The depression is lowered to restore the equilibrium. The depression in freezing point in a dilute solution is proportional to molality of the solute.

An aqueous solution of 0.1 molal concentration of sucrose should have freezing point $\left(K_{f}=1.86 K mol^{-1} kg\right)$

A. $0.186^{\circ} C$

B. $1.86^{\circ} C$

C. $-1.86^{\circ} C$

D. $-0.186^{\circ}C$

Answer: D

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8. When we add a non-volatile solute to a solvent lowers its vapour pressure. Therefore, the vapour pressure of a solution is lower than that of pure solvent, at the same temperature. A higher temperature is needed to raise the vapour pressure upto one atmosphere pressure, when boiling point is attained. However, b.pt. increases small. For example, 0.1 molal aqueous sucrose solution boils at $100.05^{\circ}C$. Sea water, which is rich in Na^{+} and Cl^{-} ions, freezes about $1^{\circ}C$ lower than freezes pure water. At the freezing point of a pure-solvent, the rates at which two molecule stick together to form the solute is present. Few solvent molecules are in constant with surface of solid. However, the rate at which the solvent molecules leave the surface of solid remains unchanged. That is why temperature is lowered to restore the equilibrium. The depression is lowered to restore the equilibrium. The depression in freezing point in a dilute solution is proportional to molality of the solute.

The freezing point of a $5gCH_3COOH(aq)$ per 100 g water is $1.576^\circ C$.

The van't Hoff factor (K_f of water $= 1.86Kmol^{-1}$ kg)

A. 0.996

B. 2

C. 0.5

D. 1.016

Answer: D

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When 250 mg of eugenol is added to 100 g of camphor $\left(k_{f}=39.7 \mathrm{K} \text{ molality}^{-1}\right)$, it lowered the freezing point by $0.62^{\circ} C$. The molar mass of eugenol is

A. $1.6 \times 10^{2} g / mol$

B. $1.6 \times 10^{4} g / mol$

C. $1.6 \times 10^{3} g / mol$

D. 200 g/mol

Answer: A

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10. The volume (in mL) of $0.1MAgNO_3$ required for complete precipitation of chloride ions present in $30mL$ of $0.01M$ solution of $[Cr(H_2O)_5Cl]Cl_2$, as silver chloride is close to:

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11. MX_2 dissociates into M^{2+} and $X^{\ominus}$ ion in an aqueous solution, with a degree of dissociation (α) of 0.5. The ratio of the observed depression of freezing point of the aqueous solution to the value of the depression of freezing point in absence of ionic dissociation is

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12. A compound H_2X with molar mass of $80g$ is dissolved in a solvent having density of $0.4gmL^{-1}$. Assuming no change in volume upon dissolution, the molality of a 3.2 molar solution is

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13. If the freezing point of a 0.01 molal aqueous solution of a cobalt (III) chloride-ammonia complex (which behaves as a strong electrolyte) is $-0.0558^{\circ}C$, the number of chloride (s) in the coordination sphere of the complex if $\left[K_f \text{ of water } = 1.86Kkgmol^{-1}\right]$

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14. The mole fraction of a solute in a solutions is 0.1. At $298K$ molarity of this solution is the same as its molality. Density of this solution at 298 K is $2.0gcm^{-3}$. The ratio of the molecular weights of the solute and solvent, $\frac{MW_{\text{solute}}}{MW_{\text{solvent}}}$ is

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15. The ratio of the value of any colligative property of KCl solution to that of sugar solution is

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16. A certain mass of a substance when dissolved in $100 g C_6H_6$ lowers the freezing point by $1.28^\circ C$. The same mass of solute dissolved in $100 g$ of water lowers of the freezing point by $1.40^\circ C$. If the substance has normal molecular weight in benzene and is completely dissocited in water, into how many ions does it dissocite in water ? K_f for H_2O and C_6H_6 are 1.86 and $5.12 K mol^{-1} kg$ respectively.

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17. A mixture of $(H_2O + C_6H_5NO_2)$ boils at $90^\circ C$. In the vapours of mixture partial vapour pressures of H_2O and $C_6H_5NO_2$ are 733 mm Hg and 27 mm Hg respectively. The $W_{H_2O} / W_{C_6H_5NO_2}$ is

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18. A 0.0020 m aqueous solution of an ionic compound $Co(NH_3)_5(NO_2)Cl$ freezes at $-0.00744^\circ C$. The number of moles of ions which 1 mole of ionic compound produces on being dissolve in water is $\left(K_f = -1.86^\circ C / m\right)$

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19. The Van't Hoff factor (i) for a dilute solution of $K_3\left[Fe(CN)_6\right]$ is

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JEE SECTION (Matrix Match type questions)

1. Match the entries listed in Column I with appropriate listed in Column II.

	Column I		Column II
(A)	$0.1 M BaCl_2$ solution	(p)	$271 K$
(B)	$0.1 M NaCl$ solution	(q)	$270 K$
(C)	$0.1 M K_3[Fe(CN)_6]$ solution	(r)	$268 K$
(D)	$0.1 M Al_2(SO_4)_3$ solution	(s)	$269 K$

Given : Freezing point of 0.1 M sucrose solution = 272 K

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JEE SECTION (JEE (Advanced)2018) (Numeric answer type questions)

1. Liquids A and B form ideal solution over the entire range of composition. At temperature T, equimolar binary solution of liquids A and B has vapour pressure 45 torr. At the same temperature, a new solution of A and B having mole fractions x_A and x_B, respectively, has vapours pressure of 22. torr. The value of x_A / x_B in the new solution is _____. (Given that the vapour pressure of pure liquid A is 20 torr at temperature T).

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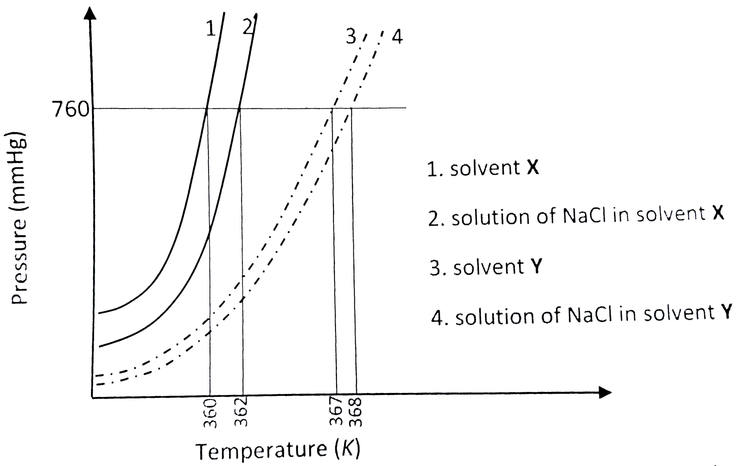
2. The plot given below shows $P-T$ curves (where P is the pressure and T is the temperature) for two solvents X and Y and isomolal solutions of NaCl in these solvents. NaCl completely dissociates in both the solvents.



On addition of equal number of moles of a non-volatile solute S in equal amount (in kg) of these solvents, the elevation of boiling point of solvent X is three times that of solvent Y. Solute S is known to undergo dimerization in these solvents. If the degree of dimerization is 0.7 in solvent Y, the degree of dimerization in solvent X is ____.

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3. Dilution process of different aqueous solution , with water are given in List-I. The effects of dilution of the solutions on $[H^+]$ are given in List-II. (Note : Degree of dissociation (α) of weak acid and weak base is ltlt 1, degree of hydrolysis of salt $< \; < 1$, $[H^+]$ represents the concentration of H^+ ions)

List-I

(P) $(10 \text{ mL of } 0.1 \text{ M NaOH} + 20 \text{ mL of } 0.1 \text{ acetic acid})$ dilutes to 60 mL

(Q) $(20 \text{ mL of } 0.1 \text{ M NaOH} + 20 \text{ mL of } 0.1 \text{ M acetic acid})$ diluted to 80 m

(R) $(20 \text{ mL of } 0.1 \text{ M HCl} + 20 \text{ mL of } 0.1 \text{ M ammonia solution})$ diluted to

(S) 10 mL saturated solution of $Ni(OH)_2$ in equilibrium with excess s diluted to 20 mL (solid $Ni(OH)_2$ is still present after dilution)

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