CHEMISTRY

PHYSICAL, INORGANIC, AND ORGANIC CHEMISTRY

SOLUTION AND COLLIGATIVE PROPERTIES

Physical Chemitry Solution Colligative Properties

1. To aqueous solution of Nal, increasing amounts of solid Hgl_2, is added. The vapor pressure of the solution

A. decreases to a constant value

B. increases to a constant value

C. increases first and then decreases

D. remains constant because Hgl_2 is sparingly soluble in water.

Answer: 2

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2. Depression of freezing point of which of the following solutions does represent the cryoscopic constant of water ?

A. 6% by mass of urea is aqueous solution

B. $100g$ of aqueous solution containing $18g$ of glucose

C. $1MKCl$ solution in water

D. $59g$ of aqueous solution containing $9g$ of glucose

Answer: 4

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3. $1M$ of glucose solution has a freezing point of $-1.86^\circ C$. If $10ml$ of $1M$ glucose is mixed with $30ml$ of $3M$ glucose then the resultant solution will have a freezing point of

A. $-2.79^\circ C$

B. $-4.65^\circ C$

C. $-5.58^{\circ}C$

D. $-7.44^{\circ}C$

Answer: 2

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4. A solution of x moles of sucrose in 100 gram of water freezes at $00.2^{\circ}C$. As ice separates the freezing point goes down to $0.25^{\circ}C$. How many gram of ice would have separated ?

A. 18 gram

B. 20 gram

C. 25 gram

D. 23 gram

Answer: 2

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5. $2.56g$ of sulfur in $100g$ of CS_2 of has depression in freez point of $0.01^\circ C$. $K_f = 0.1^\circ$ mol al^{-1}. Hence, he atomicity of sulfur is CS_2 is

A. 2

B. 4

C. 6

D. 8

Answer: 4

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6. What weight of glucose dissolved in 100 grams of water will produce the same lowering of vapour pressure as one gram of urea dissolved in 250 grams of water, at the same temperature ?

A. $3g$

B. $5g$

C. $6g$

D. $4g$

Answer: 3

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7. The plots of $\frac{1}{X_A}$ (on $y-$ axis) vs $\frac{1}{Y_A}$ (on $x-$ axis) (where X_A and Y_A are the mole fractions of liquid A in liquid and vapour phase respectively) is linear with slpe and $y-$ intercept respectively.

A. $\frac{P_A^\circ}{P_B^\circ}$ and $\frac{\left(P_A^\circ - P_B^\circ\right)}{P_B^\circ}$

B. $\frac{P_B^\circ}{P_A^\circ}$ and $\frac{\left(P_A^\circ - P_B^\circ\right)}{P_B^\circ}$

C. $\frac{P_A^\circ}{P_B^\circ}$ and $\frac{\left(P_B^\circ - P_A^\circ\right)}{P_B^\circ}$

D. $\frac{P_B^\circ}{P_A^\circ}$ and $\frac{\left(P_B^\circ - P_A^\circ\right)}{P_B^\circ}$

Answer: 3

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8. Mixture of volatile components A and B has total pressure (in Torr) $p = 265 - 130x_A$, where X_A is mole fraction of A in mixture . Hence $P_A^\circ + P_B^\circ =$ (in T o r r).

A. 265

B. 135

C. 400

D. 150

Answer: C

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9. What is the mole ratio of benzene $\left(P_B^{\circ} = 150torr\right)$ and toluence $\left(P_{\tau}^{\circ} = 50torr\right)$ in vapour phase if the given solution has a vapour phase if the given solution has a vapour pressure of 120 torr ?

A. $7:1$

B. $7:3$

C. $8:1$

D. $7:8$

Answer: 1

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10. In which case, van't Hoff factor I remains unchanged ? (Assume common complexes of these ions)

A. $PtCl_4$ reacts with KCl

B. $aq.$ $ZnCl_2$ reacts with $aq.$ NH_3

C. $aq.$ $FeCl_3$ reacts with $aq.$ $K_4[Fe(CN)]_6$

D. $KMnO_4$ reduced to MnO_2 in alkaline medium (MnO_2 a black ppt)

Answer: 2

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11. The vapor pressures of benzenen, toluene and a xylene are 75 Torr, 22 Torr and 10 Torr respectively at $20^{\circ}C$ Which of the following is not a possible value of the vapor pressure of an equimolar binarytemary solution of these at $20^{\circ}C$? Assume all form ideal solution with each other?

A. $48\frac{1}{2}$

B. 16

C. $35\frac{1}{3}$

D. $53\frac{1}{2}$

Answer: 4

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12. The freezing point depression constant for water is $1.86^{\circ} Cm^{-1}$. If $5.00 g NaSO_4$ 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. 2.05

B. 2.63

C. 3.11

D. 0.381

Answer: 2

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13. Depression of freezing point of which of the following solutions does represent the cryoscopic constant of water?

A. $6\ \%$ by mass of urea in aqueous solution

B. $100g$ of aqueous solution containing $18g$ of glucose

C. $59g$ of aqueous solution containing $9g$ of glucose

D. $1MKCl$ solution in water.

Answer: 3

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14. An aqueous solution containing liquid $A(M.Wt. = 128)64\,\%$ by weight has a vapour pressure of $145mm$. Find the vapour pressure A. If that of water is $155mm$ at the same temperature.

A. $205mm$

B. $2.05mm$

C. $1.05mm$

D. $105mm$

Answer: 4

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15. We have a $0.1M$ solution of NH_2CONH_2, H_3PO_3 and H_3PO_4 then which of the following statement is correct, if we consider $100\,\%$ dissociation for H_3PO_3 and H_3PO_4

A. The V.P. and freezing pooint are highest for urea

B. The elevation in boiling point is the lowest for H_3PO_4

C. The V.P. and freezing point are the lowest for urea.

D. The depression in freezing point is the highest for H_3PO_3.

Answer: 1

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

A. $1MNaCl$

B. $1MAlCl_3$

C. $1MCaCl_2$

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

Answer: 4

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17. An aqueous solution containing $21.6mg$ at a solute in $100ml$ of solution has an osmotic pressure of $3.70mm$ of Hg at $25^\circ C$. The molecular wt of solute in g/mol is

A. 1085

B. 9035

C. 1355

D. 700

Answer: 1

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18. At $300K, 36g$ of glucose present per litre in its solution had an osmotic pressure 4.98 bar. If the osmotic pressure of solution is 1.52 bar at the same temperature, what would be its concentration.

A. 0.06

B. 0.03

C. 0.08

D. 0.01

Answer: 1

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19. The Vapour pressure of solution containing $2g$ of $NaCl$ in $100g$ of water at $100^\circ C$ is $753.2mm$ of Hg, then degree of dissociation of $NaCl$.

A. 0.6

B. 0.7

C. 0.8

D. 0.9

Answer: 1

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20. $5g$ each of two solutes X and Y (mol. wt of $X > Y$) are dissolved in $100g$ each of same solvent.

A. Solution of Y shows greater elevation of boiling point

B. Solution of X shows greater elevation of boiling point

C. Both solutinos of X and Y boils at the same temperature

D. Solution of X freezes after freezing of solution Y

Answer: 1

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21. A complex containing $K, Pt(IV)$ and Cl^- is $100\,\%$ ionized giving $i = 3$ the complext is

A. $K_2[PtCl_4]$

B. $K_2[PtCl_5]$

C. $K[PtCl_3]$

D. $K_2[PtCl_6]$

Answer: 4

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22. The azeotropic mixture of water and HCl boils at $110^\circ C$ when this mixture is simple distilled 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: 4

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23. If the freezing point of $0.1MHA(aq)$ solution is $-0.2046^\circ C$ then pH of solution is

(If K_f water $= 1.86mol^{-1}kg^{-1}$)

A. 1

B. 1.3

C. 1.7

D. 2

Answer: 4

24. The lowest concentration of oxygen that can support aquatic life is about $1.3 \times 10^{-4} mol/L$. The partial pressure of oxygen is $0.21 atm$ at sea level.

What is the lowest partial pressure of oxygen that can

support life ?

$k_H(O_2) = 11.3 \times 10^{-3} mol/L.\, atm$

A. $0.02 atm$

B. $0.10 atm$

C. $1.0 atm$

D. $10 atm$

Answer: 2

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25. The ratio aof $\Delta T_f \left[Fe(CN)_6\right]$ solution (assuming complete ionisation) to ΔT_f for solution of sugar of equal concentration is

A. $4:1$

B. $5:2$

C. $5:1$

D. $4:15$

Answer: 3

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26. What weight of glucose dissolved in $100g$ of water will produce the same lowering of vapour pressure as one gram of urea dissolved in $50g$ of water at the same temperature

A. $3g$

B. $5g$

C. $6g$

D. $4g$

Answer: 3

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27. The 1.25 mola sucrose solution at temperature 60° has a density of $0.1142g/ml$, then the osmotic pressure of solution will be

A. 2.5

B. 3.5

C. 2.0

D. 4.0

Answer: 1

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28. Which of the following solutions $(1molal)$ will have the maximum freezing point, assuming equal ionization in each case?

A. $\left[Fe(H_2O)_6\right]Cl_3$

B. $\left[Fe(H_2O)_5\right]Cl]Cl_2.\ H_2O$

C. $\left[Fe(H_2O)_4Cl_2\right]Cl.2H_2O$

D. $\left[Fe(H_2O)_3Cl_3\right].3H_2O$

Answer: 4

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29. An aqueous solution of a solute AB has b.p. of $101.08^\circ C(AB$ is $100\,\%$ ionised at boiling point of the solution) and freezes at $-1.80^\circ C.$ Hence, $AB\left(K_b/K_f=0.3\right)$

A. is $100\,\%$ ionised at the $f.p.$ of the solution

B. behaves as non $-$ electrolyte at the $f.p.$ of the solution

C. forms dimer

D. none of the above

Answer: 2

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30. What weight of non − volatile solute,urea (NH_2CONH_2) needs to be dissolved in $100g$ of water, in order to decrease the vapour pressure of water by $25\ \%$.

A. $11.1gm$

B. $111.1gm$

C. $9.82gm$

D. $982gm$

Answer: 2

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31. At $25^\circ C$, a solution containing $0.2g$ of polyisobutylene in $100mL$ of benzene develpoed a rise of $2.4mm$ at osmotic equilibrium. Calculate the molecular weight of polyisobutylene if the density of solution is $0.88g/mL$

A. $2.39 \times 10^5 g$

B. $33.9 \times 10^5 g$

C. $43.8 \times 10^5 g$

D. $78.6 \times 10^5 g$

Answer: 1

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32. Osomotic pressure at $300K$ when $1g$ glucose (P_1), $1g$ urea(P_2) and $1g$ sucrose (P_3) are dissolved in $500ml$ of water are follows the order.

A. $P_1 > P_2 > P_3$

B. $P_2 > P_1 > P_3$

C. $P_3 > P_1 > P_2$

D. $P_2 > P_3 > P_1$

Answer: 2

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33. Which of the following statement is incorrect . If the intermolecular forces in liquid x, y and z are in the order $x < y < z$

A. y evaporates more readily than x

B. y evaporates less readily than z

C. x and y evaporates at same rate

D. x evaporates more readily than z

Answer: D

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34. 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: 4

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35. When $250mg$ of eugenol is added to $100g$ of camphor $\left(k_f = 39.7 \text{ molality}^{-1}\right)$, it lowered the freezing point by $0.62^\circ C$. The molar 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. $200g/mol$

Answer: 1

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36. The freezing point of a $5gCH_3COOH(aq)$ per $100g$ water is $01.576^\circ C$. The van't Hoff factor $\left(K_f \text{ of water } -1.86Kmol^{-1}kg\right)$:

A. 0.996

B. 2

C. 0.5

D. 1.016

Answer: 4

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37. $6g$ 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. $0.10P^\circ$

B. $1.10P^\circ$

C. $0.90P^\circ$

D. $0.99P^\circ$

Answer: 4

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38. Calculate the weight of non $-$ volatile solute having molecular weight 40, which should be dissolvd in $57gm$ octane to reduce its vapour pressure to $80\,\%$:

A. $47.2g$

B. $5g$

C. $106.2g$

D. None of these

Answer: 2

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39. At $25^\circ C$, the vapour pressure of pure liquid $A(molwt. = 40)$ is $100torr$, while that of pure liquid B is 40 torr, $(mol. Wt. = 80)$. The vapour pressure at $25^\circ C$ of a solution containing $20g$ of each A and B is :

A. 80 torr

B. $59.8torr$

C. $68torr$

D. 48 torr

Answer: 1

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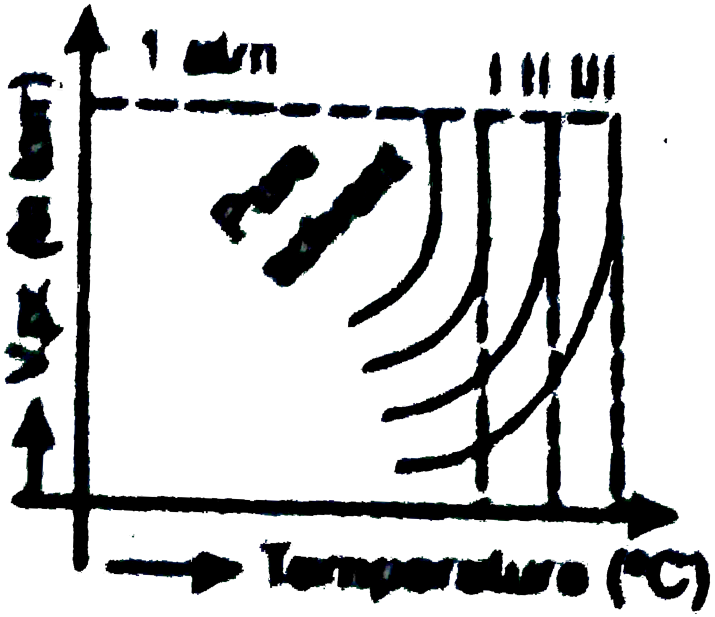
40. The vapour pressure curves of the same solute in the same solvent are shown. The curves are parallel to each other and do not intersect. The concentrations of solutions are in order of :



A. $I < II < III$

B. $I = II = III$

C. $I > II > III$

D. $I > III > II$

Answer: 1

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41. Total vapour pressure of mixture of 1 mole of volatile component A $\left(P_A^\circ = 100mmHg\right)$ and 3 mole of volatile component $B\left(P_B^\circ = 80mmHg\right)$ is $90mmHg$. For such case :

A. there is positive deviation from Raoult's law

B. boiling point has been lowered

C. force of attraction between A and B is smaller than that between A and A or between B and B

D. all the above statements are correct

Answer: 4

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42. Water and chlorobenzene are immiscible liquids. Their mixture boils at $89^\circ C$ under a redued pressure of $7.7 \times 10^4 Pa$. The vapour pressure of pure water at $89^\circ C$ is $7 \times 10^4 Pa$. Weight per ccent of chlorobenzene in the distillate is :

A. 50

B. 60

C. 78.3

D. 38.46

Answer: 4

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43. The degree of dissociation of an electrolyte is α and its van't Hoff factor is i. The number of ions obtained by complete dissociation of 1 molecules of the electrolyte is :

A. $\frac{i+\alpha-1}{\alpha}$

B. $i-\alpha-1$

C. $\frac{i-1}{\alpha}$

D. $\frac{i+1+\alpha}{1-\alpha}$

Answer: 1

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44. A complex is represented as $CoCl_3Xnh_3$. Its 0.1 molal solution in water $\Delta T_f = 0.588K$. K_f for H_2O is $1.86K$ molality^{-1}. Assuming $100\,\%$ ionisation of complex and co $-$ ordination number of Co is six calculate formula of complex.

A. $\left[Co(NH_3)_5\right]Cl_3$

B. $\left[Co(NH_3)_5Cl\right]Cl_2$

C. $\left[Co(NH_3)_4Cl_2\right]Cl$

D. None of these

Answer: 2

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

A. $C_6H_5NH_3Cl$

B. $Ca(NO_3)_2$

C. $La(NO_3)_2$

D. $C_6H_{12}O_6$

Answer: 4

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46. A 5% solution of cane sugar (molecular weight =342) is isotonic with a 1% solution of substance X. The molecular weight of X is

A. 34.2

B. 171.2

C. 68.4

D. 136.8

Answer: C

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47. What is the correct sequence of osmotic pressure of $0.01 Maq.$ solution of :

$(a) Al_2(SO_4)_3 \quad (b) Na_3PO_4 \quad (c) BaCl_2 \quad (d) Glucose$

A. $\pi_4 > \pi_2 > \pi_3 > \pi_1$

B. $\pi_3 > \pi_4 > \pi_2 > \pi_1$

C. $\pi_3 > \pi_4 > \pi_1 > \pi_2$

D. $\pi_1 > \pi_2 > \pi_3 > \pi_4$

Answer: 4

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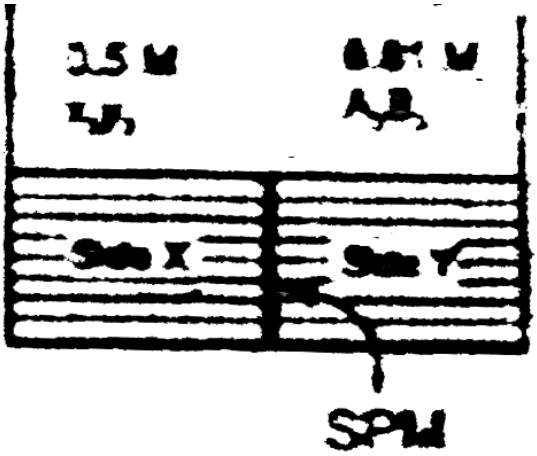
48. $X_3Y_2(i=5)$ when reacted with $A_2B_3(i=5$ in aqueous solution gives brown colour. These are separated by a semipermeable membrane AB as shown. Due to oxmosis there is :



A. brown colour formation in side X

B. brown colour formation in side Y

C. formation in both the sides X and Y

D. no brown colour formation

Answer: 4

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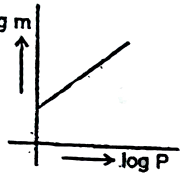
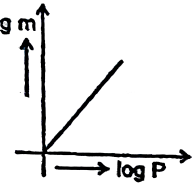
49. Which of the following curves represents the Henry's law ?

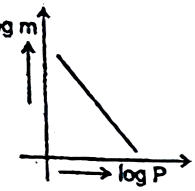
A. (1)

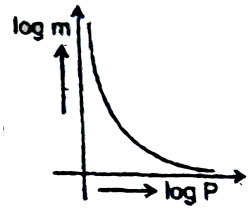


B. (2)



C. (3)



D. 

Answer: A

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50. At $300K$, $40mL$ of $O_3(g)$ dissolves in $100g$ of water at $1.0atm$. What mass of ozone dissolved in $400g$ of water at a pressure of $4.0atm$ at $300K$?

A. $0.1g$

B. $1.2g$

C. $0.48g$

D. $4.8g$

Answer: 4

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51. $106.2g$ 1 molal aqueous solutio of ethylene glycol is cooled to $-3.72^\circ C$. Mass of of ice separated during cooling is $\left(K_{f0} \text{ water } = 1.86 \text{ freezing point of water } = 0^\circ C\right)$

A. $25g$

B. $50g$

C. $60g$

D. $40g$

Answer: 2

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52. The freezing point depression constant for water is $-1.86^\circ Cm^{-1}$. if $5.00gNa_2SO_4$is dissolved in $45.0gH_2O$,the freezing point is changed by $-3.82^\circ C$,Calculate the van't Hoff factor for Na_2SO_4

A. 2.05

B. 2.63

C. 3.11

D. 0.381

Answer: 2

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