Quiz: SOLUTIONS 1

Q1: Molarity of a solution is defined as:

A) Moles of solute per kg of solvent
B) Moles of solute per litre of solution
C) Grams of solute per litre of solvent
D) Equivalent of solute per litre

Q2: Which concentration term is independent of temperature?

A) Molarity
B) Normality
C) Molality
D) Formality

Q3: Mole fraction of a component in solution is:

A) Moles of solute / mass of solution
B) Moles of solute / total moles
C) Mass of solute / mass of solvent
D) Volume of solute / volume of solution

Q4: Henry's law relates solubility of a gas with:

A) Temperature
B) Volume of solvent
C) Partial pressure of gas
D) Nature of solvent

Q5: If Henry's constant is high, the solubility of gas in liquid will be:

A) High
B) Low
C) Zero
D) Independent of pressure

Q6: Raoult's law is applicable to:

A) Only non-ideal solutions
B) Only gaseous solutions
C) Ideal solutions
D) Electrolytic solutions

Q7: An ideal solution shows:

A) DeltaHmix != 0
B) DeltaVmix != 0
C) DeltaHmix = 0 and DeltaVmix = 0
D) Only DeltaVmix = 0

Q8: Positive deviation from Raoult's law occurs when:

A) A-B interactions are stronger
B) A-B interactions are weaker
C) Solution is ideal

D) Solute is volatile

Q9: Negative deviation from Raoult's law occurs when:

A) A-B interactions are weaker
B) Solution is ideal
C) A-B interactions are stronger
D) Solute is non-volatile

Q10: Azeotropes are mixtures which:

A) Can be separated by distillation
B) Have constant boiling point
C) Obey Raoult's law
D) Are ideal solutions

Q11: Colligative properties depend on:

A) Nature of solute
B) Nature of solvent
C) Number of solute particles
D) Chemical formula of solute

Q12: Relative lowering of vapour pressure is equal to:

A) Mole fraction of solvent
B) Mole fraction of solute
C) Molality
D) Molarity

Q13: Elevation in boiling point is given by:

A) $\Delta T_b = K_f \, m$
B) $\Delta T_b = K_b \, m$
C) $\Delta T_b = iRT$
D) $\Delta T_b = \pi V$

Q14: Depression in freezing point is given by:

A) $\Delta T_f = K_b \, m$
B) $\Delta T_f = K_f \, m$
C) $\Delta T_f = RT$
D) $\Delta T_f = \pi$

Q15: Osmotic pressure of a solution depends on:

A) Molality
B) Molarity
C) Mass fraction
D) Density

Q16: Van't Hoff factor accounts for:

A) Temperature change
B) Association or dissociation
C) Volume change
D) Pressure change

Q17: For electrolytes, Van't Hoff factor is generally:

A) Less than 1
B) Equal to 1
C) Greater than 1
D) Zero

Q18: For association of solute molecules, Van't Hoff factor is:

A) > 1
B) = 1
C) < 1
D) Infinite

Q19: Which colligative property is best for determining molar mass of proteins?

A) Elevation of boiling point
B) Depression of freezing point
C) Osmotic pressure
D) Vapour pressure lowering

Q20: Isotonic solutions have:

A) Same molarity
B) Same molality
C) Same osmotic pressure
D) Same vapour pressure

Q21: Reverse osmosis is used for:

A) Electrolysis
B) Distillation
C) Desalination of water
D) Crystallisation

Q22: Addition of non-volatile solute causes vapour pressure to:

A) Increase
B) Decrease
C) Remain same
D) Become zero

Q23: Freezing point depression occurs because:

A) Vapour pressure increases
B) Chemical potential decreases
C) Volume increases
D) Density decreases

Q24: Boiling point elevation occurs because:

A) Vapour pressure is higher
B) Vapour pressure is lower
C) Solvent evaporates easily
D) Density increases

Q25: Which solution shows maximum colligative effect?

A) 0.1 m NaCl
B) 0.1 m glucose
C) 0.1 m urea
D) 0.1 m sucrose

Q26: Which solution has minimum vapour pressure?

A) Pure solvent
B) Dilute solution
C) Concentrated solution
D) Ideal solution

Q27: Molality is preferred over molarity because:

A) It is easier to calculate
B) It is temperature independent
C) It depends on volume
D) It is smaller in value

Q28: A hypotonic solution has:

A) Higher osmotic pressure
B) Lower osmotic pressure
C) Equal osmotic pressure
D) Zero osmotic pressure

Q29: Which solution obeys Raoult's law?

A) Ideal solution
B) Electrolytic solution
C) Azeotropic mixture
D) Colloidal solution

Q30: Maximum boiling azeotrope shows:

A) Positive deviation
B) Negative deviation
C) Ideal behaviour
D) No deviation

Q31: Osmotic pressure increases with:

A) Decrease in temperature
B) Decrease in concentration
C) Increase in temperature
D) Decrease in volume only

Q32: Which property is independent of nature of solute?

A) Viscosity
B) Colligative property
C) Density
D) Refractive index

Q33: Abnormal molar mass is observed due to:

A) Impurities
B) Association or dissociation
C) Temperature change
D) Pressure change

Q34: Which colligative property is used in blood osmotic studies?

A) Boiling point elevation
B) Freezing point depression
C) Osmotic pressure
D) Vapour pressure lowering

Q35: Mole fraction of solvent in dilute solution is approximately:

A) 0
B) 1
C) Greater than 1
D) Equal to mole fraction of solute

Q36: Which solute shows abnormal molar mass due to association?

A) NaCl in water
B) Acetic acid in benzene
C) Glucose in water
D) Urea in water

Q37: Electrolytes show greater colligative effect because:

A) They are heavier
B) They ionise
C) They are volatile
D) They are acidic

Q38: Which solution has highest osmotic pressure?

A) 0.1 M glucose
B) 0.1 M NaCl
C) 0.1 M urea
D) Pure water

Q39: Raoult's law for non-volatile solute relates vapour pressure with:

A) Molarity
B) Molality
C) Mole fraction
D) Normality

Q40: Which method is most accurate for molar mass determination?

A) Boiling point elevation
B) Freezing point depression
C) Osmotic pressure
D) Vapour pressure lowering

Q41: Which of the following expressions represents Henry's law?

A) $p = k_H \cdot x$
B) $p = RT$
C) $pi = CRT$
D) $DeltaT_b = K_b\, m$

Q42: Solubility of gases in liquids generally decreases with:

A) Increase in pressure
B) Decrease in temperature
C) Increase in temperature
D) Increase in volume

Q43: Which solution shows positive deviation from Raoult's law?

A) Acetone + chloroform
B) Water + nitric acid
C) Ethanol + acetone
D) Benzene + toluene

Q44: Negative deviation from Raoult's law leads to:

A) Lower boiling point
B) Higher vapour pressure
C) Higher boiling point
D) Lower osmotic pressure

Q45: Which of the following is a minimum boiling azeotrope?

A) Water-nitric acid
B) Ethanol-water
C) Acetone-chloroform
D) Phenol-aniline

Q46: Which of the following is NOT a colligative property?

A) Osmotic pressure
B) Boiling point elevation
C) Freezing point depression
D) Viscosity

Q47: Relative lowering of vapour pressure depends on:

A) Nature of solute
B) Nature of solvent
C) Mole fraction of solute
D) Temperature only

Q48: If a solute associates in solution, Van't Hoff factor (i) becomes:

A) Greater than 1
B) Equal to 1
C) Less than 1
D) Zero

Q49: For dissociation of solute in solution, Van't Hoff factor is:

A) < 1
B) = 1
C) > 1
D) Negative

Q50: Which colligative property is directly proportional to temperature?

A) Freezing point depression
B) Boiling point elevation
C) Osmotic pressure
D) Relative vapour pressure lowering

Q51: Which solution will have highest osmotic pressure at same concentration?

A) Glucose
B) Urea
C) NaCl
D) Sucrose

Q52: Which property is most useful for determining molar mass of polymers?

A) Boiling point elevation
B) Freezing point depression
C) Osmotic pressure
D) Vapour pressure lowering

Q53: A solution having same osmotic pressure as blood is called:

A) Hypotonic
B) Hypertonic
C) Isotonic
D) Ideal

Q54: If RBCs are placed in hypotonic solution, they will:

A) Shrink
B) Burst
C) Remain unchanged
D) Coagulate

Q55: If RBCs are placed in hypertonic solution, they will:

A) Burst
B) Shrink
C) Swell
D) Remain unchanged

Q56: Which of the following lowers freezing point maximum?

A) 0.1 m glucose
B) 0.1 m urea
C) 0.1 m NaCl
D) 0.1 m sucrose

Q57: Which of the following is a non-volatile solute?

A) Ethanol
B) Benzene
C) Urea
D) Acetone

Q58: Which concentration term is best for colligative properties?

A) Molarity
B) Normality
C) Molality
D) Mole percent

Q59: Boiling point elevation occurs because:

A) Density increases
B) Vapour pressure decreases
C) Surface tension decreases
D) Entropy increases

Q60: Freezing point depression is proportional to:

A) Molarity
B) Normality
C) Molality
D) Mole fraction

Q61: Which solution has minimum vapour pressure?

A) Pure solvent
B) Dilute solution
C) Concentrated solution
D) Ideal solution

Q62: Raoult's law for non-volatile solute is based on:

A) Molarity of solute
B) Molality of solute
C) Mole fraction of solvent
D) Normality of solution

Q63: Which shows abnormal molar mass due to association?

A) NaCl in water
B) Acetic acid in benzene
C) Glucose in water
D) Urea in water

Q64: Which property is independent of temperature?

A) Molarity
B) Molality
C) Normality
D) Osmotic pressure

Q65: Reverse osmosis is based on:

A) High vapour pressure
B) Applied pressure greater than osmotic pressure
C) Heating of solution
D) Electrolysis

Q66: Which solution obeys Raoult's law most closely?

A) Acetone-chloroform
B) Ethanol-water
C) Benzene-toluene
D) Phenol-water

Q67: Which factor does NOT affect osmotic pressure?

A) Temperature
B) Molarity
C) Nature of solute
D) Gas constant

Q68: Which solution shows highest boiling point?

A) 0.1 m glucose
B) 0.1 m urea
C) 0.1 m NaCl
D) Pure water

Q69: Which colligative property is least affected by temperature change?

A) Osmotic pressure
B) Boiling point elevation
C) Freezing point depression
D) Vapour pressure lowering

Q70: Mole fraction of solvent in dilute solution is approximately:

A) 0
B) 1
C) 0.5
D) Equal to solute

Q71: Which solute causes maximum freezing point depression?

A) Glucose
B) Urea
C) Na2SO4
D) Sucrose

Q72: Which statement about colligative properties is correct?

A) Depend on solute nature
B) Depend on number of solute particles
C) Depend on solvent nature
D) Depend on temperature only

Q73: Which condition gives Van't Hoff factor equal to 1?

    A) Association
    B) Dissociation
    C) Non-electrolyte
    D) Strong electrolyte

Q74: Which solution will have lowest boiling point?

    A) Pure solvent
    B) Electrolyte solution
    C) Concentrated solution
    D) Non-electrolyte solution

Q75: Which colligative property explains osmosis in living cells?

    A) Boiling point elevation
    B) Freezing point depression
    C) Osmotic pressure
    D) Vapour pressure lowering

Q76: Which solution shows abnormal molar mass due to dissociation?

    A) Glucose in water
    B) Urea in water
    C) NaCl in water
    D) Acetic acid in benzene

Q77: Which property is best for studying biological membranes?

    A) Freezing point depression
    B) Boiling point elevation
    C) Osmotic pressure
    D) Vapour pressure

Q78: Which factor increases osmotic pressure?

    A) Decrease in concentration
    B) Increase in temperature
    C) Decrease in temperature
    D) Decrease in solute particles

Q79: Which property is directly proportional to molality?

    A) Osmotic pressure
    B) Boiling point elevation
    C) Vapour pressure
    D) Density

Q80: Which solution obeys Raoult's law exactly?

    A) Ideal solution
    B) Electrolytic solution
    C) Azeotropic mixture
    D) Colloidal solution

Q81: Calculate the molarity of a solution containing 10 g NaOH in 250 mL solution.

A) 0.5 M
B) 1.0 M
C) 0.25 M
D) 2.0 M

Q82: What is the molality of a solution containing 5 g urea (M = 60) dissolved in 250 g water?

A) 0.25 m
B) 0.33 m
C) 0.5 m
D) 1.0 m

Q83: Calculate mole fraction of solute when 1 mol NaCl is dissolved in 9 mol water.

A) 0.10
B) 0.11
C) 0.09
D) 0.90

Q84: If vapour pressure of pure solvent is 100 mmHg and solution is 95 mmHg, find mole fraction of solute.

A) 0.05
B) 0.95
C) 0.10
D) 0.02

Q85: Calculate elevation in boiling point for 0.5 m urea solution. (Kb = 0.52 K kg mol-1)

A) 0.26 K
B) 0.52 K
C) 1.04 K
D) 0.13 K

Q86: Calculate depression in freezing point for 0.2 m glucose solution. (Kf = 1.86 K kg mol-1)

A) 0.186 K
B) 0.372 K
C) 0.93 K
D) 1.86 K

Q87: Osmotic pressure of 0.1 M solution at 300 K is (R = 0.082 L atm mol-1 K-1):

A) 2.46 atm
B) 0.246 atm
C) 24.6 atm
D) 4.92 atm

Q88: If Van't Hoff factor for NaCl is 2, what is DeltaTb for 0.2 m NaCl? (Kb = 0.5)

A) 0.1 K
B) 0.2 K
C) 0.4 K
D) 0.05 K

Q89: Calculate Van't Hoff factor if expected molar mass = 100 and observed = 50.

A) 0.5
B) 1
C) 2
D) 4

Q90: Which solution has highest osmotic pressure at same molarity?

A) 0.1 M glucose
B) 0.1 M urea
C) 0.1 M NaCl
D) 0.1 M sucrose

Q91: Calculate molar mass if 5 g solute produces osmotic pressure 2.46 atm at 300 K in 1 L.

A) 50 g mol-1
B) 60 g mol-1
C) 100 g mol-1
D) 150 g mol-1

Q92: Freezing point of solution is -0.372 degC. Calculate molality. (Kf = 1.86)

A) 0.1 m
B) 0.2 m
C) 0.5 m
D) 1.0 m

Q93: Boiling point elevation is 0.52 K. Find molality. (Kb = 0.52)

A) 0.5 m
B) 1.0 m
C) 2.0 m
D) 0.25 m

Q94: Which solution gives maximum freezing point depression?

A) 0.1 m glucose
B) 0.1 m urea
C) 0.1 m NaCl
D) 0.1 m sucrose

Q95: Calculate relative lowering of vapour pressure if mole fraction of solvent is 0.98.

A) 0.98
B) 0.02
C) 0.5
D) 0.01

Q96: If 1 mole solute associates to form dimers, Van't Hoff factor becomes:

A) 2
B) 1
C) 0.5
D) 0

Q97: Calculate osmotic pressure at 300 K for 0.05 M solution.

A) 1.23 atm
B) 0.82 atm
C) 2.46 atm
D) 0.41 atm

Q98: Which solution shows ideal behaviour?

A) Ethanol-water
B) Acetone-chloroform
C) Benzene-toluene
D) Water-HCl

Q99: Calculate molality if 10 g solute (M = 100) dissolved in 500 g solvent.

A) 0.1 m
B) 0.2 m
C) 0.5 m
D) 1.0 m

Q100: Which property is most accurate for molar mass determination?

A) Boiling point elevation
B) Freezing point depression
C) Osmotic pressure
D) Vapour pressure lowering

Q101: If osmotic pressure doubles, temperature remaining constant, molarity becomes:

A) Half
B) Same
C) Double
D) Four times

Q102: Which electrolyte gives highest colligative effect?

A) NaCl
B) CaCl2
C) KCl
D) Glucose

Q103: If i = 1.5, the solute shows:

A) Complete dissociation
B) Partial dissociation
C) Association
D) Non-electrolyte

Q104: Which colligative property does NOT depend on temperature?

A) Osmotic pressure
B) Boiling point elevation
C) Freezing point depression
D) Relative vapour pressure lowering

Q105: Freezing point depression is directly proportional to:

A) Molarity
B) Normality
C) Molality
D) Density

Q106: Calculate molality when 18 g glucose (M = 180) is dissolved in 90 g water.

A) 0.5 m
B) 1.0 m
C) 0.25 m
D) 2.0 m

Q107: 0.2 m NaCl solution has Van't Hoff factor 1.8. Calculate DeltaTf. (Kf = 1.86)

A) 0.67 K
B) 0.74 K
C) 0.93 K
D) 1.34 K

Q108: Osmotic pressure of a solution is 4.92 atm at 300 K. Find molarity.

A) 0.1 M
B) 0.2 M
C) 0.5 M
D) 1.0 M

Q109: 10 g urea is dissolved in 180 g water. Calculate mole fraction of urea.

A) 0.03
B) 0.05
C) 0.09
D) 0.01

Q110: Calculate molar mass if 2 g solute gives DeltaTf = 0.372 K in 100 g solvent. (Kf = 1.86)

A) 50
B) 100
C) 200
D) 25

Q111: Which solution will show maximum elevation in boiling point?

A) 0.1 m glucose
B) 0.1 m NaCl
C) 0.1 m CaCl2
D) 0.1 m urea

Q112: Calculate Van't Hoff factor if 1 mole solute forms 80% dimers.

A) 0.6
B) 0.7
C) 0.8
D) 0.9

Q113: A solution freezes at -0.93 degC. Find molality. (Kf = 1.86)

A) 0.25 m
B) 0.5 m
C) 1.0 m
D) 0.75 m

Q114: Which property gives most accurate molar mass of proteins?

A) DeltaTb
B) DeltaTf
C) pi
D) Relative vapour pressure

Q115: Calculate osmotic pressure of 0.25 M solution at 300 K.

A) 6.15 atm
B) 4.92 atm
C) 2.46 atm
D) 1.23 atm

Q116: If relative lowering of vapour pressure is 0.02, find mole fraction of solvent.

A) 0.98
B) 0.02
C) 0.5
D) 1.0

Q117: Calculate molality of 10% (w/w) NaCl solution.

A) 1.9 m
B) 2.0 m
C) 1.7 m
D) 1.5 m

Q118: Which solution has lowest vapour pressure?

A) 0.1 m glucose
B) 0.1 m NaCl
C) 0.1 m CaCl2
D) Pure water

Q119: If i = 2.5 for CaCl2, degree of dissociation is:

A) 0.5
B) 0.75
C) 0.8
D) 1.0

Q120: Which solution will cause RBCs to burst?

A) Isotonic
B) Hypertonic
C) Hypotonic
D) Ideal

Q121: Calculate freezing point of 0.2 m urea solution. (Kf = 1.86)

A) -0.186 degC
B) -0.372 degC
C) -1.86 degC
D) -0.93 degC

Q122: If molar mass observed is double the normal value, solute shows:

A) Dissociation
B) Association
C) Ionisation
D) Electrolysis

Q123: Calculate molarity if 5 g NaCl is present in 500 mL solution.

A) 0.1 M
B) 0.17 M
C) 0.2 M
D) 0.34 M

Q124: Which concentration term is best for temperature-varying experiments?

A) Molarity
B) Normality
C) Molality
D) Formality

Q125: Which solute will show Van't Hoff factor exactly 1?

A) NaCl
B) CaCl2
C) Glucose
D) K2SO4

Q126: Calculate DeltaTb for 0.3 m CaCl2. (Kb = 0.52, i = 3)

A) 0.468 K
B) 0.936 K
C) 0.78 K
D) 0.156 K

Q127: If osmotic pressure of solution is zero, the solution is:

A) Electrolytic
B) Hypertonic
C) Pure solvent
D) Colloid

Q128: Calculate molar mass if 1 g solute gives pi = 1.23 atm at 300 K in 500 mL.

A) 50
B) 100
C) 25
D) 75

Q129: Which solution obeys Raoult's law most closely?

A) Benzene-toluene
B) Ethanol-water
C) Acetone-chloroform
D) Phenol-water

Q130: Which colligative property is independent of temperature?

A) pi
B) DeltaTb
C) DeltaTf
D) Relative vapour pressure lowering

Q131: Which solution has highest vapour pressure?

A) Concentrated solution
B) Dilute solution
C) Pure solvent
D) Electrolyte

Q132: If i = 0.5, solute shows:

A) Complete dissociation
B) Partial dissociation
C) Association
D) Ionisation

Q133: Which electrolyte shows maximum colligative effect per mole?

A) NaCl
B) K2SO4
C) CaCl2
D) AlCl3

Q134: Calculate mole fraction of solvent if solute mole fraction is 0.04.

A) 0.96
B) 0.04
C) 0.5
D) 1.0

Q135: Which property explains water movement in plants?

A) Boiling point elevation
B) Freezing point depression
C) Osmotic pressure
D) Vapour pressure