SAMPLE CONTENT

MHT-CET 2021

TRIUMPH

CHEMISTRY

MULTIPLE CHOICE QUESTIONS

3049 MCQS

BASED ON STD. XII SYLLABUS 2020-21

A chameleon basks in the sun. As its body temperature increases, the chemical reactions of its metabolism speed up!

Target Publications® Pvt. Ltd.

Written in accordance with the topics based on new syllabus XII Sci.
(Maharashtra State Board)

MHT-CET TRIUMPH
CHEMISTRY MULTIPLE CHOICE QUESTIONS
Based on New Syllabus

Salient Features

- Includes chapters of Std. XII as per textbook of 2020.
- Exhaustive subtopic wise coverage of MCQs.
- 3049 MCQs including questions from various competitive exams.
- Quick Review provided for all the chapters.
- Important Formulae provided for relevant chapters
- Includes MCQs from JEE (Main) (8th April, shift 1), NEET (UG), NEET (Odisha), MHT-CET (6th May, Afternoon) 2019 and JEE (Main) (7th January, shift 1) 2020.
- Includes MCQs from JEE (Main), NEET and MHT-CET upto 2018.
- Various competitive examination questions updated till the latest year.
- Evaluation test provided at the end of each chapter.
- Inclusions: 'Real world applications' and 'Compilation of organic reaction based MCQs'.

Scan the adjacent QR code or visit ***www.targetpublications.org/tp1629*** *to download Hints for relevant questions and Evaluation Test in PDF format.*

Printed at: **Print to Print,** Mumbai

Balbharati Registration No.: 2018MH0022 **TEID: 1629** P.O. No. 1107

PREFACE

"Don't follow your dreams; chase them!"- a quote by Richard Dumbrill is perhaps the most pertinent for one who is aiming to crack entrance examinations held after std. XII. We are aware of an aggressive competition a student appearing for such career defining examinations experiences and hence wanted to create books that develop the necessary knowledge, tools and skills required to excel in these examinations.

For the syllabus of MHT-CET 2020, 80% of the weightage is given to the syllabus for XIIth standard whi only 20% is given to the syllabus for XIth standard (with inclusion of only selected chapters). Since there is no clarity on the syllabus for MHT-CET 2021 till the time when this book was going to be printed and taking the fact into consideration that the entire syllabus for std. XIIth Science has always been an integral part of MHT CET syllabus, this book includes all the topics of std. XIIth Chemistry.

We believe that although the syllabus for Std. XII and MHT-CET is aligned, the outlook to study the subject should be altered based on the nature of the examination. To score in MHT-CET, a student has to be not just good with the concepts but also quick to complete the test successfully. Such ingenuity can be developed through sincere learning and dedicated practice.

Having thorough knowledge of basic principles, laws, concepts and their applications is a prerequisite for beginning with MCQs on a given chapter in Chemistry. For physical chemistry students must know formulae, conversion factors, units and dimensions of physical quantities involved in the chapter. For inorganic and organic chemistry, students need to focus on chemical behaviour of elements and compounds and understand the mechanism of chemical reactions. It should be kept in mind that every single line of text has potential of generating several MCQs.

As a first step to MCQ solving, students should start with elementary questions. Once a momentum is gained, complex MCQs with higher level of difficulty should be practised. Questions from previous years as well as from other similar competitive exams should be solved to obtain an insight about plausible questions.

The competitive exams challenge understanding of students about subject by combining concepts from different chapters in a single question. To figure these questions out, cognitive understanding of subject is required. Therefore, students should put in extra effort to practise such questions.

Such a holistic preparation is the key to succeed in the examination!
To quote Dr. A.P.J. Abdul Kalam, **"*If you want to shine like a sun, first burn like a sun.*"**

Our **Triumph Chemistry** book has been designed to achieve the above objectives. Commencing from basic MCQs the book proceeds to develop competence to solve complex MCQs. It offers ample practice of recent questions from various competitive examination. It also includes hints that provide explanations and solutions to help students learn how to solve the MCQs. Each chapter ends with an Evaluation test to allow self-assessment.

Features of the book presented on the next page will explicate more about the same!

We hope the book benefits the learner as we have envisioned.

The journey to create a complete book is strewn with triumphs, failures and near misses. If you think we've nearly missed something or want to applaud us for our triumphs, we'd love to hear from you.
Please write us on mail@targetpublications.org

A book affects eternity; one can never tell where its influence stops.

Best of luck to all the aspirants!

From
Publisher

Edition: First

FEATURES

Quick Review

Iron

Cast iron	Wrought iron	Steel
Contains 4% C	Contains less than 0.2% C	Contains 0.2 - 2% C
Hard and brittle	Very soft	Neither too hard nor too soft
Uses: making pipes, manufacturing automotive parts, pots, pans, utensils, etc.	**Uses:** making pipes, bars for stay bolts, engine bolts and rivets, etc.	**Uses:** in buildings infrastructure, tools, ships, automobiles, weapons, et

Quick Review

Quick Review includes tables, arts to summarize the key po ts/imp tant chemical reactions in e cha ter *This is our att pt to l stude s to reinforce key c nts.*

Formulae

1. **Density (ρ)** = $\frac{M\,n}{a^3\,N_A}$

   Where M = molar mass of substance (g/mol),
   n = number of particles in a cubic unit cell,
   a = edge length (cm),
   N_A = Avogadro number (6.022×10^{23} mol^{-1})

2. **Packing efficiency**

   $= \frac{\text{Volume occupied by particles in unit cell}}{\text{Total volume of unit cell}} \times 100$

Formulae

Formulae includes all of the k formulae in the chapter.
This is our attempt to mak tools f formulae accessible for stu ts whil solving problems an sing t minute at a glance

Classical Thinking

9.1 Introduction

1. Coordination compounds contain ligands attached to central metal atom/ion through _____ bonds.
   (A) covalent (B) ionic
   (C) coordinate (D) metallic

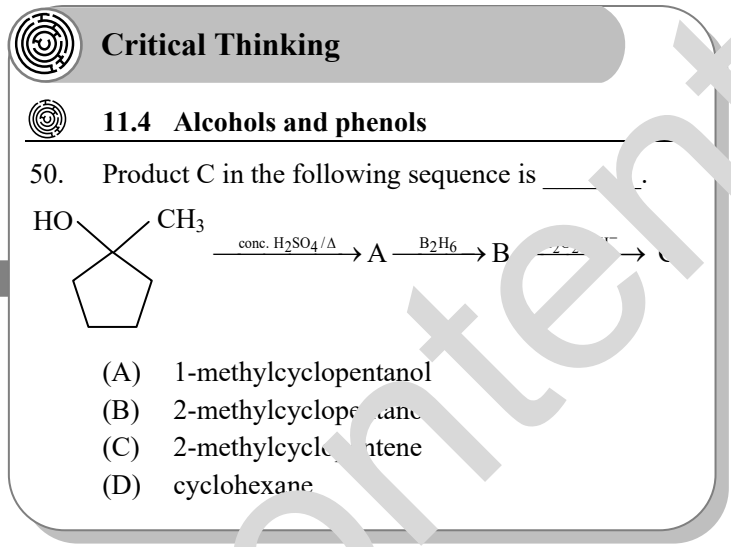
Classical Thinking

Classical Thinking section encompasses straight forward questions including knowledge based questions.
This is our attempt to revise chapter in its basic form and warm up students to deal with complex MCQs.

FEATURES

Critical Thinking

Critical Thinking section encompasses challenging questions which test understanding, rational thinking and application skills of students.
This is our attempt to take students from beginner to proficient level in smooth steps.



Critical Thinking

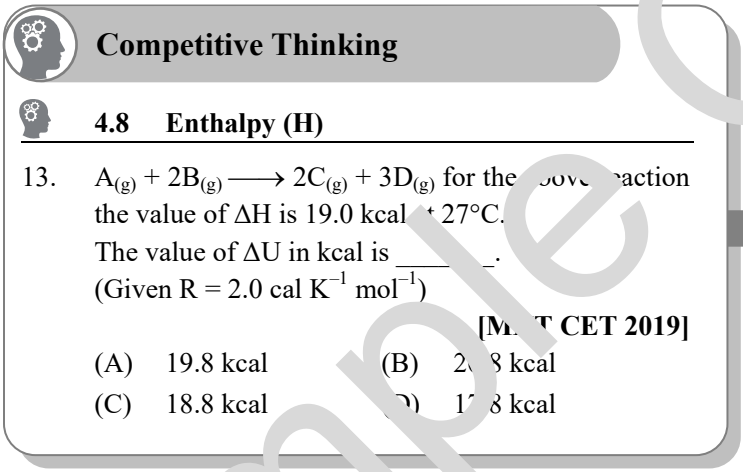
11.4 Alcohols and phenols

50. Product C in the following sequence is _____.

(A) 1-methylcyclopentanol
(B) 2-methylcyclope[illegible]anol
(C) 2-methylcycl[illegible]ntene
(D) cyclohexane

Competitive Thinking

Competitive Thinking section encompasses questions from various competitive examinations like MHT CET, JEE, AIPMT/NEET-UG, etc.
This is our attempt to give students practice of competitive questions and advance them to acquire knack essential to solve such questions.



Competitive Thinking

4.8 Enthalpy (H)

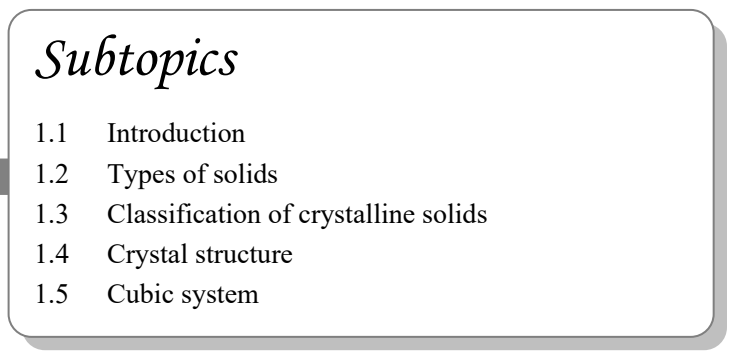
13. $A_{(g)} + 2B_{(g)} \longrightarrow 2C_{(g)} + 3D_{(g)}$ for the [illegible] reaction the value of ΔH is 19.0 kcal [illegible] 27°C. The value of ΔU in kcal is _____.
(Given R = 2.0 cal K^{-1} mol^{-1})

[M[illegible]T CET 2019]

(A) 19.8 kcal (B) 2[illegible].8 kcal
(C) 18.8 kcal (D) 1[illegible].8 kcal

Sub[illegible]wise segregation

Every section is **segregated sub-topic wise**.
This is our attempt to cater to individualistic pace and preferences of studying a chapter in students and enable easy assimilation of questions based on the specific concept.



Subtopics

1.1 Introduction
1.2 Types of solids
1.3 Classification of crystalline solids
1.4 Crystal structure
1.5 Cubic system

FEATURES

Miscellaneous

76. The end product in the following sequence of reaction is _____.

$$HC \equiv CH \xrightarrow[20\%\,H_2SO_4]{1\%\,HgSO_4} A \xrightarrow{CH_3MgX} B \xrightarrow{[O]} ?$$

(A) acetic acid (B) isopropyl alcohol
(C) acetone (D) ethanol

Miscellaneous

Every section, in general, ends with a sub-topic; miscellaneous.

Miscellaneous incorporates MCQs whose solutions require knowledge of concepts covered in different sub-topics of same chapter or from different chapters.

This is our attempt to develop cognitive thinking in the students essential to solve questions involving fusion of multiple key concepts.

Evaluation test

Evaluation Test covers questions from chapter for self-evaluation purpose.

This is our attempt to provide the students with a practice test and help them assess their range of preparation of the chapter.

Evaluation Test

1. Which of the following cell the chemicals consumed during current generation CANNOT be regenerated?
(A) Lead storage cell (B) Dry cell
(C) Mercury cell (D) NICAD cell

Straight or curly?

Hair is primarily composed of keratin, a protein, which grows from a sac called the follicle. Cells in the hair follicle generate keratin, and various other proteins, which become a part of the hair shaft. These proteins contain sulfur atoms, and when two of these sulfur atoms pair up and bond, they form a disulfide bond. If the two sulfur atoms in the same protein are at a distance and join to form the disulfide bond, the protein will bend.

The greater the number of links, the curlier the hair, and the fewer the number of links, the straighter the hair.

Real-world applications

Each chapter includes **real-world applications or examples** related to the concept discussed.

This is our attempt to link learning to the life and make students conscious of how Chemistry is related to everything we see, feel, touch and taste.

Organic Reactions

Organic Reactions – is a compilation of questions based on various organic chemistry concepts and reactions.

This is our attempt to help the students develop a strong understanding of organic chemistry.

22. Predict the products in the following reactions.


'A'

$$\xrightarrow[\text{anhydrous } AlCl_3,\ CuCl]{CO,\,HCl} \text{'B'} \xrightarrow[\text{conc. NaOH}]{HCHO} \text{'C'} +$$

(A) Benzoic acid, benzyl acohol, sodium formate
(B) Benzaldehyde, sodium benzoate, methanol
(C) Benzoic acid, sodium benzoate, methanol
(D) Benzaldehyde, benzyl alcohol, sodium formate

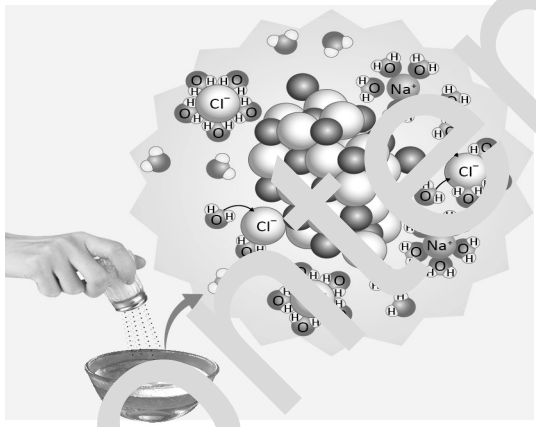
CONTENTS

Textbook
Chapter No.

02 Solutions

Subtopics

Addition of salt to water decreases the total volume!!!!!



When salt is added to the water there is an increase in the volume before the salt dissolves in it. However, as the dissolution occurs, there is a decrease in the total volume! This is due to the breaking of crystal structure of NaCl into the free ions of Na^+ and Cl^-. Moreover, the water molecules attend to the free ions i.e., the negative oxygen ends of water molecules surround the positive sodium ions (Na^+) and the positive hydrogen ends surround the negative chlorine ions. Salt ions (being smaller than the water molecules) enter the voids between them and hence, cause shrinkage of the total volume.

Quick Review

➢ **Classification of mixtures:**

Mixtures
Combination of two or more substances

Homogeneous mixture
Uniform composition of components

Heterogeneous mixture
Nonuniform composition of components

Based on size of particles

Colloid

True solution

Unsaturated solution
Contains less amount of solute than that can be dissolved in solvent at given temperature.

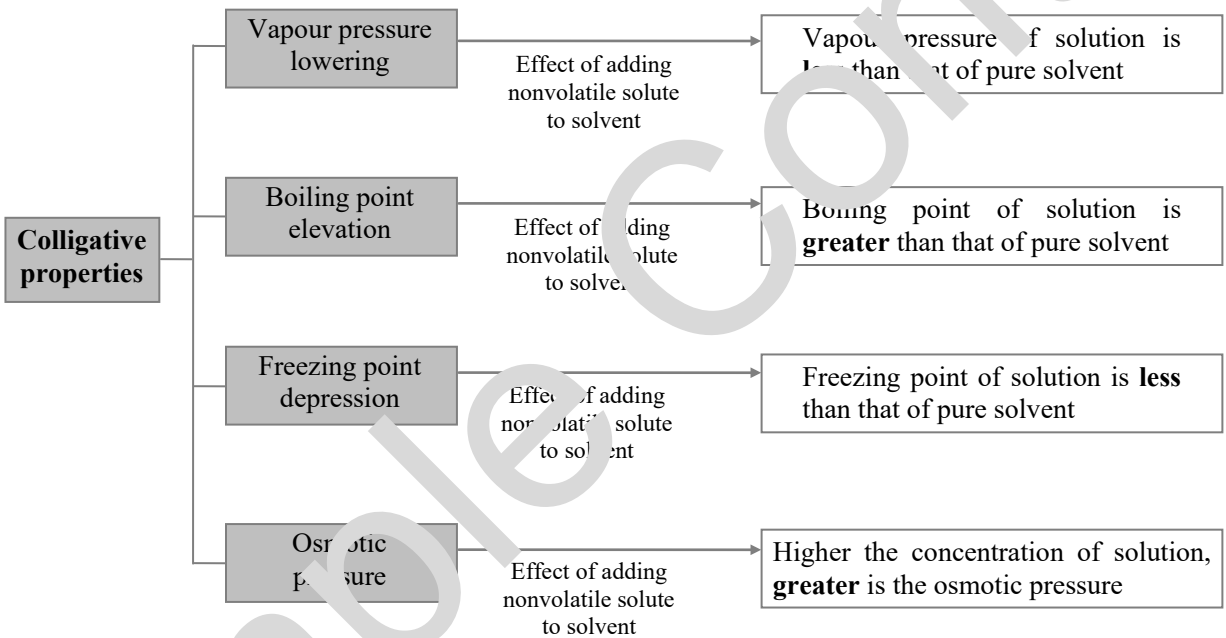
Saturated solution
Contains maximum (equilibrium) amount of solute that can be dissolved in solvent at given temperature.

Supersaturated solution
Contains greater than the equilibrium amount of solute.

➢ **Types of solutions:**

State of solute	State of solvent	Examples
Solid	Liquid	Sea water, benzoic acid in benzene, sugar in water
Solid	Solid	Metal alloys such as brass, bronze.
Solid	Gas	Iodine in air
Liquid	Liquid	Gasoline, ethanol in water
Liquid	Solid	Amalgams of mercury with metals i.e., mercury in silver
Liquid	Gas	Chloroform in nitrogen
Gas	Liquid	Carbonated water (CO_2 in water), oxygen in water.
Gas	Solid	H_2 in palladium
Gas	Gas	Air (O_2, N_2, Ar and other gases)

➢ **Colligative properties:**



➢ **Types of solution depending on the osmotic pressure of two solutions:**

No.	Type of Solution	Definition	Example
i.	**Isotonic** (Iso means equal)	Two or more solutions having the same osmotic pressure are said to be isotonic solutions.	0.1 M urea solution and 0.1 M sucrose solution are isotonic.
ii.	**Hypertonic** (Hyper means higher)	If two solutions have unequal osmotic pressures, the more concentrated solution with higher osmotic pressure is said to be hypertonic solution.	If osmotic pressure of sucrose solution is higher than that of urea solution, the sucrose solution is hypertonic to urea solution.
iii.	**Hypotonic** (Hypo means lower)	A solution having an osmotic pressure lower than that of another solution owing to lower concentration of solute is called hypotonic solution.	If osmotic pressure of sucrose solution is higher than that of urea solution, the urea solution is hypotonic to sucrose solution.

Formulae

1. Henry's law:

$S = K_H P$

where, S = solubility,
P = pressure of the gas
K_H = Henry's constant

2. Raoult's law:

For a binary solution of two volatile components:

$P_1 = P_1^0 x_1$

$P_2 = P_2^0 x_2$

where,

P_1^0 is the vapour pressure of pure component 1 and P_1 is the partial vapour pressure of component 1 in solution.

x_1 is the mole fraction of component 1 in solution.

P_2^0 is the vapour pressure of pure component 2 and P_2 is the partial vapour pressure of component 2.

x_2 is the mole fraction of component 2 in solution.

3. Dalton's law of partial pressures:

$P = P_1 + P_2$ OR $P = P_1^0 x_1 + P_2^0 x_2$

where, P is the total pressure of solution.

4. Partial pressures in vapour phase:

$P_1 = y_1 P$

$P_2 = y_2 P$

where, y_1 and y_2 as the mole fractions of two components in the vapour.

P_1 and P_2 are the partial pressures of two components in the vapour.

P is the total vapour pressure.

5. For a solution containing a non-volatile solute:

$P_1 = P_1^0 x_1$

where, P_1 is the vapour pressure of the solution, P_1^0 is the vapour pressure of pure solvent and x_1 is its mole fraction in solution.

6. Relative lowering of vapour pressure:

$$\frac{\Delta P}{P_1^0} = \frac{P_1^0 - P_1}{P_1^0}$$

where, P_1^0 = vapour pressure of pure solvent and P_1 = vapour pressure of solution

7. Molecular mass determination from lowering of vapour pressure:

i. $$\frac{\Delta P}{P_1^0} = x_2 = \frac{P_1^0 - P_1}{P_1^0} = \frac{n_2}{n_1 + n_2}$$

where, P_1^0 = Vapour pressure of pure solvent and P_1 = Vapour pressure of solution

x_2 = Mole fraction of solute
n_1 = Moles of solvent
n_2 = Moles of solute

ii. $n_2 = \frac{W_2}{M_2}$ and $n_1 = \frac{W_1}{M_1}$

where, W_2 = Mass of solute,
W_1 = Mass of solvent,
M_2 = Molar mass of solute,
M_1 = Molar mass of solvent

iii. Relative lowering of vapour pressure,

$$\frac{P_1^0 - P_1}{P_1^0} = \frac{\Delta P}{P_1^0} = \frac{W_2 M_1}{W_1 M_2}$$

8. Elevation of boiling point:

i. $\Delta T_b = T_b - T_b^0$

where, ΔT_b = Elevation in boiling point,
T_b = Boiling point of solution and
T_b^0 = Boiling point of pure solvent.

ii. $\Delta T_b = K_b m$

where, m = Molality of solution
K_b = boiling point elevation constant

iii. $$\Delta T_b = \frac{1000 K_b W_2}{M_2 W_1}$$

where, ΔT_b = Elevation in boiling point,
K_b = Molal elevation constant,
W_1 = Mass of solvent,
W_2 = Mass of solute,
M_2 = Molar mass of solute

iv. Molecular mass determination from elevation of boiling point:

Molecular mass of solute,

$$M_2 = \frac{1000\ K_b W_2}{\Delta T_b W_1}$$

9. Depression of freezing point:

i. $\Delta T_f = T_f^0 - T_f$

where, ΔT_f = Depression in freezing point,
T_f = Freezing point of solution and
T_f^0 = Freezing point of pure solvent.

ii. $\Delta T_f = K_f m$

where, m = Molality of solution
K_f = Freezing point depression constant

iii. $$\Delta T_f = \frac{1000 K_f W_2}{M_2 W_1}$$

where, ΔT_f = Depression in freezing point,
K_f = Molal depression constant,
W_2 = Mass of solute,
W_1 = Mass of solvent,
M_2 = Molar mass of solute

iv. **Molecular mass determination from depression of freezing point:**

Molecular mass of solute, $M_2 = \frac{1000\ K_f W_2}{\Delta T_f W_1}$

10. van't Hoff equation for osmotic pressure:

$\pi = MRT = CRT$

where, π = Osmotic pressure,
M = C = Concentration of solution in mol L^{-1},
R = Gas constant
T = Temperature in Kelvin

11. Molecular mass from osmotic pressure:

$\pi = \frac{W_2RT}{M_2V}$ OR $M_2 = \frac{W_2RT}{\pi V}$

where, π = Osmotic pressure,
R = Gas constant
(0.08205 atm dm^{-3} K^{-1} mol^{-1}),
M_2 = Molecular mass of solute,
W_2= Mass of solute,
T = Temperature in Kelvin,
n = number of moles of solute,
V = volume in dm^3

12. van't Hoff factor (i):

$$i = \frac{\text{Colligative property of electrolyte solution}}{\text{Colligative property of nonelectrolyte solution of the same concentration}}$$

$$= \frac{\text{Actual moles of particles in solution after dissociation}}{\text{Moles of formula units dissolved in solution}}$$

$$= \frac{\text{Formula mass of substance}}{\text{Observed molar mass of substance}}$$

$$= \frac{M_{Theoretical}}{M_{Observed}}$$

13. Modified equations for colligative properties by inclusion of van't Hoff factor:

i. $\Delta P = i\ P_1^0 x_2 = i\frac{W_2M_1}{M_2W_1}$

ii. $\Delta T_b = iK_b m = i\frac{1000K_bW_2}{M_2W_1}$

iii. $\Delta T_f = iK_f m = i\frac{1000K_fW_2}{M_2W_1}$

iv. $\pi = iMRT = i\frac{W_2RT}{M_2V}$

14. Degree of dissociation (α):

$\alpha = \frac{i-1}{n-1}$

where, α = Degree of dissociation,
i = van't Hoff factor,
n = Moles of ions obtained from dissociation of 1 mole of electrolyte

Classical Thinking

2.1 Introduction

1. True solutions contain solute particles with diameters in the range of _____ nm.
(A) 0.1 to 2 (B) 1 to 20
(C) 10 to 200 (D) 100 to 2000

2. In a solution, the larger proportion of the component is known as _____.
(A) solution (B) solute
(C) solvent (D) mixed solution

2.2 Types of solutions

3. Depending on the physical states of solvents and solutes, there are _____ types of solutions.
(A) five (B) seven
(C) nine (D) twelve

4. Sugar dissolved in water is a _____ type of solution.
(A) solid in solid (B) solid in gas
(C) solid in liquid (D) gas in solid

5. An alloy is a homogeneous mixture of _____ type of solution.
(A) solid in solid (B) solid in gas
(C) solid in liquid (D) gas in solid

6. An example for solid in solid solution is _____.
(A) bronze (B) iodine in air
(C) H_2 in palladium (D) gasoline

2.3 Capacity of solutions to dissolve solute

7. If we continue the addition of solute in a given amount of solvent, the dissolution stops after some time. The solution at this point is said to be _____.
(A) supersaturated (B) saturated
(C) unsaturated (D) none of these

2.4 Solubility

8. Solubility is expressed in the concentration unit(s) of _____.
(A) mol L^{-1} (B) mol g^{-1}
(C) mole fraction (D) mol kg^{-1}

9. Solubility of which of the following changes only slightly with temperature?
(A) NaBr (B) KNO_3
(C) KBr (D) $NaNO_3$

10. The solubility of a gas in water increases with _____.
(A) increase in temperature
(B) reduction in gas pressure
(C) decrease in temperature
(D) amount of liquid taken

11. Henry's law constant is expressed in the unit(s) of _____.
(A) $mol^{-1}\ L^{-1}\ bar^{-1}$
(B) $mol\ L^{-1}\ bar$
(C) $L\ mol^{-1}\ bar^{-1}$
(D) $mol\ L^{-1}\ bar^{-1}$

2.5 Vapour pressure of solutions of liquids in liquids

12. Partial vapour pressure of any volatile component in a solution is _____.
(A) directly proportional to its mole fraction in the solution
(B) inversely proportional to its mole fraction in the solution
(C) inversely proportional to the mole fraction of the solvent
(D) directly proportional to its molarity

13. An ideal solution is that which _____ over the entire range of concentration.
(A) shows positive deviation from Raoult's law
(B) shows negative deviation from Raoult's law
(C) obeys Raoult's law
(D) Both (A) and (B)

14. Which of the following behaves as an ideal solution?
(A) Ethanol + acetone
(B) Carbon disulphide + acetone
(C) Benzene + toluene
(D) Chloroform + acetone

15. Which of the following shows negative deviation from Raoult's law?
(A) Benzene + toluene
(B) Phenol + aniline
(C) Ethanol + acetone
(D) Carbon disulphide + acetone

2.6 Colligative properties of nonelectrolyte solutions

16. Which of the following is a colligative property?
(A) Melting point of a substance
(B) Surface tension of a solution
(C) Boiling point elevation
(D) Radioactivity of a substance

17. While dealing with colligative properties of nonelectrolyte solutions, the relatively dilute solutions with concentrations _____ or less are considered.
(A) 0.2 M (B) 1 M
(C) 2 M (D) 0.5 M

2.7 Vapour pressure lowering

18. Vapour pressure of the solution, of a non-volatile solute is always _____.
(A) equal to the vapour pressure of pure solvent
(B) higher than vapour pressure of pure solvent
(C) lower than vapour pressure of pure solvent
(D) constant

19. The lowering of vapour pressure of solvent by the addition of a non-volatile solute to it, is equal to _____.
(A) the product of vapour pressure of pure solvent and mole fraction of the non-volatile solute
(B) the product of vapour pressure of pure solvent and mole fraction of the pure solvent
(C) the sum of vapour pressure of pure solvent and mole fraction of the non-volatile solute
(D) the sum of vapour pressure of pure solvent and mole fraction of the pure solvent

20. At 30 K, when a solute is added to a solvent, its vapour pressure over mercury reduces from mm to 45 mm. The value of mole fraction of solute will be _____.
(A) 0.005 (B) 0.01
(C) 0.1 (D) 0.9

21. The mathematical expression for relative lowering of vapour pressure is _____.
(A) $\frac{P_1^0 - P_1}{P_1^0} = \frac{W_2 M_1}{W_1 M_2}$ (B) $\frac{P_1 - P_1^0}{P_1} = \frac{W_2 M_1}{W_1 M_2}$
(C) $\frac{P_1 - P_1^0}{P_1^0} = \frac{W_2 M_1}{W_1 M_2}$ (D) $\frac{P_1^0 - P_1}{P_1^0} = \frac{W_1 M_1}{W_2 M_2}$

2.8 Boiling point elevation

22. Boiling point of water is defined as the temperature at which _____.
(A) vapour pressure of water equals to that of atmospheric pressure
(B) bubbles are formed
(C) steam comes out
(D) vapour pressure of water is higher than that of atmospheric pressure

23. Which of the following statement is CORRECT for the boiling point of solvent, containing a dissolved solid substance?
(A) Boiling point of the liquid is lowered.
(B) Boiling point of the liquid is elevated.
(C) There is no effect on the boiling point.
(D) Boiling point of the liquid becomes equal to the boiling point of water.

24. The boiling point of a solution of a non-volatile solute is always _____.
(A) lower than the boiling point of the solvent
(B) higher than the boiling point of the solvent
(C) equal to the boiling point of the solvent
(D) independent of the boiling point of the solvent

25. The molal elevation constant is the ratio of the elevation of boiling point to _____.
(A) molarity of the solution
(B) molality of the solution
(C) mole fraction of the solute
(D) mole fraction of the solvent

26. Unit of boiling point elevation constant (K_b) is _____.
(A) $kg\ mol^{-1}$ (B) $K\ mol^{-1}$
(C) $g\ mol^{-1}$ (D) $K\ kg\ mol^{-1}$

27. The boiling point of 0.15 molal aqueous solution of an unknown solute is 373.23 K at 1 atm. The molal elevation constant of water is _____ $K\ kg\ mol^{-1}$.
(A) 0.53 (B) 0.88 (C) 1.8 (D) 5.3

28. K_b is given by _____.
(A) $\frac{\Delta T_b \times W_2 \times M_2}{1000 \times W_1}$ (B) $\frac{W_2 \times 1000}{\Delta T_b \times W_1 \times M_2}$
(C) $\frac{\Delta T_b \times W_1 \times M_2}{1000 \times W_2}$ (D) $\frac{W_1 \times 1000}{\Delta T_b \times W_2 \times M_2}$

2.9 Depression in freezing point

29. The temperature at which the vapour pressure of a solid is equal to the vapour pressure of liquid is called _____.
(A) elevation of boiling point
(B) freezing point
(C) boiling point
(D) depression of freezing point

30. Solute when dissolved in water _____.
(A) increases the vapour pressure of water
(B) decreases the boiling point of water
(C) decreases the freezing point of water
(D) increases the freezing point of water

31. Depression in freezing point in any dilute solution containing a non-volatile solute is directly proportional to _____.
(A) molarity of the solution
(B) molality of the solution
(C) mass of solvent
(D) mole fraction of solvent

32. Relationship between K_f, m and ΔT_f can be written as _____.
(A) $\Delta T_f = K_f / m$ (B) $\Delta T_f = K_f m$
(C) $\Delta T_f = K_f + m$ (D) $\Delta T_f = m / K_f$

33. What is the molality of solution of a certain solute in a solvent, if there is a freezing point depression of 0.184 °C, and if the freezing point depression constant is 18.4 K $kg\ mol^{-1}$?
(A) 0.01 m (B) 1 m
(C) 0.001 m (D) 100 m

34. The molar mass of the solute using depression of freezing point may be calculated using the formula, _____.
(A) $M_2 = \frac{K_f W_2 1000}{\Delta T_f m}$ (B) $M_2 = \frac{K_f W_1 1000}{\Delta T_f W_2}$
(C) $M_2 = \frac{\Delta T_f W_2 1000}{K_f W_1}$ (D) $M_2 = \frac{K_f W_2 1000}{\Delta T_f W_1}$

2.10 Osmotic pressure

35. A membrane which allows solvent molecules but NOT the solute molecules to pass through it is called as _____.
(A) semipermeable membrane
(B) permeable membrane
(C) filter membrane
(D) porous membrane

36. During osmosis, flow of water through a semipermeable membrane is _____.
(A) unidirectional (B) bidirectional
(C) multidirectional (D) unpredictable

37. Osmosis is a process in which _____.
(A) solvent molecules flow through a semi-permeable membrane from a solution of lower concentration to a solution of higher concentration
(B) solute molecules flow through a semi-permeable membrane from a solution of lower concentration to a solution of higher concentration
(C) solvent molecules flow through a semi-permeable membrane from a solution of higher concentration to a solution of lower concentration
(D) solute molecules flow through a semi-permeable membrane from a solution of higher concentration to a solution of lower concentration

38. A solution having a higher osmotic pressure than another solution is called a _____.
(A) hypotonic solution
(B) isotopic solution
(C) isotonic solution
(D) hypertonic solution

39. If two solutions separated by a semipermeable membrane have the same osmotic pressure, they are called _____ solutions.
(A) hypertonic (B) hypotonic
(C) isotonic (D) saturated

40. At constant temperature, 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 root of the concentration

41. If mole fraction of the solvent in a solution decreases, then _____.
(A) vapour pressure of solution increases
(B) boiling point decreases
(C) osmotic pressure increases
(D) osmotic pressure decreases

42. Which statement is INCORRECT about osmotic pressure (π), volume (V) and temperature (T)?
(A) $\pi \propto 1/V$ if T is constant.
(B) $\pi \propto T$ if V and n are constant.
(C) $\pi \propto V$ if T is constant.
(D) πV is constant if T and n are constant.

43. 1 M and 2 M solutions of glucose are prepared in water. Hence, _____.
(A) the osmotic pressure of both the solutions will be the same at the same temperature
(B) 2 M solution will have higher osmotic pressure
(C) 1 M solution will have higher osmotic pressure
(D) osmotic pressure will be independent of the concentration

44. The molar mass (M_2) of W_2 g solute and the osmotic pressure (π) of the solution prepared in V litres by the solute at temperature T has the following relationship _____.
(A) $M_2 = \frac{W_2RT}{V}$ (B) $M_2 = \frac{W_2R}{\pi T}$
(C) $M_2 = mRT$ (D) $M_2RT = \pi$

The direction of osmosis can be reversed by applying _____ pressure larger than the _____ pressure.
(A) absolute (B) atmospheric
(C) osmotic (D) vapour

2.11 Colligative properties of electrolytes

46. The van't Hoff factor will be highest for _____.
(A) sodium chloride
(B) magnesium chloride
(C) sodium phosphate
(D) urea

47. Which of the following has the highest boiling point?
(A) 1 m glucose solution
(B) 1 m CH_3COOH solution
(C) 1 m Na_2SO_4 solution
(D) 1 m urea solution

48. van't Hoff factor is _____.
(A) less than one in case of dissociation
(B) always more than one
(C) always less than one
(D) greater than one in case of dissociation

49. Which of the following is NOT the correct modified equation of colligative properties for electrolyte solutions?
(A) $\Delta P = i\frac{W_2M_1}{M_2V}$ (B) $\Delta T_b = iK_bm$
(C) $\Delta T_f = \frac{1000K_fW_2}{M_2W_1}$ (D) $\pi = i\frac{M_2RT}{W_2V}$

Miscellaneous

50. 5 cm^3 of methyl alcohol is added to 100 cm^3 of water, then the vapour pressure of the solution _____.
(A) will be equal to the vapour pressure of pure water
(B) will be less than the vapour pressure of pure water
(C) will be greater than the vapour pressure of pure water
(D) will be very large

51. Select the CORRECT option for a solution containing non-volatile solute in it.
(A) $T_f^0 < T_f$ (B) $T_b^0 < T_b$
(C) $\Delta P = P_1^0 x_1$ (D) $\Delta T_f = T_f - T_f^0$

52. When swimming for a long time in salt water, the skin of one's fingertips wrinkles. Which one of the following properties is responsible for this observation?
(A) Osmosis (B) Dialysis
(C) Electrodialysis (D) Coagulation

53. When a substance is dissolved in a solvent, the vapour pressure of the solvent is decreased. This results in _____.
(A) an increase in the boiling point of the solution
(B) a decrease in the boiling point of the solution
(C) no change in the boiling point of the solution
(D) an initial decrease in the boiling point followed by a sharp increase in the boiling point of the solution

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To see complete chapter buy **Target Notes** or **Target E-Notes**

72. On dissolving 3.24 g of sulfur in 40 g of benzene, boiling point of solution was higher than that of benzene by 0.81 K. K_b value of benzene is 2.53 K kg mol^{-1}. Atomic mass of sulfur is 32 g mol^{-1}. The molecular formula of sulfur is _____.
(A) S_6 (B) S_7 (C) S_8 (D) S_9

73. 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 is increased
(C) the higher pressure inside the cooker crushes the food material
(D) cooking involves chemical changes helped by a rise in temperature

Competitive Thinking

2.4 Solubility

1. The relation between solubility of a gas in liquid at constant temperature and external pressure is stated by which law? **[MHT CET 2016]**
(A) Raoult's law
(B) van't Hoff Boyle's law
(C) van't Hoff Charles' law
(D) Henry's law

2.5 Vapour pressure of solutions of liquids in liquids

2. The vapour pressures of pure liquids A and B are 400 and 600 mm Hg, respectively at 298 K. On mixing the two liquids the sum of their initial volumes is equal to the volume of the final mixture. The mole fraction of liquid B is 0.5 in the mixture. The vapour pressure of the final solution, the mole fractions of components A and B in vapour phase, respectively are _____. **[JEE (Main) 2019]**
(A) 500 mm Hg, 0.5, 0.5
(B) 480 mm Hg, 0.4, 0.6
(C) 500 mm Hg, 0.5, 0.5
(D) 500 mm Hg, 0.4, 0.6

3. The mole fractions of benzene and toluene vapours in equilibrium with the ideal solution of benzene in toluene at 300 K are 0.61 and 0.39 respectively. The total vapour pressure of the solution is 41 mm Hg. If the vapour pressures of pure benzene and toluene at 300 K are 50 and 32 mm Hg respectively, the mole fractions of benzene and toluene in solution respectively are _____. **[AP EAMCET (Med.) 2019]**
(A) 0.25, 0.75 (B) 0.75, 0.25
(C) 0.30, 0.70 (D) 0.50, 0.50

4. The vapour pressures of pure heptane and pure octane are 92 and 31 torr, respectively at 40 °C. The total vapour pressure (in torr) of a solution containing 1.00 mole of heptane and 4.00 moles of octane is _____. **[TS EAMCET (Med.) 2019]**
(A) 18.4 (B) 24.8
(C) 43.2 (D) 51.2

5. Which of the following statements is CORRECT regarding a solution of two components A and B exhibiting positive deviation from ideal behaviour? **[NEET (Odisha) 2019]**
(A) Intermolecular attractive forces between A–A and B–B are equal to those between A–B.
(B) Intermolecular attractive forces between A–A and B–B are stronger than those between A–B.
(C) $\Delta_{mix}H = 0$ at constant T and P.
(D) $\Delta_{mix}V = 0$ at constant T and P.

2.7 Vapour pressure lowering

6. 9 g of glucose (mol wt = 180) is dissolved in 90 g of H_2O. Relative lowering of vapour pressure is _____. **[MH CET 2011]**
(A) 0.99 (B) 0.099
(C) 0.0099 (D) 0.00099

7. Relative lowering of vapour pressure of a dilute solution of glucose dissolved in 1 kg of water is 0.002.
The molality of the solution is _____. **[KCET 2019]**
(A) 0.111 (B) 0.021
(C) 0.004 (D) 0.222

8. On dissolving 18 g solid in 100 g H_2O at 20 °C, water vapour pressure decreases from 17.53 mm to 17.22 mm. The molecular weight of solid is _____. **[BCECE 2014]**
(A) 18 g mol^{-1} (B) 183 g mol^{-1}
(C) 27 g mol^{-1} (D) 274 g mol^{-1}

9. The vapour pressure of acetone at 20 °C is 185 torr. When 1.2 g of a non-volatile substance was dissolved in 100 g of acetone at 20 °C, its vapour pressure was 183 torr. The molar mass (g mol^{-1}) of the substance is _____. **[JEE (Main) 2015]**
(A) 32 (B) 64
(C) 128 (D) 488

10. Vapour pressure of pure solvent and its solution at certain temperature are 660 mm and 600 mm of Hg respectively. If 3.6×10^{-3} kg of solute is added into 40×10^{-3} kg of solvent, what is the molar mass of solute?
(solvent = Benzene, C = 12, H = 1)
[MH CET 2013]
(A) 78.0 g mol^{-1} (B) 58.5 g mol^{-1}
(C) 72.0 g mol^{-1} (D) 156 g mol^{-1}

11. The vapour pressure of a solution of 6.0 g of non-volatile solute in 390 g of benzene at 298 K is 3.00 kPa. If 78 g of benzene is added to this solution the vapour pressure becomes 3.02 kPa at the same temperature. The molar mass of solute in g mol^{-1} is _____.
[AP EAMCET (Med.) 2019]
(A) 60.8 (B) 50.4
(C) 31.2 (D) 21.2

12. 18 g glucose ($C_6H_{12}O_6$) is added to 178.2 g water. The vapour pressure of water (in torr) for this aqueous solution is _____.
[JEE (Main) 2016]
(A) 7.6 (B) 76.0
(C) 752.4 (D) 759.0

2.8 Boiling point elevation

13. An aqueous dilute solution containing non-volatile solute boils at 100.052 °C. What is the molality of solution? (K_b = 0.52 kg [illegible]
Boiling temperature of water = 100 °C
[TS EAMCET (Engg.) 2015]
(A) 0.1 m (B) 0.[illegible] m
(C) 0.001 m (D) 1.0 m

14. The CORRECT relation between elevation of boiling point and molar mass of solute is_____. **[MH CET 2018]**
(A) $M_2 = \frac{K_b \cdot W_2}{\Delta T_b}$ (B) $M_2 = \frac{K_b \cdot W_1}{\Delta T_b \cdot W_2}$
(C) $M_2 = \frac{\Delta T_b \cdot K_b}{W_1 \cdot W_2}$ (D) $M_2 = \frac{\Delta T_b \cdot W_1}{K_b \cdot W_2}$

15. If the elevation in boiling point of a solution of 5 g of solute (molar mass = 100) in 500 g of water is ΔT_b. The ebullioscopic constant K_b of water is equal to _____. **[MHT CET 2019]**
(A) 100 ΔT_b (B) $\frac{\Delta T_b}{50}$
(C) 10 ΔT_b (D) ΔT_b

2.9 Depression in freezing point

16. If molality of the dilute solution is doubled, the value of molal depression constant (K_f) will be _____. **[NEET (UG) 2017]**
(A) halved (B) tripled
(C) unchanged (D) doubled

17. Find the K_f if 6 g of urea is dissolved in 0.1 dm^3 of water and it corresponds to 0.15 °C in ΔT_f. (Molecular weight of urea = 60 g mol^{-1})
[MH CET 2010]
(A) 0.015 (B) 0.15
(C) 0.30 (D) 0.030

18. After adding non-volatile solute, freezing point of water decreases to –0.186 °C.
Calculate ΔT_b if K_f = 1.86 K kg [illegible] and K_b = 0.521 K kg mol^{-1}. **[KCET 2015]**
(A) 0.521 K (B) 0.0521 K
(C) 1.86 K (D) 0.0[illegible]5 K

19. 6 g of a mixture of naphthalene ($C_{10}H_8$) and anthracene ($C_{14}H_{10}$) is dissolved in 500 g of benzene. If the depression in freezing point is 0.70 K, the composition of naphthalene and anthracene in the mixture respectively in g are _____.
(molal depression constant of benzene is 5.1 K kg [illegible] **[AP EAMCET (Engg.) 2019]**
(A) 2.60, 3.4[illegible] (B) 3.40, 2.60
(C) 2.[illegible]0, 2.[illegible]0 (D) 3.10, 2.90

2.10 Osmotic pressure

20. 0.06 % (W/V) aqueous solution of urea is isotonic with _____. **[KCET 2015]**
(A) 0.06 % (W/V) glucose solution
(B) 0.6 % (W/V) glucose solution
(C) 0.01 M glucose solution
(D) 0.1 M glucose solution

21. If M, W and V represent molar mass of solute, mass of solute and volume of solution in litres respectively, which among following equations is TRUE? **[MH CET 2015]**
(A) $\pi = \frac{MWR}{TV}$ (B) $\pi = \frac{TMR}{WV}$
(C) $\pi = \frac{TWR}{VM}$ (D) $\pi = \frac{TRV}{WM}$

22. The osmotic pressure of solution containing 34.2 g of cane sugar (molar mass = 342 g mol^{-1}) in 1 L of solution at 20 °C is _____.
(Given: R = 0.082 L atm K^{-1} mol^{-1})
[MHT CET 2017]
(A) 2.40 atm (B) 3.6 atm
(C) 24 atm (D) 0.0024 atm

23. The osmotic pressure of solution at 0 °C is 4 atm. What will be the osmotic pressure at 546 K under similar condition?
[MHT CET 2019]
(A) 2 atm (B) 8 atm
(C) 4 atm (D) 0.5 atm

24. 30×10^{-4} kg of urea dissolved in water to make 500 mL aqueous solution and this solution is isotonic with cane-sugar solution. How much mass of cane sugar in its one litre solution? (H = 1, N = 14, O = 16, C = 12) **[MH CET 2013]**
(A) 17.1 g (B) 171.0 g
(C) 3.42 g (D) 34.2 g

25. Pure water can be obtained from sea water by _____. **[BCECE 2015]**
(A) centrifugation (B) plasmolysis
(C) reverse osmosis (D) sedimentation

2.11 Colligative properties of electrolytes

26. Of the following 0.10 m aqueous solutions, which one will exhibit the largest freezing point depression? **[AIPMT 2014]**
(A) KCl (B) $C_6H_{12}O_6$
(C) $Al_2(SO_4)_3$ (D) K_2SO_4

27. Identify the compound amongst the following of which 0.1 M aqueous solution has highest boiling point. **[MHT CET 2016]**
(A) Glucose (B) Sodium chloride
(C) Calcium chloride (D) Ferric chloride

28. The van't Hoff factor (i) for a dilute aqueous solution of the strong electrolyte barium hydroxide is _____. **[NEET P-II 2016]**
(A) 3 (B) 0 (C) 1 (D)

29. For which among the following equimolar aqueous solutions, van't Hoff factor has the lowest value? **[MHT CET 2017]**
(A) Aluminium chloride
(B) Potassium sulphate
(C) Ammonium chloride
(D) Urea

30. Which one of the following electrolytes has the same value of van't Hoff's factor (i) as that of $Al_2(SO_4)_3$ (all are 100% ionised)? **[AIPMT 2015]**
(A) K_2S (B) $K_3[Fe(CN)_6]$
(C) $Al(NO_3)_3$ (D) $K_4[Fe(CN)_6]$

31. van't Hoff factor for aqueous monofluoroacetic acid is _____. **[MH CET 2013]**
(A) $i = 1 + 2\alpha$ (B) $i = 1 - 2\alpha$
(C) $i = 1 + \alpha$ (D) $i = 1 - \alpha$

32. vant Hoff's factor for 0.1 m $Ba(NO_3)_2$ solution is 2.74. The percentage dissociation of it is _____. **[MHT CET 2019; Similar in Assam CEE 2015]**
(A) 90% (B) 100%
(C) 87% (D) 75%

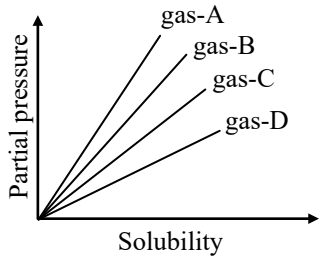
33. van't Hoff factor of centimolal solution of $K_3[Fe(CN)_6]$ is 3.333. Calculate the percent dissociation of $K_3[Fe(CN)_6]$. **[MH CET 2015]**
(A) 33.33 (B) 0.78
(C) 78 (D) 23.33

Miscellaneous

34. In water saturated air, the mole fraction of water vapour is 0.02. If the total pressure of the saturated air is 1.2 atm, the partial pressure of dry air is _____. **[NEET (Odisha) 2019]**
(A) 0.98 atm (B) 1.18 atm
(C) 1.76 atm (D) 1.176 atm

35. For an ideal solution, the CORRECT option is _____. **[NEET (UG) 2019]**
(A) $\Delta_{mix}V < 0$ at constant T and P
(B) $\Delta_{mix}H = 0$ at constant T and P
(C) $\Delta_{mix}G = 0$ at constant T and P
(D) $\Delta_{mix}S = 0$ at constant T and P

36. From the given graph at constant temperature, which gas has the least solubility? **[GUJ CET 2014]**



(A) Gas - D (B) Gas - B
(C) Gas - A (D) Gas – C

37. A non-volatile solute, 'A' tetramerises in water to the extent of 80%. 2.5 g of 'A' in 100 g of water, lowers the freezing point by 0.3 °C. The molar mass of A in g mol^{-1} is _____.
(K_f for water = 1.86 K kg mol^{-1}) **[KCET 2019]**
(A) 155 (B) 354
(C) 62 (D) 221

38. To observe an elevation of boiling point of 0.05 °C, the amount of solute (Mol. Wt. = 100) to be added to 100 g of water ($K_b = 0.5$) is _____. **[WB JEEM 2014]**
(A) 2 g (B) 0.5 g
(C) 1 g (D) 0.75 g

39. The freezing point of benzene decreases by 0.45 °C when 0.2 g of acetic acid is added to 20 g of benzene. If acetic acid associates to form a dimer in benzene, percentage association of acetic acid in benzene will be _____.
(K_f for benzene = 5.12 K kg/mol)
[JEE (Main) 2017]
(A) 61.2 % (B) 75.6 %
(C) 82.7 % (D) 94.6 %

40. At 100 °C, the vapour pressure of a solution of 6.5 g of a solute in 100 g water is 732 mm. If K_b = 0.52, the boiling point of this solution will be _____. **[NEET P-I 2016]**
(A) 102 °C (B) 103 °C
(C) 101 °C (D) 100 °C

41. The freezing point of solution containing 10 mL of non-volatile and non-electrolyte liquid "A" in 500 g of water is –0.413 °C. If K_f of water is 1.86 K kg mol^{-1} and the molecular weight of A = 60 g mol^{-1}, what is the density of the solution in g mL^{-1}? (Assume $\Delta_{mix}V = 0$)
[TS EAMCET (Engg.) 2019]
(A) 1.13 (B) 1.3
(C) 0.90 (D) 0.993

Why salt is applied on leeches?

When leeches are stuck to any body part, the easiest way to get rid of them is to apply salt on them. It involves simple phenomenon of osmosis resulting in the drying up of the organism when enough salt is applied. Some worms or pests like the slug, leech have no protective barrier between the cell walls and the outside world. On application of salt on their body, the high concentration of the salt on the outside of the organism initiates the process of osmosis wherein water from cells of organism moves out of its body and the organism dries up.

Answer Key

Classical Thinking

1.	(A)	2.	(C)	3.	(C)	4.	(C)	5.	(A)	6.	(A)	7.	(B)	8.	(A)	9.	(A)	10.	(C)
11.	(D)	12.	(A)	13.	(C)	14.	(C)	15.	(B)	16.	(C)	17.	(A)	18.	(C)	19.	(A)	20.	(C)
21.	(A)	22.	(A)	23.	(B)	24.	(D)	25.	(B)	26.	(D)	27.	(A)	28.	(C)	29.	(B)	30.	(C)
31.	(B)	32.	(B)	33.	(A)	34.	(D)	35.	(A)	36.	(A)	37.	(A)	38.	(D)	39.	(C)	40.	(A)
41.	(C)	42.	(C)	43.	(B)	44.	(C)	45.	(C)	46.	(C)	47.	(C)	48.	(D)	49.	(D)	50.	(C)
51.	(B)	52.	(A)	53.	(A)	54.	(C)	55.	(A)										

Critical Thinking

1.	(C)	2.	(C)	3.	(B)	4.	(D)	5.	(A)	6.	(C)	7.	(B)	8.	(D)	9.	(B)	10.	(C)
11.	(B)	12.	(C)	13.	(C)	14.	(C)	15.	(C)	16.	(D)	17.	(A)	18.	(A)	19.	(D)	20.	(C)
21.	(A)	22.	(B)	23.	(A)	24.	(A)	25.	(A)	26.	(A)	27.	(A)	28.	(C)	29.	(C)	30.	(B)
31.	(A)	32.	(C)	33.	(C)	34.	(C)	35.	(B)	36.	(B)	37.	(B)	38.	(D)	39.	(C)	40.	(B)
41.	(C)	42.	(A)	43.	(C)	44.	(B)	45.	(B)	46.	(D)	47.	(D)	48.	(D)	49.	(A)	50.	(A)
51.	(D)	52.	(B)	53.	(A)	54.	(B)	55.	(D)	56.	(C)	57.	(B)	58.	(B)	59.	(A)	60.	(C)
61.	(B)	62.	(B)	63.	(C)	64.	(A)	65.	(D)	66.	(D)	67.	(C)	68.	(D)	69.	(A)	70.	(C)
71.	(D)	72.	(C)	73.	(B)														

Competitive Thinking

1.	(D)	2.	(D)	3.	(D)	4.	(C)	5.	(B)	6.	(C)	7.	(A)	8.	(B)	9.	(B)	10.	(A)
11.	(C)	12.	(C)	13.	(A)	14.	(A)	15.	(D)	16.	(C)	17.	(B)	18.	(B)	19.	(B)	20.	(C)
21.	(C)	22.	(A)	23.	(B)	24.	(D)	25.	(C)	26.	(C)	27.	(D)	28.	(A)	29.	(D)	30.	(D)
31.	(C)	32.	(C)	33.	(C)	34.	(D)	35.	(B)	36.	(C)	37.	(C)	38.	(C)	39.	(D)	40.	(C)
41.	(D)																		

Evaluation Test

1. Calculate van't Hoff factor for a 0.2 m aqueous solution of KCl which freezes at – 0.680 °C. [K_f = 1.86 K kg mol^{-1}]
   (A) 1.50 (B) 1.65
   (C) 1.83 (D) 2.00

2. Which of the following solutions exhibits positive deviation from Raoult's law?
   (A) Chloroform + Acetone
   (B) Ethanol + Acetone
   (C) Aniline + Phenol
   (D) Benzene + Toluene

3. A solution containing 3.56 g of a polymer in 1 litre of a solvent was found to have an osmotic pressure of 5.2×10^{-4} atmosphere at 300 K. The molecular mass of the polymer is _____.
   (R = 0.082 L atm mol^{-1} K^{-1})
   (A) 1.68×10^3 g mol^{-1}
   (B) 1.68×10^2 g mol^{-1}
   (C) 1.68 g mol^{-1}
   (D) 1.68×10^5 g mol^{-1}

4. Identify the compound amongst the following of which 0.05 m aqueous solution has highest boiling point.
   (A) Urea
   (B) Potassium chloride
   (C) Sodium sulphate
   (D) Silver nitrate

5. For sodium chloride dissolved in water, the van't Hoff factor (i) accounts for the extent of _____ of the solute.
   (A) solubility (B) [illegible]bility
   (C) dissociation (D) mole fraction

6. The vapour pressure of pure benzene at 25 °C is 180 [illegible] Hg. The vapour pressure lowering caused by the addition of 25 g of a solute (molar mass = 342) to 250 g of benzene is _____.
   (A) 1.4 mm Hg (B) 2.6 mm Hg
   (C) 4.1 mm Hg (D) 3.2 mm Hg

7. 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 π = 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 in the solution.
   (D) Two sucrose solutions of same molality prepared in different solvents will have the same freezing point depression.

8. At 300 K, vapour pressure of substance A is 0.95 atm and vapour pressure of substance B is 0.15 atm. A solution of A and B is prepared and allowed to equilibrate with its vapour. The vapour is found to have equal number of A and B. What is the mole fraction of A in the original solution?
   (A) 0.18 (B) 0.14
   (C) 0.23 (D) 0.34

9. Henry's law is applicable at _____.
   (A) constant concentration
   (B) constant pressure
   (C) constant volume
   (D) constant temperature

10. Colligative properties are used for the determination of _____.
    (A) molar mass
    (B) equivalent weight
    (C) arrangement of molecules
    (D) melting point and boiling point

11. A solution contains 0.524 g of camphor (molar mass = 152 g/mol dissolved in 36.8 g of ether (boiling point = 34.6 °C). The molal elevation constant of ether is 1.94 K kg mol^{-1}. The boiling point of the solution is _____.
    (A) 317.68 K (B) 307.78 K
    (C) 307.6 K (D) 317.6 K

12. 0.1 m solution each of glucose, sodium chloride, sodium sulphate and sodium phosphate are taken; the ratio of depression in freezing point is _____.
    (A) 1 : 3 : 2 : 1 (B) 1 : 2 : 3 : 4
    (C) 4 : 3 : 2 : 1 (D) 1 : 1 : 2 : 4

13. 18 g of glucose is dissolved in 90 g of H_2O. Relative lowering of vapour pressure is _____. [Molar mass of glucose = 180]
    (A) 0.0196 (B) 0.180
    (C) 0.0990 (D) 0.510

14. The osmotic pressure of a solution at 276 K is 2.5 atm. Its osmotic pressure at 546 K under similar conditions will be _____.
    (A) 0.5 atm (B) 1.0 atm
    (C) 2.5 atm (D) 5.0 atm

15. Two elements X and Y form compounds having molecular formula XY_2 and XY_4. When dissolved in 20 g of benzene, 1 g of XY_2 lowers the freezing point by 2.3 K, whereas 1.0 g of XY_4 lowers it by 1.3 K. The molal depression constant for benzene is 5.1 K kg mol^{-1}. The atomic mass of X and Y is _____ respectively.
(A) 23.88, 40.31 (B) 25.59, 42.64
(C) 27.13, 44.83 (D) 29.28, 46.73

16. Identify the CORRECT statement.
(A) Osmosis is a colligative property.
(B) Boiling point of solvent is lower than that of solution.
(C) Osmotic pressure of solution is lower than that of solvent.
(D) Vapour pressure of solution is higher than that of pure solvent.

17. A solution of glucose containing 9.2 g/litre (molecular weight: 180 g/mol) is isotonic with 3% (W/V) solution of a non-volatile solute. The molecular weight of the solute will be _____.
(A) 267.2 g mol^{-1} (B) 587 g mol^{-1}
(C) 567 g mol^{-1} (D) 5.87 g mol^{-1}

18. If 10 g of a solute was dissolved in 250 mL of water and osmotic pressure of the solution was found to be 600 mm of Hg at 300 K, then molecular weight of the solute is _____ g mol^{-1}.
(A) $\frac{22800 \times R}{1.5}$ (B) $\frac{22800}{5}$
(C) $\frac{1.5 \times R}{22800}$ (D) $\frac{22800 \times R}{1.5}$

19. Henry's law constant for a gas CH_3Br is 0.159 mol dm^{-3} at $^{-1}$ at 5 °C. What is the solubility of CH_3Br in water at 25 °C and a partial pressure 0.164 at ?
(A) 0.015 M (B) 0.164 M
(C) 0.02 M (D) 0.042 M

20. The vapour pressure will be lowest for _____.
(A) 0.1 M sugar solution
(B) 0.1 M NaCl solution
(C) 0.1 M $Cu(NO_3)_2$ solution
(D) 0.1 M $AgNO_3$ solution

21. Cryoscopic constant is the freezing point depression when the concentration of solution is _____.
(A) 1 M (B) 1 m
(C) 1 ppm (D) 1% (W/V)

22. When an electrolyte is dissociated in solution, the van't Hoff factor (i) is _____.
(A) = 0 (B) = 1
(C) > 1 (D) < 1

23. Which of the following is an example of a solution of gas in liquid?
(A) Hydrogen in palladium
(B) Carbonated water
(C) Chloroform in nitrogen
(D) Gasoline

24. The CORRECT equation for osmotic pressure of dilute solution is given as _____.
(A) $\pi V = K$ (B) $\pi V = \frac{W_2}{M_2}$
(C) $\pi = \frac{W_2RT}{M_2}$ (D) $\pi V = M_2 T$

25. The mass of ascorbic acid ($C_6H_8O_6$) to be dissolved in 100 g acetic acid to lower its freezing point by 1.5 °C is _____.
(K_f of acetic acid 3.9 K kg mol^{-1})
(A) 0.015 (B) 3.6
(C) 0.30 (D) 0.66

Answers to Evaluation Test

1. (C) 2. (B) 3. (D) 4. (C)
5. (C) 6. (C) 7. (D) 8. (B)
9. (D) 10. (A) 11. (B) 12. (B)
13. (A) 14. (D) 15. (B) 16. (B)
17. (B) 18. (A) 19. (C) 20. (C)
21. (B) 22. (C) 23. (B) 24. (B)
25. (B)

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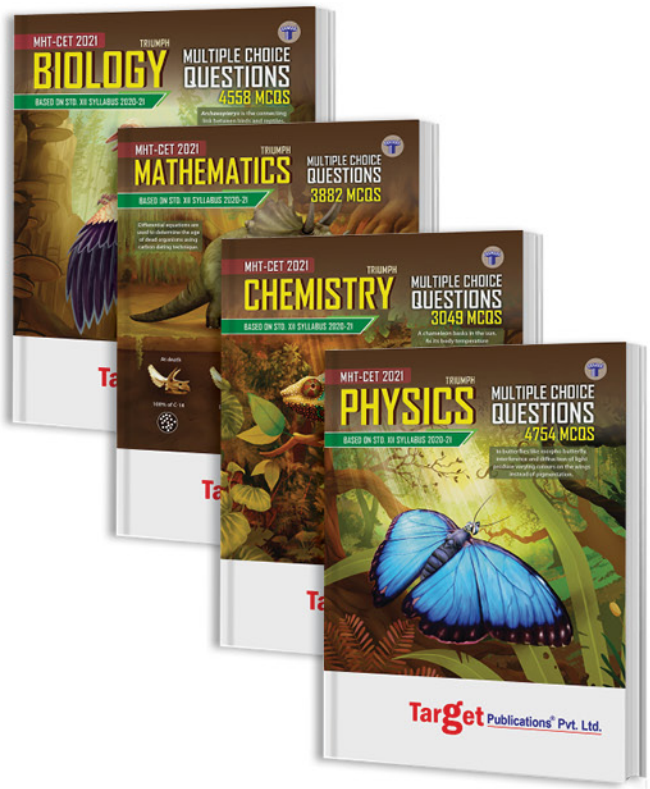

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