



INDIAN SCHOOL SOHAR
PRE-BOARD- 1 (2023-24)
CHEMISTRY THEORY (043)
SET-2

CLASS : XII
DATE : 07/01 /24

MAX. MARK : 70
TIME : 3Hours

General instructions:

1. There are **33** questions in this question paper with internal choice.
2. **SECTION A-** consists of **16** multiple-choice questions carrying **1** mark each.
3. **SECTION B-** consists of **5** short answer questions carrying **2** marks each.
4. **SECTION C-** consists of **7** short answer questions carrying **3** marks each.
5. **SECTION D-** consists of **2** case-based question carrying **4** marks.
6. **SECTION E-** consists of **3** long answer questions carrying **5** marks with internal choice.
7. **All questions are compulsory.**
8. **Use of log tables and calculators is not allowed**

SECTION- A

The following questions are multiple - choice questions with one correct answer. Each question carries **1** mark. There is no internal choice in this section.

- 1 **Thymine is held by two H-bonds with the base**
(a) guanine
(b) cytosine
(c) uracil
(d) adenine
- 2 **234.2 gm of sugar syrup contains 34.2 gm of sugar. What is the molal concentration of the solution.**
(a) 0.1
(b) 0.5
(c) 5.5
(d) 55
- 3 **Saturated solution of KNO_3 is used to make salt bridge because:**
(a) Velocity of K^+ ion is greater than that of NO_3^-
(b) Velocity of K^+ ion is lesser than that of NO_3^-
(c) Velocity of K^+ and NO_3^- ions are equal
(d) KNO_3 is highly soluble in water
- 4 **Radioactive disintegration is an example of:**
(a) zero order reaction
(b) first order reaction
(c) second order reaction
(d) third order reaction
- 5 **Cerium (Z=58) is an important member of lanthanoids. Which of the following statements about cerium is incorrect:**
(a) The common oxidation state of cerium are +3 and +4.
(b) The +3 oxidation state of cerium is more stable than +4 oxidation state.
(c) The +4 oxidation state of cerium is not known in solutions.
(d) Cerium(IV) acts as an oxidizing agent.
- 6 **The complex ion which has no d-electrons in the central metal atom is:**

- (a) $[\text{MnO}_4]^-$
 (b) $[\text{Co}(\text{NH}_3)_6]^{3-}$
 (c) $[\text{Fe}(\text{CN})_6]^{3-}$
 (d) $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$
- 7 **Ortho-nitrophenol is less soluble in water than p- and m-nitrophenols because:**
 (a) o-nitrophenol shows intramolecular H-bonding
 (b) o-nitrophenol shows intermolecular H-bonding
 (c) melting point of o-nitrophenol is lower than those of m- and p-nitrophenols
 (d) o-nitrophenols is more volatile in steam than those of m- and p-isomers
- 8 **Propanone can be prepared from ethyne by:**
 (a) passing a mixture of ethyne and steam over a catalyst, magnesium at 420°C
 (b) passing a mixture of ethyne and ethanol over a catalyst zinc chromite
 (c) boiling ethyne with water in the presence of HgSO_4 and H_2SO_4
 (d) treating ethyne with iodine and NaOH
- 9 **Acetamide and ethylamine can be distinguished by reacting with:**
 (a) Aq. HCl and heat
 (b) Aq. NaOH and heat
 (c) Acidified KMnO_4
 (d) Bromine water
- 10 **When glucose reacts with bromine water, the main product is:**
 (a) Gluconic acid
 (b) Glyceraldehyde
 (c) Saccharic acid
 (d) Acetic acid
- 11 **The formation of cyanohydrin from a ketone is an example of:**
 (a) electrophilic addition
 (b) nucleophilic addition
 (c) nucleophilic substitution
 (d) electrophilic substitution
- 12 **Which is the correct increasing order of boiling points of the following compounds?
 1-Iodobutane, 1-Bromobutane, 1-Chlorobutane, Butane**
 (a) Butane < 1-Chlorobutane < 1-Bromobutane < 1-Iodobutane
 (b) 1-Iodobutane < 1-Bromobutane < 1-Chlorobutane < Butane
 (c) Butane < 1-Iodobutane < 1-Bromobutane < 1-Chlorobutane
 (d) Butane < 1-Chlorobutane < 1-Iodobutane < 1-Bromobutane

In the following questions ,a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices:

- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation for the Assertion (A).
 (b) Both Assertion (A) and Reason (R) are true and Reason (R) is **not** the correct explanation for the Assertion (A).
 (c) Assertion (A) is true statement, but Reason (R) is False statement.
 (d) Assertion (A) is False statement, but Reason (R) is True statement
- 13 **Assertion :** Compounds containing $-\text{CHO}$ group are easily oxidized to corresponding carboxylic acids.
Reason: Carboxylic acids can be reduced to alcohols by treatment with LiAlH_4 .

- 14 **Assertion:** Actinoids form relatively less stable complexes as compared to lanthanoids.
Reason: Actinoids can utilize their 5f orbitals along with 6d orbitals in bonding but lanthanoids do not use their 4f orbital for bonding.
- 15 **Assertion :** If one component of a solution obeys Raoult's law over a certain range of composition, the other component will not obey Henry's law in that range.
Reason : Raoult's law is a special case of Henry's law
- 16 **Assertion :** KCl, NaCl and NH₄Cl cannot be used in the salt bridge of a cell containing silver.
Reason : A salt bridge contains concentrated solution of an inert electrolyte like KCl, KNO₃, K₂SO₄ or solidified solution of such an electrolyte in agar-agar and gelatine.

SECTION B

This section contains 5 questions with internal choice in one question. The following questions are short answer type and carry 2 marks each

- 17 (a) Which aqueous solution has higher concentration :
 1 molar or 1 molal solution of the same solute. Give reason.
 (b) Show graphically the depression in freezing point on adding a non volatile solute?
- 18 [NiCl₄]²⁻ is paramagnetic while [Ni(CO)₄] is diamagnetic though both are tetrahedral. Why?
- 19 Explain the mechanism of acid catalysed hydration of an alkene to form corresponding alcohol.
- 20 (a) Aniline does not undergo Friedel – Craft's reaction. Give reason
 (b) Arrange the following in increasing order of their acidic strength:
 Methylamine, dimethylamine, aniline, N-methylaniline

OR

- (a) Arrange the following in decreasing order of the pK_b values:
 C₂H₅NH₂, C₆H₅NHCH₃, (C₂H₅)₂NH and C₆H₅NH₂
 (b) Write short note on Gabriel phthalimide synthesis.
- 21 (a) What happens when :

$$\text{D-glucose} \xrightarrow{HI / \Delta}$$

 (b) Why can't we digest cellulose, even though both starch and cellulose are made up of glucose units?

SECTION C

This section contains 7 questions with internal choice in one question . The following questions are short answer type and carry 3 marks each.

- 22 (a) What happens when:
 (i) n-butyl chloride is treated with alcoholic KOH.
 (ii) Phenol is treated with conc. Nitric acid.
 (b) Chlorobenzene is less reactive towards nucleophilic substitution reaction. Why?
- 23 (a) A reaction is second order with respect to a reactant. How is the rate of reaction affected if the concentration of the reactant is
 (i) doubled
 (ii) reduced to half?
 (b) How does collision theory explain formation of products in a chemical reaction?

OR

- (a) A first order reaction takes 40 min for 30% decomposition. Calculate $t_{1/2}$.
- (b) The rate constant for the first order decomposition of N_2O_5 at $25^\circ C$ is $3 \times 10^{-2} \text{min}^{-1}$. If the initial concentration of N_2O_5 is $2 \times 10^{-3} \text{mol/L}$. How long will it take to drop the concentration to $5 \times 10^{-4} \text{mol/L}$? [$\text{Log } 4 = 0.6021$]
- 24 (a) Reaction of anisole with HI gives methyl iodide and phenol. Why?
- (b) A compound 'A' with molecular formula $C_4H_{10}O$ on oxidation forms compound 'B' gives positive iodoform test and on reaction with CH_3MgBr followed by hydrolysis gives (c). Identify A, B & C.
- 25 The time required for 10% completion of a first order reaction at 298 K is equal to that required for its 25% completion at 308 K. If the value of A is $4 \times 10^{10} \text{s}^{-1}$. Calculate k at 318 K and E_a . ($\text{Log } 3 = 0.4771$, $\text{Log } 4 = 0.6021$)
- 26 (a) Give one chemical test to distinguish between the following pairs of compounds write the chemical equation related to it.
Aniline and N-methylaniline.
- (b) Account for the following :
Methylamine in water reacts with ferric chloride to precipitate hydrated ferric oxide.
- 27 The cell in which the following reactions occurs:
 $2Fe_{(aq)}^{3+} + 2I_{(aq)}^- \rightarrow 2Fe_{(aq)}^{2+} + I_{2(s)}$ has $E_{cell}^\circ = 0.236V$ at 298 K. Calculate the standard Gibbs energy and the equilibrium constant of the cell reaction.
- 28 (a) Name a complex used as anticancer agent?
- (b) Name a complex used for determining hardness of water. Write its full name? What is its denticity?
- (c) Draw the structures of optical isomers of: $[Cr(C_2O_4)_3]^{3-}$

SECTION D

The following questions are case based questions. Each question has an internal choice and carries 4(1+1+2) marks each. Read the passage carefully and answer the questions that follow.

- 29 Read the given passages and answer the questions that follow.

The spontaneous flow of the solvent through a semipermeable membrane from a pure solvent to a solution or from a dilute solution to a concentrated solution is called osmosis. The phenomenon of osmosis can be demonstrated by taking two eggs of the same size. In an egg, the membrane below the shell and around the egg material is semi-permeable. The outer hard shell can be removed by putting the egg in dilute hydrochloric acid. After removing the hard shell, one egg is placed in distilled water and the other in a saturated salt solution. After some time, the egg placed in distilled water swells-up while the egg placed in salt solution shrinks. The external pressure applied to stop the osmosis is termed as osmotic pressure (a Colligative property). Reverse osmosis takes place when the applied external pressure becomes larger than the osmotic pressure.

- (a) What happen when red blood corpuscles are placed in 0.5% NaCl solution?
- (b) Name one SPM which can be used in the process of reverse osmosis.
- (c) What are isotonic solutions? Which one of the following will have higher osmotic pressure in 1 M KCl or 1 M urea solution?

OR

Carbon tetrachloride and water are immiscible whereas alcohol and water are miscible.

Explain on the basis of molecular structures of these compounds.

30 **Read the given passages and answer the questions that follow.**

Proteins are poly peptide chains made up of amino acids. There are 20 types of amino acids joined together by peptide bond between amino and carboxylic acid group. The amino acids are of two types-essential amino acids and non-essential amino acids. The primary structure of a protein is defined as the sequence of amino acids linked together to form a polypeptide chain. The first amino acid of sequence is called N-terminal amino acid and last amino acid of peptide chain is called C-terminal amino acid. The secondary structure of protein are α -helix, β -pleated sheet structure and collagen helix. The tertiary structure of proteins represents overall folding of the polypeptide chains i.e., further folding of the secondary structure. The spatial arrangement of these subunits with respect to each other is known as quaternary structure

- How do you explain the amphoteric behavior of amino acids?
- What do you understand by secondary structure of proteins?
- What is denaturation of proteins? Explain with examples.

OR

Differentiate between α - helical and β - pleated sheet structure.

SECTION E

The following questions are Long answer type and carry 5 marks each. All questions have an internal choice.

31 Attempt any **five** of the following:

- The molar conductivity of 0.025 mol L⁻¹ methanoic acid is 46.1 S cm²mol⁻¹. Calculate its degree of dissociation.
Given $\lambda^\circ \text{H}^+ = 349.6 \text{ cm}^2 \text{mol}^{-1}$ and $\lambda^\circ (\text{HCOO}^-) = 54.6 \text{ cm}^2 \text{mol}^{-1}$.
- Explain the electrochemical theory of rusting of iron .
- What is the effect of catalyst on:
 - Gibbs energy (ΔG) and
 - activation energy of a reaction?
- Write the Nernst equation and emf of the following cells at 298 K:
$$\text{Mg}_{(s)} / \text{Mg}^{2+} (0.001\text{M}) \parallel \text{Cu}^{2+} (0.0001\text{M})$$

 $E^\circ_{\text{Mg}^{2+}/\text{Mg}} = -2.36\text{V}$, $E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34\text{V}$
- Write the anode and cathode reactions and overall reaction occurring in a lead storage battery when current is drawn from it.
- The resistance of conductivity cell containing 0.001 M KCl solution at 298 K is 1500 Ω . What is the cell constant if the conductivity of 0.001 M KCl solution at 298 K is $0.146 \times 10^{-3} \text{ S cm}^{-1}$.
- The conductivity of metals decreases while that of electrolytes increases with increases in temperature. Why?

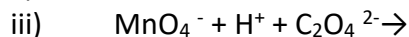
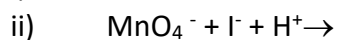
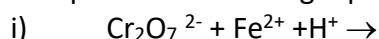
32 (a) Give reasons for :

- Transition metals have high melting points.
 - Second ionization is difficult from Cu and Cr whereas it is easy for Zn.
- Which is a stronger reducing agent Cr^{2+} or Fe^{2+} and why?
 - Actinoid contraction is greater from element to element than lanthanoid Contraction. Why?
 - Complete the following equation: $\text{Cr}_2\text{O}_7^{2-} + 8\text{H}^+ + 3 \text{NO}_2^- \rightarrow$

OR

- (a) How would you account for the following:
- Of the d^4 species, Cr^{2+} is strongly reducing while manganese(III) is strongly oxidising.
 - The d^1 configuration is very unstable in ions.

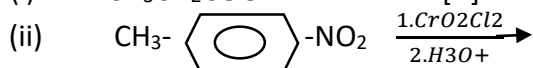
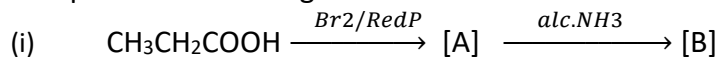
(b) Complete the following equation:



- 33 (a) An organic compound 'A' which has characteristic odour, on treatment with NaOH forms two compounds 'B' and 'C'. Compound 'B' has the molecular formula C_7H_8O which on oxidation with CrO_3 gives back compound 'A'. Compound 'C' is the sodium salt of the acid. 'C' when heated with soda lime yields an aromatic hydrocarbon 'D'. Deduce the structures of 'A', 'B', 'C' and 'D'.
- (b) Give reasons :
- Electrophilic substitution in Benzoic acid takes place at meta position.
 - Carboxylic acids do not give characteristic reactions of carbonyl group.

OR

(a) Complete the following reactions:



- (b) Write a short note with reaction for cross- aldol condensation.
- (c) Distinguish between the following with reaction: -
- Pentan-2-one and pentan-3-one
 - Propanal and Propanone
