



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

No. of printed pages: 6

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**

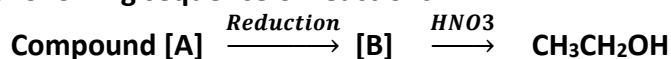
SECTION- A

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. **Which one is a colligative property ?**
 - (a) Boiling point
 - (b) Vapour pressure
 - (c) Osmotic pressure
 - (d) Freezing point
2. **Which of the following is the use of electrolysis?**
 - (a) Electro-refining
 - (b) Electroplating
 - (c) Both (a) and (b)
 - (d) None of these
3. **In respect of the equation $k = Ae^{-E_a/R/T}$ in chemical kinetics, which of the following statements is correct?**
 - (a) A is adsorption factor
 - (b) E_a is energy of activation
 - (c) R is Rydberg's constant
 - (d) k is equilibrium constant
4. **Which of the following forms colourless compound?**
 - (a) Sc^{3+}
 - (b) V^{3+}
 - (c) Ti^{3+}
 - (d) Cr^{3+}
5. **Oxidation number of Ni in $[Ni(C_2O_4)_3]^{4-}$ is**
 - (a) 3
 - (b) 4
 - (c) 2
 - (d) 6
6. **The most reactive nucleophile among the following is:**
 - (a) CH_3O^-
 - (b) $C_6H_5O^-$
 - (c) $(CH_3)_2CHO^-$
 - (d) $(CH_3)_3CO^-$

- 7 **Diethyl ether on heating with conc. HI gives two moles of:**
 (a) Ethanol
 (b) Iodoform
 (c) Ethyl iodide
 (d) Methyl iodide
- 8 **An ester is boiled with KOH. The product is cooled and acidified with concentrated HCl. A crystalline acid separates. The ester is:**
 (a) Methyl acetate
 (b) Ethyl acetate
 (c) Ethyl formate
 (d) Ethyl benzoate

- 9 **Consider the following sequence of reactions:**



The compound [A] is:

- (a) $\text{CH}_3\text{CH}_2\text{CN}$
 (b) CH_3NO_2
 (c) CH_3NC
 (d) CH_3CN
- 10 **When glucose reacts with bromine water, the main product is:**
 (a) Gluconic acid
 (b) Glyceraldehyde
 (c) Saccharic acid
 (d) Acetic acid
- 11 **The molecular weight of benzoic acid in benzene as determined by depression in freezing Point method corresponds to:**
 (a) Ionization of benzoic acid.
 (b) Dimerization of benzoic acid.
 (c) Trimerization of benzoic acid.
 (d) Solvation of benzoic acid.
- 12 **Toluene reacts with a halogen in the presence of iron (III) chloride giving ortho and para halo compounds. The reaction is :**
 (a) Electrophilic elimination reaction
 (b) Electrophilic substitution reaction
 (c) Free radical addition reaction
 (d) Nucleophilic substitution reaction

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 :** KCl, NaCl and NH_4Cl 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, KNO_3 , K_2SO_4 or solidified solution of such an electrolyte in agar-agar and gelatine.
- Assertion :** Members of 4d and 5d series of transition elements have nearly same atomic radii.
 14 **Reason :** Atomic and ionic radii for transition elements are smaller than their corresponding s-block elements.
- 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.
 15 **Reason :** Raoult's law is a special case of Henry's law

Assertion : Compounds containing -CHO group are easily oxidized to corresponding carboxylic acids.

16

Reason: Carboxylic acids can be reduced to alcohols by treatment with LiAlH_4 .

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 For the complex $[\text{Fe}(\text{CN})_6]^{3-}$, write the hybridization type, magnetic character and spin nature of the complex.
- 19 Explain the mechanism of acid catalyzed 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:
 $\text{C}_2\text{H}_5\text{NH}_2$, $\text{C}_6\text{H}_5\text{NHCH}_3$, $(\text{C}_2\text{H}_5)_2\text{NH}$ and $\text{C}_6\text{H}_5\text{NH}_2$
(b) Write short note on Gabriel phthalimide synthesis.
- 21 (a) Why can't we digest cellulose, even though both starch and cellulose are made up of glucose units?
(b) Write the products of hydrolysis of lactose.

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 An organic compound 'A' having molecular formula C_4H_8 on treatment with dil. H_2SO_4 give another compound 'B'. B on treatment with conc. HCl and anhy. ZnCl_2 gives 'C'. C on treatment with sodium ethoxide gives back 'A'. Identify the compound. Write the equations involved.
- 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) The rate constant for the first order decomposition of N_2O_5 at 25°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 $5 \times 10^{-4}\text{mol/L}$? [$\text{Log } 4 = 0.6021$]

OR

- (a) A first order reaction takes 40 min for 30% decomposition. Calculate $t_{1/2}$.
(b) For the reaction $\text{R} \rightarrow \text{P}$, the concentration of a reactant changes from 0.03 M to 0.02 M in 25 minutes. Calculate the average rate of reaction using units of time both in minutes and in seconds.

- 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 k is $4 \times 10^{10} s^{-1}$. Calculate k at 318 K and E_a . (Log 3 = 0.4771, Log 4 = 0.6021)
- 26 (a) Give one chemical test to distinguish between the following pairs of compounds and write the chemical equation related to it :
 Aniline and N-methylaniline.
 (b) Account for the following :
 Although amino group is *o, p* – directing in aromatic electrophilic substitution reactions, aniline on nitration gives a substantial amount of *m*-nitroaniline
- 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 $46.1 \text{ S cm}^2\text{mol}^{-1}$. 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.
- Write the Nernst equation and emf of the following cells at 298 K:
 $\text{Mg}_{(s)}/\text{Mg}^{2+}(0.001\text{M}) \parallel \text{Cu}^{2+}(0.0001\text{M})$
 $E^\circ_{\text{Mg}^{2+}/\text{Mg}} = -2.36\text{V}$, $E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34\text{V}$
- What is the effect of catalyst on:
 - Gibbs energy (ΔG) and
 - activation energy of a reaction?
- Write the anode and cathode reactions and overall reaction occurring in a lead storage battery when current is drawn from it.
- The conductivity of metals decreases while that of electrolytes increases with increases in temperature. Why?
- E°_{cell} for the given redox reaction is 2.71 V $\text{Mg}(s) + \text{Cu}^{2+}(0.01 \text{ M}) \rightarrow \text{Mg}^{2+}(0.001 \text{ M}) + \text{Cu}(s)$
Calculate E_{cell} for the reaction. Write the direction of flow of current when an external opposite potential applied is:
 - less than 2.71 V and
 - greater than 2.71 V

32 (a) Give reasons for :

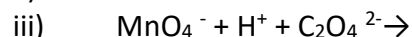
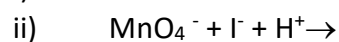
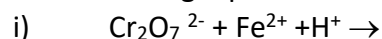
- Transition metals have high melting points. Give reason
 - Second ionization is difficult from Cu and Cr whereas it is easy for Zn. Why?
- (b) Which is a stronger reducing agent Cr^{2+} or Fe^{2+} and why?
- (c) Actinoid contraction is greater from element to element than lanthanoid contraction. Why?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

OR

- (a) Of the d^4 species, Cr^{2+} is strongly reducing while manganese(III) is strongly oxidising. Explain.

(b) The E° value of Mn^{3+}/Mn^{2+} couple is much more positive than for Cr^{3+}/Cr^{2+} or Fe^{3+}/Fe^{2+} couple. Give reason.

(c) 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'.

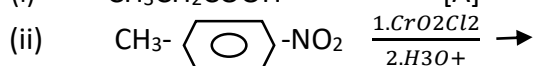
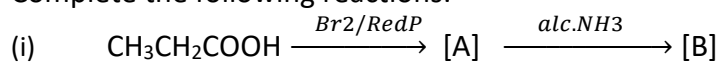
(b) Give reasons :

(i) Electrophilic substitution in Benzoic acid takes place at meta position.

(ii) 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: -

i) Pentan-2-one and pentan-3-one

ii) Benzoic acid and Ethyl benzoate
