



D.A.V PUBLIC SCHOOLS, JHARKHAND ZONE -G
PRE-BOARD EXAMINATION(2023-24)
CHEMISTRY-XII

Maximum marks:70

Time allowed: 3 Hours

General Instructions:

Read the following instructions carefully:

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

SECTION-A(16 Marks)

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

- Two faradays of electricity are passed through a solution of CuSO_4 . The mass of copper deposited at the cathode is
a) 2g b) 127g c) 0g d) 63.5g
- If the rate constant for a first order reaction is K , the time required for the completion of 99% of the reaction is given by
a) $t=2.303/k$ b) $t=0.693/k$ c) $t=6.909/k$ d) $t=4.606/k$
- Gadolinium belongs to 4f series. Its atomic number is 64. Which of the following is the correct electronic configuration of Gadolinium?
a) $[\text{Xe}]4f^7 5d^1 6s^2$ b) $[\text{Xe}]4f^6 5d^2 6s^2$ c) $[\text{Xe}]4f^9 5s^1$ d) $[\text{Xe}]4f^8 6d^2$
- The organochloro compound which shows complete stereochemical inversion during a S_N^2 reaction is :
a) CH_3Cl b) $(\text{C}_2\text{H}_5)_2\text{CHCl}$ c) $(\text{CH}_3)_2\text{CHCl}$ d) $(\text{CH}_3)_3\text{CCl}$
- Addition of water to alkynes in acidic medium and in the presence of Hg^{2+} ions as a catalyst, Which of the following products will be formed on addition of water to But-1-yne under these conditions.
a) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CHO}$ b) $\text{CH}_3\text{-CH}_2\text{-CO-CH}_3$
c) $\text{CH}_3\text{-CH}_2\text{-COOH} + \text{CO}_2$ d) $\text{CH}_3\text{-CH}_2\text{-COOH} + \text{HCHO}$
- Best method for preparing primary amines from alkyl halides without changing the number of carbon atoms in the chain is :

- a) Hoffmann Bromamide reaction
 - b) Sandmeyer reaction
 - c) Reaction with NH_3
 - d) Gabriel phthalimide synthesis
- 7) Nucleic acids are the polymers of:
- a) Nucleosides b) Nucleotides c) Bases d) sugars
- 8) In the chemical reaction, $\text{CH}_3\text{CH}_2\text{NH}_2 + \text{CHCl}_3 + 3\text{KOH} \rightarrow \text{A} + \text{B} + 3\text{H}_2\text{O}$
A and B are:
- a) $\text{C}_2\text{H}_5\text{CN}$ and 3 KCl
 - b) $\text{CH}_3\text{CH}_2\text{CONH}_2$ and 3KCl
 - c) $\text{C}_2\text{H}_5\text{NC}$ and K_2CO_3
 - d) $\text{C}_2\text{H}_5\text{NC}$ and 3KCl
- 9) The decomposition of PH_3 on tungsten at low pressure is a first order reaction. It is because the
- a) Rate is independent of surface coverage
 - b) Rate of decomposition is very low
 - c) Rate is propotional to the surface coverage
 - d) Rate is inversely propotional to the surface coverage
- 10) Which of the following pairs has the same size?
- a) Zn^{2+} , Hf^{4+}
 - b) Fe^{2+} , Ni^{2+}
 - c) Zr^{4+} , Ti^{4+}
 - d) Zr^{4+} , Hf^{4+}
- 11) Which one of the following is the strongest base in aqueous solution?
- a) Dimethylamine
 - b) Trimethylamine
 - c) Aniline
 - d) Methylamine
- 12) From amongst the following alcohols the one that would react fastest with conc.HCl and anhydrous ZnCl_2 is:
- a) 2-Butanol
 - b) 2-Methylpropan-2-ol
 - c) 2-Methylpropanol
 - d) 1-Butanol

Assertion-Reason Based questions:

For Question numbers 13 to 16, a statement of assertion(A) followed by a statement of Reason(R) 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 of the Assertion(A)
- b) Both Assertion(A) and Reason(R) are true but Reason(R) is not the correct explanation of the Assertion(A).
- c) Assertion(A) is true and Reason(R) is false
- d) Assertion(A) is false and Reason(R) is true

- 13) Assertion(A) : All naturally occurring α -amino acids except glycine are Optically active.
Reason (R) : Most naturally occurring amino acids have L-configuration
- 14) Assertion(A): The α -hydrogen atom in carbonyl compounds is less acidic.
Reason (R) : The anion formed after the loss of α -hydrogen atom is Stabilized.
- 15) Assertion(A): p-Nitrophenol is more acidic than phenol.
Reason (R) : Nitro group helps in the stabilization of phenoxide ion by dispersal of negative charge due to resonance.
- 16) Assertion(A): CuSO_4 cannot be stored in Zinc vessel.
Reason (R): Zinc is more reactive than copper

SECTION-B(10 Marks)

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

- 17) Calculate the freezing point depression expected for 0.0711 m aqueous Solution of Na_2SO_4 . If this solution actually freezes at -0.320°C , what would be Value of van't Hoff factor?
(Given: K_f for $\text{H}_2\text{O} = 1.86 \text{ kg mol}^{-1}$)
- 18) a) Define order of a reaction. How does order of a reaction differ from Molecularity for a complex reaction
b) Calculate the half life of first order reaction whose rate constant is 200 S^{-1}
- 19) Give reasons:
a) C-Cl bond length in chlorobenzene is shorter than C-Cl bond length in $\text{CH}_3\text{-Cl}$
b) S_N^1 reactions are accompanied by racemization in optically active halides

OR

Write the equations with structures of main products:

- a) Chlorination of Benzene in presence of U.V light
b) Chlorobenzene is treated with NaOH at 623K and high pressure
- 20) a) The two strands in DNA are not identical but complementary. Explain
b) What is the difference between a nucleotide and nucleoside
- 21) a) Write one test to distinguish between phenol and Benzoic acid
b) Arrange the following acids in order of increasing acidity with reason
 HCOOH , CH_3COOH , $(\text{CH}_3)_2\text{CHCOOH}$, $\text{CH}_3\text{CH}_2\text{COOH}$, $(\text{CH}_3)_3\text{CCOOH}$

SECTION -C(21 Marks)

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 is electrochemical equivalent?
b) Calculate the cell emf and ΔG° for the cell reaction at 25°C
 $\text{Zn(s)} | \text{Zn}^{2+}(0.1\text{M}) || \text{Cd}^{2+}(0.01\text{M}) | \text{Cd(s)}$
[Given: $E^\circ_{\text{Zn}^{2+}|\text{Zn}} = 0.76\text{V}$, $E^\circ_{\text{Cd}^{2+}|\text{Cd}} = -0.40\text{V}$]

23) Write short notes on:

- a) Glycosidic linkage
- b) Essential and non essential amino acids
- c) Reducing and non reducing sugars

OR

Write the chemical equations for the reactions of Glucose with:

- a) Acetic anhydride
- b) Bromine water
- c) HI

24) Write a chemical equation for each of the following processes:

- a) cannizzaro reaction
- b) Rosenmund reduction
- c) Diasotisation reaction

25) a) Bring out the following conversions:

- (i) Chlorobenzene to p-Nitrophenol
- (ii) Benzyl alcohol to 2- phenylethanoic acid

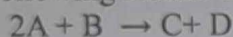
b) Write the structures of the following compounds.

- (i) 4-Tert-butyl-3-iodoheptane
- (ii) 2-Hydroxycyclopentane carbaldehyde

26) a) An aromatic compound (A) on treatment with aqueous NH_3 and heating forms compound (B) which on heating with Br_2 and KOH forms a compound (C) of molecular formula $\text{C}_6\text{H}_7\text{N}$. Write the structures and IUPAC names of compounds A, B and C.

b) Write the reactions of aromatic primary amine with Nitrous acid

27) The following results have been obtained during kinetic studies of the reaction:



Exp No.	[A]	[B]	Initial rate of formation of D
1	0.1M	0.1M	$6.0 \times 10^{-3} \text{Mmin}^{-1}$
2	0.3M	0.2M	$7.3 \times 10^{-3} \text{Mmin}^{-1}$
3	0.3M	0.4M	$2.88 \times 10^{-3} \text{Mmin}^{-1}$
4	0.4M	0.1M	$2.40 \times 10^{-3} \text{Mmin}^{-1}$

Determine rate law and the rate constant for the reaction.

- a) What is Activation energy and what is the effect of a catalyst on activation energy of a reaction.

28) a) Describe the type of hybridization, shape and magnetic behaviour of $[\text{Co}(\text{NH}_3)_6]^{3+}$

b) Write the formulas for the following coordination compounds

- (i) tetraamminediaquacobalt(III) chloride
- (ii) potassium tetracyanonickelate(II)

SECTION-D(8 MARKS)

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) Molar conductivity ($\wedge_m$) of electrolyte is the conducting power of all the ions produced by one mole of it in a solution placed between two large electrodes and

centimetre apart. The molar conductivity of the electrolyte is highest at infinite dilution when each ion of the electrolyte makes a definite contribution towards the molar conductivity. Molar conductivity at infinite dilution is called limiting molar conductivity (Λ_m^0). The degree of dissociation of electrolyte at any concentration can be obtained from the ratio of Λ_m / Λ_m^0 . Kohlrausch studied the molar conductivities at infinite dilution Λ_m^0 for a number of pairs of strong electrolytes, each pair having a common cation or anion.

Based on above information, answer the following questions:

- 1) Define conductivity and molar conductivity for solution of an electrolyte.
- 2) State Kohlrausch law of independent migration of ions.
- 3) The molar conductivity of a 0.20M solution of KCl at 298 K is 0.0248 S cm^{-1} . Calculate its molar conductivity?

OR

Write Debye Huckel onsager equation and draw the graph to show the variation of molar conductivity of a strong electrolyte with concentration

30) The ions or molecules bound to the central atom or ion in the coordination entity are called ligands. These may be simple ions, small molecules, large molecules or even macromolecules such as proteins. The ligand may contain one or more than one donor atom. Ligands are unidentate, bidentate or polydentate ligand. The total number of ligands attached to the central metal atom or ion through coordinate bonds is called coordination number. The oxidation number of the central atom is the charge that it carries as calculated by assigning appropriate charges to the ligands and equating the sum of the charges on the central atom and the ligands equal to the charge on the coordination sphere.

Based on the above information, answer the following questions.

- 1) What is meant by unidentate, bidentate and ambidentate ligands?
- 2) Specify the oxidation state of the metal atom in the following complexes:
(i) $[\text{Co}(\text{H}_2\text{O})(\text{CN})(\text{en})_2]^{2+}$ (ii) $[\text{Cr}(\text{NH}_3)_3\text{Cl}_3]$
- 3) What is meant by chelate effect? Give an example. How does it contribute in the stability of the complexes?

OR

What are Homoleptic and Heteroleptic complexes? Give Examples.

SECTION -E(15 Marks)

The following questions are long answer type and carry 5 marks each.

All questions have an internal choice.

31) a) What is meant by positive and negative deviations from Raoult's law and how is the sign of ΔH_{mix} related to positive and negative deviations from Raoult's law?

b) At 300K, 36g of Glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) is dissolved in one litre of solution which has an osmotic pressure of 4.98 bar. If the osmotic pressure of another Glucose solution is 1.52 bar at the same temperature, calculate the concentration of the other solution?

c) State how the vapour pressure of a solvent is affected when a non volatile solute is added to it?

OR

- a) Define the term osmotic pressure. Why a person suffering from high blood pressure is advised to take minimum quantity of common salt?
- b) Henry's law constant for CO_2 dissolving in water is $1.67 \times 10^8 \text{ Pa}$ at 298K. Calculate the quantity of CO_2 in 1 litre of soda water when packed under 2.5 atm CO_2 pressure at 298K?
- c) Explain why a solution of CHCl_3 and CH_3COCH_3 shows negative deviation from Raoult's law?

- 32) a) Write the steps involved in the preparation of $\text{K}_2\text{Cr}_2\text{O}_7$ from chromite ore
b) What is meant by Lanthanoid contraction? What effect does it have on the chemistry of the elements which follow lanthanoids?
c) What is Misch metal? Mention its important uses.

OR

- a) The electronic configuration of an element is $3d^5 4s^1$. Write its most stable oxidation state and most oxidizing state.
- b) Zinc salts are white while Cu^{2+} salts are coloured? Why?
- c) Silver atom has completely filled d-orbitals ($4d^{10}$) in its ground state. How can you say that it is a transition element?
- d) Why a transition element exhibits higher oxidation states in oxides and fluorides?
- e) With $3d^4$ configuration, why Cr^{2+} acts as a reducing agent and Mn^{3+} acts as an oxidizing agent?

- 33) a) Explain the mechanism of a nucleophilic attack on the carbonyl group of an Aldehyde or a ketone.
b) Describe Hinsberg method for the identification of primary, secondary and tertiary amines. Also write the chemical equations of the reactions involved.
c) Write the names of the reagents and equation in the conversion of Anisole to p-Methoxyacetophenone.

OR

- a) A compound of (A) of molecular formula $\text{C}_3\text{H}_7\text{O}_2\text{N}$ on reaction with Fe and conc. HCl gives a compound (B) of molecular formula $\text{C}_3\text{H}_9\text{N}$. Compound (B) on treatment with NaNO_2 and HCl gives another compound (C) of molecular formula $\text{C}_3\text{H}_8\text{O}$. The compound (C) gives effervescence with Na. On oxidation with CrO_3 , the compound (C) gives a saturated aldehyde containing three carbon atoms. Deduce the structures of A, B and C and write the equations for the reactions involved.
- b) Write a chemical test to distinguish between Benzaldehyde and acetophenone.
- c) Write reaction to show weakly acidic nature of phenol.