

General Instructions:

Read the following instructions carefully.

- There are **35** questions in this question paper with choice.
- SECTION A** consists of **18** multiple-choice questions carrying **1** mark each.
- SECTION B** consists of **7** very short answer questions carrying **2** marks each.
- SECTION C** consists of **5** 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 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.

- The solubility of a substance in a solvent depends on** 1
 - Temperature
 - Pressure
 - Nature of solute and solvent
 - All of the above
- What does Henry's constant depend upon?** 1
 - Nature of gas
 - Nature of solvent
 - Temperature
 - All of the above
- Which of the following condition is not satisfied by an ideal solution?** 1
 - $\Delta H_{\text{mixing}} = 0$
 - $\Delta V_{\text{mixing}} = 0$
 - Raoult's Law is obeyed
 - Formation of an azeotropic mixture
- .A cathode and an anode are the most common components of an electrochemical cell. Which of the following claims about the cathode is correct?** 1
 - Oxidation occurs at the cathode
 - Electrons move into the cathode
 - Usually denoted by a negative sign
 - Is usually made up of insulating material

- 5 In a dry cell, which of the following is the electrolyte? 1
- Potassium hydroxide
 - Sulphuric acid
 - Ammonium chloride
 - Manganese dioxide
- 6 The reaction 1
- $$\text{CH}_2 = \text{CH} - \text{CH}_3 + \text{HBr} \longrightarrow \begin{array}{c} \text{Br} \\ | \\ \text{CH}_3 - \text{CH} - \text{CH}_3 \end{array}$$
- is an example of
- nucleophilic addition
 - free radical addition
 - electrophilic addition
 - electrophilic substitution
- 7 Which of the following compounds is formed when secondary alcohols are oxidised by [O]? 1
- Ether
 - Aldehyde
 - Ketone
 - Amine
- 8 Major product obtained on reaction of 3-Phenyl propene with HBr in presence of organic peroxide (a)3- 1
Phenyl 1- bromopropane
- 1 -Phenyl -3- bromopropane
 - 1-Phenyl -2-bromopropane
 - 3-Phenyl -2- bromopropane
- 9 Which reagents are required for one step conversion of chlorobenzene to toluene? 1
- CH₃Cl / AlCl₃
 - CH₃Cl, Na, Dry ether
 - CH₃Cl/Fe dark
 - NaNO₂/ HCl /0-50C
- 10 Chloro-Ethane reacts with Which of the Following to Give Diethyl Ether? 1
- NaOH
 - H₂SO₄
 - C₂H₅ONa
 - Na₂S₂O₃
- 11 Which of the following reaction is not shown by ketones? 1
- Reaction with HCN
 - Reaction with NaHSO₃
 - Reaction with 2,4-dinitrophenyl hydrazine
 - Reaction with Fehling solution
- 12 Which of the following should be most volatile? 1
- CH₃CH₂CH₂NH₂
 - (CH₃)₃N
 - $$\begin{array}{c} \text{CH}_3\text{CH}_2 \\ \text{CH}_3 \end{array} \text{NH}$$

IV. $\text{CH}_3\text{CH}_2\text{CH}_3$

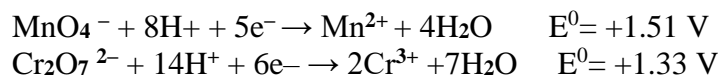
- (a) II
- (b) IV
- (c) I
- (d) III

- 13 IUPAC name of product formed by reaction of methyl amine with two moles of ethyl chloride 1
- a) N,N-Dimethylethanamine
 - b) N,N-Diethylmethanamine
 - c) N-Methyl ethanamine
 - d) N-Ethyl - N-methylethanamine
- 14 Reduction of $\text{CH}_3\text{CH}_2\text{NC}$ with hydrogen in presence of Ni or Pt as catalyst gives 1
- (a) $\text{CH}_3\text{CH}_2\text{NH}_2$
 - (b) $\text{CH}_3\text{CH}_2\text{NHCH}_3$
 - (c) $\text{CH}_3\text{CH}_2\text{NHCH}_2\text{CH}_3$
 - (d) $(\text{CH}_3)_3\text{N}$
- 15 Given below are two statements labelled as Assertion (A) and Reason (R) 1
- Assertion :** Magnetic moment values of actinides are lesser than the theoretically predicted values.
Reason : Actinide elements are strongly paramagnetic. Select the most appropriate answer from the options given below:
- a. Both A and R are true and R is the correct explanation of A
 - b. Both A and R are true but R is not the correct explanation of A.
 - c. A is true but R is false.
 - d. A is false but R is true.
- 16 Given below are two statements labelled as Assertion (A) and Reason (R) 1
- Assertion :** SN^2 reaction of an optically active aryl halide with an aqueous solution of KOH always gives an alcohol with opposite sign of rotation.
Reason : SN^2 reactions always proceed with inversion of configuration.
- a. Both A and R are true and R is the correct explanation of A
 - b. Both A and R are true but R is not the correct explanation of A.
 - c. A is true but R is false.
 - d. A is false but R is true.
- 17 **Assertion :** The bond angle in alcohols is slightly less than the tetrahedral angle. 1
- Reason :** In alcohols, the oxygen of $-\text{OH}$ group is attached to sp^3 hybridized carbon atom.
- a. Both A and R are true and R is the correct explanation of A
 - b. Both A and R are true but R is not the correct explanation of A.
 - c. A is true but R is false.
 - d. A is false but R is true.
- 18 Given below are two statements labelled as Assertion (A) and Reason (R) 1
- Assertion :** Formaldehyde is a planar molecule.
Reason : It contains sp^2 hybridised carbon atom.
- a. Both A and R are true and R is the correct explanation of A
 - b. Both A and R are true but R is not the correct explanation of A.
 - c. A is true but R is false.
 - d. A is false but R is true.

SECTION B

This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.

- 19 (i) On the basis of E^0 values identify which amongst the following is the strongest oxidising agent 2
- $\text{Cl}_2(\text{g}) + 2\text{e}^- \longrightarrow 2\text{Cl}^- \quad E^0 = +1.36\text{ V},$



(ii) State Kohlrausch law.

20 For a reaction the rate law expression is represented as follows: $\text{Rate} = k [\text{A}][\text{B}]^{1/2}$ 2

i Interpret whether the reaction is elementary or complex. Give reason to support your answer.

ii. Write the units of rate constant for this reaction if concentration of A and B is expressed in moles/L.

OR

Show that for a first order reaction the time required for 99% completion of a reaction is twice the time required to complete 90% of the reaction.

21 The C-14 content of an ancient piece of wood was found to have three tenths of that in living trees. How old is that piece of wood? ($\log 3 = 0.4771$, $\log 7 = 0.8540$, Half-life of C-14 = 5730 years) 2

OR

A first-order reaction takes 69.3 min for 50% completion. What is the time needed for 80% of the reaction to get completed? (Given: $\log 5 = 0.6990$, $\log 8 = 0.9030$, $\log 2 = 0.3010$)

22 The following haloalkanes are hydrolysed in presence of aq KOH. (i) 2-Chlorobutane (ii) 2-chloro-2-methylpropane Which of the above is most likely to give a racemic mixture? Justify your answer. 2

23 Arrange the following carbonyl compounds in increasing order of their reactivity in nucleophilic addition reactions : 2

(a) Ethanal, propanal, propanone, butanone

(b) Benzaldehyde, p-tolualdehyde, p-nitrobenzaldehyde, acetophenone

24 Define these terms i) peptide linkage ii) denaturation 2

25 i) Name polysaccharide which is stored in the liver of animals. 2

ii) Write one reaction of D- glucose which cannot be explain by its open chain structure

SECTION C

This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.

26 . The following results have been obtained during the kinetic studies of the reaction. 1



Experiment	[A] mol L ⁻¹	[B] mol L ⁻¹	Initial rate of formation of D mol L ⁻¹ min ⁻¹
I	0.1	0.1	6.0×10^{-3}
II	0.3	0.2	7.2×10^{-2}
III	0.3	0.4	2.88×10^{-1}
IV	0.4	0.1	2.40×10^{-2}

Determine the rate law and the rate constant for the reaction.

27 Answer the following questions: 3

a. $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ (aq) is green in colour whereas $[\text{Ni}(\text{H}_2\text{O})_4(\text{en})]^{2+}$ (aq) is blue in colour, give reason in support of your answer.

b. Write the formula and hybridization of the following compound: tris(ethane-1,2-diamine) cobalt (III) sulphate

28 Write **any two** reactions 3

i) Kolbe's Reaction

ii) Reimer-Tiemann Reaction.

iii) Williamson synthesis

- 29 Give the chemical tests to distinguish between the following pairs of compounds : 3
(i) Ethyl amine and Aniline
(ii) Aniline and Benzylamine
- 30 (i) Name the two components of starch? Which one is water-soluble? 3
(ii) Name the vitamin responsible for the coagulation of blood.

OR

- (i) Write the structural differences (**any two**) between DNA and RNA
(ii) What is meant by 'reducing sugars'?

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.

- 31 The boiling point of a liquid is the temperature at which the vapour pressure is equal to atmospheric pressure. We know that on the addition of a non-volatile liquid to a pure solvent, the vapour pressure of a solution decrease. Therefore, to make vapour pressure equal to atmospheric pressure we have to increase the temperature of the solution. The difference in the boiling point of the solution and the boiling point of the pure solvent is termed as elevation in boiling point.

The freezing point of a substance is defined as the temperature at which the vapour pressure of its liquid is equal to the vapour of the corresponding solid. According to Raoult's law when a non-volatile solid is added to the solvent its vapour pressure decreases and now it would become equal to that of solid solvent at a lower temperature. The difference between the freezing point of the pure solvent and its solution is called depression in freezing point.

QA When a non-volatile liquid is mixed with water, what will happen to its boiling point and freezing point?

QB Which of the following aqueous solutions should have the highest boiling point? Solution A 1.0 M NaOH, Solution B 1.0 M Na₂SO₄, Solution C 1.0 M NH₄NO₃ Solution d 1.0 M KNO₃

QC How does sprinkling of salt help in clearing the snow-covered roads in hilly areas? Explain the phenomenon involved in the process.

OR

- i) Elevation of boiling point of 1M KCl solution is nearly double than that of 1M sugar solution.
ii) what will happen with molal depression constant when molality of a diluted solution is doubled .

32

IUPAC Nomenclature of Coordination Compounds

Rules For Naming Coordination Compound

The standard rules that must be followed in the nomenclature of coordination compounds are described below.

When the coordination centre is bound to more than one ligand, the names of the ligands are written in an alphabetical order which is not affected by the numerical prefixes that must be applied to the ligands: di-, tri-, tetra-, and so on. The names of the anions present in a coordination compound must end with the letter 'o', which generally replaces the letter 'e'. After the ligands are named, the name of the central metal atom is written. If the complex has an anionic charge associated with it, the suffix '-ate' is applied. When writing the name of the central metallic atom in an anionic complex, priority is given to the Latin name of the metal if it exists (with the exception of mercury). The oxidation state of the central metal atom/ion must be specified with the help of roman numerals that are enclosed in a set of parentheses. If the coordination compound is accompanied by a counter ion, the cationic entity must be written before the anionic entity.

Q1 Write down the formula of : Tetraamineaquachloridocobalt(III) chloride .

Q2. What is the IUPAC name of the complex $[\text{Ni}(\text{NH}_3)_6]\text{Cl}_2$?

Q3 When a co-ordination compound $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ is mixed with AgNO_3 , 2 moles of AgCl are precipitated per mole of the compound. Write

(i) Structural formula of the complex.

(ii) IUPAC name of the complex.

OR

Write oxidation no and coordination no of central metal of following compounds

i) $\text{K}_3[\text{Al}(\text{C}_2\text{O}_4)_3]$

(ii) $[\text{Co}(\text{Cl})_2(\text{en})_2]^+$

SECTION E

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

33 Qi) What is the effect of adding a catalyst on

(a) Activation energy (E_a), and

(b) Gibbs energy (ΔG) of a reaction?

Qii) Given that the standard electrode potentials (E°) of metals are :

$\text{K}^+/\text{K} = -2.93 \text{ V}$, $\text{Ag}^+/\text{Ag} = 0.80 \text{ V}$, $\text{Cu}^{2+}/\text{Cu} = 0.34 \text{ V}$,

$\text{Mg}^{2+}/\text{Mg} = -2.37 \text{ V}$, $\text{Cr}^{3+}/\text{Cr} = -0.74 \text{ V}$, $\text{Fe}^{2+}/\text{Fe} = -0.44 \text{ V}$.

Arrange these metals in increasing order of their reducing power.

Qiii) Why is it safe to stir AgNO_3 solution with a copper spoon?

$$E^0(\text{Ag}^+/\text{Ag}) = 0.80 \text{ Volt}; E^0(\text{Cu}^{2+}/\text{Cu}) = 0.34 \text{ Volt}$$

OR

Qi) 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 and dissociation constant. Given $\lambda^\circ(\text{H}^+) = 349.6 \text{ S cm}^2 \text{ mol}^{-1}$ and $\lambda^\circ(\text{HCOO}^-) = 54.6 \text{ S cm}^2 \text{ mol}^{-1}$

Qii) The cell in which the following reaction occurs:

$2\text{Fe}^{3+}(\text{aq}) + 2\text{I}^-(\text{aq}) \longrightarrow 2\text{Fe}^{2+}(\text{aq}) + \text{I}_2(\text{s})$ has $E^\circ_{\text{cell}} = 0.236 \text{ V}$ at 298 K . Calculate the standard Gibbs energy and the equilibrium constant of the cell reaction.

34 a. Why are fluorides of transition metals more stable in their higher oxidation state as compared to the lower oxidation state?

b. Which one of the following would feel attraction when placed in magnetic field: Co^{2+} , Ag^+ , Ti^{4+} , Zn^{2+}

c. It has been observed that first ionization energy of 5d series of transition elements are higher than that of 3d and 4d series, explain why?

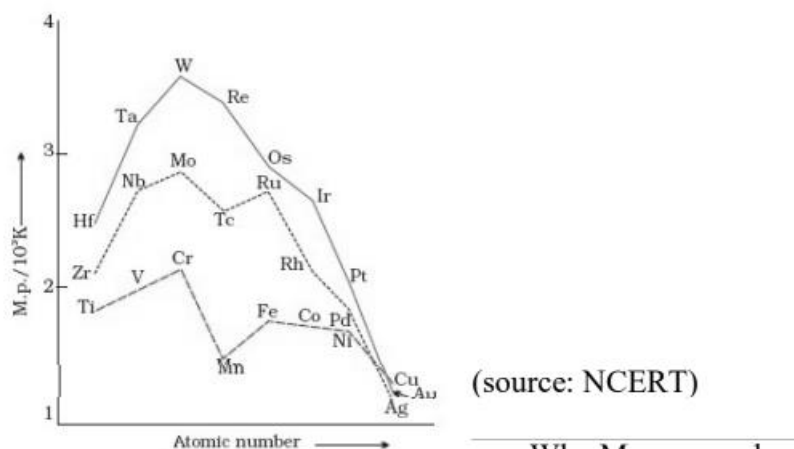
Assign reasons for the following :

d. (i) Copper (I) ion is not known in aqueous solution.

(ii) Actinoids exhibit greater range of oxidation states than lanthanoids.

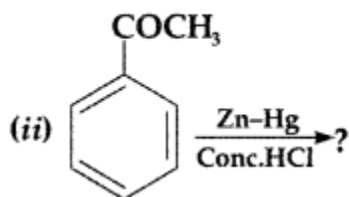
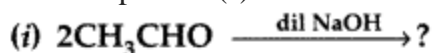
OR

i) On the basis of the figure given below, answer the following questions:



- a. Why Manganese has lower melting point than Chromium?
b. Why do transition metals of 3d series have lower melting points as compared to 4d series?
c. In the third transition series, identify and name the metal with the highest melting point.
d) Explain the following observations :
(i) Transition elements generally form coloured compounds.
(ii) Zinc is not regarded as a transition element.

35 (a) Write the product(s) in the following :



- (b) Give simple tests to distinguish the following pairs of compounds :
(i) Ethanal and Propanal
(ii) Benzaldehyde and Acetophenone
(iii) Benzoic acid and Ethyl benzoate

OR

- a) Write the reactions involved in the following:
(i) Etard reaction (ii) Stephen reduction
(b) How will you convert the following in not more than two steps:
(i) Benzoic acid to Benzaldehyde (ii) Acetophenone to Benzoic acid
(iii) Ethanoic acid to 2-Hydroxyethanoic acid

GENERAL INSTRUCTIONS

- 1 There are 35 questions in this question paper.
- 2 This Question paper has been divided into 5 sections
- 3 SECTION A contains 18 questions carrying 1 marks each.
- 4 SECTION B contains 7 questions (internal choice in some) carrying 2 marks each.
- 5 SECTION C contains 5 questions (internal choice in some) carrying 3 marks each.
- 6 SECTION D contains 2 CASE BASED questions carrying 4 marks each.
- 7 SECTION E contains 3 questions with internal choice carrying 5 marks each.

SECTION A

- | | | |
|------|--|---|
| Q. 1 | On dissolving sugar in water at room temperature solution feels cool to touch. Under which of the following cases dissolution of sugar will be most rapid?
(i) Sugar crystals in cold water.
(ii) Sugar crystals in hot water.
(iii) Powdered sugar in cold water.
(iv) Powdered sugar in hot water. | 1 |
| Q. 2 | Considering the formation, breaking and strength of hydrogen bond, predict which of the following mixtures will show a positive deviation from Raoult's law?
(i) Methanol and acetone.
(ii) Chloroform and acetone.
(iii) Nitric acid and water.
(iv) Phenol and aniline. | 1 |
| Q. 3 | The difference between the electrode potentials of two electrodes when no current is drawn through the cell is called _____.
(i) Cell potential
(ii) Cell emf
(iii) Potential difference
(iv) Cell voltage | 1 |
| Q. 4 | Which of the statements about solutions of electrolytes is not correct?
(i) Conductivity of solution depends upon size of ions.
(ii) Conductivity depends upon viscosity of solution.
(iii) Conductivity does not depend upon solvation of ions present in solution.
(iv) Conductivity of solution increases with temperature. | 1 |
| Q. 5 | The cell constant of a conductivity cell _____.
(i) changes with change of electrolyte.
(ii) changes with change of concentration of electrolyte.
(iii) changes with temperature of electrolyte.
(iv) remains constant for a cell. | 1 |
| Q. 6 | The role of a catalyst is to change _____.
(i) Gibb's energy of reaction.
(ii) enthalpy of reaction.
(iii) activation energy of reaction. | 1 |

	(iv) equilibrium constant.	
Q. 7	Electronic configuration of a transition element X in +3 oxidation state is $[\text{Ar}]3d^5$. What is its atomic number? (i) 25 (ii) 26 (iii) 27 (iv) 24	1
Q. 8	The colour of the coordination compounds depends on the crystal field splitting. What will be the correct order of absorption of wavelength of light in the visible region, for the complexes, $[\text{Co}(\text{NH}_3)_6]^{3+}$, $[\text{Co}(\text{CN})_6]^{3-}$, $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$ (i) $[\text{Co}(\text{CN})_6]^{3-} > [\text{Co}(\text{NH}_3)_6]^{3+} > [\text{Co}(\text{H}_2\text{O})_6]^{3+}$ (ii) $[\text{Co}(\text{NH}_3)_6]^{3+} > [\text{Co}(\text{H}_2\text{O})_6]^{3+} > [\text{Co}(\text{CN})_6]^{3-}$ (iii) $[\text{Co}(\text{H}_2\text{O})_6]^{3+} > [\text{Co}(\text{NH}_3)_6]^{3+} > [\text{Co}(\text{CN})_6]^{3-}$ (iv) $[\text{Co}(\text{CN})_6]^{3-} > [\text{Co}(\text{NH}_3)_6]^{3+} > [\text{Co}(\text{H}_2\text{O})_6]^{3+}$	1
Q. 9	The process of converting alkyl halides into alcohols involves_____ (i) addition reaction (ii) substitution reaction (iii) dehydrohalogenation reaction (iv) rearrangement reaction	1
Q. 10	Which of the following compounds will react with sodium hydroxide solution in water? (i) $\text{C}_6\text{H}_5\text{OH}$ (ii) $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$ (iii) $(\text{CH}_3)_3\text{COH}$ (iv) $\text{C}_2\text{H}_5\text{OH}$	1
Q. 11	Phenol is less acidic than _____. (i) ethanol (ii) o-nitrophenol (iii) o-methylphenol (iv) o-methoxyphenol	1
Q. 12	Which of the following monosaccharides are present as five membered cyclic structure (furanose structure)? (i) Sucrose (ii) Glucose (iii) Fructose (iv) Galactose	1
	Following questions consist of two statements, each as Assertion and Reason. While answering these questions, you are required to select any one of the following five responses. (i) Both A and R are true and R is the correct explanation of A. (ii) A is true but R is false. (iii) A is false but R is true. (iv) Both A and R are false. (v) Assertion and reason both are correct statements but reason is not correct explanation of assertion.	
Q. 13	Assertion : Order of the reaction can be zero or fractional. Reason : We cannot determine order from balanced chemical equation.	1
Q. 14	Assertion : Cu^{2+} iodide is not known. Reason : Cu^{2+} oxidises iodide to iodine.	
Q. 15	Assertion : Toxic metal ions are removed by the chelating ligands. Reason : Chelate complexes tend to be more stable.	1
Q. 16	Assertion : Formaldehyde is a planar molecule.	1

	Reason : It contains sp^2 hybridised carbon atom.	
Q. 17	Assertion : Acylation of amines gives a monosubstituted product whereas alkylation of amines gives polysubstituted product. Reason : Acyl group sterically hinders the approach of further acyl groups.	1
Q. 18	Assertion : D (+) – Glucose is dextrorotatory in nature. Reason : ‘D’ represents its dextrorotatory nature.	1
SECTION B		
Q. 19	Why do gases always tend to be less soluble in liquids as the temperature is raised?	2
Q. 20	What is the effect of catalyst on: (i) Gibbs energy (ΔG) and (ii) activation energy of a reaction?	2
Q. 21	Why does the conductivity of a solution decrease with dilution?	2
Q. 22	Which of the 3d series of the transition metals exhibits the largest number of oxidation states and why?	2
Q. 23	Explain why alkyl halides, though polar, are immiscible with water?	2
Q. 24	Would you expect benzaldehyde to be more reactive or less reactive in nucleophilic addition reactions than propanal? Explain your answer.	2
Q. 25	Write structures and IUPAC names of (i) the amide which gives propanamine by Hoffmann bromamide reaction. (ii) the amine produced by the Hoffmann degradation of benzamide.	2
<u>OR</u>		
	(i) What are the expected products of hydrolysis of lactose?	1
	(ii) How do you explain the absence of aldehyde group in the pentaacetate of D-glucose?	1
SECTION C		
Q. 26	(a) Define Osmosis and osmotic pressure. (b) What is the use of putting vegetables dipped inside the salt solution.	
Q. 27	Compare the chemistry of the actinoids with that of lanthanoids with reference to: (i) electronic configuration (ii) oxidation states and (iii) chemical reactivity.	1 1 1
<u>OR</u>		
	What is lanthanoid contraction? What are the consequences of lanthanoid contraction?	1 2
Q. 28	Give the structures and IUPAC names of the products expected from the following reactions: (a) Catalytic reduction of butanal. (b) Hydration of propene in the presence of dilute sulphuric acid. (c) Reaction of propanone with methylmagnesium bromide followed by hydrolysis.	3
Q. 29	Arrange the following sets of compounds in order of their increasing (a) boiling points: (a) Pentan-1-ol, butan-1-ol, butan-2-ol, ethanol, propan-1-ol, methanol. (b) acid strength: Propan-1-ol, 2,4,6-trinitrophenol, 3-nitrophenol, 3,5-dinitrophenol, phenol, 4-methylphenol. (c) Write the reagents to prepare methyl tert-butyl ether according to Williamson synthesis.	1 1 1
<u>OR</u>		
	Account for the following:	1
	(i) pK_b of aniline is more than that of methylamine.	1
	(ii) Ethylamine is soluble in water whereas aniline is not.	1
	(iii) Methylamine in water reacts with ferric chloride to precipitate hydrated ferric oxide.	

Q. 30	(i) Why cannot vitamin C be stored in our body? (ii) When RNA is hydrolysed, there is no relationship among the quantities of different bases obtained. What does this fact suggest about the structure of RNA?	1 2
SECTION D		
Q. 31	An electrochemical cell consists of two metallic electrodes dipping in electrolytic solution(s). Thus an important component of the electrochemical cell is the ionic conductor or electrolyte. Electrochemical cells are of two types. In galvanic cell, the chemical energy of a spontaneous redox reaction is converted into electrical work, whereas in an electrolytic cell, electrical energy is used to carry out a nonspontaneous redox reaction. The standard electrode potential for any electrode dipping in an appropriate solution is defined with respect to standard electrode potential of hydrogen electrode taken as zero. (a) Arrange the following metals in the order in which they displace each other from their salts: Al, Cu, Fe, Mg and Zn. (b) How much charge is required for reducing 1 mol of Al^{3+} to Al? (c) Write the Nernst equation for the cell at 298 K: $\text{Mg(s)} \text{Mg}^{2+} \text{Cu}^{2+} \text{Cu(s)}$ OR Write the reactions taking place at anode and cathode of fuel cell and write two uses of fuel cell.	1 2 1
Q. 32	The polarity of C—X bond is responsible for the nucleophilic substitution reactions of alkyl halides which mostly occur by SN_1 and SN_2 mechanisms. The rates of SN_1 reaction are governed by the stability of intermediate carbocations while that of SN_2 reactions are governed by steric factors. Chirality has a great role in understanding the mechanism of SN_1 and SN_2 reactions. SN_1 reactions of chiral alkyl halides are accompanied by racemisation. Whereas SN_2 reactions are characterised by inversion of configuration (A) What do you mean by chirality? (B) In the pair, $(\text{CH}_3)_3\text{C—Br}$ and $\text{CH}_3\text{—CH}_2\text{—Br}$, which one is more reactive towards SN_2 reaction and why? (C) p-Dichlorobenzene has higher m.p. than those of o- and m-isomers. Discuss OR Why dipole moment of chlorobenzene is lower than that of cyclohexyl chloride?	1 1 1 1
SECTION E		
Q. 33	A reaction is first order in A and second order in B. (i) Write the differential rate equation. (ii) How is the rate affected on increasing the concentration of B three times? (iii) How is the rate affected when the concentrations of both A and B are doubled? (iv) What will be the units of rate constant and Rate of the reaction.	1 1 2 1
Q. 34	(a) Give examples of unidentate and ambidentate ligands. (b) Specify the oxidation numbers of platinum in $[\text{PtCl}_4]^{2-}$ (c) Write the formulas for the: Hexaamminecobalt(III) sulphate (d) Write the coordination number of cobalt in: Pentaamminenitrito-O-cobalt(III) OR (a) A solution of $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ is green but a solution of $[\text{Ni}(\text{CN})_4]^{2-}$ is colourless. Explain. (b) $[\text{Fe}(\text{CN})_6]^{4-}$ and $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ are of different colours in dilute solutions. Why? (c) What is meant by the chelate effect? Give an example.	2 1 1 1 2 2 1

Q. 35	Give one example of the following reactions:	1
	(a) Cannizaro reaction	1
	(b) Wolff Kishner reaction	1
	(c) Rosenmund's Reduction	1
	(d) Aldol Reaction	1
	(e) Gattermann Koach reaction	
	<u>OR</u>	
	Give plausible explanation for each of the following:	1
	(i) Cyclohexanone forms cyanohydrin in good yield but 2,2,6-trimethylcyclohexanone does not.	2
	(ii) There are two $-NH_2$ groups in semicarbazide. However, only one is involved in the formation of semicarbazones.	2
	(iii) During the preparation of esters from a carboxylic acid and an alcohol in the presence of an acid catalyst, the water or the ester should be removed as soon as it is formed.	

SAMPLE PAPER SET : 3

CLASS - XII

SUBJECT: CHEMISTRY

TIME :3H

MM: 70

QUESTION PAPER

Time: 3 hours General Instructions: Read the following instructions carefully.

- a) There are 35 questions in this question paper with internal choice.
- b) SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
- c) SECTION B consists of 7 very short answer questions carrying 2 marks each.
- d) SECTION C consists of 5 short answer questions carrying 3 marks each.
- e) SECTION D consists of 2 case- based questions carrying 4 marks each.
- f) SECTION E consists of 3 long answer questions carrying 5 marks each.
- g) All questions are compulsory.

SECTION A

1. Effect of dilution on conductance is as follow:
 - (a) Specific conductance increase, molar conductance decrease.
 - (b) Specific conductance decrease, molar conductance increase.
 - (c) Specific conductance increase, molar conductance increase.
 - (d) Specific conductance decrease, molar conductance decrease.
2. For a reaction $nx + y \rightarrow z$ the rate of reaction becomes twenty-seven times when the concentration of X is increased three times. What is the order of the reaction?
 - (a) 2
 - (b) 1
 - (c) 3
 - (d) 0
3. The product of oxidation of I^- with MnO_4^- in alkaline medium is:
 - (a) IO_3^-
 - (b) I_2
 - (c) IO^-
 - (d) IO_4^-
4. The number of possible isomers for the complex $[Co(C_2O_4)_2(NH_3)_2]$
 - (a) 1
 - (b) 2
 - (c) 3
 - (d) 4
5. Which of the following reactions follows Markovnikov's rule?
 - (a) $C_2H_4 + HBr$
 - (b) $C_3H_6 + Cl_2$
 - (c) $C_3H_6 + HBr$
 - (d) $C_3H_6 + Br_2$
6. Which of the following reagents cannot, be used to oxidise primary alcohols to aldehydes?
 - (a) CrO_3 in anhydrous medium
 - (b) $KMnO_4$ in acidic medium
 - (c) Pyridinium chlorochromate

(d) Heat in the presence of Cu at 573 K

7. Which of the following compounds does not react with NaHSO_3 ?

(a) HCHO

(b) $\text{C}_6\text{H}_5\text{COCH}_3$

(c) CH_3COCH_3

(d) CH_3CHO

8. The most convenient method to prepare primary (1° Amine) amine containing one carbon atom less is

(a) Gabriel phthalimide synthesis

(b) Reductive amination of aldehydes

(c) Hofmann bromamide reaction

(d) Reduction of isonitriles

9. 1-Phenylethanol can be prepared by the reaction of benzaldehyde with

(a) methyl bromide

(b) ethyl iodide and magnesium

(c) methyl iodide and magnesium (Grignard reagent's)

(d) methyl bromide and aluminium

bromide

10. Secondary amines can be prepared by

(a) reduction of nitro compounds

(b) oxidation of N-substituted amides

(c) reduction of isonitriles

(d) reduction of nitriles

11. Ammonia acts as a very good ligand but ammonium ion does not form complexes because

(a) NH_3 is a gas while NH_4^+ is in liquid form.

(b) NH_3 undergoes sp^3 hybridisation while NH_4^+ undergoes $sp^3 d$ hybridisation

(c) NH_4^+ ion does not have any lone pair of electrons

(d) NH_4^+ ion has one unpaired electron while NH_3 has two unpaired electrons

12. Which of the following statement is not correct for the reaction? $4A + B \rightarrow 2C + 2D$

(a) The rate of disappearance of B is one-fourth the rate of disappearance of A

(b) The rate of appearance of C is one-half the rate of disappearance of B

(c) The rate of formation of D is one-half the rate of consumption of A

(d) The rate of formation of C and D are

equal

13. The product of hydrolysis of ozonide of 1-butene are

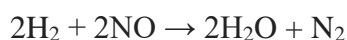
(a) ethanol only

(b) ethanal and methanal

(c) propanal and methanal

(d) methanal only

14. The unit of rate constant for the reaction



which has rate = $K[\text{H}_2][\text{NO}]^2$, is

(a) $\text{mol L}^{-1} \text{s}^{-1}$

(b) s^{-1}

- (c) $\text{mol}^{-2} \text{L}^2 \text{s}^{-1}$
(d) mol L^{-1}

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 and reason are true, and reason is the correct explanation of the assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is not true but reason is true.
(d) Both assertion and reason are false.

15. Assertion :- Actinoids form relatively less stable complexes as compared to lanthanoids.
Reason :- Actinoids can utilise their 5f orbitals along with 6d orbitals in bonding but lanthanoids do not use their 4f orbital for bonding.

16. Assertion : ter – Butyl methyl ether is not prepared by the reaction of ter-butyl bromide with sodium methoxide.

Reason : Sodium methoxide is a strong nucleophile.

17. Assertion : Acylation of amines gives a monosubstituted product whereas alkylation of amines gives the polysubstituted product.

Reason : Acyl group sterically hinders the approach of further acyl groups

18. Assertion : D (+) – Glucose is dextrorotatory in nature.

Reason : ‘D’ represents its dextrorotatory nature.

SECTION B

19. From the given cells: Lead storage cell, Mercury cell, Fuel cell and Dry cell Answer the following:

- (i) Which cell is used in hearing aids?
(ii) Which cell was used in Apollo Space Programme?

20. A first order reaction takes 20 minutes for 25% decomposition. Calculate the time when 75% of the reaction will be completed.

21. Name the following coordination compounds according to IUPAC system of nomenclature: (i) $[\text{NiCl}_4]^{2-}$ (ii) $\text{K}_3[\text{Al}(\text{C}_2\text{O}_4)_3]$

22. Give a chemical test to distinguish between $\text{C}_2\text{H}_5\text{Br}$ and $\text{C}_6\text{H}_5\text{Br}$.

23. Write the structural and functional difference between DNA and RNA.

OR

Describe what you understand by primary structure and secondary structure of proteins.

24. Illustrate the following name reactions giving a chemical equation in each case:

- (i) Clemmensen reaction (ii) Cannizzaro’s reaction.

OR

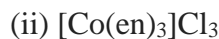
Give reasons:

- (a) HCHO is more reactive than $\text{CH}_3\text{-CHO}$ towards the addition of HCN.
(b) pKa of $\text{NO}_2\text{—CH}_2\text{—COOH}$ is lower than that of $\text{CH}_3\text{—COOH}$.
(c) Alpha hydrogen of aldehydes and ketones is acidic in nature.

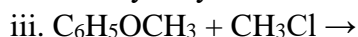
25. Calculate the factor by which the rate of I order reaction is increased for a temperature rise of 10°C from 25°C to 35°C. The energy of activation is 35 kcal mol⁻¹.

SECTION C

26. Write the state of hybridization, the shape and the magnetic behaviour of the following complex entities:



27. Predict the products of the following reactions



28. Calculate the mass of compound (molar mass = 256 g mol⁻¹) to be dissolved in 75 g of benzene to lower its freezing point by 0.48 K (K_f = 5.12 K kg mol⁻¹).

29. How would you account for the following:

(a) Electrophilic substitution in case of aromatic amines takes place more readily than benzene.

(b) Ethanamide is a weaker base than ethanamine

30. Answer the following:

(i) Haloalkanes easily dissolve in organic solvents, why?

(ii) What is known as a racemic mixture? Give an example.

(iii) Of the two bromoderivatives, C₆H₅CH(CH₃)Br and C₆H₅CH(C₆H₅)Br, which one is more reactive in S_N1 substitution reaction and why?

OR

(i) The treatment of alkyl chlorides with aq KOH leads to the formation of alcohols but in presence of alcoholic KOH, alkenes are the major products. Explain.

(ii) Haloalkanes react with KCN to form alkyl cyanides as major product while AgCN form isocyanide as the chief product. Explain.

SECTION D

31. Read the passage to answer the questions given below:

Ideal Solution An ideal solution is a solution where the intermolecular interactions between solute-solute (A-A) and solvent-solvent (B-B) are similar to the interaction between solute-solvent (A-B). An ideal solution fulfils the following criteria: • It obeys Raoult's law for all the concentration and temperature ranges. Which states that the partial vapour pressure of each component is proportional to the mole fraction of the component in a solution at a given temperature. • The enthalpy of mixing is zero, i.e. $\Delta H_{\text{mix}} = 0$. It means that no heat is absorbed or released. • The volume of mixing is zero, $\Delta V_{\text{mix}} = 0$. It means that the volume of the solution is equal to the sum of the volume of components. The ideal solution is possible with components of the same size and polarity. There is no association, dissociation or reaction taking place between components. A perfect ideal solution is rare but some solutions are near to the ideal solution. Examples are Benzene and toluene, hexane and heptane, bromoethane and chloroethane, chlorobenzene and bromobenzene, etc.

Non-ideal Solution When a solution does not obey Raoult's law for all the concentration and temperature ranges it is known as a non-ideal solution. A non-ideal solution may show positive or negative

deviation from Raoult's law. ΔH_{mix} and ΔV_{mix} for non-ideal solutions are not equal to zero. a) Non-ideal solution showing positive deviation Here the total vapour pressure is higher than that calculated from Raoult's equation. The interaction between solute-solvent (A-B) is weaker than those of pure components (A-A or B-B). The ΔH_{mix} and ΔV_{mix} are positive. E.g. ethanol and acetone, carbon disulphide and acetone, acetone and benzene, etc. b) Non-ideal solution showing negative deviation Here the total vapour pressure is lower than that calculated from Raoult's equation. The interaction between solute-solvent (A-B) is stronger than those of pure components (A-A or B-B). The ΔH_{mix} and ΔV_{mix} are negative. E.g. phenol and aniline, chloroform and acetone, etc.

(i). Give example of solution showing negative deviation

(ii) What type of interaction between solute and solvent(A &B) for ideal solution?

(iii)What is the nature of ΔH of mixing for solution showing negative and positive deviation
OR

(iii) Define Azeotrope mixture showing negative deviation with one example.

32. Read the passage to answer the questions given below:

When a protein in its native form, is subjected to physical changes like change in temperature or chemical changes like change in pH, the hydrogen bonds are disturbed. Due to this, globules unfold and helix get uncoiled and protein loses its biological activity. This is called denaturation of protein. The denaturation causes change in secondary and tertiary structures but primary structures remain intact. Examples of denaturation of protein are coagulation of egg white on boiling, curding of milk, formation of cheese when an acid is added to milk.

(i)How many peptide bonds are formed when four amino acids combined?

(ii)Write the structure of zwitter ion of amino acids.

(iii)Differentiate between essential and non essential aminoacids with examples

OR

(iii) Give differences between fibrous protein and globular protein.

SECTION E

33. A compound 'X' ($\text{C}_2\text{H}_4\text{O}$) on oxidation gives 'Y' ($\text{C}_2\text{H}_4\text{O}_2$). 'X' undergoes haloform reaction. On treatment with HCN 'X' forms a product 'V' which on hydrolysis gives 2-hydroxy propanoic acid.

(i) Write down structures of 'X' and 'Y'.

(ii) Name the product when 'X' reacts with dil. NaOH.

(iii) Write down the equations for the reactions involved

OR

- (i) Fluoro acetic acid is a stronger acid than acetic acid.
- (ii) Carboxylic acids have higher boiling points than alcohols of same no. of carbon atoms.
- (iii) Ethanoic acid has molar mass of 120 in vapour state.

34. Explain giving reasons: (1½, 1½, 2)

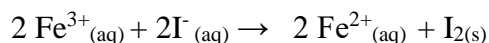
- (a) Why is the enthalpy of atomization increases up to the middle of transition series and then decreases.
- (b) What is the reason of transition elements to exhibit variable oxidation state?
- (c) Why E° values for Mn, Ni and Zn are more negative than expected?

OR

Comment on the following:

- (a) Zr and Hf have similar sizes
- (b) Actinoids show greater no. of oxidation state than Lanthanoids.
- (c) The 4d and 5d series of transition metals have more frequent metal-metal bonding in their compound than in 3d metals.

35. (a) The cell in which the following reaction occurs: (3,2)



has $E^\circ_{\text{cell}} = 0.236 \text{ V}$ at 298K. Calculate the standard Gibbs energy and equilibrium constant of the cell reaction. (Antilog of 6.5 = 3.162×10^6 ; of 7.983 = 9.616×10^7 ; of 8.5 = 3.162×10^8)

- (b) Calculate the pH of the half-cell: Pt, $\text{H}_2/\text{H}_2\text{SO}_4$. The oxidation electrode potential is = 0.3 V

OR

(a) The molar conductivity of a 1.5 M solution of an electrolyte is found to be $138.9 \text{ S cm}^2 \text{ mol}^{-1}$. Calculate the conductivity of the solution. (2,2,1)

(b) Calculate the strength of the current required to deposit 1.2 g of magnesium from the molten MgCl_2 in 1 hour.

(c) Why a cell stops working after sometime?

SAMPLE PAPER SET : 4

CLASS - XII
TIME :3H

SUBJECT: CHEMISTRY
MM: 70

QUESTION PAPER

General Instructions:

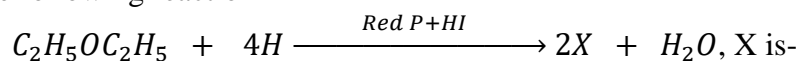
Read the following instructions carefully.

- a) There are **35** questions in this question paper with internal choice.
- b) SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
- c) SECTION B consists of 7 very short answer questions carrying 2 marks each.
- d) SECTION C consists of 5 short answer questions carrying 3 marks each.
- e) SECTION D consists of 2 case- based questions carrying 4 marks each.
- f) SECTION E consists of 3 long answer questions carrying 5 marks each.
- g) All questions are compulsory.**
- h) Use of log tables and calculators is not allowed**

SECTION A

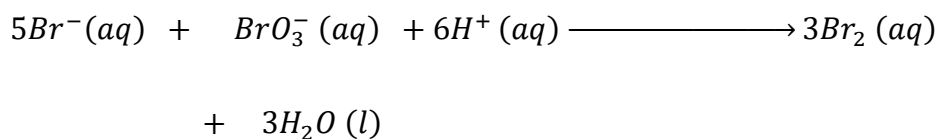
The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

1. In the following reaction-



- i. Ethane
 - ii. Ethylene
 - iii. Butane
 - iv. Propane
2. Reaction of $C_6H_5CH_2Br$ with aqueous sodium hydroxide follows:
- i. S_N1 reaction
 - ii. S_N2 reaction
 - iii. Any of the above two depending upon the temperature of the reaction.
 - iv. Saytzeff rule
3. Lanthanoid contraction is caused due to
- i. Atomic number
 - ii. Size of 4f orbitals
 - iii. Effective nuclear charge
 - iv. Poor shielding effect of 4f electrons

4. Which of the following expression is correct for the rate of reaction given below?

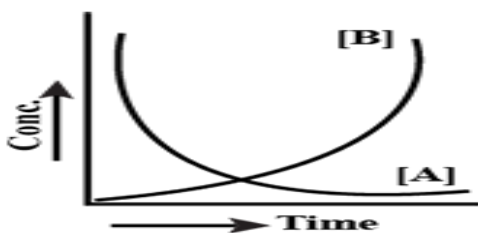


- i. $\frac{\Delta[\text{Br}^-]}{\Delta t} = 5 \frac{\Delta[\text{H}^+]}{\Delta t}$
- ii. $\frac{\Delta[\text{Br}^-]}{\Delta t} = \frac{6}{5} \frac{\Delta[\text{H}^+]}{\Delta t}$
- iii. $\frac{\Delta[\text{Br}^-]}{\Delta t} = \frac{5}{6} \frac{\Delta[\text{H}^+]}{\Delta t}$
- iv. $\frac{\Delta[\text{Br}^-]}{\Delta t} = 6 \frac{\Delta[\text{H}^+]}{\Delta t}$

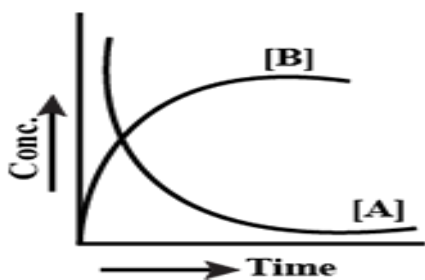
5. An electrochemical cell behaves like an electrolytic cell when

- i. $E_{\text{cell}} = E_{\text{external}}$
- ii. $E_{\text{cell}} = 0$
- iii. $E_{\text{external}} > E_{\text{cell}}$
- iv. $E_{\text{external}} < E_{\text{cell}}$

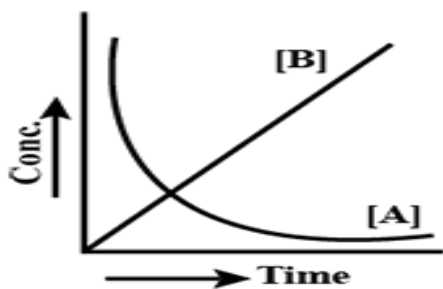
6. Consider the reaction $\text{A} \rightarrow \text{B}$; the concentration of both the reactants and the products varies exponentially with time. Which of the following figures correctly describes the change in concentration of reactants and products with time?



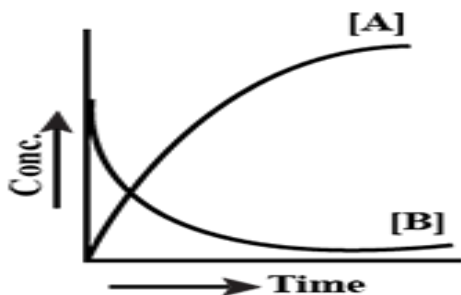
i.



ii.



iii.



iv.

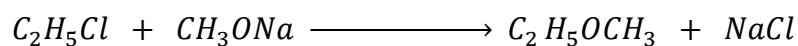
7. Propanamide on reaction with bromine in aqueous NaOH gives:

- i. Propanamine
- ii. Ethanamine
- iii. N-Methylethanamine
- iv. Propanenitrile

8. Atomic number of Mn, Fe and Co are 25, 26 and 27 respectively. Which of the following inner orbital octahedral complex ions are diamagnetic?

- i. $[\text{Co}(\text{NH}_3)_6]^{3+}$
- ii. $[\text{Mn}(\text{CN})_6]^{3-}$
- iii. $[\text{Fe}(\text{CN})_6]^{3-}$
- iv. [None of these]

9. The following reaction is-



- i. Mendius Reduction
- ii. Carbylamine reaction
- iii. Williamson's synthesis
- iv. Finkelstein reaction

10. Methylamine reacts with HNO_2 to form _____

- i. $\text{CH}_3 - \text{O} - \text{N}=\text{O}$
- ii. $\text{CH}_3 - \text{O} - \text{CH}_3$
- iii. CH_3OH
- iv. CH_3CHO

11. The conductivity of electrolytic conductors is due to _____

- i. Flow of free moving electrons.
- ii. Movement of ions
- iii. Either movement of electrons or ions
- iv. None of above

12. For a zero-order reaction, the slope in the plot of [R] vs. time is:

- i. $\frac{-k}{2.303}$
- ii. -k
- iii. $\frac{+k}{2.303}$
- iv. +k

13. Which of the following options are correct for $[\text{Fe}(\text{CN})_6]^{3-}$ complex?

- i. Sp^3 hybridisation
- ii. Sp^3d^2 hybridisation
- iii. Paramagnetic
- iv. Diamagnetic

14. What kind of compounds undergo Cannizaro reaction?

- i. Ketones with no α - hydrogen
- ii. Aldehydes with α - hydrogen
- iii. Carboxylic acids with α - hydrogen
- iv. Aldehydes with no α - hydrogen

15. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion (A): Ethers behave as bases in the presence of mineral acids.

Reason (R): Due to presence of lone pair of electrons on oxygen.

Select the most appropriate answer from the options given below:

- a. Both A and R are true and R is the correct explanation of A
- b. Both A and R are true but R is not the correct explanation of A.
- c. A is true but R is false.
- d. A is false but R is true.

16. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion (A): D (+)- Glucose is dextrorotatory in nature.

Reason (R): 'D' represents its dextrorotatory nature.

Select the most appropriate answer from the options given below:

- a) Both A and R are true and R is the correct explanation of A
- b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false.
- d) A is false but R is true.

17. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion (A): In transition elements, the ns orbital is filled up first and (n-1)d afterwards. During ionization, ns electrons are lost prior to (n-1)d electrons.

Reason (R): The effective nuclear charge felt by (n-1)d electrons is higher as compared to that by ns electrons.

Select the most appropriate answer from the options given below:

- a) Both A and R are true and R is the correct explanation of A.
- b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false.
- d) A is false but R is true.

18. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion(A): Aniline does not undergo Friedel-Crafts reaction.

Reason (R) : -NH₂ group of aniline reacts with AlCl₃ (Lewis acid) to give acid-base reaction.

Select the most appropriate answer from the options given below:

- a) Both A and R are true and R is the correct explanation of A
- b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false.
- d) A is false but R is true.

SECTION B

This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.

19. A first order reaction has a rate constant $1.15 \times 10^{-3} \text{ s}^{-1}$. How long will 5 g of this

reactant take to reduce to 3g?

OR

- a) What is the order of reaction whose rate constant has same units as the rate of reaction?
b) For a reaction $A + H_2O \longrightarrow B$, Rate $\propto [A]$. What is the order of reaction?

20. What happens when D – glucose is treated with the following reagents

- a) Bromine water
b) HNO_3

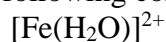
21. With the help of resonating structures explain the effect of nitro group at ortho position in chlorobenzene.

OR

Carry out the following conversion in not more than 2 steps:

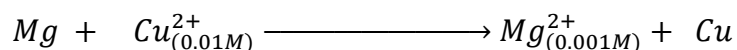
- a) Aniline to chlorobenzene
b) 2-Bromopropane to 1-Bromopropane

22. (a) Using crystal field theory, write the electronic configuration of iron ion in the following complex ion. Also predict its magnetic behaviour:



(b) Predict the geometry of $[Ni(CN)_4]^{2-}$

23. E^0_{cell} for the given redox reaction is 2.71V.



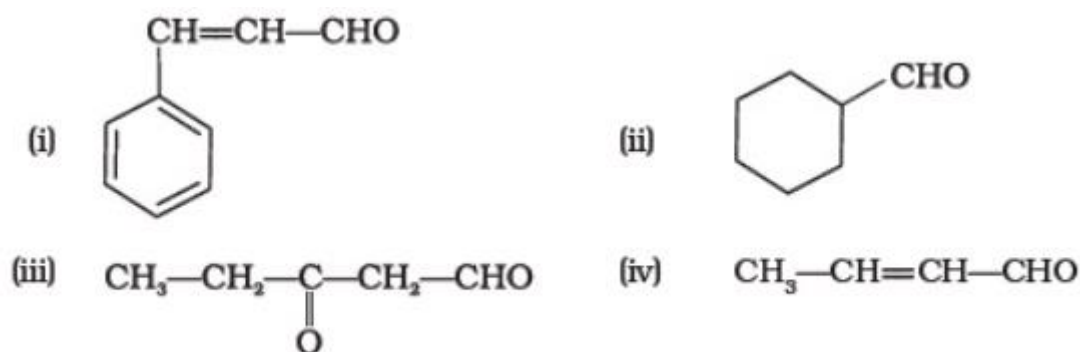
Calculate E_{cell} for the reaction. Write the direction of flow of current when an external opposite potential applied is:

- a) Less than 2.71V
b) Greater than 2.71V

24. Explain how and why will the rate of reaction for a given reaction be affected when

- a) a catalyst is added
b) the temperature at which the reaction was taking place is decreased.

25. Write the IUPAC names of the following :



SECTION C

This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.

26. Write the equations for the following reactions:

- Reimer Tieman Reaction
- Coupling reaction
- Kolbe's reaction

27. Using valence bond theory, predict following in $[\text{CO}(\text{CN})_6]^{3-}$

- Hybridization
- Magnetic behaviour
- Geometry of the complex ion

28. Give reasons:

- Cooking is faster in pressure cooker than in cooking pan.
- Red blood cells (RBCs) shrink when placed in saline water but swells in distilled water.

29. How would you account for the following :

- Aniline is a weaker base than cyclohexyl amine.
- Methylamine in aqueous medium gives reddish-brown precipitate with FeCl_3
- Electrophilic substitution in case of aromatic amines takes place more readily than benzene.

OR

Give the chemical tests to distinguish between the following pairs of compounds :

- Ethyl amine and Aniline
- Aniline and Benzylamine
- Aniline and N-methylaniline

30. (a) Why are alkyl halides are insoluble in water?

(b) Why is butan-1-chloride is optically inactive but butan-2-chloride is optically active in nature?

(c) Although Chlorine is an electron withdrawing group yet it is ortho, para directing in electrophilic aromatic substitution reactions. Why?

OR

- (a) Rearrange the following in increasing ease of dehydrohalogenation:
 $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$, $\text{CH}_3\text{CHClCH}_3$, $\text{CH}_3\text{CCl}(\text{CH}_3)_2$
- (b) Arrange the following in decreasing order of reactivity towards $\text{S}_\text{N}2$ reaction:
 $\text{C}_2\text{H}_5\text{Br}$, $\text{C}_2\text{H}_5\text{I}$, $\text{C}_2\text{H}_5\text{Cl}$
- (c) Arrange the following in decreasing order of reactivity towards $\text{S}_\text{N}1$ reaction:
 $(\text{CH}_3)_3\text{CBr}$, $(\text{CH}_3)_2\text{CHBr}$, $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$

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.

31. Proteins are the most abundant biomolecules of the living system. The chief sources of protein are milk, cheese, pulses, fish, meat, peanuts, etc. They are found in every part of the body and form a fundamental basis of structure and functions of life. These are also required for growth and maintenance of body. The word protein is derived from Greek word 'proteios' meaning 'primary' or 'of prime importance'. Chemically, proteins are the polymers in which the monomeric units are the α -amino acids. Amino acids contain amino ($-\text{NH}_2$) and carboxyl ($-\text{COOH}$) functional groups. Depending upon the relative position of amino group with respect to carboxyl group, the amino acids can be classified as α , β , γ , δ Amino acids which are synthesized by the body are called non-essentials amino acid. On the other hand those amino acids which cannot be synthesized in the human body and are supplied in the form of diet (because they are required for proper health and growth) are called essential amino acids.

- a. Amino acids show amphoteric behavior. Why?
- b. _____ is a basic amino acid ?
- c. What type of bonding helps in stabilizing the α -helix structure of proteins ?
- d. What do you mean by denaturation of protein. Give one example.

OR

What is meant by a peptide linkage? Explain with one example.

32. Henna is investigating the melting point of different salt solutions. She makes a salt solution using 10 mL of water with a known mass of NaCl salt. She puts the salt solution into a freezer and leaves it to freeze. She takes the frozen salt solution out of the freezer and measures the temperature when the frozen salt solution melts. She repeats each experiment.

S.No	Mass of the salt used in g	Melting point in $^{\circ}\text{C}$	
		Readings Set 1	Reading Set 2
1	0.3	-1.9	-1.9
2	0.4	-2.5	-2.6
3	0.5	-3.0	-5.5
4	0.6	-3.8	-3.8
5	0.8	-5.1	-5.0
6	1.0	-6.4	-6.3

Assuming the melting point of pure water as 0°C , answer the following questions:

- One temperature in the second set of results does not fit the pattern. Which temperature is that? Justify your answer.
- Why did Henna collect two sets of results?
- In place of NaCl, if Henna had used glucose, what would have been the melting point of the solution with 0.6 g glucose in it?

OR

What is the predicted melting point if 1.2 g of salt is added to 10 mL of water? Justify your answer.

SECTION E

33. The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.

- The resistance of 0.01 M NaCl solution at 25°C is $200\ \Omega$. The cell constant of the conductivity cell used is unity. Calculate the molar conductivity of the solution.
- When acidulated water (dilute H_2SO_4) is electrolysed, will the pH of the solution be affected? Justify your answer.
- Which gas is evolved at cathode when an aqueous solution of NaCl is electrolysed?

OR

- Consider a cell given below
 $\text{Cu} | \text{Cu}^{2+} || \text{Cl}^- | \text{Cl}_2, \text{Pt}$
Write the reaction that occur at anode and cathode.
- The molar conductivity of a 1.5 M solution of an electrolyte is found to be $138.9\ \text{S cm}^2\ \text{mol}^{-1}$. Calculate the conductivity of the solution.

c) What flows in the internal circuit of a galvanic cell?

34. An organic compound (A) has a characteristic odor. On treatment with NaOH, it forms two compounds (B) and (C). Compound (B) has molecular formula C_7H_8O which on oxidation gives back (A). The compound (C) is a sodium salt of an acid. When (C) is treated with soda lime it yields an aromatic hydrocarbon (D).

- Deduce the structures of (A), (B), (C) and (D).
- Write the sequence of reactions involved

OR

A compound 'X' (C_2H_4O) on oxidation gives 'Y' ($C_2H_4O_2$). 'X' undergoes haloform reaction. On treatment with HCN 'X' forms a product 'Y' which on hydrolysis gives 2-hydroxy propanoic acid.

- Write down structures of 'X' and 'Y'.
- Name the product when 'X' reacts with dil NaOH.
- Write down the equations for the reactions involved.

35. Answer the following:

- Out of Ag_2SO_4 , CuF_2 , MgF_2 , $CuCl$ which compound will be coloured?
- Mn (II) shows maximum paramagnetic character amongst the divalent ions of the first transition series. Why?
- Explain why Ce^{+4} is a stronger oxidizing agent ?
- Why is $K_2Cr_2O_7$ will generally preferred over $Na_2Cr_2O_7$ in volumetric analysis although both are oxidizing agent.
- What is the effect of pH on dichromate ion solution?

SAMPLE PAPER SET : 5

CLASS - XII
TIME :3HRS

SUBJECT: CHEMISTRY
MM: 70

General Instructions:

Read the following instructions carefully.

- There are 35 questions in this question paper with internal choice.
- SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
- SECTION B consists of 7 very short answer questions carrying 2 marks each.
- SECTION C consists of 5 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 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.

Q-1- What is the mass percentage of carbon tetrachloride if 22g of benzene is dissolved in 122g of carbon tetrachloride?

- | | |
|------------|-------------|
| (a) 84.72% | (b) 15.28 % |
| (c) 50% | (d) 44% |

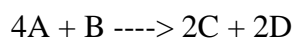
Q-2 2g of sugar is added to one litre of water to give sugar solution. What is the effect of addition of sugar on the boiling point and freezing point of water?

- Both boiling point and freezing point increase.
- Both boiling point and freezing point decrease.
- Boiling point increases and freezing point decreases.
- Boiling point decreases and freezing point increases.

Q-3- If the concentration is expressed in mol litre⁻¹ and time in second, then the units of rate constant for the first order reactions are

- | | |
|---|--|
| (a) Mol litre ⁻¹ s ⁻¹ | (b) Mol ⁻¹ litre s ⁻¹ |
| (c) s ⁻¹ | (d) Mol ² litre ⁻² s ⁻¹ |

Q-4- Which of the following statement is not correct for the reaction?



- The rate of disappearance of B is one-fourth the rate of disappearance of A
- The rate of appearance of C is one-half the rate of disappearance of B
- The rate of formation of D is one-half the rate of consumption of A
- The rate of formation of C and D are equal.

Q-5- HCl is not used to make the medium acidic in oxidation reactions of KMnO_4 in acidic medium because:-

- (a) Both HCl and KMnO_4 acts as oxidizing agents.
- (b) KMnO_4 oxidises HCl to Cl_2 which also is an oxidizing agent.
- (c) KMnO_4 is a weaker oxidizing agent
- (d) KMnO_4 acts as a reducing agent in the presence of HCl

Q-6- Among the following which are ambidentate ligands?

- (i) SCN^-
- (ii) NO^{-3}
- (iii) NO^{-2}
- (iv) $\text{C}_2\text{O}_2^{-4}$

- (a) (i) and (iii)
- (b) (i) and (iv)
- (c) (ii) and (iii)
- (d) (ii) and (iv)

Q-7- For the square planar complex $[\text{M}_{abcd}]$ where M is the central atom and a, b, c, d are monodentate ligands, the number of possible geometrical isomers are

- (a) 1
- (b) 2
- (c) 3
- (d) 4

Q-8- Phenol can be distinguished from ethanol by the reaction with

- a) Br_2 water
- b) Na
- c) Cl_2 water
- d) All above

Q-9- Salicylic acid on heating with acetic anhydride in basic medium gives

- a) Aspirin
- b) Methyl salicylate
- c) Phenyl salicylate
- d) Acetyl salicylate

Q-10- Through which of the following reactions number of carbon atoms can be increased in the chain?

- (a) Grignard reaction
- (b) Cannizzaro's reaction
- (c) Rosenmund Reductions
- (d) HVZ reaction

Q-11-What is the test to differentiate between penta-2-one and pentan-3-one?

- (a) Iodoform test
- (b) Benedict's test
- (c) Fehling's test
- (d) Aldol condensation test

Q-12-The best oxidising agent- for oxidation of $\text{CH}_3\text{-CH}=\text{CH-CHO}$ to $\text{CH}_3\text{-CH}=\text{CH-COOH}$ is

- (a) Bayer's reagent
- (b) Tollen's reagent
- (c) Schiff's reagent
- (d) Acidified dichromate

Q-13- Identify the correct IUPAC name

- (a) $(\text{CH}_3\text{CH}_2)_2\text{NCH}_3$ = N-Ethyl-N-methylethanamine
- (b) $(\text{CH}_3)_3\text{CNH}_2$ = 2-methylpropan-2-amine
- (c) $\text{CH}_3\text{NHCH}(\text{CH}_3)_2$ = N-Methylpropan-2-amine
- (d) $(\text{CH}_3)_2\text{CHNH}_2$ = 2, 2-Dimethyl-N-propanamine

Q-14- Arrange the following compounds in increasing order of basicity:

CH_3NH_2 , $(\text{CH}_3)_2\text{NH}$, NH_3 , $\text{C}_6\text{H}_5\text{NH}_2$

- (a) $\text{C}_6\text{H}_5\text{NH}_2 < \text{NH}_3 < (\text{CH}_3)_2\text{NH} < \text{CH}_3\text{NH}_2$
- (b) $\text{CH}_3\text{NH}_2 < (\text{CH}_3)_2\text{NH} < \text{NH}_3 < \text{C}_6\text{H}_5\text{NH}_2$
- (c) $\text{C}_6\text{H}_5\text{NH}_2 < \text{CH}_3\text{NH}_2 < (\text{CH}_3)_2\text{NH}$
- (d) $(\text{CH}_3)_2\text{NH} < \text{CH}_3\text{NH}_2 < \text{C}_6\text{H}_5\text{NH}_2$

15. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion:- If in a zero order reaction, the concentration of the reactant is doubled, the half-life period is also doubled.

Reason:- For a zero order reaction, the rate of reaction is independent of initial concentration

Select the most appropriate answer from the options given below:

- a. Both A and R are true and R is the correct explanation of A
- b. Both A and R are true but R is not the correct explanation of A.
- c. A is true but R is false.
- d. A is false but R is true.

Q-16- Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion :- Actinoids form relatively less stable complexes as compared to lanthanoids.

Reason :- Actinoids can utilise their 5f orbitals along with 6d orbitals in bonding but lanthanoids do not use their 4f orbital for bonding.

Select the most appropriate answer from the options given below:

- a. Both A and R are true and R is the correct explanation of A
- b. Both A and R are true but R is not the correct explanation of A.

- c. A is true but R is false.
- d. A is false but R is true.

Q-17- Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion : Phenol is more reactive than benzene towards electrophilic substitution reaction.

Reason : In the case of phenol, the intermediate carbocation is more resonance stabilized.

Select the most appropriate answer from the options given below:

- a. Both A and R are true and R is the correct explanation of A
- b. Both A and R are true but R is not the correct explanation of A.
- c. A is true but R is false.
- d. A is false but R is true.

Q-18- Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion: In methanol, all the four atoms are in the same plane

Reason: The carbon atom in methanol is sp^2 hybridized

Select the most appropriate answer from the options given below:

- a. Both A and R are true and R is the correct explanation of A
- b. Both A and R are true but R is not the correct explanation of A.
- c. A is true but R is false.
- d. A is false but R is true.

SECTION B

This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.

Q-19. 1.00 g of a non-electrolyte solute dissolved in 50 g of benzene lowered the freezing point of benzene by 0.40 K. The freezing point depression constant of benzene is $5.12 \text{ K kg mol}^{-1}$. Find the molar mass of the solute.

Q-20-(a) For a reaction $A + B \rightarrow P$, the rate law is given by, $r = k[A]^{1/2} [B]^2$. What is the order of this reaction?

(b) A first order reaction is found to have a rate constant $k = 5.5 \times 10^{-14} \text{ s}^{-1}$. Find the half-life of the reaction.

OR

A first order gas phase reaction: $A_2B_2(g) \rightarrow 2A(g) + 2B(g)$ at the temperature 400°C has the rate constant $k = 2.0 \times 10^{-4} \text{ sec}^{-1}$. What percentage of A_2B_2 is decomposed on heating for 900 seconds? (Antilog $0.0781 = 1.197$)

Q-21- Write following name reactions:

(a) Sandmeyer reaction

(b) Swart's reaction

OR

What are the enantiomers? Draw the possible enantiomers of 3-Methylpent-1-ene

Q-22- Explain why is Chlorobenzene difficult to hydrolyse than ethyl chloride ?

Q-23- The treatment of alkyl chlorides with aq KOH leads to the formation of alcohols but in presence of alcoholic KOH, alkenes are the major products. Explain.

Q-24- Write down the structures and names of the products formed when D-glucose is treated with (i) Hydroxylamine (ii) Acetic anhydride.

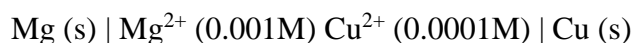
Q-25- Define the following (i) Peptide linkage (ii) Primary structure of proteins.

SECTION C

This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.

Q-26- Calculate the freezing point of a solution containing 0.5 g KCl (Molar mass = 74.5 g/ mol) dissolved in 100 g water, assuming KCl to be 92% ionised. K_f of water = 1.86 K kg / mol.

Q-27- Write the Nernst equation and emf of the following cell at 298K.



Given that, $E^0_{\text{Mg}^{2+}/\text{Mg}} = -2.36\text{V}$ $E^0_{\text{Cu}^{2+}/\text{Cu}} = 0.34\text{V}$

Q-28- Explain $[\text{Co}(\text{NH}_3)_6]^{3+}$ is an inner orbital complex whereas $[\text{Ni}(\text{NH}_3)_6]^{2+}$ is an outer orbital complex

Q-29- (a) How can we produce nitro benzene from phenol ?

(b) Why are reactions of alcohol/phenol and with acid chloride in the presence of pyridine?

(c) How is tert-butyl alcohol obtained from acetone?

Q-30- (i) Write two differences between DNA and RNA. (2)

(ii) Write one difference between nucleotide and nucleoside. (1)

OR

Define the following terms: (i) Glycosidic linkage (ii) Invert sugar (iii) Oligosaccharides

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.

Q-31- Read the passage given below and answer the following questions:

The constant k is the reaction rate constant or rate coefficient of the reaction. Its value may depend on conditions such as temperature, ionic strength, surface area of an adsorbent, or light irradiation.

The integrated rate equations can be fitted with kinetic data to determine the order of a reaction. The integrated rate equations for zero, first and second order reactions are:

Zero order: $[\text{A}] = -kt + [\text{A}]_0$

First order: $\log [\text{A}] = -kt/2.303 + \log [\text{A}]_0$

Second order: $1/[A] = kt + 1/[A]_0$

These equations can also be used to calculate the half-life periods of different reactions, which give the time during which the concentration of a reactant is reduced to half of its initial concentration, i.e. at time $t_{1/2}$; $[A] = [A]_0/2$

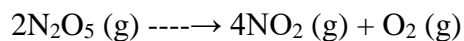
(a) For a second order reaction, rate at a particular time is x . If the initial concentration is tripled, the rate will become

(b) What will be the plot of $[A]$ versus t for zero order reaction

(c) The rate for the first order reaction is $0.0069 \text{ mol L}^{-1}\text{min}^{-1}$ and the initial concentration is 0.2 mol L^{-1} . The half-life period is

OR

The decomposition of nitrogen pentoxide:



Is a first order reaction. The plot of $\log [\text{N}_2\text{O}_5]$ vs time (min) has slope = -0.01389 . the rate constant k will be?

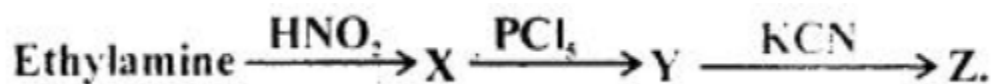
Q-32- Read the passage given below and answer the following questions:

The process of conversion of a primary aromatic amino compound into a diazonium salt is known as diazotization. This process is carried out by adding an aqueous solution of sodium nitrite to a solution of primary aromatic amine (e.g., aniline) in excess of HCl at a temperature below 5°C . Nitrous acid reacts with all classes of amines; The products obtained from these reactions depend on whether the amine is primary, secondary or tertiary and whether the amine is aliphatic or aromatic. Aliphatic Primary amines react with nitrous acid ($\text{NaNO}_2 + \text{HCl}$) to form alcohol as major product.

(a) Which of the following compounds reacts with NaNO_2 and HCl at $0-4^\circ\text{C}$ to give alcohol/phenol?

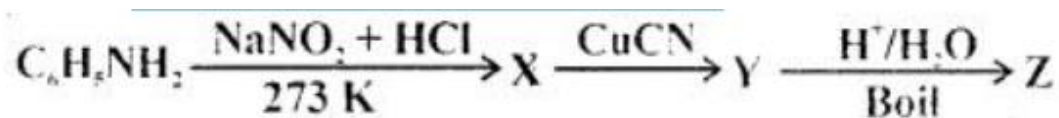
(b) Why is the reason for the stability of aromatic diazonium salts?

(c) The end product Z of the reaction



OR

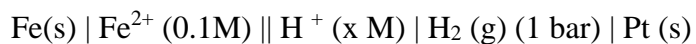
Identify 'Z' in the sequence?



SECTION-E

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

Q-33- (i) The emf of the following cell at 298K is 0.745V.



Given $E^0_{\text{Fe}^{2+}/\text{Fe}} = -0.44\text{V}$

Calculate the H^+ ions concentration of the solution at the electrode where hydrogen is being produced.

(ii) Why on dilution the \wedge_m of CH_3COOH increase drastically, while that of CH_3COONa increase gradually?

Q-34- Assign the reason for the following:-

- (a) Transition elements form complex compounds.
- (b) Transition elements are used to make alloy.
- (c) Transition elements form interstitial compounds
- (d). Of the d^4 species, Cr^{2+} is strongly reducing while Mn^{3+} is strongly oxidising.
- (e) La^{3+} ($Z=57$) and Lu^{3+} ($Z=71$) do not show any colouring solutions

Or

Assign the reason for the following

- (a) The enthalpies of atomization of transition elements are quite high.
- (b) The transition metals generally form coloured compounds.
- (c) Transition metals are well known to form complex compounds.
- (d) Transition metals and their compounds generally exhibit a paramagnetic behavior.
- (e) Zn, Cd, Hg are not regarded as a transition elements.

Q-35- (a) p-Dichlorobenzene has higher melting point and lower solubility than those of o- and m-isomers. Discuss.

(b) The treatment of alkyl chlorides with aq KOH leads to the formation of alcohols but in presence of alcoholic KOH, alkenes are the major products. Explain.

(c) What is Lucas reagent?

(d) Tert-butyl chloride reacts with aq. NaOH by SN_1 mechanism while n-butyl chloride reacts by SN_2 mechanism. Why ?

(e) Allyl Chloride is more reactive than n-propyl Chloride towards nucleophilic substitution reactions. Explain.

OR

How are the following conversions carried out?

(i) Ethanol to propanoic acid

(ii) Aniline to chlorobenzene

(iii) 2-Chlorobutane to 3,4-dimethylhexane

(iv) 2-Methyl-1-propene to 2-chloro-2-methylpropane

(v) Ethyl chloride to propanoic acid

SAMPLE PAPER SET : 6

CLASS - XII

SUBJECT: CHEMISTRY

TIME : 3Hrs

MM: 70

General Instructions:

Read the following instructions carefully.

- a) There are **35** questions in this question paper with internal choice.
- b) SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
- c) SECTION B consists of 7 very short answer questions carrying 2 marks each.
- d) SECTION C consists of 5 short answer questions carrying 3 marks each.
- e) SECTION D consists of 2 case- based questions carrying 4 marks each.
- f) SECTION E consists of 3 long answer questions carrying 5 marks each.
- g) **All questions are compulsory.**
- h) **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. Acid catalyzed hydration of alkene except ethene leads to the formation of :
 - a. Mixture of secondary and tertiary alcohols
 - b. Mixture of primary and secondary alcohols
 - c. Secondary or tertiary alcohols
 - d. Primary alcohol

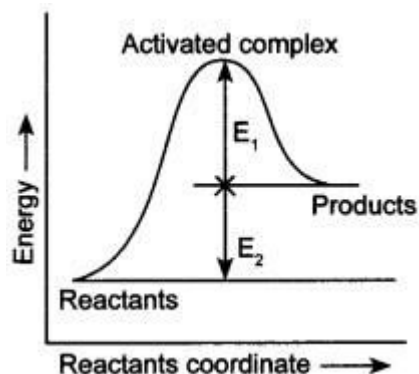
2. Molecules whose mirror image is non super imposable over them are known as chiral. Which of the following molecules is chiral in nature?
 - a. 2-Bromobutane
 - b. 1-Bromobutane
 - c. 2-Bromopropane
 - d. 2-Bromopropan-2-ol

3. Which of the following statements is not correct?
 - a. $\text{Na}_2\text{Cr}_2\text{O}_7$ is preferred over $\text{K}_2\text{Cr}_2\text{O}_7$ in volumetric analysis
 - b. $\text{K}_2\text{Cr}_2\text{O}_7$ solution in acidic medium is orange
 - c. $\text{K}_2\text{Cr}_2\text{O}_7$ solution becomes yellow on increasing the pH beyond 7
 - d. On passing H_2S through acidified $\text{K}_2\text{Cr}_2\text{O}_7$ solution, a milky colour is observed.

4. Which of the following is correct for a first order reaction?
 - a. $t_{1/2} \propto a$
 - b. $t_{1/2} \propto 1/a$
 - c. $t_{1/2} \propto a^0$

d. $t_{1/2} \propto a^2$

5. Consider the following diagram and mark the correct option:



- Activation energy of forward reaction is $E_1 + E_2$ and product is less stable than reactant.
- Activation energy of forward reaction is $E_1 + E_2$ and product is more stable than reactant.
- Activation energy of both forward and backward reaction is $E_1 + E_2$ and reactant is more stable than product.
- Activation energy of backward reaction is E_1 and product is more stable than reactant.

6. The charge required for the reduction of 1 mol of MnO_4^- to MnO_2 is

- 1 F
- 3 F
- 5 F
- 6 F

7. Which of the following is correct decreasing order of basicity of amines in gas phase?

- $(\text{CH}_3)_2\text{NH} > (\text{CH}_3)_3\text{N} > \text{CH}_3\text{NH}_2 > \text{NH}_3$
- $(\text{CH}_3)_3\text{N} > (\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2 > \text{NH}_3$
- $(\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2 > (\text{CH}_3)_3\text{N} > \text{NH}_3$
- $(\text{CH}_3)_3\text{N} > \text{CH}_3\text{NH}_2 > (\text{CH}_3)_2\text{NH} > \text{NH}_3$

8. From the stability constant (hypothetical values) given below, predict the most stable complex?

- $\text{Cu}^{2+} + 4\text{NH}_3 \rightleftharpoons [\text{Cu}(\text{NH}_3)_4]^{2+}$ ($k = 4.5 \times 10^{11}$)
- $\text{Cu}^{2+} + 2\text{en} \rightleftharpoons [\text{Cu}(\text{en})_2]^{2+}$ ($k = 3.0 \times 10^{15}$)
- $\text{Cu}^{2+} + 4\text{CN}^- \rightleftharpoons [\text{Cu}(\text{CN})_4]^{2-}$ ($k = 2.0 \times 10^{27}$)
- $\text{Cu}^{2+} + 4\text{H}_2\text{O} \rightleftharpoons [\text{Cu}(\text{H}_2\text{O})]^{2+}$ ($k = 9.5 \times 10^8$)

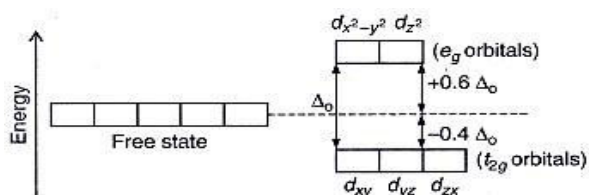
9. 'A' reacts with $\text{C}_2\text{H}_5\text{I}$ giving 'B' and NaI . Here 'A' and 'B' respectively, are:

- $\text{A} = \text{CH}_3\text{COONa}$, $\text{B} = \text{CH}_3\text{OCH}_3$
- $\text{A} = \text{C}_2\text{H}_5\text{ONa}$, $\text{B} = \text{C}_2\text{H}_5\text{OC}_2\text{H}_5$

- c. $A=C_2H_5OC_2H_5$, $B=C_2H_5OC_2H_5$
 d. $A=C_2H_5OH$, $B=C_2H_5OC_2H_5$

10. Which of the following when heated with a mixture of ethanamine and alcoholic potash gives ethyl isocyanide?
 a. 2-chloropropane
 b. 2,2-dichloropropane
 c. trichloromethane
 d. tetrachloromethane
11. Formaldehyde reacts with Grignard's reagent to give addition products which on hydrolysis give
 a. tertiary alcohols
 b. secondary alcohols
 c. primary alcohols
 d. carboxylic acids
12. The value of rate constant of a pseudo first order reaction:
 a. Depend on the concentration of reactants present in small amount
 b. Depend on the concentration of reactants present in excess amount
 c. Independent of the concentration of reactants
 d. Depend only on temperature
13. Clemmensen reduction of a ketone is carried out in the presence of which of the following :
 a. H_2 / Pt
 b. $LiAlH_4$
 c. Ethylene glycol / KOH
 d. $Zn - Hg / HCl$

14.



The above splitting of d – orbitals takes place in the formation of :

- a. tetrahedral complexes
 b. square planar complexes
 c. octahedral complexes
 d. both tetrahedral and square planar complexes .
15. Given below are two statements labelled as Assertion (A) and Reason (R)
Assertion (A): Bond angle in ether is slightly less than the tetrahedral angle.
Reason (R): There is a repulsion between the two bulky (-R) groups.
 Select the most appropriate answer from the options given below:
 a. Both A and R are true and R is the correct explanation of A
 b. Both A and R are true but R is not the correct explanation of A.
 c. A is true but R is false.

d. A is false but R is true.

16. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion (A): All naturally occurring α -amino acids except glycine are optically active.

Reason (R): Most naturally occurring amino acids have L-configuration.

- Both A and R are true and R is the correct explanation of A
- Both A and R are true but R is not the correct explanation of A.
- A is true but R is false.
- A is false but R is true.

17. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion : Aniline is stronger base than ammonia.

Reason : In aniline electron density decreases at nitrogen due to mesomeric effect.

- Both A and R are true and R is the correct explanation of A
- Both A and R are true but R is not the correct explanation of A.
- A is true but R is false.
- A is false but R is true.

18. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion (A): Ionic radii of M^{3+} ions of Lanthanoids decrease with increase in atomic number

Reason (R): M^{3+} ions of Lanthanoids have stable electronic configuration

- Both A and R are true and R is the correct explanation of A
- Both A and R are true but R is not the correct explanation of A.
- A is true but R is false.
- A is false but R is true.

SECTION B

This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.

19. The rate constant for a first order reaction is 60 s^{-1} . How much time will it take to reduce the initial concentration of the reactants to its $1/16^{\text{th}}$ value?

(Given: $\log 2 = 0.3010$)

20. a. Name the monomers that are obtained on hydrolysis of Lactose
b. Differentiate between amylose and amylopectin

OR

- Glucose on treating with HCN yield Cyanohydrin what does it indicate
- What does the symbols $\alpha, D, (-)$ indicate in α -D-(-)-Glucose

21. Which would undergo S_N2 reaction faster in the following pairs and why?

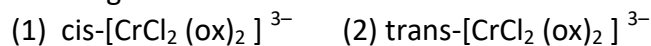
- 1- Bromo-2-methylbutane or 2- Bromo-2-methylbutane.
- 2-Bromopentane or 1-Bromopentane.

OR

Haloalkanes react with KCN to form alkyl cyanide as the main product while with AgCN it forms alkyl isocyanide as the chief product .Explain.

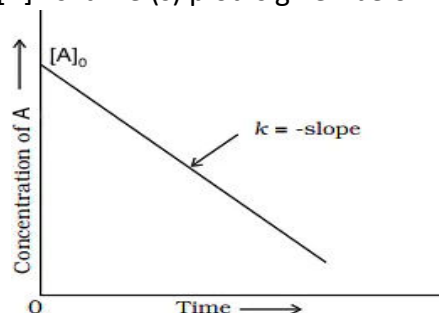
22. a. Write IUPAC name for the compound : $[\text{CoCl}_2(\text{en})_2]\text{Cl}$

b. Out of the following two coordination entities which is chiral (optically active) and Why ?



23. At 298 K, the molar conductivities at infinite dilution of NH_4Cl , NaOH and NaCl are 129.8, 217.4 and $108.9 \text{ Scm}^2\text{mol}^{-1}$ respectively. If molar conductivity of 0.01 M NH_4OH solution is $9.33 \text{ Scm}^2\text{mol}^{-1}$, calculate degree of dissociation of NH_4OH at this dilution.

24. For a certain chemical reaction variation in concentration $[\text{A}]$ vs. time (s) plot is given below:



- Predict the order of the given reaction?
- What is the unit of rate constant k ?

25. a Arrange the following compounds in an increasing order of their reactivity in nucleophilic addition reactions: Ethanal, Propanal, Propanone, and Butanone.

b Give a chemical test to distinguish between Ethanal and Propanal.

SECTION C

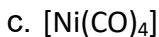
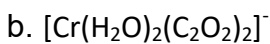
This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.

26. Write the equations for the following reaction:

- Propan-2-ol is heated with $\text{H}_3\text{PO}_4/440 \text{ K}$
- 2-Methoxy-2-methyl is treated with HI

c. Phenol is treated with carbondioxide in the presence of NaOH followed by acid catalysed hydration.

27. Compare the following complexes with respect to their shape, magnetic behaviour and the hybrid orbitals involved:



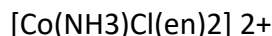
(At. No.: Co = 27, Cr = 24, Ni = 28)

OR

a. Write the IUPAC name of the isomer of the following complex:



b. Draw all the isomers (geometrical and optical) of:



28. Answer the following:

a. The boiling point of benzene is 353.23 K. When 1.80 g of a non-volatile solute was dissolved in 90 g of benzene, the boiling point is raised to 354.11 K. Calculate the molar mass of the solute. K_b for benzene is $2.53 \text{ K kg mol}^{-1}$

b. Why is freezing point depression of 0.1M sodium chloride solution nearly twice that of 0.1 M glucose solution?

29. Give reasons for **any 3** of the following observations:

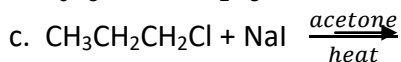
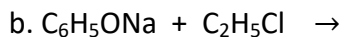
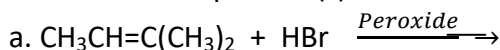
a. Diazonium salts of aromatic amines are more stable than those of aliphatic amines.

b. Aromatic primary amines cannot be prepared by Gabriel phthalimide synthesis.

c. Aniline does not undergo Friedel-Crafts reaction.

d. m-Nitroaniline is the dominating product than o- Nitroaniline during reaction with nitrating mixture at 288 K.

30. Write the main product(s) in each of the following reactions:



OR

a. What happens when:

(i) N-butylchloride is treated with alcoholic KOH

(ii) Chloroform is exposed to sunlight and air.

b. Write a chemical test to distinguish between Chloroethane and Chlorobenzene

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.

31. Proteins are the polymers of α -amino acids and they are connected to each other by peptide bond or peptide linkage. Chemically, peptide linkage is an amide formed between -COOH group and -NH₂ group. The reaction between two molecules of similar or different amino acids, proceeds through the combination of the amino group of one molecule with the carboxyl group of the other. This results in the elimination of a water molecule and formation of a peptide bond -CO-NH-. The product of the reaction is called a dipeptide because it is made up of two amino acids. For example, when carboxyl group of glycine combines with the amino group of alanine we get a dipeptide, glycylalanine. If a third amino acid combines to a dipeptide, the product is called a tripeptide. A tripeptide contains three amino strengthening acids linked by two peptide linkages. Similarly, when four, five or six amino acids are linked, the respective products are known as tetrapeptide, pentapeptide or hexapeptide, respectively. When the number of such amino acids is more than ten, then the products are called polypeptides. A polypeptide with more than hundred amino acid residues, having molecular mass higher than 10,000u is called a protein. However, the distinction between a polypeptide and a protein is not very sharp. Polypeptides with fewer amino acids are likely to be called proteins if they ordinarily have a well-defined conformation of a protein such as insulin which contains 51 amino acids. Proteins can be classified into two types on the basis of their molecular shape.

Fibrous proteins

Globular proteins

Answer the following questions:

- Write zwitter ion structure of amino acid.
- Which force/forces are responsible for a three dimensional structure of proteins.
- Define denaturation of Proteins.

OR

Write differences between Fibrous and Globular proteins. Give one example of each type.

32. When a solution does not obey Raoult's law over the entire range of concentration, then it is called non-ideal solution. The vapour pressure of such a solution is either higher or lower than that predicted by Raoult's law. If it is higher, the solution exhibits positive deviation and if it is lower, it exhibits negative deviation from Raoult's law.

The osmotic pressure of a solution is the excess pressure that must be applied to a solution to prevent osmosis, i.e., to stop the passage of solvent molecules through a Semipermeable

membrane into the solution. Osmotic pressure is colligative property as it depends on the number of solute molecules and not on their identity. For dilute solutions, it has been found experimentally that osmotic pressure is proportional to the molarity, C of the Solution at a given temperature T. Thus: $\pi = CRT$ Here π is the osmotic pressure and R is the gas constant .

- Define ideal solution.
- What kind of deviation is found in solution of alcohol in water?
- 200 cm³ of an aqueous solution of a protein contains 1.26 g of the protein. The osmotic pressure of such a solution at 300 K is found to be 2.57×10^{-3} bar. Calculate the molar mass of the protein.

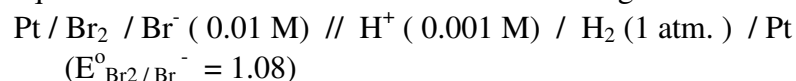
OR

Why Osmotic Pressure is used to measure the molar mass of biomolecules?

SECTION E

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

33. a. Write Nernst equation and calculate the EMF of the following cell at 298 K :-



- b. Write down the mechanism of rusting of iron

OR

- a. The resistance of a conductivity cell containing 10^{-3} M KCl solution at 25°C is 1500 Ω . What is the cell constant and molar conductivity if conductivity of 10^{-3} M KCl solution at 25°C is 1.5×10^{-4} S cm⁻¹?

- b. How many Faraday's are required for the following :-

- To get 0.5 moles of Ca from CaCl₂ .
- To decompose 8.7 moles MnO₄⁻ to give Mn⁺²

34. a. Arrange the following compounds in increasing order of their boiling points:



- b. Write the structure of alkene that on ozonolysis give ketones only

- c. 4-Nitro benzoic acid is more acidic than 4- methoxy benzoic acid. Give reason.

- d. Explain the following reaction

- Aldol condensation
- Etard reaction

OR

- a) Arrange the following compounds in increasing order of their acidity:

benzoic acid, nitro benzoic acid, methyl benzoic acid

- b) What happens when Phenyl magnesium bromide react with dry ice

- c) Write the reactions involved in the following:

- Hell-Volhard Zelinsky reaction.
- Decarboxylation reaction .
- Wolff-Kishner reduction.

35. Answer the following:

a. Describe the preparation of potassium permanganate.

b. How would you account for the following?

(i) With the same *d*-orbital configuration (d^4) Cr^{2+} is a reducing agent while Mn^{3+} is an oxidizing agent.

(ii) The actinoids exhibit a larger number of oxidation states than the corresponding members in the lanthanoid series.

(iii) Cu^{+1} is unstable in aqueous solution. Explain.

DAV CENTENARY PUBLIC SCHOOL, PASCHIM ENCLAVE, NEW DELHI-87

SAMPLE PAPER SET : 7

CLASS - XII

SUBJECT: CHEMISTRY

TIME :3H

MM: 70

General Instructions:

Read the following instructions carefully.

- a) There are 35 questions in this question paper with internal choice.
- b) SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
- c) SECTION B consists of 7 very short answer questions carrying 2 marks each.
- d) SECTION C consists of 5 short answer questions carrying 3 marks each.
- e) SECTION D consists of 2 case- based questions carrying 4 marks each.
- f) SECTION E consists of 3 long answer questions carrying 5 marks each.
- g) All questions are compulsory.
- h) 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. Monochlorination of toluene in sunlight followed by hydrolysis with aq. NaOH yields.

- (a) o-Cresol
- (b) m-Cresol
- (c) 2, 4-Dihydroxytoluene
- (d) Benzyl alcohol

2. Which of the following alkyl halides will undergo SN^1 reaction most readily?

- (a) $(CH_3)_3C-F$
- (b) $(CH_3)_3C-Cl$
- (c) $(CH_3)_3C-Br$
- (d) $(CH_3)_3C-I$

3. Generally transition elements form coloured salts due to the presence of unpaired electrons. Which of the following compounds will be coloured in solid state?

- (a) Ag_2SO_4
- (b) CuF_2

(c) ZnF_2

(d) Cu_2Cl_2

4. Radioactive disintegration is an example of

(a) zero order reaction

(b) first order reaction

(c) second order reaction

(d) third order reaction

5. $\Lambda_{m(\text{NH}_4\text{OH})}^0$ is equal to _____.

(a) $\Lambda_{m(\text{NH}_4\text{OH})}^0 + \Lambda_{m(\text{NH}_4\text{Cl})}^0 - \Lambda_{m(\text{HCl})}^0$

(b) $\Lambda_{m(\text{NH}_4\text{Cl})}^0 + \Lambda_{m(\text{NaOH})}^0 - \Lambda_{m(\text{NaCl})}^0$

(c) $\Lambda_{m(\text{NH}_4\text{Cl})}^0 + \Lambda_{m(\text{NaCl})}^0 - \Lambda_{m(\text{NaOH})}^0$

(d) $\Lambda_{m(\text{NaOH})}^0 + \Lambda_{m(\text{NaCl})}^0 - \Lambda_{m(\text{NH}_4\text{Cl})}^0$

6. Rate law for the reaction $\text{A} + 2\text{B} \rightarrow \text{C}$ is found to be $\text{Rate} = k[\text{A}][\text{B}]$ Concentration of reactant 'B' is doubled, keeping the concentration of 'A' constant, the value of rate constant will be_____.

(a) the same

(b) doubled

(c) quadrupled

(d) halved

7. Which of the following should be most volatile?

(a) $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$

(b) $(\text{CH}_3)_3\text{N}$

(c) $\text{CH}_3\text{CH}_2\text{NHCH}_3$

(d) $\text{CH}_3\text{CH}_2\text{CH}_3$

8. The colour of the coordination compounds depends on the crystal field splitting. What will be the correct order of absorption of wavelength of light in the visible region, for the complexes, $[\text{Co}(\text{NH}_3)_6]^{3+}$, $[\text{Co}(\text{CN})_6]^{3-}$, $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$

(a) $[\text{Co}(\text{CN})_6]^{3-} > [\text{Co}(\text{NH}_3)_6]^{3+} > [\text{Co}(\text{H}_2\text{O})_6]^{3+}$

(b) $[\text{Co}(\text{NH}_3)_6]^{3+} > [\text{Co}(\text{H}_2\text{O})_6]^{3+} > [\text{Co}(\text{CN})_6]^{3-}$

(c) $[\text{Co}(\text{H}_2\text{O})_6]^{3+} > [\text{Co}(\text{NH}_3)_6]^{3+} > [\text{Co}(\text{CN})_6]^{3-}$

(d) $[\text{Co}(\text{CN})_6]^{3-} > [\text{Co}(\text{NH}_3)_6]^{3+} > [\text{Co}(\text{H}_2\text{O})_6]^{3+}$

9. Chloro-Ethane reacts with Which of the Following to Give Diethyl Ether?

(a) NaOH

- (b) H_2SO_4
- (c) $\text{C}_2\text{H}_5\text{ONa}$
- (d) $\text{Na}_2\text{S}_2\text{O}_3$

10. Tertiary amines have lowest boiling points amongst isomeric amines because

- (a) they have highest molecular mass
- (b) they do not form hydrogen bonds
- (c) they are more polar in nature
- (d) they are most basic in nature

11. The reagent which does not react with both, acetone and benzaldehyde.

- (a) Sodium hydrogensulphite
- (b) Phenyl hydrazine
- (c) Fehling's solution
- (d) Grignard reagent

12. Consider the Arrhenius equation given below and mark the correct option. $k = A e^{-E_a/RT}$

- (a) Rate constant increases exponentially with increasing activation energy and decreasing temperature.
- (b) Rate constant decreases exponentially with increasing activation energy and decreasing temperature.
- (c) Rate constant increases exponentially with decreasing activation energy and decreasing temperature.
- (d) Rate constant increases exponentially with decreasing activation energy and increasing temperature.

13. When 1 mol $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ is treated with excess of AgNO_3 , 3 mol of AgCl are obtained. The formula of the complex is :

- (a) $[\text{CrCl}_3 (\text{H}_2\text{O})_3] \cdot 3\text{H}_2\text{O}$
- (b) $[\text{CrCl}_2 (\text{H}_2\text{O})_4] \text{Cl} \cdot 2\text{H}_2\text{O}$
- (c) $[\text{CrCl}(\text{H}_2\text{O})_5] \text{Cl}_2 \cdot \text{H}_2\text{O}$
- (d) $[\text{Cr}(\text{H}_2\text{O})_6] \text{Cl}_3$

14. In Clemmensen Reduction carbonyl compound is treated with _____.

- (a) Zinc amalgam + HCl
- (b) Sodium amalgam + HCl
- (c) Zinc amalgam + nitric acid
- (d) Sodium amalgam + HNO_3

15. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion (A): Bond angle in ethers is slightly less than the tetrahedral angle.

Reason (R): There is a repulsion between the two bulky (—R) groups.

Select the most appropriate answer from the options given below:

- a. Both A and R are true and R is the correct explanation of A.
- b. Both A and R are true but R is not the correct explanation of A.
- c. A is true but R is false.
- d. A is false but R is true.

16. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion (A): All naturally occurring α -aminoacids except glycine are optically active.

Reason : Most naturally occurring amino acids have L-configuration.

Select the most appropriate answer from the options given below:

- a. Both A and R are true and R is the correct explanation of A.
- b. Both A and R are true but R is not the correct explanation of A.
- c. A is true but R is false.
- d. A is false but R is true.

17. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion (A): Actinoids form relatively less stable complexes as compared to lanthanoids.

Reason : Actinoids can utilise their 5f orbitals along with 6d orbitals in bonding but lanthanoids do not use their 4f orbital for bonding.

Select the most appropriate answer from the options given below:

- a. Both A and R are true and R is the correct explanation of A.
- b. Both A and R are true but R is not the correct explanation of A.
- c. A is true but R is false.
- d. A is false but R is true.

18. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion (A): N-Ethylbenzene sulphonamide is soluble in alkali.

Reason : Hydrogen attached to nitrogen in sulphonamide is strongly acidic

Select the most appropriate answer from the options given below:

- a. Both A and R are true and R is the correct explanation of A.
- b. Both A and R are true but R is not the correct explanation of A.
- c. A is true but R is false.
- d. A is false but R is true.

SECTION B

This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.

19. Show that in a first order reaction, time required for completion of 99.9% is 10 times of half-life ($t_{1/2}$) of the reaction.
20. What happens when D-glucose is treated with the following reagents? (i) HI (ii) Bromine water.

Or

Enumerate the reactions of D-glucose which cannot be explained by its open chain structure.

21. Haloalkanes react with KCN to form alkyl cyanides as main product while AgCN forms isocyanides as the chief product. Explain.

Or

A hydrocarbon C_5H_{10} does not react with chlorine in dark but gives a single monochloro compound C_5H_9Cl in bright sunlight. Identify the hydrocarbon.

22. Give evidence that $[Co(NH_3)_5Cl]SO_4$ and $[Co(NH_3)_5(SO_4)]Cl$ are ionisation isomers.
23. Explain how rusting of iron is envisaged as setting up of an electrochemical cell.
24. Mention the factors that affect the rate of a chemical reaction.
25. Predict the products formed when cyclohexanecarbaldehyde reacts with $PhMgBr$ and then H_3O^+

SECTION C

This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.

26. Give equations of the following reactions:

- (i) Oxidation of propan-1-ol with alkaline $KMnO_4$ solution.
- (ii) Bromine in CS_2 with phenol.
- (iii) Dilute HNO_3 with phenol.

27. $[Cr(NH_3)_6]^{3+}$ is paramagnetic while $[Ni(CN)_4]^{2-}$ is diamagnetic. Explain why?

28. a. State Henry's law and mention some important applications.

b. Henry's law constant for CO_2 in water is 1.67×10^8 Pa at 298 K. Calculate the quantity of CO_2 in 500 mL of soda water when packed under 2.5 atm CO_2 pressure at 298 K.

29. Give reasons for any 3 of the following observations:

- (i) pK_b of aniline is more than that of methylamine.

(ii) Although amino group is o- and p- directing in aromatic electrophilic substitution reactions, aniline on nitration gives a substantial amount of m-nitroaniline.

(iii) Aniline does not undergo Friedel-Crafts reaction.

(iv) Ethylamine is soluble in water whereas aniline is not.

30. Explain why

(i) the dipole moment of chlorobenzene is lower than that of cyclohexyl chloride?

(ii) alkyl halides, though polar, are immiscible with water?

(iii) Grignard reagents should be prepared under anhydrous conditions?

Or

What happens when

(i) n-butyl chloride is treated with alcoholic KOH,

(ii) bromobenzene is treated with Mg in the presence of dry ether,

(iii) methyl bromide is treated with sodium in the presence of dry ether?

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.

31. Proteins are large, complex molecules that play many critical roles in the body. They do most of the work in cells and are required for the structure, function, and regulation of the body's tissues and organs.

Proteins are made up of hundreds or thousands of smaller units called amino acids, which are attached to one another in long chains. There are 20 different types of amino acids that can be combined to make a protein. The sequence of amino acids determines each protein's unique 3-dimensional structure and its specific function. Amino acids are coded by combinations of three DNA building blocks (nucleotides), determined by the sequence of genes.

answer the following questions:

a. What type of bonding helps in stabilising the α -helix structure of proteins?

b. What are the common types of secondary structure of proteins?

c. The melting points and solubility in water of amino acids are generally higher than that of the corresponding halo acids. Explain.

or

What are essential and non-essential amino acids? Give two examples of each type.

32. Osmotic pressure is the minimum pressure which needs to be applied to a solution to prevent the inward flow of its pure solvent across a semipermeable membrane. It is also defined as the measure of the tendency of a solution to take in a pure solvent by osmosis. Potential osmotic pressure is the maximum osmotic pressure that could develop in a solution if it were separated from its pure solvent by a semipermeable membrane.

Osmosis occurs when two solutions containing different concentrations of solute are separated by a selectively permeable membrane. Solvent molecules pass preferentially through the membrane from the low-concentration solution to the solution with higher solute concentration. The transfer of solvent molecules will continue until equilibrium is attained.

answer the following questions:

- a. What is “semi permeable membrane”?
- b. What are isotonic solutions ?
- c. Calculate the osmotic pressure in pascals exerted by a solution prepared by dissolving 1.0 g of polymer of molar mass 185,000 in 450 mL of water at 37°C

or

One mole of table salt is dissolved in one litre of water. At a temperature of 27°C, what would be the osmotic temperature of this solution?

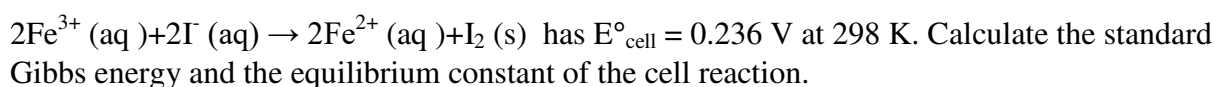
SECTION E

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

33. a. Calculate the emf of the cell in which the following reaction takes place:



b. The cell in which the following reaction occurs:



Or

a. A solution of $\text{Ni}(\text{NO}_3)_2$ is electrolysed between platinum electrodes using a current of 5 amperes for 20 minutes. What mass of Ni is deposited at the cathode?

b. Conductivity of 0.00241 M acetic acid is $7.896 \times 10^{-5} \text{ S cm}^{-1}$. Calculate its molar conductivity. If Λ^0 m for acetic acid is $390.5 \text{ S cm}^2 \text{ mol}^{-1}$, what is its dissociation constant?

34. An organic compound with the molecular formula $\text{C}_9\text{H}_{10}\text{O}$ forms 2,4-DNP derivative, reduces Tollens' reagent and undergoes Cannizzaro reaction. On vigorous oxidation, it gives 1,2-benzenedicarboxylic acid. Identify the compound.

or

An organic compound (A) (molecular formula $C_8H_{16}O_2$) was hydrolysed with dilute sulphuric acid to give a carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid produced (B). (C) on dehydration gives but-1-ene. Write equations for the reactions involved.

35. a. On what ground can you say that scandium ($Z = 21$) is a transition element but zinc ($Z = 30$) is not?
- b. The $E^0_{(M^{2+}/M)}$ value for copper is positive (+0.34V). What is possible reason for this?
- c. What is lanthanoid contraction?
- D. Why is the highest oxidation state of a metal exhibited in its oxide or fluoride only?
- e. What is the effect of increasing pH on a solution of potassium dichromate?

SAMPLE PAPER SET : 8

CLASS - XII

SUBJECT: CHEMISTRY

TIME :3H

MM: 70

Time: 3 hours General Instructions: Read the following instructions carefully.

- a) There are 35 questions in this question paper with internal choice.
- b) SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
- c) SECTION B consists of 7 very short answer questions carrying 2 marks each.
- d) SECTION C consists of 5 short answer questions carrying 3 marks each.
- e) SECTION D consists of 2 case- based questions carrying 4 marks each.
- f) SECTION E consists of 3 long answer questions carrying 5 marks each.
- g) All questions are compulsory.

SECTION A

1. The standard electrode potentials for the half cell reactions are:
$$\text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}^- \quad E^\circ = 0.76 \text{ V}$$
$$\text{Fe} \rightarrow \text{Fe}^{2+} + 2\text{e}^- \quad E^\circ = -0.41 \text{ V}$$
The emf of the cell reaction
$$\text{Fe}^{2+} + \text{Zn} \rightarrow \text{Zn}^{2+} + \text{Fe}$$
 is
 - (a) -0.35 V
 - (b) +0.35 V
 - (c) -1.17 V
 - (d) +1.17 V
2. In a reaction, $2\text{X} \rightarrow \text{Y}$, the concentration of X decreases from 0.50 M to 0.38 M in 10 min. What is the rate of reaction in Ms^{-1} during this interval?
 - (a) 2×10^{-4}
 - (b) 4×10^{-2}
 - (c) 2×10^{-2}
 - (d) 1×10^{-2}
3. What happens to the atomic size of lanthanides as the atomic number increases?
 - a. The radius remains unchanged
 - b. The radius first increases and then decreases
 - c. The radius increases
 - d. The radius decreases
4. Which of the following compounds has tetrahedral geometry?
 - (a) $[\text{Ni}(\text{CN})_4]^{2-}$
 - (b) $[\text{Pd}(\text{CN})_4]^{2-}$
 - (c) $[\text{PdCl}_4]^{2-}$
 - (d) $[\text{NiCl}_4]^{2-}$
5. Phenol reacts with bromine in CS_2 at low temperature to give

- a. m-bromophenol
 - b. o-and p-bromophenol
 - c. p-bromophenol
 - d. 2,4,6-tribromophenol
6. A reaction in which reactants (R) are converted into products (P) follows second order kinetics. If concentration of R is increased by four times, what will be the increase in the rate of formation of P?
- (a) 9 times
 - (b) 4 times
 - (c) 16 times
 - (d) 8 times
7. Among the following which are ambidentate ligands?
- (i) SCN^-
 - (ii) NO^-
 - (iii) NO^{2-}
 - (iv) $\text{C}_2\text{O}_4^{2-}$
- Pick the correct option:
- (a) (i) and (iii)
 - (b) (i) and (iv)
 - (c) (ii) and (iii)
 - (d) (ii) and (iv)
8. The number of molecules of the reactants taking part in a single step of the reaction is indicative of
- (a) order of a reaction
 - (b) molecularity of a reaction
 - (c) fast step of the mechanism of a reaction
 - (d) half-life of the reaction
9. What happens when tertiary butyl alcohol is passed over heated copper at 300°C ?
- (a) Secondary butyl alcohol is formed
 - (b) 2-methylpropene is formed
 - (c) 1-butene is formed
 - (d) Butanol is formed
10. The negative part of the addendum (the molecule to be added) adds on the carbon atom of the double bond containing the least number of hydrogen atoms. This rule is known as
- (a) Saytzeff's rule
 - (b) Peroxide rule
 - (c) Markovnikov's rule
 - (d) van't Hoff rule

11. The oxidation of toluene to benzaldehyde by chromyl, chloride is called
- Etard reaction
 - Riemer-Tiemann reaction
 - Wurtz reaction
 - Cannizzaro's reaction
12. Which of the following does not react with Hinsberg reagent?
- Ethylamine
 - $(\text{CH}_3)_2\text{NH}$
 - $(\text{CH}_3)_3\text{N}$
 - Propan-2-amine
13. Aldehydes other than formaldehyde react with Grignard's reagent to give addition products which on hydrolysis give
- tertiary alcohols
 - secondary alcohols
 - primary alcohols
 - carboxylic acids
14. Which of the following: when heated with a mixture of ethanmine and alcoholic potash gives ethyl isocyanide?
- 2-chloropropane
 - 2,2-dichloropropane
 - trichloromethane
 - tetrachloromethane

ASSERTION AND REASONING QUESTIONS

Note: 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.

- Both assertion and reason are true, and reason is the correct explanation of the assertion.
- Both assertion and reason are true but reason is not the correct explanation of assertion.
- Assertion is not true but reason is true.
- Both assertion and reason are false.

15. **Assertion:** Separation of Zr and Hf is difficult.

Reason: Because Zr and Hf lie in the same group of the periodic table.

16. **Assertion:** Aromatic 1° amines can be prepared by Gabriel Phthalimide Synthesis.

Reason: Aryl halides undergo nucleophilic substitution with anion formed by phthalimide.

17. **Assertion:** Vitamin D cannot be stored in our body

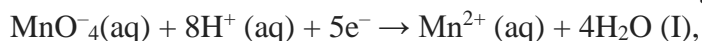
Reason: Vitamin D is fat soluble vitamin and is excreted from the body in urine

18. **Assertion:** Phenols give o- and p-nitrophenol on nitration with conc. HNO_3 and H_2SO_4 mixture.

Reason: —OH group in phenol is o-, p- directing.

SECTION B

19. Two half-cell reactions of an electrochemical cell are given below:



$$E^\circ = +1.51 \text{ V}$$



$$E^\circ = +0.15 \text{ V}$$

Construct the redox equation from the two half-cell reactions and predict if this reaction favours formation of reactants or product shown in the equation

20. A reaction is of first order in reactant A and of second order in reactant B. How is the rate of this reaction affected when

(i) the concentration of B alone is increased to three times

(ii) the concentrations of A as well as B are doubled?

21. A coordination compound $\text{CrCl}_3 \cdot 4\text{H}_2\text{O}$ precipitates silver chloride when treated with silver nitrate. The molar conductance of its solution corresponds to a total of two ions. Write the structural formula of the compound and name it.

22. Chlorobenzene is extremely less reactive toward a nucleophilic substitution reaction. Give two reasons for the same.

23. The rate constant for a first order reaction is 60 s^{-1} . How much time will it take to reduce the concentration of the reactant to 1/10th of its initial value?

Or

Rate constant 'k' of a reaction varies with temperature 'T' according to the equation:

$$\log k = \log A - E_a/2.303R(1/T)$$

where E_a is the activation energy. When a graph is plotted for $\log k$ vs. $1/T$, a straight line with a slope of -4250 K is obtained. Calculate ' E_a ' for the reaction ($R = 8.314 \text{ JK}^{-1}\text{mol}^{-1}$).

24. Write the equations involved in the following reactions:

(i) Wolff-Kishner reduction

(ii) Etard reaction

25. (i) What are glycosidic linkages? In which type of biomolecules are they present?

(ii) Which monosaccharide units are present in starch, cellulose and glucose

SECTION C

26. 15.0 g of an unknown molecular material was dissolved in 450 g of water. The resulting solution was found to freeze at -0.34°C . What is the molar mass of this material? (k_f for water = $1.86 \text{ K kg mol}^{-1}$)

27. Using valence bond theory, explain the following in relation to the complexes given below:



- (i) Type of hybridisation.
- (ii) Inner or outer orbital complex.
- (iii) Magnetic behaviour.
- (iv) Spin only magnetic moment value.

28. Explain

- i. Why is it necessary to avoid even traces of moisture during the use of a Grignard reagent?
- ii. Allyl chloride is hydrolysed more readily than n-propyl chloride. Why?

Or

- i. Define ambident nucleophile with an example.
- ii. What happens when bromine attacks $\text{CH}_2 = \text{CH} - \text{CH}_2 - \text{C} \equiv \text{CH}$?
- iii. What happens when ethyl chloride is treated with aqueous KOH?

29.

- a) Ortho nitrophenol has lower boiling point than p-nitrophenol. Why?
- b) Give a chemical test to distinguish between 2-Pentanol and 3-Pentanol.
- c) How would you obtain acetophenone from phenol?

30. Fill in the blank



SECTION D

31. Osmosis plays a significant role in the absorption of water by plant roots from the soil and its movement to different parts of the plant body. When placed in water containing less than 0.9% (mass/volume) salt, blood cells collapse due to loss of water by osmosis.

In animals' circulation of water to all parts of the body takes place due to osmosis.

Osmosis helps in plant growth and germination of seeds.

The phenomenon of osmosis is also useful in some industrial processes. It is employed commercially for the desalination of seawater so that it may become useful for drinking purposes. (Reverse osmosis) The Reverse Osmosis process is very popular for the purification of drinking water in households.

Answer following questions:

1. Why does water from the soil rise to the top of a tree?
2. What happens when blood cells are placed in water?
3. What happens when external pressure becomes more than osmotic pressure of the solution

Or

What happens when reverse osmosis takes place?

4. Why do vegetable seller sprinkle water on vegetables

31. Protein primary structure is the linear sequence of amino acids in a peptide or protein. In contrast, Secondary structure refers to regular, recurring arrangements in the space of adjacent amino acid residues in a polypeptide chain. It is maintained by hydrogen bonds between amide hydrogens and carbonyl oxygens of the peptide backbone. The major secondary structures are α -helices and β -structures. The tertiary structure of protein represents overall folding of secondary structure.

Two major type molecular shapes are which are found naturally are fibrous and globular. Protein found in a biological system with a unique three-dimensional structure and biological activity is called a native protein. Protein denaturation occurs when a protein in its native form is subjected to a physical change like a change in temperature or a chemical change like a change in pH.

Answer following questions:

1. What is the importance of amino acids?
2. Write the name of the linkage joining two amino acids?
3. What type of bonding occurs in globular protein? Give example

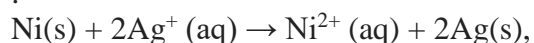
Or

What happens when protein is denatured? Also give an example.

Section E

32.

- (i) Determine the values of equilibrium constant (K_c) and ΔG° for the following reaction :



$$E^\circ = 1.05 \text{ V}$$
$$(1F = 96500 \text{ C mol}^{-1})$$

(ii) Write the name of the cell which is generally used in inverters. Write the reactions taking place at the anode and the cathode of this cell.

Or

- (i) A copper-silver cell is set up. The copper ion concentration in it is 0.10 M. The concentration of silver ion is not known. The cell potential is measured 0.422 V. Determine the concentration of silver ion in the cell. Given: $E^\circ_{\text{Ag}^+/\text{Ag}} = +0.80 \text{ V}$, $E^\circ_{\text{Cu}^{2+}/\text{Cu}} = +0.34 \text{ V}$
- (ii) Define molar conductivity of a solution and explain how molar conductivity changes with change in concentration of solution for a weak and a strong electrolyte.

34. Complete the following chemical reaction equations



- (iii) Which metal in the first transition series (3d series) exhibits +1 oxidation state most frequency and why?
- (iv) Which of the following cations are coloured in aqueous solutions and why? Sc^{3+} , V^{3+} , Ti^{4+} , Mn^{2+} .
(At. nos. Sc = 21, V = 23, Ti = 22, Mn = 25)
- (v) What is Lanthanoid contraction?

35.

a) Write chemical equations to illustrate the following name bearing reactions:

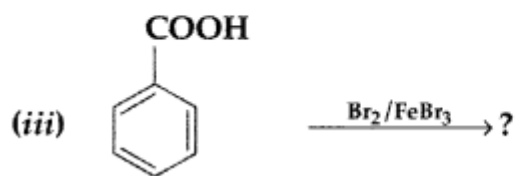
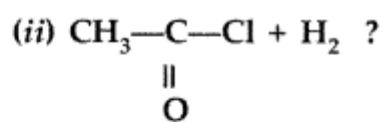
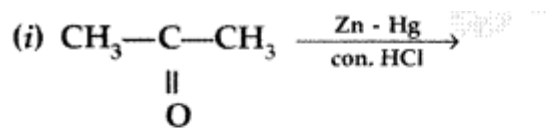
- (i) Cannizzaro's reaction
(ii) Hell-Volhard-Zelinsky reaction

(b) Give chemical tests to distinguish between the following pairs of compounds:

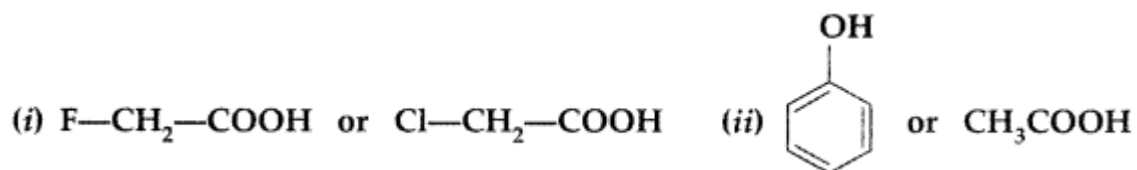
- (i) Propanal and Propanone
(ii) Acetophenone and Benzophenone
(iii) Phenol and Benzoic acid

Or

a) Write the products of the following reactions:



b) Which acid of each pair shown here would you expect to be stronger?



General instructions.

Read the following instructions carefully.

- There are 35 questions in this question paper. All questions are compulsory.
- Section A: Q.NO.1 to 18 multiple choice questions carrying 1 mark each.
- Section B: Consists of 7 very short answer questions carrying 2 marks each.
- Section C: Consists of 5 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 calculators is not allowed.**

SECTION-A

The following questions are multiple choice question. Choose the most appropriate ans . Each question carries 1 mark. There is no internal choice in this section.

- What is the formula of hexachloroplatinic(II)acid?
a) $H_4[Pt(CN)_6]$ b) $H_3[Pt(CN)_6]$ c) $H_2[Pt(CN)_6]$ d) $H_1[Pt(CN)_6]$
- Which of the following ion is coloured?
a) Zn^{2+} b) Sc^{3+} c) Cu^+ d) Cu^{2+}
- Which one is more acidic ?
a) $ClCH_2COOH$ b) $BrCH_2COOH$ c) FCH_2COOH d) ICH_2COOH
- What is the name of this reaction $R-X + Na I \rightarrow R-I + Na X$
a) Sandmeyer reaction b) Swart reaction c) Finkelstein reaction d) wurtz reaction
dryacetone
- Which one is more reactive toward SN^1 reaction.
a) $CH_3CH_2CH_2CH_2Cl$ b) $(CH_3)_2CHCl$ c) $(CH_3)_3CCl$ d) None of the above
- The unit of rate constant for 1st order reaction is.
a) $Mol\ l^{-1}s^{-1}$ b) s^{-1} c) $Mol^{-1}l\ s^{-1}$ d) $Mol^{-2}l\ s^{-2}$
- The unit of rate constant and rate of reaction is same for which order of reaction.
a) first order reaction b) second order reaction
c) zero order reaction d) Third order reaction
- The IUPAC name of CH_3CH_2COCHO is
a) 3-Ketobutanal b) 3-oxopentanal c) 2-ketobutanal d) 2-ketopropanal.

9. The number of faraday is required for oxidation of 1 mole of H_2O is:
a) 3F b) 2F c) 0.5F d) 1F

10. The coordination number of Pt in $[\text{Pt}(\text{en})_2\text{Br}_2]^{2+}$
a) 2 b) 3 c) 4 d) 6

11. KMnO_4 is coloured due to:-
a) d-d transition c) ligand to metal charge transfer
b) Metal to ligand charge transfer d) f-f transition

12. Aniline is less basic than
a) Benzylamine b) Triphenylamine c) P-nitroaniline d) Diphenylamine

13. In which of the following reaction does amide get converted to amine
a) Carbylamine reaction c) Diazotisation
b) Perkin reaction d) Hoffmann reaction

14. On electrolysis of dilute sulphuric acid using platinum electrodes, the product obtained at the anode will be
a) Hydrogen b) oxygen c) hydrogen sulphide d) sulphurdioxide

15. Given below are two statements labelled as Assertion (A) and Reason (R)
Assertion(A): Methoxy ethane reacts with HI to give ethanol and iodomethane.
Reason(R): : Reaction of ether with HI follows S_N^2 mechanism.
Select the most appropriate answer from the options given below:
a. Both A and R are true and R is correct explanation of A
b. Both A and R are true and R is not correct explanation of A
c. A is true and R is false
d. A is false and R is true

16. Given below are two statements labelled as Assertion (A) and Reason (R)
Assertion(A): Vitamin D can be stored in our body
Reason(R): Vitamin D is water soluble vitamin and is excreted from the body in urine
Select the most appropriate answer from the options given below:
a) Both A and R are true and reason is correct explanation of A
b) Both A and R are true and reason is not correct explanation of A
c) A is true and R is false
d) A is false and R is true

17. Given below are two statements labelled as Assertion (A) and Reason (R)
Assertion: Aniline does not undergo Friedel -craft reaction
Reason: $-\text{NH}_2$ group of aniline reacts with AlCl_3 to give acid-base reaction.
Select the most appropriate answer from the options given below:
a) Both A and R are true and reason is correct explanation of A

- b) Both A and R are true and reason is not correct explanation of A
- c) A is true and R is false
- d) A is false and R is true

18. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion(A):- Aromatic 1^o amine can not be prepared by Gabriel phthalimide synthesis.

Reason(R): Alkyl halides undergo nucleophilic substitution with anion formed by phthalimide.

Select the most appropriate answer from the options given below:

- a) Both A and R are true and reason is correct explanation of A
- b) Both A and R are true and reason is not correct explanation of A
- c) A is true and R is false
- d) A is false and R is true

SECTION-B

This section contains 7 questions with internal choice in 2 questions the following questions are very short answer type and carry 2 marks each.

19. Define molar conductivity ? Give the relation between conductivity, conductance and cell constant.
20. a) What is peptide bond.
b) write down the hydrolysis product of Lactose.
21. For the reaction $A \rightarrow B$, the rate of reaction becomes 3 times when the concentration of A is increased 9 times. What is the order of reaction.

OR

A first order reaction has a rate constant $1.15 \times 10^{-3} \text{ s}^{-1}$. How long will 5 g of this reactant take to reduce to 3 g?

22. a) What is difference between ambidentate ligand and bidentate ligand.
b) Out of $[\text{Fe}(\text{NH}_3)_6]^{3+}$ and $[\text{Fe}(\text{ox})_3]^{3-}$. Which complex is more stable and why.

23. Write the equation involved in the following reactions:

- a) H.V.Z reaction b) Soda-lime decarboxylation

OR

How would you convert

- a) Ethanal to 3-hydroxy butanal
b) Benzoic acid to benzaldehyde.

24. What is the effect of adding catalyst on

- a) activation energy b) Gibb's free energy change

25. a) Why chloroform is stored in closed dark coloured bottles.

- b) Write down two uses of chloroform.

SECTION-C

This section contains 5 questions with internal choice .This following questions are short answer type and carry 3 marks each.

26. A 4% solution of Sucrose ($M=342\text{g/mole}$) in water has a freezing point 271.15K . Calculate the freezing point of 5% solution of glucose ($M=180\text{g/mole}$) in water. (Freezing point of water is 273.15K).

27. Give the answers of any three questions:-

a) For the complex $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$. Write the hybridization and magnetic character of the complex.

b) what is the coordination number and oxidation state of platinum of the complex $[\text{Pt}(\text{en})_2\text{Cl}_2]^{2+}$.

c) What is meant by the chelate effect? Give an example.

d) Why are low spin tetrahedral complexes are not formed?

28. How do you convert:

(i) Chlorobenzene to biphenyl

ii) Propene to iodopropane

iii) 2-bromobutane to but-2ene.

29. How do you convert

(i) Ethanal to isopropyl alcohol

(ii) chlorobenzene to phenol

iii) phenol to benzene

OR

Give reasons for the following:-

(i) Preparation of ethers by acid catalyzed dehydration of 2° and 3° Alcohols not a suitable method?

(ii) phenol has much less pK_a than alcohol, explain.

(iii) Ethers possess a net dipole moment even if they are symmetrical in structure

30. Give reason

i) Acylation of aniline is carried out in presence of pyridine.

ii) N- Ethyl ethanamine boils at 329K and butanamine boils at 350K .

iii) pK_b of aniline is more than methylamine.

SECTION-D

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

31. When a protein in its native form, is subjected to physical changes like change in temperature or chemical changes like change in pH , the hydrogen bonds are disturbed. Due to this, globules unfold and helix get uncoiled and protein loses its biological activity. This is called denaturation of protein. The denaturation causes change in secondary and tertiary structures but primary structure remains intact. Examples of denaturation of protein are coagulation of egg, curdling of milk, formation of cheese when an acid is added to milk. Based on the above passage, answer the following questions :

- a) What happens with helical structure of secondary protein on denaturation.
- b) why polypeptide chain in helix structure become helical pattern.
- c) which type of protein in boiled egg and unboiled egg.

d) What is denatured protein.

Or

d) Give any one differences between fibrous protein and globular protein.

32. Solution play a very important role in our daily life. Alloys, homogeneous mixture of Metal are solution of solid in solid. 1PPm of Fluoride ions prevent tooth decay. All intravenous injection must be isotonic with our body fluids i.e. should have same concentration as blood plasma. Diabetic patients are more likely to have heart attack and high blood pressure due to higher glucose level in blood. Common salt increases blood pressure because Na^+ mixes up with blood. Aquatic species are more comfortable in cold water than warm water.

Based on the above passage, answer the following questions :

- a) Why aquatic species are more comfortable in cold water than warm water.
- b) The blood cell contain fluid having concentration 0.9% placed in a saline solution with concentration more than cell fluid. what happen with blood cell.
- c) Why People suffering from high blood pressure are advised to consume less amount of salt.

or

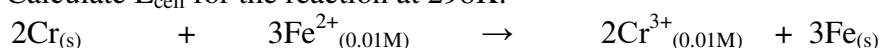
c) Define Azeotropic mixture

SECTION E

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

33. a) Write down the complete chemical reaction for rusting of iron.

b) Calculate E_{cell} for the reaction at 298K.



E°_{cell} for the reaction is 0.261V.

Or

- a) State Kohlrausch's law. why does the conductivity of a solution decreases with dilution.
- b) A steady current of 2 Ampere was passed through 2 electrolytic cells X and Y connected in series containing FeSO_4 and ZnSO_4 until 2.8 gm of Fe deposited at the cathode of cell X. How long did the current flow. Calculate the mass of Zn deposited. [Molar mass of Fe = 56g/mole] [Molar mass of Zn= 63.5g/mole].

34.a) Account for the following.

- i) Mn shows highest oxidation state of +7 with oxygen but with fluorine it show the oxidation state of +4 .
- ii) Zr and Hf exhibit similar properties.

iii) Transition metal act as catalyst.

b) write one difference and one similarity between lanthanoids and actinoids

35.a) Give reason

i) carboxylic acid is more acidic than phenol.

ii) PKa value of 2-chloroethanoic acid is lower than the PKa value of ethanoic acid.

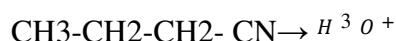
b) Write the test to distinguish between following pairs of compound.

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

ii) phenol and benzoic acid.

c) Complete the reaction

DIBAL-H



OR

a) An alkene A (Mol. formula C_5H_{10}) on ozonolysis gives a mixture of two compounds B and C. Compound B gives positive Fehling's test and also forms iodoform on treatment with I_2 and NaOH . Compound C does not give Fehling's test but forms iodoform. Identify the compounds A, B, C. write the reaction for ozonolysis and formation of iodoform from B and C.

b) How would you convert

i) Methyl benzene to benzoic acid

ii) Benzoic acid to benzaldehyde.

General Instructions:

Read the following instructions carefully.

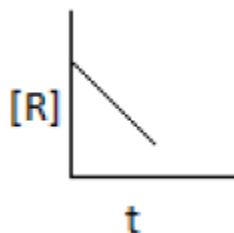
- There are 35 questions in this question paper with internal choice.
- SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
- SECTION B consists of 7 very short answer questions carrying 2 marks each.
- SECTION C consists of 5 short answer questions carrying 3 marks each.
- SECTION 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 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.

- Which one of the following compounds is more reactive towards SN^1 reaction?
 - $\text{CH}_2=\text{CHCH}_2\text{Br}$
 - $\text{C}_6\text{H}_5\text{CH}_2\text{Br}$
 - $\text{C}_6\text{H}_5\text{CH}(\text{C}_6\text{H}_5)\text{Br}$
 - $\text{C}_6\text{H}_5\text{CH}(\text{CH}_3)\text{Br}$
- $\text{K}_2\text{Cr}_2\text{O}_7$ is coloured due to:
 - d-d transitions.
 - Charge transfer from ligand to metal.
 - Charge transfer from metal to ligand.
 - Unpaired electrons in d orbital of Cr.
- Which radioactive isotope would have the high value of disintegration constant U^{235} or U^{237} ? (Given half-life for U^{235} and U^{237} are 5600 and 4500 years respectively.)
 - U^{235}
 - U^{237}
 - Both will have the same disintegration constant.
 - None of the above, information given is insufficient.
- For the reaction, $2\text{B} + \text{C} \longrightarrow \text{B}_2\text{C}$, the order w.r.t. reactant B is 1 and w.r.t reactant C is 2. What will be the overall order of the reaction if reactant B is present in excess?
 - 3
 - 1
 - 2
 - 0

5. The electronic configuration of Metal ion in $K_3[Fe(CN)_6]$ on the basis of CFT is:
- $T_{2g}^2 E_g^3$
 - $T_{2g}^3 E_g^2$
 - $T_{2g}^5 E_g^1$
 - $T_{2g}^5 E_g^0$
6. Arrange the following in the increasing order of their pK_b values:
A: $C_6H_5NH_2$, B: NH_3 , C: $C_2H_5NH_2$, D: $(CH_3)_2N$
- $C < D < B < A$
 - $D < C < B < A$
 - $A > B > C > D$
 - $A > B > D > C$
7. Which of the following statement is correct?
- E_{cell} is an intensive property while $\Delta_r G$ of cell reaction is an extensive property.
 - E_{cell} and $\Delta_r G$ of cell reaction both are extensive property.
 - E_{cell} and $\Delta_r G$ of cell reaction both are intensive property.
 - E_{cell} is an extensive property while $\Delta_r G$ of cell reaction is an intensive property.
8. For a chemical reaction $R \longrightarrow P$, the variation in the concentration (R) vs. time (t) plot is given as



The order and slope of the graph is:

- Zero and kt .
 - One and K .
 - Zero and $-K$.
 - One and $-K$.
9. The number of ions formed on dissolving one molecule of $[Co(NH_3)_5Cl]Cl_2$:
- 3
 - 4
 - 2
 - 1
10. Identify the following reaction:
 $2CH_3Cl + 2Na \rightarrow 2NaCl + CH_3 - CH_3$
- Etard reaction.
 - Wurtz reaction.
 - Fittig reaction.
 - Kolbe's reaction.
11. Which of the statement about solutions of electrolytes is not correct?
(a) Conductivity of solution depends upon size of ions.

- (b) Conductivity depends upon viscosity of solution.
(c) Conductivity does not depend upon salvation of ions present in solution.
(d) Conductivity of solution increases with temperature.
12. Which of the following polymer is stored in the liver of animals?
(a) Glycogen
(b) Amylopectin
(c) Amylose
(d) Cellulose
13. Proteins are found to have two different types of secondary structures namely α -helix and β -pleated sheet structure, α -helix structure of protein is stabilized by
(a) Peptide bonds
(b) Van der waals forces
(c) Dipole-dipole interactions
(d) Hydrogen bonds
14. Phenol and ethanol can be distinguished by which test
a) Ferric chloride test
b) Carbylamine test
c) Tollens test
d) Fehlings test
15. **Assertion (A):** D(+)- Glucose is dextrorotatory in nature.
Reason (R): 'D' represents its dextrorotatory nature.
Select the most appropriate answer from the options given below:
a. Both A and R are true and R is the correct explanation of A.
b. Both A and R are true but R is not the correct explanation of A.
c. A is true but R is false.
d. A is false but R is true.
16. **Assertion (A):** Separation of Zr and Hf is difficult.
Reason (R): Because Zr and Hf lie in the same group of the periodic table.
Select the most appropriate answer from the options given below:
a. Both A and R are true and R is the correct explanation of A.
b. Both A and R are true but R is not the correct explanation of A.
c. A is true but R is false.
d. A is false but R is true.
17. **Assertion (A):** Boiling points of alcohols and ethers are high.
Reason (R): They can form intermolecular hydrogen-bonding.
Select the most appropriate answer from the options given below:
a. Both A and R are true and R is the correct explanation of A.
b. Both A and R are true but R is not the correct explanation of A.
c. A is true but R is false.
d. A is false but R is true.
18. **Assertion (A):** Vitamin D can be stored in our bodies.
Reason (R): Vitamin D is a fat-soluble vitamin.

Select the most appropriate answer from the options given below:

- Both A and R are true and R is the correct explanation of A.
- Both A and R are true but R is not the correct explanation of A.
- A is true but R is false.
- A is false but R is true.

SECTION B

This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.

- A first order reaction is 50% completed in 40 minutes. How much time is required for 90% completion?
- Give reason for the following:
 - The product formed during SN^1 reaction is optically inactive.
 - Alkyl halides, being polar, are insoluble in water.

OR

Identify the structure of A and B



- Draw the geometrical isomers of $[Pt(en)_2Cl_2]^{2+}$.
- What is fuel cell? Write the chemical reactions involved in it.
- In the given reaction $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$ the rate of formation of NH_3 is $3.6 \times 10^{-4} \text{ molL}^{-1}\text{s}^{-1}$. Calculate
 - Rate of reaction
 - Rate of disappearance of $H_2(g)$.
- Write the following name reactions:
 - Carbylamine reaction.
 - Hoffman Bromide Degradation.
- Identify the major product formed when 1-chlorobutane reacts with the followings reagents:
 - Alco. NaOH
 - C_2H_5ONa

OR

- Name the possible alkenes which will be produced by dehydrohalogenation of 1-chloro-2-phenyl ethane.
- How will you convert aniline into chlorobenzene? Write the reaction.

SECTION C

This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.

26. What mass of NaCl (molar mass = 58.5 g/mol) must be dissolved in 65 g of water to lower the freezing point by 7.50°C ? The freezing point depression constant, K_f for water is 1.86 K kg/mol. Assume van't Hoff factor for NaCl is 1.87.

27. Amino acids may be acidic, alkaline or neutral. How does this happen? What are essential and non-essential amino acids? Name one of each type.

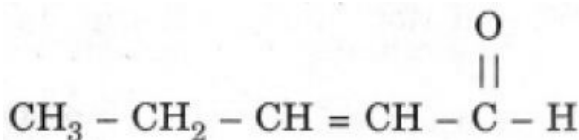
OR

i) Write two differences between DNA and RNA

ii) Differentiate between nucleotide and nucleoside

28. Answer the followings:

(a) Write the IUPAC name of



(b) Give chemical tests to distinguish between

(i) Propanol and Propanone

(ii) Benzaldehyde and Acetophenone.

29. Using Valence bond theory, explain the following of $[\text{CoF}_6]^{3-}$

a. Hybridisation

b. Geometry

c. Magnetic moment.

30. Give reasons for the following observations:

a. Aniline is weaker base than methylamine.

b. Aniline gives m-nitro aniline in a substantial amount during nitration.

c. Methylamine is highly soluble in water than aniline.

OR

Arrange the following in increasing order of their basic strength :--

a) NH_3 , $\text{C}_3\text{H}_7\text{NH}_2$, $(\text{CH}_3)_2\text{NC}_2\text{H}_5$, $(\text{CH}_3)_3\text{N}$

b) Ammonia , Aniline , p-Amino phenol , Ethanamine

SECTION D

The following questions are case-based questions. Each question has an internal choice and carried 4 marks each. Read the passage carefully and answer the questions that follow.

31. Blood cells in the human body have semi-permeable membrane and depending upon the concentration of solution inside blood cells and outside (in the blood), 'Lysis' (expansion of blood cells) and 'Crenation' (contraction of blood cells) may occur. Kidneys are responsible for keeping the solution inside blood cell and blood at the same concentration.

Answer the following questions:

a. What happens when blood cell is kept in distilled water?

b. What is difference between diffusion and osmosis?

c. What is isotonic solution?

OR

If a person is habitual to take higher salt in his diet then what is the effect of it on his body?

32. Unlike other renewable energy sources, biomass can be converted directly into liquid fuels, called “biofuels” to help meet transportation fuel needs. The two most common types of biofuels, both of which represent the first generation of bio-fuel technology. The **Bioenergy Technologies Office (BETO)** is collaborating with industry to develop next-generation bio-fuels made from wastes, cellulosic biomass, and algae-based resources. BETO is focused on the production of hydrocarbon bio-fuels- also known as ‘drop-in’ fuels – which can serve as petroleum substituents in existing refineries, tanks, pipelines, pumps, vehicles and smaller engines.

Ethanol is a renewable fuel that can be made from various plant materials, collectively known as “biomass”. It is an alcohol used as a blending agent with gasoline to increase octane and cut down carbon monoxide and other smog-causing emissions.

The most common blend of ethanol is **E10** (10% ethanol, 90% gasoline) and is approved for use in most conventional gasoline-powered vehicles up to **E15**. Most ethanol is made from plant starches and sugars-particularly corn starch in the United States-but scientists are continuing to develop technologies that would allow for the use of cellulose and hemicelluloses, the non-edible fibrous material that constitutes the bulk of plant matter.

Answer the following questions:

- What percentage of ethanol is used in E15?
- Name the process of formation of ethanol from sugarcane juice.
- How the cost of gasoline is affected if it is blended with ethanol? Explain.

OR

How the ethanol is useful in other ways also? (Give two points)

SECTION E

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

33.

- What is the direction of flow of electrons in Galvanic Cell ?
- Why does the cell voltage of a mercury cell remain constant during its lifetime?

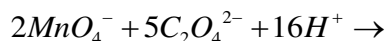
iii) Calculate the standard cell potential of the galvanic cell in which the following reaction takes place:

$Fe^{2+}(aq) + Ag^+(aq) \rightarrow Fe^{3+}(aq) + Ag(s)$. Calculate the $\Delta_r G^0$ and equilibrium constant of the reaction also. ($E^0_{Ag^+/Ag} = 0.80V$ and $E^0_{Fe^{3+}/Fe^{2+}} = 0.77V$)

34. An organic compound (A) with molecular formula C_8H_8O forms an orange-red precipitate with 2,4-DNP reagent and gives yellow precipitate on heating with iodine in the presence of sodium hydroxide. It neither reduces Tollen's reagent, nor does it decolourise bromine water or Baeyer's reagent. On drastic oxidation with chromic acid (H_2CrO_4), it gives a carboxylic acid (B) having molecular formula $C_7H_6O_2$.
- Identify the structure of (A) and (B).
 - Write the reaction of (A) with 2,4-DNP reagent.
 - Write the reaction of (A) with Tollen's reagent.
 - Write the reaction of (A) with chromic acid.

OR

- Account for the following:
 - $ClCH_2COOH$ is a stronger acid than CH_3COOH .
 - Carboxylic acid don't give reactions of carbonyl group.
 - Write the chemical equations to illustrate the following name reactions:
 - Rosenmund's Reduction
 - Cannizzaro reaction.
 - Out of $CH_3CH_2COCH_2CH_3$ and $CH_3CH_2CH_2COCH_3$, which gives iodoform test.
35. Answer the followings:
- La^{3+} ($Z=57$) and Lu^{3+} ($Z = 71$) do not show any colour in solutions.
 - Among the divalent cations in the first series of transition elements, manganese exhibits the maximum paramagnetism.
 - Cu^+ ion is not known in aqueous solutions.
 - What happens when pH of chromate ions is decreased? Write reaction only.
 - Complete the following reaction:



OR

Give reasons for the following:

- Mn^{3+} is a good oxidizing agent.
- $E^0_{M^{3+}/M}$ values are not regular for first row transition metals (3d series).
- Although F is more electronegative than O, the highest Mn fluoride is MnF_4 , whereas the highest oxide is Mn_2O_7 .
- With reference to structural variability and chemical reactivity, write the difference between lanthanoids and actinoids.

SAMPLE PAPER SET : 11

CLASS - XII

SUBJECT:

CHEMISTRY

TIME :3H

MM: 70

QUESTION PAPER

Time: 3 Hours

Max. Marks: 70

General Instructions:

1. There are 35 questions in this question paper with internal choice.
2. SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
3. SECTION B consists of 7 very short answer questions carrying 2 marks each.
4. SECTION C consists of 5 short answer questions carrying 3 marks each.
5. SECTION D consists of 2 case-based questions carrying 4 marks each.
6. SECTION E consists of 3 long answer questions carrying 5 marks each.
7. All questions are compulsory.
8. Use of log tables and calculators is not allowed.

SECTION A

Directions (Q. Nos. 1-18) : 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. The Van't Hoff's factor of 0.1 M $\text{Ba}(\text{NO}_3)_2$ solution is 2.74. The degree of dissociation is
(a) 91.3% (b) 87% (c) 100% (d) 74%
2. A dilute aqueous solution of sodium fluoride is electrolysed; the products at the anode and cathode are :
(a) F_2, Na (b) F_2, H_2 (c) O_2, Na (d) O_2, H_2
3. For a zero order reaction:
(a) $t_{1/2} \propto a$ (b) $t_{1/2} \propto 1/a$ (c) $t_{1/2} \propto a^2$ (d) $t_{1/2} \propto 1/a^2$
4. Copper sulphate solution on treatment excess of KI gives white precipitate. The precipitate is
(a) CuI_2 (b) Cu_2I_2 (c) Cu_2SO_4 (d) I_2
5. Which of the following compounds has tetrahedral geometry?
(a) $[\text{Ni}(\text{CN})_4]^{2-}$ (b) $[\text{Pd}(\text{CN})_4]^{2-}$ (c) $[\text{PdCl}_4]^{2-}$ (d) $[\text{NiCl}_4]^{2-}$
6. A Grignard reagent is prepared by the action of magnesium in dry ether on:
(a) $\text{C}_2\text{H}_5\text{OH}$ (b) C_2H_6 (c) $\text{C}_2\text{H}_5\text{Cl}$ (d) $\text{C}_2\text{H}_5\text{CN}$
7. $\text{R-OH} + \text{CH}_2\text{N}_2 \rightarrow$ Leaving group in this reaction is
(a) CH_3 (b) R (c) N_2 (d) CH_2
8. Cannizzaro's reaction is not given by
(a) Formaldehyde (b) Acetaldehyde

(c) Benzaldehyde

(d) Furfural

9. An organic compound reacts with benzene sulphonyl chloride and product dissolves in aqueous NaOH. The compound is

(a) $R-NH_2$

(b) $\begin{array}{l} R \\ \diagdown \\ \diagup \\ R \end{array} NH$

(c) $\begin{array}{l} R \\ \diagdown \\ \diagup \\ R \end{array} N$

(d) All of these

10. Sweetest of all sugars is:

(a) Glucose

(b) Lactose

(c) Sucrose

(d) Fructose

11. Azeotropic mixture of HNO_3 and H_2O has:

(a) 48% HNO_3

(b) 22.2% HNO_3

(c) 36% HNO_3

(d) 68% HNO_3

12. If the rate of a reaction is expressed by, $Rate = k[A]^2[B]$. Then the order of reaction will be

(a) 2

(b) 3

(c) 0

(d) 1

13. The general electronic configuration of transition elements is:

(a) $(n-1)d^5$

(b) $(n-1)d^{(1-10)}ns^{1 \text{ or } 2}$

(c) $(n-1)d^{(1-10)}ns^1$

(d) none of these

14. What is the coordination number of Zinc in sodium oxide $Na_2[Zn(OH)_4]$?

(a) 6

(b) 2

(c) 8

(d) 4

Directions (Q. No. 15-18) : Each of the following questions consists of two statements, one is Assertion and the other is Reason. Give answer :

15. **Assertion :** SN_2 reaction of an optically active aryl halide with an aqueous solution of KOH always gives an alcohol with opposite sign of rotation.

Reason : SN_2 reactions always proceed with retention of configuration.

(a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.

(b) Both Assertion and Reason are correct but Reason is not the correct explanation of the Assertion.

(c) Assertion is correct but Reason is incorrect.

(d) Both the Assertion and Reason are incorrect.

16. **Assertion :** DNA as well as RNA molecules are found in the nucleus of a cell.

Reason : On heating, the enzymes do not lose their specific activity.

(a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.

(b) Both Assertion and Reason are correct but Reason is not the correct explanation of the Assertion.

- (c) Assertion is correct but Reason is incorrect.
(d) Both the Assertion and Reason are incorrect.
17. **Assertion :** The rate of the reaction is the rate of change of concentration of a reactant or a product.
Reason : Rate of reaction remains constant during the course of reaction.
(a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.
(b) Both Assertion and Reason are correct but Reason is not the correct explanation of the Assertion.
(c) Assertion is correct but Reason is incorrect.
(d) Both the Assertion and Reason are incorrect.
18. **Assertion :** Disruption of the natural structure of a protein is called denaturation.
Reason : The change in colour and appearance of egg during cooking is due to denaturation.
(a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.
(b) Both Assertion and Reason are correct but Reason is not the correct explanation of the Assertion.
(c) Assertion is correct but Reason is incorrect.
(d) Both the Assertion and Reason are incorrect.

SECTION B

Directions (Q. No. 19-25) : This section contains 7 questions with internal choice in two questions. The following questions are short answer type and carry 2 marks each.

19. What is meant by molality and mole fraction of the solution ?
20. Any transition series contains only ten elements. Why ?

OR

Write 3d series of transition metals.

21. How will you distinguish between primary, secondary and tertiary alcohols?
22. What do you mean by half-life period of a reaction? Write mathematical relation also.

OR

Define Pseudo first order reactions with one example.

23. Give one example of each of the following reactions:
(i) Wurtz reaction
(ii) Wurtz-Fittig reaction.
24. Express the rate of the following reaction $2\text{HI}(\text{g}) \rightarrow \text{H}_2(\text{g}) + \text{I}_2(\text{g})$
25. (i) Why chloroform should be kept in dark coloured bottle and away from sunlight?
(ii) Out of ethyl bromide and ethyl chloride which has higher boiling point and why?

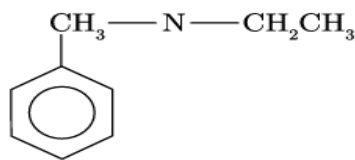
SECTION C

Directions (Q. Nos. 26-30) : This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.

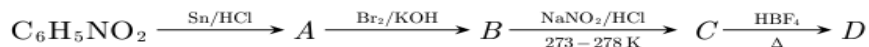
26. (i) Draw the structural formulas and write IUPAC names of all the isomeric alcohols with the molecular formula $C_5H_{12}O$.
(ii) Classify the isomers of alcohols given in part (a) as primary, secondary and tertiary alcohols.
27. Construct electric cells for the following reactions:
(i) $Fe^+ + Cu^{2+} \rightarrow Cu + Fe^{2+}$
(ii) $2Fe^{3+} + 2Cl^- \rightarrow Cl_2 + 2Fe^{2+}$
Write the reactions involved at anode and cathode also.
28. (i) Write the IUPAC name of the following complex: $[Co(NH_3)_4(H_2O)Cl]Cl_2$
(ii) What is the difference between an Ambidentate ligand and a Bidentate ligand?
(iii) Out of $[Fe(NH_3)_6]^{3+}$ and $[Fe(C_2O_4)_3]^{3-}$, which complex is more stable and why?
29. What happens when :
(i) N-ethylethanamine reacts with benzene sulphonyl chloride.
(ii) Benzyl chloride is treated with ammonia followed by the reaction with Chloromethane.
(iii) Aniline reacts with chloroform in the presence of alcoholic potassium hydroxide.

OR

- (i) Write the IUPAC name for the following organic compound :



- (ii) Complete the following :



30. How will you convert ethanal to the following compounds?
(i) Butane-1, 3-diol
(ii) But-2-enal
(iii) But-2-enoic acid

SECTION D

Directions (Q. No. 31-32) : 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.

31. The four colligative properties of the dilute solutions help in calculating the molecular mass of the solute which is often called observed molecular mass. It may be same as the theoretical molecular mass (calculated from the molecular formula) if the solute behaves normally in solution. In case, it undergoes association or dissociation, the observed molar mass gives different results. The nature of the solute in solution is expressed in terms of van't Hoff factor (i) which may be 1 (if the solute behaves normally), less than 1 (if the solute associates) and more than 1 (if the solute dissociates). The extent of association or dissociation is represented by α which is:

$$a = \frac{i - 1}{\frac{1}{n} - 1} \text{ (for association) or } a = \frac{i - 1}{n - 1} \text{ (for disassociation)}$$

Based on the above passage, answer the following questions :

- (i) What is common in all the four colligative properties?
- (ii) What is the expected value of Van't Hoff factor for $K_4[Fe(CN)_6]$ when it completely dissociates in water?
- (iii) What is the value of Van't Hoff factor for a dilute solution of K_2SO_4 in water?

OR

(iv) In the determination of molar mass of A^+B^- using colligative property, what will be the Van't Hoff factor if the solute is 40% dissociated?

32. Polysaccharides may be very large molecules. Starch, glycogen, cellulose, and chitin are examples of polysaccharides. Starch is the stored form of sugars in plants and is made up of amylose and amylopectin (both polymers of glucose). Amylose is soluble in water and can be hydrolyzed into glucose units breaking glycosidic bonds, by the enzymes α -amylase and β -amylase. It is straight chain polymer. β -amylopectin is a branched chain polymer of several D-glucose molecules. 80% of amylopectin is present in starch. Plants are able to synthesize glucose, and the excess glucose is stored as starch in different plant parts, including roots and seeds. The starch that is consumed by animals is broken down into smaller molecules, such as glucose. The cells can then absorb the glucose. Glycogen is the storage form of glucose in humans and other vertebrates, and is made up of monomers of glucose. It is structurally quite similar to amylopectin. Glycogen is the animal equivalent of starch. It is stored in liver and skeletal muscles. Cellulose is one of the most abundant natural biopolymers. The cell walls of plants are mostly made of cellulose, which provides structural support to the cell. Wood and paper are mostly cellulosic in nature. Like amylose, cellulose is a linear polymer of glucose. Cellulose is made up of glucose monomers that are linked by bonds between particular carbon atoms in the glucose molecule. Every other glucose monomer in cellulose is flipped over and packed tightly as extended long chains. This gives cellulose its rigidity and high tensile strength—which is so important to plant cells. Cellulose passing through our digestive system is called dietary fiber.

Based on the above passage, answer the following questions:

- (i) Glycogen is a kind of polysaccharide and is the storage form of glucose present in humans and other vertebrates. It is the animal equivalent of starch but can you say where is it stored in animals?
- (ii) What can you infer about the characteristic of amylose from the passage?
- (iii) Whenever glucose levels drop in our body, a bipolymer breaks down to release glucose. Name this bipolymer and it is structurally similar to which polymer?

OR

- (iv) Which polymer is important to plant cells? How?

SECTION E

Directions (Q. No. 33-35) : The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.

33. (i) Write a short note on the following naming reaction :
- (a) Etard reaction
 - (b) Stephen's reduction
- (ii) How will you convert the following in not more than two steps :
- (a) Benzoic acid to Benzaldehyde
 - (b) Acetophenone to Benzoic acid
 - (c) Ethanoic acid to 2-hydroxyethanoic acid.

OR

(i) An organic compound [A] with molecular formula $C_8H_{16}O_2$ was hydrolysed with dilute sulphuric acid to give a carboxylic acid [B] and an alcohol [C]. Oxidation of [C] with chromic acid produced [B]. The alcohol [C] on dehydration gave but-1-ene. Write equations for the reactions involved.

(ii) How many asymmetric carbon atoms are created during the complete reduction of benzil ($PhCOCOPh$) with $LiAlH_4$? Also write the number of possible stereoisomers formed as the product.

34. (i) Account for the following :
- (a) Copper (I) compounds are white whereas Copper (II) compounds are coloured.
 - (b) Chromates change their colour when kept in an acidic solution.
 - (c) Zn, Cd, Hg are considered as d-block elements, but not as transition elements.
- (ii) Calculate the spin-only moment of Co^{2+} ($Z = 27$) by writing the electronic configuration of Co and Co^{2+} .

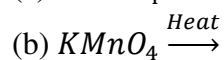
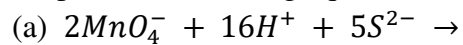
OR

(i) Following are the transition metal ions of 3d series :

Ti^{4+} , V^{2+} , Mn^{3+} , Cr^{3+} (Atomic numbers : Ti = 22, V = 23, Mn = 24, Cr = 25) Answer the following :

- (a) Which ion is most stable in an aqueous solution and why?
(b) Which ion is a strong oxidising agent and why?
(c) Which ion is colourless and why?

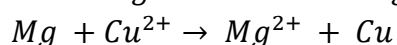
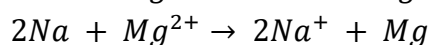
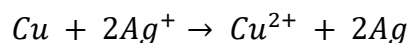
(ii) Complete the following equations :



35. (i) Calculate the mass of Ag deposited at cathode when a current of 2 amperes was passed through a solution of $AgNO_3$ for 15 minutes. (Given : Molar mass of Ag = 108 g mol^{-1} , $1F = 96500 C mol^{-1}$)

(ii) What do you mean by fuel cell?

(iii) Write Cu, Na, Mg and Ag in the decreasing order of electrochemical series with the help of the following reactions:



General Instructions:

Read the following instructions carefully.

- a) There are 35 questions in this question paper with internal choice.
- b) SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
- c) SECTION B consists of 7 very short answer questions carrying 2 marks each.
- d) SECTION C consists of 5 short answer questions carrying 3 marks each.
- e) SECTION D consists of 2 case- based questions carrying 4 marks each.
- f) SECTION E consists of 3 long answer questions carrying 5 marks each.
- g) All questions are compulsory.
- h) 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. Cell reaction is spontaneous, when
 - (a) E°_{red} is negative
 - (b) ΔG° is negative
 - (c) E°_{oxid} is Positive
 - (d) ΔG° is positive
2. $\text{K}_2\text{Cr}_2\text{O}_7$ is coloured due to:
 - a. d-d transitions
 - b. charge transfer from ligand to metal
 - c. unpaired electrons in d orbital of Cr
 - d. charge transfer from metal to ligand
3. If the rate of a reaction is expressed by, $\text{rate} = A [\text{A}]^2 [\text{B}]$, the order of reaction will be
 - (a) 2
 - (b) 3
 - (c) 1
 - (d) 0
4. Molar conductivity of ionic solution depends on
 - (a) temperature
 - (b) distance between electrodes
 - (c) concentration of electrolytes in solution
 - (d) surface area of electrodes
5. The correct IUPAC name of the coordination compound $\text{K}_3[\text{Fe}(\text{CN})_5\text{NO}]$ is
 - (a) Potassium pentacyanonitrosylferrate (II)
 - (b) Potassium pentacyanonitroferrate (II)
 - (c) Potassium nitritopentacyanoferrate (IV)
 - (d) Potassium nitritepentacyanoiron (II)
- 6 Which one of the following is diamagnetic ion?
 - A. Co^{2+}

B. Ni²⁺

C. Cu²⁺

D. Zn²⁺

7. CH₃CHO and C₆H₅CH₂CHO can be distinguished chemically by

(a) Benedict's test

(b) iodoform test

(c) Tollens' reagent test

(d) Fehling's solution test

8 Identify the correct IUPAC name

(a) (CH₃CH₂)₂NCH₃ = N-Ethyl-N-methylethanamine

(b) (CH₃)₃CNH₂ = 2-methylpropan-2-amine

(c) CH₃NHCH(CH₃)₂ = N-Methylpropan-2-amine

(d) (CH₃)₂CHNH₂ = 2, 2-Dimethyl-N-propanamine

9. What is the molar conductance at infinite dilution for sodium chloride if the molar conductance at infinite dilution of Na⁺ and Cl⁻ ions are $51.12 \times 10^{-4} \text{ Scm}^2/\text{mol}$ and $73.54 \times 10^{-4} \text{ Scm}^2/\text{mol}$ respectively?

a. $124.66 \times 10^{-4} \text{ Scm}^2/\text{mol}$

b. $22.42 \times 10^{-4} \text{ Scm}^2/\text{mol}$

c. $198.20 \times 10^{-4} \text{ Scm}^2/\text{mol}$

d. $175.78 \times 10^{-4} \text{ Scm}^2/\text{mol}$

10. For the reaction, $A + 2B \rightarrow AB_2$, the order w.r.t. reactant A is 1 and w.r.t. reactant B is 1. What will be change in rate of reaction if the concentration of A and B is doubled ?

a. increases four times

b. decreases four times

c. increases two times

d. no change

11. Which of these statements about [Co(CN)₆]³⁻ is true?

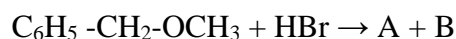
(a) It has 4 unpaired electron, high spin

(b) No unpaired electron, high spin

(c) No unpaired electron, low spin

(d) 4 unpaired electron, low spin

12. What would be the major product of the following reaction?



a. A = C₆H₅CH₂OH, B = CH₃Br

b. A = C₆H₅CH₂OH, B = C₂H₅Br

c. A = C₆H₅CH₂Br, B = CH₃OH

d. A = C₆H₅CH₂Br, B = C₂H₅OH

13. The oxidation of toluene to benzaldehyde by chromyl chloride is called

- (a) Etard reaction
 - (b) Riemer-Tiemann reaction
 - (c) Wurtz reaction
 - (d) Cannizzaro's reaction
- 14 Which reagent is used to convert glucose into saccharic acid?

- (a) $\text{Br}_2/\text{H}_2\text{O}$
- (b) Nitric acid
- (c) Alkaline solution of iodine
- (d) Ammonium hydroxide

15. Given below are two statements labeled as Assertion (A) and Reason (R)

Assertion (A): When a solution is separated from the pure solvent by a semi-permeable membrane, the solvent molecules pass through it from the pure solvent side to the solution side.

Reason (R): Diffusion of solvent occurs from a region of high concentration solution to a region of low concentration solution.

- a. Both A and R are true and R is the correct explanation of A
- b. Both A and R are true but R is not the correct explanation of A.
- c. A is true but R is false.
- d. A is false but R is true.

16. Given below are two statements labeled as Assertion (A) and Reason (R)

Assertion (A): Complexes of MX_6 and MX_5L type (X and L are unidentate) do not show geometrical isomerism.

Reason (R): Geometrical isomerism is not shown by complexes of coordination number 6.

Select the most appropriate answer from the options given below:

- a. Both A and R are true and R is the correct explanation of A.
- b. Both A and R are true but R is not the correct explanation of A.
- c. A is true but R is false.
- d. A is false but R is true.

17. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion: The boiling point of alcohol is higher than those of hydrocarbons of comparable molecular mass.

Reason: Alcohol show intramolecular hydrogen banding..

Select the most appropriate answer from the options given below:

- a. Both A and R are true and R is the correct explanation of A
- b. Both A and R are true but R is not the correct explanation of A.
- c. A is true but R is false.
- d. A is false but R is true.

18. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion : Lanthanide contraction is more than actinoid contraction.

Reason: Actinoids have 5f orbitals being filled which are more dispersed in space compare to 4f orbitals.

Select the most appropriate answer from the options given below:

- a. Both A and R are true and R is the correct explanation of A
- b. Both A and R are true but R is not the correct explanation of A.
- c. A is true but R is false.
- d. A is false but R is true.
- e.

This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.

19. A first order reaction is 50% completed in 40 minutes. How much time is required for 90% completion?

20. Why cannot molecularity of any reaction be equal to zero

OR

State a condition under which a bimolecular reaction is kinetically first order reaction.

21. Which one of the following has the highest dipole moment?

(i) CH_3Cl (ii) CHCl_3 (iii) CCl_4

OR

a. Explain diazotisation reaction

b. Out of the Chloromethane and Fluoromethane, which one has lower dipole moment and why?

22. Discuss the nature of bonding in metal carbonyls.

23. What do you understand by the term glycosidic linkage?

24. What are ambident nucleophiles? Explain with an example.

25. What happens when D-glucose is treated with the following reagents?

(i) HI (ii) Bromine water (iii) HNO_3

SECTION C

This section contains 5 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.

26. Write the important structural and functional differences between DNA and RNA.

27. Using Valence bond theory, explain the following in relation to the complex $[\text{Ni}(\text{CN})_4]^{2-}$

a. type of hybridization

b. magnetic moment value

c. Magnetic behaviour.

28. Answer the following questions:

a. State Henry's law and explain why are the tanks used by scuba divers filled with air diluted with helium?

b. Why are aquatic species more comfortable in cold water in comparison to warm water?

29. Give reasons for the following observations:

a. Aniline does not undergo Friedel-Crafts reaction

b. Aliphatic amines are stronger bases than ammonia

c. Aromatic primary amines cannot be prepared by Gabriel phthalimide synthesis

30. Explain the following with example

a. Aldol condensation.

b. Rosenmund reaction.

c. Tollens test.

OR

a. Conversion of toluene into benzaldehyde.

b. Sodium propanoate convert into ethane.

- c. Propyl chloride is hydrolysed more readily than tert. butyl chloride. Why?

SECTION D

The following questions are case-based questions. Each question has a choice and carries (1) marks each. Read the passage carefully and answer the questions that follow.

31. Boiling point or freezing point of liquid solution would be affected by the dissolved solids in the liquid phase. A soluble solid in solution has the effect of raising its boiling point and depressing its freezing point. The addition of non-volatile substances to a solvent decreases the vapor pressure and the added solute particles affect the formation of pure solvent crystals. According to many researches the decrease in freezing point directly correlated to the concentration of solutes dissolved in the solvent. This phenomenon is expressed as freezing point depression and it is useful for several applications such as freeze concentration of liquid food and to find the molar mass of an unknown solute in the solution. Freeze concentration is a high quality liquid food concentration method where water is removed by forming ice crystals. This is done by cooling the liquid food below the freezing point of the solution. The freezing point depression is referred as a colligative property and it is proportional to the molar concentration of the solution (m), along with vapor pressure lowering, boiling point elevation, and osmotic pressure. These are physical characteristics of solutions that depend only on the identity of the solvent and the concentration of the solute. The characters are not depending on the solute's identity. (Jayawardena, J. A. E. C., Vanniarachchi, M. P. G., & Wansapala, M. A. J. (2017). Freezing point depression of different Sucrose solutions and coconut water.)

(1). What is deicing agent?

(2) Why NaCl is added to clear roadside during snowfall ?

(3) Plot a graph between vapour pressure and temperature to show the depression in freezing point for a solution containing non volatile solute.

32. Proteins are the most abundant biomolecules of the living system. The chief sources of proteins are milk, cheese, pulses, fish, meat, peanuts etc. They are found in every part of the body and form a fundamental basis of structure and functions of life. These are also required for growth and maintenance of body. The word protein is derived from Greek word, 'proteios' meaning 'primary' or of 'prime importance'. Chemically, proteins are the polymers in which the monomeric units are the α -amino acids. Amino acids contain amino ($-NH_2$) and carboxylic ($-COOH$) functional groups. Depending upon the relative position of amino group with respect to carboxylic group, the amino acids can be classified as α , β and γ -amino acids. Amino acids which are synthesised by the body are called non-essential amino acid. On the other hand, those amino acids which cannot be synthesised in the human body and are supplied in the form of diet (because they are required for proper health and growth) are called essential amino acids.

Q. 1. Why amino acids show amphoteric behaviour?

Q. 2. What is Peptide linkage ?

Q. 3. What are polypeptides?

a. 10 α -amino acids joined together b. amino acids joined together

c. 20 β -amino acids joined together d. None of the above

Q. 4. What type of bonding helps in stabilising the α -helix structure of proteins?

a. Peptide linkage b. Hydrogen bonding

c. Amino linkage d. Van der waals force

SECTION E

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

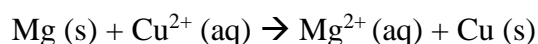
33.a) Express the relation among cell constant, resistance of the solution in the cell and conductivity of the solution. How is molar conductivity of a solution related to its conductivity?

- b) The molar conductivity of a 1.5 M solution of an electrolyte is found to be $138.9 \text{ S cm}^2 \text{ mol}^{-1}$. Calculate the conductivity of this solution.
- c) A voltaic cell is set up at 25°C with the following half cells:
 $\text{Al} | \text{Al}^{3+} (0.0010 \text{ M})$ and $\text{Ni} | \text{Ni}^{2+} (0.50 \text{ M})$
 Write the equation for the cell reaction that occurs when the cell generates an electric current and determine the cell potential.
 (Given $E^\circ (\text{Ni}^{2+}/\text{Ni}) = -0.25 \text{ V}$, $E^\circ (\text{Al}^{3+}/\text{Al}) = -1.66 \text{ V}$)

OR

34. a. State Kohlrausch law of independent migration of ions. Why does the conductivity of a solution decrease with dilution?

b. Calculate $\Delta_r G^\circ$ for the reaction



Given: $E^\circ_{\text{cell}} = +2.71 \text{ V}$, $1F = 96500 \text{ C/mol}$

c. Define the following terms:

i) Fuel Cell ii) Limiting molar conductivity (Λ°_m)

34. An aromatic compound 'A' (Molecular formula $\text{C}_8\text{H}_8\text{O}$) gives a positive 2, 4-DNP test. It gives a yellow precipitate of compound 'B' on treatment with iodine and sodium hydroxide solution. Compound 'A' does not give Tollen's or Fehling's test. On severe oxidation with potassium permanganate forms a carboxylic acid 'C' (Molecular formula $\text{C}_7\text{H}_6\text{O}_2$), which is also formed along with the yellow compound in the above reaction. Identify A, B and C and write all the reactions involved.

OR

When liquid 'A' is treated with a freshly prepared ammoniacal silver nitrate solution, it gives a bright silver mirror. The liquid forms a white crystalline solid on treatment with sodium hydrogen sulphite. Liquid 'B' also forms a white crystalline solid with sodium hydrogen sulphite, but it does not give a test with ammoniacal silver nitrate. Which of the two liquids is aldehyde? Write the chemical equations of these reactions also.

35.(a) What is meant by 'lanthanoid contraction'?

(b) Explain why

- i. with $3d^4$ configuration, Cr^{2+} acts as a reducing agent but Mn^{3+} acts as an oxidizing agent
- ii. In a transition series the metal which exhibits greatest number of oxidation states occurs in the middle of the series
- iii. Cu^+ ion is not known in aqueous solutions

General Instructions:

Read the following instructions carefully.

- There are **35** questions in this question paper with internal choice.
- SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
- SECTION B consists of 7 very short answer questions carrying 2 marks each.
- SECTION C consists of 5 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 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.

- A zero order reaction is one-
(A) In which reactants do not react
(B) In which one of the reactants is in large excess
(C) Whose rate does not change with time
(D) Whose rate increases with time
- E° for the reaction $\text{Fe} + \text{Zn}^{2+} = \text{Zn} + \text{Fe}^{2+}$ is -0.35 V. The given cell reaction is-
(A) Feasible (B) Not feasible (C) In equilibrium (D) None.
- Which of the following has maximum number of unpaired electrons ?
(A) Fe^{2+} (B) Fe^{3+} (C) Co^{3+} (D) Co^{2+}
- When a primary amine reacts with chloroform in ethanolic KOH, then the product is a/an
(A) Isocyanide (B) Aldehyde (C) Cyanide (D) Alcohol
- The specific conductivity of solution depends upon :
(A) Number of ions as well as mobility of ions (B) Number of ions per ml solution
(C) Number of ions per cc as well as mobilities of ions (D) Mobilities of ions only
- The number of ions formed in aqueous solution by the compound $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}$ is-
(A) 2 (B) 3 (C) 4 (D) 7
- Which of the following method cannot be considered suitable for the preparation of alkyl halide:
(A) Halogenation of alkane (B) ROH and PX_3 (C) ROH and HX (D) Alkene and HX
- The charge on cobalt in $[\text{Co}(\text{CN})_6]^{3-}$ is-
(A) -6 (B) $+3$ (C) -3 (D) $+6$
- For a given reaction the concentration of the reactant plotted against time gave a straight line with negative slope. The order of the reaction is-
(A) 3 (B) 2 (C) 1 (D) 0
- Phenol is less acidic than
(A) ethanol (B) methanol (C) o-nitrophenol (D) p-cresol.
- The formation of acetanilide from aniline is an example of-
(A) An aromatic electrophilic substitution (B) An aromatic nucleophilic substitution
(C) An addition-elimination reaction (D) A primary amide formation
- Diethyl ether on heating with conc. HI gives two moles of:
(A) Ethanol (B) Iodoform (C) Ethyl iodide (D) Methyl iodide

- 13 Which of the following rate laws has an overall order of 0.5 for the reaction $A + B + C \rightarrow \text{Product}$ -
(A) $R = k[A].[B].[C]$ (B) $R = k[A]^{0.5} [B]^{0.5} [C]^{0.5}$
(C) $R = k[A]^{1.5} [B]^{-1} [C]^0$ (D) $R = k[A] [B]^0 [C]^{0.5}$

14 Ni^{2+} is a system of :

- (A) d^7 type (B) d^8 type (C) d^6 type (D) d^5 type

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 and reason are true, and reason is the correct explanation of the assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is not true but reason is true.
(d) Both assertion and reason are false.

15. **Assertion(A):-Cyclic structure of glucose does not gives Schiffs test.**

Reason(R):-CHO group is not free.

16. **Assertion(A):** Alcohols are comparatively more soluble in water than hydrocarbons of comparable molecular mass.

Reason(R):- Alcohol molecules can form hydrogen bonds with water. Hydrocarbons do not form hydrogen bonds with water.

17 **Assertion(A):-** : Diazonium salts of aromatic amines are more stable than those of aliphatic amines.

Reason(A):- : Diazonium ion shows resonance.

18. **Assertion(A):-** : Transition metals have high boiling points and high enthalpy of atomization.

Reason(R) : The transition metals occur in bcc, hcp or ccp structures characteristic of metals.

SECTION B

This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.

19. Define molar conductivity of a solution and explain how molar conductivity changes with change in concentration of solution for a weak electrolyte.

Or

Λ_m^0 for NaCl, HCl and CH_3COONa are 126.4, 425.9 and $91.0 \text{ S cm}^2 \text{ mol}^{-1}$ respectively.

Calculate

Λ_m^0 for CH_3COOH

20. 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?

21. Write the reaction and IUPAC name of the product formed when 2-Methylpropanal (isobutyraldehyde) is treated with ethyl magnesium bromide followed by hydrolysis.

22. What happens when D-glucose is treated with
i) HI ii) Br_2 water

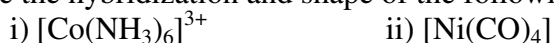
23. Define half-life of a reaction and Write the expression of first order reaction rate constant.

24. Why are haloalkanes more reactive towards nucleophilic substitution reactions than haloarenes and vinylic halides?

Or

Arrange the compounds Bromomethane, Bromoform, Chloromethane, Dibromomethane in order of increasing boiling points

25. Write the hybridization and shape of the following complexes.



SECTION C

This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.

26. a) Write IUPAC name of the compounds $(\text{CH}_3\text{CH}_2)_2\text{NCH}_3$ and $(\text{CH}_3)_3\text{N}$

b) Complete the following reactions:



Or

a) Arrange the following in increasing order of their basic strength

(i) $\text{C}_2\text{H}_5\text{NH}_2$, $\text{C}_6\text{H}_5\text{NH}_2$, NH_3 , $(\text{C}_2\text{H}_5)_2\text{NH}$

(ii) $\text{C}_2\text{H}_5\text{NH}_2$, $(\text{C}_2\text{H}_5)_2\text{NH}$, $(\text{C}_2\text{H}_5)_3\text{N}$

(iii) CH_3NH_2 , $\text{C}_6\text{H}_5\text{NH}_2$, $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$

27. Give simple chemical tests to distinguish between the following pairs of compounds:

a) Phenol and Benzoic acid

b) Acetaldehyde and Benzaldehyde

c) Benzoic acid and Ethyl benzoate

28. a). Write the hybridization and shape of the following complexes:



b). Out of NH_3 and 'en' which ligand forms more stable complex with metal and why ?

or

Write the formula for the following coordination compounds

(a) Tetraammineaquachloridocobalt (III) chloride

(b) Potassium trioxalatoaluminate (III)

(c) Dichloridobis(ethane-1,2-diamine)cobalt(III)ion

29. Give reasons for the following:

a) Methyl iodide undergoes SN^2 reaction faster than methyl bromide.

b) (\pm) 2-Butanol is optically inactive.

c) C-X bond length in halobenzene is smaller than C-X bond length in $\text{CH}_3\text{-X}$.

30. a). What are azeotropes ?

b). Calculate the amount of KCl which must be added to **1 kg.** of water so that the freezing point is depressed by 2K. (K_f for water = 1.86kg/mol)

SECTION D

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

31. Henna is investigating the melting point of different salt solutions. She makes a salt solution using 10 mL of water with a known mass of NaCl salt. She puts the salt solution into a freezer and leaves it to freeze. She takes the frozen salt solution out of the freezer and measures the temperature when the frozen salt solution melts. She repeats each experiment.

S.No	Mass of the salt used in g	Melting point in $^{\circ}\text{C}$	
		Readings Set 1	Reading Set 2
1	0.3	-1.9	-1.9
2	0.4	-2.5	-2.6
3	0.5	-3.0	-5.5
4	0.6	-3.8	-3.8
5	0.8	-5.1	-5.0
6	1.0	-6.4	-6.3

Assuming the melting point of pure water as 0°C , answer the following questions:

- One temperature in the second set of results does not fit the pattern. Which temperature is that? Justify your answer.
- Why did Henna collect two sets of results?
- In place of NaCl, if Henna had used glucose, what would have been the melting point of the solution with 0.6 g glucose in it?

OR

- What is the predicted melting point if 1.2 g of salt is added to 10 mL of water? Justify your answer.

32. Bharati a domestic helper of Mrs. Ashadevi fainted while mopping the floor. Mrs. Ashadevi immediately took her to the nearby hospital where she was diagnosed to be severely 'anaemic', the doctor prescribed an iron rich diet and multivitamin supplement to her Mrs Ashadevi supported her financially to get the medicines. After a month Bharati was diagnosed to be normal,

- Name the vitamin which help in clotting of blood.
- Name the vitamin which cause pernicious anaemia?
- (a) Give an example of water insoluble vitamin?
(b) Write the chemical name of vitamin B_{12}

SECTION E

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

33. (a) Write chemical equations to illustrate the following name reactions:

- Cannizzaro's reaction
- Hell Volhard-Zelinsky reaction

(b) Give chemical tests to distinguish between the following pairs of compounds:

- Propanal and propanone
- Acetophenone and Benzophenone
- Phenol and Benzoic acid

34. a). Zinc(Zn), Cadmium(Cd) and Mercury(Hg) are not regarded as transition elements. Justify this statement using electronic configuration.

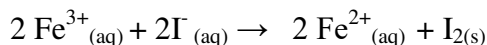
- Give suitable reason for the following:

- i). Sc^{3+} is colourless in aqueous solution whereas Ti^{3+} is coloured.
- ii). The Mn^{2+} compounds are more stable than Fe^{2+} towards oxidation to their +3 state.
- iii). Many transition elements and their compounds act as good catalysts.

OR

- a). What is Lanthanoid contraction ? Write two consequences of lanthanoid contraction.
- b) Complete the following equations:
 - i) $\text{MnO}_4^- + \text{NO}_2^- + \text{H}^+ \rightarrow$
 - ii) $\text{Cr}_2\text{O}_7^{2-} + \text{H}_2\text{S} + \text{H}^+ \rightarrow$
- c) Actinoids exhibit much larger number of oxidation states than the lanthanoids. Why?

35. (a) The cell in which the following reaction occurs:



has $E^{\circ}_{\text{cell}} = 0.236 \text{ V}$ at 298K. Calculate the standard Gibbs energy and equilibrium constant of the cell reaction. (Antilog of 6.5 = 3.162×10^6 ; of 8.0 = 10×10^8 ; of 8.5 = 3.162×10^8)

- (b) State Kohlrausch's law and limiting molar conductivity.

OR

- (a) A current of one ampere is flowing through a wire. Calculate the number of electrons flowing through the cross-section of the wire per second.
- (b) What type of a battery is lead storage battery? Write anodic and cathodic reactions and the overall cell reactions occurring in the operation of lead storage battery.

General Instructions:**Read the following instructions carefully.**

- There are **35** questions in this question paper with internal choice.
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- SECTION E consists of 3 long answer questions carrying 5 marks each.
- All questions are compulsory.
- 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. What is the correct order of boiling points of alcohols having the same number of carbon atoms?

- $1^\circ > 2^\circ > 3^\circ$
- $3^\circ > 2^\circ > 1^\circ$
- $3^\circ > 1^\circ > 2^\circ$
- $2^\circ > 1^\circ > 3^\circ$

2. Which of the following alkyl halides will undergo S_N1 reaction most readily?

- $(CH_3)_3 C-F$
- $(CH_3)_3 C-Cl$
- $(CH_3)_3 C-Br$
- $(CH_3)_3 C-I$

3. What happens to the atomic size of lanthanides as the atomic number increases?

- The radius remains unchanged
- The radius first increases and then decreases
- The radius increases
- The radius decreases

4. What effect does temperature have on the half-life of a first-order reaction?

- It increases
- It decreases
- It remains the same
- Both increases as well as decreases.

5. Which of the following statement is false about a lead storage battery?

- It is a primary cell
- The cathode is made up of lead (IV) oxide
- The anode is made up of lead
- The electrolyte used is an aqueous solution of sulphuric acid.

6. In 30 minutes, a first-order reaction is 50% complete. Calculate the amount of time it took to complete 87.5% of the reaction.

- a. 30 minutes
- b. 60 minutes
- c. 90 minutes
- d. 120 minutes

7. Identify the name of the reaction, when acetamide is converted into methylamine?

- a. Friedel-Craft's reaction
- b. Hofmann reaction
- c. Hoffmann bromamide degradation reaction
- d. Hinsberg reaction

8. Which of the following statement is not correct about bonding in coordination compounds?

- a. Crystal Field Theory
- b. VSEPR Theory
- c. Valence Bond Theory
- d. Molecular Orbital Theory

9. Which of the following process does not involve in the production of alcohol?

- a. Acid catalysed hydration of alkenes
- b. Free radical halogenation of alkanes
- c. Reduction of aldehydes
- d. Hydroboration-oxidation of alkenes

10. Which of the following reacts with primary amines and can be separated from secondary and tertiary amines?

- a. Chloroform alone
- b. Methyl iodide
- c. Chloroform and alcoholic KOH
- d. Zinc dust

11. Which of the following is not an application regarding formaldehyde?

- a. Preservation of biological specimens
- b. Preparation of acetic acid
- c. Silvering of mirrors
- d. Manufacturing of Bakelite

12. Rate law for the reaction $A + 2B \rightarrow C$ is found to be $\text{Rate} = k[A][B]$, Concentration of reactant 'B' is doubled, keeping the concentration of 'A' constant, the value of rate constant will be ____

- a. The same
- b. Doubled
- c. Quadruple
- d. Halved

13. Primary and secondary valency of Pt in $[\text{Pt}(\text{en})_2\text{Cl}_2]$ are

- a. 4, 4
- b. 4, 6
- c. 6, 4
- d. 2, 6

14. Which of the following compounds is formed when benzyl alcohol is oxidised with KMnO_4

- a. CO_2 and H_2O
- b. Benzoic acid
- c. Benzaldehyde
- d. Benzophenone

15. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion (A): Addition reaction of water to but-1-ene in acidic medium yields butan-2-ol

Reason (R): Addition of water in acidic medium proceeds through the formation of primary carbocation.

Select the most appropriate answer from the options given below:

- a. Both A and R are true and R is the correct explanation of A
- b. Both A and R are true but R is not the correct explanation of A.
- c. A is true but R is false.
- d. A is false but R is true.

16. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion (A): Vitamin D can be stored in our body.

Reason (R): Vitamin D is fat soluble vitamin.

Select the most appropriate answer from the options given below:

- a. Both A and R are true and R is the correct explanation of A
- b. Both A and R are true but R is not the correct explanation of A.
- c. A is true but R is false.
- d. A is false but R is true.

17. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion: Transition metals are good catalysts.

Reason: V_2O_5 or Pt is used in the preparation of H_2SO_4 by contact process. Select the most appropriate answer from the options given below:

- a. Both A and R are true and R is the correct explanation of A
- b. Both A and R are true but R is not the correct explanation of A.
- c. A is true but R is false.
- d. A is false but R is true.

18. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion (A): Acetanilide is less basic than aniline.

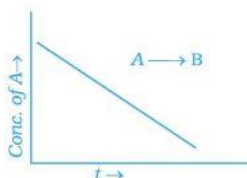
Reason (R): Acetylation of aniline results in decrease of electron density on nitrogen. Select the most appropriate answer from the options given below:

- a. Both A and R are true and R is the correct explanation of A
- b. Both A and R are true but R is not the correct explanation of A.
- c. A is true but R is false.
- d. A is false but R is true.

SECTION B

This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.

19. For a general reaction $A \longrightarrow B$, the plot of concentration of A vs time is given in Fig. Answer the following question on the basis of graph.



- (a) What is the order of the reaction ?
(b) What is the unit of the rate constant?

20. Differentiate between the following:

- (i) Amylose and Amylopectin
(ii) Fibrous proteins and Globular proteins

OR

Write chemical reactions to show that open structure of D-glucose contains the following:

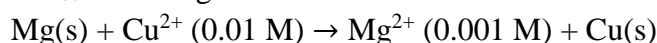
- (i) Straight chain
(ii) Aldehyde as carbonyl group

- 21.(a) Out of Chlorobenzene and benzyl chloride, which one gets easily hydrolysed by aqueous NaOH and why?
(b) Predict the major product formed when 2-Bromopentane reacts with alcoholic KOH.

22..Give the formulae of the following compounds:

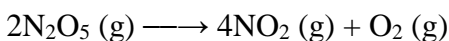
- (i) Potassium tetrahydrozincate (II)
(ii) Hexaammineplatinum (IV) chloride

23. E^0_{cell} for the given redox reaction is 2.71 V



Calculate E_{cell} for the reaction.

24. For the reaction



The rate of formation of $\text{NO}_2 (\text{g})$ is $2.8 \times 10^{-3} \text{ ms}^{-1}$.

Calculate the rate of disappearance of $\text{N}_2\text{O}_5 (\text{g})$.

25. How do you convert the following?

- (a) Ethanal to Propanone
(b) Toluene to Benzoic acid

OR

Account for the following:

- (a) Aromatic carboxylic acids do not undergo Friedel-Crafts reaction.
(b) pK_a value of 4-nitrobenzoic acid is lower than that of benzoic acid.

SECTION C

This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.

26. An organic compound 'A' having molecular formula C_3H_6 on treatment with aq. H_2SO_4 give 'B' which on treatment with Lucas reagent gives 'C'. The compound 'C' on treatment with ethanolic KOH gives back 'A'. Identify A, B, C.

27. (a) Write the formula of the following coordination compound: Iron (III) hexacyanoferrate (II)

(b) What type of isomerism is exhibited by the complex $[\text{Co} (\text{NH}_3)_5\text{Cl}] \text{SO}_4$?

(c) Write the hybridisation and number of unpaired electrons in the complex $[\text{CoF}_6]^{3-}$. (Atomic No. of Co =

27)

28. Give reasons for the following:

- (a) Measurement of osmotic pressure method is preferred for the determination of molar masses of macromolecules such as proteins and polymers.
- (b) Aquatic animals are more comfortable in cold water than in warm water.
- (c) Elevation of boiling point of 1 M KCl solution is nearly double than that of 1 M sugar solution.

OR

State Henry's law and write its two applications.

29. (a) Give reasons:

- (i) $(\text{CH}_3)_2\text{NH}$ is more basic than $(\text{CH}_3)_3\text{N}$ in an aqueous solution.
- (ii) Aromatic Diazonium salts are more stable than aliphatic Diazonium salts.
- (b) Give a simple chemical test to distinguish between Aniline and N, N-dimethyl aniline.

30. (i) Out of $(\text{CH}_3)_3\text{C}-\text{Br}$ and $(\text{CH}_3)_3\text{C}-\text{I}$, which one is more reactive towards SN^1 and why?

(ii) Write the product formed when p-nitro Chlorobenzene is heated with aqueous NaOH at 443 K followed by acidification.

(iii) Why dextro and laevo – rotatory isomers of Butan-2-ol are difficult to separate by fractional distillation?

OR

(a) Identify the chiral molecule in the following pair:

(i) 3-methyl butan-2-ol (ii) 2,4-dimethyl butan-3-ol

(b) Write the structure of the product when Chlorobenzene is treated with methyl chloride in the presence of sodium metal and dry ether.

(c) Write the structure of the alkene formed by dehydrohalogenation of 1-bromo-1-methylcyclohexane with alcoholic KOH.

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.

31. Carbohydrates play a vital role in our daily life. These are classified as monosaccharides, oligosaccharides and polysaccharides depending upon the number of smaller molecules on hydrolysis. It has been suggested that monosaccharides do not have a free aldehydic or ketonic group but have cyclic hemiacetal or hemiketal structures. D-glucose exists in two stereo isomeric forms; α -D-glucose and β -D-glucose which have different positions of H and OH groups on first carbon atom. Disaccharides such as sucrose, maltose, lactose etc. give monosaccharides on hydrolysis. Polysaccharides are starch, cellulose, glycogen having molecular formula $(\text{C}_6\text{H}_{10}\text{O}_5)_n$.

Answer the following questions:

- (i) What is the name of the linkage which holds together monosaccharide units in sucrose?
- (ii) Name the water insoluble component of starch.
- (iii) a) Why does glucose not give 2, 4-DNP test?

b) When glucose is heated with methyl alcohol in the presence of dry HCl gas, it forms two methyl glycosides.

Is it true or false?

32. Two solutions having same osmotic pressure at a given temperature are called isotonic solutions. When such solutions are separated by semipermeable membrane, no osmosis occurs between them. For example, the osmotic pressure associated with fluid inside the blood cell is equivalent to that of 0.9% (mass/volume) sodium chloride solution, called normal saline solution and it is safe to inject intravenously. On the other hand, if we place the cells in a solution containing more than 0.9% sodium chloride, water will flow out of the cells and they would shrink. Such a solution is called hypertonic. If the salt concentration is less than 0.9%, the solution is said to be hypotonic. In this case, water will flow into the cells if placed in this solution and they would swell.

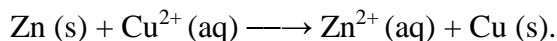
Answer the following questions:

- (i) What is meant by isotonic solution?
- (ii) Which concentration of sodium chloride solution is suitable for transfusion into blood?

- (iii)a) If a solution of 3g of sodium chloride dissolved in 500 ml of water is injected into the body, what will happen to the blood cells?
 b) What is the difference between hypertonic solution and hypotonic solution?

SECTION E

33. (a) Calculate ΔG^0 for the reaction



Given: E^0 for $\text{Zn}^{2+}/\text{Zn} = -0.76 \text{ V}$ and E^0 for $\text{Cu}^{2+}/\text{Cu} = +0.34 \text{ V}$

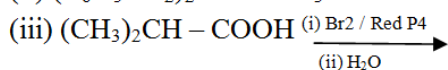
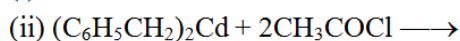
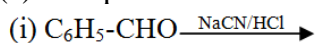
$R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$, $F = 96500 \text{ C mol}^{-1}$.

- (b) Give two advantages of fuel cells.

OR

- (a) Out of the following pairs, predict with reason which pair will allow greater conduction of electricity:
 (i) Silver wire at 30^0C or Silver wire at 60^0C .
 (ii) $0.1 \text{ M CH}_3\text{COOH}$ solution or $1 \text{ M CH}_3\text{COOH}$ solution.
 (iii) KCl solution at 20^0C or KCl solution at 50^0C .
 (b) Give two points of differences between electrochemical and electrolytic cells.

34. (a) Complete the following reactions:



- (b) What happens when?

- (i) Propanone is treated with methyl magnesium iodide and then hydrolysed.
 (ii) Benzene is treated with CH_3COCl in presence of anhydrous AlCl_3 ?

OR

- (a) Write chemical equations for the following reactions:

(i) Propanone is treated with dilute Ba (OH)_2 .

(ii) Acetophenone is treated with Zn (Hg)/Conc. HCl

(iii) Benzoyl chloride is hydrogenated in presence of Pd/BaSO_4 .

- (b) Account for the following:

- (i) Aromatic carboxylic acids do not undergo Friedel-Crafts reaction.
 (ii) pK_a value of 4-nitrobenzoic acid is lower than that of benzoic acid.

35. (a) Account for the following:

(i) Copper (I) compounds are white whereas Copper (II) compounds are coloured.

(ii) Chromates change their colour when kept in an acidic solution.

(iii) Zn , Cd , Hg are considered as d-block elements but not as transition elements.

- (b) Calculate the spin-only moment of Co^{2+} ($Z = 27$) by writing the electronic configuration of Co and Co^{2+} .

SAMPLE PAPER SET : 15

CLASS - XII
TIME :3H

SUBJECT: CHEMISTRY
MM: 70

PRACTICE QUESTION PAPER

MM:70

Time: 3 hours

General Instructions:

Read the following instructions carefully.

- a) There are **35** questions in this question paper with internal choice.
- b) SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
- c) SECTION B consists of 7 very short answer questions carrying 2 marks each.
- d) SECTION C consists of 5 short answer questions carrying 3 marks each.
- e) SECTION D consists of 2 case- based questions carrying 4 marks each.
- f) SECTION E consists of 3 long answer questions carrying 5 marks each.
- g) All questions are compulsory.**
- h) 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. Ethyl alcohol can be prepared from Grignard reagent by the reaction of :
(a) HCHO (b) R₂CO
(c) RCN (d) RCOCl
2. Haloarenes are ortho and para directing due to
(a) Resonance in aryl halide
(b) – I effect of halogen atom
(c) + I effect of halogen atom
(d) Both (a) and (b)
3. A compound of a metal ion M²⁺(Z= 24) has a spin only magnetic moment of 15 Bohr Magnetons. The number of unpaired electrons in the compound are
(a) 2
(b) 4
(c) 5
(d) 3
4. Which of the following is not a first order reaction ?
(a) Hydrogenation of ethene
(b) Natural radioactive decay of unstable nuclei
(c) Decomposition of HI on gold surface
(d) Decomposition of N₂O
5. Molar conductivities (\wedge^0m) at infinite dilution of NaCl, HCl and CH₃COONa are 126.4, 425.9 and 91.0 S cm² mol⁻¹ respectively. \wedge^0m for CH₃COOH will be
(a) 425.5 S cm² mol⁻¹

- (b) $180.5 \text{ S cm}^2 \text{ mol}^{-1}$
- (c) $290.8 \text{ S cm}^2 \text{ mol}^{-1}$
- (d) $390.5 \text{ S cm}^2 \text{ mol}^{-1}$

6. In the Arrhenius plot of $\ln k$ vs $1/T$ a linear plot is obtained with a slope of $-2 \times 10^4 \text{ K}$. The energy of activation of the reaction (in kJ mol^{-1}) is (R value is $8.3 \text{ J K}^{-1} \text{ mol}^{-1}$)

- (a) 83
- (b) 166
- (c) 249
- (d) 332

7. Which of the following statements are correct ?

- (i) Primary amines show more intermolecular association than secondary amines.
 - (ii) Tertiary amines do not show intermolecular association.
 - (iii) Boiling points of isomeric amines follow the order $3^\circ > 2^\circ > 1^\circ$
- (a) (i) and (iii)
 - (b) (i) and (ii)
 - (c) (i), (ii) and (iii)
 - (d) (ii) and (iii)

8. What is the denticity of the ligand ethylenediaminetetra acetate ion?

- (a) 4
- (b) 2
- (c) 6
- (d) 1

9. The major organic product in the reaction, $\text{CH}_3\text{—O—CH}(\text{CH}_3)_2 + \text{HI} \rightarrow$ is

- (a) $\text{ICH}_2\text{CH}(\text{CH}_3)_2$
- (b) $\text{CH}_3\text{OC}(\text{I})(\text{CH}_3)_2$
- (c) $\text{CH}_3\text{I} + (\text{CH}_3)_2\text{CHOH}$
- (d) $\text{CH}_3\text{OH} + (\text{CH}_3)_2\text{CHI}$

10. Carbylamine reaction is used for the detection of

- (a) aliphatic 2° amines
- (b) aliphatic 1° amines
- (c) aromatic 1° amines
- (d) Both (b) and (c)

11. Less reactivity of ketone is due to

- (a) + I inductive effect decrease positive charge on carbonyl carbon atom
- (b) steric effect of two bulky alkyl groups
- (c) sp^2 hybridised carbon atom of carbonyl carbon atom
- (d) Both (a) and (b)

12. In the reaction, $2\text{A} + \text{B} \rightarrow \text{A}_2\text{B}$ if the concentration of A is doubled and that of B is halved, then the rate of the reaction will:

- (a) increase 2 times
- (b) increase 4 times
- (c) decrease 2 times
- (d) remain the same

13. The stabilisation of coordination compounds due to chelation is called the chelate effect.

Which of the following is the most stable complex species ?

- (a) $[\text{Fe}(\text{CO})_5]$

- (b) $[\text{Fe}(\text{CN})_6]^{3-}$
(c) $[\text{Fe}(\text{C}_2\text{O}_4)_3]^{3-}$
(d) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$

14. Which of the following compound will show positive silver mirror test ?

- (a) HCOOH
(b) $\text{CH}_3(\text{CHOH})_3\text{CHO}$
(c) $\text{CH}_3\text{CO}(\text{CHOH})\text{CH}_3$
(d) Both (a) and (b)

15. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion(A) : tert - Butyl methyl ether is not prepared by the reaction of ter-butyl bromide with sodium methoxide.

Reason (R): Sodium methoxide is a strong nucleophile.

Select the most appropriate answer from the options given below:

- a. Both A and R are true and R is the correct explanation of A
B. Both A and R are true but R is not the correct explanation of A.
c. A is true but R is false.
d. A is false but R is true.

16. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion (A) : Sucrose is called an invert sugar.

Reason (R) : On hydrolysis, sucrose bring the change in the sign of rotation from dextro (+) to laevo(-).

Select the most appropriate answer from the options given below:

- a. Both A and R are true and R is the correct explanation of A
b. Both A and R are true but R is not the correct explanation of A.
c. A is true but R is false.
d. A is false but R is true.

17. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion (A): Magnetic moment values of actinides are lesser than the theoretically predicted values.

Reason (R) : Actinide elements are strongly paramagnetic.

Select the most appropriate answer from the options given below:

- a. Both A and R are true and R is the correct explanation of A
b. Both A and R are true but R is not the correct explanation of A.
c. A is true but R is false.
d A is false but R is true.

18. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion (A): Aromatic 1° amines can not be prepared by Gabriel phthalimide synthesis.

Reason (R) : Aryl halides undergo nucleophilic substitution with anion formed by phthalimide

Select the most appropriate answer from the options given below:

- a. Both A and R are true and R is the correct explanation of A
b. Both A and R are true but R is not the correct explanation of A.
c. A is true but R is false.
d. A is false but R is true.

SECTION B

This section contains 7 questions with internal choice in two questions. The following

questions are very short answer type and carry 2 marks each.

19. A first order reaction is 25% complete in 40 minutes. Calculate the value of rate constant. In what time will the reaction be 80% completed?

20. Give the plausible explanation for the following :

(a) Glucose doesn't give 2,4-DNP test.

(b) The two strands in DNA are not identical but are complementary.

OR

(i) Write the name of two monosaccharides obtained on hydrolysis of lactose sugar.

(ii) Why Vitamin C cannot be stored in our body?

21. Give reasons for the following :

(a) The presence of $-\text{NO}_2$ group at ortho or para position increases the reactivity of haloarenes towards nucleophilic substitution reactions.

(b) p-dichlorobenzene has higher melting point than that of ortho or meta isomer.

OR

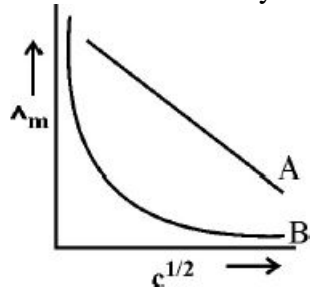
How do you convert:

(i) Chlorobenzene to biphenyl

(ii) Propene to 1-iodopropane

22. Write IUPAC name of the complex $[\text{Cr}(\text{NH}_3)_4\text{Cl}_2]^+$. Draw structures of geometrical isomers for this complex.

23. In the plot of molar conductivity (Λ_m) vs square root of concentration ($c^{1/2}$), following curves are obtained for two electrolytes A and B :



Answer the following :

(i) Predict the nature of electrolytes A and B.

(ii) What happens on extrapolation of Λ_m to concentration approaching zero for electrolytes A and B?

24.(a) Explain the following terms:

(i) Order of a reaction (ii) Molecularity of a reaction

25. What happens when

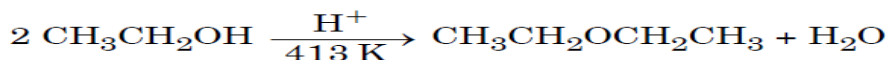
(a) Acetone is treated with $\text{Zn}(\text{Hg}) / \text{Conc. HCl}$, and

(b) Ethanal is treated with methylmagnesium bromide and then hydrolysed ?

SECTION C

This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.

26.(a) Write the mechanism of the following reaction :



(b) Write the preparation of phenol from cumene.

27. Explain the following terms giving a suitable example in each case:

(i) Ambident ligand

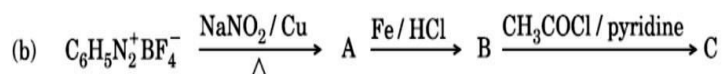
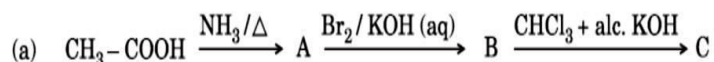
(ii) Denticity of a ligand

(iii) Crystal field splitting in an octahedral field.

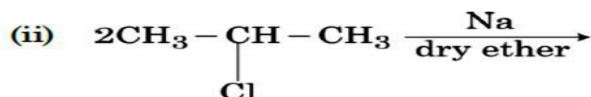
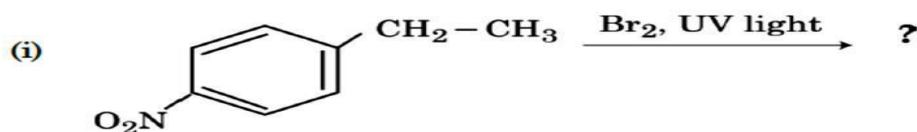
28. State Henry's law. Calculate the solubility of CO_2 in water at 298 K under 760 mm Hg.

(K_H for CO_2 in water at 298 K is 1.25×10^6 mm Hg)

29. Write the structures of compounds A, B and C in the following reactions :



30. Write the major product (s) in the following:



OR

Name the reagents used in the following reactions:

(i) Benzyl alcohol to benzoic acid.

(ii) Dehydration of propan-2-ol to propene.

(iii) Butan-2-one to butan-2-ol.

SECTION D

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

31. Organic compounds containing amine as functional group are present in a vivid variety of compounds, namely amino acids, hormones, neurotransmitters, DNA, alkaloids, dyes, etc. Drugs including nicotine, morphine, codeine and heroin, etc. which have physiological effects on humans also contain amino group in one form or another. Amines are basic because of the presence of lone pair of electrons on nitrogen. Addition of nitrogen into an organic framework leads to the formation of two families of molecules, namely amines and amides. As chemistry students, we must appreciate the versatility of nitrogen.

1. What are amino acids ?
2. Why are amino acids amphoteric ?
3. Give one point of difference between acidic and basic amino acid.
4. What are essential amino acids ?

OR

Name the linkage formed when carboxyl end of one amino acid condenses with amino end of other amino acid.

32. Read the following passage and answer the questions that follow: Solutions are homogeneous mixture of two or more substances. Ideal solution follow Raoult's law. The vapour pressure of each component is directly proportional to their mole fraction if both solute and solvent are volatile. The relative lowering of vapour pressure is equal to mole fraction of solute if only solvent is volatile. Non-ideal solution form azeotropes which cannot be separated by fractional distillation. Henry's law is special case of Raoult's law applicable to gases dissolved in liquids.

Colligative properties depend upon number of particles of solute. Relative lowering of vapour pressure, elevation in boiling point, depression in freezing point and osmotic pressure are colligative properties which depend upon mole fraction of solute, molality and molarity of solutions. When

solute undergoes either association or dissociation, molecular mass determined by colligative property

will be abnormal. van't Hoff factor is used in such cases which is ratio of normal molecular mass over observed molar mass.

(1) 50 ml of an aqueous solution of glucose (Molar mass 180 g/mol) contains 6.02×10^{22} molecules. What is molarity?

(2) Identify which liquid has lower vapour pressure at 90°C if boiling point of liquid 'A' and 'B' are 140°C and 180° respectively.

(3) What type of azeotropes are formed by nonideal solution showing negative deviation from Raoult's law?

(4) For a 5% solution of urea (molar mass 60 g mol^{-1}), calculate the osmotic pressure at 300 K ($R = 0.0821 \text{ L atm K}^{-1}$).

OR

Predict the van't Hoff factor for (i) CH_3COOH dissolved in water, (ii) dissolved in benzene.

SECTION E

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

33. (a) Write the cell reaction and calculate the e.m.f. of the following cell at 298 K :

$\text{Sn (s)} \mid \text{Sn}^{2+} (0.004 \text{ M}) \parallel \text{H}^+ (0.020 \text{ M}) \mid \text{H}_2 (\text{g}) (1 \text{ bar}) \mid \text{Pt (s)}$, (Given : $E^\circ(\text{Sn}^{2+}/\text{Sn}) = -0.14 \text{ V}$)

(b) Give reasons :

(i) On the basis of E° values, O_2 gas should be liberated at anode but it is Cl_2 gas which is liberated in the electrolysis of aqueous NaCl .

(ii) Conductivity of CH_3COOH decreases on dilution.

OR

(a) Define conductivity and molar conductivity for the solution of an electrolyte.

(b) Resistance of a conductivity cell filled with 0.1 mol L^{-1} KCl solution is 100Ω . If the resistance of the same cell when filled with 0.02 mol L^{-1} KCl solution is 520Ω , calculate

the conductivity and molar conductivity of 0.02 mol L^{-1} KCl solution. The conductivity of 0.1 mol L^{-1} KCl solution is $1.29 \times 10^{-2} \Omega^{-1} \text{ cm}^{-1}$.

34. (a) Account for the following:
- (i) ClCH_2COOH is a stronger acid than CH_3COOH .
 - (ii) Carboxylic acids do not give reactions of carbonyl group.
- (b) Write the chemical equations to illustrate the following name reactions:
- (i) Rosenmund reduction (ii) Cannizzaro's reaction
- (c) Out of Pentan-2-one and Pentan-3-one which gives iodoform test?

OR

(a) A and B are two functional isomers of compound $\text{C}_6\text{H}_6\text{O}$. On heating with NaOH and I_2 isomer B forms yellow precipitate of iodoform whereas isomer A does not form precipitate. Write the formulae of A and B.

(b) Distinguish between:

(i) $\text{C}_6\text{H}_5\text{COCH}_3$ and $\text{C}_6\text{H}_5\text{CHO}$ (ii) CH_3COOH and HCOOH

(c) Arrange the following in the increasing order of their boiling points:

CH_3CHO , CH_3COOH , $\text{CH}_3\text{CH}_2\text{OH}$

35. Answer the following:

1. Why are Zn, Cd and Hg non-transition elements ?
2. Which transition metal of 3d series does not show variable oxidation states ?
3. Why do transition metals and their compounds show catalytic activity ?
4. Why are melting points of transition metals high ?
5. Why is Cu^{2+} ion coloured while Zn^{2+} ion is colourless in aqueous solution ?