

General Instructions:

Read the following instructions carefully.

- a) There are 33 questions in this question paper with internal choice.
- b) SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
- c) SECTION B consists of 5 very short answer questions carrying 2 marks each.
- d) SECTION C consists of 7 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	Which of the following lanthanoids show +2 oxidation state besides the characteristic oxidation state +3 of lanthanoids? (a) Ce (b) Eu (c) Lu (d) Ho	1
2	The formula of the complex tris(ethan-1,2 diamine)cobalt(III) Sulphate is (a) [Co(en) ₃]SO ₄ (b) [Co(en) ₃ SO ₄] (c) [Co(en) ₃] ₂ (SO ₄) ₃ (d) [Co(en) ₃](SO ₄) ₃	1
3	The compounds [Co(SO ₄)(NH ₃) ₅]Br and [Co(SO ₄)(NH ₃) ₅]Cl represents (a) Linkage isomerism (b) No isomerism (c) Ionisation isomerism (d) Coordination isomerism	1
4	Hoffmann Bromamide Degradation reaction is shown by (a) ArNH ₂ (b) ArCONH ₂ (c) ArNO ₂ (d) ArCH ₂ NH ₂	1
5	For NaCl the value of Van't Hoff factor is (a) 0 (b) 1 (c) >1 (d) <1	1
6	The magnetic moment is associated with its spin angular momentum and orbital angular momentum. Spin only magnetic moment value of Mn ²⁺ ion is (a) 5.87 B.M. (b) 5.92 B.M. (c) 3.47 B.M (d) 4.57 B.M	1
7	The difference between the electrode potentials of two electrodes when no current is drawn through the cell is called (a) Cell potential (b) Cell emf (c) Potential difference (d) Cell voltage	1
8	Charge carried by 1 mole of electrons is (a) 6.023 × 10 ²³ coulomb (b) 9.65 × 10 ⁴ coulomb (c) 1.6 × 10 ⁻¹⁹ coulomb (d) 6.28 × 10 ¹⁹ coulomb	1
9	Which reagent will you use for the following reaction? CH ₃ CH ₂ CH ₂ CH ₃ → CH ₃ CH ₂ CH ₂ CH ₂ Cl + CH ₃ CH ₂ CHClCH ₃ (a) Cl ₂ /UV light (b) NaCl + H ₂ SO ₄ (c) Cl ₂ gas in presence of Fe in dark (d) Cl ₂ gas in dark	1
10	Phenol is less acidic than (a) Ethanol (b) o-nitrophenol (c) o-methylphenol (d) o-methoxyphenol	1

11	Which out of the following reactions needs no α -H atom to get started? (a) Etard reaction (b) Cannizaro's reaction (c) Aldol condensation (d) HVZ reaction	1
12	In the reaction, $A + 2B \rightarrow 6C + 2D$, if the initial rate $-d[A]/dt$ at $t = 0$ is $2.6 \times 10^{-2} \text{ M sec}^{-1}$, what will be the value of $-d[B]/dt$ at $t = 0$? (a) $8.5 \times 10^{-2} \text{ M sec}^{-1}$ (b) $2.5 \times 10^{-2} \text{ M sec}^{-1}$ (c) $5.2 \times 10^{-2} \text{ M sec}^{-1}$ (d) $7.5 \times 10^{-2} \text{ M sec}^{-1}$	1

In the Following questions a statement of Assertion(A) is followed by a statement of Reason(R). 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.

13	Assertion (A): Sucrose is a non-reducing sugar. Reason (R): In sucrose, the aldehydic group of glucose and ketonic group of fructose are not free.	1
14	Assertion (A): D-(+)-Glucose is dextrorotatory in nature. Reason (R): D-(+) Glucose rotates the plane polarised light in clockwise direction.	1
15	Assertion (A): Aromatic 1° amine can be prepared by Gabriel phthalamide synthesis. Reason (R): Primary Alkylhalide undergoes nucleophilic substitution reaction with anion formed by phthalamide.	1
16	Assertion (A): Nitration of aniline can be conventionally done by protecting the amino group by acetylation. Reason (R): Acetylation increases the electron density in benzene ring.	1

SECTION B

This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 02 marks each.

17	Write the reaction involve in recharging the lead storage battery.	2
18	Calculate the emf of the cell in which the following reaction takes place: $\text{Ni(s)} + 2\text{Ag}^+ (0.002 \text{ M}) \rightarrow \text{Ni}^{2+} (0.160 \text{ M}) + 2\text{Ag(s)}$ [Given that $E^\circ_{\text{cell}} = 1.05 \text{ V}$, $\log 2 = 0.301$]	2
19	A metal ion M^+ having d^4 valence electronic configuration combines with three bidentate ligands to form a complex compound. Assuming $\Delta_0 > P$: (i) Name the type of orbital splitting during this complex formation. (ii) Write the electronic configuration of the valence electrons of the metal M^+ ion in terms of t_{2g} and e_g .	2
20	Arrange the following sets of compounds in order of their increasing boiling points: (a) Pentan-1-ol, butan-1-ol, butan-2-ol, ethanol, propan-1-ol, methanol. (b) Pentan-1-ol, n-butane, pentanal, ethoxyethane. OR Explain the mechanism of the acid catalysed hydration of ethene.	2
21	What happens when D-glucose is treated with the following reagents? (i) HCN (ii) NH_2OH	2

SECTION C

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

22	The limiting molar conductivity of sodium acetate, sodium chloride and hydrochloric acid are 83, 127 and 426 $\text{mho cm}^2 \text{mol}^{-1}$ at 250 C respectively. Calculate the limiting molar conductivity of acetic acid solution.	3
23	The chemistry of corrosion of iron is essentially an electrochemical phenomenon. Explain the reactions occurring during the corrosion of iron in the atmosphere.	3
24	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	3
25	$\text{CoSO}_4 \cdot 5\text{NH}_3$ exists in two isomeric forms 'A' and 'B'. Isomer 'A' reacts with AgNO_3 to give white precipitate, but does not react with BaCl_2 . Isomer 'B' gives white precipitate with BaCl_2 but does not react with AgNO_3 . Answer the following questions. (i) Identify 'A' and 'B' and write their structural formulas. (ii) Name the type of isomerism involved. (iii) Give the IUPAC name of 'A' and 'B'.	3
26	Give reasons for the following: - Alcohols are more soluble in water than the hydrocarbon of comparable molecular masses. (b) Phenoxide ion is more stable than phenol. (c) Ortho nitro phenol is more acidic than Ortho-methoxyphenol. OR Write Short notes on the following reactions (a) Williamson Synthesis (b) Reimer Tiemann reaction (c) Oxidation of phenol	3
27	Arrange the following: (i) CH_3NH_2 , $(\text{CH}_3)_2\text{NH}$, NH_3 , $(\text{CH}_3)_3\text{N}$ [basic strength in gaseous phase] (In decreasing order) (ii) $\text{C}_2\text{H}_5\text{NH}_2$, $\text{C}_6\text{H}_5\text{NH}_2$, NH_3 , $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$ and $(\text{C}_2\text{H}_5)_2\text{NH}$ [basic strength] (In increasing order) (iii) $\text{C}_6\text{H}_5\text{NH}_2$, $\text{C}_6\text{H}_5\text{N}(\text{CH}_3)_2$, $(\text{C}_2\text{H}_5)_2\text{NH}$ and CH_3NH_2 [basic strength] (In increasing order)	3
28	Give answer for the following: (i) Give one structural difference between amylose and amylopectin (ii) Name the protein and its shape present in the oxygen carrier in the human body. (iii) What type of linkage is present in proteins?	3

SECTION D

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

29	<p>Read the passage given below and answer the following questions: Aldehydes and ketones having acetyl group are oxidised by sodium hypohalate (NaOX) or halogen and alkali ($X_2 + OH^-$) to corresponding sodium salt having one carbon atoms less than the carbonyl compound and give a haloform. Sodium hypoiodite (NaOI) when treated with compounds containing CH_3CO- group gives yellow precipitate of iodoform. Haloform reaction does not affect a carbon-carbon double bond present in the compound.</p> <p>(i) Why the methanal is more reactive towards nucleophilic substitution reaction than ethanal.</p> <p>(ii) Write the structure of pentane -2- one.</p> <p style="text-align: center;">OR</p> <p>Write the common name of 1,1,1trichloro ethanal.</p> <p>(iii) How can you distinguish between Acetophenone and benzophenone.</p>	4
30	<p>Read the passage given below and answer the following questions: The solubility of gases increases with increase of pressure. William Henry made a systematic investigation of the solubility of a gas in a liquid. According to Henry's law "the mass of a gas dissolved per unit volume of the solvent at constant temperature is directly proportional to the pressure of the gas in equilibrium with the solution". Dalton during the same period also concluded independently that the solubility of a gas in a liquid solution depends upon the partial pressure of the gas. If we use the mole fraction of gas in the solution as a measure of its solubility, then Henry's law can be modified as "the partial pressure of the gas in the vapour phase is directly proportional to the mole fraction of the gas in the solution":</p> <p>(i) Why the aquatic animals feel more comfortable in cold water.</p> <p>(i) How solubility of gas in liquid varies with increasing temperature.</p> <p>(ii) Write any two applications of henry law.</p> <p style="text-align: center;">OR</p> <p>State Henry's law for gas in liquid solution. Write the mathematical expression of this law.</p>	4

SECTION E

31	<p>Attempt any five of the following-</p> <p>(a) Why enthalpy of atomisation of transition metals are quite high.</p> <p>(b) There is a close similarity in physical and chemical properties of the 4d and 5d series of the transition elements, Explain.</p> <p>(c) Why the members in the actinoid series exhibit larger number of oxidation states than the corresponding members in the lanthanoid series.</p> <p>(d) Cu^{2+} is stable in aqueous solution inspite of having 3d configuration. Why?</p> <p>(e) The E° values of Mn and Zn is more negative. Give reason.</p> <p>(f) The transition metals are generally paramagnetic in nature why?</p> <p>(g) Scandium is a transition element but Zinc is not. Why?</p>	5
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The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.

32	<p>(i) Among all the isomers of molecular formula C_4H_9Br, identify-</p> <p>(a) the one isomer which is optically active.</p> <p>(b) the one isomer which is highly reactive towards S_N2.</p> <p>(c) the two isomers which give the same product on dehydrohalogenation with alcoholic KOH.</p> <p>(ii) Give IUPAC the name of the following organic compounds:</p> <p>(a) </p> <p>(b) $(CH_3)_3CCH_2Br$</p> <p style="text-align: center;">OR</p> <p>What happens when-</p> <p>(i) n-butyl chloride is treated with alcoholic KOH,</p> <p>(ii) bromobenzene is treated with Mg in the presence of dry ether,</p> <p>(iii) chlorobenzene is subjected to hydrolysis,</p> <p>(iv) ethyl chloride is treated with aqueous KOH,</p> <p>(v) methyl bromide is treated with sodium in the presence of dry ether.</p>	5
33	<p>) 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 reactant to its 1/16th value?</p> <p>) Calculate the energy of activation of a reaction for which rate constant becomes doubles by Increase of 10K temperature from 298K</p> <p style="text-align: center;">OR</p> <p>(a)(i) A reaction is 50% complete in 2 hours and 75% complete in 4 hours. What is the order of the reaction?</p> <p>(ii) A first order reaction is 50% completed in 1.26×10^{14} s. How much time would it take for 100% completion?</p> <p>(iii) The activation energy of a reaction is zero. Will the rate constant depend upon temperature? Explain.</p> <p>(b) A reaction is first order in A and second order in B. Write the differential rate equation and calculate how the rate is affected when</p> <p>(i) concentration of B is tripled, (ii) concentration of both A and B is doubled.</p>	5