General Instructions:

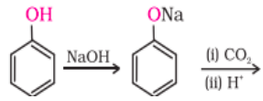
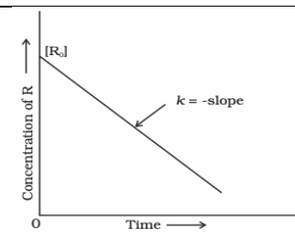
(a) There are **33** questions in this question paper .
(b) SECTION A consists of 16 multiple -choice questions carrying 1 mark each.
(c) SECTION B consists of 5 short answer questions carrying 2 marks each.
(d) SECTION C consists of 7 short answer questions carrying 3 marks each.
(e) SECTION D consists of 2 case - based questions carrying 4 marks each.
(f) SECTION E consists of 3 long answer questions carrying 5 mark each
(g) All questions are compulsory.
(h) Use of log tables and calculators is not allowed.

SECTION A

Question 1 to 16 are multiple choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions

Q.No	Questions	Marks
1	Which of the following sequences will convert Nitrobenzene to 4-Bromoaniline**?** (a) Nitration → Reduction → Bromination (b) Bromination → Nitration → Reduction (c) Reduction → Bromination → Nitration (d) Nitration → Bromination → Reduction	1
2	How would you define the potential difference between its electrodes in a Galvanic cell? (a) The potential difference is the voltage measured across the two electrodes, expressed in volts (b) The potential difference is the difference between the electrode potentials of the cathode and anode (c) The potential difference is the sum of the electrode potentials of the cathode and anode (d) The potential difference is determined only by the type of electrodes, not the solutions used	1
3	The crystal field splitting ,$\Delta_t = 4/9\Delta_o$.The main reason for this is (a) Stronger repulsion between orbitals, which increase Δ_t. (b) The ligands are closer to the metal ion, increasing the splitting energy. (c) There are fewer ligands , and none lie directly on the metal–ligand axes. (d) The value of Δ_t depends only on the charge of the metal ion and not on geometry.	1
4	Calculate the mass of urea (NH_2CONH_2) required to prepare 2.5 kg of a 0.25 molal aqueous solution. (a) 25.0 g (b) 37.5 g (c) 15.0 g (d) 60.0 g	1
5	The highest oxidation state of vanadium in VO_2^+ is stabilised due to: (a) Multiple bonds and electronegativity of oxygen. (b) Vanadium being very electropositive. (c) VO_2^+ is soluble in water, which stabilises the oxidation states. (d) Vanadium has completely filled 3d orbitals in VO_2^+.	1

6	The major product formed in the given reaction is:  (a) 1,2-Dibromocyclohexane (b) 3-Bromocyclohexene (c) Vinyl bromide (d) Bromocyclohexane	1
7	The initial concentration of the reactant in the reaction R → P is 4.62×10^{-2} mol/L. What is the half life for the reaction ,if $k = 2.31 \times 10^{-2}$ $molL^{-1}s^{-1}$ (a) 30 s (b) 3 s (c)1 s (d) 10 s	1
8	The stability of +4 oxidation state increases down the group, in group14. Identify the option that supports the above statement.? (a) Ti(IV) is more stable because 3d electrons are more available for bonding. (b) Zr(IV) and Hf(IV) are less stable than Ti(IV) due to greater hydration enthalpy. (c) All Group 4 elements are equally good oxidising agents (d) Ti(IV) is less stable than Zr(IV) and Hf(IV) due to smaller size and higher polarisation of Ti–O bonds.	1
9	Predict the option with correct order of reactivity of the following in S_N2 reactions: (a) $C_6H_5CH(C_6H_5)Br > C_6H_5C(CH_3)(C_6H_5)Br > C_6H_5CH_2Br > C_6H_5CH(CH_3)Br$ (b) $C_6H_5C(CH_3)(C_6H_5)Br > C_6H_5CH(C_6H_5)Br > C_6H_5CH(CH_3)Br > C_6H_5CH_2Br$ (c) $C_6H_5CH(CH_3)Br > C_6H_5CH_2Br > C_6H_5CH(C_6H_5)Br > C_6H_5C(CH_3)(C_6H_5)Br$ (d) $C_6H_5CH_2Br > C_6H_5CH(CH_3)Br > C_6H_5CH(C_6H_5)Br > C_6H_5C(CH_3)(C_6H_5)Br$	1
10	Which of the following statements is correct? (a) All ambidentate ligands form chelate complexes (b) Chelating ligands always increase stability of metal complexes (c) Monodentate ligands are always more stable than chelates (d) Ambidentate ligands never show isomerism	1
11	Which of the following purines are common to RNA and DNA? (a) Adenine, Thymine (b) Guanine, Thymine (c) Thymine, Cytosine (d) Adenine, Guanine	1
12	Ankit has been given : a primary amine, a secondary amine. Which of the following set of tests can he use to distinguish the compounds? (a) Sodium metal and bromine water (b) Carbylamine and Ammonia (c) Hinsberg's reagent and Nitrous acid (d) Sodium metal and Hinsberg's reagent	1
A statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices. (a) Assertion and reason both are correct statements and reason is correct explanation for assertion. (b) Assertion and reason both are correct statements but reason is not correct explanation for assertion. (c) Assertion is correct statement but reason is wrong statement. (d) Assertion is wrong statement but reason is correct statement.		
13	**Assertion (A):** Proper orientation of reactant molecules during collisions leads to the formation of products. **Reason (R):** The steric factor determines the energy required for molecules to overcome the activation barrier.	1

14	**Assertion (A):** The compound $C_6H_5NHCOCH_3$ is obtained when a compound "A" reacts with acetic anhydride in the presence of pyridine. Compound A does not undergo Friedel–Crafts reaction **Reason (R):** The functional group present in "A" reacts with the Lewis acid in Friedel–Craft's reaction .	1
15	**Assertion (A):** Hydrolysis of α-1,4 glycosidic linkages in starch increases its solubility in cold water. **Reason (R):** Breaking α-1,4 linkages removes all branching in starch, making it completely linear.	1
16	**Assertion (A):** Grignard reagents must be handled in water to increase their reactivity. **Reason (R):** Grignard reagents react with water, alcohols, and amines to give hydrocarbons.	1
	Section-B	
	Question No. 17 to 21 are very short answer questions carrying 2 marks each	
17	Give reason for ; I The technique of osmotic pressure for determination of molar mass of solutes is particularly useful for biomolecules. II. A soda bottle will go flat faster in Delhi than in Srinagar **OR** Derive a relation between relative lowering of the vapour pressure of the solution and molar mass of the solute	(1+1)
18	I Give structures of the products of the reaction (a)  (b) $CH_3\,CH_2\,CH_2CH{=}CHCH_2OH \xrightarrow{PCC}$ II Give reason for: (a)The ortho and para isomers of Nitrophenols can be separated by steam distillation. (b) The reaction of alcohols with acid chloride is carried out in the presence pyridine.	(1+1)
19	I Define molecularity of a reaction. II Derive the integrated rate law expression for the graph represented here. . 	(1+1)
20	Give the IUPAC name and the isomerism shown by the following compounds (a) $[Cr(NH_3)_6][Co(CN)_6]$, (b) $[PtCl_2(en)_2]^{2+}$	(1+1)
21	I Show "Peptide linkage", with a suitable equation II What are the different types of RNA found in the cell.	(2)
	Section C	
	Question No. 22 to 28 are short answer questions, carrying 3 marks each.	
22	I Calculate the standard Gibb's free energy and equilibrium constant of the reaction: $Cu(s) + Ag^+(aq) \longrightarrow Cu^{2+}(aq) + Ag(s)$; E^o cell = 0.46 (antilog of 0.562=3648, 0.781=6039) II. Write the cathode- anode chemistry of recharging the lead storage battery	(2+1)
23	I Show the splitting of d orbitals as per crystal field electronic configuration in $[Co(H_2O)_6]^{3+}$ ion .Comment on the colour and magnetic moment of the complex .[Z of Co = 27] II Distinguish between double salt and coordination compounds.	(2+1)

<table>
<tr><td>24</td><td>The treatment of 2-Bromopentane with aqueous potassium hydroxide leads to the formation of alcohols but in the presence of alcoholic potassium hydroxide, the products formed are different. Answer any three of the following.
I Explain the reason for the difference in the product formation
II State the rule which governs the major and minor products formed in presence of alcoholic potassium hydroxide
III Give the equations for each case mentioned (in statement I)
IV Give the complete equation for 2-Bromopentane undergoing Wurtz reaction.</td><td>(1+1+1)</td></tr>
<tr><td>25</td><td>I Give equation for the following .Arrange the major products obtained in the following cases in the increasing order of their p^{Ka} values:
(a) Reaction of propanoic acid with bromine in the presence of red phosphorus
(b)Reaction of isopropyl magnesium bromide with carbon dioxide, followed by hydrolysis.
II Is benzaldehyde more/less reactive in nucleophilic addition reactions than propanal? Justify with suitable structures.</td><td>(2 +1)</td></tr>
<tr><td>26</td><td>The following data were obtained during the first order thermal decomposition of SO_2Cl_2 at a constant volume.
SO_2Cl_2 (g).⟶ SO_2 (g) +Cl_2 (g)
(log 4=0.6040,log 5=0.6989, log 1.25=0.0969)
<table><tr><th>Experiment</th><th>Time/s^{-1}</th><th>Total pressure/atm</th></tr><tr><td>1</td><td>0</td><td>0.5</td></tr><tr><td>2</td><td>100</td><td>0.6</td></tr></table>Calculate the rate of the reaction when total pressure is 0.65 atm.</td><td>(3)</td></tr>
<tr><td>27</td><td>I Carry out following conversion : Aniline to benzyl alcohol
II Arrange the following in increasing order of basic strength in aqueous solution: $C_6H_5N(CH_3)_2$, $(C_2H_5)_2NH$. Justify.
III Gabriel phthalimide synthesis is preferred for synthesising primary amines. Why?</td><td>(2+1)</td></tr>
<tr><td>28</td><td>I Why do amino acids behave as salts?
II Show the pyranose structures of anomers of glucose?
III Doctor advised a 50 year old woman enough exposure to sunlight and addition of fish and egg yolk to her diet. What is the possible disease diagnosed by the doctor? Enlist the symptoms.</td><td>(1+1+!)</td></tr>
<tr><td colspan="3">Section D
Question No. 29 & 30 are case-based/data -based questions carrying 4 marks each</td></tr>
<tr><td>29</td><td>Fragrance Formulation Stability
An R&D lab tests a new fragrance oil by dissolving 0.018 kg of camphor in 500 g of cyclohexane. When cooled, the freezing-point depression is found to be 2.5°C. Fragrance formulations that show a greater freezing point depression are generally more stable during storage at low temperatures.
Given K_f(cyclohexane)=20.0 K kg mol^{-1} and molar mass of camphor = 152 g/mol,
I Calculate the Van’t Hoff factor .
II Calculate the percent of association, if it dimerises in the solvent.
III A greater freezing point depression leads to greater stability during storage at low temperatures. Explain.
OR</td><td>(2+1+21)</td></tr>
</table>

	III Plot a graph representing depression of the freezing point of a solvent in a solution.	
30	Organic Reactions to Origins of Life Experimental studies show that alcohols can undergo dehydration under conditions, forming alkenes or ethers. These settings may have promoted the assembly of primitive lipid-like structures, relevant to early life forms. To verify the same ,under controlled heating, a student observes that heating propanol at 413 K under acidic conditions led to the formation of an organic product, while a slight increase in temperature or using different isomers resulted in different products. I Write the mechanism of the dehydration of propanol taking place at 413 K. II Dehydration of isomeric propanols yields/does not yield the same product . Choose the correct option. (a) Yields .All isomers form the same carbocation intermediate. (b) Different isomers form carbocations of varying stability, leading to different products. Does not yield. (c) Dehydration is independent of the structure of the alcohol. Does not yield (d) All isomers produce the same product through intermolecular dehydration. Yields III Effect the conversion of 2-Methylpropan-2-ol to an ether with six carbons. OR III Give a chemical test to distinguish between Propanol and 2-Methylpropan-2-ol	(2+1+1)
	Section E Question No. 31 to 33 are long answer type questions carrying 5 marks each	
31	I Three electrolytic cells A,B,C containing solutions of $ZnSO_4$, $AgNO_3$ and $CuSO_4$, respectively are connected in series. A steady current of 1.5 amperes was passed through them until 1.08 g of silver deposited at the cathode of cell B. How long did the current flow? What mass of copper and zinc were deposited? (Molar mass of Ag = 108 g/mol, Cu = 63.5 g/mol, Zn = 65.3 g/mol) II Plot a graph depicting variation of "Molar conductivity with dilution " for (i)acetic acid and (ii)potassium chloride in aqueous solutions. **OR** I Resistance of a conductivity cell filled with 0.1 mol L^{-1} KCl solution is 100 Ω. If the resistance of the same cell when filled with 0.02 mol L^{-1} KCl solution is 520 Ω, 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 1.3 S/m. II. Explain how rusting of iron is envisaged as setting up of an electrochemical cell.	(3+2)

32	I Using the data given here on I,II and III ionisation enthalpies of 3d series , answer the questions that follows **Element** Sc Ti V Cr Mn Fe Co Ni Cu Zn **Atomic number** 21 22 23 24 25 26 27 28 29 30 **Ionisation enthalpy/$\Delta_i H^0$/kJ mol^{-1}** $\Delta_i H^0$ I 631 656 650 653 717 762 758 736 745 906 $\Delta_i H^0$ II 1235 1309 1414 1592 1509 1561 1644 1752 1958 1734 $\Delta_i H^0$ III 2393 2657 2833 2990 3260 2962 3243 3402 3556 3837 (a) Compare the variation of second ionization enthalpy of copper with that of zinc . (b) The E^o value for the Mn^{3+}/Mn^{2+} couple is much more positive than that for Cr^{3+}/Cr^{2+} . Explain (c) Analyse the variation of ionisation enthalpy across the period between the transition and p block elements. II Give complete equation for (a) Manganate ion disproportionates in acidic medium (b) Cu(II) ion oxidises iodide to iodine. **OR** I A crystalline compound 'X' and another compound 'Y' are interconvertible in aqueous solution depending upon p^H of the solution. .The compound 'Y' is prepared chemically using chromite ore . (a) Identify compounds 'X' and 'Y', by writing the interconversion equation (b) Give the ionic equation for the reaction of "X" with hydrogen sulphide in acidic medium (c) Give suitable equation to show the preparation of the compound 'X' II Account for the following: (a)Actinoid contraction is greater from element to element than lanthanoid contraction. (b) Transition metals and many of their compounds show paramagnetic behaviour.	(3+2)
33	An organic compound 'A', does not undergo aldol condensation .However, it reacts with its functional isomer. the compound 'B' in the presence of a base to give the compound "Z" .i.e.1,3-Diphenylprop-2-en-1-one.The compound "A" reacts with 2,4-Dinitrophenylhydrazine. I Identify 'A' and 'B' . II Write the equation of "A" reacting with 2,4-Dinitrophenylhydrazine. III Give the Clemmensen's reduction of "Z". IV Give one chemical test to distinguish between "A" and "B". V Boiling point of "B" is higher than "A". Explain **OR** I Distinguish between; Propanal and Propanone II Draw structures of : The semicarbazone of cyclobutanone III Bring about the following conversion: Benzaldehyde to Benzophenone IV Benzoic acid does not undergo Friedel-Craft's reaction.Explain. V Arrange the following compounds in increasing order of their boiling points. CH_3CHO, CH_3CH_2OH. Justify.	(1+1+1+1+1)
