KENDRIYA VIDYALAYA SANGATHAN, LUCKNOW REGION
PRE BOARD 2025-26
CLASS – XII
CHEMISTRY(043)

Max.Marks:70 **Time:3Hours**

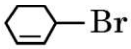
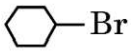
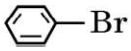
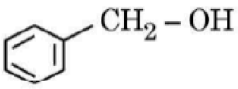
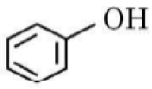
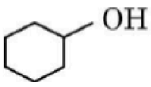
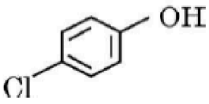
ReadthefollowingInstructionscarefully.

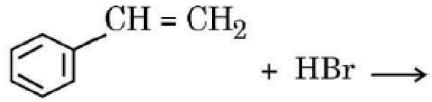
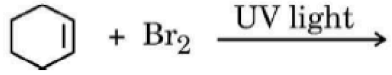
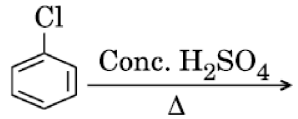
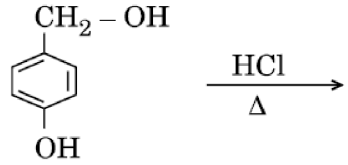
(a) There are **33** questions in this question paper with internal choice.
(b) SECTION A consists of 16 multiple -choice questions carrying 1 mark each.
(c) SECTION B consists of 5 short answer questions carrying 2 marks each.
(d) SECTION C consists of 7 short answer questions carrying 3 marks each.
(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.

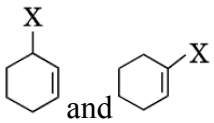
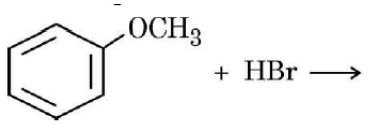
SECTION-A

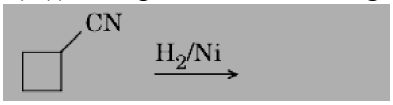
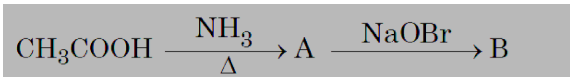
Question 1 to 16 are multiple choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

1	Which one of the following first row transition elements is expected to have the highest second ionization enthalpy ? (A) Iron (Z = 26) (B) Manganese (Z = 25) (C) Chromium (Z = 24) (D) Vanadium (Z = 23)	**[1]**
2	For an electrolyte undergoing dissociation in a solvent, the vant hoff factor : (A) is always greater than one (B) has negative value (C) has zero value (D) is always less than one	**[1]**
3	Which of the following compounds will give a ketone on oxidation with chromic anhydride (CrO_3) ? (A) $(CH_3)_2CH - CH_2OH$ (B) $CH_3CH_2CH_2OH$ (C) $(CH_3)_3C - OH$ (D) $CH_3 - CH_2 - \underset{\displaystyle OH}{\underset{\vert}{CH}} - CH_3$	**[1]**
4	Two among the three components of RNA are β-D-ribose and a heterocyclic base. The third component is : (A) Adenine (B) Phosphoric acid (C) Sulphuric acid (D) Uracil	**[1]**
5	The reaction of an alkyl halide with sodium alkoxide forming ether is known as : (A) Wurtz reaction (B) Reimer-Tiemann reaction (C) Williamson synthesis (D) Kolbe reaction	**[1]**
6	The slope in the plot of ln[R] vs. time for a first order reaction is (A) $\frac{+k}{2.303}$	**[1]**

	(B) $\frac{-k}{2.303}$ (C) $-k$ (D) $+\ k$	
7	The compound which undergoes S_N2 reaction most rapidly is : (A)  (B)  (C)  (D) 	**[1]**
8	The formation of hemiacetal from an aldehyde is an example of : (A) nucleophilic addition (B) electrophilic addition (C) nucleophilic substitution (D) electrophilic substitution	**[1]**
9	When Acetic acid is heated with red P_4/Cl_2followed by hydrolysis gives : (A) Cl - CH_2-COCl (B) Cl - CH_2- COOH (C) CH_3-COCl (D) CCl_3-COCl	**[1]**
10	For the reaction A + 2B C + D, the rate law is given by r = k[A] $[B]^{2,}$ the concentration of A is kept constant while that of B is doubled. The rate of the reaction will : (A) double (B) become half (C) not change (D) quadruple	**[1]**
11	Which of the following is most acidic? (A)  (B)  (C)  (D) 	**[1]**
12	The vitamin which plays an important role in coagulating blood is : (A) Vitamin D (B) Vitamin E (C) Vitamin K (D) Vitamin A	**[1]**
	For Questions number 13 to 16, two statements are given one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below. (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A). (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A). (C) Assertion (A) is true, but Reason (R) is false.	

	(D) Assertion (A) is false, but Reason (R) is true.	
13	Assertion (A) : Separation of Zr and Hf is difficult. Reason (R) :Zr and Hf have similar radii due to lanthanoid contraction.	**[1]**
14	Assertion (A) : Addition of ethylene glycol to water lowers its freezing point. Reason (R) : Ethylene glycol is insoluble in water due to lack of its ability to form hydrogen bonds with water molecules.	**[1]**
15	Assertion (A) : Benzoic acid do not undergo Friedel Crafts Reaction Reason (R) :Carboxyl group is deactivating and the catalyst aluminum Chloride gets bonded to the carboxyl group.	**[1]**
16	Assertion (A) :Methanamine is a weak base than ammonia. Reason (R) : The electron density increases on nitrogen atom in methanamine due to +I effect of methyl group.	**[1]**
	SECTION B Question No. 17 to 21 are very short answer questions carrying 2 marks each.	
17	Calculate the half-cell potential at 298 K for the reaction $Zn^{2+} + 2e^{-} \rightarrow Zn$ $if\ \left[Zn^{2+}\right] = 0.1M\ and\ E^{o}_{Zn^{2+}/Zn} = -0.79V$	**[2]**
18	Define order of reaction. How does order of a reaction differ from molecularity for a complex reaction?	**[2]**
19	What happens when D-glucose is treated with the following reagents? (a) Br_2 water (b) HCN	**[2]**
20	(a) Draw the structures of major monohalo products in each of the following reactions : (i)  (ii)  OR (b) Write the major product(s) of the following reactions : (i)  (ii) 	**[2]**
21	Give chemical equation for the following reactions : (i) Propanone is treated with dil. $Ba(OH)_2$. (ii) Acetophenone is treated with Zn(Hg)/Conc. HCl.	**[2]**
	SECTION C Question No. 22 to 28 are short answer questions, carrying 3 marks each.	
22	The rate constant for the first order decomposition of N_2O_5 is given by the following equation : $k = (2.5 \times 10^{14}\ s^{-1})\ e^{(-25000K)/T}$ Calculate Ea for this reaction and rate constant if its half-life period be 300 minutes.	**[3]**

23	(a) Write the formula for the following coordination compound : Tetraamminechloridonitrito-N-cobalt(III) chloride (b) Arrange the following complexes in the increasing order of conductivity of their solution : $[Cr(NH_3)_5Cl]Cl_2$, $[Cr(NH_3)_3Cl_3]$, $[Cr(NH_3)_6]Cl_3$ (c) Identify the type of isomerism exhibited by the following complexes : (i) $[Co(NH_3)_5(SO_4)]Cl$ (ii) $[Co(en)_3]Cl_3$	**[3]**
24	 (a) Out of and , which is an example of allylic halide? (b) Outofchlorobenzeneand2,4,6-trinitrochlorobenzene,whichismore reactive towards nucleophilic substitution and why ? (c) WhichisomerofC$_4$H$_9$Clhasthelowestboilingpoint?	**[3]**
25	(a) Write the mechanism of the following reaction : $CH_3CH_2OH \xrightarrow[443\ K]{H^+} CH_2 = CH_2 + H_2O$ (b) Write the main product in each of the following reaction : 	**[3]**
26	Give reasons for any 3 of the following observations : (a) Penta-acetate of glucose does not react with hydroxylamine. (b) Amino acids behave like salts. (c) Water soluble vitamins must be taken regularly in diet. (d) The two strands in DNA are complimentary to each other.	**[3]**
27	An organic compound (A) having molecular formula C_4H_8O gives orange red precipitate with 2, 4-DNP reagent. It does not reduce Tollens' reagent but gives yellow precipitate of iodoform on heating with NaOH and I_2. Compound (A) on reduction with $NaBH_4$ gives compound (B) which undergoes dehydration reaction on heating with conc. H_2SO_4 to form compound (C). Compound (C) on Ozonolysis gives two molecules of ethanal. Identify (A), (B) and (C) and write their structures. Write the reactions of compound (A) with (i) $NaOH/I_2$ and (ii) $NaBH_4$.	**[3]**
28	The electrical resistance of a column of 0.05 M KOH solution of length 50 cm and area of cross-section 0.625 cm^2 is 5 x 10^3 ohm. Calculate its resistivity, conductivity and molar conductivity.	**[3]**
	SECTION D Question No. 29 & 30 are case-based/data -based questions carrying 4 marks each.	
29	Fuel cells and batteries are both electrochemical energy storage and conversion devices, but they differ fundamentally in their operation. Batteries store a fixed amount of chemical energy and convert it to electrical energy, while fuel cells generate electricity continuously as long as they are supplied with fuel like hydrogen, methane etc and an oxidant like oxygen. Batteries are also classified as primary batteries if they can be used only once or secondary batteries if they can be recharged by passing current through it in the opposite direction. Answer the following questions : (a) What are the fundamental differences between batteries and fuel cells? (b) The cell potential of Mercury cell is 1·35 V, and remains constant during its life. Give reason. (c) Write the reactions involved in the discharging of the lead storage battery. OR	**[4]**

	(c) Write the reactions involved in H_2-O_2 fuel cell.	
30	The nature of bonding, structure of the coordination compound can be explained to some extent by valence bond theory. The central metal atom/ion makes available a number of vacant orbitals equal to its coordination number. The appropriate atomic orbitals (s, p and d) of the metal hybridize to give a set of equivalent orbitals of definite geometry such as square planar, tetrahedral, octahedral and so on. A strong covalent bond is formed only when the orbitals overlap to the maximum extent. The d-orbitals involved in the hybridisation may be either inner d-orbitals i.e. (n-1) d or outer d-orbitals i.e. nd. The complexes formed are called inner orbital complex (low spin complex) and outer orbital complex (high spin complex) respectively. Further, the complexes can be paramagnetic or diamagnetic in nature. The drawbacks of this theory are that this involves number of assumptions and also does not explain the colour of the complex. Answer the following questions: (a) Predict whether $[Co(NH_3)_6]^{3+}$ is diamagnetic or paramagnetic and why? [Atomic number: Co=27] (b) What is the coordination number of Co in $[Co(ox)_2\ Br\ Cl)]^{3-}$? (c) (i) Write the IUPAC name of the given complex: $[Fe(CN)_6]^{3-}$ (ii) Explain $[CoF_6]^{3-}$ is an inner orbital or outer orbital complex. OR (c) Using valence bond theory, deduce the shape and hybridisation of $[Ni(NH_3)_6]^{2+}$ [Atomic number of Ni = 28]	**[4]**
	SECTION E Question No. 31 to 33 are long answer type questions carrying 5 marks each.	
31	A. (a) Measurement of osmotic pressure method is preferred for the determination of molar masses of macromolecules such as proteins and polymers. (b) Red Blood Cells (RBC) shrink when placed in saline water but swell in distilled water. (c) 3.9 g of benzoic acid dissolved in 49 g of benzene shows a depression in freezing point of 1.62 K. Calculate the van't Hoff factor and predict the nature of solute (associated or dissociated). (Given: Molar mass of benzoic acid=122 $gmol^{-1}$ for benzene = 4.9 K Kg $K\ mol^{-1}$) OR B. (a) Identify which liquid will have a higher vapour pressure at 90°C if the boiling points of two liquids A and B are 140°C and 180°C, respectively. (b) Differentiate between Ideal solution and Non-ideal solution. (c) The freezing point of a solution containing 5g of benzoic acid (M = 122 g mol^{-1}) in 35g of benzene is depressed by 2.94 K. What is the percentage association of benzoic acid if it forms a dimer in solution? (K_f for benzene = 4.9 K kg mol^{-1})	**[5]**
32	A) (i) Aniline does not undergo Friedal-Crafts reactions. (ii) $(CH_3)_2NH$ is more basic than $(CH_3)_3N$ in an aqueous solution. (iii) Primary amines have higher boiling point than tertiary amines (iv) Write a chemical test to distinguish between N,N-dimethylaniline and aniline. (v) How will you convert Aniline to benzene OR B) (i) Complete the following reaction :  (ii) Write the structures of A and B in the following reaction :  	**[5]**

	(iii) Gabriel phthalimide synthesis is not preferred for preparing aromatic primary amines. (iv) Give reason why Ammonolysis of alkyl halides is not a good method to prepare pure primary amines. (v) How will you convert Ethanoic acid to methanamine	
33	(a) (i) Account for the following : (1) A new element is discovered whose electronic configuration is found to be $6d^{10}\ 7s^2$. Comment on the expected melting and boiling points of the element. (2) Of the d^4 species, Cr^{2+} is strongly reducing while Mn^{3+} is strongly oxidizing. (3) A lanthanoid element forms M^{4+} ion. Whether this ion will be oxidizing or reducing agent and why? (ii) Complete and balance the following chemical equations : (A) $8MnO_4^- + 3S_2O_3^{2-} + H_2O$ ——> (B) $Cr_2O_7^{2-} + 14H^+ + 3\ H_2S$——> OR (b) (i) Out of Cu_2Cl_2 and $CuCl_2$, which is more stable in aqueous solution and why ? (ii) Write one similarity and one difference between chemistry of Lanthanoids and Actinoids. (iii) Explain why the oxidizing power of oxyanions are in the order $VO_2^+ < Cr_2O_7^{2-} < MnO_4^-$ (iv) What is colour change of chromate ion by the action of an acid and why? (v) Many of the transition elements and their compounds can act as good catalysts.	**[5]**