

**KENDRIYA VIDYALAYA SANGATHAN JAMMU REGION**  
**FIRST PREBOARD EXAMINATION 2025-26**

**SET NO. I**  
**CODE: 4311**

**Class : XII**  
**Subject: Chemistry(Theory)**

**Maximum Marks: 70**  
**Time Allowed: 3Hrs.**

**GENERAL INSTRUCTIONS:**

**Read the following instructions carefully.**

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

<b>Section-A</b>		
	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.	In Clemmensen Reduction carbonyl compound is treated with _ (a) Zinc amalgam + HCl      (b) Sodium amalgam + HCl (c) Zinc amalgam + HNO <sub>3</sub> (d) Sodium amalgam + HNO <sub>3</sub>	1
2.	What is the correct order of reactivity of alcohols in the following reaction? $\text{R-OH} + \text{HCl} \xrightarrow{\text{ZnCl}_2} \text{R-Cl} + \text{H}_2\text{O}$ a) 1° > 2° > 3°      (b) 1° < 2° > 3° (c) 3° > 2° > 1°      (d) 3° > 1° > 2°	1
3	Of the following complexes, which one will show linkage isomerism? (a) [Cr(NH <sub>3</sub> ) <sub>6</sub> ][Co(en) <sub>3</sub> ]      (b) [Cr(NH <sub>3</sub> ) <sub>6</sub> ]Cl <sub>3</sub> (c) [Cr(en) <sub>3</sub> ]Cl <sub>3</sub> (d) [Cr(NH <sub>3</sub> ) <sub>5</sub> NO <sub>2</sub> ]Cl <sub>2</sub>	1
4	The -NH <sub>2</sub> group is o-, p- directing and strongly activates the aromatic ring. Therefore, aromatic amines undergo electrophilic substitution reactions readily and it is difficult to stop the reaction at the mono substitution stage. However, sometimes mono substitution product is required. How can the activating effect of -NH <sub>2</sub> group be controlled to get mono substitution product? (a) Protecting -NH <sub>2</sub> group by chlorination with chlorine (b) Protecting -NH <sub>2</sub> group by nitration with nitric acid (c) Protecting -NH <sub>2</sub> group by alkylation with alkyl chloride (d) Protecting -NH <sub>2</sub> group by acetylation with acetic anhydride	1

5.	Pure benzene has vapour pressure three times that of pure toluene. They form nearly ideal solution. What would be the ratio of their mole fractions in the vapour phase of a solution having equal mole fractions of benzene and toluene. a) 1                      b) 2/3                      c) 3                      d) 1/3	1
6.	Based on the position of -Br in the compound in $\text{CH}_3\text{CH}=\text{CHC}(\text{Br})(\text{CH}_3)_2$ can be classified as _____ halide. (a) Allyl                      (b) Aryl                      (c) Vinyl                      (d) Secondary	1
7.	When Phenol is distilled with zinc dust, it gives (a) Benzene                      (b) Toluene (c) Benzaldehyde                      (d) Benzoic acid	1
8.	What are the hydrolysis products of lactose? (a) $\beta$ -D-galactose and $\beta$ -D-Glucose (b) $\alpha$ -D-Galactose and $\alpha$ -D-Glucose (c) $\alpha$ -D-Glucose and $\beta$ -D-Fructose (d) None of these	1
9.	Which of the following ion has magnetic moment value of 5.9? (a) $\text{Mn}^{2+}$ (b) $\text{Fe}^{2+}$ (c) $\text{Ni}^{2+}$ (d) $\text{Cu}^{2+}$	1
10.	$\Lambda m^\circ \text{CH}_3\text{COOH}$ can be calculated if the values of the following are given: 1. $\Lambda m^\circ \text{HCl}$ , $\Lambda m^\circ \text{KCl}$ and $\Lambda m^\circ \text{CH}_3\text{COOK}$ 2. $\Lambda m^\circ \text{NaCl}$ , $\Lambda m^\circ \text{KCl}$ and $\Lambda m^\circ \text{CH}_3\text{COONa}$ 3. $\Lambda m^\circ \text{H}_2\text{SO}_4$ , $\Lambda m^\circ \text{Na}_2\text{SO}_4$ and $\Lambda m^\circ \text{CH}_3\text{COONa}$ a. Only 1 b. Either 1 or 2 c. Either 1 or 3 d. Either 2 or 3	1
11.	Which is the most suitable reagent for conversion? $\text{CH}_3-\text{CH}_2-\text{CH}-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3 \rightarrow \text{CH}_3-\text{CH}_2-\text{CH}-\text{CH}_2-\overset{\text{OH}}{\underset{\text{H}}{\text{C}}}$ (a) Tollen's reagent (b) Benzoyl peroxide (c) $\text{I}_2$ and NaOH solution (d) Sn and NaOH solution	1
12.	Match the column I and column II:	1

	Column I	Column II	
	<p>A.</p> $\begin{array}{c} \text{CH}_3 \\   \\ \text{H}-\text{C}-\text{CH}_2-\text{C}-\text{OH} \\   \\ \text{CH}_2 \\   \\ \text{CH}_3 \end{array} + \text{H}-\text{Cl} \xrightarrow{\text{heat}} \begin{array}{c} \text{CH}_3 \\   \\ \text{H}-\text{C}-\text{CH}_2-\text{C}-\text{Cl} \\   \\ \text{CH}_2 \\   \\ \text{CH}_3 \end{array} + \text{H}-\text{OH}$	(i) Addition reaction	
	<p>B.</p> $\begin{array}{c} \text{H}_3\text{C} \\   \\ \text{H} \\   \\ \text{C}_6\text{H}_{13} \end{array} - \text{Br} + ^-\text{OH} \longrightarrow \text{HO} - \begin{array}{c} \text{CH}_3 \\   \\ \text{H} \\   \\ \text{C}_6\text{H}_{13} \end{array} + \text{Br}^-$	(ii) Elimination reaction	
	<p>C.</p> $\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\overset{\text{Br}}{\underset{\text{H}}{\text{C}}}-\text{CH}_2 \xrightarrow{^-\text{OH}} \text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}=\text{CH}_2$	(iii) $S_N^2$ reaction	
	<p>D.</p> $\text{CH}_3\text{CH}=\text{CH}_2 + \text{H}-\text{I} \longrightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{I} + \text{CH}_3\text{CHICH}_3$	(iv) $S_N^1$ reaction	
	<p>a. A-(i), B-(ii), C-(iii), D-(iv)  b. A-(iv), B-(ii), C-(iii), D-(i)  c. A-(i), B-(iii), C-(ii), D-(iv)  d. A-(iv), B-(iii), C-(ii), D-(i)</p>		
	<p><b>For Question 13 to 16, two statements are given- one labelled as Assertion(A) and other labelled as Reason(R). Select the correct answer to these questions from the codes (a), (b), (c), and (d) as given below:</b></p> <p>a. Both A and R are true, and R is the correct explanation of A.  b. Both A and R are true, and R is not the correct explanation of A.  c. A is true but R is false.  d. A is false but R is true</p>		
13.	<p><b>Assertion(A):</b> Aldehydes undergo Aldol condensation only if it has <math>\alpha</math>-hydrogen.  <b>Reason(R):</b> <math>\alpha</math>-hydrogen in aldehydes are acidic in nature because anion is formed by loss of <math>\alpha</math>-hydrogen is resonance stabilized.</p>		1
14.	<p><b>Assertion (A):</b> Secondary cells are used in invertors.  <b>Reason (R):</b> A primary cell can be recharged by passing current through it in the opposite direction after it has been used.</p>		1
15.	<p><b>Assertion(A):</b> Amylopectin is water soluble and contributes 15-20% of starch.  <b>Reason(R) :</b> Amylopectin has <math>C_1-C_4</math> &amp; <math>C_1-C_6</math> glycosidic linkages.</p>		1
16.	<p><b>Assertion(A):</b> When methyl alcohol is added to water, the boiling point of water decreases.  <b>Reason(R):</b> When a volatile solute is added to a volatile solvent elevation in boiling point is observed</p>		1
	<p><b>Section-B</b>  Question No. 17 to 21 are very short answer questions carrying 2 marks each.</p>		
17	<p><b>Attempt either option A or B</b>  <b>A: Answer the following</b></p>		2X1

	<p>a) Common salt and Calcium chloride are used to clear snow on the roads, both are of almost same cost but sodium chloride is preferred. Why?</p> <p>b) How the freezing point changes when mercuric iodide is added to the aqueous solution of potassium iodide?</p> <p style="text-align: center;"><b>OR</b></p> <p><b>B: Answer the following</b></p> <p>a) What is the degree of dissociation for 0.1M Ba (NO<sub>3</sub>)<sub>2</sub> if i (Van't Hoff factor) is 2.74</p> <p>b) Arrange the following solutions in increasing order of Van't Hoff factor. 0.1M CaCl<sub>2</sub>, 0.1M KCl, 0.1M C<sub>12</sub>H<sub>22</sub>O<sub>11</sub>, 0.1 M Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub></p>	
18.	<p>The rate for the decomposition of NH<sub>3</sub> on platinum surface is zero order. What are the rate of production of N<sub>2</sub> and H<sub>2</sub> if K=2.5×10<sup>-4</sup> mol litre<sup>-1</sup>s<sup>-1</sup>.</p>	2
19.	<p>Carry out following conversions :</p> <p>I. Nitrobenzene to 4- bromobenzenamine</p> <p>II. Chlorophenylmethane to 2-phenyl-ethanamine</p>	2X1
20.	<p>[Fe(H<sub>2</sub>O)<sub>6</sub>]<sup>3+</sup> is strongly paramagnetic whereas [Fe(CN)<sub>6</sub>]<sup>3-</sup> is weakly paramagnetic. Explain. (At. no. Fe = 26)</p>	2
21.	<p>Ethers can be prepared by Williamson synthesis in which an alkyl halide is reacted with sodium alkoxide. Di-tert-butyl ether can't be prepared by this method. Explain.</p>	2
	<p><b>Section-C</b></p> <p><b>Q. No. 22 to 28 are short answer questions, carrying 3 marks each.</b></p>	
22.	<p>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 g mol<sup>-1</sup>, K<sub>f</sub> for benzene = 4.9 K kg mol<sup>-1</sup>)</p>	3
23.	<p>Write the Nernst equation for the following:</p> <p>I. Ni (s) + Cu<sup>2+</sup> (aq) ⇌ Ni<sup>2+</sup> (aq) + Cu (s)</p> <p>II. Al (s) + FeSO<sub>4</sub> (aq) ⇌ Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> (aq) + Fe (s)</p> <p>III. Mg (s)/Mg<sup>2+</sup> (aq)//Ag<sup>+</sup> (aq)/Ag(s)</p>	3X1
24.	<p>Compound 'A' with molecular formula C<sub>4</sub>H<sub>9</sub>Br is treated with aq. KOH solution. The rate of this reaction depends upon the concentration of compound 'A' only. When another optically active isomer 'B' of this compound was treated with aq. In KOH solution, the rate of reaction was found to be dependent on the concentration of the compound and KOH both.</p> <p>(i) Write down the structural formula of both compounds 'A' and 'B'.</p> <p>(ii) Out of these two compounds, which one will be converted to the product with an inverted configuration?</p>	2+1
25.	<p>Account for the following</p> <p>(a) Although Zr belongs to 4d and Hf belongs to 5d transition series but it is quite difficult to separate them.</p> <p>(b) There is in general increase in density of element from titanium to copper.</p>	3x1

	(c) Most of the transition metals and their compounds act as good catalysts.	
26.	Account for the following: (i) $pK_b$ of aniline is more than that of methylamine. (ii) Ethylamine is soluble in water whereas aniline is not. (iii) Methylamine in water reacts with ferric chloride to precipitate hydrated ferric oxide.	3
27.	Carry out the following conversions : <b>(Attempt any 3)</b> (i) Phenol to anisole (ii) Ethyl magnesium chloride to Propan-1-ol (ii) Cumene to phenol (iv) Phenol to picric acid	3X1
28.	(a) What happens when Manganate ions ( $MnO_4^{2-}$ ) undergoes disproportionation reaction in acidic medium? (b) Explain why the colour of $KMnO_4$ disappears when oxalic acid is added to its solution in acidic medium. (c) When an orange solution containing $Cr_2O_7^{2-}$ ion is treated with an alkali, a yellow solution is formed and when $H^+$ ions are added to a yellow solution, an orange solution is obtained. Explain why does this happen?	3X1
	<b>Section D</b> Q. No. 29 & 30 are case-based/data -based questions carrying 4 marks each.	
29.	<b>Read the passage carefully and answer the questions.</b> Redox reactions play an important role in chemistry. Whenever a redox reaction takes place directly in a single beaker, chemical energy in the form of heat is produced. By suitable means, it is possible to bring about the redox reactions indirectly so as to convert the chemical energy into electrical energy. A device used to convert the chemical energy produced in a redox reaction into electrical energy is called an electrochemical cell. If a redox reaction is allowed to take place in such a way that oxidation half reaction takes place in one beaker and the reduction half reaction in another beaker, the electrons given out by the former will be taken by the latter and the current will flow. The two portions of the cell are called half cells. The values of standard redox potential ( $E^0$ ) of two half cell reactions decides in which way the reaction will proceed. A redox reaction is feasible when the substance having higher reduction potential gets reduced and the one having lower reduction potential gets oxidised. For example, In Daniel cell, zinc goes into solution and copper gets deposited. <b>1.</b> Formulate the galvanic cell for: $Zn(s) + 2Ag^+(aq) \rightarrow Zn^{2+}(aq) + 2Ag(s)$ <b>2.</b> Is it safe to stir $AgNO_3$ solution with a copper spoon? Why or why not? Given: $E_{Ag^+/Ag}^0 = 0.80$ volt and $E_{Cu^{2+}/Cu}^0 = 0.34$ volt <b>3.</b> Two half-cell reactions of an electrochemical cell are given below:	4

	<p> <math>\text{MnO}_4^- (\text{aq}) + 8\text{H}^+ (\text{aq}) + 5\text{e}^- \rightarrow \text{Mn}^{2+} (\text{aq}) + 4\text{H}_2\text{O} (\text{l}), \quad E^0 = +1.51\text{V}</math>  <math>\text{Sn}^{2+} (\text{aq}) \rightarrow \text{Sn}^{4+} (\text{aq}) + 2\text{e}^-, \quad E^0 = +0.15\text{V}</math> </p> <p>Construct the redox reaction from the two half-cell reactions and predict if this reaction favours formation of reactants or products shown in the equation.</p> <p style="text-align: center;"><b>OR</b></p> <p><b>(i)</b> State the factors affecting cell potential of: <math>\text{Mg} (\text{s})   \text{Mg}^{2+} (\text{aq})    \text{Ag}^+ (\text{aq})   \text{Ag} (\text{s})</math></p> <p><b>(ii)</b> Can <math>E_{\text{cell}}^0</math> or <math>\Delta_r G^0</math> for cell reaction ever be equal to zero?</p>	
30.	<p>Alfred Werner, a Swiss chemist was the first to formulate his idea about the structure of coordination compounds. He proposed the concept of primary and secondary valences for a metal ion. The primary valences are normally ionisable and satisfied by negative ions. The secondary valences are non-ionisable and it is equal to coordination number and is fixed for a metal. The groups bound by the secondary linkages to metal have spatial arrangements corresponding to different coordination numbers. Octahedral, tetrahedral and square planar geometrical shapes are more common in coordination compounds of transition metals. Double salts and coordination complexes are formed by the combination of two or more stable compounds in stoichiometric ratio. Double salts are dissociated into simple ions completely when dissolved in water whereas complexes do not dissociate completely into its ions. Werner was the first to discover optical activity in certain coordination compounds.</p> <p>(i) What is the oxidation number of cobalt in coordination entity <math>[\text{Co}(\text{H}_2\text{O})(\text{CN})(\text{en})_2]^{2+}</math>?</p> <p>(ii) What is the coordination number of chromium in <math>\text{K}[\text{Cr}(\text{H}_2\text{O})_2(\text{C}_2\text{O}_4)_2]</math>?</p> <p>(iii) Arrange the following complexes in increasing order of conductivity of their solution. Give reason.  <math>[\text{Co}(\text{NH}_3)_3\text{Cl}_3]</math>, <math>[\text{Co}(\text{NH}_3)_4\text{Cl}_2] \text{Cl}</math>, <math>[\text{Co}(\text{NH}_3)_6] \text{Cl}_3</math>, <math>[\text{Co}(\text{NH}_3)_5\text{Cl}] \text{Cl}_2</math></p> <p style="text-align: center;"><b>OR</b></p> <p>(iii)a) How many ions are produced from the complex <math>[\text{Co}(\text{NH}_3)_6]\text{Cl}_3</math> in solution?</p> <p>b) When 1 mol <math>\text{CrCl}_3 \cdot 6\text{H}_2\text{O}</math> is treated with excess of <math>\text{AgNO}_3</math>, 3 mol of <math>\text{AgCl}</math> are obtained. Write the formula of the complex.</p>	4
	<p><b>Section-E</b></p> <p><b>Question No. 30 to 33 are long answer questions, carrying 5 marks each.</b></p>	
31	<p><b>Attempt either A or B</b></p> <p><b>A:</b></p> <p><b>(a) (i)</b> For the reaction <math>2\text{X} \rightarrow \text{X}_2</math>, the rate of reaction becomes three times, when concentration of X is increased 27 times. What is the order of the</p>	5

reaction?

(ii) Write the rate equation for the reaction

$2A + B \rightarrow 2C$ , if the order of the reaction is zero.

(iii) Oxygen is available in plenty in air, yet fuels do not burn by themselves at room Temperature. Explain.

**(b)** Rate constant for first order reaction has been found to be  $2.54 \times 10^{-3} \text{ s}^{-1}$ . Calculate its three-fourth life. [ $\log 2 = 0.3010$ ].

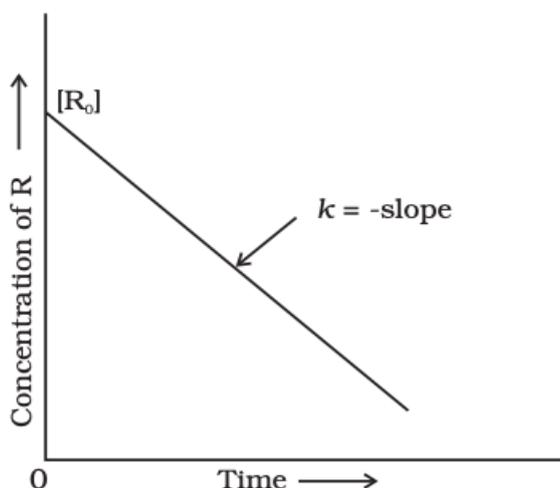
**OR**

**B:**

**I.** The rate of a reaction triples when the temperature changes from 298 K to 318 K. Calculate the energy of activation of the reaction assuming that it does not change with temperature.

(Given  $R = 8.314 \text{ JK}^{-1}\text{mol}^{-1}$ ,  $\log 3 = 0.4771$ )

**II.** Identify the order of reaction and write its integrated rate equation mentioning what each term in the equation represents.



32. **Attempt either A or B**

**A:**

Answer the following questions:

(a) Why D- Glucose does show mutarotation?

(b) What will be the condensation product of glucose and fructose? Which linkage is responsible for condensation of monosaccharides?

(c) Mention the difference in anomeric forms of glucose and evidence to support the cyclic forms of glucose.

(d) Under what conditions glucose is converted to gluconic and saccharic acid? Write chemical reactions.

**OR**

**B:**

1+1+1+2

	<p>Give reasons for the following observations.</p> <p>a) Amino acids behave like salts rather than simple amines or carboxylic acids.</p> <p>b) Amino acids show amphoteric behavior.</p> <p>c) The two strands of DNA are complementary to each other.</p> <p>d) Pentaacetate of glucose does not react with hydroxyl amine.</p> <p>e) Starch and cellulose both contain glucose units as monomers yet they are structurally different.</p>	5X1=5
33.	<p><b>Attempt either A or B</b></p> <p><b>A:</b></p> <p>(a) Arrange the following compounds in an increasing order of their indicated property :</p> <p>(i) Benzoic acid, 4-Nitrobenzoic acid, 3,4-Dinitrobenzoic acid, 4-Methoxybenzoic acid (acid strength)</p> <p>(ii) <math>\text{CH}_3\text{CH}_2\text{CH}(\text{Br})\text{COOH}</math>, <math>\text{CH}_3\text{CH}(\text{Br})\text{CH}_2\text{COOH}</math>, <math>(\text{CH}_3)_2\text{CHCOOH}</math>, <math>\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}</math> (acid strength)</p> <p>(b) How would you bring about the following conversions :</p> <p>(i) Propanone to Propene (ii) Benzoic acid to Benzaldehyde</p> <p>(iii) Bromobenzene to 1-phenylethanol</p> <p style="text-align: center;"><b>OR</b></p> <p><b>B:</b></p> <p>a) An organic compound (A) (molecular formula <math>\text{C}_8\text{H}_{16}\text{O}_2</math>) was hydrolysed with dilute sulphuric acid to give a carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid also produced (B). On dehydration (C) gives but-1-ene. Write the equations for the reactions involved.</p> <p>b) Write chemical equations to illustrate the following name bearing reactions :</p> <p>(i) Cannizzaro's reaction (ii) Hell-Volhard-Zelinsky reaction</p>	5