



COMMON PRE-BOARD EXAMINATION

CHEMISTRY-Code No. 043

Class-XII-(2025-26)

SET: 3



Time allowed: 3 Hrs.

Maximum Marks: 70

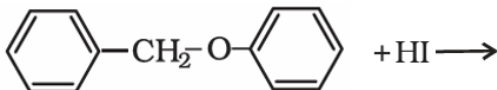
General Instructions:

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.

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.

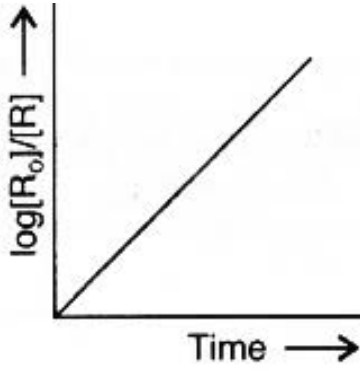
1	Which property of transition metals enables them to behave as catalysts? A. High melting point B. High ionisation enthalpy C. Alloy formation D. Variable oxidation states	1
2	Predict the major products of the following reaction:  A. Benzyl iodide and phenol B. Toluene and phenol C. Iodobenzene and Anisole D. Iodobenzene and benzyl alcohol	1
3	The acid formed when propyl magnesium bromide is treated with CO ₂ followed by acid hydrolysis is: A. C ₃ H ₇ COOH B. C ₂ H ₅ COOH C. CH ₃ COOH D. C ₃ H ₇ OH	1

4	Dilution affects both conductivity as well as molar conductivity. Effect of dilution on both is as follows: A. Both increase with dilution. B. Both decrease with dilution. C. Conductivity increases whereas molar conductivity decreases on dilution. D. Conductivity decreases whereas molar conductivity increases on dilution.	1
5	The colligative property used for the determination of the molar mass of polymers and proteins is: A. Osmotic pressure B. Depression in freezing point C. Relative lowering in vapour pressure D. Elevation in boiling point	1
6	Which one of the following is not an allylic halide? A. 4-Bromopent-2-ene B. 3-Bromo-2-methylbut-1-ene C. 1-Bromobut-2-ene D. 4-Bromobut-1-ene	1
7	The conversion of an alkyl halide into an alcohol by aqueous NaOH is classified as: A. an addition reaction B. a dehydration reaction C. a substitution reaction D. a dehydrohalogenation reaction	1
8	Reaction of ethylamine with chloroform in alcoholic KOH gives A. C_2H_5CN B. C_2H_5NC C. CH_3CN D. CH_3NC	1
9	Which of the following is the correct formula of Potassium dioxalatozincate(II)? A. $K_3[Zn(C_2O_4)_2]$ B. $K_2[Zn(C_2O_4)_2]$ C. $K_4[Zn(C_2O_4)_2]$ D. $K[Zn(C_2O_4)_2]$	1
10	The bond that determines the secondary structure of proteins is A. Covalent bond B. Disulphide linkages C. Hydrogen bond D. Ionic bond	1
11	Phosgene is a common name for A. phosphoryl chloride B. thionyl chloride C. carbon dioxide and phosphine D. carbonyl chloride	1

12	<p>Acetic acid reacts with PCl_5 to give:</p> <p>A. ClCH_2COCl B. ClCH_2COOH C. CH_3COCl D. CCl_3COOH</p>	1
13	<p>Assertion (A): For a Daniell cell, $\text{Zn}/\text{Zn}^{2+}(\text{1M})\parallel\text{Cu}^{2+}(\text{1M})/\text{Cu}$ With $E^\ominus_{\text{cell}} = 1.1 \text{ V}$, if the external opposing potential is more than 1.1 V, the electrons flow from Cu to Zn.</p> <p>Reason (R): The cell acts like a galvanic cell.</p> <p>Select the most appropriate answer from the options given below:</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>	1
14	<p>Assertion (A): In polysaccharides, monosaccharide units are linked by glycosidic linkage.</p> <p>Reason (R): Glycosidic linkage is an amide linkage.</p> <p>Select the most appropriate answer from the options given below:</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>	1
15	<p>Assertion (A): When KCl is added to water, a depression in the freezing point is observed.</p> <p>Reason (R): KCl undergoes dissociation in water.</p> <p>Select the most appropriate answer from the options given below:</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>	1
16	<p>Assertion (A): Aniline is a weaker base than ammonia.</p> <p>Reason (R): Due to resonance, the lone pair of electrons is less available on Nitrogen.</p> <p>Select the most appropriate answer from the options given below:</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>	1

Section-B

Question No. 17 to 21 are very short answer questions carrying 2 marks each.

17	What is meant by crystal field splitting energy? For a d^6 ion, write the configuration if (i) $\Delta_o < P$, and (ii) $\Delta_o > P$.	2
18	<p>For a chemical reaction $R \rightarrow P$, a plot of $\log [R]_0 / [R]$ vs time (s) is given as</p>  <p>I. Predict the order of the reaction</p> <p>II. What is the slope of the line?</p> <p>III. Write the unit of rate constant for this reaction.</p>	<p>1</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
19	<p>Write the final product(s) in each of the following reactions:</p> <p>I. $(CH_3)_3C - OH \xrightarrow[573\text{ K}]{Cu}$</p> <p>II. $C_6H_5 - OH \xrightarrow[(ii)\ H^+]{(i)\ CHCl_3 + aq.NaOH}$</p>	2
20	<p>Attempt either option A or B</p> <p>A. Answer the following questions: What is Henry's law? Give one application of it.</p> <p style="text-align: center;">OR</p> <p>B. Answer the following questions: Define Azeotrope. What type of Azeotrope is formed by negative deviation from Raoult's law? Give an example.</p>	<p>2</p> <p>2</p>
21	<p>Write the structures of A and B in the following reactions.</p> <p>I $CH_3CH_2CN \xrightarrow{Na(Hg)/ethanol} A \xrightarrow{HNO_2} B$</p> <p>II $C_6H_5NH_2 \xrightarrow[0 - 5^\circ C]{NaNO_2/HCl} A \xrightarrow{H_3PO_2} B$</p>	2

Section-C

Question No. 22 to 28 are short answer questions, carrying 3 marks each.

22	<p>Give reasons for the following statements:</p> <p>I. Scandium ($Z = 21$) is a transition element, but Zn ($Z = 30$) is not.</p> <p>II. Physical and chemical properties of the 4d and 5d series of the transition elements are quite similar than expected.</p> <p>III. Transition metals and most of their compounds show paramagnetic behaviour.</p>	3
23	<p>Explain the following:</p> <p>I. Out of Sc^{3+}, Co^{2+} and Cr^{3+} ions, only Sc^{3+} is colourless in aqueous solutions. (Atomic no. Co = 27; Sc = 21 and Cr = 24)</p> <p>II. The $E^{\theta}_{\text{Cu}^{2+}/\text{Cu}}$ for copper metal is positive (+0.34), unlike the remaining members of the first transition series.</p> <p>III. $\text{La}(\text{OH})_3$ is more basic than $\text{Lu}(\text{OH})_3$.</p>	3
24	<p>I. Aryl chlorides and bromides can be easily prepared by electrophilic substitution of arenes with chlorine and bromine, respectively, in the presence of Lewis acid catalysts. But why does the preparation of aryl iodides require the presence of an oxidising agent?</p> <p>II. How can you convert the following? But-1-ene to 1-iodobutane</p> <p>III. Which isomer of C_5H_{10} gives a single monochloro compound $\text{C}_5\text{H}_9\text{Cl}$ in bright sunlight?</p>	3
25	<p>Give reasons:</p> <p>I. Mercury cell delivers a constant potential during its lifetime.</p> <p>II. In the experimental determination of electrolytic conductance, Direct Current (DC) is not used.</p> <p>III. Define fuel cell with an example.</p>	3
26	<p>Complete the following reactions:</p> <p>I. $\text{C}_6\text{H}_5\text{CH}_2\text{CH}_3 \xrightarrow[\text{(b) H}^+]{\text{(a) KMnO}_4, \text{KOH}}$ </p> <p>II. $\text{C}_6\text{H}_5\text{COCl} \xrightarrow{\text{H}_2, \text{Pd-BaSO}_4}$ </p> <p>III. $2 \text{C}_6\text{H}_5\text{CHO} \xrightarrow{\text{Conc. NaOH}}$ </p>	3
27	<p>Calculate the mass of ascorbic acid (Molar mass = 176 g mol^{-1}) to be dissolved in 75 g of acetic acid, to lower its freezing point by 1.5°C. ($K_f = 3.9 \text{ K kg mol}^{-1}$)</p>	3

28	Carry out the following conversions. (Attempt any 3) I. Propene to Acetone II. Phenol to Toluene III. Ethanal to Propan-2-ol IV. Phenol to benzoquinone	3
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Section D

Question No. 29 & 30 are case-based/data -based questions carrying 4 marks each.

29	<p>Oxidation-reduction reactions are commonly known as redox reactions. They involve the transfer of electrons from one species to another. In a spontaneous reaction, energy is released, which can be used to do useful work. The reaction is split into two half-reactions. Two different containers are used, and a wire is used to drive the electrons from one side to the other, and a Voltaic/Galvanic cell is created. It is an electrochemical cell that uses spontaneous redox reactions to generate electricity. A salt bridge also connects the half-cells. The reading of the voltmeter gives the cell voltage or cell potential or electromotive force. If $E^{\ominus}_{\text{cell}}$ is positive, the reaction is spontaneous, and if it is negative, the reaction is non-spontaneous and is referred to as an electrolytic cell. Electrolysis refers to the decomposition of a substance by an electric current. One mole of electric charge, when passed through a cell, will discharge half a mole of a divalent metal ion such as Cu^{2+}. This was first formulated by Faraday in the form of the laws of electrolysis.</p> <p>The conductance of a material is its property due to which a material allows the flow of ions through itself and thus conducts electricity. Conductivity is represented by k, and it depends upon the nature and concentration of the electrolyte, temperature, etc. A more common term, molar conductivity of a solution at a given concentration, is the conductance of the volume of solution containing one mole of electrolyte kept between two electrodes, with the unit area of cross-section and the distance of unit length. The limiting molar conductivity of weak electrolytes cannot be obtained graphically.</p>	
	<p>Based on the information provided above, answer the following questions:</p> <p>I. Does the silver plate act as anode or cathode in the above-given cell? Justify your answer.</p> <p>II. Represent the cell which is given in the diagram above.</p>	<p>1</p> <p>1</p>
	OR	

	<p>What will happen if the salt bridge is removed?</p> <p>III. The value of E^{θ}_{cell} is 1.260V. What is the value of E_{cell}?</p> $2\text{Al (s)} + 3\text{Cd}^{2+} (0.1 \text{ M}) \rightarrow 3\text{Cd (s)} + 2\text{Al}^{3+} (0.01 \text{ M})$	2
30	<p>Werner was the first to describe the bonding features in coordination compounds. But his theory could not answer a lot of basic questions. Many approaches have been put forth to explain the nature of bonding in coordination compounds, viz. Valence Bond Theory, Crystal Field Theory, Ligand Field Theory and Molecular Orbital Theory. According to Valence bond theory, the metal atom or ion under the influence of ligands can use its (n-1)d, ns, np or ns, np, nd orbitals for hybridisation to yield a set of equivalent orbitals of definite geometry, such as octahedral, tetrahedral, square planar and so on. These hybridised orbitals are allowed to overlap with ligand orbitals that can donate electron pairs for bonding.</p> <p>Based on the information provided above, answer the following questions:</p> <p>I. Write the hybridisation and magnetic character of $[\text{FeF}_6]^{3-}$ [Atomic number: Fe = 26]</p> <p>II. What type of isomerism is shown by the coordination compound? $[\text{Cr}(\text{NH}_3)_6][\text{Co}(\text{CN})_6]$</p> <p>III. Draw the optical isomers of $[\text{Co}(\text{en})_3]^{3+}$</p>	<p>1</p> <p>1</p> <p>2</p>
<p>Section-E</p> <p>Question No. 31 to 33 are long answer type questions carrying 5 marks each.</p>		
31	<p>Attempt either A or B</p> <p>A. Answer the following questions:</p> <p>I. What are the products of the hydrolysis of maltose?</p> <p>II. Distinguish between globular and fibrous proteins.</p> <p>III. Name the vitamin whose deficiency in our body results in impaired clotting of blood.</p> <p>IV. Give a reaction of glucose which cannot be explained by its open structure.</p> <p>V. Name the four bases in RNA.</p> <p style="text-align: center;">OR</p> <p>B. Answer the following questions:</p> <p>I. What are anomers? Give an example.</p> <p>II. What is denaturation of proteins?</p> <p>III. Name a polysaccharide containing an α-glycosidic linkage and a polysaccharide containing a β-glycosidic linkage.</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>

	IV. Except for vitamin B ₁₂ , all other vitamins of group B should be supplied regularly in the diet. Why?	1																				
	V. How is a nucleotide different from a nucleoside?	1																				
32	<p>Attempt either A or B</p> <p>A.</p> <p>The following data were obtained during the kinetic studies of the reaction:</p> $2P + Q \rightarrow R + 2S$ <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Experiment</th> <th>Initial [P] (molL⁻¹)</th> <th>Initial [Q] (molL⁻¹)</th> <th>Initial rate of formation of R (molL⁻¹s⁻¹)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0.2</td> <td>0.03</td> <td>5 x 10⁻³</td> </tr> <tr> <td>2</td> <td>0.4</td> <td>0.06</td> <td>4.0 x 10⁻²</td> </tr> <tr> <td>3</td> <td>0.2</td> <td>0.09</td> <td>4.5 x 10⁻²</td> </tr> <tr> <td>4</td> <td>1.0</td> <td>0.15</td> <td>-</td> </tr> </tbody> </table> <p>(i) Determine the order of reaction with respect to each reactant. 2</p> <p>(ii) Write the rate law expression for the reaction. 1</p> <p>(iii) Calculate the value of the rate constant for the reaction. Give its unit. 1</p> <p>(iv) Determine the initial rate of formation of R in experiment number 4. 1</p> <p style="text-align: center;">OR</p> <p>B.</p> <p>I. For a first order reaction, show that the time required for 99% completion is twice the time required for the completion of 90% of the reaction. 2</p> <p>II. The rate of a chemical reaction is tripled when the temperature increases from 27 °C to 47 °C. Calculate the activation energy (E_a). 3</p> <p>(Given: R = 8.314 J K⁻¹ mol⁻¹, log 2 = 0.301, log 3 = 0.477)</p>	Experiment	Initial [P] (molL ⁻¹)	Initial [Q] (molL ⁻¹)	Initial rate of formation of R (molL ⁻¹ s ⁻¹)	1	0.2	0.03	5 x 10 ⁻³	2	0.4	0.06	4.0 x 10 ⁻²	3	0.2	0.09	4.5 x 10 ⁻²	4	1.0	0.15	-	
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33	<p>Attempt either A or B</p> <p>A. Answer the following questions:</p> <p>I. Explain why:</p> <p>(i) The carboxyl group in benzoic acid is meta-directing. 1</p> <p>(ii) Sodium bisulphite is used for the purification of aldehydes and ketones. 1</p>																					

	<p>(iii) Carboxylic acids do not give characteristic reactions of the carbonyl group.</p>	1
	<p>II. An organic compound 'A' having the molecular formula C_3H_8O, on treatment with Cu at 573 K, gives compound 'B'. 'B' does not reduce Fehling's reagent but gives a yellow precipitate of compound 'C' with Iodine and NaOH. Deduce the structures of A, B and C.</p>	2
OR		
	<p>B. Answer the following questions:</p>	
	<p>I. Write the structure of the expected product of Wolf-Kishner reduction of 2-Methylbutanal.</p>	1
	<p>II. How would the presence of $-SO_3H$ group affect the acidic strength of benzoic acid?</p>	1
	<p>III. Prepare acetic acid from ethanamine.</p>	1
	<p>IV. Convert Aniline to benzoic acid.</p>	1
	<p>V. Give a chemical test to distinguish between: propanal and ethanal.</p>	1