CBSE EXAMINATION PAPER-2025

CHEMISTRY

(Solved)

Time allowed : 3 hours | Maximum Marks : 82

General Instructions :

Read the following instructions carefully and follow them :

i. This question paper contains **39 questions.** All questions are **compulsory.**

ii. This question paper is divided into **5 sections.**

iii. **Section A** – questions number **1 to 3** are case based questions

iv. **Section B** – questions number **4 to 19** are multiple choice questions

v. **Section C** – questions number **20 to 25** are very short answer

vi. **Section D** – questions number **26 to 33** are short answer

vii. **Section E** – questions number **34 to 39** are long answer

viii. There is no overall choice given in the question paper. However, an internal choice has been provided in few questions.

ix. Use of calculator is NOT allowed.

Section A

Question 1. Carbohydrates are polyhydroxy aldehydes or ketones that represent enormous structural diversity in terms of the arrangement of atoms in space, resulting in hundreds of stereoisomers. Although the chemical properties of most stereoisomers may not be very different, their metabolic rate and utilization in biological systems is significantly different and known to influence the overall carbohydrate metabolism. Structural variants, which arise due to a different arrangement of atoms in three-dimensional space are known as stereoisomers. The number of stereoisomers can be theoretically estimated by using the formula 2n, where ‘n’ is the number of stereocenters or

asymmetric (chiral) carbon atoms in a molecule. Out of these stereoisomers, there are some structures, which are mirror images of each other, and they are referred to as enantiomers.

Question 2.

Carbohydrates are polyhydroxy aldehydes or ketones that represent enormous structural diversity in terms of the arrangement of atoms in space, resulting in hundreds of stereoisomers. Although the chemical properties of most stereoisomers may not be very different, their metabolic rate and utilization in biological systems is significantly different and known to influence the overall carbohydrate metabolism. Structural variants, which arise due to a different arrangement of atoms in three-dimensional space are known as stereoisomers. The number of stereoisomers can be theoretically estimated by using the formula 2n, where 'n' is the number of stereocenters or asymmetric (chiral) carbon atoms in a molecule. Out of these stereoisomers, there are some structures, which are mirror images of each other, and they are referred to as enantiomers.

Answer the following questions :

(1)

Give chemical reactions to show the presence of an aldehydic groupand straight chain in glucose.

[2 Marks]

(2)

Draw the structure of β-D-Glucopyranose.

[1 Marks]

(3)

Define anomers.

[1 Marks]

(4)

Sucrose is known as invert sugar. Explain.

[1 Marks]

Question 3.

Werner's coordination theory in 1893 was the first attempt to explain the bonding in coordination complexes. It must be remembered that this theory was put forward before the electron had been discovered by J.J. Thomson in 1897, and before the electronic theory of valency. Werner did not have any of the modern instrumental techniques and all his studies were made using simple experimental techniques. Werner was able to explain the nature of bonding in complexes and he concluded that in complexes, the metal shows two different sorts of valency : primary and secondary. Primary valences are normally ionisable whereas secondary valences are non ionisable.

Answer the following questions :

(1)

One mole of $CrCl_3 \cdot 4H_2O$ precipitates one mole of AgCl whentreated with excess of $AgNO_3$ solution. Write (i) the structuralformula of the complex, and (ii) the secondary valency of Cr.

[2 Marks]

(2)

What is the difference between a complex and a double salt ?

[1 Marks]

(3)

Arrange the following complexes in the increasing order of conductivity of their solution :

$[Cr(NH_3)_3Cl_3]$, $[Cr(NH_3)_6]Cl_3$, $[Cr(NH_3)_5Cl]Cl_2$

[1 Marks]

(4)

Write two differences between primary and secondary valences in coordination compounds.

[1 Marks]

Section B

Question 4.

The role of a catalyst is to change:

[1 Marks]

(A) Gibbs energy of reaction

(B) enthalpy of reaction

(C) activation energy of reaction

(D) equilibrium constant

Question 5.

Which of the following molecules is chiral in nature?

[1 Marks]

(A) 1-chlorobutane

(B) 2-chlorobutane

(C) 1-chloropropane

(D) 2-chloropropane

Question 6.

CH_3CH_2OH can be converted to CH_3CHO by:

[1 Marks]

(A) treatment with PCC

(B) treatment with $KMnO_4$

(C) treatment with $LiAlH_4$

(D) catalytic hydrogenation

Question 7.

The IUPAC name for CH_3-CH_2-N(CH_3)-CH_2-CH_2-CH_3 is:

[1 Marks]

(A) N,N-dimethylpropan-1-amine

(B) N-ethyl-N-methylpropan-1-amine

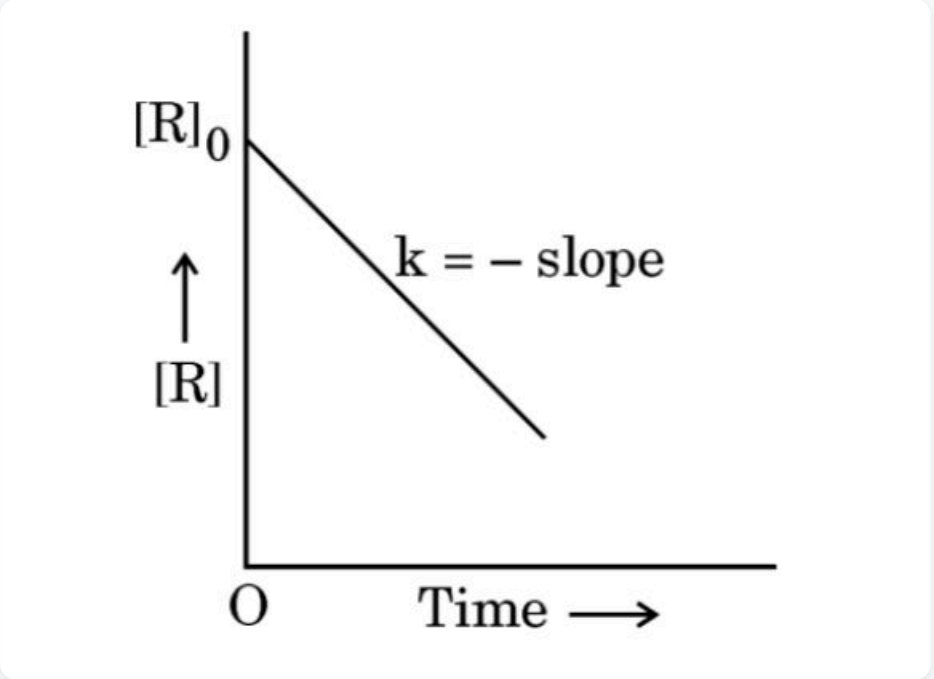
(C) N,N-diethylpropan-1-amine

(D) N-methylpentan-2-amine

Question 8.

A plot between concentration of reactant [R] and time 't' is shown below. Which of the given order of reaction is indicated by the graph?

[1 Marks]



(A) Zero order

(B) Third order

(C) First order

(D) Second order

Question 9.

The treatment of ethyl bromide with alcoholic silver nitrite gives:

[1 Marks]

(A) ethyl nitrite

(B) nitromethane

(C) ethene

(D) nitroethane

Question 10.

Which of the following aqueous solutions will have the highest freezing point?

[1 Marks]

(A) 1·0 M Na_2SO_4

(B) 1·0 M KCl

(C) 1·0 M Glucose

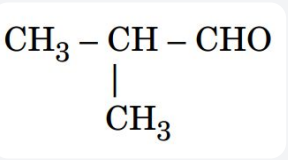
(D) 1·0 M $AlCl_3$

Question 11.

Which of the following aldehydes will undergo Cannizzaro reaction?

[1 Marks]

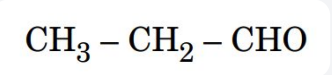
(A)



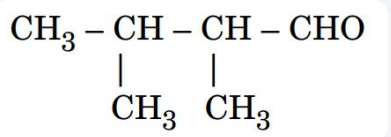
(B)



(C)



(D)



Question 12.

In which of the following groups are both ions coloured in aqueous solution?

I. Cu^+ II. Ti^{4+} III. Co^{2+} IV. Fe^{2+}

[Atomic number : Cu = 29, Ti = 22, Co = 27, Fe = 26]

[1 Marks]

(A) I and IV

(B) II and III

(C) I and II

(D) III and IV

Question 13.

CH_3CH_2CHO and CH_3CH_2COOH can be distinguished by:

[1 Marks]

(A) Iodoform test

(B) Sodium bicarbonate test

(C) Hinsberg test

(D) Lucas test

Question 14.

Match the type of cell given in Column I with their use given in Column II.

[1 Marks]

	Column I		*Column II*
i.	Lead storage cell	a.	Wall clock
ii.	Mercury cell	b.	Apollo Space Programme
iii.	Dry cell	c.	Wrist watch
iv.	Fuel cell	d.	Inverter

(A) i-a, ii-b, iii-c, iv-d

(B) i-d, ii-c, iii-a, iv-b

(C) i-b, ii-a, iii-d, iv-c

(D) i-c, ii-d, iii-b, iv-a

Question 15.

While doing qualitative analysis in chemistry lab, Abhishek added yellow coloured potassium chromate solution into a test tube. He was surprised to see the colour of the solution changing immediately to orange. He realised that the test tube was not clean and contained a few drops of some liquid. Which of the following substances will be the most likely liquid to be present in the test tube before adding potassium chromate solution?

[1 Marks]

(A) Sodium hydroxide solution

(B) Methyl orange solution

(C) HCl solution

(D) Sodium hydrogen carbonate solution

Question 16.

Assertion (A) : For measuring resistance of an ionic solution an AC source is used.

Reason (R) : Concentration of ionic solution will change if DC source is used.

[1 Marks]

(A) Assertion (A) is true, but Reason (R) is false.

(B) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(C) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

(D) Assertion (A) is false, but Reason (R) is true

Question 17.

Assertion (A) : Henry's law constant (KH) decreases with increase in temperature.

Reason (R) : As the temperature increases, solubility of gases in liquids decreases.

[1 Marks]

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(B) Assertion (A) is true, but Reason (R) is false.

(C) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

(D) Assertion (A) is false, but Reason (R) is true

Question 18.

Assertion (A) : The solubility of aldehydes and ketones in water decreases with increase in size of the alkyl group.

Reason (R) : Aldehydes and ketones have dipole-dipole interaction.

[1 Marks]

(A) Assertion (A) is false, but Reason (R) is true

(B) Assertion (A) is true, but Reason (R) is false.

(C) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(D) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

Question 19.

Assertion (A) : The boiling points of alkyl halides decrease in the order RI > RBr > RCl > RF.

Reason (R) : The van der Waals forces of attraction decrease in the order RI > RBr > RCl > RF

[1 Marks]

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(B) Assertion (A) is true, but Reason (R) is false.

(C) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

(D) Assertion (A) is false, but Reason (R) is true

Section C

Question 20.

Calculate the elevation of boiling point of a solution when 3 g of $CaCl_2$ (Molar mass = 111 g mol^{-1}) was dissolved in 260 g of water, assuming that $CaCl_2$ undergoes complete dissociation. (Kb for water = 0·52 K kg mol^{-1})

[2 Marks]

Question 21.

Liquids 'X' and 'Y' form an ideal solution. The vapour pressure of pure 'X' and pure 'Y' are 120 mm Hg and 160 mm Hg respectively. Calculate the vapour pressure of the solution containing equal moles of 'X' and 'Y'.

[2 Marks]

Question 22.

Based on the data given above, give plausible reason for the variation of conductivity and molar conductivity with concentration.

[2 Marks]

Concentration of KCl solution in mol / L	*Conductivity at 298·15 K in S cm^{-1}*	*Molar Conductivity at 298·15 K in S cm^2 mol^{-1}*
1·000	0·1113	111·3
0·100	0·0129	129·0
0·010	0·00141	141·0

Question 23.

(a) Write the rate law expression for the reaction $2HI \rightarrow H_2 + I_2$, if the order of the reaction is zero.

(b) What is the effect of temperature on the rate of reaction ? Write a mathematical expression for the same.

[2 Marks]

Question 24.

Explain the mechanism of acid catalysed hydration of ethene.

[2 Marks]

Question 25.

(a) How can acetaldehyde be prepared from acetyl chloride ?

(b) Propanal is more reactive than propanone towards nucleophilic addition reaction. Give reason.

[2 Marks]

Section D

Question 26.

Shweta mixed two liquids A and B of 10 mL each. After mixing, the volume of the solution was found to be 20·2 mL.

(i) Why was there a volume change after mixing the liquids ?

(ii) Will there be an increase or decrease of temperature after mixing ?

(iii) Give one example for this type of solution.

[3 Marks]

Question 27.

(i) How does sprinkling of salt help in clearing the snow covered roads in hilly areas ?

(ii) What happens when red blood cells are kept in 0·5% (mass/vol) NaCl solution ? Justify your answer.

(iii) Write an application of reverse osmosis.

[3 Marks]

Question 28.

For the reaction A + B → Products, the following initial rates were obtained at various initial concentrations of reactants: Determine the order of the reaction with respect to A and B and overall order of the reaction.

[3 Marks]

Sl. No.	$[A]/mol\ L^{-1}$	$[B]/mol\ L^{-1}$	$Initial\ rate/mol\ L^{-1}\ s^{-1}$
1	0·1	0·1	0·05
2	0·2	0·1	0·10
3	0·1	0·2	0·05

Question 29.

(a) What is meant by crystal field splitting energy ? For a d^4 ion, write the configuration if

(i) $\Delta o < P$,and (ii) $\Delta o > P$.

(b) Explain why in tetrahedral coordination entities, low spin configurations are rarely observed.

[3 Marks]

Question 30.

Account the following:

(a) The C – Cl bond length in chlorobenzene is shorter than that in methyl chloride.

(b) Grignard reagents should be prepared under anhydrous conditions

(c) In case of optically active alkyl halides, SN_1 reactions are accompanied by racemisation.

[3 Marks]

Question 31.

(a) Arrange the following compounds in the increasing order of their acidic strength :

3,5-dinitrophenol, 4-methylphenol, phenol, 2,4,6-trinitrophenol

(b) What happens when : (write equations)

(i) Phenol is distilled with Zn dust ?

(ii) Anisole is treated with HBr ?

[3 Marks]

Question 32.

An organic compound ‘A’ (molecular formula C_8H_8O) gives 2,4-DNP test. It does not give Tollen’s test, but gives a yellow precipitate ‘B’ with NaOH and I_2. On drastic oxidation, it gives a carboxylic acid ‘C’ with formula $C_7H_6O_2$. Identify ‘A’, ‘B’, ‘C’ and write the reactions involved.

[3 Marks]

Question 33.

(a) Name the type of linkage responsible for the formation of proteins from a-amino acids.

(b) Write any two differences between DNA and RNA.

[3 Marks]

Section E

Question 34.

(i) For a galvanic cell, the following half reactions are given. Decide, which will remain as reduction reaction and which will be reversed to become an oxidation reaction. Give reason for your answer.

(I) $Cr^{3+} + 3e^- \rightarrow Cr(s)$; $E^\circ = -0.74$ V

(II) $Fe^{2+} + 2e^- \rightarrow Fe(s)$; $E^\circ = -0.44$ V

(ii) Represent the cell in which the following reaction takes place:

$Mg(s) + 2Ag^+ (0.001\ M) \rightarrow Mg^{2+} (0.100\ M) + 2Ag(s)$.

Calculate E_{cell} if $E^\circ_{cell} = 3.17$ V. (log 10 = 1)

[5 Marks]

Question 35.

(i) State Kohlrausch's law. Give any two applications of it.

(ii) $\wedge_m^\circ NH_4Cl$, $\wedge^\circ_m NaOH$ and $\wedge^\circ_m$ NaCl are 129.8, 217.4, and 108.9 S cm² mol⁻¹ respectively. Molar conductivity of 1×10^{-2} M solution of NH_4OH is 9.33 S cm² mol⁻¹. Calculate the degree of dissociation (α) of NH_4OH solution at this concentration.

[5 Marks]

Question 36.

(i) In a chemistry practical class, the teacher gave his students an amine 'X' having molecular formula C_2H_7N, and asked the students to identify the type of amine. One of the students, Neeta, observed that it reacts with $C_6H_5SO_2Cl$, to give a compound which dissolves in NaOH solution. Can you help Neeta to identify the compound 'X'?

(ii) Arrange the following in the increasing order of their pK_b value in aqueous phase:

$C_6H_5NH_2$, $(CH_3)_2NH$, NH_3, CH_3NH_2, $(CH_3)_3N$.

(iii) Aniline on nitration gives considerable amount of meta product along with ortho and para products. Why?

(iv) Convert aniline to:

(I) p-bromoaniline

(II) phenol

[5 Marks]

Question 37.

(i) When pyrolusite ore is fused with KOH, in presence of air, a dark green coloured product 'A' is obtained which changes to purple coloured compound 'B' in acidic medium.

(I) Write the formulae of 'A' and 'B'.

(II) Write the ionic equation for the reaction when compound 'B' reacts with Fe^{2+} in acidic medium.

(ii) Give reasons:

(I) Ce^{4+} in aqueous solution is a good oxidising agent.

(II) The actinoid contraction is greater from element to element than lanthanoid contraction.

(III) $E°Zn^{2+}/Zn$ value is more negative than expected, whereas $E°Cu^{2+}/Cu$ is positive.

[5 Marks]

Question 38.

(i) While studying the periodic properties, Arti came across an abnormal behaviour in the atomic size of Hf. She found that, even though Hf is placed below Zr in the same group, both have almost similar atomic sizes.

(I) Which phenomenon is responsible for the above behaviour ? Define it.

(II) Mention any other consequence of the above phenomenon.

(ii) Give reasons for the following :

(I) Transition metals exhibit catalytic properties.

(II) Transition metals have high enthalpy of atomisation.

(III) Sc is a transition element, while Zn is not.

[5 Marks]

Question 39.

(i) Arun heated a mixture of ethylamine and $CHCl_3$ with ethanolic KOH, which forms a foul smelling gas. Write the chemical equation involved.

(ii) Identify A and B in the following reactions:

(iii) Convert aniline to :

(I) benzene

(II) sulphanilic acid

[5 Marks]

