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 **45 questions.** All questions are **compulsory.**

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

iii. **Section A** – questions number **1 to 9** are case based questions

iv. **Section B** – questions number **10 to 25** are multiple choice questions

v. **Section C** – questions number **26 to 31** are very short answer

vi. **Section D** – questions number **32 to 39** are short answer

vii. **Section E** – questions number **40 to 45** 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. Phenols undergo electrophilic substitution reactions readily due to the strong activating effect of OH group attached to the benzene ring. Since the OH group increases the electron density more to o- and p- positions, therefore the OH group is ortho, para-directing. Reimer-Tiemann reaction is one of the examples of aldehyde group being introduced on the aromatic ring of phenol, ortho to the hydroxyl group.

Question 2.

The following questions are case based questions. Read the passage carefully and answer the questions that follow.

The rate of a chemical reaction is expressed either in terms of decrease in the concentration of reactants or increase in the concentration of a product per unit time. Rate of the reaction depends upon the nature of reactants, concentration of reactants, temperature, presence of catalyst, surface area of the reactants and presence of light. Rate of reaction is directly related to the concentration of reactant. Rate law states that the rate of reaction depends upon the concentration terms on which the rate of reaction actually depends, as observed experimentally. The sum of powers of the concentration of the reactants in the Rate law expression is called order of reaction while the number of reacting species taking part in an elementary reaction which must collide simultaneously in order to bring about a chemical reaction is called molecularity of the reaction.

Question 3.

The following questions are case based questions. Read the passage carefully and answer the questions that follow.

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Question 4.

The following questions are case based questions. Read the passage carefully and answer the questions that follow.

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Question 5.

The following questions are case based questions. Read the passage carefully and answer the questions that follow.

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Question 6.

The following questions are case based questions. Read the passage carefully and answer the questions that follow.

The rate of a chemical reaction is expressed either in terms of decrease in the concentration of reactants or increase in the concentration of a product per unit time. Rate of the reaction depends upon the nature of reactants, concentration of reactants, temperature, presence of catalyst, surface area of the reactants and presence of light. Rate of reaction is directly related to the concentration of reactant. Rate law states that the rate of reaction depends upon the concentration terms on which the rate of reaction actually depends, as observed experimentally. The sum of powers of the concentration of the reactants in the Rate law expression is called order of reaction while the number of reacting species taking part in an elementary reaction which must collide simultaneously in order to bring about a chemical reaction is called molecularity of the reaction.

Question 7.

Question 8.

The following questions are case based questions. Read the passage carefully and answer the questions that follow.

The rate of a chemical reaction is expressed either in terms of decrease in the concentration of reactants or increase in the concentration of a product per unit time. Rate of the reaction depends upon the nature of reactants, concentration of reactants, temperature, presence of catalyst, surface area of the reactants and presence of light. Rate of reaction is directly related to the concentration of reactant. Rate law states that the rate of reaction depends upon the concentration terms on which the rate of reaction actually depends, as observed experimentally. The sum of powers of the concentration of the reactants in the Rate law expression is called order of reaction while the number

of reacting species taking part in an elementary reaction which must collide simultaneously in order to bring about a chemical reaction is called molecularity of the reaction.

Answer the following questions :

(1)

(i) What is a rate determining step ?

(ii) Define complex reaction.

[2 Marks]

(2)

What is the effect of temperature on the rate constant of a reaction ?

[1 Marks]

(3)

The conversion of molecule X to Y follows second order kinetics. If concentration of X is increased 3 times, how will it affect the rate of formation of Y ?

[1 Marks]

(4)

Why is molecularity applicable only for elementary reactions whereas order is applicable for elementary as well as complex reactions ?

[1 Marks]

Question 9.

Phenols undergo electrophilic substitution reactions readily due to the strong activating effect of OH group attached to the benzene ring. Since, the OH group increases the electron density more to 0— and — positions therefore OH group is ortho, para-directing. Reimer-Tiemann reaction is one of the examples of aldehyde group being introduced on the aromatic ring of phenol, ortho to the hydroxyl group. This is a general method used for the ortho-formylation of phenols.

Answer the following questions :

(1)

Why phenol does not undergo protonation readily ?

[1 Marks]

(2)

Which is a stronger acid — phenol or cresol ? Give reason.

[1 Marks]

(3)

What happens when phenol reacts with

(i) Br_2/CS_2

(ii) Conc. HNO_3

[2 Marks]

(4)

Write the IUPAC name of the product formed in the Reimer-Tiemann reaction.

[1 Marks]

Section B

Question 10.

In case of association, abnormal molar mass of solute will

[1 Marks]

(A) increase

(B) decrease

(C) remain same

(D) first increase and then decrease

Question 11.

Standard electrode potential for Snx^{4+}/Sn^{2+} couple is +0.15 V and that for the Cr^{3+}/Cr couple is — 0.74 V. The two couples in their standard states are connected to make a cell. The cell potential will be

[1 Marks]

(A) +0.18 V

(B) +0.89 V

(C) +1.19 V

(D) +1.83 V

Question 12.

The magnetic moment is associated with its spin angular momentum and orbital angular momentum . Spin only magnetic moment value of Cr^{3+} ion (Atomic no. : Cr=24) is_____ .

[1 Marks]

(A) 3.47 B.M.

(B) 2.87 B.M.

(C) 3.87 B.M.

(D) 3.57 B.M.

Question 13.

Acidified $KMnO_4$ oxidises sulphite to

[1 Marks]

(A) SO^{2-}_4

(B) $SO_2(g)$

(C) $S_2O^{2-}_8$

(D) $S_2O^{2-}_3$

Question 14.

The correct IUPAC name of $[Pt(NH_3)_2Cl_2]^{2+}$ is

[1 Marks]

(A) Diamminedichloridoplatinum (O)

(B) Diamminedichloridoplatinum (IV)

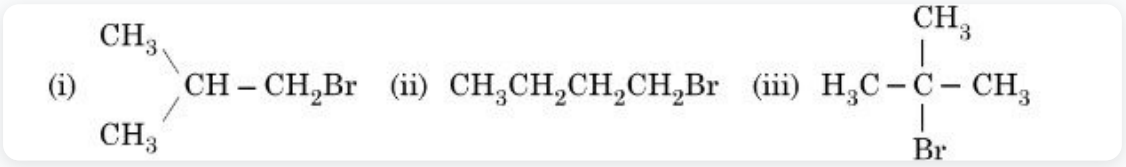
(C) Diamminedichloridoplatinate (II)

(D) Diamminedichloridoplatinate (IV)

Question 15.

Arrange the following compounds in increasing order of their boiling points:

[1 Marks]



(A) (ii) < (i) < (iii)

(B) (iii) < (ii) < (i)

(C) (iii) < (i) < (ii)

(D) (i) < (ii) < (iii)

Question 16.

Alkyl halides undergoing nucleophilic bimolecular substitution reaction involve

[1 Marks]

(A) formation of racemic mixture

(B) inversion of configuration

(C) formation of carbocation

(D) retention of configuration

Question 17.

Which is the correct order of acid strength from the following?

[1 Marks]

(A) $C_6H_5OH>ROH>H_2O$

(B) $H_2O>C_6H_5OH>ROH$

(C) $C_6H_5OH >H_2O >ROH$

(D) $ROH>C_6H_5OH>H_2O$

Question 18.

The acid formed when propyl magnesium bromide is treated with CO_2 followed by acid hydrolysis is

[1 Marks]

(A) CH_3COOH

(B) C_3H_7COOH

(C) C_3H_7OH

(D) C_2H_5COOH

Question 19.

The best reagent for converting propanamide into propanamine is _____.

[1 Marks]

(A) excess H_2

(B) iodine in the presence of red phosphorus

(C) Br_2 in aqueous NaOH

(D) $LiAlH_4$ in ether

Question 20.

Which of the following statements is not true about glucose?

[1 Marks]

(A) On heating with HI it forms n-hexane.

(B) It does not give Schiff's test.

(C) It exists in furanose form.

(D) It is an aldohexose.

Question 21.

An unripe mango placed in a concentrated salt solution to prepare pickle, shrivels because_____.

[1 Marks]

(A) it gains water due to reverse osmosis

(B) it loses water due to osmosis

(C) it loses water due to reverse osmosis

(D) it gains water due to osmosis

Question 22.

Assertion (A): $[Cr(H_2O)_6]Cl_2$ and $[Fe(H_2O)_6]Cl_2$ are examples of homoleptic complexes.

Reason (R) : All the ligands attached to the metal are the same.

[1 Marks]

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

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

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

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

Question 23.

Assertion (A) :	The boiling points of alkyl halides decrease in the order : RI > RBr > RCI > RF.
Reason (R) :	The boiling points of alkyl chlorides, bromides and iodides are considerably higher than that of the hydrocarbon of comparable molecular mass.

[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 false, but Reason (R) is true

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

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

Question 24.

Assertion (A):	The boiling point of ethanol is higher than that of methoxymethane.
Reason (R) :	There is intramolecular hydrogen bonding in ethanol.

[1 Marks]

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

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

(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 25.

Assertion (A) :	All naturally occurring a-amino acids except glycine areoptically active.

Reason (R) : Most naturally occurring amino acids have L-configuration

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

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

Section C

Question 26. Define Azeotrope. What type of Azeotrope is formed by negative deviation from Raoult's law? Give an example.

[2 Marks]

Question 27.

Complete and balance the following chemical equations:

(a) $2MnO_4^-(aq) + 10I^-(aq) + 16H^+(aq) \rightarrow$

(b) $Cr_2O^{2-}_7(aq) + 6Fe^{2+}(aq) + 14H^+(aq) \rightarrow$

[2 Marks]

Question 28.

Identify A and B in each of the following reaction sequence:

[2 Marks]

$$\text{(a)} \quad CH_3CH_2Cl \xrightarrow{NaCN} A \xrightarrow{H_2/Ni} B$$

$$\text{(b)} \quad C_6H_5NH_2 \xrightarrow[0-5\,^\circ C]{NaNO_2/HCl} A \xrightarrow[H^+]{C_6H_5NH_2} B$$

Question 29.

Write the reactions involved when D-glucose is treated with following reagents:

(a) HCN

(b) Br_2 water

[2 Marks]

Question 30.

Give reasons :

(a) Cooking is faster in pressure cooker than in an open pan.

(b) on mixing liquid X and Y , volume of the resulting solution decreases . what type of deviation from raoult's law is shown by the resulting solution ? what change in temperature would you observe after mixing liquids X and Y?

[2 Marks]

Question 31.

Would you expect benzaldehyde to be more reactive or less reactive in nucleophilic addition reactions than propanal ? Justify your answer.

[2 Marks]

Section D

Question 32.

A solution of glucose (molar mass =180 g mol^{-1}) in water has a boiling point of 100.20 ºC. Calculate the freezing point of the same solution. Molal constants for water Kf and Kb are 1.86 K kg $mol^{-1}$and 0.512 K kg mol^{-1} respectively.

[3 Marks]

Question 33.

(a) State the following :

(i) Kohlrausch law of independent migration of ions and

(ii) Faraday's first law of electrolysis.

(b) Using $E°_{values}$ of X and Y given below, predict which is better for coating the surface of iron to prevent corrosion and why ?

Given $E°_{X^{2+}/X} = –2.36$ V,

$E°_{Y^{2+}/Y} = –0.14$ V,

$E°_{Fe^{2+}/Fe} = –0.44$ V

[3 Marks]

Question 34.

A certain reaction is 50% complete in 20 minutes at 300 K and the same reaction is 50% complete in 5 minutes at 350 K. Calculate the activation energy if it is a first order reaction.

[R=8.314 J K^{-1} mol^{-1}; log 4 =0.602]

[3 Marks]

Question 35.

The elements of 3d transition series are given as :

Sc, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn

Answer the following :

(a) Copper has exceptionally positive $E^{\circ}_{m^{2+}/m}$ value, why ?

(b) Which element is a strong reducing agent in +2 oxidation state and why ?

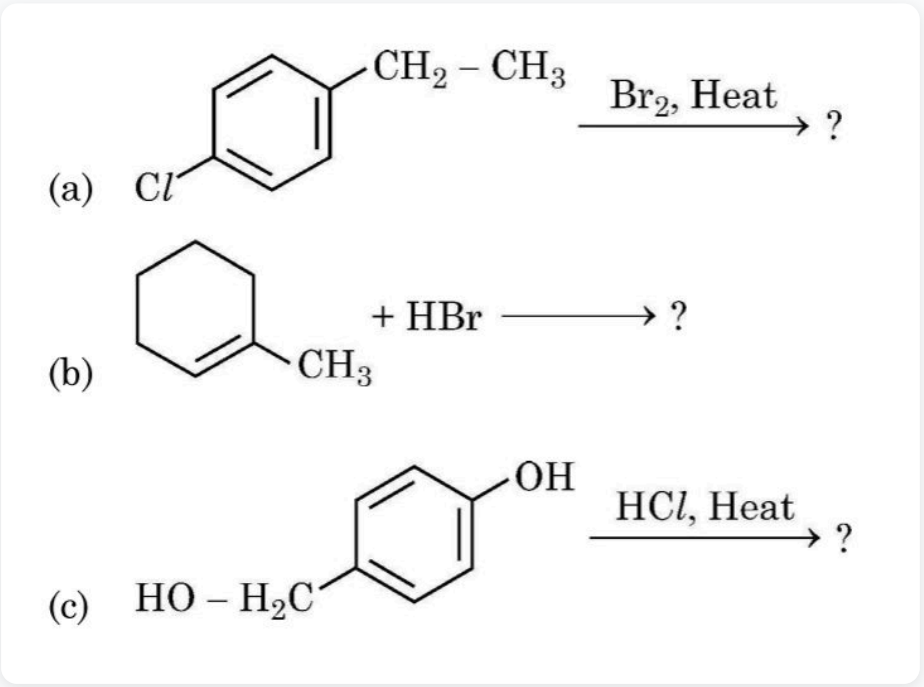
(c) Zn^{2+} salts are colourless. Why ?

[3 Marks]

Question 36.

Draw the structure of the major monohalo product for each of the following reaction:

[3 Marks]



Question 37.

How do you convert :

(a) Chlorobenzene to biphenyl

(b) Propene to I-lodopropane

(c) 2-bromobutane to but-2-ene.

[3 Marks]

Question 38.

(a) Arrange the following compounds in increasing order of their boiling point :

$(CH_3)_2NH$, $CH_3CH_2NH_2$, CH_3CH_20H.

(b) Give plausible explanation for each of the following :

(i) Aromatic primary amines cannot be prepared by Gabriel Phthalimide synthesis.

(iI) Amides are less basic than amines.

[3 Marks]

Question 39.

(a) What is the difference between native protein and denatured protein ?

(b) Which one of the following is a disaccharide ? Glucose, Lactose, Amylose, Fructose

(c) Which vitamin is responsible for the coagulation of blood ?

[3 Marks]

Section E

Question 40.

(a) Write the cell reaction and calculate the e.m.f. of the following cell at 298 K:

$Sn(s)|Sn^{2+}(0.004\ M)||H^+(0.02\ M)|H_2(g)(1\ Bar)|Pt(s)$

(Given: $E°(_{sn_2+}/_{sn}$=-0.14 V, $E°H_+|H_{2(g)pt}$= 0.00 V)

(b) Account for the following observations:

(i) On the basis of E° values, O_2 gas should be liberated at anode but it is Cl_2 gas which is liberated in the electrolysis of aqueous NaCl;

(ii) Conductivity of CH_3COOH decreases on dilution.

[5 Marks]

Question 41.

(a) Write the anode and cathode reactions and the overall cell reaction occurring in a lead storage battery during its use.

(b) Calculate the potential for half-cell containing 0.01 M K_2Cr_207(aq), 0.01 M Cr^{3+} (aq) and 1.0 x 10^{-4} M H^+ (aq).

The half cell reaction is

$Cr_20^{2-}{}_7(aq)+14H^+(aq) + 6e^- \rightarrow 2Cr^{3+}(aq) + 7H_20(l)$

and the standard electrode potential is given as E^0= 1.33 V.

[Given : log 10 = 1].

[5 Marks]

Question 42.

Answer the following :

(a) Low spin tetrahedral complexes are not known.

(b) $c0^{2+}$ is easily oxidised to $C0^{3+}$ in the presence of a strong ligand [At. No. of co = 27]

(c) What type of isomerism is shown by the complex $[Co(NH_3)_6]$ $[Cr(CN)_6]$?

(d) Why a solution$[Ni(H_2O)_6]^{2+}$ is green while a solution of $[Ni(CN)_4]^{2-}$is colourless.

(At. No. of Ni = 28)

(e) Write the IUPAC name of the following complex : $[Co(NH_3)_5(C0_3)]Cl$

[5 Marks]

Question 43.

(a) What is meant by 'Chelate effect' ? Give an example.

(b) Write the hybridization and magnetic behaviour of$[Fe(CN)_6]^{4-}$ (Atomic number : Fe= 26)

(c) If $PtCl_2 \bullet 2NH_3$ does not react with $AgN0_3$, what will be its formula ?

[5 Marks]

Question 44.

(a)Carry out the following conversions:

(i) Ethanal to But-2-enal;

(ii) Propanoic acid to ethane.

(b) An alkene A with molecular formula C5H10 on ozonolysis gives a mixture of two compounds B and C. Compound B gives positive Fehling test and also reacts with iodine and NaOH solution. Compound C does not give Fehling solution test but forms iodoform. Identify the compounds A, B and C.

[5 Marks]

Question 45. An organic compound (A) (molecular formula $C_8H_{18}O_2$) was hydrolyzed with dilute sulfuric acid to get a carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid produced (B). (C) on dehydration gives But-1-ene. Identify (A), (B), and (C) and write chemical equations for the reactions involved.

[5 Marks]