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. Alcohols undergo a number of reactions involving the cleavage of C – OH bond. However, phenols do not undergo reactions involving the cleavage of C – OH bond. Alcohols are weaker acids than water. Alcohols react with halogen acids to form the corresponding haloalkanes. Phenols are stronger acids than alcohols. A characteristic feature of phenols is that they undergo electrophilic substitution reactions such as halogenation, nitration, etc. Since – OH group is a strong activating group, phenol gives trisubstituted products during halogenation, nitration, etc.

Question 2.

Alcohols undergo a number of reactions involving the cleavage of C – OH bond. However, phenols do not undergo reactions involving the cleavage of C – OH bond. Alcohols are weaker acids than water. Alcohols react with halogen acids to form the corresponding haloalkanes. Phenols are stronger acids than alcohols. A characteristic feature of phenols is that they undergo electrophilic substitution reactions such as halogenation, nitration, etc. Since – OH group is a strong activating group, phenol gives trisubstituted products during halogenation, nitration, etc.

(1)

What happens when phenol is treated with the following ?

(i) Br_2 water (ii) Conc. HNO_3

[2 Marks]

(2)

Why do phenols not undergo reactions involving cleavage of C – OH bond ?

[1 Marks]

(3)

Write the mechanism of alcohol reacting as nucleophile in are action with $CH_3\oplus$.

[1 Marks]

(4)

How can you distinguish between Butan-1-ol and 2-Methylpropan-2-ol by using HCl in the presence of anhydrous $ZnCl_2$?

[1 Marks]

Question 3.

The a-amino acids are the building blocks of proteins. All a-amino acids exist as zwitter ion due to which they show amphoteric behaviour. All amino acids are joined through peptide bond. Proteins are broadly classified as globular proteins and fibrous proteins. Globular proteins are water soluble,

whereas fibrous proteins are not. The complete structure of protein is discussed at four different levels i.e. primary, secondary, tertiary and quaternary structures. Protein loses its biological activity in denatured form.

(1)

Define the following :

(i) Peptide linkage (ii) Denatured protein

[2 Marks]

(2)

Write the names of two different secondary structures of proteins.

[1 Marks]

(3)

Why do amino acids show amphoteric behaviour ?

[1 Marks]

(4)

How can you differentiate between Fibrous protein and Globular protein ?

[1 Marks]

Section B

Question 4.

Williamson synthesis of preparing unsymmetrical ether is:

[1 Marks]

(A) Elimination reaction

(B) SN_2 reaction

(C) SN_1 reaction

(D) Electrophilic addition reaction

Question 5.

Which of the following compounds would be hydrolysed by aqueous KOH most easily?

[1 Marks]

(A)

$$CH_2 = CH - Br$$

(B)

$$CH_3 - CH_2 - Br$$

(C)

$$\begin{array}{l} CH_3 - CH - CH_3 \\ \quad\quad | \\ \quad\quad Br \end{array}$$

(D)

$$CH_2 = CH - CH_2 - Br$$

Question 6.

According to Werner's theory of coordination compounds:

[1 Marks]

(A) Primary valences are ionisable.

(B) Both primary and secondary valences are non-ionisable.

(C) Secondary valences are ionisable.

(D) Both primary and secondary valences are ionisable.

Question 7.

Which of the following complex ion is not optically active?

[1 Marks]

(A) cis-$[Co(en)_2Cl_2]^+$

(B) $[Co(ox)_3]^{3-}$

(C) trans-$[Co(en)_2Cl_2]^+$

(D) $[Co(en)_3]^{3+}$

Question 8.

Which of the following is the softest metal?

[1 Marks]

(A) Fe

(B) Zn

(C) Cu

(D) Sc

Question 9.

In the Hinsberg's method for separation of primary, secondary and tertiary amines, the reagent used is:

[1 Marks]

(A)

$\mathrm{Nitrous\ acid}$

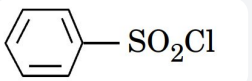
(B)

$\mathrm{HCl\ /\ ZnCl_2}$

(C)

$\mathrm{CHCl_3 + aq.\ NaOH}$

(D)

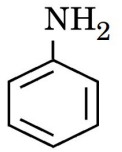


Question 10.

Which one of the following amines gives an alcohol on reaction with HNO_2?

[1 Marks]

(A)



(B)

$(C_2H_5)_2NH$

(C)

$(C_2H_5)_3N$

(D)

$C_2H_5NH_2$

Question 11.

The freezing point of one molal KCl solution, assuming KCl to be completely dissociated in water, is: (Kf for water = 1·86 K kg mol^{-1})

[1 Marks]

(A) –1·86°C

(B) +2·72°C

(C) +3·72°C

(D) –3·72°C

Question 12.

A solution of acetone in ethanol:

[1 Marks]

(A) obeys Raoult's law.

(B) shows a negative deviation from Raoult's law.

(C) shows a positive deviation from Raoult's law.

(D) forms an ideal solution.

Question 13.

Which of the following cell converts the energy of combustion of fuel into electrical energy?

[1 Marks]

(A) Mercury cell

(B) Lead storage cell

(C) Dry cell

(D) Fuel cell

Question 14.

The unit of rate and rate constant are same for a:

[1 Marks]

(A) Second order reaction

(B) Zero order reaction

(C) First order reaction

(D) Third order reaction

Question 15.

Pyranose ring of glucose is formed due to the reaction between:

[1 Marks]

(A) C_1 and C_5

(B) C_1 and C_3

(C) C_1 and C_2

(D) C_1 and C_4

Question 16.

Assertion (A) : Actinoids show wide range of oxidation states.

Reason (R) : Actinoids are radioactive in nature .

[1 Marks]

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

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

(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 17.

Assertion (A) : Hydrolysis of an ester follows first order kinetics.

Reason (R) : The concentration of water does not get altered much during the reaction.

[1 Marks]

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

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

Question 18.

Assertion(A): Boiling point of (CH3)3N is higher than that of $CH_3CH_2CH_2NH_2$.

Reason (R) : Hydrogen bonding is more extensive in $CH_3CH_2CH_2NH_2$.

[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 19.

Assertion (A) : Phenol is strongly acidic as compared to ethanol.

Reason (R) : Phenoxide ion is more stable than ethoxide ion.

[1 Marks]

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

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

Section C

Question 20.

State Henry's law. Why are aquatic species more comfortable in cold water as compared to warm water ?

[2 Marks]

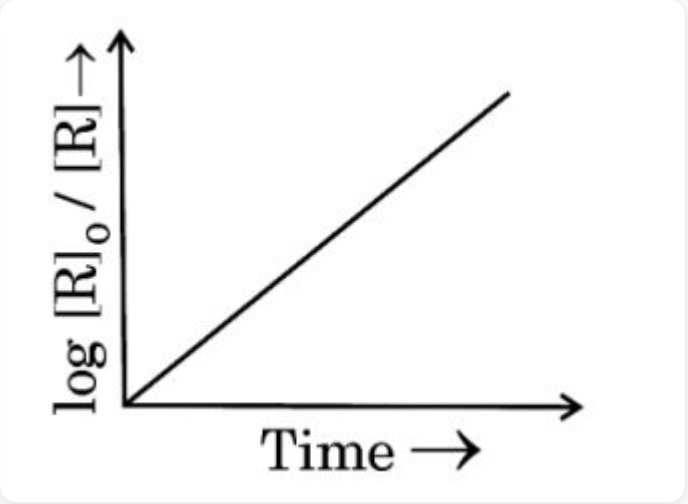
Question 21.

Observe the graph in the given figure and answer the following questions :

(a) Predict the order of reaction.

(b) What is the slope of the curve ?

[2 Marks]



Question 22.

Write IUPAC names of the following coordination compounds :

(i) $[CoCl_2(en)_2]SO_4$

(ii) $K_3[Fe(C_2O_4)_3]$

[2 Marks]

Question 23.

Differentiate between :

(i) Double salt and Complex compound

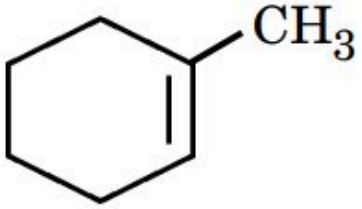
(ii) Didentate ligand and Ambidentate ligand

[2 Marks]

Question 24.

Draw the structures of major monohalo products in each of the following reactions :

[2 Marks]

(a)  + HI ⟶ ?

(b)  + Br_2 $\xrightarrow[\text{UV light}]{\text{Heat or}}$?

Question 25.

How do you explain the following ?

(a) Presence of an aldehydic group in glucose.

(b) Presence of five – OH groups in glucose.

[2 Marks]

Section D

Question 26.

The rate of a reaction :

A + B □□→productis given below as a function of different initial concentrations of A and B.

Calculate the order of the reaction with respect to A and B. Determine the rate constant of the reaction.

[3 Marks]

Experiment	[A] / mol L^{-1}	[B] / mol L^{-1}	Initial Rate/mol L^{-1} min^{-1}
1	0·01	0·01	5×10^{-3}
2	0·02	0·01	1×10^{-2}
3	0·01	0·02	5×10^{-3}

Question 27.

Give reasons for the following :

(a) The pH of aqueous NaCl increases when it is electrolysed.

(b) Unlike dry cell, mercury cell has a constant cell potential through its lifetime.

(c) Conductivity of solution decreases with dilution.

[3 Marks]

Question 28.

Answer the following about the complexes $[FeF_6]^{3-}$ and $[Fe(CN)_6]^{4-}$:

(i) Write the hybridization involved in each case.

(ii) Which of them is the outer orbital complex and which one is the inner orbital complex ?

(iii) Compare their magnetic behaviour.

[Atomic number : Fe = 26]

[3 Marks]

Question 29.

(i) What happens to the colour of complex $[Ti(H_2O)_6]^{3+}$ when heated gradually ?

(ii) Write the electronic configuration for d^5 ion if $\Delta_o < P$.

(iii) Write the hybridization and magnetic behaviour of the complex $[Ni(CO)_4]$.

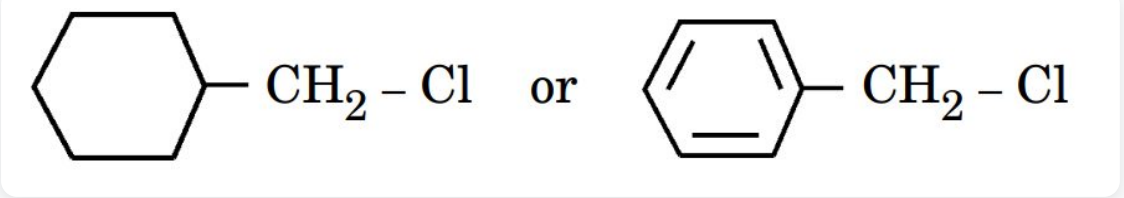
[Atomic number : Ni = 28]

[3 Marks]

Question 30.

Write any two differences between SN_1 and SN_2 reactions. Which of the following compounds would undergo SN_1 reaction faster and why ?

[3 Marks]



Question 31.

A compound (A) with molecular formula C_4H_5N on reduction with DIBAL-H followed by hydrolysis, gives a compound (B). Compound (B) gives positive Tollens' test but does not give iodoform test. Compound (B) can also be obtained when ethanal is treated with dilute NaOH followed by heating. Identify (A) and (B). Write the reactions of (A) with DIBAL-H followed by hydrolysis.

[3 Marks]

Question 32.

How will you obtain the following from aniline ? Give chemical equations only.

(a) Sulphanilic acid

(b) Phenylisocyanide

(c) Acetanilide

[3 Marks]

Question 33.

Vapour pressure of pure water at 298 K is 24·8 mm Hg. Calculate the lowering in vapour pressure of an aqueous solution which freezes at– 0·3°C. (Kf of water = 1·86 K kg mol^{-1})

[3 Marks]

Section E

Question 34.

(i) Calculate Ecell of a galvanic cell in which the following reaction takes place at 25°C: $Zn(s) + Pb^{2+}(0.02\ M) \rightarrow Zn^{2+}(0.1\ M) + Pb(s)$

[Given: Zn^{2+}/Zn E = -0.76 V, Pb^{2+}/Pb E° = -0.13 V;

log 2 = 0.3010, log 4 = 0.6021, log 5 = 0.6990].

(ii) State Faraday's first law of electrolysis. How much electricity, in terms of Faraday, is required to reduce one mol of MnO_4^- to Mn^{2+} ion?

[5 Marks]

Question 35.

(i) The resistance of a conductivity cell containing 0.001 M KCl solution at 298 K is 1000 ohm. What is the cell constant if conductivity of 0.001 M KCl solution at 298 K is 0.125×10^{-3} S cm^{-1}?

(ii) Calculate the Mg/Mg^{2+} E potential for the following half cell at 25°C: $Mg/Mg^{2+}(1 \times 10^{-4}$ M); Mg^{2+}/Mg E = +2.36 V.

(iii) What is the effect of temperature on the electrical conductance of a metallic conductor?

[5 Marks]

Question 36.

Account for the following:

(I) Orange colour of $Cr_2O_7^{2-}$ ion changes to yellow when treated with an alkali.

(II) Zn, Cd, and Hg are non-transition elements.

(III) E° value for Mn^{3+}/Mn^{2+} couple is highly positive (+1.57 V) as compared to Cr^{3+}/Cr^{2+}.

(iii) What happens when:

(I) Manganate ion undergoes disproportionation reaction in acidic medium?

(II) $KMnO_4$ is heated?

[5 Marks]

Question 37.

(i) What is 'Misch metal'? Give its one use.

(ii) Write the formula of an oxoanion of chromium in which it shows the oxidation state equal to its group number.

(iii) Why does Vanadium pentoxide (V_2O_5) act as a catalyst?

(iv) Why do transition elements have high enthalpies of atomisation?

(v) How do you prepare $Na_2Cr_2O_7$ from Na_2CrO_4?

[5 Marks]

Question 38.

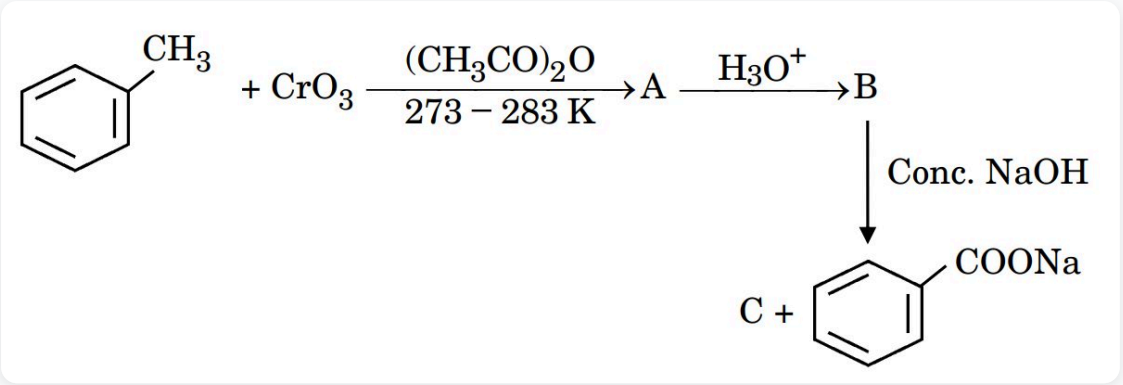
(i) Identify A, B and C in the following reactions :

(ii) Give reasons for the following :

(I) Carboxylic acids do not give the characteristic reactions of carbonyl group.

(II) Ethanoic acid is a stronger acid than ethanol.

[5 Marks]



Question 39.

(i) Write the product(s) in the following reactions :

(ii) Write the reaction involved in the following reactions :

(I) Wolff-Kishner Reduction

(II) Decarboxylation Reaction

[5 Marks]

