CBSE EXAMINATION PAPER-2025

CHEMISTRY

(Solved)

Time allowed : 3 hours | Maximum Marks : 81

General Instructions :

Read the following instructions carefully and follow them :

i. This question paper contains **40 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 20** are multiple choice questions

v. **Section C** – questions number **21 to 26** are very short answer

vi. **Section D** – questions number **27 to 34** are short answer

vii. **Section E** – questions number **35 to 40** 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. The spontaneous flow of the solvent through a semipermeable membrane from a pure solvent to a solution or from a dilute solution to a concentrated solution is called osmosis. The phenomenon of osmosis can be demonstrated by taking two eggs of the same size. In an egg, the membrane below the shell and around the egg material is semipermeable. The outer hard shell can be removed by putting the egg in dilute hydrochloric acid. After removing the hard shell, one egg is placed in distilled water and the other in a saturated salt solution. After some time, the egg placed in distilled water swells-up while the egg placed in salt solution shrinks. The external pressure applied to

stop the osmosis is termed as osmotic pressure (a colligative property). Reverse osmosis takes place when the applied external pressure becomes larger than the osmotic pressure.

Question 2.

Amines have a lone pair of electrons on nitrogen atom due to which they behave as Lewis base. Greater the value of Kb or smaller the value of pKb, stronger is the base. Amines are more basic than alcohols, ethers, esters, etc. The basic character of aliphatic amines should increase with the increase of alkyl substitution. But it does not occur in a regular manner as a secondary aliphatic amine is unexpectedly more basic than a tertiary amine in aqueous solutions. Aromatic amines are weaker bases than ammonia and aliphatic amines. Electron releasing groups such as —CH3' —OCH3, —NH2, etc., increase the basicity while electron-withdrawing substituents such as —N02, —CN, halogens etc., decrease the basicity of amines. The effect of these substitute is more at p- than at m position.

(1)

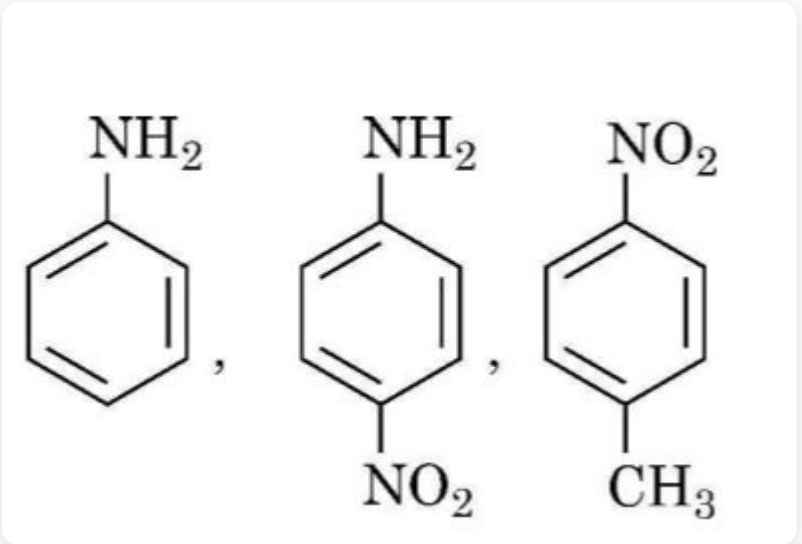
Why pKb of aniline is more than that of methylamine ?

[1 Marks]

(2)

Arrange the following in the increasing order of their basic character.

Give reason :



[2 Marks]

(3)

Why ammonolysis of alkyl halides is not a good method toprepare pure amines ?

[1 Marks]

(4)

Arrange the following in the increasing order of their basic character in an aqueous solution .

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

[1 Marks]

Question 3.

The spontaneous flow of the solvent through a semipermeable membrane from a pure solvent to a solution or from a dilute solution to a concentrated solution is called osmosis. The phenomenon of osmosis can be demonstrated by taking two eggs of the same size. In an egg, the membrane below the shell and around the egg material is semipermeable. The outer hard shell can be removed by putting the egg in dilute hydrochloric acid. After removing the hard shell, one egg is placed in distilled water and the other in a saturated salt solution. After some time, the egg placed in distilled water swells-up while the egg placed in salt solution shrinks. The external pressure applied to stop the osmosis is termed as osmotic pressure (a colligative property). Reverse osmosis takes place when the applied external pressure becomes larger than the osmotic pressure.

(1)

Define reverse osmosis. Name one SPM which can be used in the process of reverse osmosis .

[2 Marks]

(2)

Which one of the following will have higher osmotic pressure in1 M KCl or 1 M urea solution. Justify your answer.

[1 Marks]

(3)

What do you expect to happen when red blood corpuscles (RBC's) are placed in 0.5% NaCl solution ?

[1 Marks]

(4)

Why osmotic pressure is a colligative property ?

[1 Marks]

Section B

Question 4.

The charge required for the reduction of 1 mol of $Mn0^{-}_{4}$ to $Mn0_{2}$ is

[1 Marks]

(A) 5F

(B) 3F

(C) 1F

(D) 6F

Question 5.

Which among the following is false statement?

[1 Marks]

(A) Half-life of a zero order reaction is inversely proportional to the rate constant.

(B) Molecularity of a reaction may be zero.

(C) Rate of zero order reaction is independent of initial concentration of reactant.

(D) For a first order reaction, $t_{1}/_{2}$ = 0.693/k

Question 6.

The number of molecules that react with each other in an elementary reaction is a measure of the:

[1 Marks]

(A) stoichiometry of the reaction

(B) order of the reaction

(C) activation energy of the reaction

(D) molecularity of the reaction

Question 7.

The element having $[Ar]3d^{10}4s^{1}$ electronic configuration is:

[1 Marks]

(A) Zn

(B) Cr

(C) Cu

(D) Mn

Question 8.

The complex ions $[Co(NH_3)_5(NO_2)]^{2+}$ and $[Co(NH_3)_5(ONO)]^{2+}$ are called:

[1 Marks]

(A) Geometrical isomers

(B) Linkage isomers

(C) Co-ordination isomers

(D) Ionization isomers

Question 9.

The diamagnetic species is:

[At. No. Co = 27,Fe = 26, Ni = 28]

[1 Marks]

(A) $[Ni(CN)_4]^{2-}$

(B) $[NiCl_4]^{2-}$

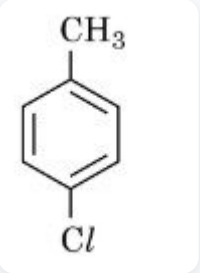
(C) $[CoF_6]^{3-}$

(D) $[Fe(CN)_6]^{3-}$

Question 10.

Which is the correct IUPAC name for

[1 Marks]



(A) 1-Chloro-4-Methylbenzene

(B) 1-Methyl-4-Chlorobenzene

(C) Methylchlorobenzene

(D) Toluene

Question 11.

What will be formed after oxidation reaction of secondary alcohol with chromic anhydride (CrO_3)?

[1 Marks]

(A) Aldehyde

(B) Ketone

(C) Carboxylic acid

(D) Ester

Question 12.

The conversion of phenol to salicylic acid can be accomplished by:

[1 Marks]

(A) Kolbe reaction

(B) Friedel-Crafts reaction

(C) Coupling reaction

(D) Reimer-Tiemann reaction

Question 13.

Which of the following is/are examples of denaturation of protein?

[1 Marks]

(A) Clotting of blood

(B) Coagulation of egg white

(C) Both Curdling of milk and Coagulation of egg white

(D) Curdling of milk

Question 14.

Nucleotides are joined together by:

[1 Marks]

(A) Peptide linkage

(B) Hydrogen bonding

(C) Glycosidic linkage

(D) Phosphodiester linkage

Question 15.

Scurvy is caused due to deficiency of:

[1 Marks]

(A) Vitamin B_1

(B) Vitamin B_2

(C) Glutamic acid

(D) Ascorbic acid

Question 16.

Assertion (A) : In a first order reaction, if the concentration of the reactant is doubled, its half-life is also doubled.

Reason (R) : The half-life of a reaction does not depend upon the initial concentration of the reactant in a first order reaction.

[1 Marks]

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

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

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

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

Question 17.

Assertion (A) : In a first order reaction, if the concentration of the reactant is doubled, its half-life is also doubled

Reason (R) : The half-life of a reaction does not depend upon the initial concentration of the reactant in a first order reaction.

[1 Marks]

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

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

Question 18.

Assertion (A) : Cu cannot liberate H_2 on reaction with dilute mineral acids.

Reason (R) : Cu has positive electrode potential .

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

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

Question 19.

Assertion (A) : Aromatic primary amines cannot be prepared by Gabriel Phthalimide synthesis.

Reason (R) : Aryl halides do not undergo nucleophilic substitution reaction with the anion formed by phthalimide.

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

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

Question 20.

Assertion (A) : Vitamin D cannot be stored in our body.

Reason (R) : Vitamin D is fat soluble vitamin and is not excreted from the body in urine.

[1 Marks]

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

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

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

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

Section C

Question 21.

The rate constant for a zero order reaction A → P is 0.0030 mol $L^{-1}s^{-1}$. How long will it take for the initial concentration of A to fall from 0.10 M to 0.075 M ?

[2 Marks]

Question 22.

The decomposition of NH_3 on platinum surface is zero order reaction. what are the rates of production of N_2 and H_2 if k = 2.5 x 10^{-4} mol L^{-1} s^{-1} ?

[2 Marks]

Question 23.

Define the following terms :

(a) Pseudo first order reaction

(b) Half-life period of reaction($t_{½}$)

[2 Marks]

Question 24.

Examine the following observations :

(a) Transition elements generally form coloured compounds.

(b) Zinc is not regarded as a transition element.

[2 Marks]

Question 25.

Name the following coordination compounds according to IUPAC norms :

(a) $[Co(NH_3)_4(H_2O)Cl]Cl_2$

(b) $[CrC1_2(en)_2]$ Cl

[2 Marks]

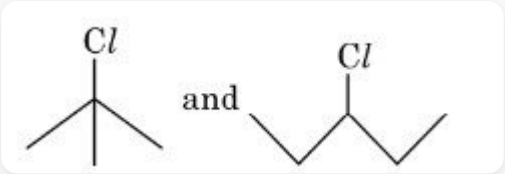
Question 26.

(a) In the following pair of halogen compounds, which compound undergoes S_nI reaction faster and why ?

(b) Arrange the following compounds in increasing order of their reactivity towards S_n2 displacement :

2—Bromo—2—methylbutane, I—Bromopentane, 2—Bromopentane.

[2 Marks]



Section D

Question 27.

At 25 ^{0}C the saturated vapour pressure of water is 24 mm Hg. Find the saturated vapour pressure of a 5% aqueous solution of urea at the same temperature. (Molar mass of urea = 60 g mol^{-1})

[3 Marks]

Question 28.

The electrical resistance of a column of 0.05 M NaOH solution of area 0.8 cm^2 and length 40 cm is 5 x 10^3 ohm. Calculate its resistivity, conductivity and molar conductivity.

[3 Marks]

Question 29.

Complete and balance the following chemical equations:

[3 Marks]

(a) $MnO_4^- + C_2O_4^{2-} + H^+ \longrightarrow$

(b) $KMnO_4 \xrightarrow[513\ K]{Heat}$

(c) $Cr_2O_7^{2-} + H_2S + H^+ \longrightarrow$

Question 30.

Using valence bond theory, explain the hybridization and magnetic character of the following :

(a) $[Co(NH_3)_6]^{3+}$

(b) $[Ni(CO)_4]$

[At. no. : Co = 27, Ni = 28]

[3 Marks]

Question 31.

(a) Define the following :

(i) Enantiomers

(ii) Racemic mixture

(b) Why is chlorobenzene resistant to nucleophilic substitution reaction ?

[3 Marks]

Question 32.

Explain the following reactions and write chemical equation involved:

(a) Wolf-Kishhner reducation

(b) Etard reaction

(c) Cannizzaro reaction

[3 Marks]

Question 33.

Write the structures of A, B and C in the following sequence of reactions:

[3 Marks]

(a) $CH_3COOH \xrightarrow{SOCl_2} A \xrightarrow{H_2,\ Pd\text{-}BaSO_4} B \xrightarrow{H_2N\text{–}NH_2} C$

(b) $CH_3CN \xrightarrow[2.\ H_2O]{1.(DIBAL\text{–}H)} A \xrightarrow{Dil.\ NaOH} B \xrightarrow{\Delta} C$

Question 34.

Define the following terms :

(a) Glycosidic linkage

(b) Invert sugar

(c) Oligosaccharides

[3 Marks]

Section E

Question 35.

(a) Give the IUPAC name of $CH_3{-}CH{=}CH{-}CHO$.

(b) Give a simple chemical test to distinguish between propanal and propanone.

(c) How will you convert the following :

(i) Toluene to benzoic acid

(ii) Ethanol to propan—2—ol

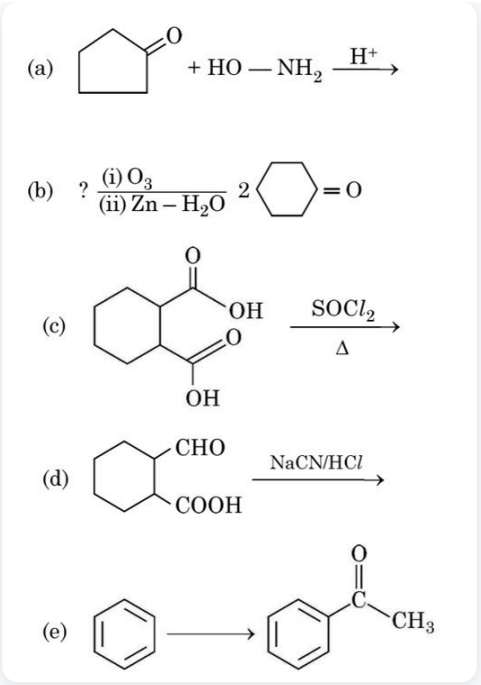
(iii) Propanal to 2—hydroxy propanoic acid

[5 Marks]

Question 36.

Complete each synthesis by giving missing starting material, reagent or products:

[5 Marks]



Question 37.

(a) Calculate the standard Gibbs energy (Δ_rG^0) of the following reaction at 25 ^{0}C: Au(S) + ca^{2+}(1M)→ Au^{3+} (1M) +Ca(s)

E^0Au^{3+}/Au= + 1.5 V,E^0Ca^{2+}/Ca=- 2.87 v

Predict whether the reaction will be spontaneous or not at 25 ^{0}C. [1 F = 96500 C mol^{-1}]

(b) Tarnished silver contains Ag2S. Can this tarnish be removed by placing tarnished silverware in an aluminium pan containing an inert electrolytic solution such as NaCl ? The standard electrode potential for half reaction :

$Ag_2S(s) + 2e^- \rightarrow 2Ag(s) + S^{2-}$ is -0.71V

and for $Al^{3+} + 3e^- \rightarrow 2Al(s)$ is -1.66 V

[5 Marks]

Question 38.

(a) Define the following :

(i) Cell potential

(ii) Fuel cell

(b) Calculate emf of the following cell at 25^{0}C :

$Zn(s)\ I\ Zn^{2+}_{(0.1m)}IICd^{2+}_{(0.01m)}I\ Cd(s)$

Given : E^0cd^{2+}/cd = -0.40V

E^0Zn^{2+}/Zn =-0.76V

[log 10=1]

[5 Marks]

Question 39.

An organic compound 'A', molecular formula C_2H_60 oxidises with $Cr0_3$ to form a compound 'B'. Compound 'B' on warming with iodine and aqueous solution of NaOH gives a yellow precipitate of compound 'C'. When compound 'A' is heated with conc. H_2S0_4 at 413 K gives a compound 'D', which on reaction with excess HI gives compound 'E'. Identify compounds 'A', 'B', 'C', 'D' and 'E' and write chemical equations involved.

[5 Marks]

Question 40.

(a) Write chemical equations of the following reactions :

(i) Phenol is treated with conc. HNO3

(ii) Propene is treated with B H followed by oxidation by H202/OH-.

(iii) Sodium t-butoxide is treated with CH3 Cl.

(b) Give a simple chemical test to distinguish between butan—1—ol and butan—2—ol.

(c) Arrange the following in increasing order of acid strength : phenol, ethanol, water.

[5 Marks]