CBSE EXAMINATION PAPER-2022

CHEMISTRY

(Solved)

Time allowed : 3 hours | Maximum Marks : 44

General Instructions :

Read the following instructions carefully and follow them :

i. This question paper contains **17 questions.** All questions are **compulsory.**

ii. This question paper is divided into **3 sections.**

iii. **Section A** – questions number **1 to 2** are case based questions

iv. **Section B** – questions number **3 to 4** are short answer

v. **Section C** – questions number **5 to 17** are long answer

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

vii. Use of calculator is NOT allowed.

Section A

Question 1. Amines constitute an important class of organic compounds derived by replacing one or more hydrogen atoms of ammonia molecule by alkyl/aryl groups. Amines are usually formed from nitro compounds, halides, amides, etc. They exhibit hydrogen bonding which influences their physical properties. Alkyl amines are found to be stronger bases than ammonia. In aromatic amines, electron releasing and withdrawing groups, respectively increase and decrease their basic character. Reactions of amines are governed by availability of the unshared pair of electrons on nitrogen. Influence of the number of hydrogen atoms at nitrogen atom on the type of reactions and nature of products is responsible for identification and distinction between primary, secondary and tertiary amines. Reactivity of aromatic amines can be controlled by acylation process.

Question 2.

Read the following passage and answer the questions that follow :

Amines constitute an important class of organic compounds derived by replacing one or more hydrogen atoms of ammonia molecule by alkyl/aryl groups. Amines are usually formed from nitro compounds, halides, amides, etc. They exhibit hydrogen bonding which influences their physical properties. Alkyl amines are found to be stronger bases than ammonia. In aromatic amines, electron releasing and withdrawing groups, respectively increase and decrease their basic character. Reactions of amines are governed by availability of the unshared pair of electrons on nitrogen. Influence of the number of hydrogen atoms at nitrogen atom on the type of reactions and nature of products is responsible for identification and distinction between primary, secondary and tertiary amines. Reactivity of aromatic amines can be controlled by acylation process.

(1)

Why does aniline not give Friedel-Crafts reaction ?

[1 Marks]

(2)

Arrange the following in the increasing order of their pKb values :

$C_6H_5NH_2$, NH_3, $C_2H_5NH_2$, $(CH_3)_3N$

[1 Marks]

(3)

How can you distinguish between $CH_3CH_2NH_2$ and $(CH_3CH_2)_2NH$ by Hinsberg test ?

[1 Marks]

(4)

How will you convert the following :

(i) Benzoic acid to aniline

(ii)Aniline to p-bromoaniline

[2 Marks]

(5)

Write the structures of A and B in the following reactions :

[2 Marks]

Section B

Question 3.

In the given reaction

($N2(g) + 3H_2(g) \rightarrow 2NH_3(g)$,

the rate of formation of NH3 is $3{\cdot}6 \times 10^{-4}$ mol L^{-1} s^{-1} . calculate the

(i) rate of reaction and (1)

(ii) rate of disappearance of $H_2(g)$.(1)

[2 Marks]

Question 4.

(i) State Kohlrausch' law of law of independent migration of ions.

(ii)Calculate the degree of dissociation (α) of CH_3COOH if Λ_m and $\Lambda°_m$ of CH_3 COOH) are 48 S cm^2 mol^{-1} and 400 S cm^2 mol^{-1} respectively.

[3 Marks]

Section C

Question 5.

Write the hybridisation and magnetic character of the following complexes :

(i) $[NiCl4]^{2-}$

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

(iii)[FeF6] $^{3-}$

[Atomic number : Ni = 28, Co = 27, Fe = 26]

[3 Marks]

Question 6.

(i) Write the IUPAC name of the following complex : $[Co(NH_3)_4(H_2O)Cl]Cl_2$. (1)

(ii) What is the difference between an Ambidentate ligand and a Bidentate ligand ?(1)

(ii) Out of $[Fe(NH_3)_6]^{3+}$ and $[Fe(C_2O_4)_3]^{3-}$, which complex is more stable and why ?(1)

[3 Marks]

Question 7.

Calculate the emf of the following cell :

$Zn\ (s)|Zn^{2+}\ (0{\cdot}01\ M)\ ||\ (0{\cdot}001\ M)\ Ag^{+}\ |Ag\ (s)$

Given : $E^{\Theta}\ Zn^{2+}/Zn = -0{\cdot}76$ V and

$E^{\Theta}\ Ag^{+}/Ag = +0{\cdot}80$ V

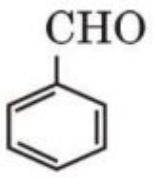
[log 2 = 0·3010, log 3 = 0·4771, log 10 = 1]

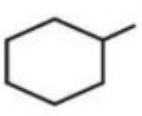
[3 Marks]

Question 8.

Write the major products in the following :

[3 Marks]

(i)  $\xrightarrow[273-283\ K]{HNO_3 + H_2SO_4}$

(ii)  $+ NaOH \xrightarrow[\Delta]{CaO}$

(iii) $CH_3 - \underset{\displaystyle H}{\underset{|}{C}} = O \xrightarrow{NH_2OH}$

Question 9.

(i) Oxidation of propanal is easier than propanone. Why ?

(ii) How can you distinguish between Acetophenone and Benzophenone ?

(iii) Draw the structure of the following derivative : 2,4-Dinitrophenylhydrazone of Propanone

[3 Marks]

Question 10.

A first order reduction takes 30 minutes for 75% decomposition. Calculate t1/2.

Given : [log 2 = 0·3, log 3 = 0·48, log 4 = 0·6, log 5 = 0·7]

[3 Marks]

Question 11.

Write three differences between Lyophobic sol and Lyophilic sol.

[3 Marks]

Question 12.

(i) Write the dispersed phase and dispersion medium of 'milk'.

(ii) What is the cause of Brownian movement in colloidal particles ?

(iii) Why does physisorption decrease with increase in temperature ?

[3 Marks]

Question 13.

From the given EΘ values of the first row transition elements, answer the following questions :

(i) Why is Mn2+ / Mn value highly negative as compared to other elements ?

(ii) what is the reason for the irregularity in the above EΘ Values ?

(iii) Why is E Θ Cu^{2} + / Cu value exceptionally positive ?

[3 Marks]

$E^{\ominus}_{M^{2+}/M}$	Cr	Mn	Fe	Co	Ni	Cu	Zn
	– 0·91	– 1·18	– 0·44	– 0·28	– 0·25	+ 0·34	– 0·76

Question 14.

Write the equation involved in the following reactions :

(i) Rosenmund reduction

(ii) Etard reaction

(iii) Stephen reaction

[3 Marks]

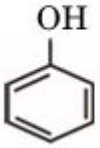
Question 15.

(i) Which acid of each pair would you expect to be stronger ? Give reason.

(ii) Distinguish between Pentan-2-one and Pentan-3-one.

[3 Marks]

(I) CH_3COOH or $F-CH_2-COOH$

(II)  or CH_3-COOH

Question 16.

Account for the following :

(i) Transition metals and their compounds show catalytic activities.

(ii) Account for the following :Zn, Cd and Hg are non-transition elements.

(iii) Zr and Hf are of almost identical atomic radii.

[3 Marks]

Question 17.

How will you carry out the following conversions :

(i) Propanal to Propane.(1)

(ii) Ethanal to But- 2-enal.(1)

(iii) Ethanoic acid to ethanamide.(1)

[3 Marks]