8. (a) Write short notes **(Any three)**

(i) Benzoin condensation

(ii) Beckmann rearrangement

(iii) Alkaline ester hydrolysis

(iv) Thorpe nitrile condensation

(b) Write the final product formed in reduction of nitrobenzene under the following conditions :

(i) Sn/HCl

(ii) Zn/NH_4Cl

(iii) Electrolytic reduction (4,4,4,3)

[This question paper contains 8 printed pages.]

29.12.2023(M)

Your Roll No.....

Sr. No. of Question Paper : 1564 **G**

Unique Paper Code : 2172012302

Name of the Paper : DSC: Carbonyls, Carboxylic Acids, Amines, Nitro Compounds, Nitriles, Isonitriles and Diazonium Salts

Name of the Course : **B.Sc. (Hons.) Chemistry**

Semester : III

Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **six** questions in all.
3. **All** questions carry equal marks.

1. (a) An organic compound $A(C_5H_8O_2)$ forms a dioxime. It gives a positive Tollen's test. On Clemmensen reduction, it forms n-pentane. It also gives a positive iodoform test to form sodium salt of

dicarboxylic acid which on acidification gives a dicarboxylic acid B ($C_4H_6O_4$).

(i) Predict the structures of A and B.

(ii) Give the reagent used in Clemmensen reduction.

(iii) Give the reaction involved in the Iodoform test of A to form B.

(iv) What is the chief use of Tollen's test?

(b) An optimum pH is required for the reaction of carbonyl compounds with ammonia derivatives. Justify the statement.

(c) Write the synthesis of the following compounds using Ethyl acetoacetate or Diethylmalonate:

(i) Crotonic acid

(ii) 5,5-Diethylbarbituric acid

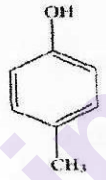
(d) Why tertiary amines with three different groups attached to nitrogen atom do not show optical activity? Explain by taking a suitable example.

(4,4,4,3)

2. (a) Amine A ($C_5H_{13}N$) on treatment with methyl iodide followed by silver hydroxide forms compound

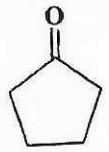
7. (a) Predict the product and give the name of the reaction involved : **(Any six)**

(i) $CH_3CH{=}CH{-}COCH_3 + CH_2(COOEt)_2 \xrightarrow{EtO^-}$

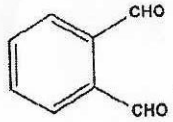
(ii)  $+ ArN_2^+Cl^- \xrightarrow{\text{aq. NaOH}}$

(iii) $CH_3CH_2CH_2NO_2 \xrightarrow[\text{(ii) } H_2SO_4/\text{boil}]{\text{(i) NaOH}}$

(iv) $CH_3CH_2CH_2\overset{+}{N}(CH_3)_2 \overset{O^-}{|} \xrightarrow{\Delta} A + B$

(v)  $\xrightarrow{CF_3COOOH}$

(vi) $C_6H_5NH_2 + CHCl_3 + 3\,KOH \longrightarrow$

(vii)  $\xrightarrow{NaOH}$

(b) 1,6-diesters undergo cyclization when treated with sodium ethoxide. Write the name of the reaction and its mechanism. (2×6,3)

P.T.O.

(b) How will you distinguish between ethylamine, diethylamine and triethylamine using Hinsberg's method? Give the reactions involved.

(c) Outline the preparation of n-propylamine by Gabriel phthalimide synthesis.

(d) Coupling reactions of diazonium salts do not take place in strongly acidic or strongly alkaline conditions. Explain using suitable structures. (4,4,4,3)

6. (a) Discuss the mechanism of acid-catalysed hydrolysis of nitriles.

(b) Give a reaction to distinguish between nitriles and isonitriles.

(c) Carry out the following conversions : **(Any two)**

(i) m-Bromotoluene from Toluene

(ii) o-Chlorophenol from Chlorobenzene

(iii) Adipic acid from Diethylmalonate

(d) How do primary, secondary and tertiary nitroalkanes react with nitrous acid. Give the reactions involved. (4,4,4,3)

B ($C_6H_{17}NO$) which is basic in nature. Compound B on heating forms 1-Propene and amine C (C_3H_9N). Identify A, B and C. Give the mechanism of formation of both products from B.

(b) Arrange the following in order of decreasing reactivity towards nucleophilic addition reactions, giving reasons :

CH_3COCH_3 ; $C_6H_5COCH_3$; HCHO ; $CH_3COCH(CH_3)_2$

(c) How will you distinguish between the following compounds on the basis of the product they form on heating:

(i) Oxalic acid and Succinic acid

(ii) β-Hydroxy acid and ϒ-Hydroxy acid

(d) Write the mechanism of Keto-enol tautomerism in an acidic OR alkaline medium. (4,4,4,3)

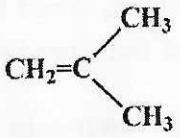
3. (a) Elaborate :

(i) p-Hydroxybenzaldehyde does not undergo Cannizzaro reaction.

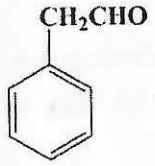
(ii) Benzil rearranges to Benzilic acid when treated with a base. Justify on the basis of reaction mechanism.

P.T.O.

(b) Outline the synthesis of the given alkene using Wittig reaction :

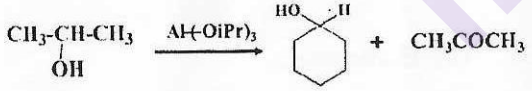


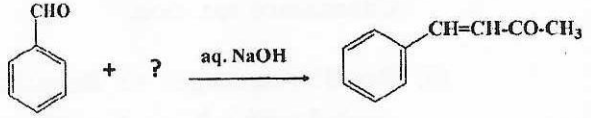
(c) Give the product formed and the mechanism involved in the aldol condensation of the given carbonyl compound :



(d) Complete the following reactions :

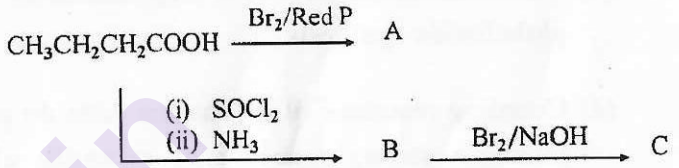
(i) $CH_3CH_2CH_2CHO \xrightarrow{LAH}$?

(ii) ? +  + CH_3COCH_3

(iii) 

(4,4,4,3)

4. (a) Complete the following sequence of reactions giving structures of A, B, and C. Also give the name of reactions involved in the two sequences:



(b) What happens when Acetone is reacted with Ethyl bromoacetate in presence of Zinc. Give the name of reaction along with the mechanism.

(c) All ortho substituted benzoic acids are stronger acids than benzoic acid. Give reason.

(d) Carboxylic acids do not form oxime even though they have $\rangle C=O$ group in their structure. Give reason. (4,4,4,3)

5. (a) Arrange the following in increasing order of basicity, give reason to justify your answer :

$C_6H_5NH_2$; m-$OCH_3C_6H_4NH_2$; p-$OCH_3C_6H_4NH_2$

P.T.O.