14/12/23

DOON UNIVERSITY, DEHRADUN

End-Semester Examination, Third Semester (July 2023 – December 2023)

Academic Year 2023–2024 (Odd Semester)

School of Physical Sciences, Department of Chemistry

Programme Name: Undergraduate Diploma in Chemistry /B.Sc. Hons. in Chemistry / B.Sc. Hons with Research in Chemistry

Course Code with Title: **CYC-202**; *Organic Compounds with Oxygen in Functional Groups*

Time Allowed: *02 Hours* ***Date:*** *14th Dec 2023* ***Maximum Marks:*** *30*

Note: Attempt All Questions from Sections A,B and C.

SECTION: A ***(Marks: 6)***

[1] Explain why must ethanoyl chloride be protected from atmospheric moisture during storage. [1]

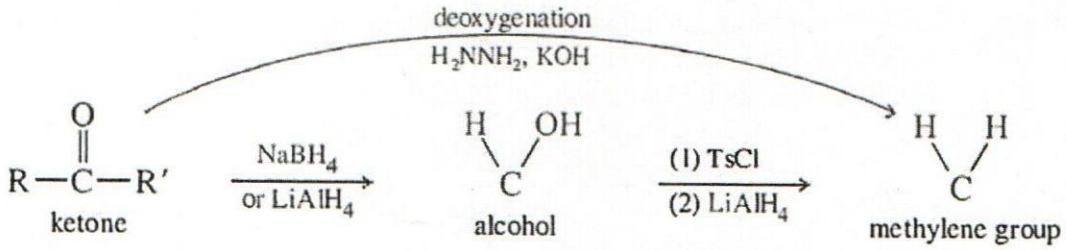
[2] What is the characteristic reaction of the derivatives of carboxylic acids? Arrange the derivatives of carboxylic acids in decreasing order of reactivity towards this particular reaction? [1]

[3] Propanoic acid has a boiling point of 141°C which is considerably higher than that of butan-1-ol (117°C), although they have the same molecular mass. Explain why. [1]

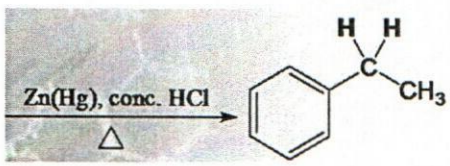
[4] Arrange the following compounds in decreasing order of solubility in water: [1]

$CH_3CH_2CH_2COOH$, $CH_3CH_2COOCH_3$ and CH_3COOH

[5] Complete the following reaction. What is the name of the reaction when it is carried out using $H_2N{-}NH_2.KOH$. [1]



[6] Complete following reactions. Write structure of the reactant and name of reaction. [1]

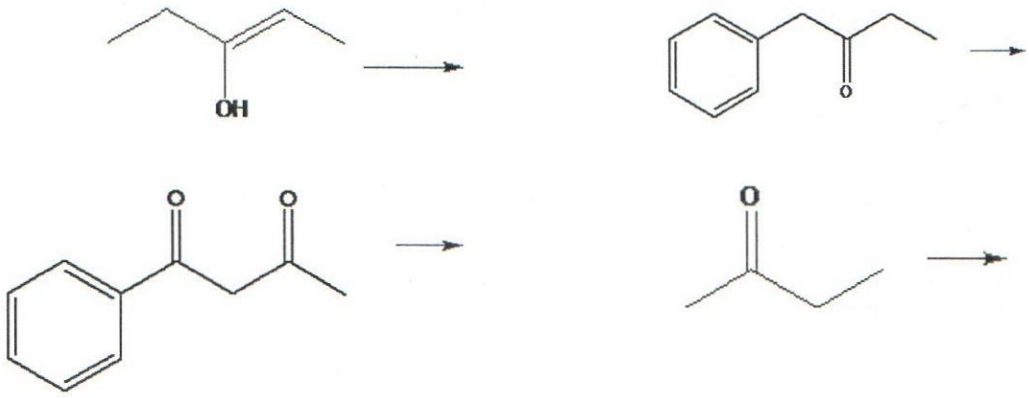


SECTION: B *(Marks: 12)*

[7] Write the chemical equations for the acid-catalyzed and alkali-catalyzed hydrolyses of each of the following compounds: (i) Ethyl butanoate and (ii) Propanamide (iii) Benzoyl chloride [2]

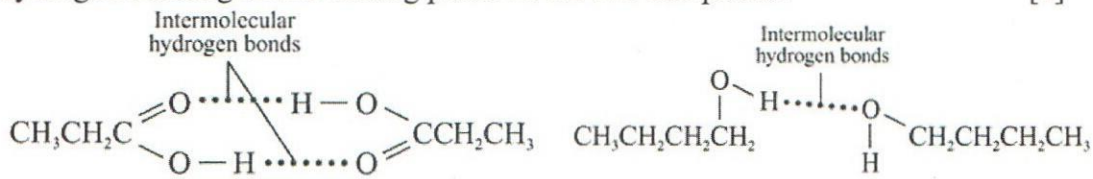
[8] (8.1) How does an Enolate function as an ambident nucleophile? [1]
(8.2) Why is the *alpha*-Hydrogen acidic in carbonyl compounds? [1]

[9] Draw the tautomers of the following compounds? [2]

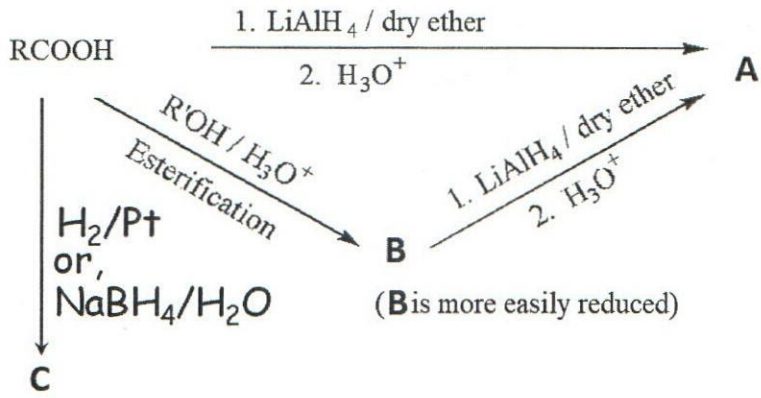


[10] Write the structures of the possible products formed after the reaction between RCOOH and R'COOH in presence of heat and P_4O_{10}? [2]

[11] See the following structures carefully. Draw them in your answer booklet. Write the names of both the compounds. Mention what is the similarity in the hydrogen bonding in these compounds. Also discuss what is the difference in the hydrogen bonding in these compounds. Explain what will be the impact of the difference in hydrogen bonding on the boiling points of the two compound. [2]



[12] See the following image carefully to understand which chemical reaction is taking place. Draw the same in your answer booklet. Fill the structures of A, B and C in the reactions. Why is B more easily reduced? [2]

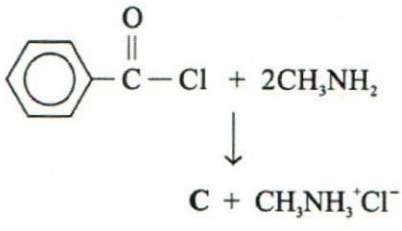


SECTION: C *(Marks:* **12)**

[13] (13.1) Write the structure of both products in following reactions and explain. [2]

2-Methyl-2-butanol

(13.2) Draw the structural formulae of the missing compounds **A** to **H** in following reactions? [2]

$CH_3CCl + H_2O \longrightarrow$ **A** + HCl	$CH_3-C(=O)-O-C(=O)-CH_2CH_3 + H_2O \longrightarrow$ **D** + **E**
$CH_3CCl + CH_3COH(CH_3) \longrightarrow$ **B** + HCl	$CH_3(CH_2)_{16}C(=O)-NH_2 + NaOH \longrightarrow$ **F** + NH_3
 **C** + $CH_3NH_3^+Cl^-$	$CH_3COCH_2CH_3 + H_2O \overset{H_3O^+}{\rightleftharpoons}$ **G** + **H**

(13.3) Why are esters less acidic than aldehydes and ketones? Explain. [2]

[14] (14.1) Explain *Dieckmann Cyclization* and *Hoffman Bromamide Degradation.* [3]

(14.2) What will be the product of dehydration of following alcohols? [1+1+1]