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### ASSIGNMENT ON CARBOXYLIC

1. Give the IUPAC names of the following compounds

$\text{HCOOH}$  - Methanoic acid

$\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$  - Butanoic acid

$\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{COOH}$  - Pentane-1,5-dioic acid

$\text{CH}_3(\text{CCH}_2)_4\text{COOH}$  - Hexanoic acid

$\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH}$  - Hex-4-enoic acid

2. Discuss briefly the physical properties of carboxylic acid, under the following heading.

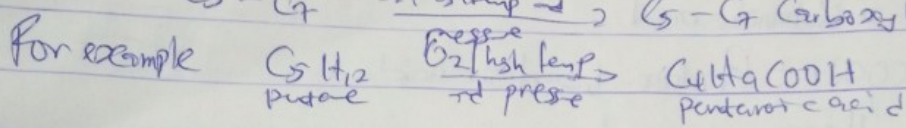
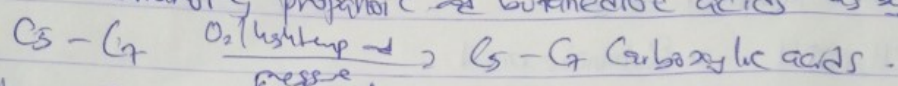
- i) **Physical appearance:** All simple aliphatic carboxylic acids up to  $\text{C}_{10}$  are liquids at room temperature. Most other carboxylic acids are solid at room temperature although anhydrous carboxylic acid (acetic acid) also known as glacial ethanoic acid freezes to an ice-like solid below the room temperature.
- ii) **Boiling Point:** The boiling point of carboxylic acids are crystalline solids and have higher melting points than their aliphatic counterparts of comparable relative molecular mass.
- iii) **Solubility:** Lower molecular mass carboxylic acids with up to four carbon atoms in their molecules are soluble in water, this is largely due to their ability to form hydrogen bonds with water molecules. The water solubility of the acids decreases as the relative molecular mass increases because the structure becomes relatively more hydrocarbon in nature and hence covalent. All carboxylic acids are soluble in organic solvents.

3. Write 2 industrial preparation of carboxylic acid.

1. From Carbon (II) oxide: Methanoic acid (formic acid) is manufactured by passing carbon (II) oxide under pressure to hot aqueous sodium hydroxide. The free carboxylic acid is liberated by

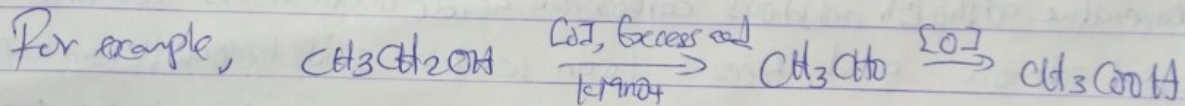
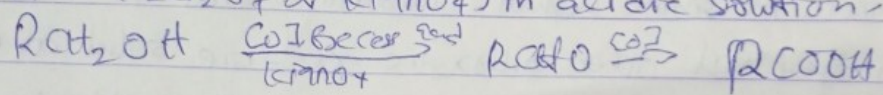
by careful reaction with  $H_2SO_4$ ,  $Co + NaOH \rightarrow HCOOH \xrightarrow{H_2SO_4} HCOOH + NaHCO_3$

2 From Petroleum liquid phase oxidation of C5-C7 alkanes, obtained in the petroleum at high temperature and pressure will give C5-C7 carboxylic acids with methanoic, propanoic and butanedioic acids as by-product

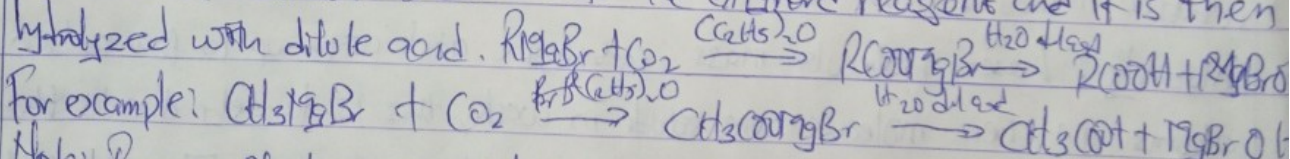


4 With eqn equations and brief explanations, discuss the synthetic preparation of carboxylic acid.

1. Oxidation of Primary alcohol and aldehyde: Carboxylic acids can be prepared by oxidizing primary alcohol and aldehydes using the usual oxidizing agent i.e.  $K_2Cr_2O_7$  or  $KMnO_4$  in acidic solution.

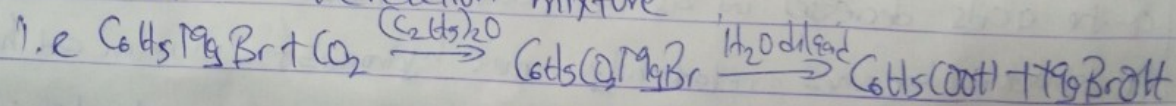


2. Carboxylation of Grignard reagents: Aliphatic carboxylic acid are obtained by bubbling carbon(IV)oxide into the Grignard reagent and it is then hydrolyzed with dilute acid.



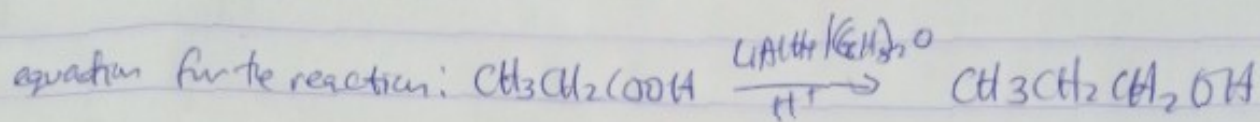
For example:  $CH_3MgBr + CO_2 \xrightarrow{(C_2H_5)_2O} CH_3CO_2MgBr \xrightarrow{H_2O, \text{dil acid}} CH_3COOH + MgBrOH$

Note: In case of benzoic acid, the reagent is added to  $CO_2$  (solid) (chance) which is constant to the reaction mixture

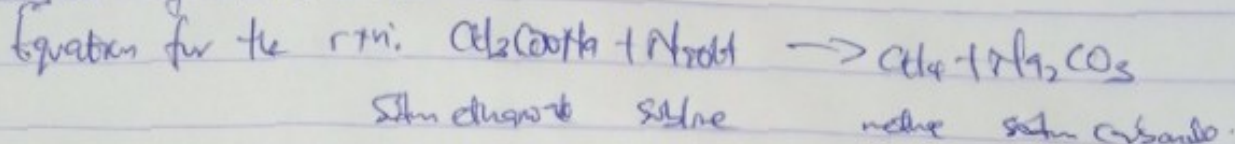


5 With chemical equation only, outline the reduction, decarboxylation and esterification of carboxylic acid.

Reduction of Carboxylic Acid: Carboxylic acid reduced primary alcohol using reagent  $LiAlH_4$  in  $(C_2H_5)_2O$



Decarboxylation of Carboxylic acid:



Esterification of Carboxylic acid: They reacts with alcohols to form Esters.

