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MATRIC NUMBER: 19/MHS01/259

DEPARMENT: MBBS

COLLEGE: MHS

COURSE: CHM102

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TITILE: ASSIGNMENT ON CARBOXYLIC ACID

- ① $\text{HCOOH} \longrightarrow \text{Methanoic acid}$
- b) $\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{COOH} \longrightarrow \text{Pentane-1,5-dicarboxylic acid}$
- c) $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH} \longrightarrow \text{Butanoic acid}$
- d) $\text{HO}_2\text{C}-\text{CO}_2\text{H} \longrightarrow \text{Ethanedioic acid}$
- e) $\text{CH}_3[\text{CH}_2]_4\text{COOH} \longrightarrow \text{Hexanoic acid}$
- f) $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH} \longrightarrow \text{Hex-4-enoic acid}$

2) PHYSICAL APPEARANCE

All simple aliphatic carboxylic acids up to C_{10} are liquids at room temperature. Most other carboxylic acids are solids at room temperature although anhydrous carboxylic acid (acetic acid) also known as glacial ethanoic acid freezes to an ice-like solid below room temperature.

i) BOILING POINTS

Boiling points increase with increasing relative molecular mass. Aromatic carboxylic acids are crystalline solids and have higher melting points than their aliphatic counterparts of comparable relative molecular mass.

iii) SOLUBILITY

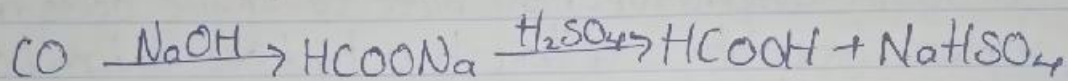
Lower ~~points~~ ^{molecular mass} increases ~~up~~ carboxylic acid with up to four carbon atoms in their molecules are soluble in water. This is largely due to their ability to form hydrogen bonds with water molecules. This water solubility of the acids decreases as the relative molecular mass increases because the structure becomes

relatively more hydrocarbon in nature and hence covalent. All carboxylic acids are soluble in organic solvents.

3) INDUSTRIAL PREPARATIONS

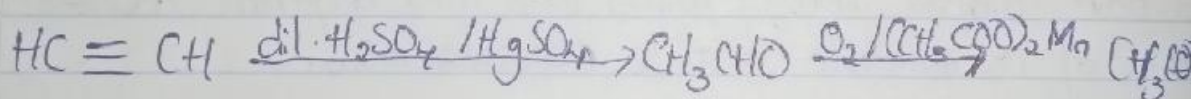
i) From Carbon (ii) oxide;

Methanoic acid (formic acid) is manufactured by adding carbon (ii) oxide under pressure to hot aqueous sodium hydroxide. The free carboxylic acid is liberated by careful reaction with tetraoxosulphate (vi) acid (H_2SO_4).



2) From ethanol

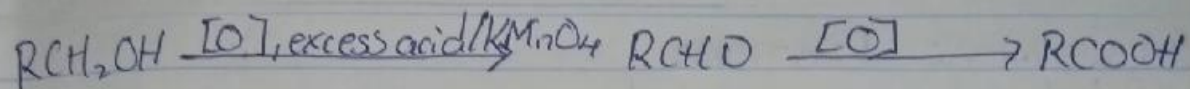
Ethanoic acid is obtained commercially by the liquid phase air-oxidation of 5% solution of ethanal to ethanoic acid using manganite (ii) ethanoate catalyst. Ethanal itself is obtained from ethylene.



4) SYNTHETIC PREPARATIONS

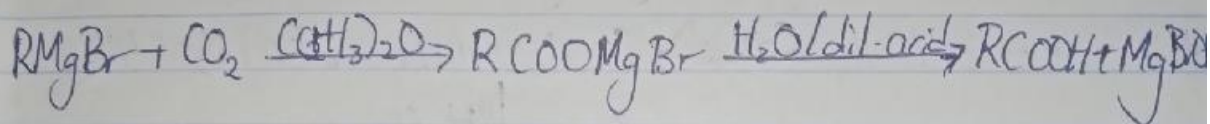
i) Oxidation of primary alcohols and aldehydes;

Oxidation of primary alcohols and aldehydes can be used to prepare carboxylic acids using the usual oxidizing agents (ie $K_2Cr_2O_7$ or $KMnO_4$) in acidic solution.



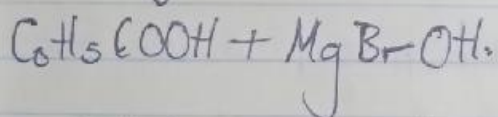
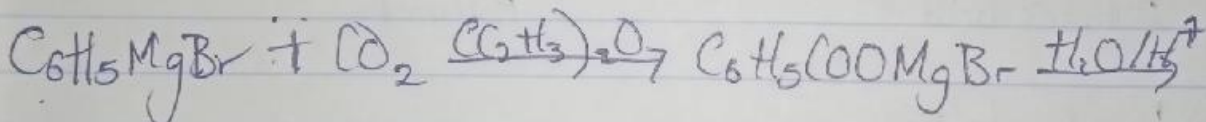
ii) Carbonation of Grignard reagent

Aliphatic carboxylic acids are obtained by bubbling carbon dioxide into the Grignard reagent and then hydrolyzed with dilute acid.

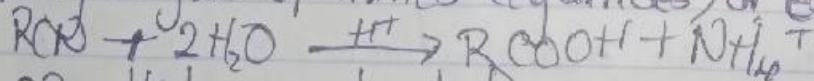


R may be 1°, 2°, 3° aliphatic alkyl or aryl radical.

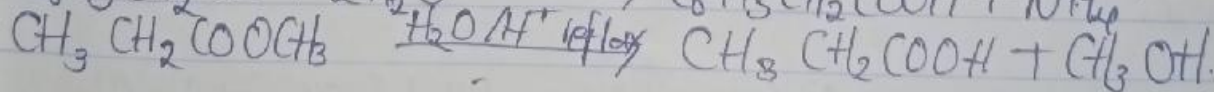
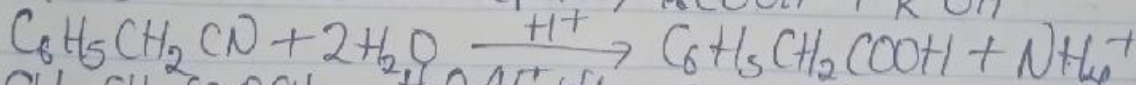
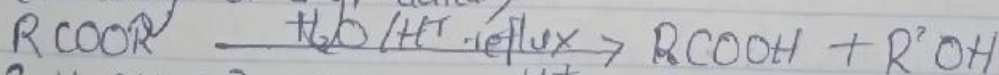
In the preparation of benzoic acid, the reagent is added to solid carbon dioxide (dry ice) which also serves as coolant to the reaction mixture.



iii) Hydrolysis of nitriles (cyanides) or esters.

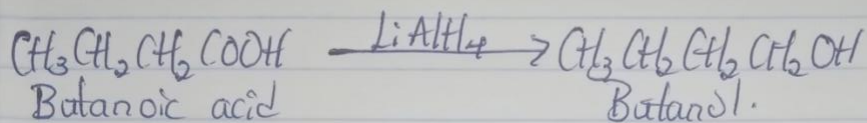
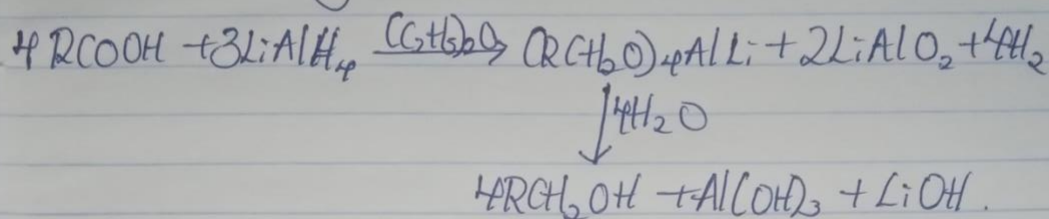


(R = alkyl or aryl radical)

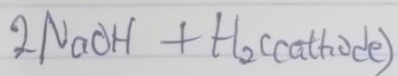
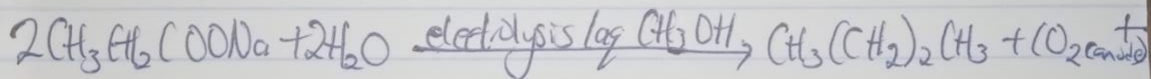
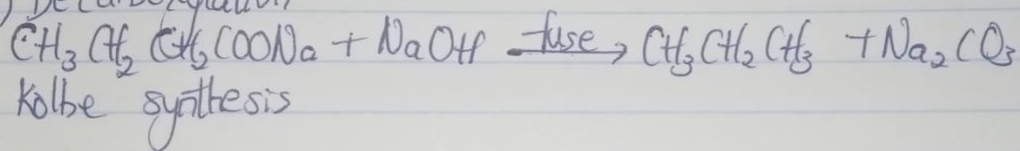


5) CHEMICAL REACTIONS

i) Reduction to primary alcohol.



ii) Decarboxylation



iii) Esterification

