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Course Code: CHM 102
Matric Number - 19/MHS061019

i) HCOOH - Methanoic acid

ii) $\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{COOH}$ - Pentan-1,5-dioic acid

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

iv) $\text{HO}_2\text{C}-\text{CO}_2\text{H}$ - Ethanedioic acid

v) $\text{CH}_3[\text{CH}_2]_4\text{COOH}$ - Hexanoic acid.

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

2) Physical Appearance

All simple aliphatic carboxylic acids up to C_{10} are liquids at room temperature while other carboxylic acids are solid at room temperature but anhydrous carboxylic acid [acetic acid] also known as glacial ethanoic acid freezes to an ice like solid below the room temperature.

i) Boiling Point

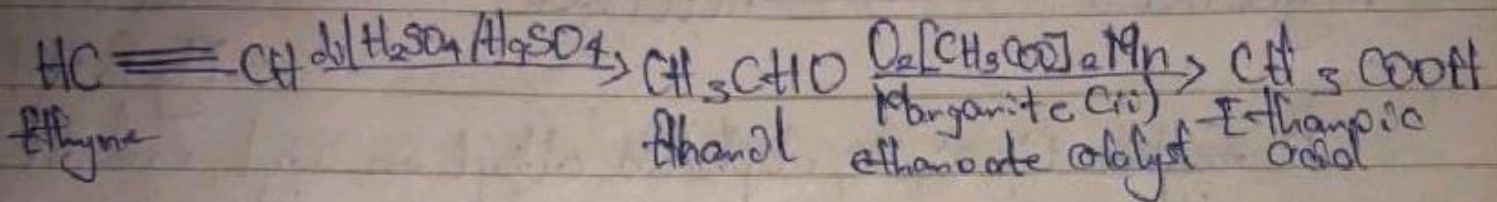
Boiling point increases with increase in relative molecular mass. Aromatic carboxylic acids are crystalline solids and have high melting points than the aliphatic of comparable relative molecular mass.

iii) Solubility

Low molecular mass carboxylic acids with up to four carbon atoms in their molecules are soluble in water and it is due to their ability to form hydrogen bonds with water molecules. The water solubility of the acids decreases with increasing relative molecular mass because the structure becomes relatively more hydrocarbon in nature and hence ~~are~~ covalent but all carboxylic acids are soluble in organic solvents.

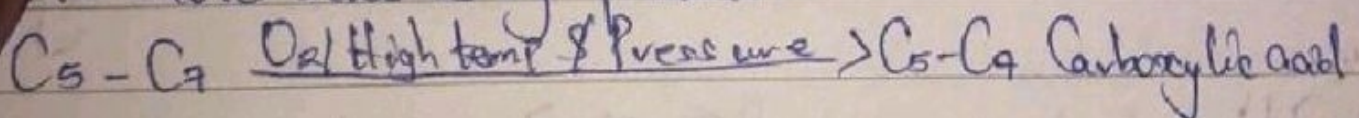
3:] From Ethanol

Ethanoic acid is obtained commercially by the liquid phase air oxidation of 5% solution of ethanol to ethanoic acid using manganese (ii) ethanoate catalyst and ethanol itself is obtained from ethylene



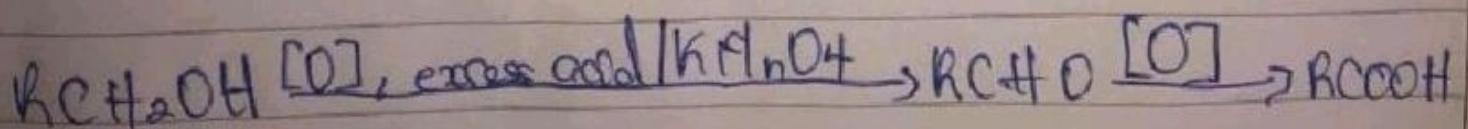
4:] From Petroleum

liquid phase air oxidation of C₅-C₇ alkanes, obtainable from petroleum at high temperature and pressure will give C₅-C₇ carboxylic acids with methanoic, propanoic and butanoic acids as by products.



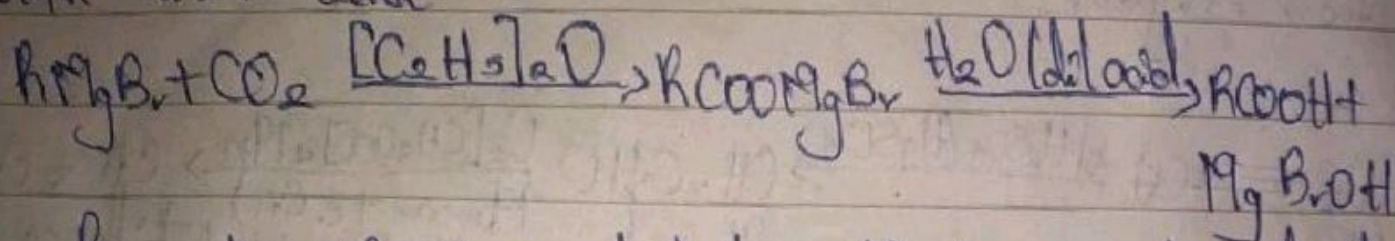
4:] Oxidation of Primary alcohols and aldehydes

This can be used to prepare carboxylic acids using the usual oxidizing agents [i.e. K₂Cr₂O₇ or KMnO₄] in acidic solution.



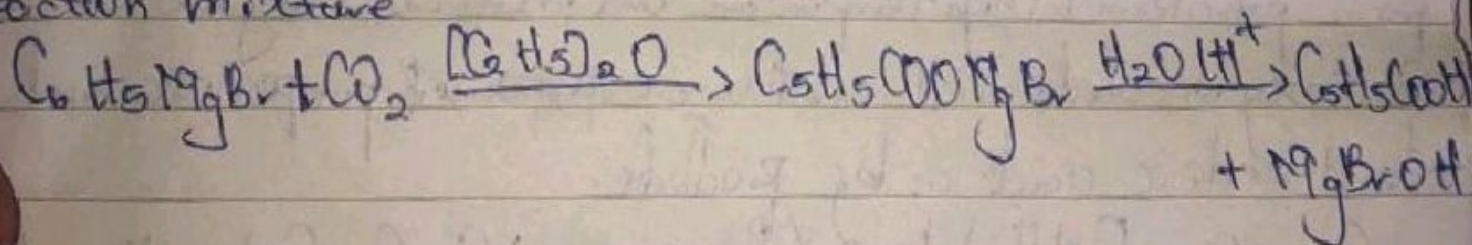
iv] Carbonation of Grignard Reagent

Propionic or butyric acids are obtained by bubbling carbon dioxide into the Grignard reagent and then hydrolyze with dilute acid.

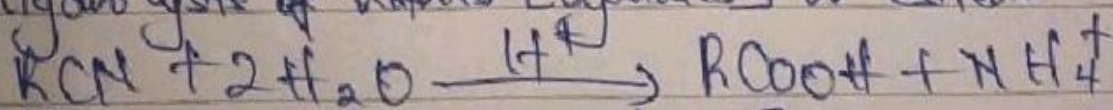


R maybe 1°, 2°, 3°, aliphatic alkyl or aryl radical

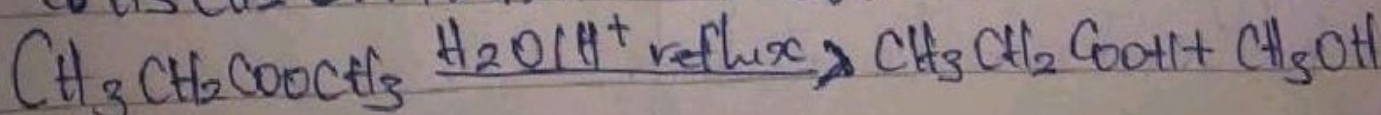
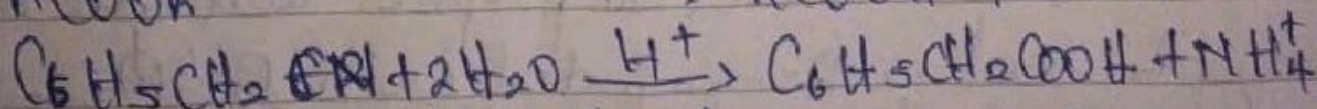
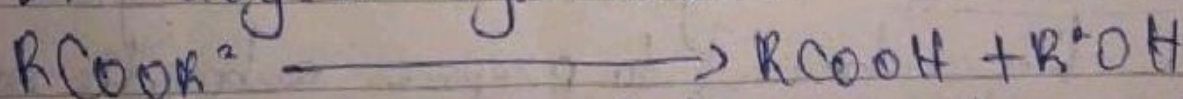
To prepare benzoic acid the reagent is added to solid carbon dioxide [dry ice] which also serves as coolant to the reaction mixture



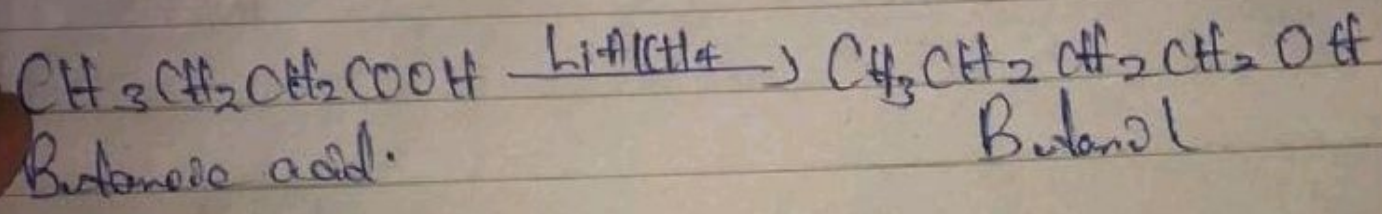
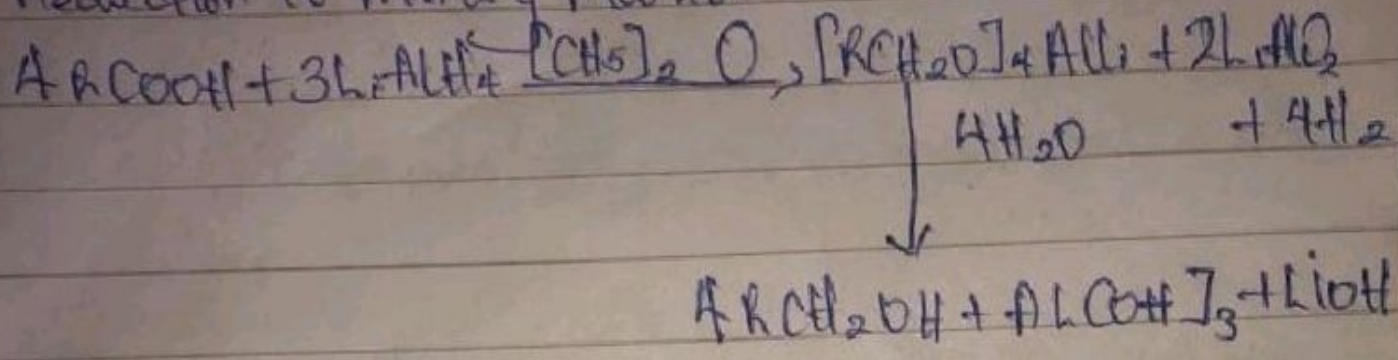
v] Hydrolysis of nitriles [Gambles] or esters



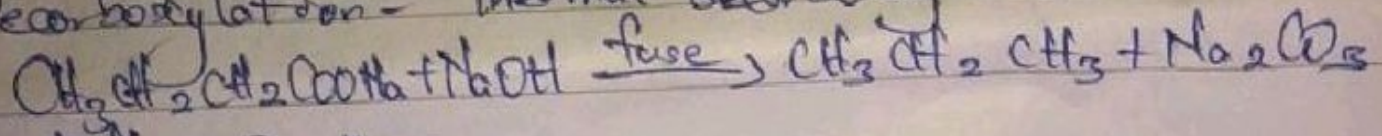
[R = alkyl or aryl radical]



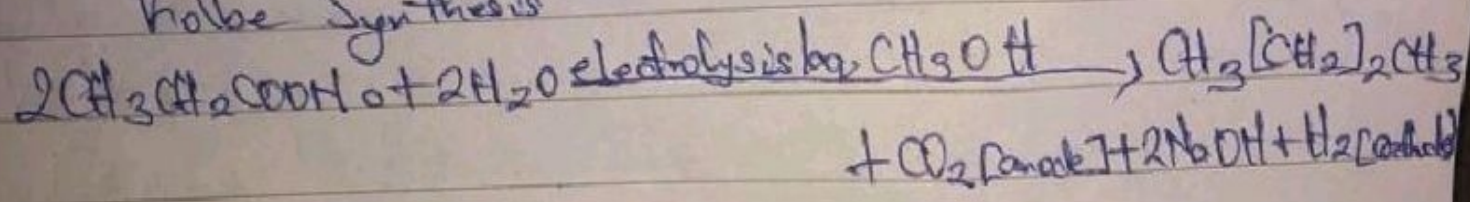
5ii] Reduction to Primary Alcohol



10) Decarboxylation - Thermal decarboxylation



Kolbe Synthesis



11] Esterification.

