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CHEM 102 ASSIGNMENT

- a. HCOOH - methanoic acid
- b. $\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{COOH}$ - pentan-1,5-dioic acid
- c. $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$ - butanoic acid
- d. $\text{HO}_2\text{C}-\text{CO}_2\text{H}$ - ethanedioic acid
- e. $\text{CH}_3(\text{CH}_2)_4\text{COOH}$ - hexanoic acid
- f. $\text{CH}_2=\text{CHCH}_2\text{CH}_2\text{COOH}$ - hex-4-enoic acid

Physical appearance: Simple aliphatic carboxylic acids are liquids at room temperature. Most other carboxylic acids are solid at room temperature while aromatic carboxylic acids are ice-like solids below the room temperature.

Boiling points: It increases with increasing molecular mass. Aromatic carboxylic acids which are crystalline solids have higher melting points.

Solubility: The water solubility of acids decreases as the relative molecular mass increases. Therefore, all carboxylic acids are soluble in organic solvents.

3. Industrial preparations of carboxylic acids
 - a. Ethanol:
 - b. From petroleum

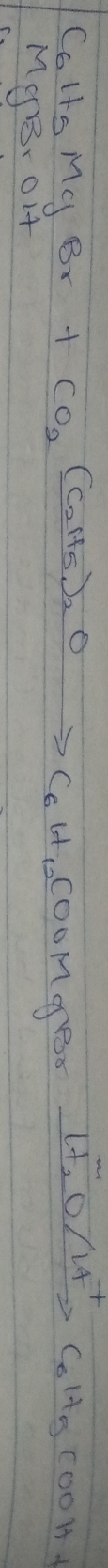
The synthetic preparation of carboxylic acids -

a. Oxidation of primary alcohols & aldehydes: It can be used to prepare carboxylic acids using the usual oxidizing agents like $\text{K}_2\text{Cr}_2\text{O}_7$ or KMnO_4 in acidic solution.

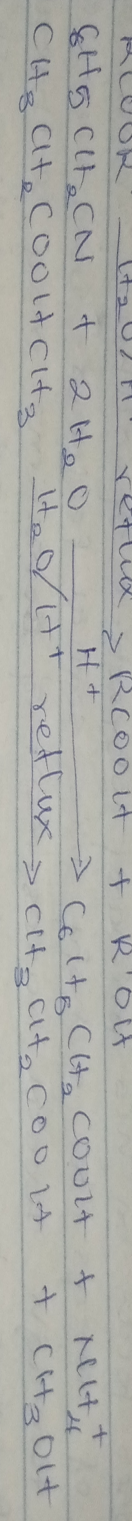
$$\text{RCH}_2\text{OH} \xrightarrow{[\text{O}], \text{excess acid/KMnO}_4} \text{RCHO} \xrightarrow{[\text{O}]} \text{RCOOH}$$

b. Carbonation of Grignard reagent: Aliphatic carboxylic acids are obtained by bubbling carbon dioxide into the Grignard reagent after which it is hydrolyzed with dilute acid.

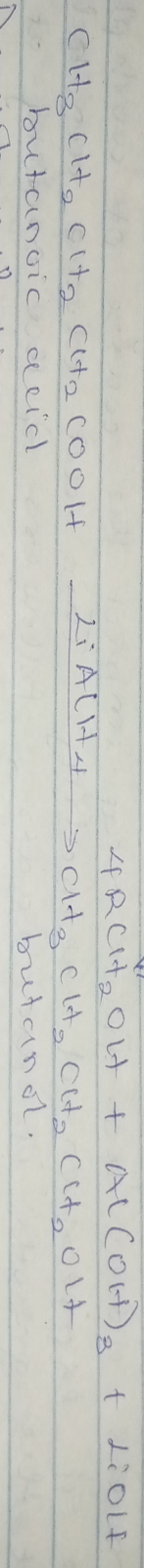
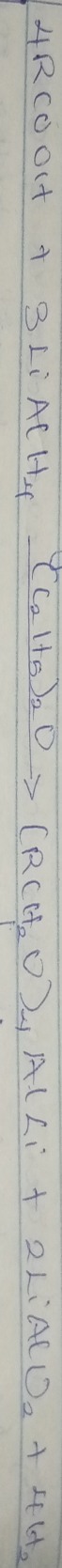
$$\text{RMgBr} + \text{CO}_2 \xrightarrow{[\text{C}_2\text{H}_5\text{O}]} \text{RCOOMgBr} \xrightarrow{\text{H}_2\text{O/dil. acid}} \text{RCOOH}$$



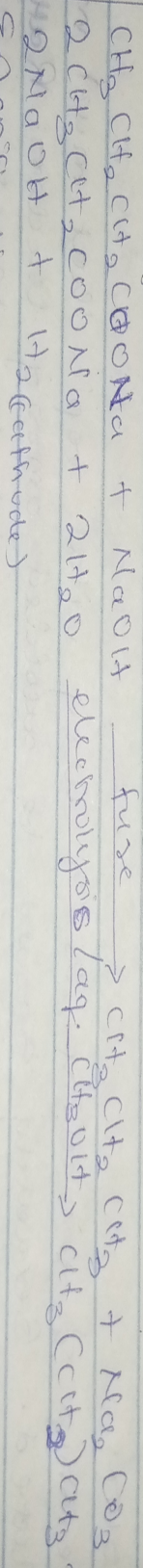
c. Hydrolysis of nitriles (cyanides) or esters.



b. Reduction of carboxylic acids



b. Decarboxylation:



c. Esterification:

