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MBBS
19/MTHSO1/170
CHEM 102

Assignment on Carboxylic Acids

- $\text{HCOOH} \longrightarrow$ Methanoic acid.
- $\text{HOOC(CH}_2\text{CH}_2\text{CH}_2\text{COOH)} \longrightarrow$ Pentan-1,5-dioic acid
- $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH} \longrightarrow$ Butanoic acid.
- $\text{HO}_2\text{C}-\text{CO}_2\text{H} \longrightarrow$ Ethanedioic acid
- $\text{CH}_3(\text{CH}_2)_4\text{COOH} \longrightarrow$ Hexanoic acid.
- $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH} \longrightarrow$ Hex-4-enoic acid.

2.i) 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 through anhydrous carboxylic acid (acetic acid) also known as glacial ~~temperature~~ ethanoic acid freezes to an ice-like solid below the room temperature.

ii) Boiling Points.

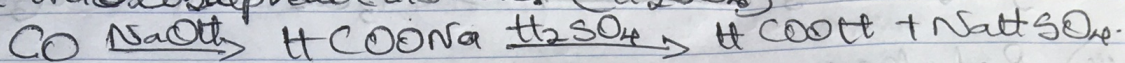
Boiling point increases with increasing relative molecular mass. Aromatic carboxylic acids are crystalline solids and have higher melting points than their aliphatic counterparts of ~~comparable~~ comparable relative molecular mass.

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.

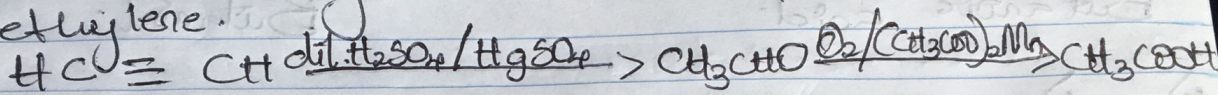
3) From Carbon (C) oxide.

Metanoic acid (formic acid) is manufactured by adding carbon (C) oxide under pressure to hot aqueous solution of sodium hydroxide. The free carbonic acid is liberated by careful reaction with tetrachlorosulphate (C) acid (H_2SO_4).



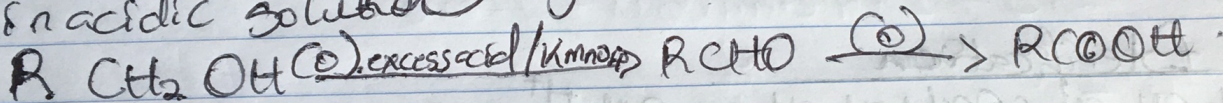
4) From ethanol.

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



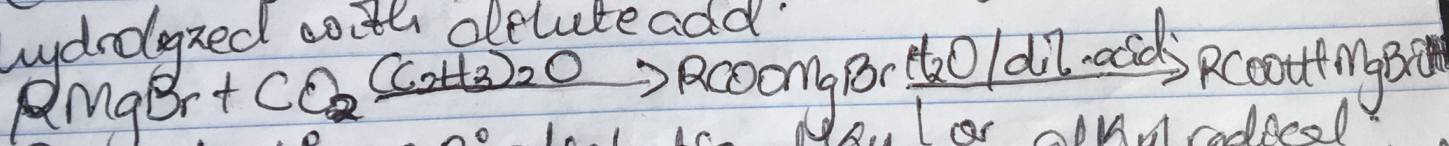
4E) Oxidation of primary alcohols and aldehydes.

Oxidation of primary alcohols and aldehydes can be used to prepare carboxylic acids using the usual oxidizing agents (i.e. $\text{K}_2\text{Cr}_2\text{O}_7$ or KMnO_4) in acidic solution.



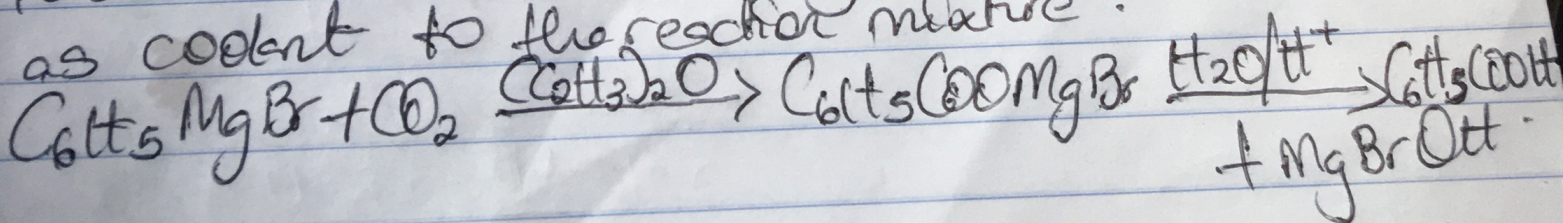
4F) Carbonation of Grignard Reagent.

Aliphatic carboxylic acids are obtained by bubbling carbon (C) oxide into the Grignard reagent and then hydrolyzed with dilute acid.

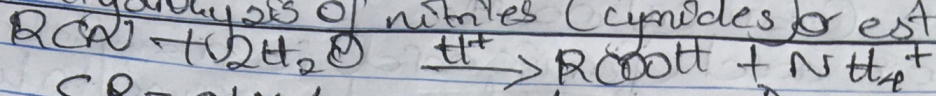


R may be 1° , 2° , 3° aliphatic alkyl or allyl radicals.

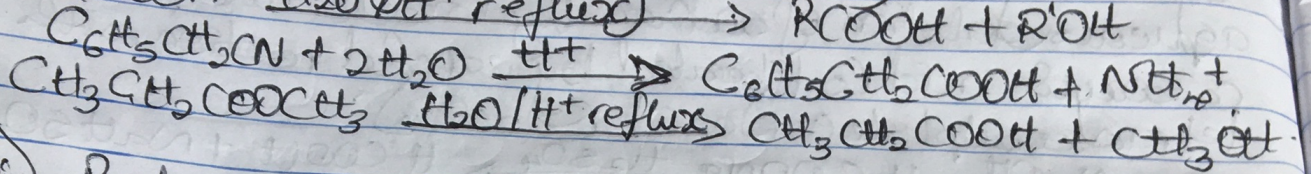
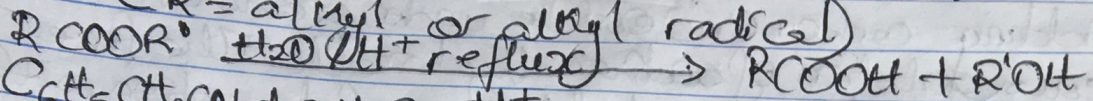
In the preparation of benzoic acid, the reagent is added to solid carbon (C) oxide (dry ice) which also serves as coolant to the reaction mixture.



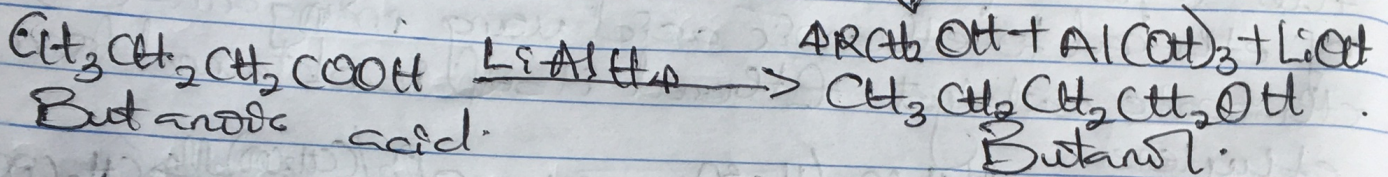
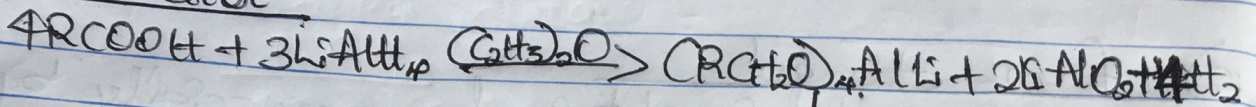
(iii) Hydrolysis of nitriles (Cyanides) or esters



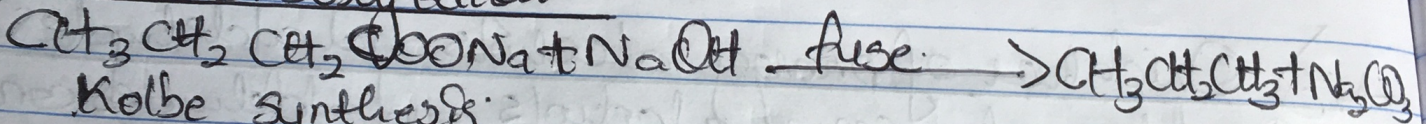
CR = alkyl or aryl radical



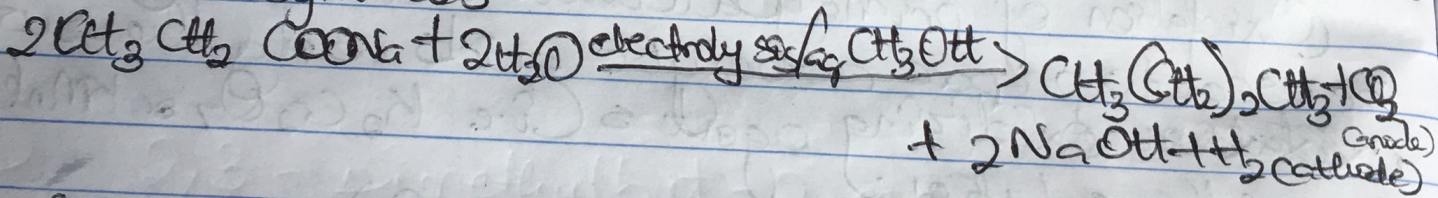
(iv) Reduction



(v) Decarboxylation



Kolbe synthesis



(vi) Esterification

