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DEPARTMENT: MBBS.
MATRIC NO: 19/MHS01/365.
COLLEGE: MHS.
COURSE: CHM 102.
DATE: 30/04/2020.
ASSIGNMENT.

1) Give the IUPAC names of the following compounds:

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) Discuss briefly the physical properties of carboxylic acids under the following headings:

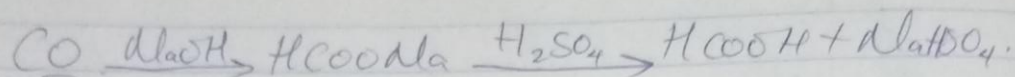
i) Physical appearance: Some aliphatic carboxylic acids up to C_{10} are liquids at room temp; most other carboxylic acids are solid at room temp. although anhydrous carboxylic acid (acetic acid) also called glacial ethanoic acid freezes to ice-like solid below room temp.

ii) Boiling point: It increases 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.

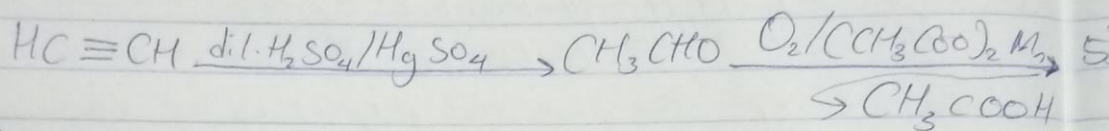
iii) Solubility: Lower molecular mass carboxylic acids with up to four carbon atoms in their molecules are soluble in water; this largely due to their ability to form hydrogen bonds with water molecules. The water solubility of the acids decreases as the relative molecular mass increases.

3) Two industrial preparations of carboxylic acids.

i) From Carbon(ii)oxide: Methanoic acid (formic acid) is manufactured by adding carbon(ii)oxide under pressure to hot aqueous solution of sodium hydroxide. The free carboxylic acid is liberated by careful reaction with tetraoxo-sulphate(vi)acid (H_2SO_4).



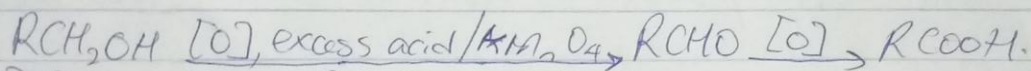
ii) From ethanal: Ethanoic acid is obtained commercially by the liquid phase air-oxidation of 5% solution of ethanal to ethanoic acid using manganite (ii) ethanoate catalyst. Ethanal itself is obtained from ethylene.



4) Synthetic preparations

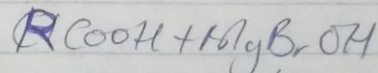
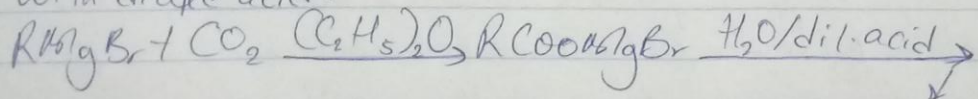
i) Oxidation of primary alcohols and aldehydes.

This can be used to prepare carboxylic acids using the usual oxidizing agents like KMnO_4 or $\text{K}_2\text{Cr}_2\text{O}_7$ in acidic solution.



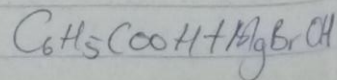
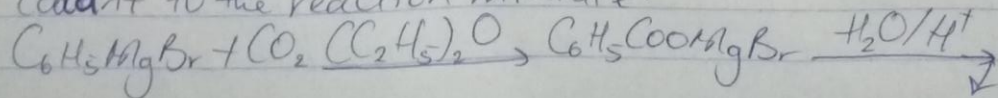
ii) Carbonation of Grignard reagent.

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

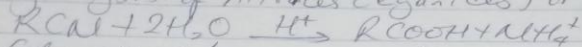


R may be 1°, 2°, 3° aliphatic alkyl or aryl radical.

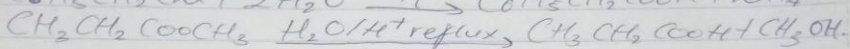
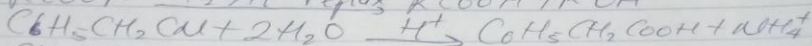
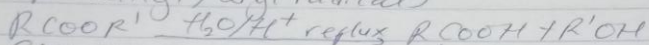
In the preparation of benzoic acid, the reagent is added to solid carbon (iv) oxide (dry ice) which serves as a coolant to the reaction mixture.



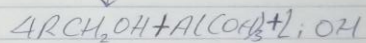
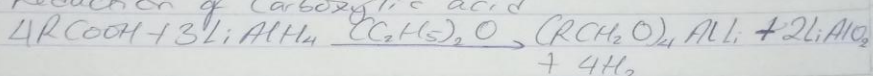
iii) Hydrolysis of nitriles (cyanides) or esters



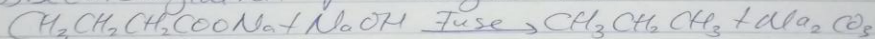
(R = alkyl/aryl radical)



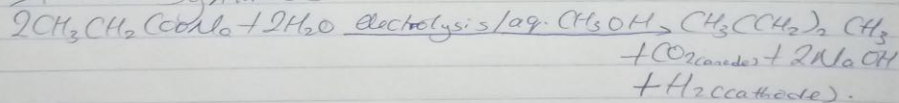
5) a) Reduction of Carboxylic acid



b) Decarboxylation of Carboxylic acid.



> Kolbe synthesis



c) Esterification of Carboxylic acid.

