

Emeanfu Faith Obiageli

19/10/2021

M&BS

Chem 102

1.  $\text{HCOOH}$  - Methanoic acid
2.  $\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{COOH}$  - Pentan-1,5-dioic acid
3.  $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$  - Butanoic acid
4.  $\text{HOOCCH}_2\text{CH}_2\text{COOH}$  - Ethanedioic acid
5.  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{COOH}$  - Hexanoic acid
6.  $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH}$  - Hex-4-enoic acid

## 2) Physical Properties

a) Solubility: When water solubility decreases as the relative molecular mass then increase. Lower molecular carboxylic acids up to carbon 4 are soluble in water. This is because they can form hydrogen bonds with water molecules.

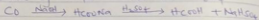
b) Boiling point: Aromatic carboxylic acids are crystalline solids and have higher melting points than their corresponding aliphatic counterparts. The bp increases as the relative molecular mass increases.

c) Physical appearance: Simple aliphatic carboxylic acids less than  $\text{C}_6$  are liquid at room temperature. The other carboxylic acids are solid at room temperature. Acetic acid, although freezes at room temperature to an ice-like solid below the room temperature.

## 3) Industrial Preparation

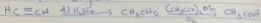
a) From Carbon(II) oxide

Formic acid is manufactured by adding CO under pressure to hot aqueous solution of NaOH. The carboxylic acid is liberated by careful reaction with  $H_2SO_4$ .



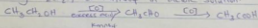
b) From ethanol

The liquid phase air oxidation of 5% solution of ethanol to ethanoic acid, using Manganate (II) ethanoic ethanoate catalyst. Ethanol itself is obtained from Ethylene.

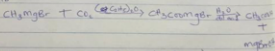


④ Synthetic preparation of carboxylic acid

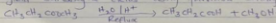
⊙ Oxidation of primary alcohols and aldehydes using  $K_2Cr_2O_7$  or  $KMnO_4$  in acidic solution.



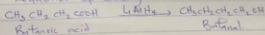
b) Carboxylation of Grignard reagent by bubbling  $CO_2$  at a Grignard reagent, then hydrolyzing with dilute acid.



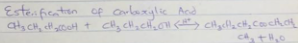
c) Hydrolysis of nitriles / cyanides (esters) can also yield carboxylic acids using favorable catalyst.



5) Reduction of carboxylic acid



Esterification of Carboxylic Acid



Decarboxylation of Carboxylic Acid

