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19/MHSO1/244

MEDICINE AND SURGERY

CHM 402 Quaran-time assignment III

13th April, 2020.

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

2) Properties of carboxylic acid

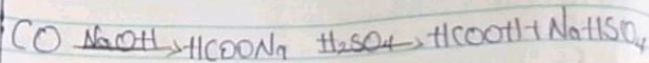
- a) Physical appearance: All simple aliphatic carboxylic acids up to C_{10} are liquids at room temperature. Most other carboxylic acids are solid at room temperature although one hydroxy carboxylic acid (acetic acid) also known as glacial ethanoic acid freezes to an ice-like solid below the room temperature.
- b) Boiling points: Boiling point increases with increasing relative molecular mass. Aromatic carboxylic acids are crystalline solids and have higher melting points than their counterparts of comparable relative molecular mass.

Solubility: Lower molecular mass carboxylic acid with up to four atoms in their molecule are soluble in water. This is largely due to their ability to form hydrogen bonds with water molecules. The water solubility of acids decreases as the relative molecular mass increases because the structure becomes relatively more hydrocarbon in nature and hence constant. All carboxylic acids are soluble in organic solvent.

3 Industrial preparation of carboxylic acids.

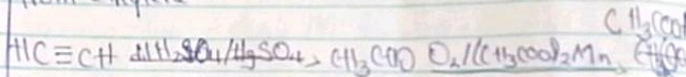
a From carbon dioxide

Methanoic acid (Formic acid) is manufactured by adding carbon dioxide under pressure to hot aqueous sodium hydroxide. The free carboxylic acid is liberated by careful reaction with tetraoxosulphuric (VI) acid.



b From ethanol

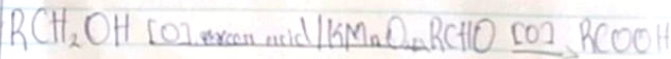
Ethanoic acid is obtained commercially by the liquid phase oxidation of 5% solution of ethanol to ethanoic acid using manganate (IV) ethanoate catalyst. Ethanol itself is obtained from ethylene.



4 Synthetic preparations of carboxylic acid

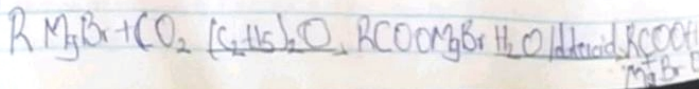
a Oxidation of primary alcohols and aldehydes.

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



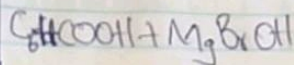
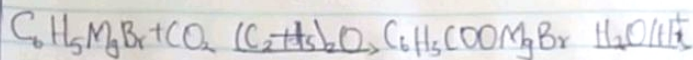
b Carbonation of Grignard reagent.

Aliphatic carboxylic acids are obtained by bubbling carbon dioxide into the Grignard reagent and then hydrolysing the diacid.



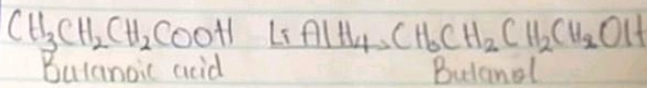
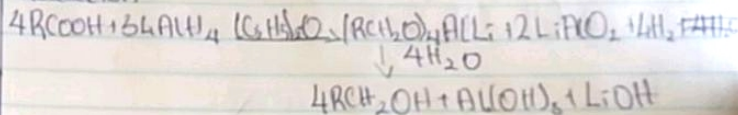
R may be 1, 2, 3° aliphatic alkyl or aryl radical.

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



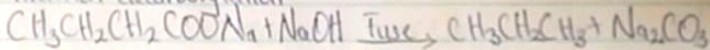
Chemical reactions of carboxylic acid.

Reduction

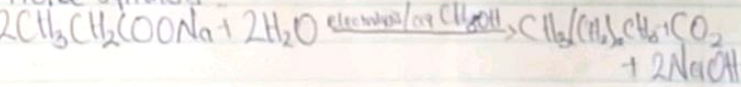


Decarboxylation:

Thermal decarboxylation



Kolbe synthesis



Esterification

