

Ando Daniel Ifeanyiobukwu

11/ENG05/011

CHEM 102

1a  $\text{HCOOH} \rightarrow$  methanoic acid

$\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{COOH} \rightarrow$  Pentan-1,5-dioic acid

$\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH} \rightarrow$  Butanoic acid

$\text{HO}_2\text{C} - \text{CO}_2\text{H} \rightarrow$  Ethanedioic acid

$\text{CH}_3(\text{CH}_2)_4\text{COOH} \rightarrow$  Hexanoic acid

$\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH} \rightarrow$  Hex-4-enoic acid

2a Physical appearance

All simple aliphatic carboxylic acids up to  $\text{C}_{10}$  are liquid at room temperature. Most other carboxylic acids are solid at room temperature. Acetic acid or anhydrous carboxylic acid known as glacial ethanoic acid freezes to an ice-like solid below room temperature.

b Boiling point

This increases with increasing relative molecular mass. Aromatic carboxylic acids are crystalline solids that have higher melting points than their aliphatic compounds or counterparts with almost the same relative molecular mass.

c Solubility

Lower molecular mass carboxylic acids of up to four carbon atoms in their molecules are soluble in water. This is due to their ability to form bonds with water (hydrogen bonds). Water solubility of acids decreases as the relative molecular mass increases because it becomes more hydrocarbon in nature hence covalent. All carboxylic acids are soluble in organic solvent.

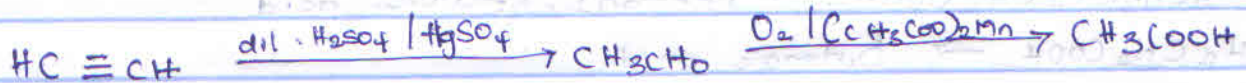
3a From petroleum:

Liquid phase air oxidation of  $\text{C}_5 - \text{C}_7$  alkanes obtained from petroleum are  $\text{C}_5 - \text{C}_7$  carboxylic acid at high temperature and pressure give off methanoic acid, propanoic and butanedioic acid as by products.

$\text{C}_5 - \text{C}_7 \xrightarrow[\text{High temp and Pressure}]{\text{O}_2}$   $\text{C}_5 - \text{C}_7$  Carboxylic acid

b) From ethanol

It is produced commercially by the liquid phase air oxidation of ethanol to ethanoic acid using manganite (II) ethanoate as the catalyst. Ethanol is gotten from ethylene.



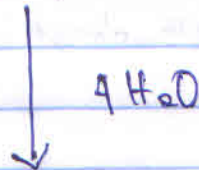
4 Synthetic preparation of Carboxylic acid

Hydrolysis of nitriles (cyanides) or esters



R = alkyl or acyl radical

5) Reduction

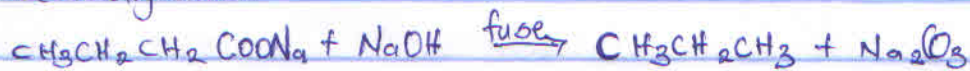


Butanoic acid

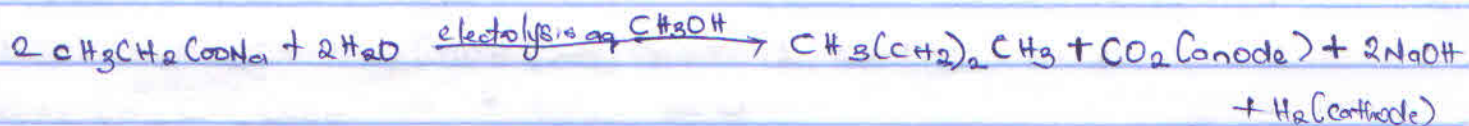
Butanol



b) Decarboxylation:



Kolbe synthesis.



c) Esterification

