

## CHM102

1) Give the IUPAC names of the following compounds:-

- $\text{HCOOH} \rightarrow$  Methanoic acid
- $\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{COOH} \rightarrow$  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
- $\text{CH}_3\text{C}(\text{CH}_3)_4\text{COOH} \rightarrow$  Hexanoic acid
- $\text{CH}_2=\text{CHCH}_2\text{CH}_2\text{COOH} \rightarrow$  Hex-4-enoic acid

2a) Physical appearance:-

All simple aliphatic carboxylic acids up to  $\text{C}_{10}$  are liquids at room temperature. Most other carboxylic acids are solid at room temperature although ethanoic acid (acetic acid) also known as glacial ethanoic acid freezes to an ice-like solid below the room temperature.

b) Boiling point

This 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.

c) Solubility:-

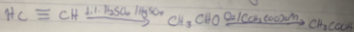
Lower molecule mass carboxylic acids with up to four carbon chain in their molecules are soluble in water. This is largely due to their ability to form hydrogen bonds with water molecules.

3a) From Petroleum

Liquid phase air oxidation of  $\text{C}_5 - \text{C}_9$  alkanes, obtainable from petroleum of high temperature and pressure will give  $\text{C}_5 - \text{C}_9$  carboxylic acids with methanoic, propanoic and butanedioic acids as by products.  $\text{C}_5 - \text{C}_9$  high temperature pressure  $\rightarrow$   $\text{C}_5 - \text{C}_9$  carboxylic acid.

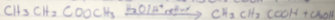
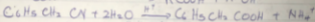
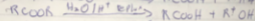
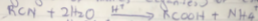
b) From ethanal

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



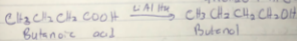
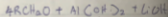
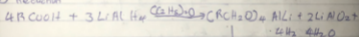
4) With equation and brief explanation, discuss the synthetic preparation of carboxylic acid

(Hydrolysis of nitriles (cyanides) or esters)

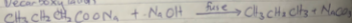


Route  
or  
method

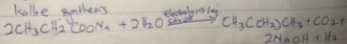
5) Reduction



b) Decarboxylation



Kolbe synthesis



c) Esbenzation

