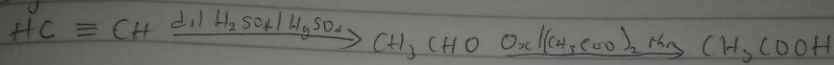


a) from petroleum

Liquid phase air oxidation of C₅-C₈ alkanes, obtainable from petroleum at high temperature and pressure will give C₅-C₈ carboxylic acids with methanoic, propanoic and butanoic acids as by-products
C₅-C₈ $\xrightarrow{O_2 / \text{high temperature and pressure}}$ C₅-C₈ carboxylic acids

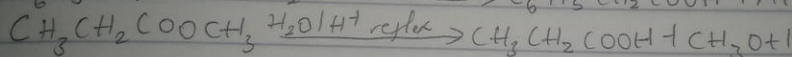
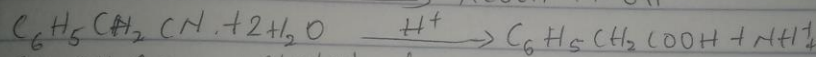
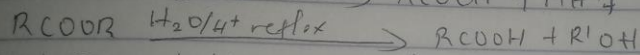
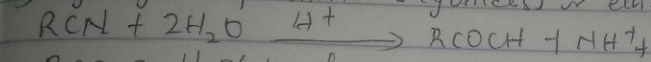
b) from ethanol

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



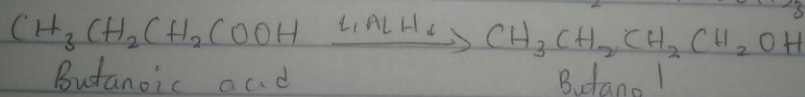
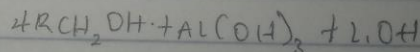
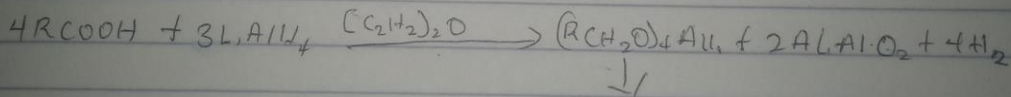
i) with equation and brief explanation,

ii) Hydrolysis of nitriles (cyanides) or ethers



R = alkyl
or aryl
radical

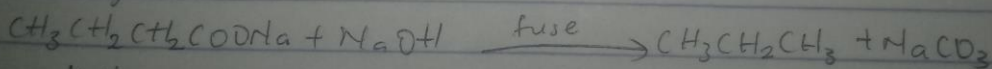
iii) Reduction



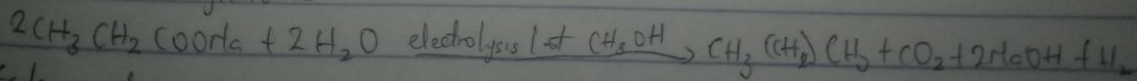
Butanoic acid

Butanol

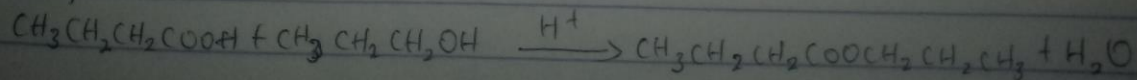
Decarboxylation



Kolbe synthesis



Esterification



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Matric no: 19/11/MS01/222
Department: Medicine and Surgery
Course: CHM 102

- a) $\text{HCOOH} \rightarrow$ Methanoic acid
b) $\text{HOOC}[\text{CH}_2\text{CH}_2\text{CH}_2\text{COOH}] \rightarrow$ Pentan-1,5-dioic acid
c) $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH} \rightarrow$ Butanoic acid
d) $\text{HO}_2\text{C}-\text{CO}_2\text{H} \rightarrow$ Ethanedioic acid
e) $\text{CH}_3[\text{CH}_2]_4\text{COOH} \rightarrow$ Hexanoic acid
f) $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH} \rightarrow$ Hex-4-enoic acid

2) Discuss briefly the physical properties of carboxylic acid.

a) Physical appearance

All simple aliphatic carboxylic acids up to C_{16} are liquids at room temperature. Most other carboxylic acids are solid at room temperature although anhydrous carboxylic acid (acetic acid) also known as glacial ethanoic 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 molecular mass carboxylic acid with up to four carbon in their molecules are soluble in water. This is largely due to their ability to form hydrogen bonds with water molecules.

All carboxylic acids are - soluble organic solvents