

- a) HCOOH - Methanoic Acid
- b) $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$ - Butanoic acid
- c) $\text{HO}_2\text{C}-\text{CO}_2\text{H}$ - Ethanedioic acid
- d) $\text{CH}_3(\text{CH}_2)_4\text{COOH}$ - Hexanoic acid
- e) $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH}$ - Hex-4-enoic Acid

2) a) Physical appearance: Simple carboxylics up to C_{10} are liquid at room temperature. Most carboxylics are solid at room temperature although anhydrous carboxylics also known as glacial ethanoic acid freezes to an ice-like solid below the room temperature.

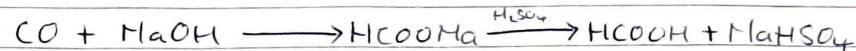
b) Boiling Point: The boiling point increases with increasing relative molecular mass. Aromatic carboxylic acids are crystalline solids and have higher melting points than their aliphatic counterparts of comparable relative molecular mass.

c) Solubility: Lower molecular mass carboxylic acids with up to four carbon atoms in their molecules are soluble in water; this is largely due to the ability to form hydrogen bonds with water molecules. The solubility in water decreases with an increase in the molecular mass. All carboxylics are soluble in organic solvents.

3) a) From Carbon (II) Oxide

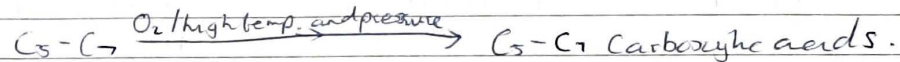
Methanoic acid is manufactured by adding carbon (II) oxide under pressure to hot aqueous solution of sodium hydroxide. The free carboxylic acid is liberated by careful reaction with tetraoxosulphate (VI).

acid (H_2SO_4)



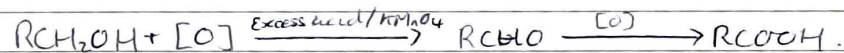
b) From petroleum.

Liquid phase air oxidation of C_5-C_7 alkanes, obtainable from petroleum at high temperature and pressure will give C_5-C_7 carboxylic acids with ethanoic, propanoic and butanedioic acids as by-products.

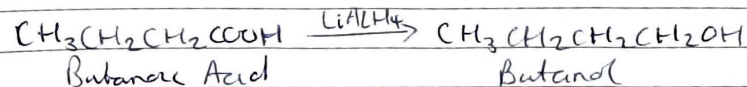
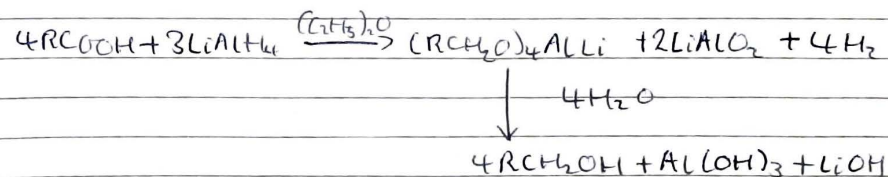


4) a) By the Oxidation of primary alcohols and aldehydes.

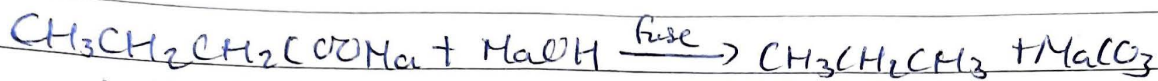
The oxidation of primary alcohols and aldehydes can be used to prepare carboxylic acids using the usual oxidizing agents in acidic solution.



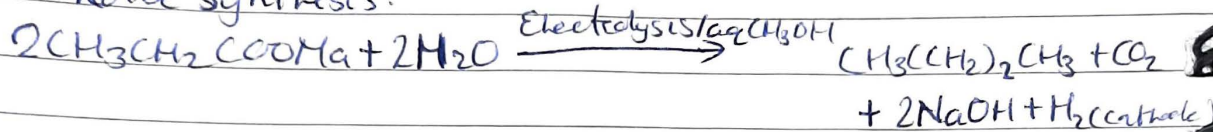
5) a) Reduction of Primary Alcohols:



b) Decarboxylation.



Kolbe Synthesis.



c) Esterification

