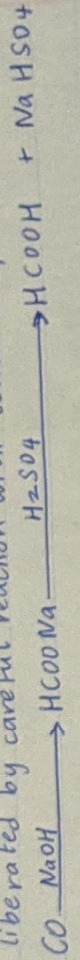


$C_5 - C_7$ alkanes $\xrightarrow{O_2 / \text{High temp. and pressure}}$ $C_5 - C_7$ carboxylic acid.

$C_5 - C_7$ alkanes

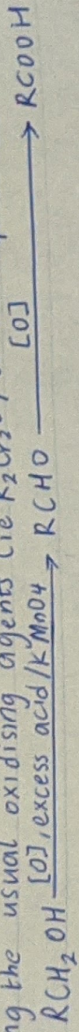
ii From carbon (II) oxide: Methanoic acid is manufactured by adding carbon (II) oxide under pressure to hot aqueous solution of sodium hydroxide. The free carboxylic acid is liberated by careful reaction with tetraoxosulphate (VI) acid (H_2SO_4).



4 SYNTHETIC PREP. OF CARBOXYLIC ACID

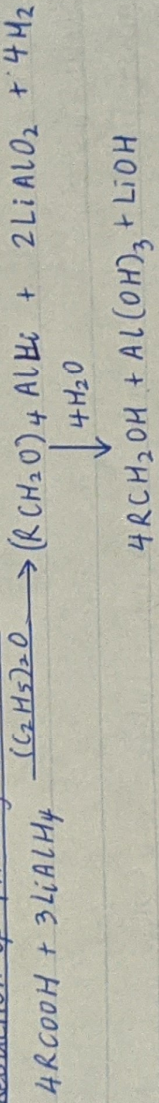
Oxidation of primary alcohols and aldehydes can be used to prepare carboxylic acid

Oxidation of primary alcohols and aldehydes can be used to prepare carboxylic acid using the usual oxidising agents (i.e. $K_2Cr_2O_7$ or $KMnO_4$) in acidic solutions.

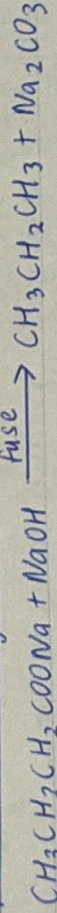


CHEMICAL REACTION OF CARBOXYLIC ACID:

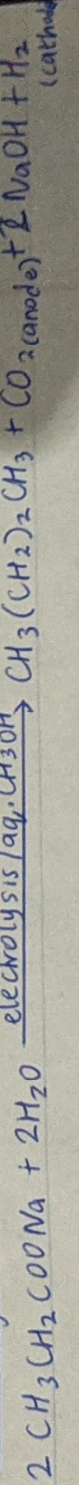
5 Reduction of Primary alcohol



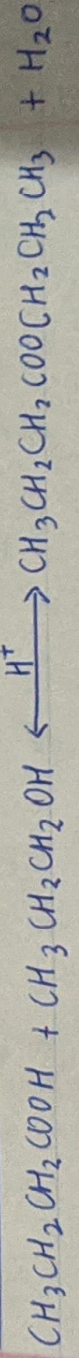
ii Thermal decarboxylation



Kolbe synthesis



iii Esterification



CARBOXYLIC ACID ASSIGNMENT

1. HCOOH
 $\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{COOH}$
 $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$
 $\text{HO}_2\text{C}-\text{CO}_2\text{H}$
 $\text{CH}_3(\text{CH}_2)_4\text{COOH}$
 $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH}$

Methanoic acid
Pentan-1,5-dioic acid
Butanoic acid
Ethanedioic acid
Hexanoic acid
Hex-4-enoic acid

2. Physical properties of carboxylic acids

i. Physical appearance.

All simple aliphatic carboxylic acids up to C_{10} are liquids at room temp. Most other carboxylic acids are solid at room temp. Anhydrous carboxylic acid (acetic acid) is also known as glacial ethanoic acid freezes to an ice-like solid below room temp.

ii. Boiling point

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.

iii. Solubility

Lower molecular mass carboxylic acids with up to four carbon atoms in their molecules are soluble in water. The water solubility of the acids decreases as the relative molecular mass increases because the structure becomes relatively more hydrocarbon in nature and hence covalent. All carboxylic acids are soluble in organic solvents.

INDUSTRIAL PREP. OF CARBOXYLIC ACID

3. From petroleum: Liquid phase air oxidation of C_5 - C_7 alkanes, obtainable from petroleum at high temp. and pressure will give C_5 - C_7 carboxylic acids with methanoic, propanoic and butanedioic acid as by-products.