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19/ENG051007

Mechanics Department

CHM102

1 HCOOH - methanoic acid

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

$\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$ - propanoic acid

$\text{HO}_2\text{C}-\text{CO}_2\text{H}$ - ethane dioic acid or ethane-1,2-dioic acid

$\text{HOOC}-\overset{\text{or}}{\text{COOH}}$

$\text{CH}_3(\text{CH}_2)_4\text{COOH}$ - ~~Pentanoic acid~~ Hexanoic acid

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

2 (i) Physical appearance - All simple aliphatic Carboxylic acids up to C_{10} are liquid at room temperature. Most other Carboxylic acid are solid at room temperature although anhydrous Carboxylic acid (acetic acid) also known as glacial ethanoic acid freeze in an ice like solid below the room temperature.

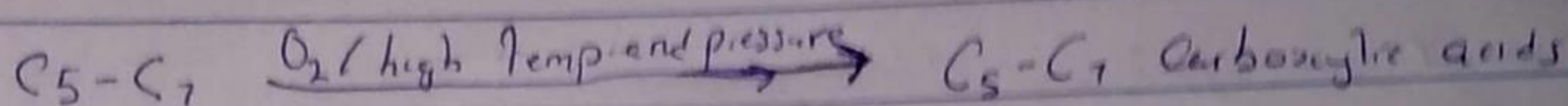
(ii) Boiling point - This increases with increasing relative molecular mass. Aromatic Carboxylic acids are crystalline solids and have higher melting points than their aliphatic counterparts of comparable relative molecular mass.

(iii) Solubility - Lower molecular mass Carboxylic acids with up to 4 Carbon atoms in their molecules are soluble in water, this largely due to their ability to form hydrogen bond with water molecules.

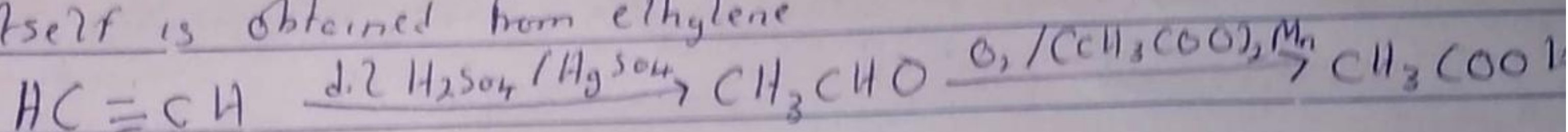
3 Production of Carboxylic acids.

(i) 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 methane, propane and butane acids as by products

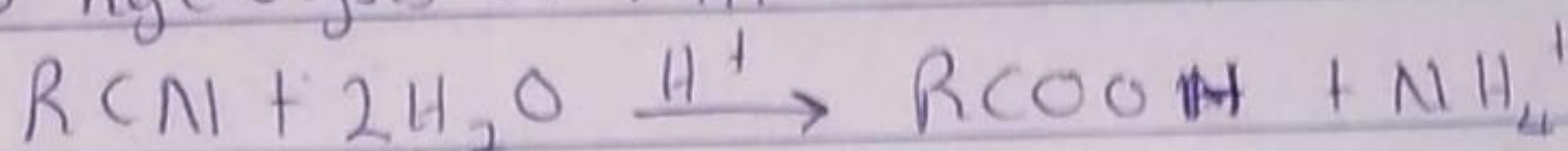


2 From ethene - ethanoic acid is obtained commercially by the liquid phase air-oxidation of 5% solution of ethene in ethanoic acid using manganate(II) ethanoate crystals. Ethene itself is obtained from ethylene

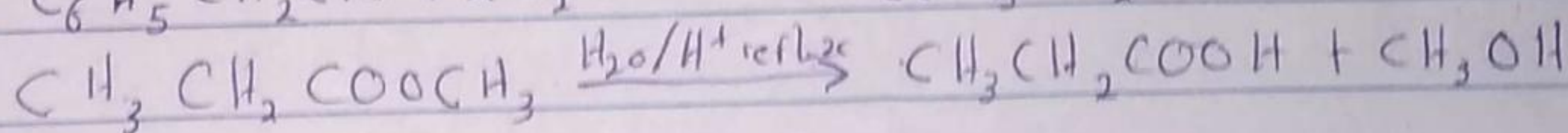
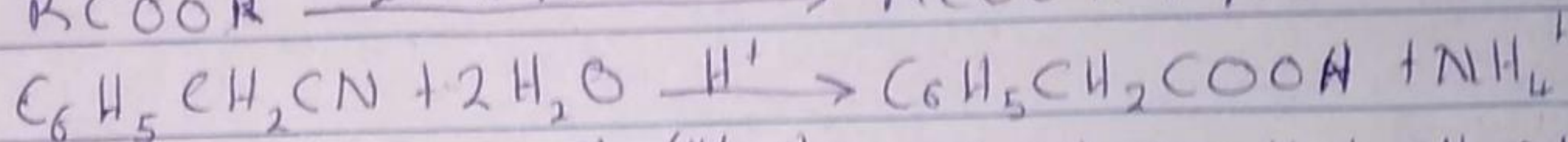
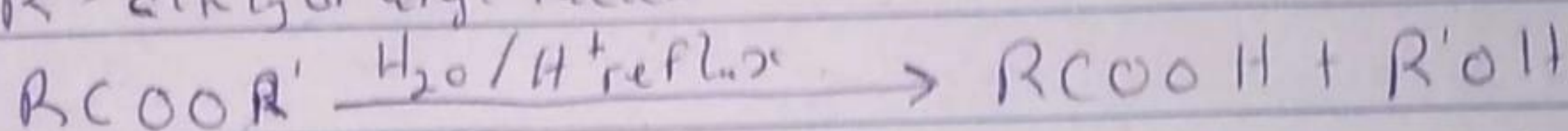


3 Synthetic preparation of Carboxylic acid

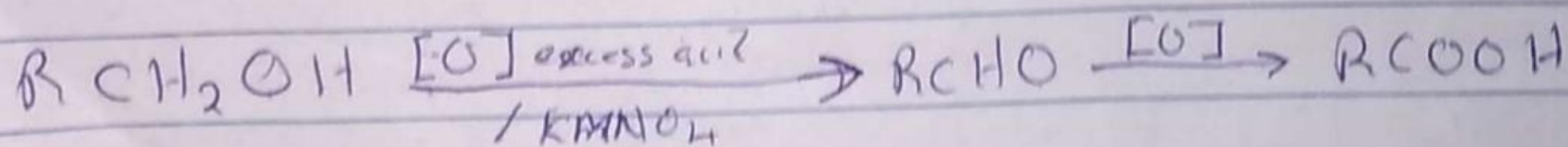
(i) hydrolysis of Nitriles or esters



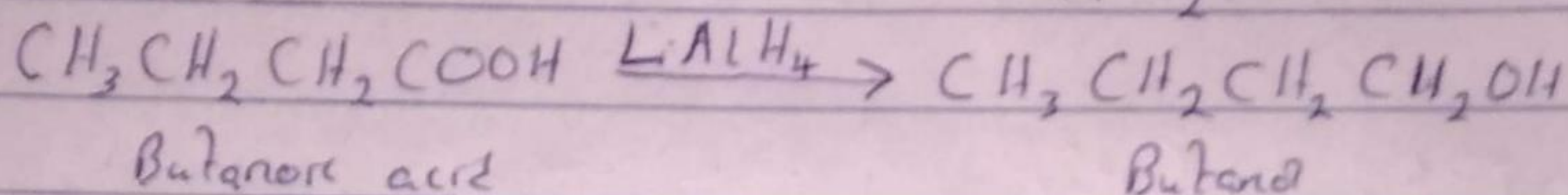
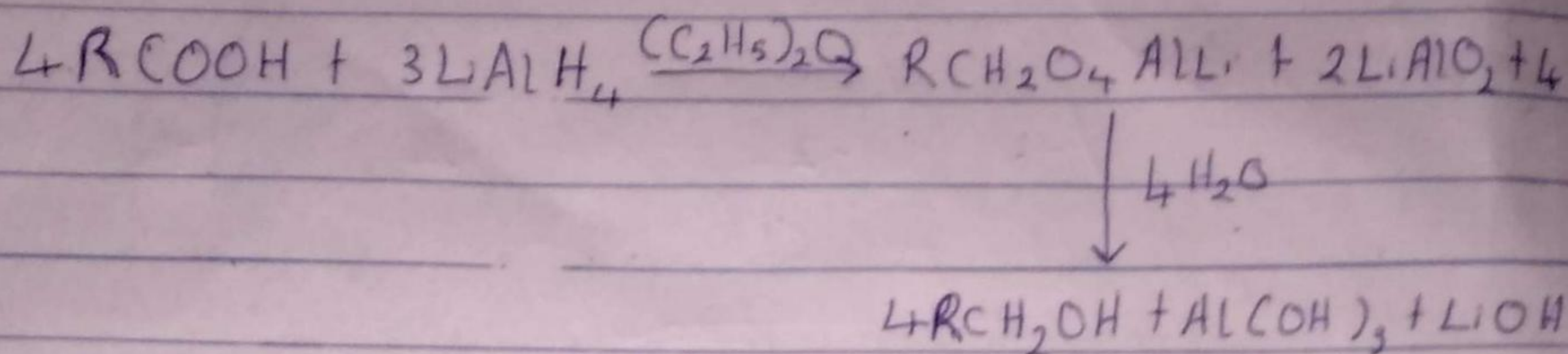
R = alkyl or aryl radical



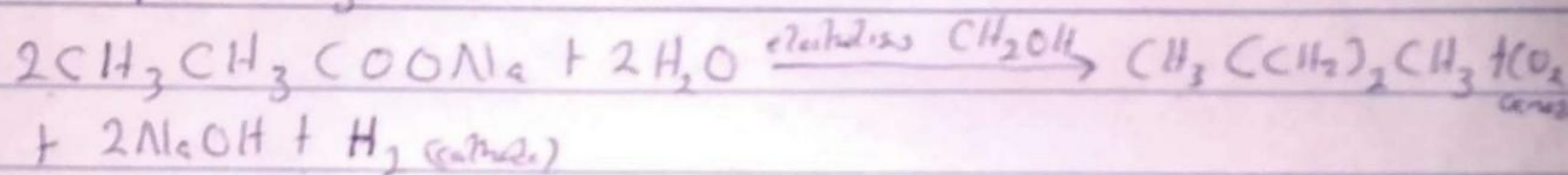
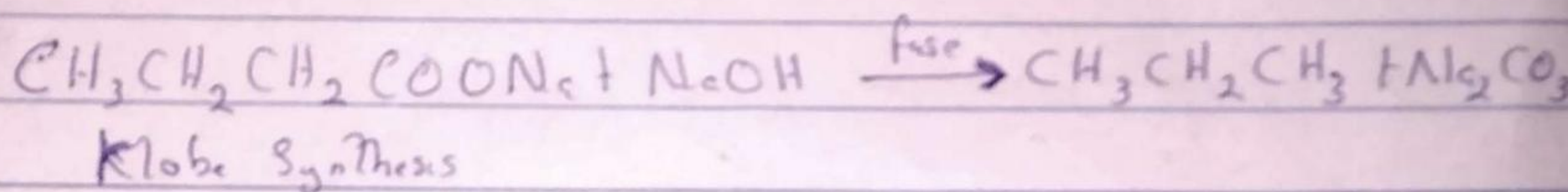
(ii) Oxidation of Primary alcohols or aldehydes - This can be used to prepare Carboxylic acids using the usual oxidizing agents in acidic solution



5 (i) Reduction



(ii) Decarboxylation



(iii) Esterification

