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MAT No - 18/ENG06/059  
DEPT - MECHANICAL ENGINEERING  
COURSE CODE - CHM 102

### Assignment

1) Write IUPAC name of the following

- $\text{HCOOH} \longrightarrow$  methanoic acid
- $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH} \longrightarrow$  Butanoic acid
- $\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{COOH} \longrightarrow$  pentan-1,5-dioic acid
- $\text{HO}_2\text{C}-\text{CO}_2\text{H} \longrightarrow$  Ethanedioic acid
- $\text{CH}_3(\text{CH}_2)_4\text{COOH} \longrightarrow$  Hexanoic acid
- $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH} \longrightarrow$  Hex-4-enoic acid

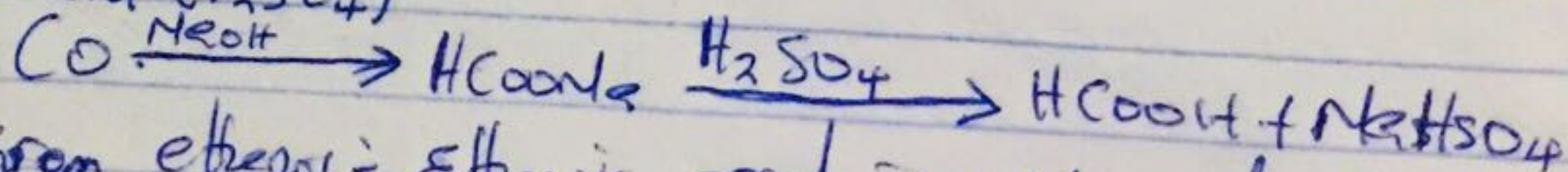
2) properties of Carboxylic acid.

- Physical Appearances: All simple aliphatic acids up to 10 are liquids at room temperature. Most other carboxylic acids are solid at room temperature.
- Boiling points 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.
- Solubility: Lower molecular mass carboxylic acids with up to four carbon atoms in their molecules are soluble in water, this largely due to their ability to form hydrogen bonds with water molecules.

3] Industrial Preparation of Carboxylic acids

i) from Carbon (II) oxide

Methanoic acid (formic 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 reactions with tetraoxosulphate (VI) acid ( $\text{H}_2\text{SO}_4$ )

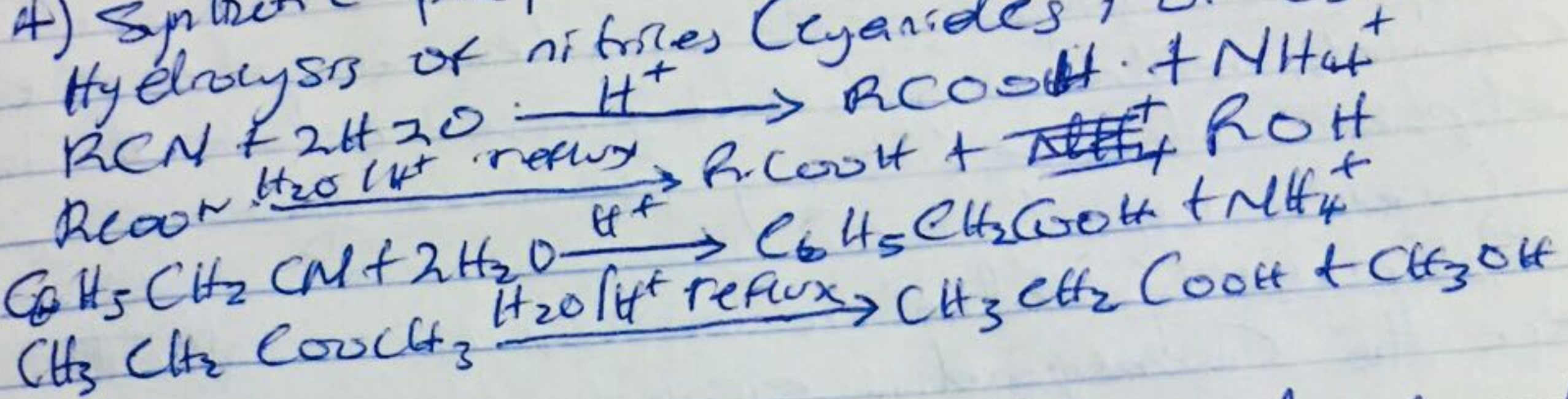


ii) from ethanal: Ethanoic acid is obtained commercially by the liquid phase air-oxidation of 5% solution of ethanal to ethanoic acid using manganate (II) ethanoate

Catalyst. Ethanol itself is obtained from ethylene.  
 $\text{HC} \equiv \text{CH} \xrightarrow{\text{dil. H}_2\text{SO}_4 / \text{H}_2\text{SO}_4} \text{CH}_3\text{CHO} \xrightarrow{\text{O}_2 / (\text{CH}_3\text{COO})_2\text{Mn}} \text{CH}_3\text{COOH}$

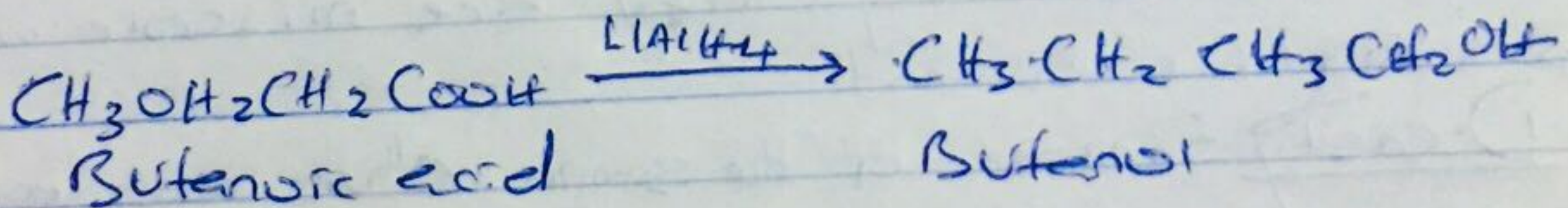
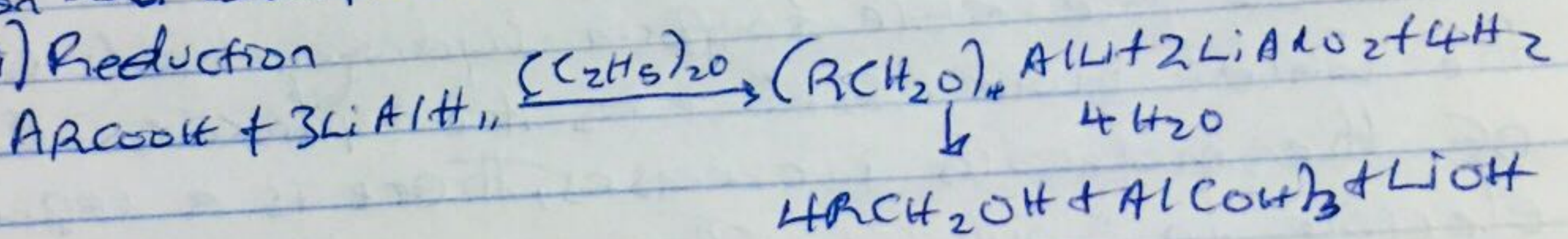
iii) from petroleum: Liquid phase oxidation of C<sub>5</sub>-C<sub>7</sub> alkenes, obtainable from petroleum at high temperature and pressure will give C<sub>5</sub>-C<sub>7</sub> carboxylic acids with methanoic, propanoic and butanedioic acid as by-products.  
 $\text{C}_5\text{-C}_7 \xrightarrow{\text{O}_2 / \text{high temperature and pressure}} \text{C}_5\text{-C}_7 \text{ Carboxylic acids}$

4) Synthetic preparation of carboxylic acid  
 Hydrolysis of nitriles (cyanides) or esters

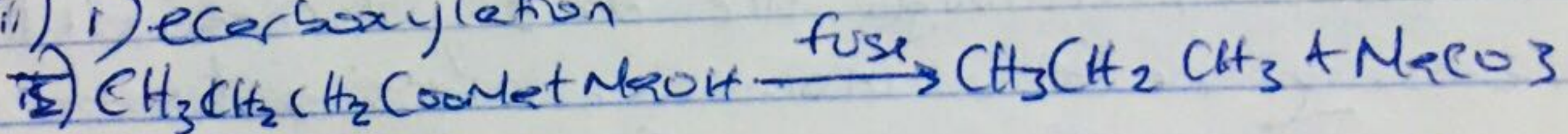


5) With chemical equation outline reduction, decarboxylation and esterification

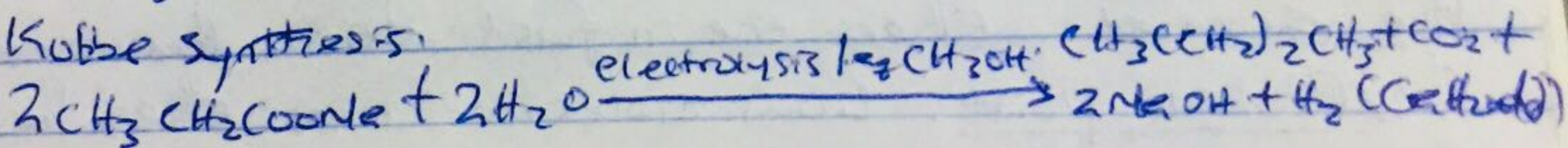
i) Reduction



ii) i) Decarboxylation



Kolbe synthesis



iii) Esterification

