

DARE BENEDICT OLUBUKOLA
MECHANICAL ENGINEERING
19/ENG06/016
CHM 102 ASSIGNMENT

1. Give the IUPAC names of the following compounds

Answer

$\text{HCOOH} \rightarrow$ Methanoic acid

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

$\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH} \rightarrow$ Butanoic acid

$\text{HO}_2\text{C}-\text{CO}_2\text{H} \rightarrow$ Ethanedioic acid

$\text{CH}_3(\text{CH}_2)_4\text{COOH} \rightarrow$ Hexanoic acid

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

2. Discuss briefly the physical properties of carboxylic acids under the following headings: (i) Physical appearance (ii) Boiling Point (iii) Solubility

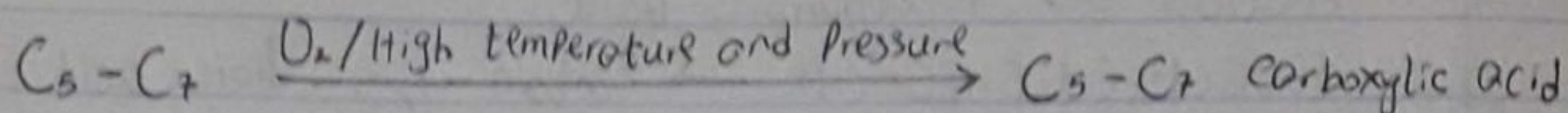
Answer

- (i) Physical Appearance; All simple carboxylic acids up to C_{10} are liquids at room temperature. Most other acids carboxylic acids are solid at room temperature although anhydrous carboxylic acid (acetic acid) also known as glacial ethanoic acid freezes to an ice-like solid below 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 four carbon atoms in their molecules are soluble in water; thus largely due to their ability to form hydrogen bonds with water molecules. The water solubility of 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.

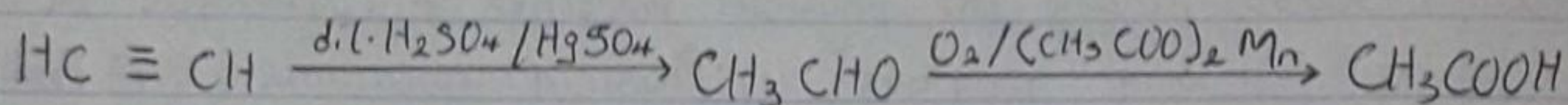
3. Write two industrial preparations of carboxylic acids.

Answer

(i) From Petroleum; Liquid phase air oxidation of C₅-C₇ alkanes, obtainable from petroleum at high temperature and pressure will give C₅-C₇ carboxylic acids with methanoic, propanoic and butanedioic acids as by products.



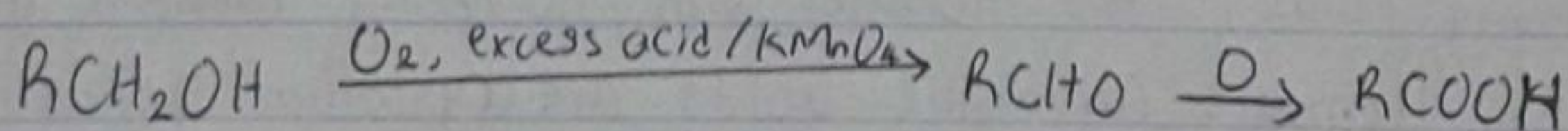
(ii) From ethanol; Ethanoic acid is obtained commercially by the liquid phase air-oxidation of 5% solution of ethanol to ethanoic acid using manganite II ethanoate catalyst. Ethanol itself is obtained from ethylene



4. With equations and brief explanation discuss the synthetic preparation of carboxylic acid.

Answer

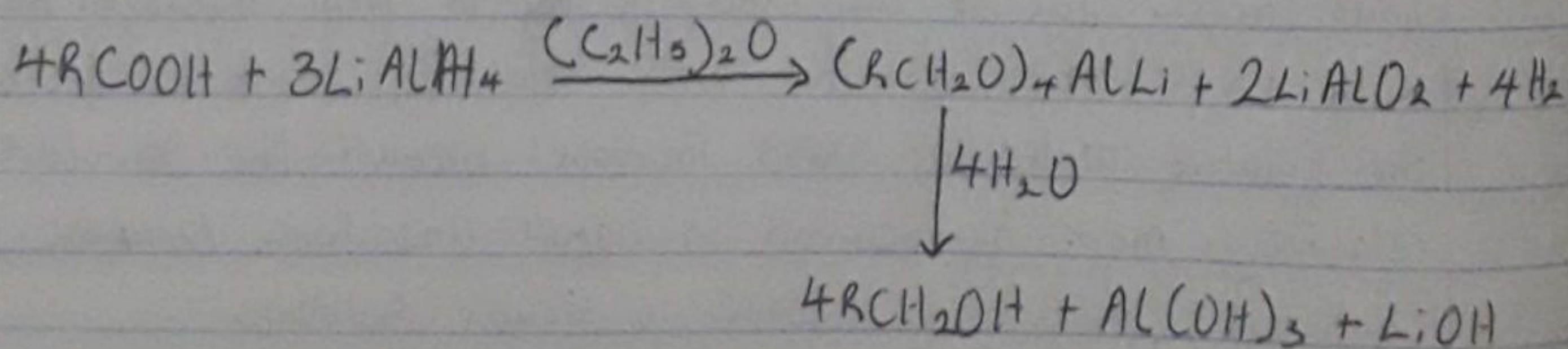
(i) Oxidation of primary alcohols and aldehydes; Oxidation of primary alcohols and ~~al~~ aldehydes can be used to prepare carboxylic acids using the usual oxidizing agents (ie K₂Cr₂O₇ or KMnO₄) in acidic solution.



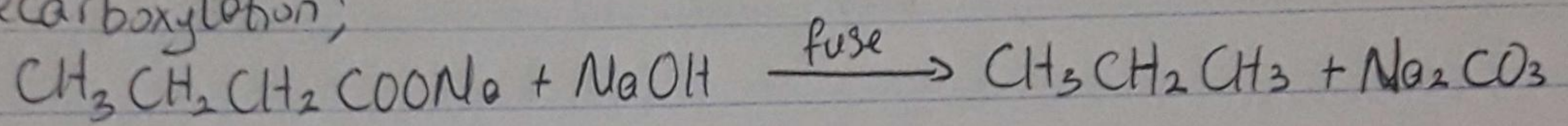
5. With Chemical equation only, outline the reduction, decarboxylation and esterification of carboxylic acid.

Answer

(i) Reduction;



(i) Decarboxylation;



(ii) Esterification;

