

Give the IUPAC names of the following compounds.

HCOOH - Methanoic acid

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

$\text{CH}_2\text{OC}-\text{CO}_2\text{H}$ - Butanoic acid

$\text{H}_2\text{OC}-\text{CO}_2\text{H}$ - Ethanedioic acid

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

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

2) Discuss briefly the physical properties of carboxylic acids under the following headings

1) Physical appearance: Simple aliphatic carboxylic acids up to C_{10} are liquid at room temperature, while others except from anhydrous carboxylic acid like acetic acid which freezes to an ice-like solid below room temperature, are solid at room temperature.

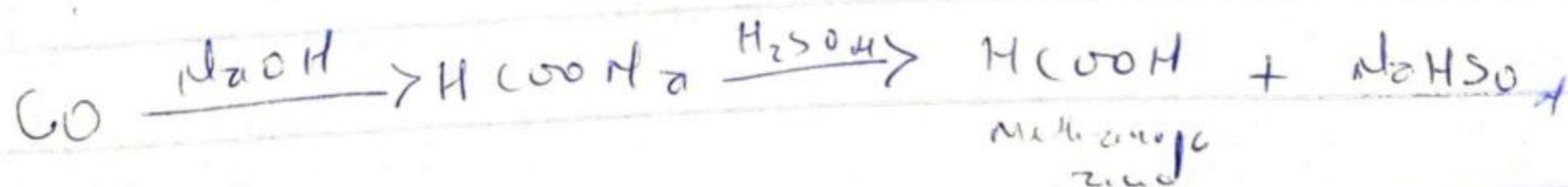
ii) Boiling points: The boiling points increase with increasing molecular mass.

iii) Solubility: Carboxylic acids with up to four carbon atoms in their molecules are soluble in water, due to their ability to form hydrogen bond with water molecules. But as the relative molecular mass increases the water solubility decreases as there is more hydrocarbon in its molecule. All carboxylic acids are soluble in organic solvents.

3) Write two industrial preparations of carboxylic acid

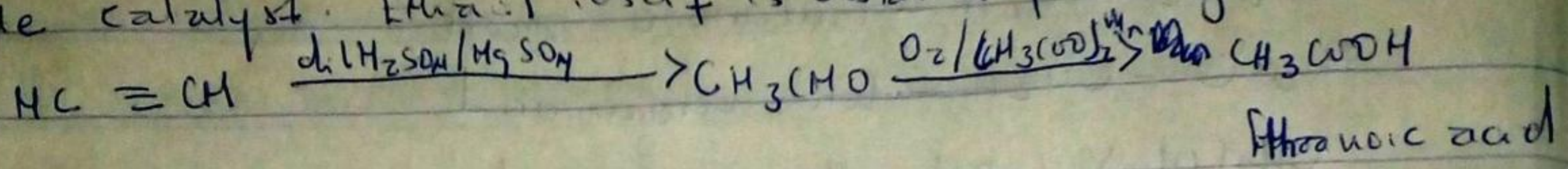
a) From carbon (II) oxide

Carbon (II) oxide is added under pressure to hot aqueous solution of sodium hydroxide. It is then carefully reacted with tetraoxosulphate (VI) acid to yield / liberate Methanoic acid



b) From Ethanol

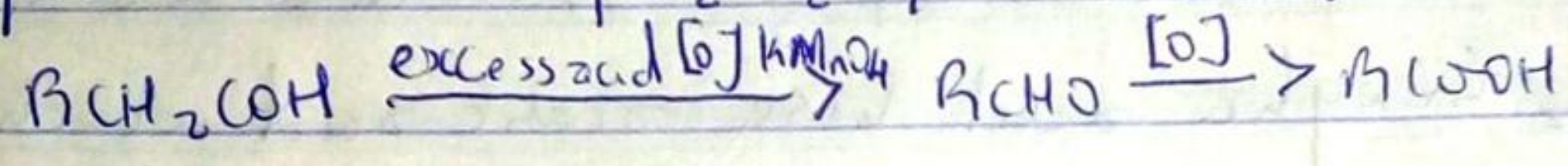
Ethanoic acid is obtained commercially by the liquid phase air-oxidation of 5% solution of ethanal to ethanoic acid using manganate(II) ethanoate catalyst. Ethanal itself is obtained from ethylene



c) With equations and brief explanation discuss the synthetic preparation of Carboxylic acid.

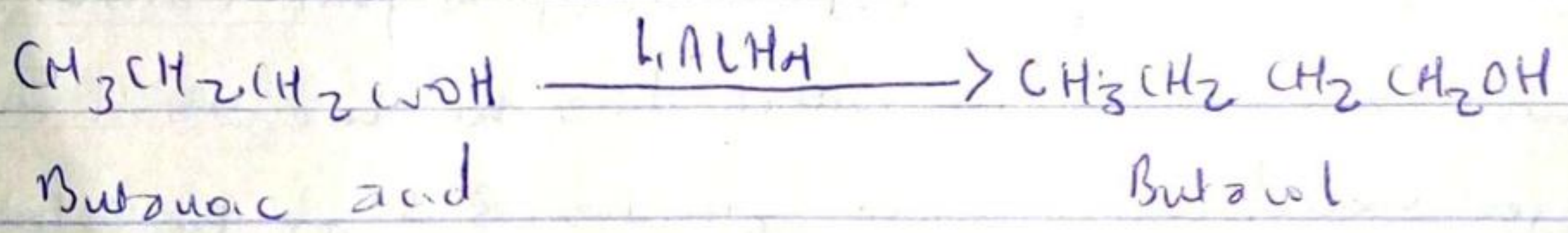
Carboxylic acid can be synthesized by oxidation of primary alcohols and aldehydes

Oxidation of primary alcohols and aldehydes can be used to prepare carboxylic acids using $\text{K}_2\text{Cr}_2\text{O}_7$ or KMnO_4 in acidic solution

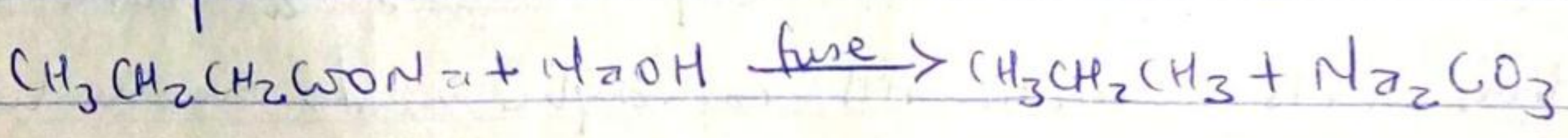


d) With chemical equation only, outline the reduction, decarboxylation and esterification of carboxylic acid

Reduction:



Decarboxylation



Esterification

