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MATRIC NUMBER: 19/MHS01/132

DEPARTMENT: MBBS

COURSE: CHM 102

1) Give the IUPAC names of the following compounds

Compound	IUPAC NAMES
1) HCOOH	Methanoic acid
2) $\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{COOH}$	Pentan-1,5-diol
3) $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$	Butanoic acid
4) $\text{HO}_2\text{C}-\text{CO}_2\text{H}$	Ethanedioic acid
5) $\text{CH}_3(\text{CH}_2)_4\text{COOH}$	Hexanoic acid
6) $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH}$	Hex-4-enoic acid

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

1) Physical Appearance

All simple Aliphatic carboxylic acids up to C_{10} are liquids at room temperature. Most carboxylic acids are solid at room temperature although

anhydrous carboxylic acid also known as glacial ethanoic acid freezes to an ice-like solid below room temperature.

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.

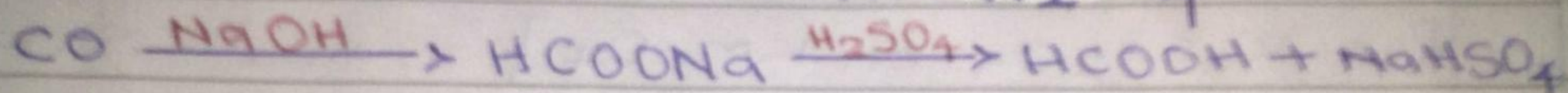
iii) Solubility

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

3) Write two industrial preparations of carboxylic acids.

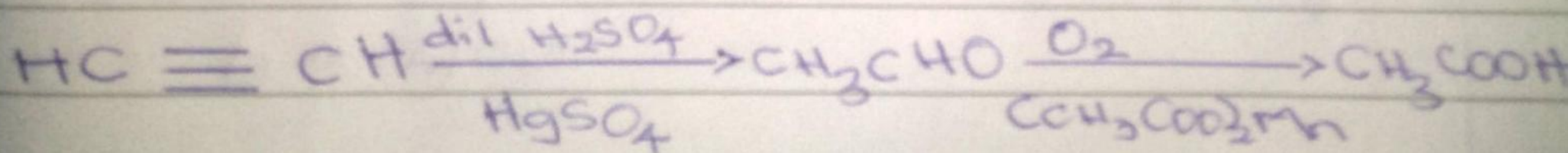
① From Carbon (II) Oxide

methanoic acid is manufactured from CO under pressure is added to hot aqueous solution of NaOH. The free carboxylic acid is liberated by careful reaction with H_2SO_4 .



② From Petroleum

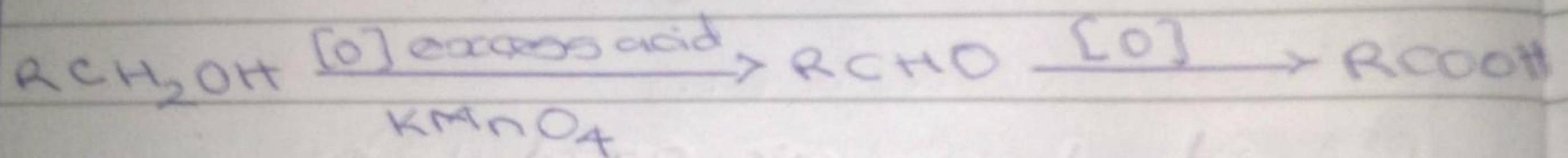
ethanoic acid is obtained commercially by the liquid phase air-oxidation of 5% solution of ethanal to ethanoic acid using manganite (II) ethanoate catalyst. Ethanal itself is obtained from ethylene.



4) With Equation and Brief explanation discuss the synthetic preparation of carboxylic acid.

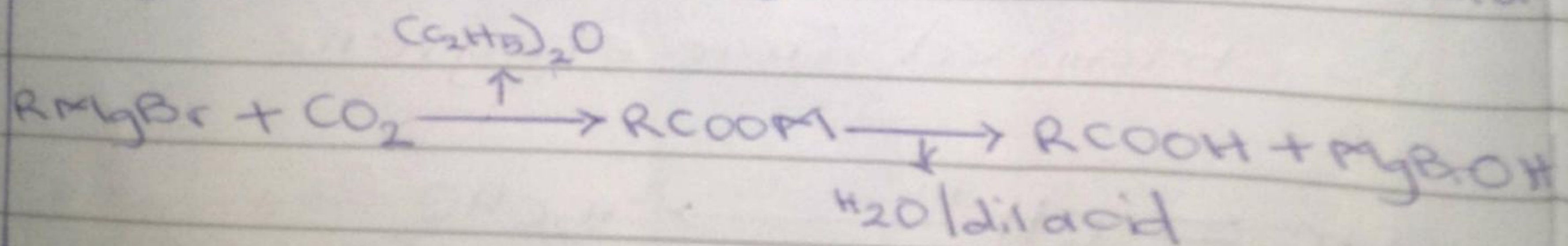
1) Oxidation of primary alcohols and aldehydes.

Carboxylic acids can be prepared by using the usual oxidizing agents {ie $K_2Cr_2O_7$ or $KMnO_4$ } in acidic solution.

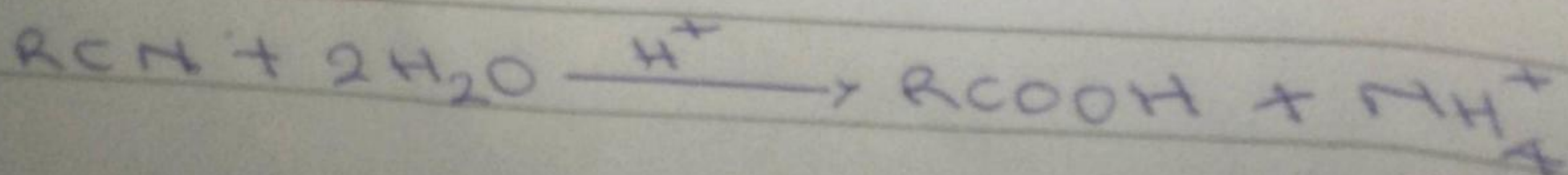


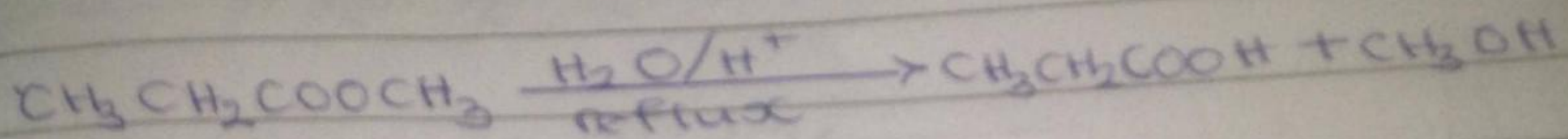
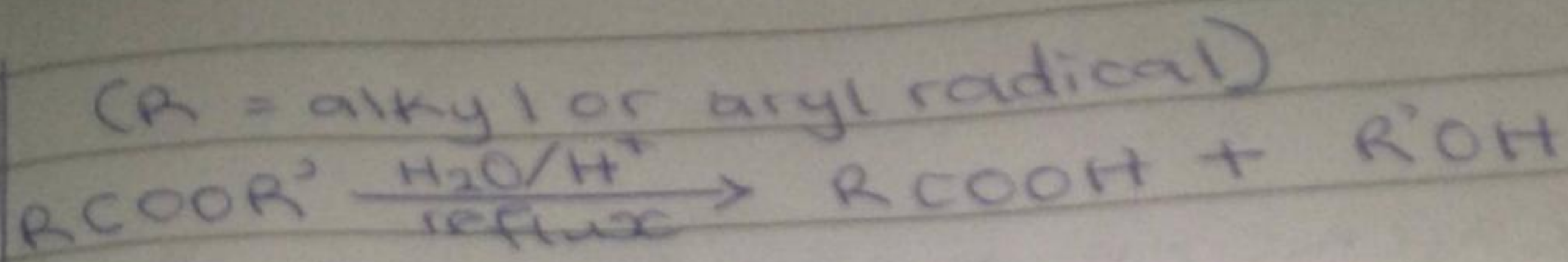
ii) Carbonation of Grignard reagent

Aliphatic carboxylic acid can be obtained by bubbling CO_2 into the Grignard reagent and hydrolyzed with dilute acid.



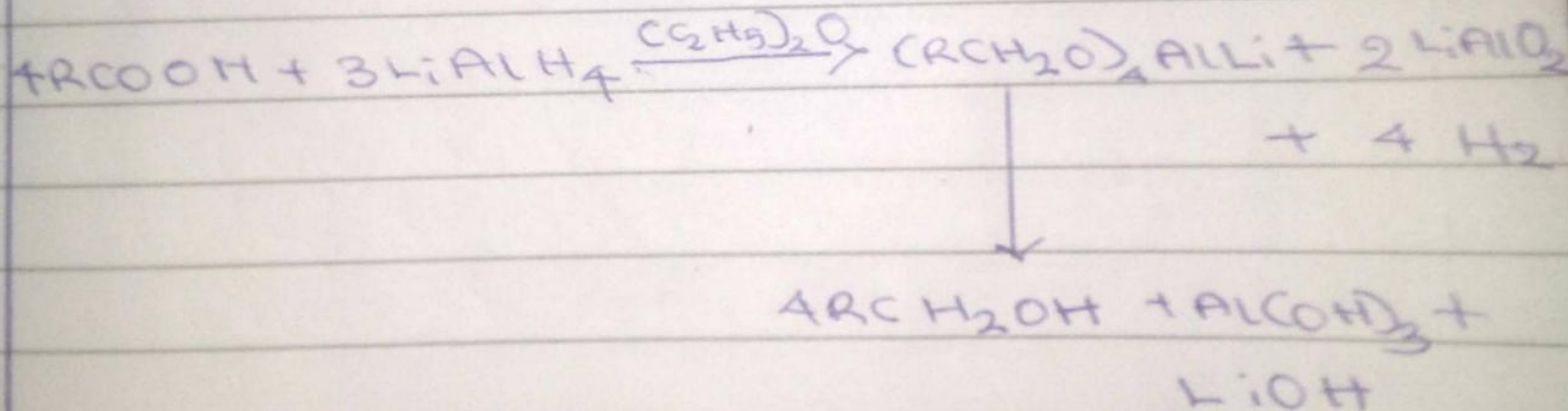
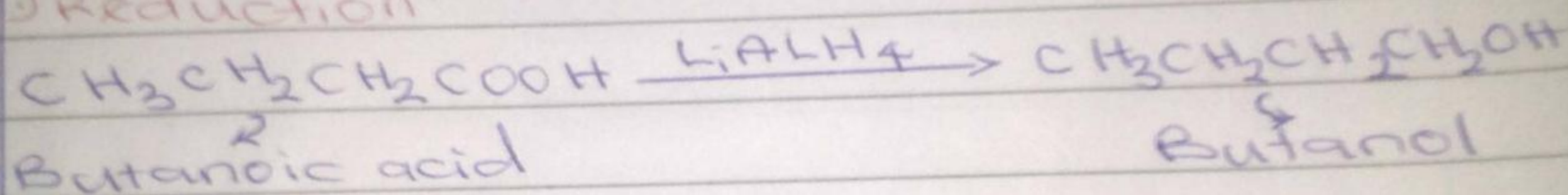
iii) Hydrolysis of nitriles (cyanides) or Esters



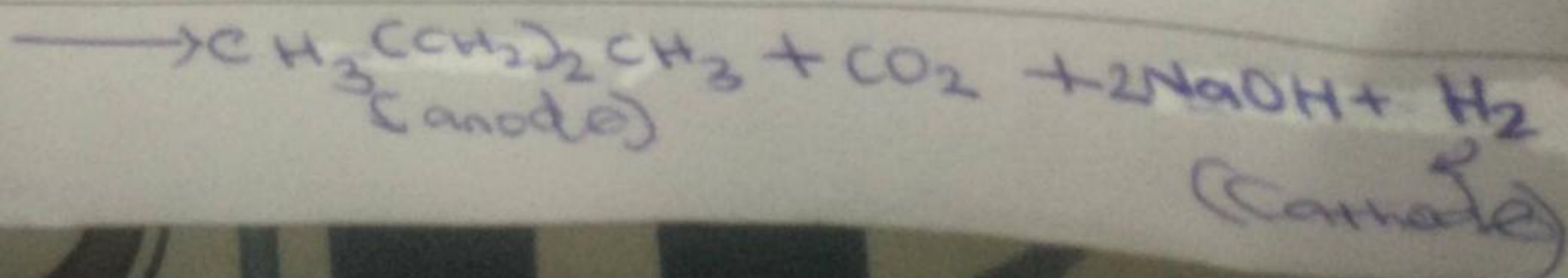
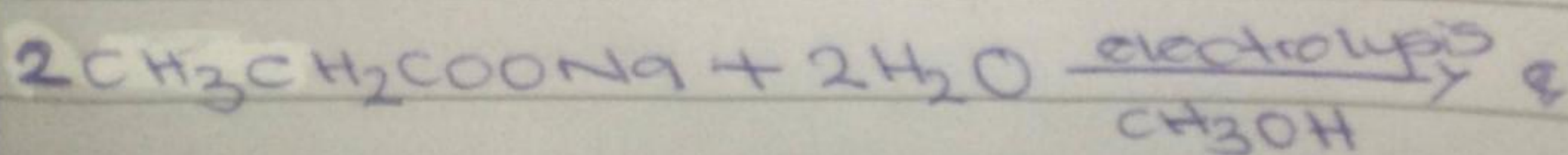
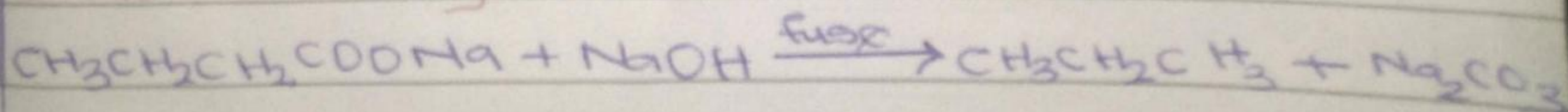


5) With chemical equations only, outline the reduction, decarboxylation and esterification of carboxylic acid.

Reduction:



Decarboxylation



(iii) Esterification

