

2/5/2020. OBIADARIE MICHELE C.
100 level | 19/11/2019/272
CHEMISTRY 102 ASSIGNMENT
solution

1. Give the IUPAC name of the following.

a $\text{HCOOH} \rightarrow$ methanoic acid

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

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

d $\text{HO}_2\text{C}_2\text{H} \rightarrow$ Ethanedioic acid (oxalic acid)

e $\text{CH}_3(\text{CH}_2)_4\text{COOH} \rightarrow$ ~~Hexanedioic~~ ^{Hexanoic} acid

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

2. Physical Properties of carboxylic acids:

i. Physical Appearance: Most carboxylic acids are liquid at room temperature when their carbon atoms are at most 10. After 10 carbon atoms, most are solid at room temperature with the exception of anhydrous carboxylic acid which forms an ice-like solid below room temperature.

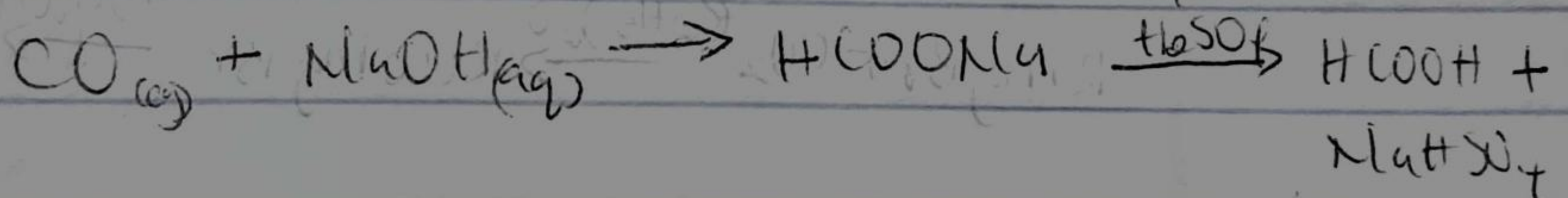
ii. Boiling Points: Their boiling points increase with increase in relative molecular mass.

iii) Solubility : Carboxylic acid compounds with up to four carbon atoms in their molecules are soluble in water. Solubility in water decreases as the relative molecular mass increases.

3. Two industrial Preparations of carboxylic acids.

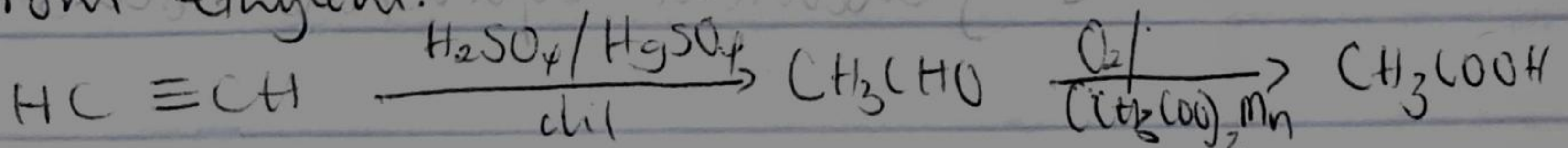
a) From Carbon (II) Oxide.

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 reaction with tetraoxosulphate (VI) acid (H_2SO_4).



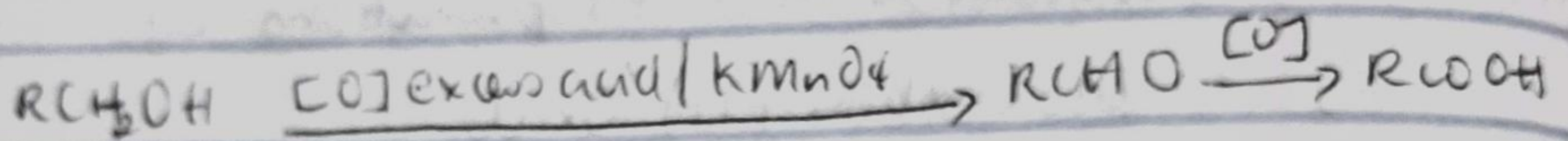
b) From ethanal.

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



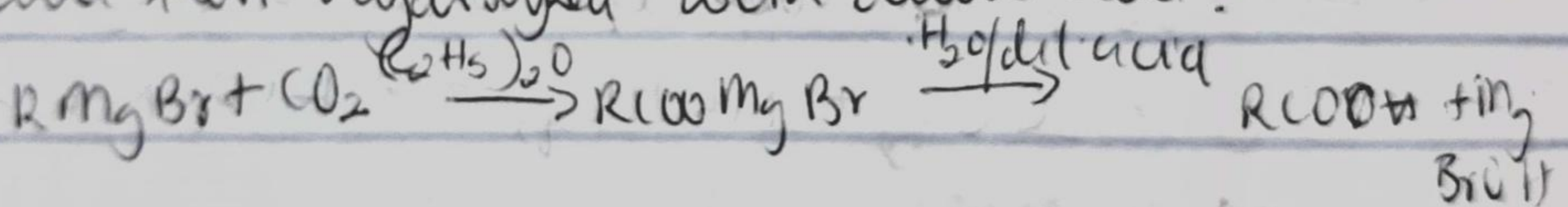
4 Synthetic Preparation of carboxylic acid with equations.

a) Oxidation of primary alcohols and aldehydes using oxidizing agents ($K_2Cr_2O_7$ or $KMnO_4$) in acidic solution.

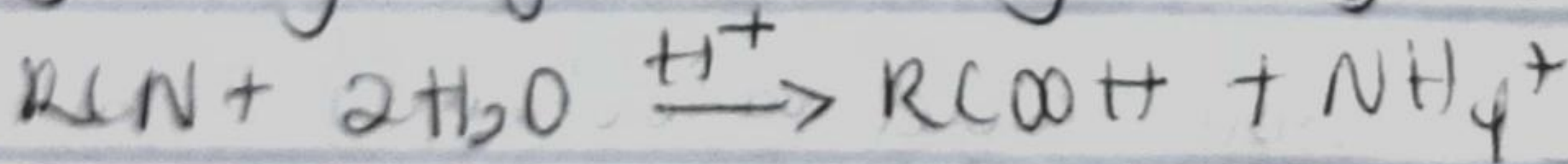


b) Carbonation of Grignard reagent.

Aliphatic carboxylic acids are obtained by bubbling carbon (CO_2) oxide into the Grignard reagent and then hydrolyzed with dilute acid.



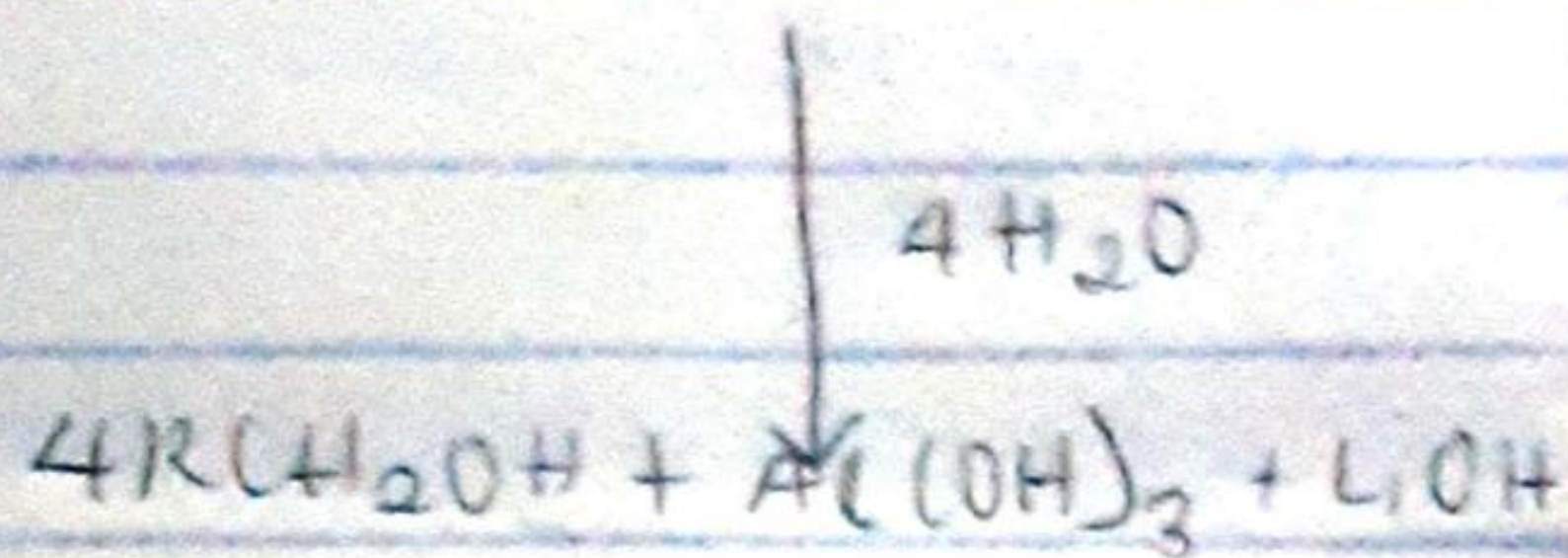
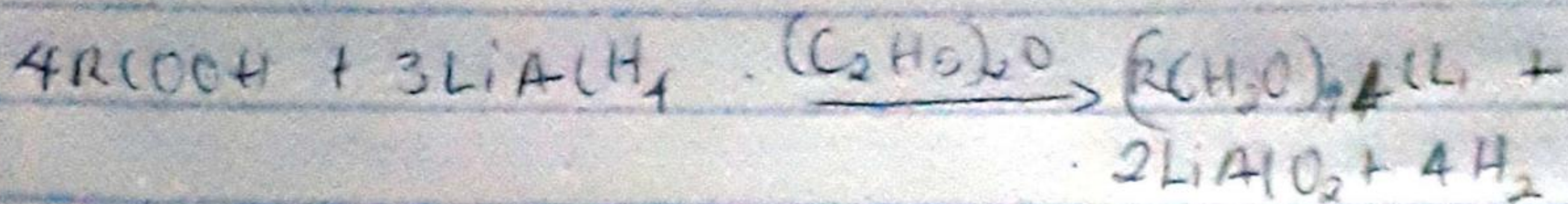
c) Hydrolysis of nitrile (cyanides) or esters.



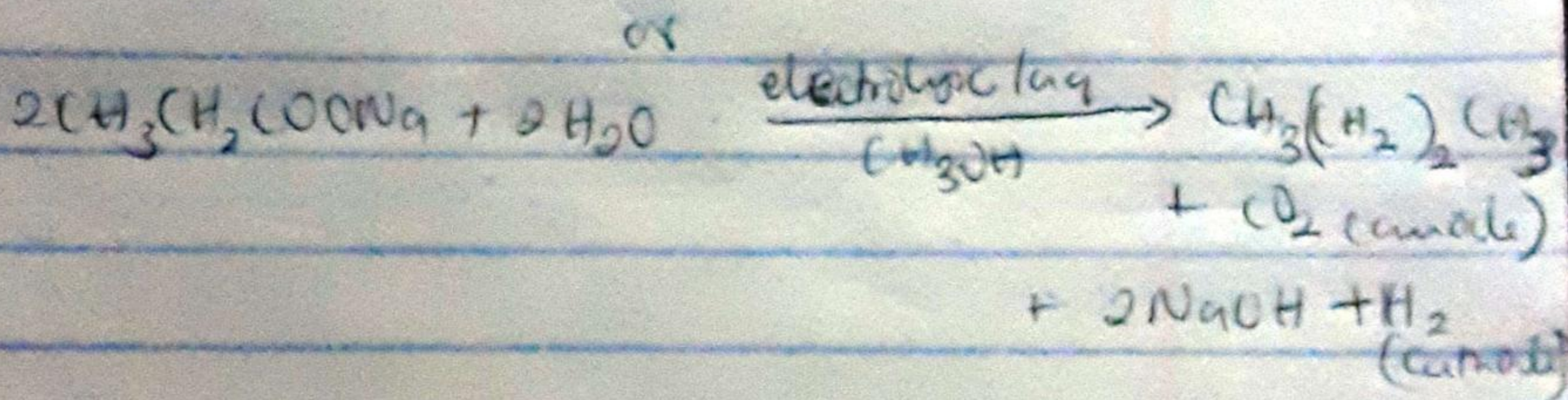
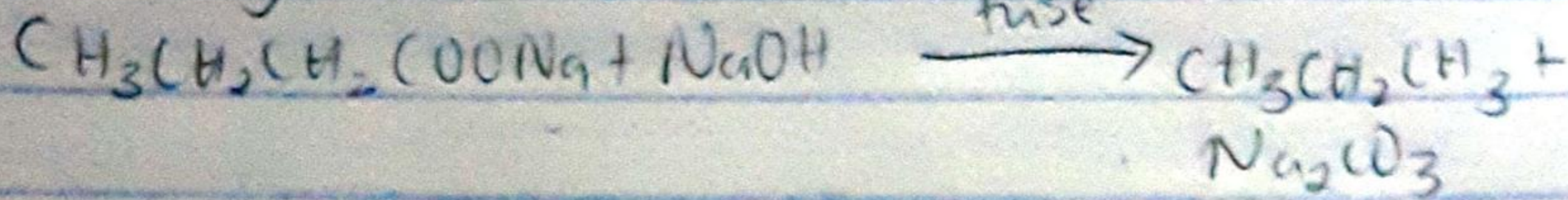
R = alkyl or aryl radical.

5 Outline reduction, decarboxylation and esterification using chemical equations only.

a) Reduction



b) ^{dry} Decarboxylation



e) Esterification

