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Department: Medicine And Surgery

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Course Code: CHM 102

Course Title: General Chemistry II

Assignment On Carboxylic Acid

1. a. HCOOH - Methanoic acid

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

c. $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$ - Butanoic acid
ethanedioic acid

d. $\text{HO}_2\text{C} - \text{CO}_2\text{H}$ - ~~ethanoic acid~~

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

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

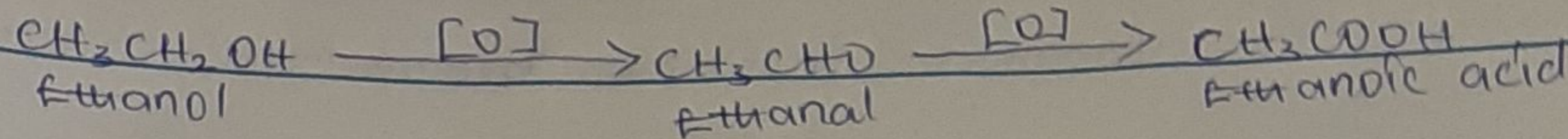
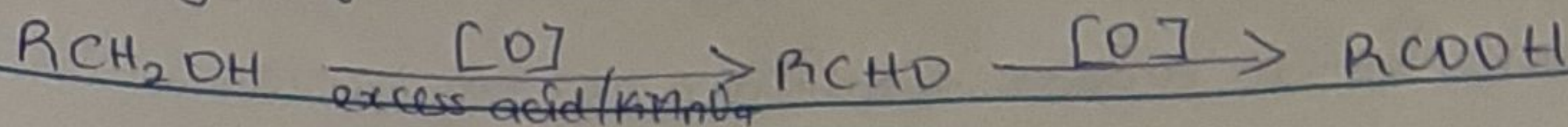
2. (i) Physical appearance: All simple aliphatic carboxylic acids up to C_{10} are liquids at room temperature. Most other carboxylic acids are solid at room temperature although acetic acid also known as glacial ethanoic acid freezes to an ice-like solid below room temperature.

(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.

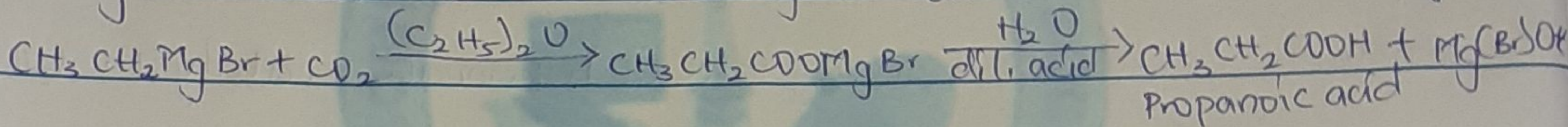
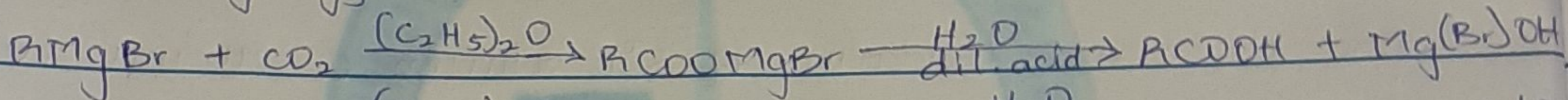
4(a) Oxidation of primary alcohols and aldehydes



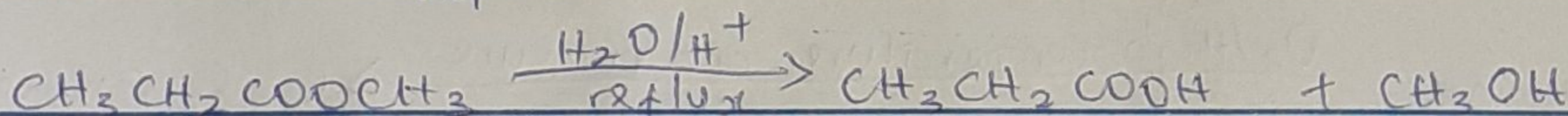
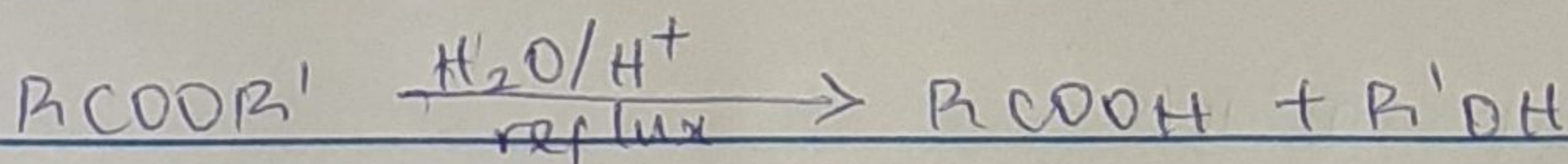
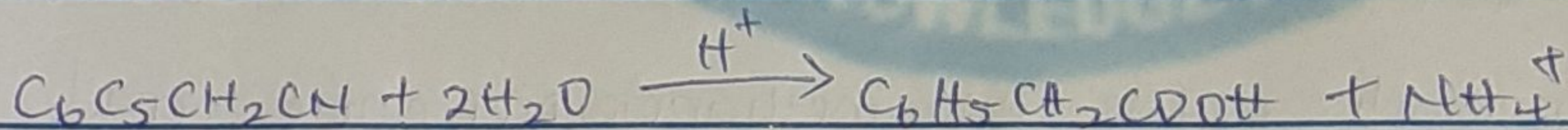
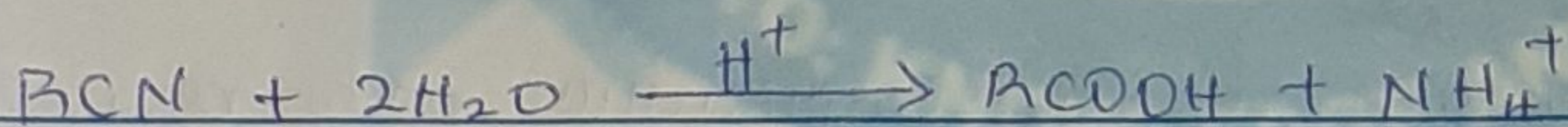
Oxidation of primary alcohols and aldehydes can be used to prepare carboxylic acids using the usual oxidizing agents (i.e. $K_2Cr_2O_7$ or $KMnO_4$) in acidic solution



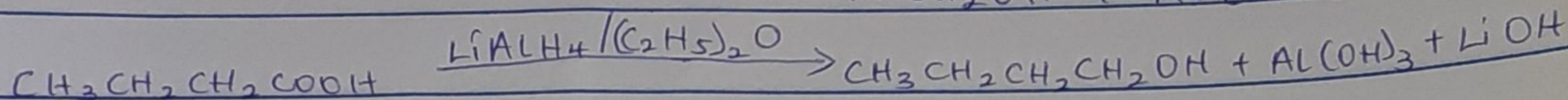
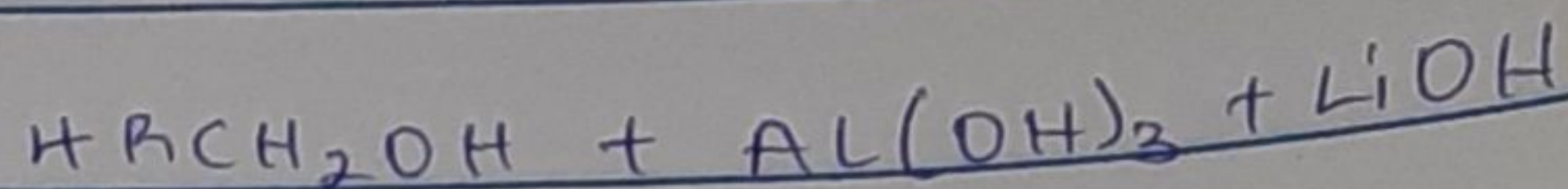
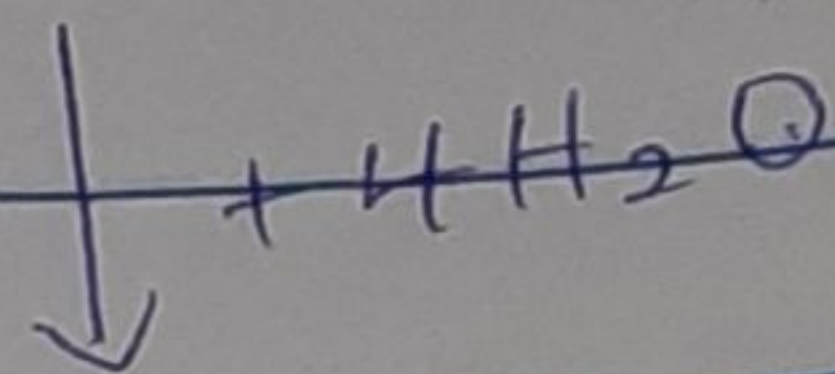
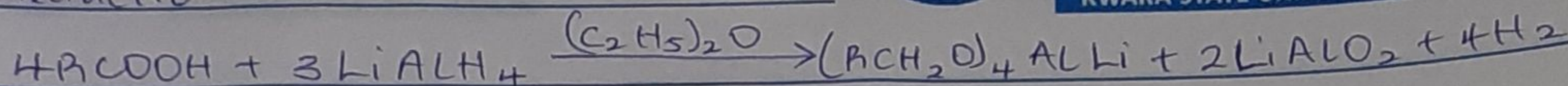
(b) Carbonation of Grignard reagent: Aliphatic carboxylic acids are obtained by bubbling carbon(IV) oxide into the Grignard reagent and then hydrolyzed with dilute acid.



(c) Hydrolysis of Nitriles (Cyanides) or esters: The hydrolysis of nitriles or esters lead to carboxylic acid formation. These hydrolysis reactions can take place in either acidic or basic solutions.



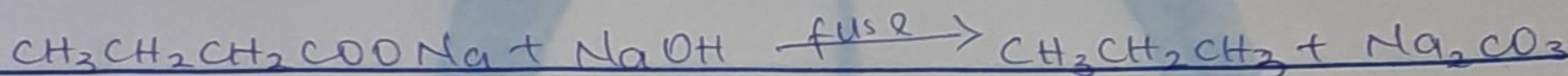
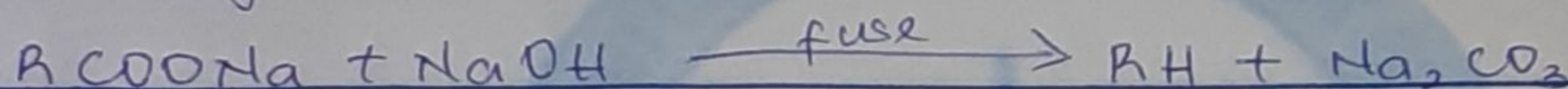
5(a) Reduction



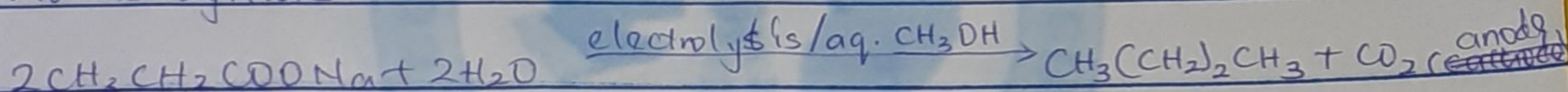
Butanoic acid

Butanol

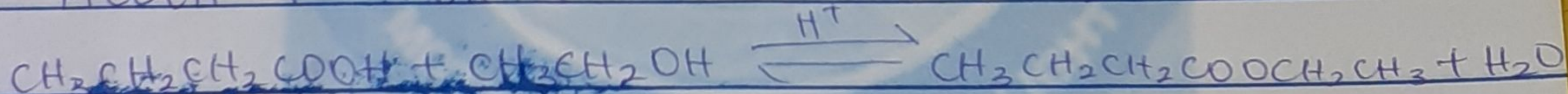
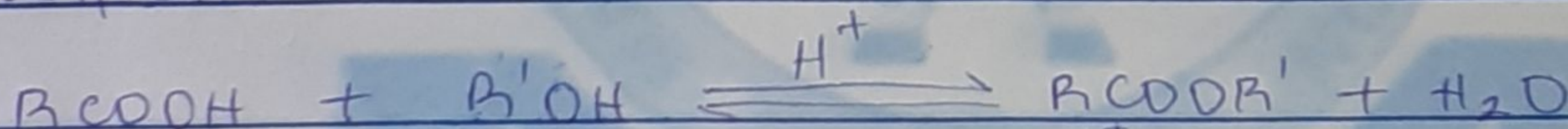
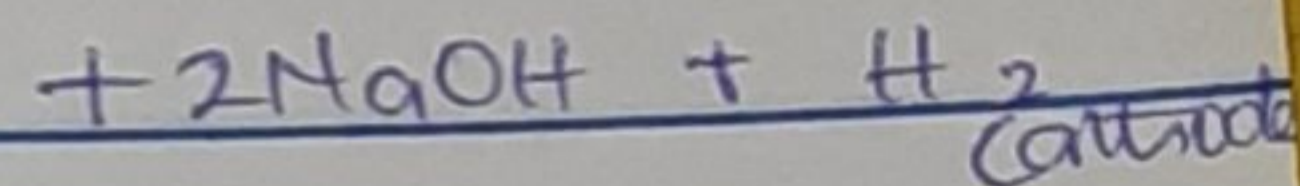
(b) Decarboxylation



Kolbe synthesis



(c) Esterification



Butanoic acid

Ethanol

Ethylbutanoate

water