

(HM 102 ASSIGNMENT)

NAME: DYATOKUN PRECIOUS YEMIDATO

DEPT: PETROLEUM ENGINEERING

MATRIC NO: 19/ENG07/018

Answers

(1) Iupac names.

- $\text{HCOOH}$  - Methanoic acid.
- $\text{HOOCCH}_2\text{CH}_2\text{CHCOOH}$  - Pentanoic, 1, 5-dioic acid.
- $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$  - Butanoic acid.
- $\text{HO}_2\text{C}-\text{CO}_2\text{H}$  - 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) Physical properties.

(i) Physical appearance: All simple aliphatic carboxylic acids up to 10 are liquids at room temperature, most are solid at room temp although acetic acid freezes on ice like solid below room temp.

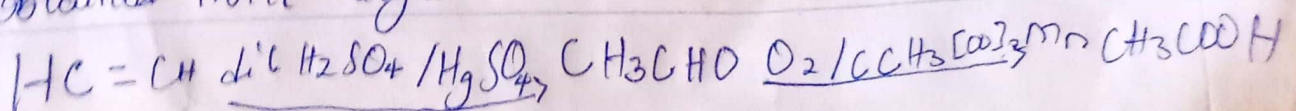
(ii) Boiling points: It increases with increasing relative mass, aromatic acids are crystalline solids have high melting point than aliphatic counterparts of comparable molecular mass.

(3) Two industrial preparation of carboxylic acids -

(i) From carbon(ii) oxide. Methanoic acid [formic acid] manufactured by adding CO under pressure to hot  $\text{NaOH(aq)}$ , the carboxylic acid is liberated by careful reaction with  $\text{H}_2\text{SO}_4$ .

$$\text{CO} + \text{NaOH} \rightarrow \text{HCOONa} \xrightarrow{\text{H}_2\text{SO}_4} \text{HCOOH} + \text{NaHSO}_4$$

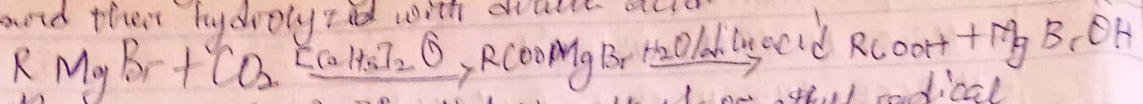
(ii) From ethanal. Ethanoic acid is obtained commercially by the liquid air-oxidation of 5% solution of ethanal to ethanoic acid using manganic(II) ethanoate catalyst, ethanal is obtained from ethylene.



(4)

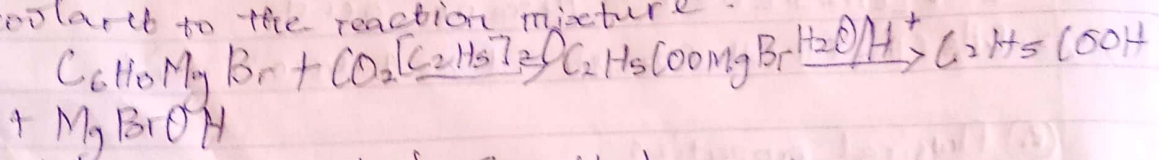
(i) Oxidation of primary alcohol & aldehydes: It can be used to prepare carboxylic acid using the usual oxidizing agents [i.e.  $K_2Cr_2O_7$  or  $KMnO_4$ ] in acidic solution  $RCH_2OH \xrightarrow{\text{excess acid}/KMnO_4} RCHO \xrightarrow{CO_2} RCOOH$

(ii) Carboxylation of Grignard reagent: Aliphatic carboxylic acids are obtained by bubbling carbon dioxide into the Grignard reagent and then hydrolyzed with dilute acid.



(R may be 1°, 2°, 3° aliphatic alkyl or ethyl radical)

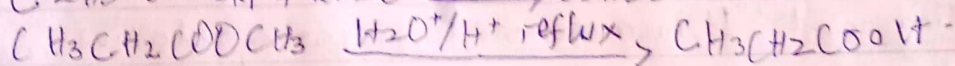
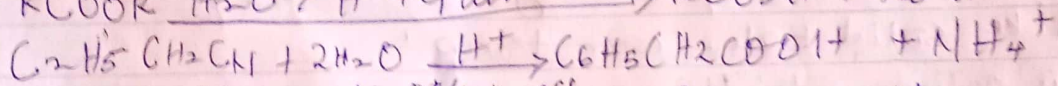
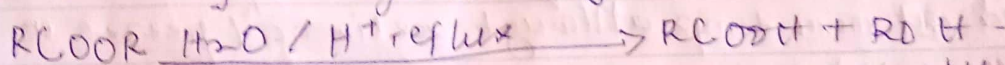
In preparation of benzoic acid, the reagent is added to solid carbon dioxide [dry ice] which serves as a coolant to the reaction mixture.



(iii) Hydrolysis of nitrile (cyanides) or ester

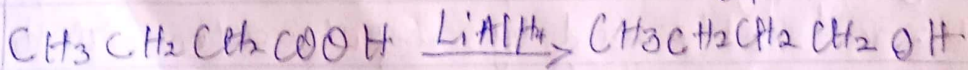
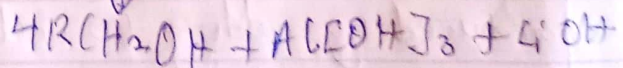
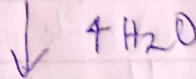
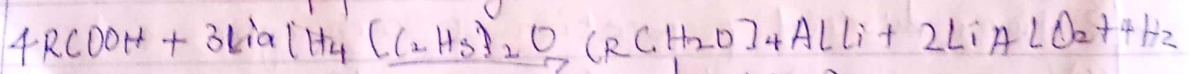


[R = alkyl or aryl radical]



(5)

- Reduction of primary alcohol

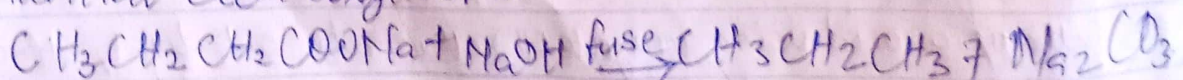


Butanoic acid

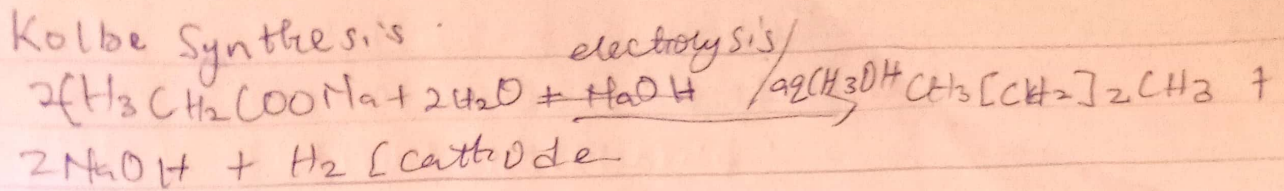
Butanol

- Decarboxylation

Thermal decarboxylation



Kolbe Synthesis



-Esterification

