

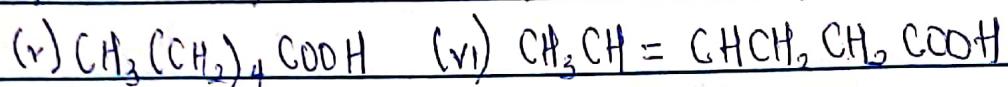
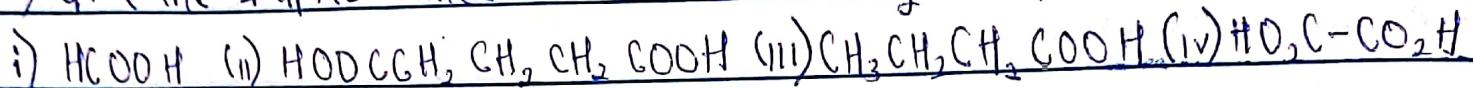
15th of April, 2020

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DEPARTMENT: Electrical Electronics Engineering

MATRIC NO: 19/ENG04/042

1) Give the IUPAC names of the following compound.



i) $\text{HCOOH} \rightarrow$ Methanoic acid ii) $\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{COOH} \rightarrow$ Pentan-1,5-dioic acid

iii) $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH} \rightarrow$ Butanoic acid iv) $\text{H}_2\text{O}_2\text{C}-\text{CO}_2\text{H} \rightarrow$ Ethanedioic acid

v) $\text{CH}_3(\text{CH}_2)_4\text{COOH} \rightarrow$ Hexanoic acid vi) $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH} \rightarrow$ Hex-4-menoic acid

2) Discuss briefly the physical properties of carboxylic acids under the following i) physical appearance ii) Boiling Point iii) Solubility

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

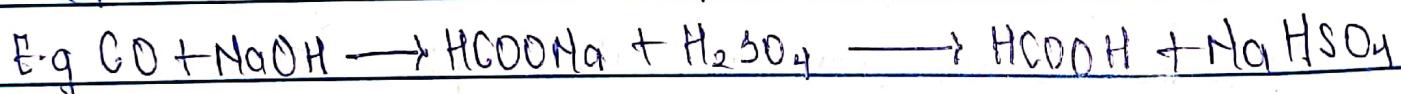
ii) BOILING POINTS: Boiling point increases with increasing relative molecular mass. Aromatic carboxylic acids are crystalline solids and have higher melting points than their aliphatic counterparts.

If comparable relative molecular mass.

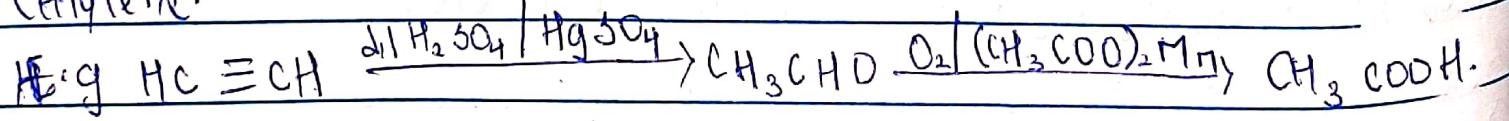
(iii) SOLUBILITY: Lower molecular mass carboxylic acids with up to four carbon atoms in their molecules are soluble in water; this largely due to their ability to form hydrogen bonds with water molecules. The water solubility of the acids decreases as the relative molecular mass increases because the structure becomes relatively more hydrocarbon in nature and hence covalent. All carboxylic acids are soluble in organic solvents.

③ Write two industrial preparations of Carboxylic acids.

(i) 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 tetroxosulfate (VI)acid (H_2SO_4).



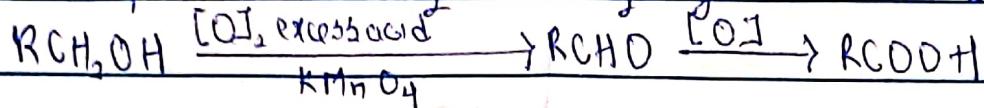
(ii) FROM ETHANOL: Ethanoic acid is obtained commercially by the liquid phase air-oxidation of 5% solution of ethanol to ethanoic acid using magnanite (II)ethanoate crystals. Ethanol itself is obtained from ethylene.



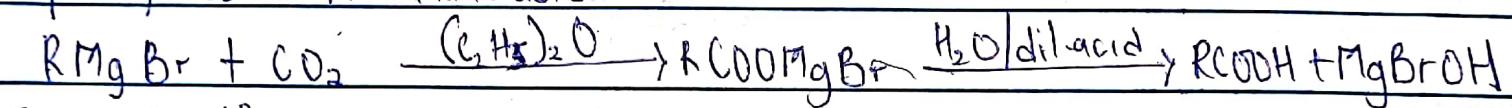
(4) With equations and brief explanation discuss the synthetic preparations of carboxylic acid.

(i) OXIDATION OF PRIMARY ALCOHOLS AND ALDEHYDES:

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

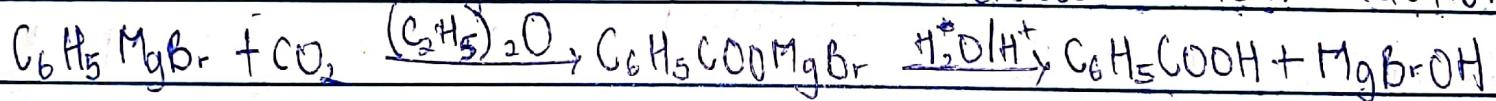


(ii) CARBONATION OF GRIGNARD REAGENT: Aliphatic carboxylic acids are obtained by bubbling carbon (IV) oxide into the Grignard reagent and then hydrolyzed with dilute acid.

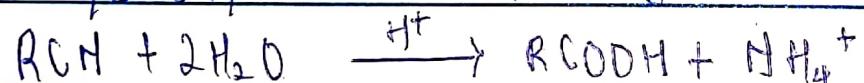


R may be 1° , 2° , 3° aliphatic alkyl or aryl radical.

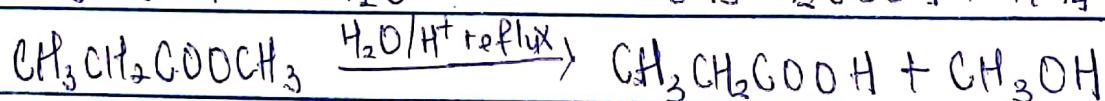
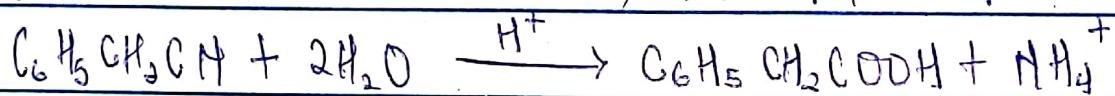
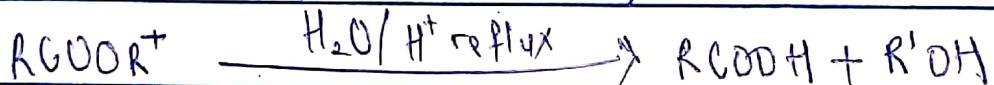
In the preparation of benzoic acid, the reagent is added to solid carbon (IV) oxide (dry ice) which also serves as coolant to the reaction.



(iii) HYDROLYSIS OF NITRILES (cyanides) OR ESTERS.

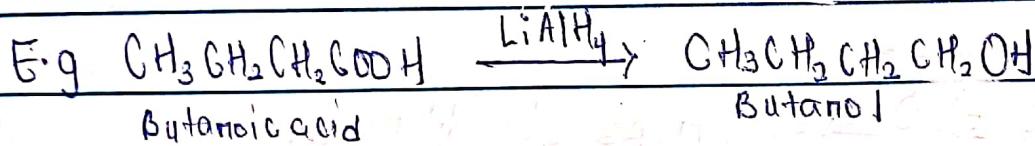
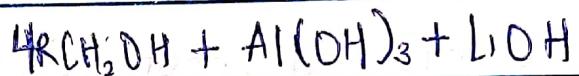
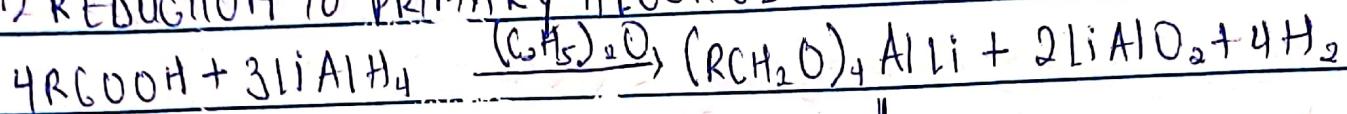


(R = alkyl or aryl radical)

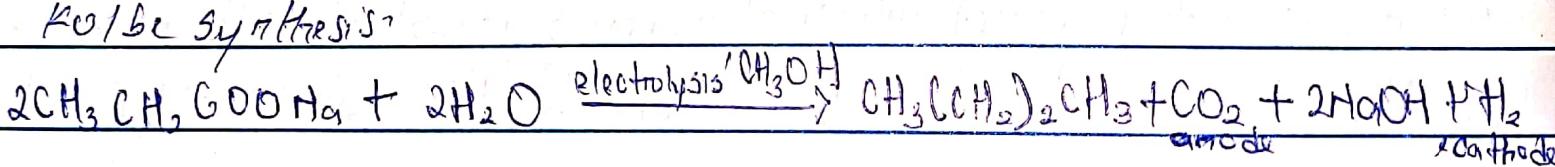
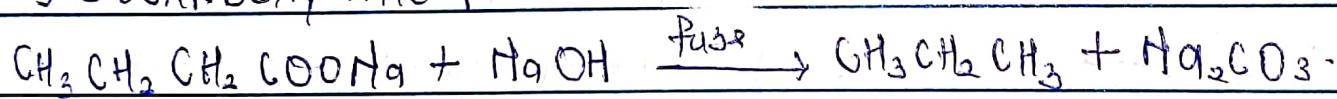


⑤ With Chemical equations only, outline the reduction, decarboxylation and esterification of carboxylic acid.

(i) REDUCTION TO PRIMARY ALCOHOL



(ii) DECARBOXYLATION



(iii) ESTERIFICATION

