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CARBOXYLIC ACID ASSIGNMENT:

A		
1.	HCOOH	Methanoic acid
2.	$\text{HOOCCH}_2\text{CH}_2\text{COOH}$	pentan-1,5-dioic acid
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

B Physical appearance of carboxylic acid:

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 form as glacial ethanoic acid freezes to an ice-like solid below the room temperature.

Boiling point: The 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.

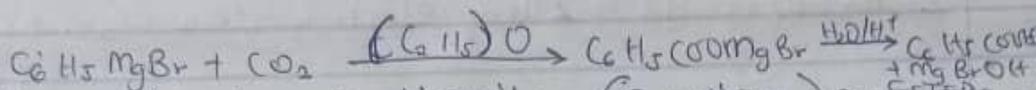
Solubility: Lower molecular mass carboxylic acids with up to four carbon atoms in their molecules are soluble in water. This largely due to their ability to form hydrogen bonds with water molecules. The water solubility of the acids decrease as the relative molecular mass increases because the structure becomes relatively more hydrocarbon in nature and hence covalent. All carboxylic acids are soluble in water.

C Industrial preparation of carboxylic acid.

1. From carbon (II) oxide:

2. CARBONYLATION OF GRIGNARD REAGENTS
 Aliphatic Carboxylic acids are obtained by bubbling Carbon (IV) oxide into the Grignard reagent and then hydrolyzed with dilute acid.
 $RMgBr + CO_2 \xrightarrow{[H^+]} RCOOMgBr \xrightarrow{H_2O/H^+} RCOOH + MgBr.OH$
 NB: 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 mixture

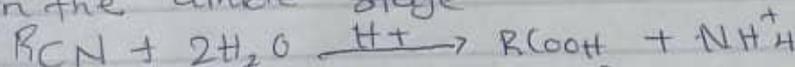


3. HYDROLYSIS OF NITRILES (CYANIDES) OR ESTERS -

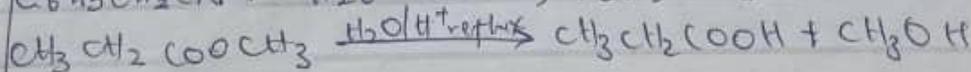
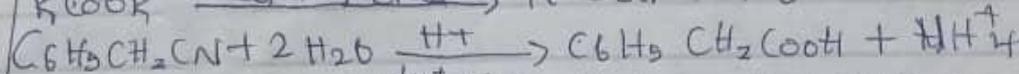
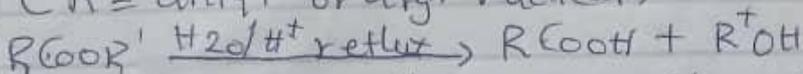
Nitriles undergo hydrolysis to form amides - the amides further undergo reaction in the presence of the catalyst which then to form:

Carboxylic acids. The catalyst for this reaction is H^+ or OH^- further more, application of mild reaction condition helps in ceasing the reaction

In the amide stage



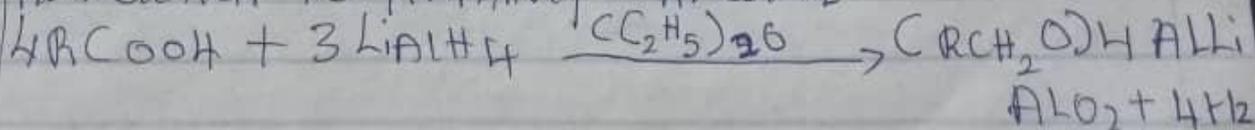
(R = alkyl or aryl radical)



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

CHEMICAL REACTIONS

1. REDUCTION TO PRIMARY ALCOHOL

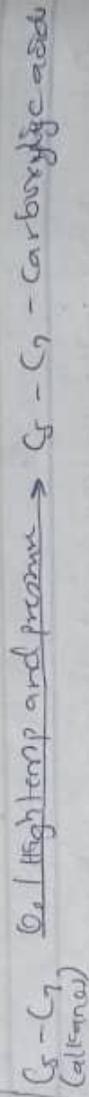


Propionic acid (formic acid) is manufactured by acting CO oxide under pressure to not aqueous solution of sodium hydroxide the free Carboxylic acid is liberated by Careful reaction with tetraoxosulphate (vi) acid (H_2SO_4)



FROM PETROLEUM

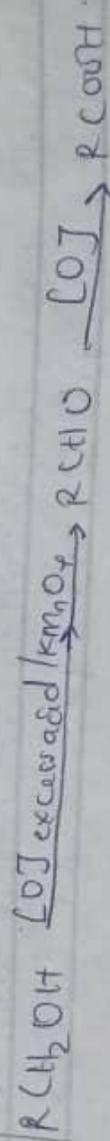
Liquid phase O_2 oxidation of $\text{C}_5 - \text{C}_7$ alkanes, obtainable petroleum at high temperature and pressure will give $\text{C}_5 - \text{C}_7$ Carboxylic acid with methanoic, Propionic and butanoic acids as by products.



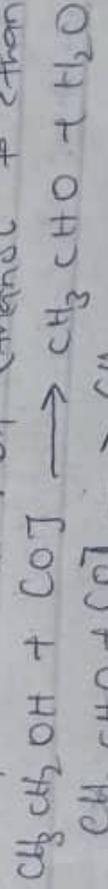
With equation and brief explanation discuss the Synthetic preparation of Carboxylic acid

SYNTHETIC PREPARATION OF CARBOXYLIC ACID

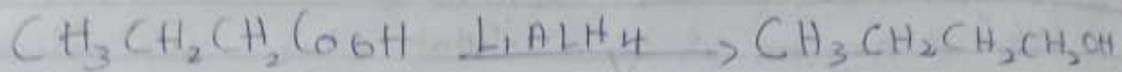
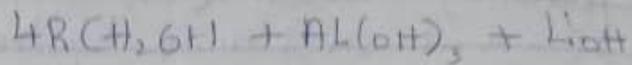
i) OXIDATION OF PRIMARY ALCOHOLS AND ALDEHYDES
Oxidation of primary alcohols and aldehydes can be used to prepare Carboxylic acids using the usual oxidizing agents ($\text{Cr}_2\text{O}_7^{2-}$ (pot dichromate (vi)) or KMnO_4 (potassium manganate (vii)) in acidic solution



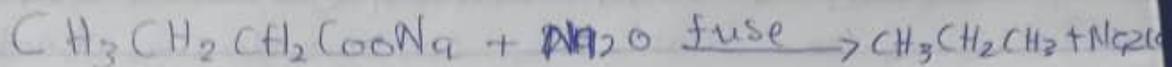
Examples: Oxidation of ethanol to ethanoic acid



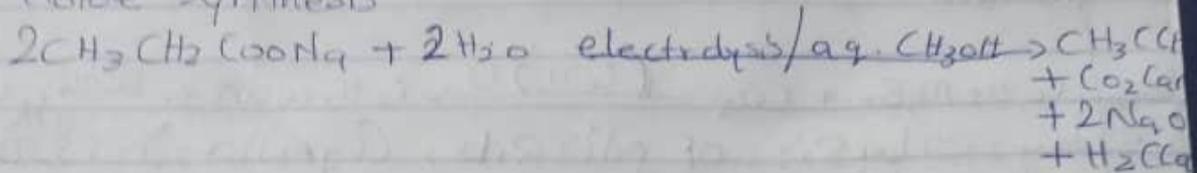
4H₂O
↓



i. DECARBOXYLATION



Kolbe Synthesis



3. ESTERIFICATION

