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MATRIC NO:- 19/MHS01/295
DEPARTMENT:- MBBS

1.) $HCOOH$ - methanoic acid
- $HOOCCH_2CH_2CH_2COOH$ - Petan - 1, 5-dioic acid
- $CH_3CH_2CH_2COOH$ - Butanoic acid
- HO_2C-CO_2H - Ethanedioic acid
- $CH_3(CH_2)_4COOH$ - Hexanoic acid
- $CH_3CH=CHCH_2CH_2COOH$ - Hex-4-enoic acid

2.) i) Physical appearances:- All simple aliphatic carboxylic acids up to C9 are liquids at room temperature. Most other carboxylic acids are solid at room temperature although anhydrous carboxylic acid (Cacetic acid) freezes to an ice-like solid below the room temperature

ii.) Boiling point:- It 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.

iii) Solubility:- Carboxylic acids of lower molecular mass with up to four carbon atoms in their molecules are soluble in water due to their ability to form hydrogen bonds with water molecule. Water solubility of acid decreases with increase in relative molecular mass because the structure becomes more hydrocarbon in nature. All carboxylic acids are soluble in organic solvent.

3) - From Carbon(II) oxide

Methanoic acid is produced by adding CO under pressure to hot aqueous solution of NaOH. The free carboxylic acid is liberated by careful reaction with tetraoxosulphate(VI) acid.

$$CO \xrightarrow{NaOH} HCOONa \xrightarrow{H_2SO_4} HCOOH + NaHSO_4$$

- From ethanol

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

to obtain $HC\equiv CH \xrightarrow{dil\ H_2SO_4/HgSO_4} CH_3CHO \xrightarrow{Cl_2/(CH_3COO)_2Mn} CH_3COOH$

4) 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 $K_2Cr_2O_7$ and $KMnO_4$) in acidic solution

$RCH_2OH \xrightarrow{[O]\ excess\ acid/KMnO_4} RCHO \xrightarrow{[O]} RCOOH$

b.) Carbonation of Grignard

Aliphatic carboxylic acids are obtained by bubbling CO_2 into the gringnard reagent and then hydrolyzed with dilute acid.

$RMgBr + CO_2 \xrightarrow{(C_2H_5)_2O} RCOOMgBr \xrightarrow{H_2O/dil\ acid} RCOOH + MgBrOH$

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

In preparation of benzoic acid, the reagent is added to solid CO_2 (dry ice) which also serves as coolant to the reaction mixture.

$C_6H_5MgBr + H_2O \xrightarrow{(C_2H_5)_2O} C_6H_5COOMgBr \xrightarrow{H_2O/H^+} C_6H_5COOH + MgBrOH$

5 a) Reduction

$4CH_3COOH + 3LiAlH_4 \xrightarrow{(C_2H_5)_2O} (CH_3CH_2)_4AlLi + 2LiAlO_2 + 4H_2$

$(CH_3CH_2)_4AlLi + 4H_2O \rightarrow 4CH_3CH_2OH + Al(OH)_3 + LiOH$

b.) Esterification

$CH_3CH_2CH_2COOH + CH_3CH_2CH_2OH \xrightleftharpoons{H^+} CH_3CH_2CH_2COOCH_2CH_2CH_3 + H_2O$

c) Decarboxylation

- Thermal decarboxylation

$CH_3CH_2CH_2COONa + NaOH \xrightarrow{fuse} CH_3CH_2CH_3 + Na_2CO_3$

- Kolbe Synthesis

$2CH_3CH_2COONa + H_2O \xrightarrow{electrolysis} CH_3(CH_2)_2CH_3 +$