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MBBS
Chem102

i $HCOOH$ – Methanoic acid
ii $HO_2CCH_2CH_2CH_2CO_2H$ – Pentan-1,5-dioic acid
iii $CH_3CH_2CH_2CO_2H$ – Butanoic acid
iv $HOOCCOOH$ – Ethanedioic acid
v $CH_3CH_2CH_2CH_2CH_2COOH$ – Hexanoic acid
vi $CH_3CH=CHCH_2CH_2CO_2H$ – Hex-4-enoic acid

2) Physical properties
a) Solubility: When water solubility decreases as the Relative molecular mass then increase. Lower molecular Carboxylic acids up to Carbon 4 are Soluble in water. this is because they can form hydrogen bonds with water molecules.
b) Boiling point. Aromatic Carboxylic acids are Crystalline Solids and have higher melting points than their corresponding aliphatic Counterparts the bp increases as the relative molecular mass increases.
c) Physical appearance: Simple aliphatic carboxylic acids less than C_{10} are liquid at room temperature. ~~Ac~~ Other carboxylic acids are solid at room temperature Acidic acid, although freezes at ~~room tem~~ to an ice-like solid below the room ~~temperature~~

3) Industrial Preparation
a) From Carbon(II) oxide

Formic acid is manufactured by adding CO under pressure to hot aqueous solution of NaOH. The carboxylic acid is liberated by careful reaction with H_2SO_4

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

b) From ethanol

The liquid phase air oxidation of 5% solution of ethanol to ethanoic acid, using Manganate (II) ethanoic ethanoate catalyst. Ethanol itself is obtained from Ethylene

$$HC\equiv CH \xrightarrow{dil\ H_2SO_4} CH_3CHO \xrightarrow[O_2]{(CH_3COO)_2Mn} CH_3COOH$$

④ Synthetic preparation of carboxylic Acid

ⓐ Oxidation of primary alcohols and aldehydes using $K_2Cr_2O_7$ or $KMnO_4$ in acidic solution.

$$CH_3CH_2OH \xrightarrow[\text{excess acid}]{[O]} CH_3CHO \xrightarrow{[O]} CH_3COOH$$

$KMnO_4$

b) Carbonation of Grignard reagent by bubbling CO_2 into a grignard reagent, then hydrolyzing with dilute acid

$$CH_3MgBr + CO_2 \xrightarrow{(C_2H_5)_2O} CH_3COOMgBr \xrightarrow[dil\ acid]{H_2O} CH_3COOH + MgBrOH$$

c) Hydrolysis of Nitriles / Cyanides (esters) can also yield carboxylic acids using favorable catalyst

$$CH_3CH_2COOCH_3 \xrightarrow[\text{Reflux}]{H_2O\ /\ H^+} CH_3CH_2COOH + CH_3OH$$

5) Reduction of carboxylic acid

$$CH_3CH_2CH_2COOH \xrightarrow{LiAlH_4} CH_3CH_2CH_2CH_2OH$$

Butanoic acid — Butanal

Esterification of carboxylic Acid

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

Decarboxylation of carboxylic Acid

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