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19/MHS01/221
Medicine and Surgery.

~~HCOOH~~ $HOOCCH_2CH_2CH_2COOH$

$CH_3CH_2CH_2COOH$ - Butanoic acid

$CH_3C(CH_2)_4COOH$ - 6-oxoheptan-1-oic acid.

$CH_3CH=CHCH_2CH_2COOH$ - 2-methyl propanoic acid

Physical properties of carbonylic acids.

Physical apperance: The smaller members of carbonylic acid are colourless. Volatile liquids have strong odours and they are solid (larger ones)

Boiling point: The simplest form boils at 101°C while ethanol at 78.5°C

Solubility: It decreases as carbon chain length increases.

~~Industrial~~ Synthetic preparation of carbonylic acids.

* Grignard Reagents: This reagent with crushed dry ice or solid carbon dioxide leads to this or acidification of the salts with mineral acids leads to the formation.

$$RMgBr + (O_2C(CH_3)_2O \xrightarrow{(CH_3)_2O} RCOOMgBr \xrightarrow{H_2O/H^+} RCOOH + C_6H_5COOH + MgBrOH$$

* Oxidation of primary alcohols: This is using aldehydes to prepare carbonylic acids using oxidizing agents.

$RCH_2OH[O] \xrightarrow{\text{excess acid/KMnO}_4} RCHO \xrightarrow{[O]} RCOOH$

Industrial method

From ethanol: This is using ethanal (50%) oxidizing to ethanoic using magnesite (II) ethanol C

from carbon (II) oxide: This is using methanoic acid under pressure of NaOH. Free carboxylic acid is titrated using H_2SO_4 as a catalyst.

REDUCTION

$4RCOOH + 3LiAlH_4 \xrightarrow{(C_2H_5)_2O} (RCH_2O)_4AlLi + 2LiAlO_2 + 4H_2$

$\downarrow$

$4RCH_2OH + Al(OH)_3 + LiOH$

$CH_3CH_2CH_2COOH \xrightarrow{LiAlH_4} CH_3CH_2CH_2CH_2OH$

Butanoic acid — Butanol.

Decarboxylation

$CH_3CH_2CH_2COONa + NaOH \xrightarrow{\text{fuse}} CH_3CH_2CH_3 + Na_2CO_3$ (Kolbe synthesis)

$2CH_3CH_2COONa + 2H_2O \xrightarrow{\text{electrolysis}} CH_3(CH_2)_2CH_3 + CO_2$ (cathode) $+ 2NaOH + H_2$ (cathode).

esterification

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