NAME: EKONG, VIVIEN UMOUDOE
DEPARTMENT: MBBS
MATRIC NO: 19/MHS01/148
LEVEL: 100

1. The IUPAC names of the following compounds are given.

a. $HCOOH$ - Formic acid
b. $HOOCCH_2CH_2CH_2COOH$ - Butanedioic acid
c. $CH_3CH_2CH_2COOH$ - Butanoic acid
d. HO_2C-CO_2H - Oxalic
e. $CH_3(CH_2)_4COOH$ - 6-oxohexanoic acid
f. $CH_3CH=CHCH_2CH_2COOH$ - 2-methyl propanoic acid

2. PHYSICAL PROPERTIES OF CARBOXYLIC ACID

i PHYSICAL APPEARANCE

Carboxylic acid is coloured red and that of the alcohol is coloured blue. Many carboxylic acids are colourless liquids with disagreeable odours. Those with 5 to 10 carbon atoms all have "goaty" odours. The acids with more than 10 carbon atoms are waxlike solids and their odor diminishes with increasing molar mass and resultant decreasing volatility.

ii BOILING POINT

These acids exhibit strong hydrogen bonding between molecules. They therefore have high boiling points. The B.P of these acids increase as the molecules get bigger.

iii SOLUBILITY

Carboxylic acids are soluble in water. They do not dimerise in water, but forms hydrogen bonds with water. Carboxylic acids are polar and due to the presence of the hydroxyl in the carboxyl group, they are

to form hydrogen bonds with water molecules.

3. INDUSTRIAL PREPARATIONS

i From Carbon (II) oxide

Methanoic 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 tetraoxosulphate (VI) acid.

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

ii From ethanol

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

$$HC \equiv CH \xrightarrow{dil.\ H_2SO_4/} CH_3CHO \xrightarrow[(H_3COO)_2Mn]{O_2} CH_3COOH$$

4. One synthetic preparation of carboxylic acid is by the oxidation of primary alcohols and aldehydes: oxidation of primary alcohols and aldehydes can be used to prepare carboxylic acids using the usual oxidizing agents in acidic solution.

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

5. REDUCTION

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

$$4RCH_2OH + AL(OH_3) + LiOH$$

$$CH_3CH_2CH_2COOH \xrightarrow{LiAlH_4} CH_3CH_2CH_2CH_2OH$$

Butanoic acid — Butanol

DECARBOXYLATION

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

Kolbe synthesis

$$2CH_3CH_2COONa + 2H_2O \xrightarrow[electrolysis]{CH_3OH} CH_3(CH_2)_2CH_3 +$$

$$CO_2(anode) + 2NaOH + H_2(cathode)$$

ESTERIFICATION

~~In the presence of strong acid catalyst, carboxylic acids react with alcohols to form est~~

$$CH_3CH_2CH_2COOH + CH_3CH_2CH_2OH \xrightleftharpoons{H^+} CH_3CH_2$$

$$CH_2COOCH_2CH_2CH_3 + H_2O.$$