OLATUNDI ANUOLUWAPO TEMIDOPE CHM 102
COMPUTER ENGINEERING.
19/ENG02/050.

3rd Assignment.

1. (i) HCOOH → Methanoic acid.
(ii) $HOOCCH_2CH_2CH_2COOH$ → Pentan-1,5-dioic acid.
(iii) $CH_3CH_2CH_2COOH$ → Butanoic acid.
(iv) $CH_3(CH_2)_4COOH$ → Hexanoic acid.
(v) HO_2C-CO_2H → Ethan-1,2-dioic acid.
(vi) $CH_3CH=CHCH_2CH_2COOH$ →

2. Physical Properties of Carboxylic acids.

(i) Physical Appearaces: All simple 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 known as glacial ethanoic acid freezes to an ice-like Solid below the room temperature.

ii. Boiling Points: 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.

iii. Solubility: The Water Solubility of the acids decreases as the relative molecular mass increases because the structure becomes relatively more hydrocarbon in nature and hence covalent. All carboxylic acids are Soluble in organic Solvents.

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

$$HC \equiv CH \xrightarrow{dil\ H_2SO_4/HgSO_4} CH_3CHO \xrightarrow{O_2/(CH_3COO)_2Mn} CH_3COOH.$$

(ii) From Petroleum: Liquid phase air oxidation of $C_5 - C_7$ alkanes, obtainable from petroleum at high temperature and pressure will give $C_5 - C_7$ carboxylic acids with methanoic, propanoic and butanedioic acids as by-products.

$$C_5 - C_7 \xrightarrow{O_2/High\ temperature\ \&\ pressure} C_5 - C_7 \text{ carboxylic acids.}$$

4. Sytnetic Preparation of Carboxylic acid

* 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 $K_2Cr_2O_7$ or $KMnO_4$) in acidic solution

$$CH_3CH_2OH \xrightarrow{[O],\ excess\ acid/KMnO_4} CH_3CHO \xrightarrow{[O]} CH_3COOH.$$

5. (i) Reduction to Primary alcohol.

$$CH_3CH_2CH_2COOH \xrightarrow{LiAlH_4} CH_3CH_2CH_2CH_2OH$$

Butanoic acid → Butanol.

(ii) Thermal decarboxylation of Carboxylic Salts.

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

(iii) Esterification of Carboxylic salts.

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