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MATRIC NO: 19/MHS01/259

DEPARTMENT: MBBS/MHS

COURSE: CHM 102

TITLE: NEW ASSIGNMENT

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Classification of Alcohols

There are two major ways of classifying alcohols

⇒ This type of classification is based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group. This classification divides alcohols into three:

- Primary alcohols: Alcohols in which there are two or three hydrogen atoms attached to the carbon carrying the hydroxyl group e.g. CH_3OH (methanol).
- Secondary alcohols: Alcohols in which there is only one hydrogen atoms attached to the carbon carrying the hydrogen group. eg $CH_3CH(OH)CH_3$.
- Tertiary alcohols: Alcohols in which there are no hydrogen atom attached to the carbon bearing the hydroxyl group e.g $(CH_3)_3C-OH$.

⇒ The second type of classification is based on the hydroxyl groups present the alcohol posses. This classification divides alcohols into four.

- Monohydric alcohols: Alcohols which have an hydroxyl group present in their alcohol structure. eg $CH_3CH_2CH_2OH$.
- Dichydric alcohols: Alcohols which have two hydroxyl groups present in their alcohol structure e.g $HOCH_2CH_2OH$
- Trihydric alcohols: Alcohols which have three hydroxyl group present in their alcohol structure. e.g $OHCH_2CH_2(OH)CH_2OH$.

Polyhydric alcohols: Alcohols which have more than three hydroxy groups in their alcohol structure. They are also referred to as polyols e.g $CH_2(OH)CH(OH)CH(OH)CH(OH)CH(OH)CH_2(OH)$

2. Solubility of Alcohols:
Lower alcohols with up to 3 carbon atoms in their molecule are soluble in water because these lower alcohols can form hydrogen bond with water molecules. The water solubility decreases with increasing relative molecular mass. All monohydric alcohols are soluble in organic solvent. The solubility of simple alcohol and polyhydric alcohols is largely due to their ability to form hydrogen bonds with water molecules.

3. Industrial manufacture of ethanol.
Generally, starchy foods such as rice, maize or barley are used as a source of starch; Potato among the list is the most common.

a) Extraction of the starch: The potato is crushed and then steamed at 1400°c to 1500°c under pressure to hydrolysis, starch undergoes germination at 100°c to 130°c for a few days. This germinated starch is called malt.

b) Hydrolysis of starch; Starch is hydrolysed to maltose by an enzyme known as diatase

$$2(C_6H_{10}O_5)_n + nH_2O \xrightarrow[50°-60°]{\text{Diatase}} n(\underset{\text{maltose}}{C_{12}H_{22}O_{11}})$$

c) Yeast is then added at room temperature. Yeast contains 2 enzymes which converts maltose to glucose.

$$\underset{\text{maltose}}{C_{12}H_{22}O_{11(aq)}} + H_2O_{(l)} \xrightarrow[15°c]{\text{maltase}} 2C_6H_{12}O_{6(aq)}$$
glucose

The glucose at constant temperature is then converted into alcohol by the enzyme zymase contained also in yeast.

$$C_6H_{12}O_6 \xrightarrow[15^\circ C]{\text{zymase}} 2CH_3CH_2OH + 2CO_2$$

glucose. ethanol

6) Reaction between 2-methyl propanal and butyl magnesium chloride.

$$CH_3CH(CH_3)-\overset{O}{\overset{\|}{C}}-H + CH_3CH_2CH_2CH_2MgCl$$

$$\longrightarrow CH_3CH(CH_3)-\overset{O}{\overset{|}{C}}-H + MgCl$$

$$\qquad\qquad CH_3CH_2CH_2CH_2$$

$$\xrightarrow{H_2O} CH_3CH(CH_3)-\overset{OH}{\overset{|}{C}}-H + Mg(OH)Cl$$

$$\qquad\qquad CH_3CH_2CH_2CH_2$$

7) $CH_3CH(CH_3)-\overset{O}{\overset{\|}{C}}-H \xrightarrow[H_2O]{LiAlH_4} CH_3CH(CH_3)CH_2OH$

2-methyl propan-1-ol

8) Propan-1-ol to propan-2-ol.

$CH_3CH_2CH_2OH + H_2SO_4$

propan-1-ol.

$\longrightarrow CH_3CH_2CH_2OH_2OSO_3H$

$\xrightarrow{-H_2O} CH_3CH_2CH_2OSO_3H$

propyl hydrogensulphate

$\xrightarrow{-H_2SO_4} CH_3CH=CH_2$

$\xrightarrow{+H_2O} CH_3CH(OH)CH_3$

propan-2-ol.