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CHM 102 ASSIGNMENT.

1) 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! ~~Alkanols~~ 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! ~~Alc~~ Alcohols in which there ~~are~~ is only one hydrogen atom attached to the carbon carrying the hydroxyl group. e.g $CH_3CH(OH)CH_3$

• Tertiary alcohols! Alcohols in which ~~three~~ there are no hydrogen atoms 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 ~~in the~~ the alcohol possesses. This classification divides alcohols into ~~three~~ four.

• Monohydric alcohols! ~~Alcohol~~ Alcohols which have an hydroxyl group present in their alcohol structure. e.g $CH_3CH_2CH_2OH$.

• Dihydric alcohols! Alcohols which have two hydroxyl ~~group~~ present in their alcohol structure e.g $HOCH_2CH_2OH$

• Trihydric alcohols! Alcohols which have three hydroxyl groups present in their alcohol structure. e.g $OHCH_2CH_2(OH)CH_2OH$.

- Polyhydric alcohols: Alcohol which have more than three hydroxyl groups in their alcohol structures. They are also reffered to as polyols eg $CH_3CH(OH)CH(OH)CH(OH)CH(OH)CH(OH)CH(OH)CH_3$.

2 Solubility of Alcohols:

Lower alcohols with up to three carbon atoms in their molecules 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 voluble in organic solvent. The volubility of simple alcohols and polyhydric alcohols is largely due to their cability to form hydrogen bonds with water molecules.

3 Industrial manufacture of ethanol.

Generally, starchy foods such as rice, maize or parley are used as a source of starch. Potato among the lot is the mart common.

a) Extraction of the starch: The potato is crushed and then steamed at 1400°c to 1500°c under pressure to prepare starch solution known as mash. Before 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 hydolyzed to maltose, by an enzyme known as diatase.

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

maltose.

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

$C_{12}H_{22}O_{11}(aq) + H_2O(l) \xrightarrow[15°C]{\text{maltase}} 2C_6H_{12}O_6(aq)$

maltose. glucose.

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

$C_6H_{12}O_6 \xrightarrow[15°C]{\text{Zymase}} 2CH_3CH_2OH + 2CO_2$

glucose. ethanol.

4) Reaction between 2-methyl propanal and butyl magesium chloride.

$CH_3CH(CH_3)-C(=O)-H + CH_3CH_2CH_2CH_2MgCl$

$\longrightarrow CH_3CH(CH_3)-C(O)(CH_2CH_2CH_3)-H + MgCl.$

$\xrightarrow{+H_2O} CH_3CH(CH_3)-C(OH)(CH_2CH_2CH_3)-H + Mg(OH)Cl.$

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

2-methyl propan-1-ol.

(8)

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.