Name [illegible]
Department: Medicine and surgery
Matric No: 19/MHS01/058.

1) CLASSIFICATIONS OF ALCOHOLS.

a) They are classified based on the number of hydrogen atoms attached to the carbon atom bearing the hydroxyl group. If the numbers of the hydrogen attached to the carbon atom bearing the hydroxyl group are three or two, it is called a primary alcohol (1°). If it is one hydrogen atom, it is called secondary alcohol (2°). and if no hydrogen atom is attached to the carbon atom, it is called tertiary alcohol. example are: CH_3OH methanol (1°), CH_3CH_2OH ethanol (2°), $CH_3CH(OH)CH_3$ propan-2-ol (2°), $(CH_3)_3C-OH$ - 2-methy propanol-2-ol (3°).

b) This is based on the number of hydroxyl groups they possess. monohydric alcohols have one hydroxyl group present in the alcohol structure example; $CH_3CH_2CH_2OH$ propanol. Dihydric alcohols are also called Glycols they have two hydroxyl groups present in the alcohol structure. example, $HOCH_2CH_2OH$ Ethane-1,2-diol - Trihydric alcohols have three hydroxyl groups present in the structure of the alcohol example; propane-1,2,3-triol. Polyhydric alcohols or polyols have more than three hydroxyl groups. Example, Heptane-2,3,4,5,6,7 Pentaol.

2) Solubility of Alcohols in Water.

Alcohols are soluble in water. This is due to the hydroxyl group in the alcohol which is able to form hydrogen bonds with water molecules. Alcohols with a smaller hydrocarbon chain are very soluble. As the length of the hydrocarbon chain increases, the solubility in water decreases. All monohydric alcohols are soluble in organic solvents.

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3) Industrial Preparation of ethanol:

Carbohydrate such as starch are natural compound that can be made to yield ethanol through the biological process of fermentation. The enzymes (biological catalyst) found in yeast breaks down the carbohydrate molecules into ethanol to give a yield of 95%.

The starch material eg potatoes on warming with malt 60°C and enzyme found in malt (diastase) are converted into maltose

$$\underset{\text{carbohydrate}}{2(C_6H_{10}O_5)_n} + nH_2O \xrightarrow[\text{Diastase}]{60°C} nC_{12}H_{22}O_{11}$$

Maltose

The maltose is broken down into glucose on addition of yeast (maltase) and temperature of 15°C.

$$\underset{\text{Maltose}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow[15°C\ \text{maltase}]{} \underset{\text{Glucose}}{2C_6H_{12}O_6}$$

Glucose is broken down into alcohol (ethanol) by yeast called zymase at 15°C temperature.

$$\underset{\text{Glucose}}{C_6H_{12}O_6} \xrightarrow[\text{zymase}/15°C]{} \underset{\text{Ethanol}}{2CH_3CH_2OH} + 2CO_2$$

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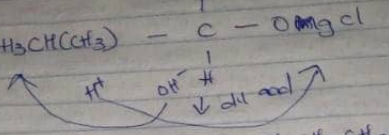
4) $CH_3CH(CH_3)-C(=O)-H$ + $CH_3CH_2CH_2CH_2MgCl$

(Aldehyde)

(Ethyl magnesium halide)



$Mg(OH)Cl$ + $CH_3OH(CH_3)-C(CH_2CH_2CH_2CH_2)-H$

2-methylheptan-5-ol

7) Reduction reaction of 2-methylpropanal

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

2-methyl propanal — 2-methylpropanol

for aldehydes

$(R)_2C=O \xrightarrow[\text{or } LiAlH_4]{H_2CN_1 \text{ or } pt} RCH_2OH$

Primary alcohol.

3) $CH_3CH_2CH_2OH \longrightarrow CH_3CHOHCH_3$

Propan-1-ol — Propan-2-ol

Hydrate propan-1-ol:

$CH_3CH_2CH_2OH + H_2SO_4 \longrightarrow CH_3CH_2CH_2CH_2OSO_3H$

$\downarrow -H_2O$

$CH_3CH_2CH_2OSO_3H$

$\downarrow H$ $\downarrow -H_2SO_4$

$CH_3CH=CH_2$

Propene

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Hydrate alkene (propene)

- $CH_3CH = CH_2 \xrightarrow{H^+ \; OH^-} CH_3CHOHCH_3$

Propan-2-ol