NAME: ATUME MIMIDOO VICTORIA
MATRICULATION NUMBER: 19/MHS01/107
DEPARTMENT: MEDICINE AND SURGERY
COLLEGE: MEDICINE AND HEALTH SCIENCES
COURSE: CHM 102

ASSIGNMENT.

1. The Classification of alcohols:

(i) The first classification of alcohols is based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group. If the numbers of hydrogen atoms attached to the carbon 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 bearing the hydroxyl group, it is called a tertiary alcohol (3°).
Example: ① CH_3CH_2OH - Ethanol (primary alcohol).

(ii) The second classification is based on the number of hydroxyl groups they possess. Monohydric alcohols have one hydroxyl group present in the alcohol structure. Dihydric alcohols are also called glycols and have two hydroxyl groups present in the alcohol structure while trihydric alcohols or triols have three hydroxyl groups present in the structure of the alcohol. Polyhydric alcohols

or polyols have more than three hydroxyl groups.
Example: ① $HOCH_2CH_2OH$ - Ethane-1,2-diol (dihydric alcohol).

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. The reason why the solubility decreases as the length of the hydrocarbon chain increases is because it requires more energy to overcome the hydrogen bonds between the alcohol molecules as the relative molecular mass increases. The water solubility of alcohols decreases with increasing relative molecular mass.

Solubility of alcohols in organic solvents:
All monohydric alcohols are soluble in organic solvents. Alcohols with two or more hydroxyl groups present on the alcohol structure such as diols and polyols are however not soluble in organic solvents.

3 Industrial Preparation of Ethanol-
Carbohydrates such as starch are major group of natural compounds that can be made to yield ethanol by the biological process of fermentation. The biological catalysts

found in yeast break down the carbohydrate molecules into ethanol to give a yield of 95%.

(a) The starch containing materials include molasses, potatoes, etc and on warming with malt to 60°C for a specific period of time are converted into maltose by the enzyme diastase contained in the malt.

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

carbohydrate — maltose (dissaccharide)

(ii) The maltose is broken down into glucose on addition of yeast which contains the enzyme maltase at a temperature of 15°C.

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

maltose — glucose

(iii) The glucose at constant temperature of 15°C is then converted into alcohol by enzyme zymase contained also in yeast.

$$C_6H_{12}O_6 \xrightarrow[\text{zymase}]{15°C} 2CH_3CH_2OH + 2CO_{2(g)}$$

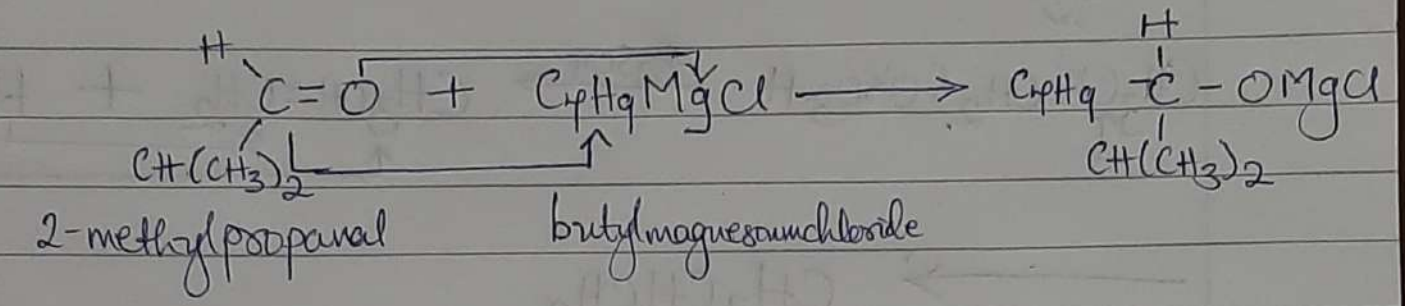
Glucose — ethanol (95%)

4 The reaction between 2-methyl propanal and butylmagnesium chloride:

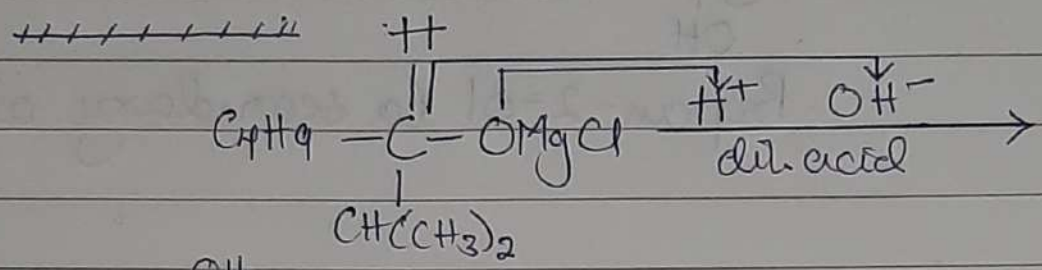
2-methylpropanal – $(CH_3)_2CHCHO$

Butylmagnesium chloride – C_4H_9MgCl.

P.T.O



2-methylpropanal butylmagnesiumchloride

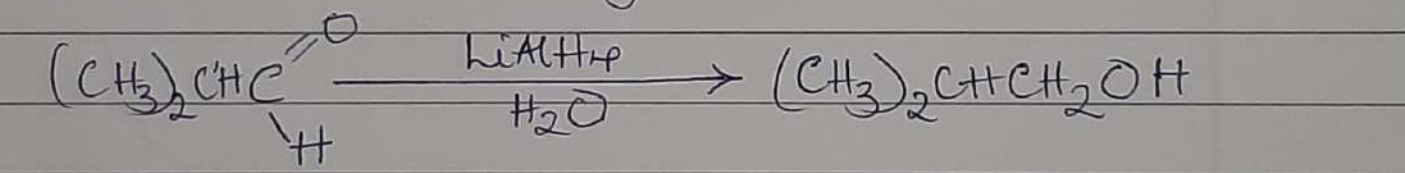


$(CH_3)_2CHCHC_4H_9 + Mg(OH)Cl$

2-methyl 3-heptanol which is a secondary alcohol.

5 Reduction reaction of 2-methylpropanal.

$(CH_3)_2CHCHO$ – 2-methylpropanal.



2-methylpropanal 2-methylpropanol.

The reduction reaction of 2-methylpropanal yields a primary alcohol, 2-methylpropanol.

6 Conversion of Propan-1-ol to Propan-2-ol.

Propan-1-ol → $CH_3CH_2CH_2OH$ (a primary alcohol)

$CH_3CH_2CH_2OH + H_2SO_4 \longrightarrow CH_3CH_2CH_2[OH_2]OSO_3H$

$CH_3CH_2CH_2[OH_2]OSO_3H \xrightarrow{-H_2O} CH_3\underset{H}{\overset{+}{C}}HCH_2[OSO_3H$

$$CH_3\underset{\underset{H}{\uparrow}}{C}HCH_2OSO_3H \xrightarrow{-H_2SO_4} CH_3CH=CH_2 + H^+ OH^-$$

$$\longrightarrow CH_3\underset{\underset{OH}{|}}{C}HCH_2$$

Propan-2-ol (a secondary alcohol).