a) $CH_3-\underset{\underset{H}{|}}{\overset{\overset{CH_3}{|}}{C}}-OH$

Propan-2-ol ($2^0$)

or

2-Propanol ($2^0$).

b) $CH_3-CH_2-CH_3-\underset{OH}{\underset{|}{CH}}-CH_3$

2-Butanol ($2^0$)

or

Butan-2-ol ($2^0$)

iii. Tertiary alkanol: They have three alkyl groups and no hydrogen atom attached to the carbon atom that carries the hydroxyl group.

E.g

a. $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-OH$

2-Methyl Propan-2-ol ($3^0$).

or

2-Methyl-2-Propanol ($3^0$)

b. $CH_3-CH_2-CH_2-\underset{\underset{CH_3}{|}}{\overset{\overset{OH}{|}}{C}}-CH_3$

2-Methyl Butan-2-ol

or

2-Methyl-2-Butanol.

2. Classification based on the number of hydroxyl groups they possess.

They are as follows:

i. Monohydric alkanols: Monohydric alkanols have only one hydroxylic group (-OH) present in the alkanol structure

E.g

a. $CH_3CH_2CH_2OH$ or $CH_3-CH_2-\underset{\underset{OH}{|}}{\overset{\overset{H}{|}}{C}}-OH$

Propanol (Monohydric alkanol)

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MATRIC NO: 19/MHS01/416

Assignment:

1. Discuss the two major Classification of Alkanols. Give two examples each for each class.

i Classification based on the number of Alkyl group

Alkanol has the general Molecular formula formula "R-OH" where "R" is the alkyl group eg

Methyl - $CH_3$-

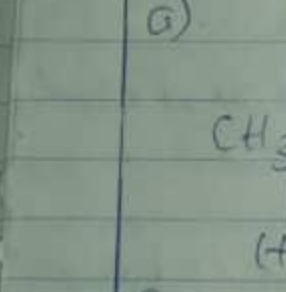
Ethyl - $CH_3CH_2$ -

while -"OH" is the hydroxyl group which is the main functional group for alkanols.

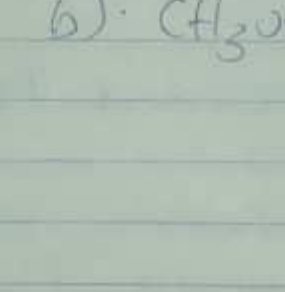
Therefore can be Classified as follows.

i: Primary alkanol: Primary alkanols have only one alkyl group or three or two hydrogen atom attach to the carbon atom that carries hydroxyl group.

Example.

a)


Ethanol (1°)

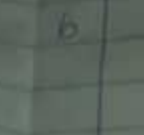
b). $CH_3OH$ or


Methanol (1°)

ii: Secondary alkanol: Secondary alkanols have two alkyl groups or one hydrogen atom attached to the carbon that carries the hydroxyl group.

Example

b)



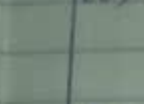
Ethanol (Monohydric alkanol)

ii) Dihydric Alkanols: They are also called glycols which have two hydroxyl groups present in the alkanol, groups present in the alkanol structure

e.g

$CH_3CH(OH)CH_2CH(OH)CH_2CH_3$

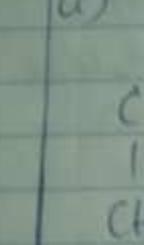
Hexane-2, 4-diol (Dihydric Alkanol)

ii). 

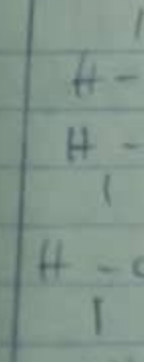
Ethane-1, 2-diol (Dihydric Alkanols).

iii Trihydric alkanol: They are alkanols that have three hydroxyl groups present in the alkanol structure

Eg.

a) 

Propane-1,2,3-triol (Trihydric alkanol).

b). 

D-glyceraldehyde

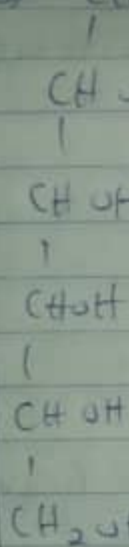
iv. Polyhydric alkanols: They are those alkanols having more than three hydroxyl groups in the alcohol structure.

Eg

a) $CH_3CH(OH)CH(OH)CH(OH)CH(OH)CH(OH)CH_3$

Heptane-2, 3, 4, 5, 6-Pentanol (Polyhydric alkanol)

b)

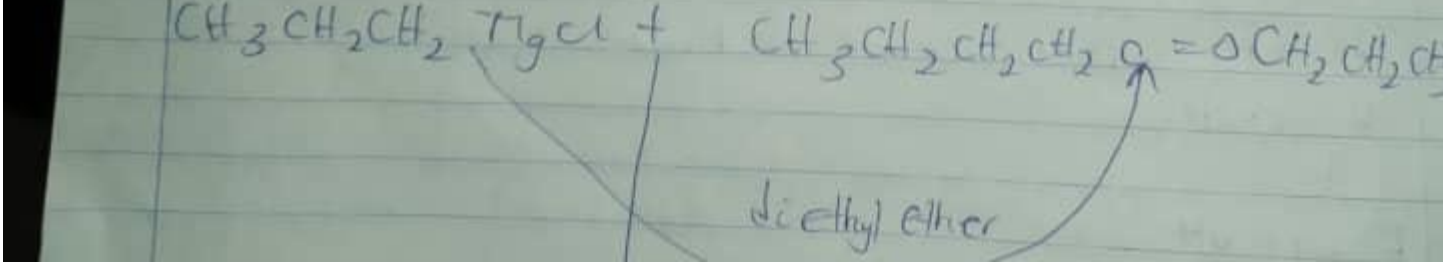


L-(-)-Talose.

2. In the grignard synthesis of alkanols, reacted a named Grignard reagent with $CH_3CH_2CH_2C=OCH_2CH_2CH_3$ Show the reaction step.

$CH_3CH_2CH_2MgCl + CH_3CH_2CH_2CH_2C=OCH_2CH_2$

Propyl Magnesium Chloride. — 4-octanone — octan-4-ol



The maltase is broken down into glucose in addition of yeast which contains the enzyme maltase and at a temperature of 15°C

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow[\text{Maltase}]{15^\circ C} 2C_6H_{12}O_6$$
Maltose. glucose.

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

$$C_6H_{12}O_6 \xrightarrow[\text{Zymase}]{15^\circ C} 2CH_3CH_2OH + 2CO_2$$
Glucose. Ethanol.

4. Determine the product obtained used in the reduction of Alkanone and Alkanal. use a specific example for each and show the equation of reaction.

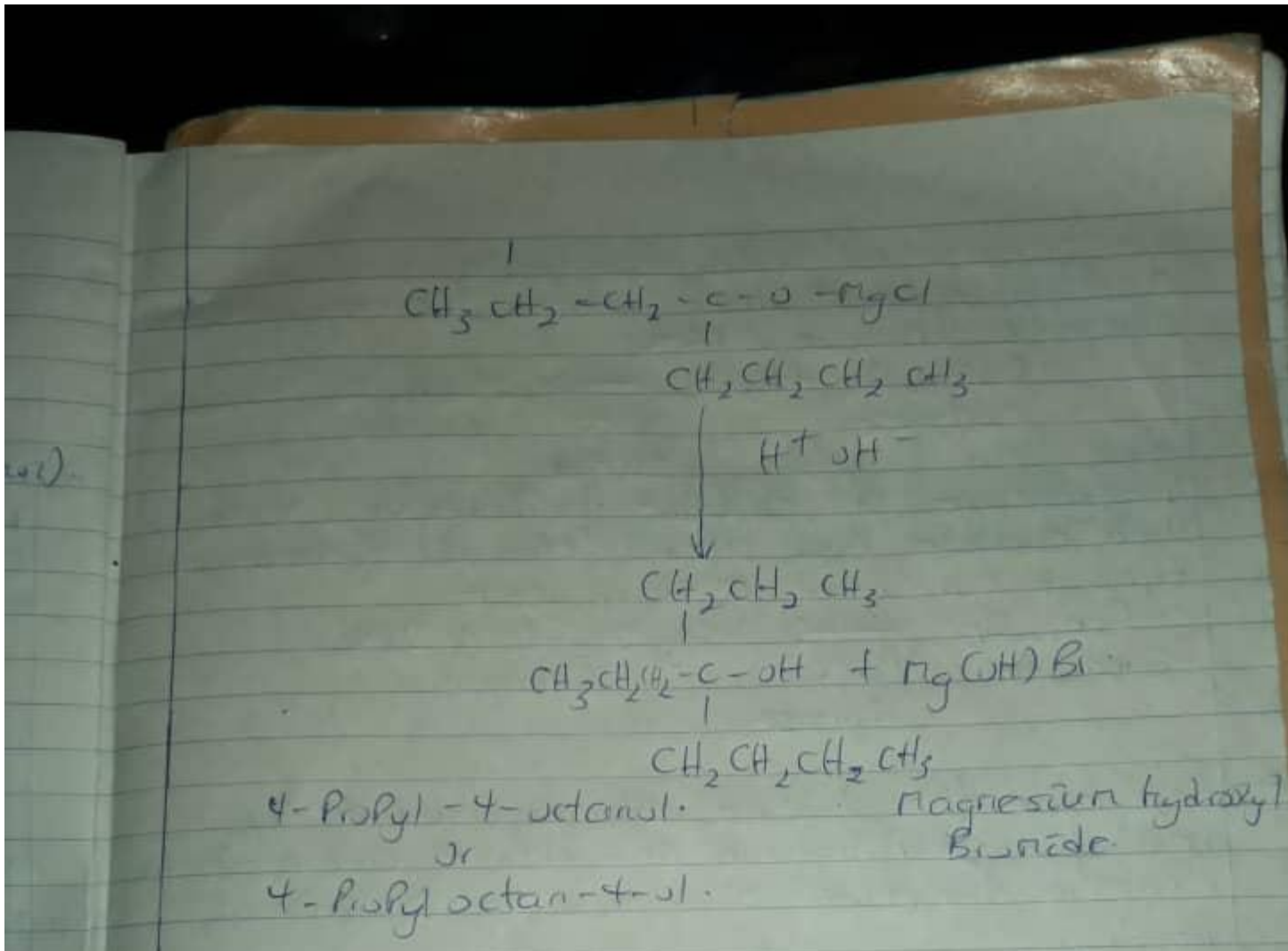
Alkanals and alkanones are reduced to primary and secondary alkanol by hydrogenation of carbon-oxygen double bonding the presence of a catalyst such as Platinum (Pt) nickel (Ni), Palladium (Pd) catalyst or with sodium Tetrahydroborate (III) ($NaBH_4$).

Examples: 1). Reduction of an alkanol yield. An alkanal are reduced to primary alkanols. e.g

$$CH_3CH_2CH_2\underset{\underset{H}{|}}{C}=O + H_2 \xrightarrow{Pt, Ni, or Pd} CH_3CH_2CH_2CH_2OH$$
Butanol.

2). Reduction of an alkanone yield a secondary alkanol e.g.

$$CH_3-\overset{\overset{O}{\|}}{C}-CH_3 + H_2 \xrightarrow{Ni, Pt, Pd} CH_3-\underset{\underset{H}{|}}{\overset{\overset{OH}{|}}{C}}-CH_3$$
2-Propanol.




4-Propyl-4-octanol. Or 4-Propyloctan-4-ol.

Magnesium hydroxyl Bromide

3. Discuss the industrial manufacture of ethanol showing all the reactions equations and necessary enzymes and temperature of reaction.

Carbohydrates such as starch are major group of natural components that can be made to yield ethanol by the biological process of fermentation. The biological catalysts, enzyme found in yeast breakdown the carbohydrate molecule into ethanol to give a yield of 95%. The starch containing Material include Molasses, Potatoes, Cereals, seed and on warming with malt to 60°C for a specific Period of time are converted to maltose by the enzyme diatase contained in malt.

$2(C_6H_{10}O_5)_n + nH_2O \longrightarrow nC_{12}H_{22}O_{11}$