

NAME: AKINKUNMI SAMUEL ADUNGBEOM  
 MATRIC NO: 17/MHS 01/071  
 DEPT: MEDICINE AND SURGERY

CHEM 102 ASSIGNMENT 1

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

Ans: There are two Major Classifications of Alkanols which are:  
 \* Classification based On the number of hydrogen atoms 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 bearing then it is called Secondary alcohol (2°) and if no hydrogen atom is attached to the carbon atom bearing the hydroxyl group it is called tertiary alcohol (3°).

Examples are:

Primary Alcohol (1°)	Secondary Alcohol (2°)	Tertiary Alcohol (3°)
- Methanol (CH <sub>3</sub> OH)	Propan-2-ol (CH <sub>3</sub> CH(OH)CH <sub>3</sub> )	
- Ethanol (CH <sub>3</sub> CH <sub>2</sub> OH)	Butan-2-ol (CH <sub>3</sub> CH <sub>2</sub> CH(OH)CH <sub>3</sub> )	
→ <u>Tertiary Alcohol (3°)</u> :		
- 2-Methylpropan-2-ol ((CH <sub>3</sub> ) <sub>3</sub> C-OH)		
- 2-Methylbutan-2-ol ((CH <sub>3</sub> ) <sub>3</sub> CH <sub>2</sub> C-OH)		

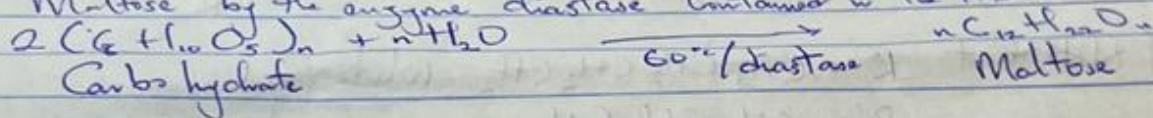
\* Classification based On the number of hydroxyl groups they possess.  
Monohydric alcohols have one hydroxyl group present in the alcohol structure. Dihydric alcohols are also called Glycols have two hydroxyl groups present in the alcohol structure while trihydric alcohols have three hydroxyl groups present in the structure of the alcohol. polyhydric alcohols or polyols have more than three hydroxyl groups.

Examples

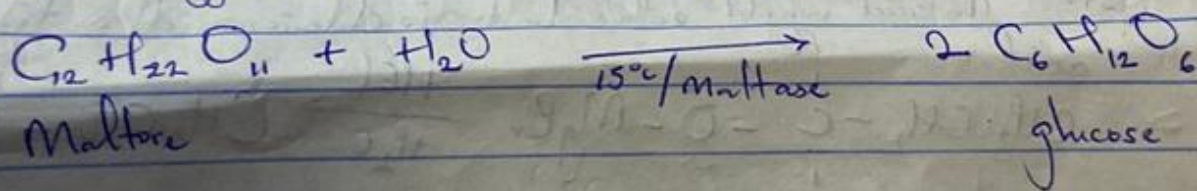
Monohydric Alcohol	Trihydric Alcohol
	Propan-1,2,3-triol (OHCH <sub>2</sub> CH(OH)CH <sub>2</sub> OH)

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

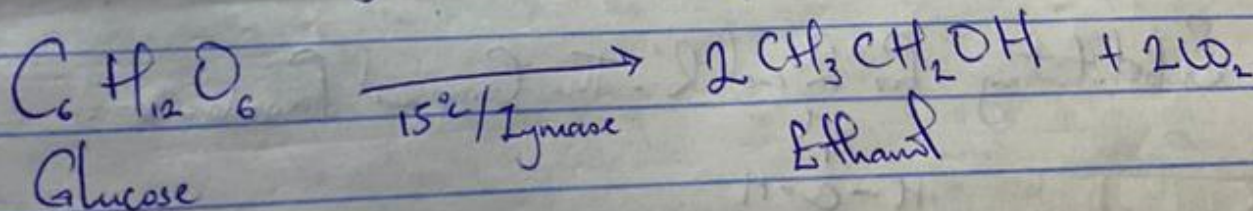
Ans → Carbohydrates such as starch are major group of natural compounds that can be made to yield ethanol by the biological process of fermentation. The biological catalyst, enzymes found in yeast break down the carbohydrate molecules into ethanol + give a yield of 95%. The starch containing materials include molasses, potatoes, cereals, rice 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.



→ The maltose is broken down into glucose on addition of yeast which contains the enzyme maltase and at temperature of 15°C.

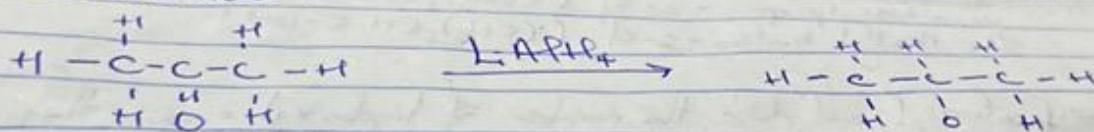


→ The glucose at constant temperature of 15°C is then converted into alcohol by the enzyme zymase contained also in yeast.



② Determine the product obtained in the reduction of Alkanone and Alkanol. Use a specific example of each and show the equation of the reaction.

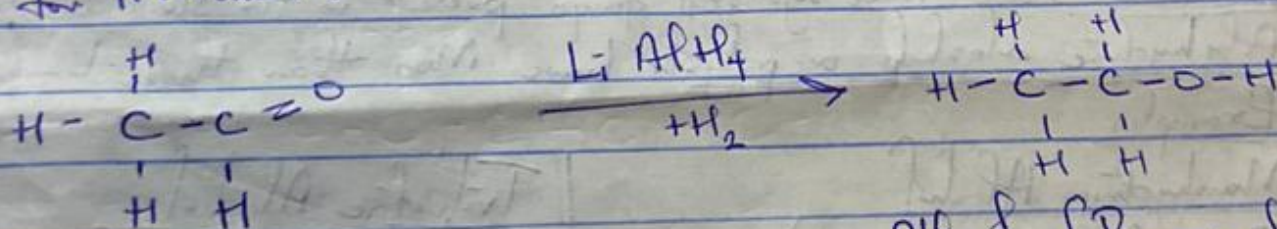
→ For Alkanone:



Propanone

Propan-2-ol [Secondary alkanol]

→ For Alkanol:



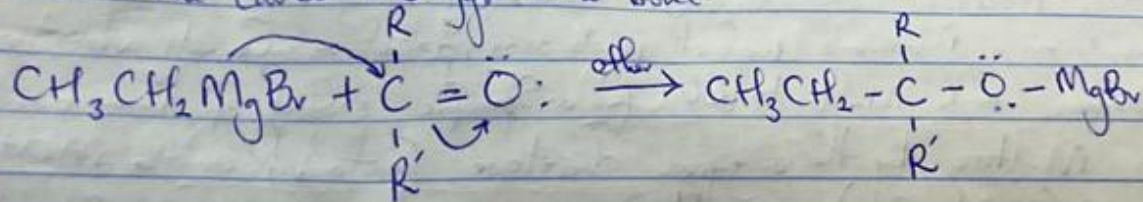
Ethanal

Ethanol [Primary alkanol]

② In the Grignard Synthesis of Alkanols, react a named Grignard reagent with  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{C}=\text{OCH}_2\text{CH}_2\text{CH}_3$ . Show the step reactions.

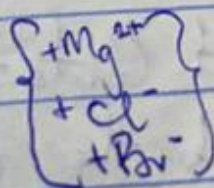
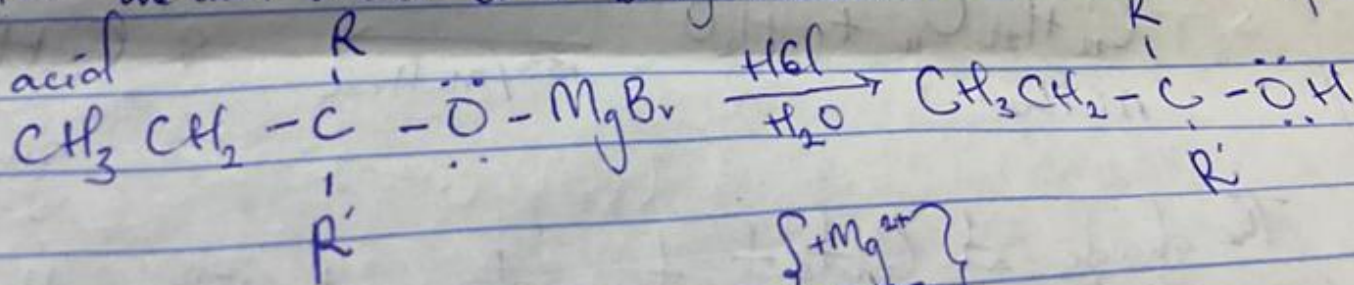
Ans: Reaction between ethyl magnesium bromide (Grignard reagent with butan-4-one.)

⇒ In the first stage, the Grignard reagent (ethylmagnesiumbromide) adds across the Carbon-Oxygen double bond.



{ Note that  $\text{R} = \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2$  while  $\text{R}' = \text{CH}_2\text{CH}_2\text{CH}_3$  }

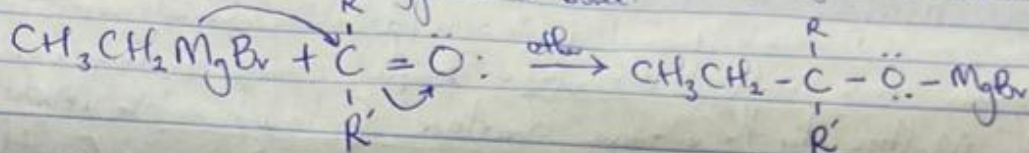
⇒ A dilute acid is then added to hydrolyse the product in  $^{\circ}\text{Rn}$  state. The acid would either be hydrochloric acid or tetraoxosulphate(VI).



② In the Grignard Synthesis of Alkanols, visit a named Grignard reagent with  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{C}=\text{OCH}_2\text{CH}_2\text{CH}_3$ . Show the step reactions.

Ans: Reaction between ethyl magnesium bromide (Grignard reagent) with butan-4-one.

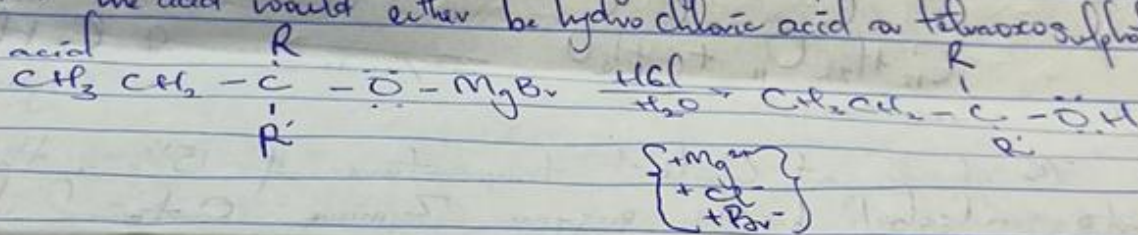
⇒ In the first stage, the Grignard reagent (ethylmagnesium bromide) adds across the Carbon-Oxygen double bond.



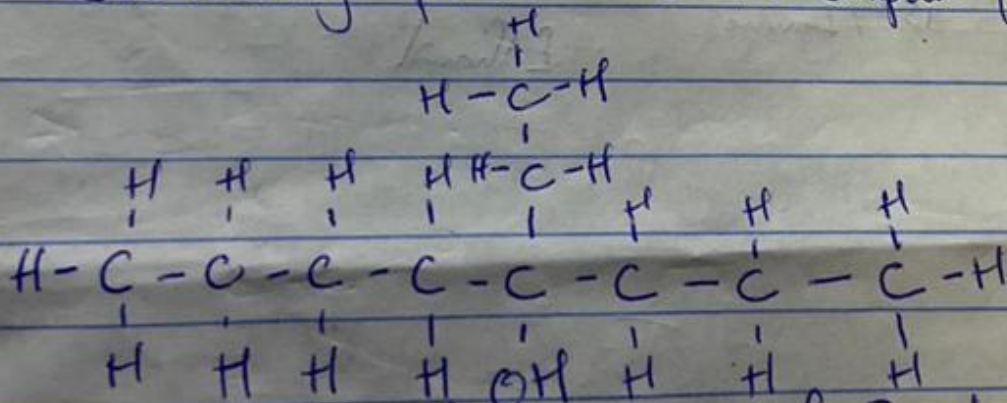
Note that  $\text{R} = \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2$  white  
 $\text{R}' = \text{CH}_2\text{CH}_2\text{CH}_3$

⇒ A dilute acid is then added to hydrolyze the product in  $\text{R}^{\text{H}}$

Note: The acid would either be hydrochloric acid or tetraoxosulphate(VI)



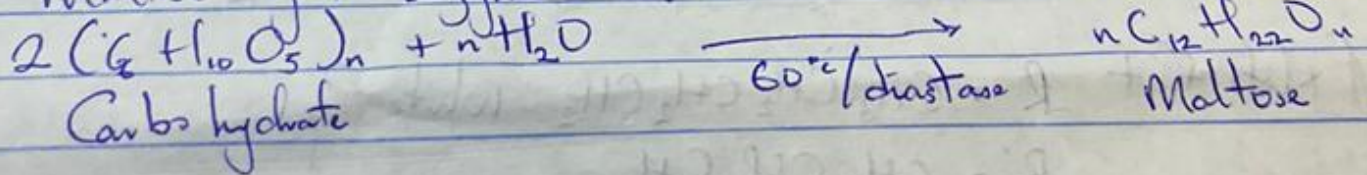
Substituting for R and R'. The Compound formula is:



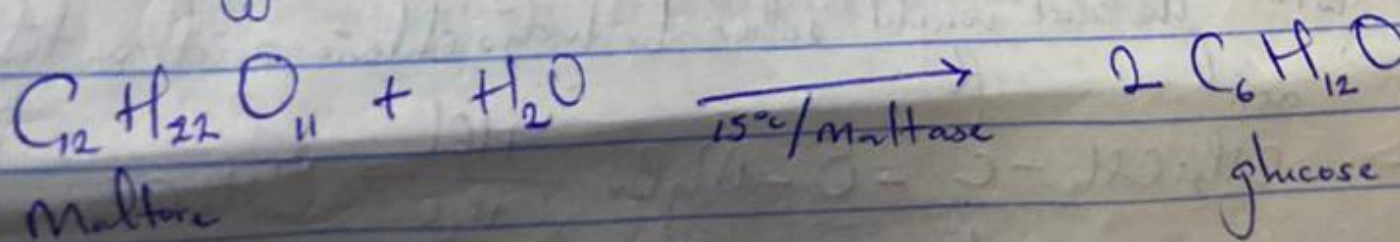
4-ethyldecan-4-ol [a tertiary alcohol]

③ Discuss the Industrial Manufacture of ethanol showing all reactions equations and necessary enzymes and temperature of reaction

Ans. → 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 catalyst, enzymes found in yeast break down the Carbohydrate molecules into ethanol + give a yield of 95%. The starch containing materials include molasses, potatoes, cereals, rice 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.



→ The Maltose is broken down into glucose on addition of yeast which contains the enzyme Maltase and at temperature of 15°C



Q) Discuss the two Major Classification of Alkano. Give two examples for each class.

Ans: There are two Major Classifications of Alkano which are:  
 \* Classification based On the number of hydrogen atoms 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 bearing then it is called Secondary alcohol (2°) and if no hydrogen atom attached to the Carbon atom bearing the hydroxyl group it is called tertiary alcohol (3°).

Examples are:

- |  |   |                              |
|--|---|------------------------------|
| → <u>Primary Alcohol (1°)</u>                  | <u>Secondary Alcohol (2°)</u>                                       | <u>Tertiary Alcohol (3°)</u> |
| - Methanol (CH <sub>3</sub> OH)                | Propan-2-ol (CH <sub>3</sub> CH(OH)CH <sub>3</sub> )                |                              |
| - Ethanol (CH <sub>3</sub> CH <sub>2</sub> OH) | Butan-2-ol (CH <sub>3</sub> CH <sub>2</sub> CH(OH)CH <sub>3</sub> ) |                              |
- Tertiary Alcohol (3°):
- 2-Methylpropan-2-ol ((CH<sub>3</sub>)<sub>3</sub>C-OH)
  - 2-Methylbutan-2-ol ((CH<sub>3</sub>)<sub>3</sub>CH<sub>2</sub>C-OH)

\* Classification 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 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.

Examples

Monohydric Alcohol

- Propanol (CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>OH)
- Ethanol (CH<sub>3</sub>CH<sub>2</sub>OH)

Trihydric Alcohol

- Propan-1,2,3-triol (OHCH<sub>2</sub>CH(OH)CH<sub>2</sub>OH)
- Benzene-1,2,3-triol

Dihydric Alcohol

- Ethane-1,2-diol (HOCH<sub>2</sub>CH<sub>2</sub>OH)
- Hexane-2,4-diol (CH<sub>3</sub>CH(OH)CH<sub>2</sub>CH(OH)CH<sub>2</sub>CH<sub>3</sub>)

Polyhydric Alcohol

- Heptane-2,3,4,5,6-pentanol
- pentaerythritol C(CH<sub>2</sub>OH)<sub>4</sub>