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MAT NO: 19/MHS01/274

CHEM 102 ASSIGNMENT

1. Discuss the two major classification of alkanols. Give two examples each for each class.

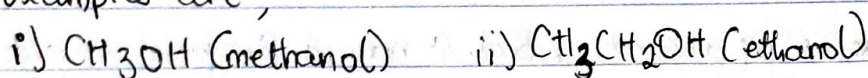
ANSWER

There are two major classifications of alkanol which are as follows;

- i) Classification based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group. Based on this classification alkanols can be further classified into the following;

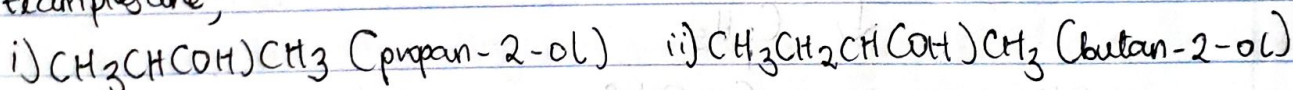
- i) Primary alkanol: If the numbers of hydrogen atoms attached to the carbon atom bearing the hydroxyl group are three or two, it is called a primary alcohol / primary alkanol ( $1^\circ$ ).

Examples are;



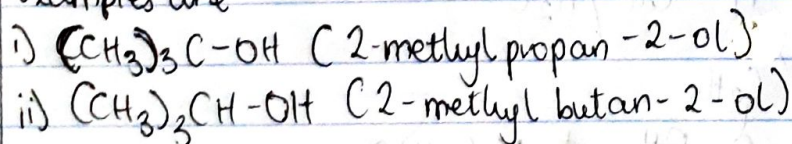
- ii) Secondary alkanol: If the number of hydrogen atom attached to the carbon atom bearing the hydroxyl group is one then it is called a secondary alkanol ( $2^\circ$ ).

Examples are;



- iii) Tertiary alkanol: If there is no hydrogen atom attached to the carbon atom bearing the hydroxyl group then it is called a tertiary alkanol ( $3^\circ$ ).

Examples are



2. Classification based on the number of hydroxyl groups they possess. Under this class we have the following;

- i) Monohydric alcohols: These alkanols have one hydroxyl group present in the alkanol structure.



- ii) Dihydric alkanols: These alkanols have two hydroxyl groups present in the alkanol structure. They are also called glycols.
- iii) Trihydric alkanols: These alcohols have three hydroxyl groups present in the alkanol structure. They are also called triols.
- iv) Polyhydric alkanols: These alkanols have more than three hydroxyl groups in the alkanol structure.

EXAMPLES include:

Monohydric alkanols i) propanol ii) Ethanol

Dihydric alkanols i) Ethane-1,2-diol ii) Hexane-2,4-diol

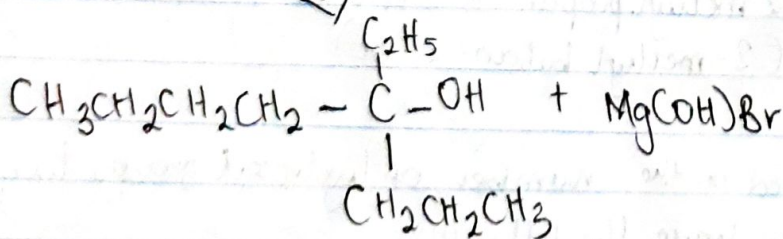
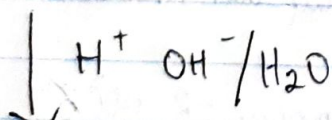
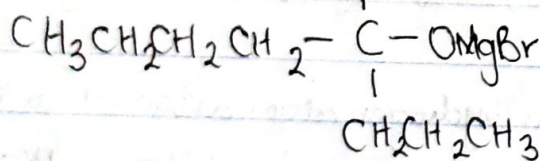
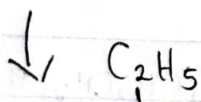
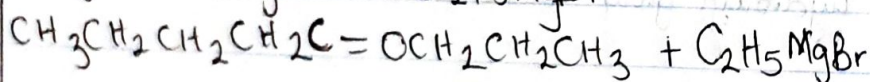
Trihydric alkanols i) Propane-1,2,3-triol ii) Glycerol

Polyhydric alkanols i) Heptane-2,3,4,5,6-pentaol ii) Glycol

2) In the Grignard synthesis of alkanols, react a named Grignard reagent with  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{C}=\text{OCH}_2\text{CH}_2\text{CH}_3$

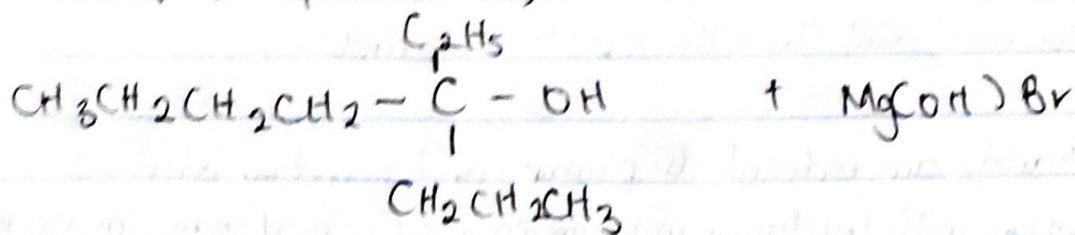
ANSWER:

Grignard reagent -  $\text{C}_2\text{H}_5\text{MgBr}$





The final product is;

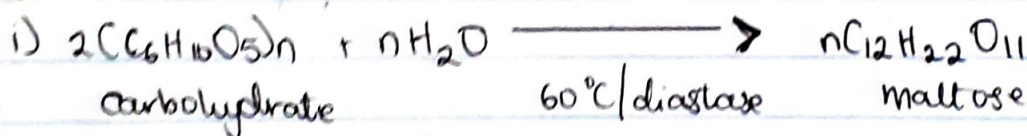


3- Discuss the industrial manufacture of ethanol showing all reaction equations and necessary enzymes and temperature of reaction.

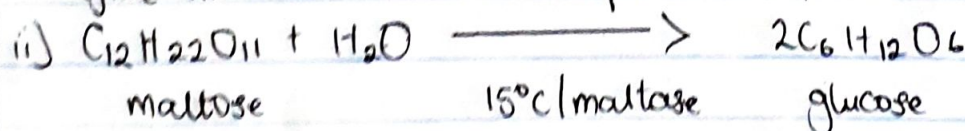
ANSWER.

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, enzymes found in yeast break down the carbohydrate molecules into ethanol to give a yield of 95%. The starch containing materials include molasses, potatoes, cereals, rice and on warming with malt to  $60^\circ\text{C}$  for a specific period of time are converted into maltose by the enzyme diastase contained in the malt.

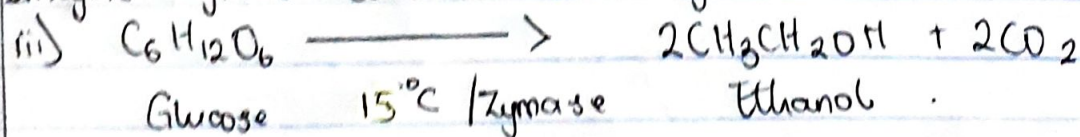
EQUATIONS



The maltose is broken down into glucose on addition of yeast which contains the enzyme maltase and at a temperature of  $15^\circ\text{C}$ .



The glucose at constant temperature of  $15^\circ\text{C}$  is then converted into alcohol by the enzyme zymase contained also in yeast.



4) Determine the product obtained in the reduction of alkanone and alkanal. Use a specific example for each and show the equation of reaction  
ANSWER:

Alkanones and alkanals are reduced to primary and secondary alcohols respectively by reaction with hydrogen in the presence of a platinum or nickel catalyst or with aluminium isopropoxide (the Meerwein-Ponndorf reaction) or with complex metal hydride, such as lithium tetrahydridoaluminate(III) ( $\text{LiAlH}_4$ ) or sodium tetrahydridoborate(III) ( $\text{NaBH}_4$ )

