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ASSIGNMENT

1.THE TWO MAJOR CLASSIFICATIONS OF ALKANOLS

A) Alcohols fall into different classes depending on how the -OH group is positioned on the chain of carbon atoms or the number of hydrogen atoms attached to thecaebon atom containing the hydroxyl group. There are some chemical differences between the various types.

Primary Alkanols

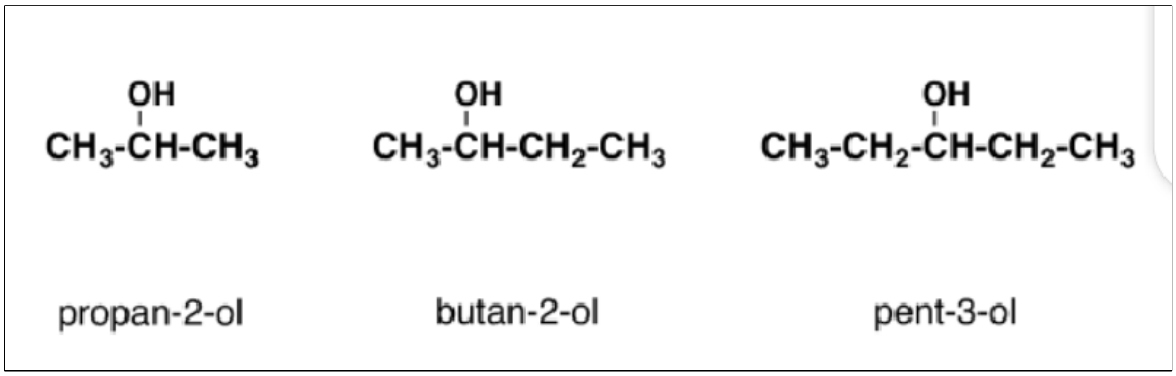
In a primary (1°) alcohol, the carbon atom that carries the -OH group is only attached to one alkyl group or attached to two or three hydrogen atoms. Some examples of primary alcohols are shown below:

CH_3-CH_2-OH	CH_3-CH_2-CH_2-OH	CH_3-CH(-CH_3)-CH_2-OH
ethanol	propan-1-ol	2-methylpropan-1-ol

Notice that the complexity of the attached alkyl group is irrelevant. In each case there is only one linkage to an alkyl group from the CH_2 group holding the -OH group. There is an exception to this. Methanol, CH_3OH, is counted as a primary alcohol even though there are no alkyl groups attached to the the -OH carbon atom.

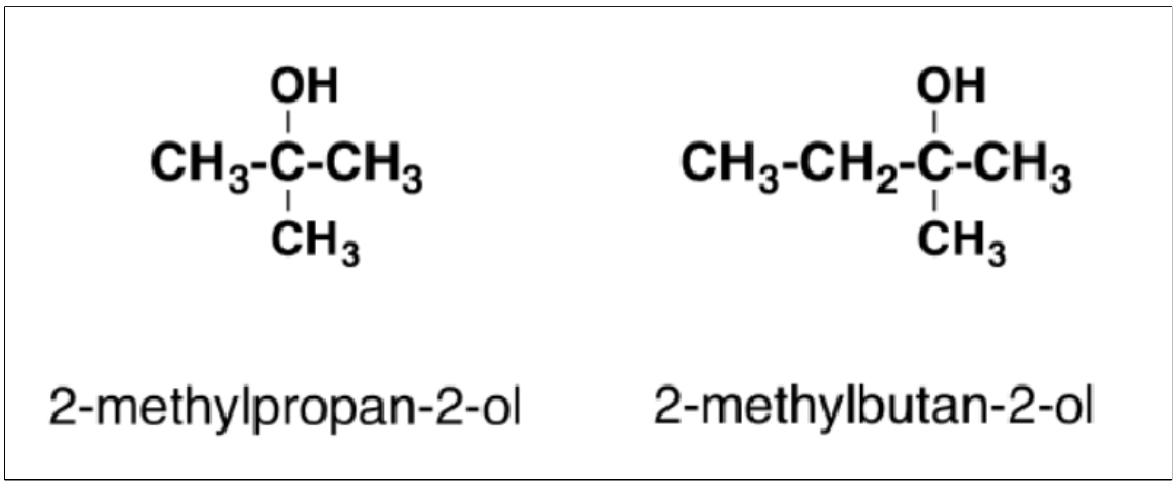
Secondary Alkanols

In a secondary (2°) alcohol, the carbon atom with the -OH group attached is joined directly to two alkyl groups, which may be the same or different or attached to only one hydrogen atom. Examples include the following:



Tertiary Alkanols

In a tertiary (3°) alcohol, the carbon atom holding the -OH group is attached directly to three alkyl groups, which may be any combination of the same or different groups or attached to no hydrogen atom. Examples of tertiary alcohols are given below:



B) This is based on the number of hydroxyl groups they possess.

Monohydric alcohols

They have only one hydroxyl group present in the alcohol strructure. E.g: Ethanol (CH_3CH_2OH) and Butanol ($CH_3CH_2CH_2CH_2OH$)

Dihydric alcohols

They are also called Glycols and have two hydroxyl groups present in the

structure of the alcohol. E.g: Ethan-1,2-diol ($HOCH_2CH_2OH$) and Hexan-2,4-diol [$CH_3CH(OH)CH_2CH(OH)CH_2CH_3$]

Tryhydric alcohols

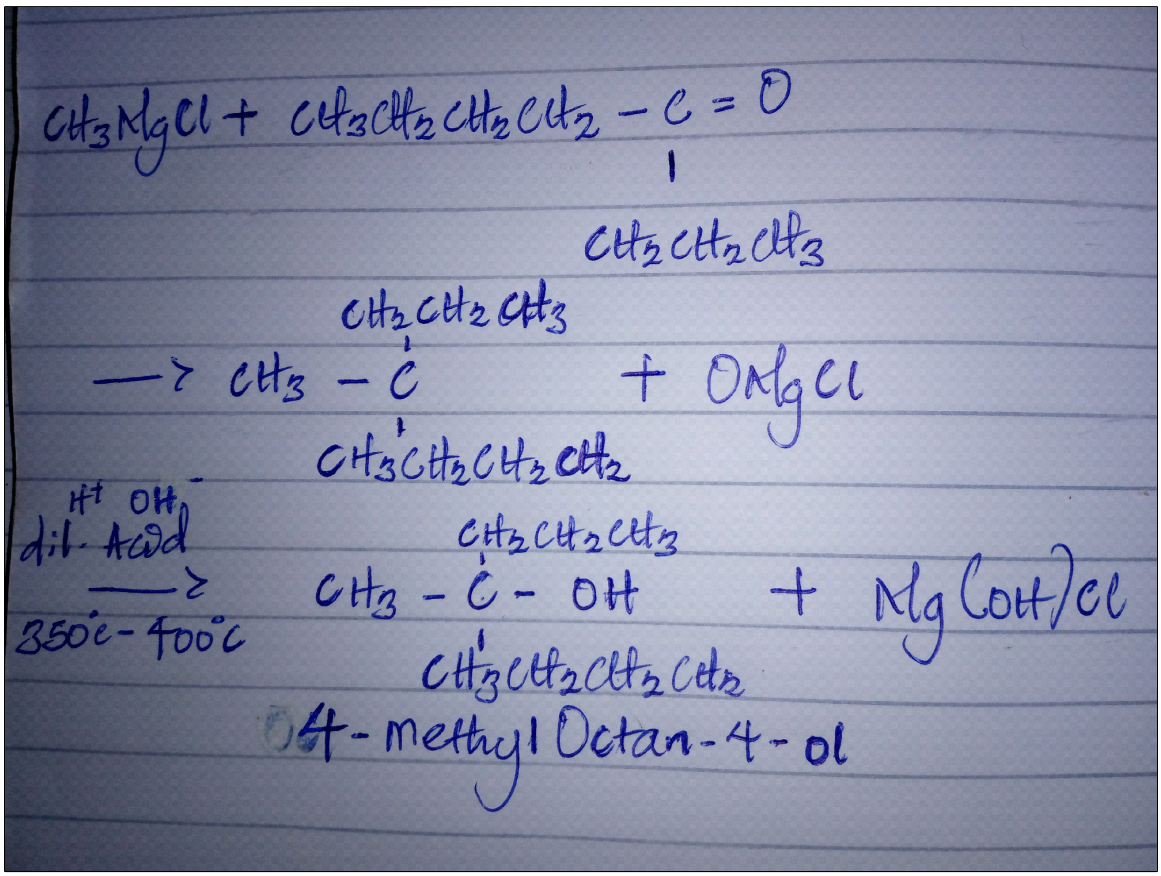
They are also called triols and have three hydroxyl groups present in their alcohol structure. E.g: Propan-1,2,3-triol [$OHCH_2CH(OH)CH_2OH$] and Butan-1,2,4-triol [$OHCH_2CH(OH)CH_2CHOH$]

Polyhydric alcohols

They are also called polyols and have more than three hydroxyl groups in their alcohol structure. E.g: Heptan-2,3,4,5,6-pentaol [$CH_3CH(OH)CH(OH)CH(OH)CH(OH)CH(OH)CH_3$] and Octan-2,3,4,6-butaol [$CH_3CH(OH)CH(OH)CH(OH)CH_2CH_2CH(OH)CH_2CH_3$].

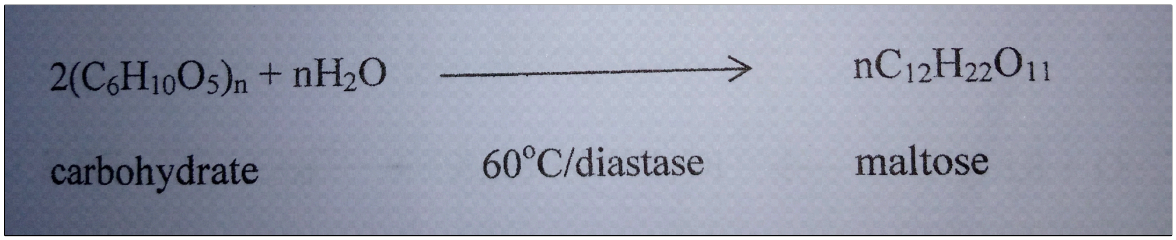
2. Grignard reagent used- CH_3MgCl (MethylmagnesiumChloride)

Alkanone given- $CH_3CH_2CH_2CH_2C{=}OCH_2CH_2CH_3$ (Octan-4-one)

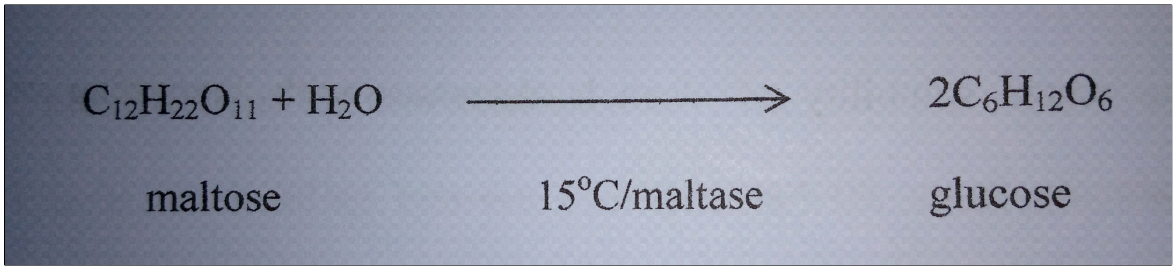


3. The Industrial Manufacture of Ethanol with all Reactions and Necessary Enzymes and Temperature of Reaction

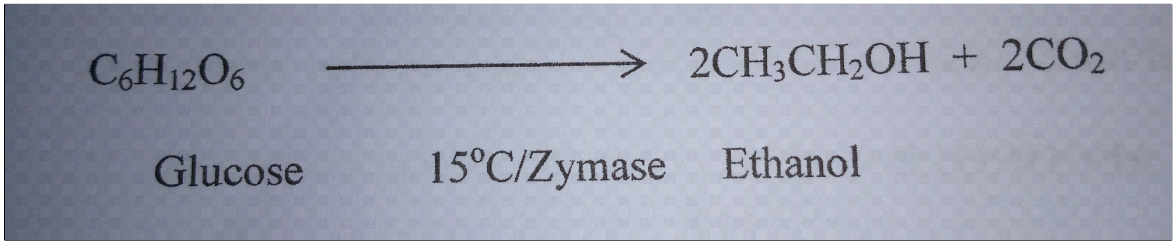
Carbonhydrates such as starch are major group of natural compounds that can be made to yeild ethanol by the biological process of fermentation. The biological catalysts, enzymes found in yeast break down the carbonhydrate molecules into ethanol to give a yeild of 95%. The starch containing materials include molasses, potatoes, cereals, rice and on warming with malt to 60^0c 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 a temperature of 15^0C



The glucose at constant temperature of 15^0C is the converted into alcohol by the enzyme Zymase contained also in yeast.



NOTE:

Substrate (the glucose solution) - Enzymes work best when there is a high enough substrate concentration for the reaction they catalyse. If too little

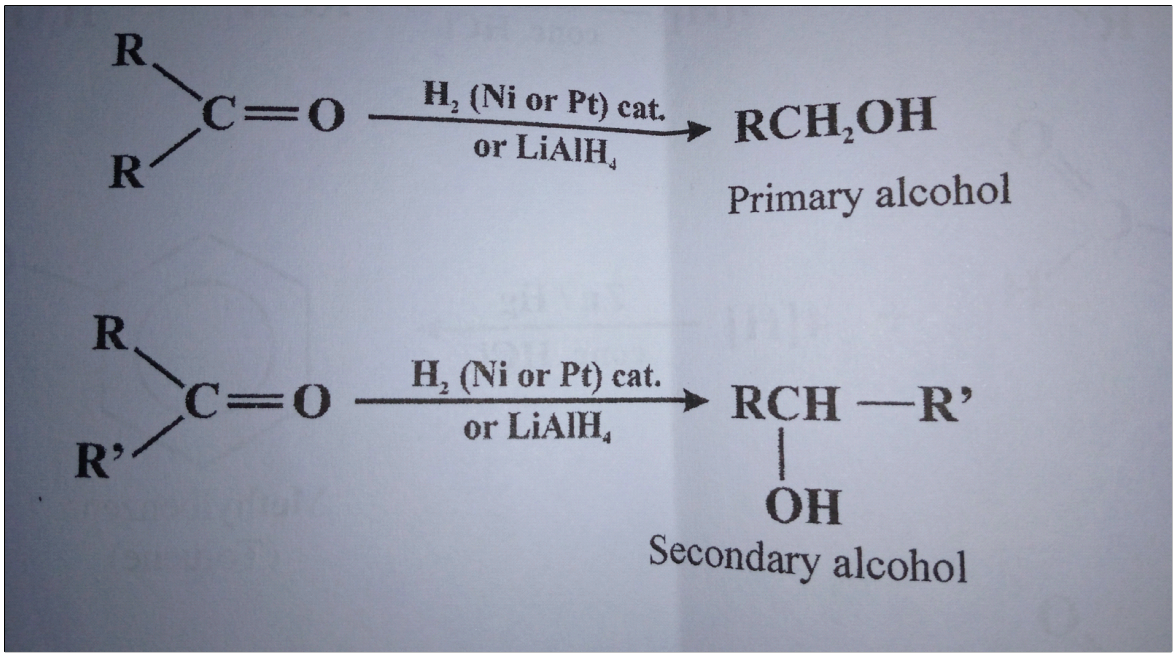
substrate is available the rate of the reaction is slowed and cannot increase any further.

Absence of Oxygen – Air must be excluded from the vessel in which fermentation is being carried out. Air contains a large proportion of bacteria called Acetobacter. Acetobacter bacteria use atmospheric oxygen from air to oxidise ethanol in the wine, producing a weak solution of ethanoic acid (vinegar).

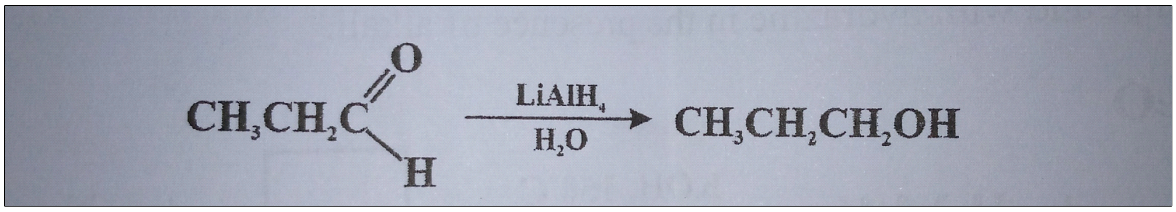
Yeast – the fermentation of the glucose solution to ethanol cannot take place without the presence of yeast. Yeast contains the enzyme zymase which acts as a catalyst for the reaction.

4. The Product Obtained in the Reduction of Alkanone and Alkanal with Specific Examples Each.

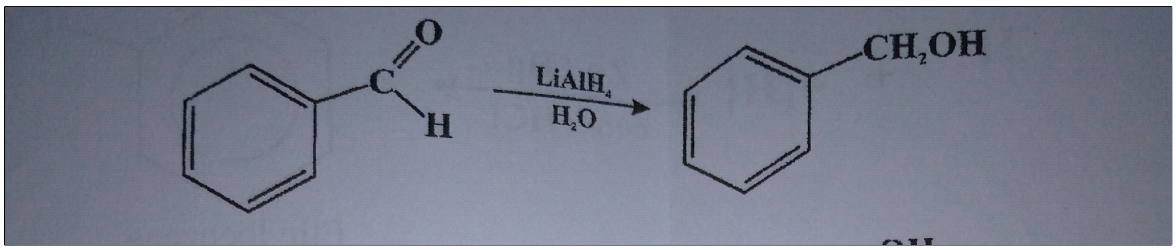
Alkanals and Alkanones are reduced to primary and secondary alcohols respectively by the reaction with hydrogen in the presence of platinum or nickel catalyst or with aluminium isopropoxide (the Meerwein-Ponndorf reaction) or with complex metal hydride, such as lithium tetrahydridoaluminate(III) ($LiAlH_4$) or sodium tetrahydridoborate (III) ($NaBH_4$).



Examples for Alkanals:

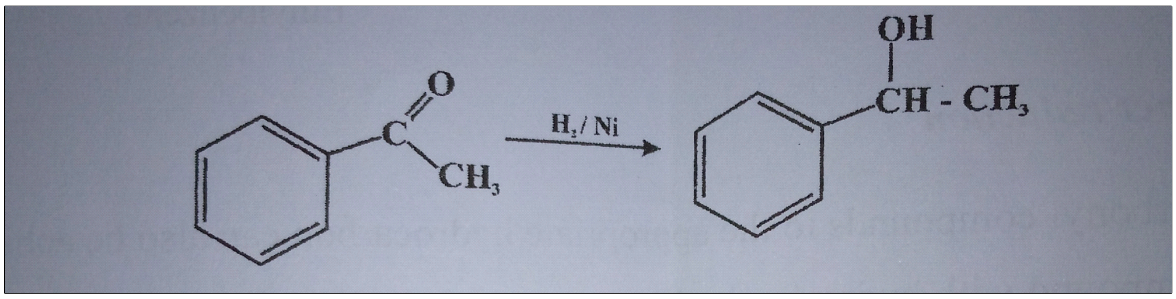


Propanal Propanol (1^0 alcohol)

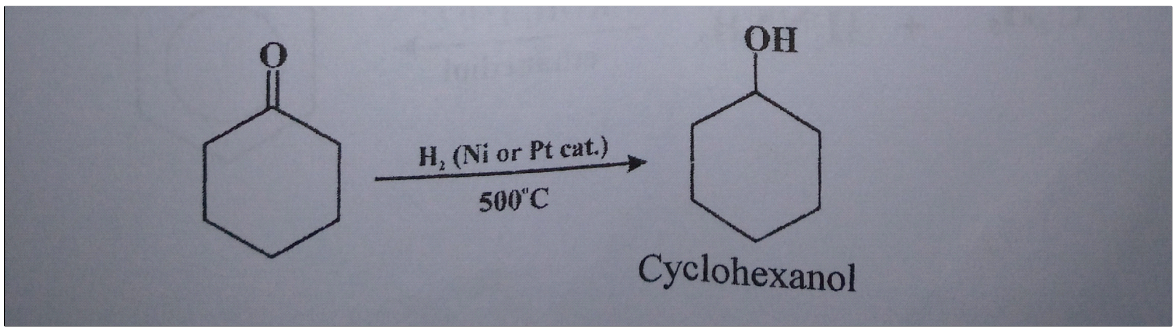


Phenylmethanal Phenylmethanol (1^0 alcohol)

Examples for Alkanones:



Phenylethanone Phenylethanol (2^0 alcohol)



Cyclohexanone Cyclohexanol (2^0 alcohol)