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Mechanical Engineering 2001/01

19/ENG06/040

Chn 102.

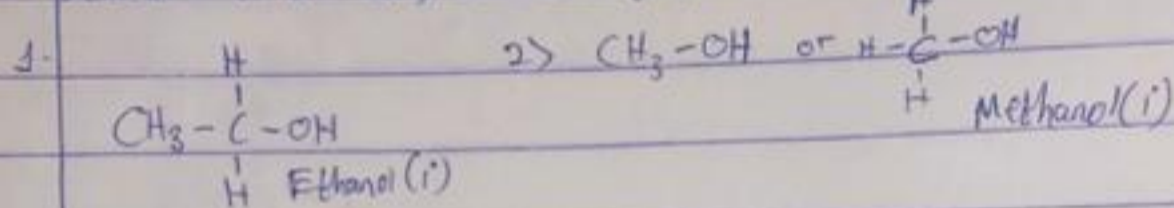
1. There are two major classifications of alkanol which are:

i. Classification based on the number of alkyl group

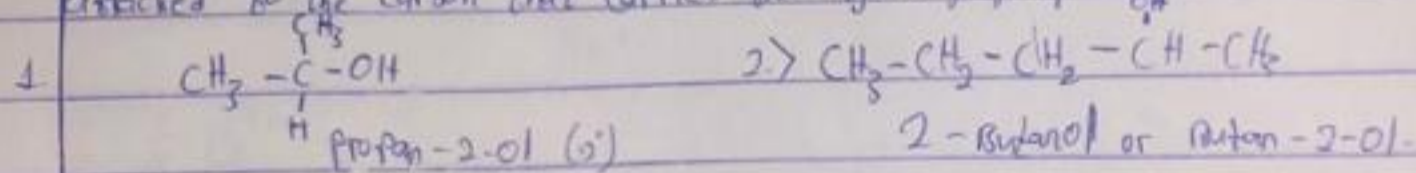
Note: Alkanol has the general molecular formula "R-OH" where R is the alkyl group

e.g. Methyl: CH_3 , etc. while -OH is the hydroxyl group which is the main functional group for alkanols. Therefore, based on this classification, alkanols can be classified as follows:

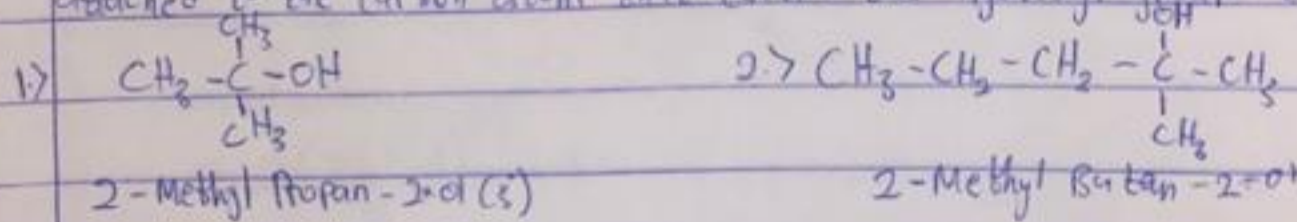
a. Primary alkanol: These have only one alkyl group or three or two hydrogen atoms attached to the carbon atom that carries hydroxyl group. e.g.



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



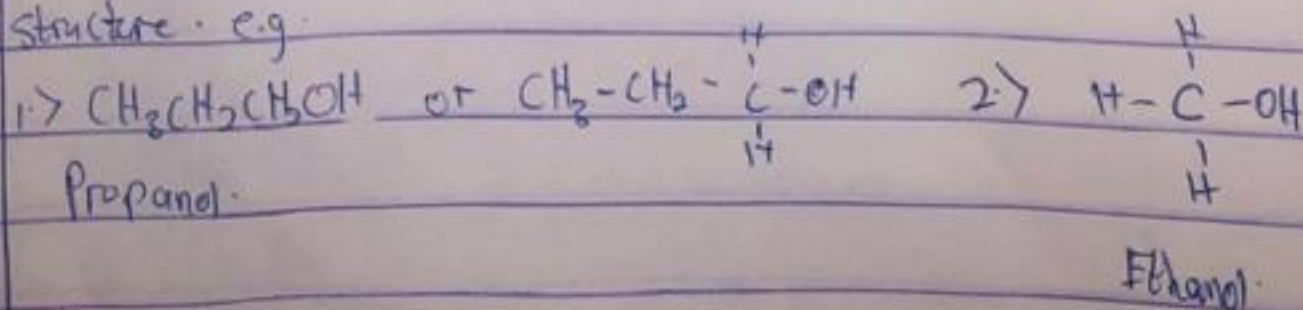
c. Tertiary alkanol: Tertiary alkanols have three alkyl groups and no hydrogen atom attached to the carbon atom that carries the hydroxyl group e.g.



ii. Classification based on the number of hydroxyl groups they possess:

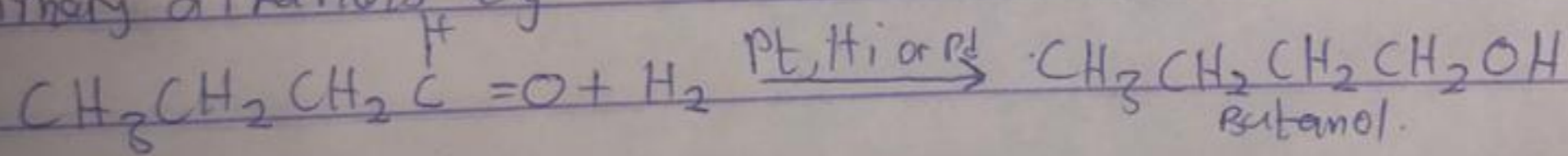
The hydroxyl group has a general formula "-OH". Therefore based on their classification alkanols can be classified as follows:

a. Monohydric alkanols: These have only one hydroxyl group (-OH) present in the alkanol structure. e.g.



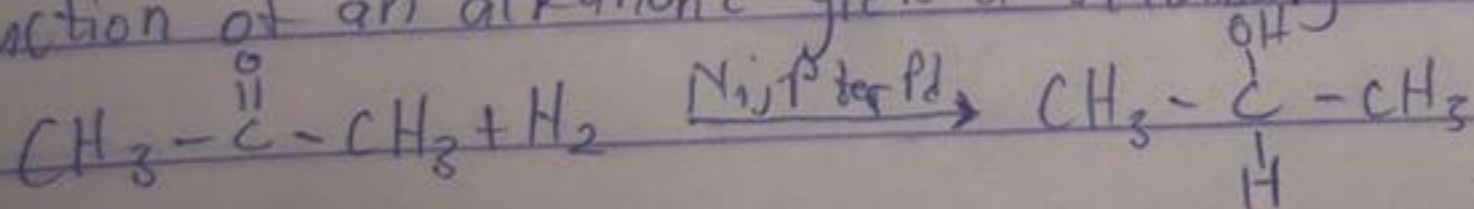
4. Alkanals and alkanones are reduced to primary and secondary alkanol by hydrogenation of carbon-oxygen double bond in the presence of a catalyst such as platinum (Pt), nickel (Ni), palladium (Pd) catalyst or with sodium tetrahydride (III) (NaBH_4).

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



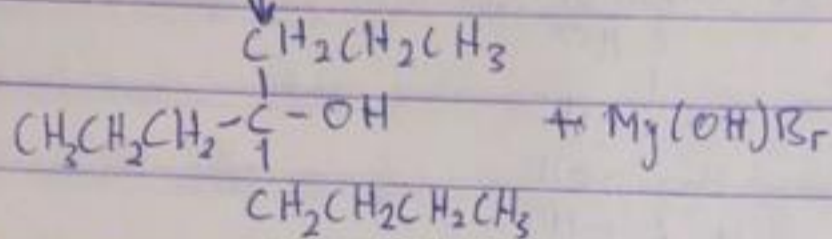
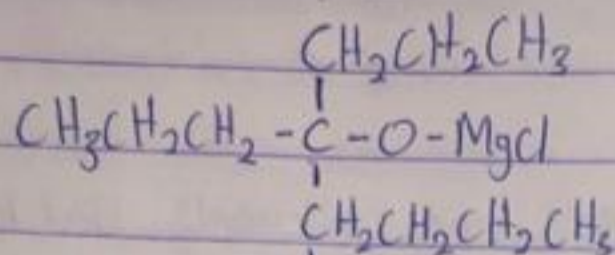
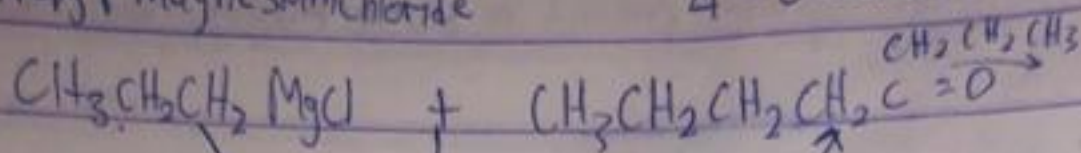
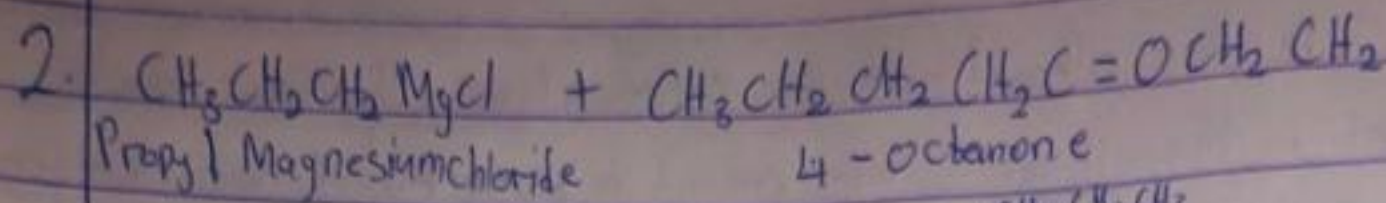
Butanol

ii Reduction of an alkanone yield a secondary alkanol. e.g



2-Propanol

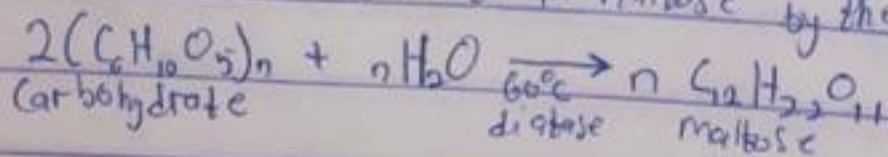
2-Propanone



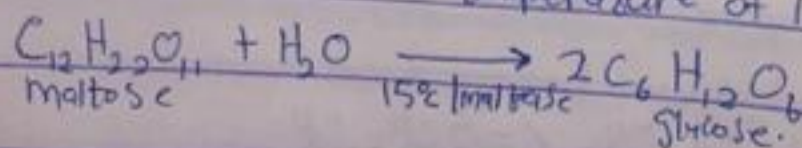
4-propyloctan-4-ol

Magnesium hydroxyl bromide

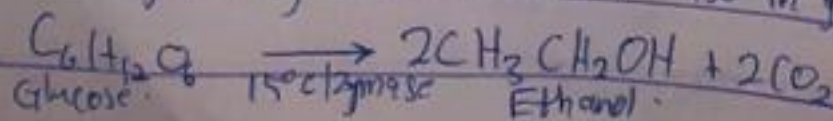
3. Carbohydrates such as starch are major group of natural components that can be made to yield ethanol by the biological process of fermentation. The biological catalysts, enzymes formed in yeast break down the carbohydrate molecules into ethanol to give a yield of 95%. The starch containing materials include molasses, potatoes, cereals, rice and on warming with malt to 60°C for a specific period of time are converted in maltose by the enzyme, diastase, contained in malt.



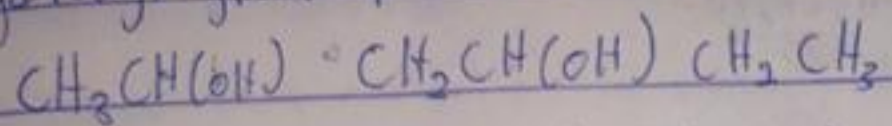
The maltose is broken down into glucose on addition of yeast which contains the enzyme maltase and at a temperature of 15°C.



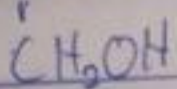
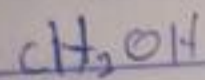
The glucose at constant temperature of 15°C is then converted into alcohol (ethanol) by the enzyme, zymase contained also in yeast.



b) Dihydric alkanols: Dihydric alkanol are also called glycols. They have two hydroxyl group present in the alkanol groups present in the alkanol structure eg

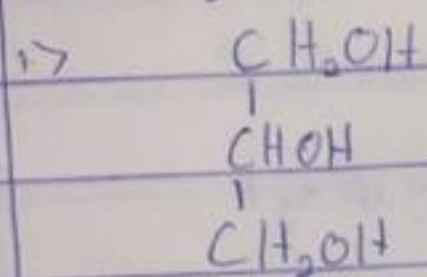


Hexane-2,4-diol (Dihydric alkanol)

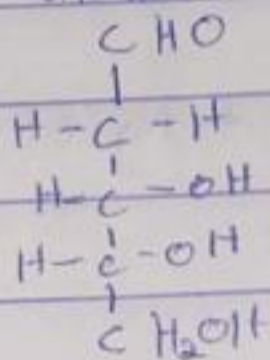


Ethane-1,2-diol (Dihydric alkanols).

c) Trihydric alkanol: Trihydric alkanol or triols are alkanols that have three hydroxyl groups present in the alkanol structure. e.g.



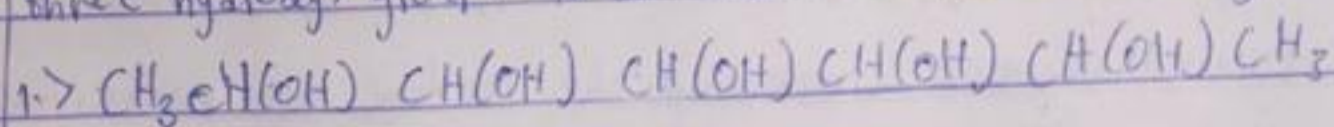
2.)



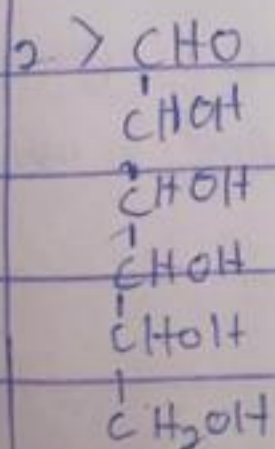
Propane-1,2,3-triol

D-glyceraldehyde

d) Polyhydric alkanols: These alkanols or polyols are those alkanols having more than three hydroxyl groups in the alcohol structure. e.g.



Heptane-2,3,4,5,6-pentanol.



L-(-)-Tartaric acid