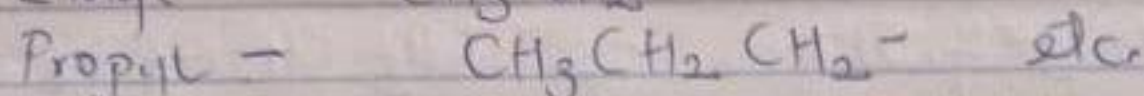
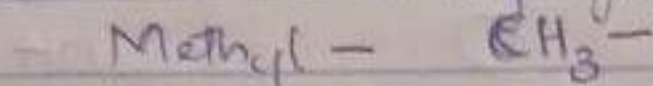


- ① Discuss the two major classification of Alkanols. Give two examples each for each class.

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

- ① Classification based on the number of alkyl group or hydrogen atom.

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

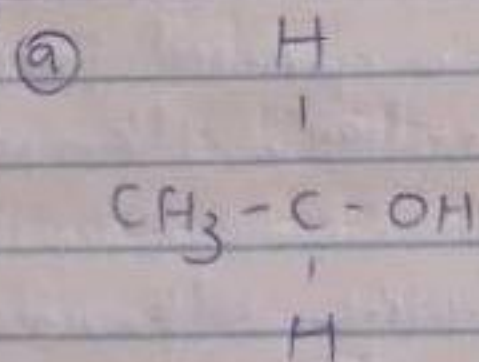


While " $-OH$ " is the hydroxyl group which is the main functional group for alkanols.

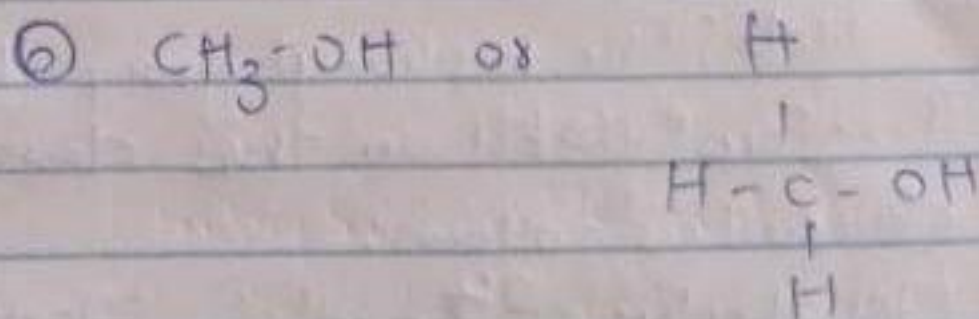
Therefore based on this classification, alkanols can be classified ^{as} follows:

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

eg



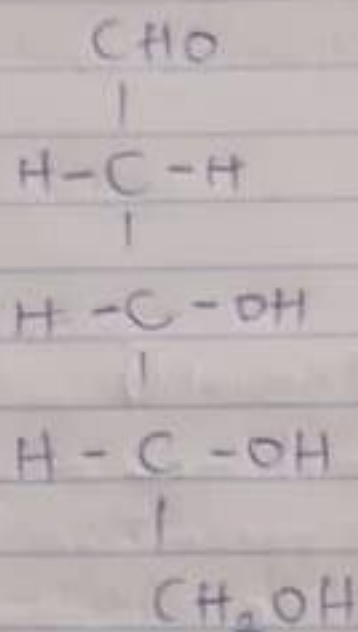
Ethanol (1°)



Methanol (1°)

- ii Secondary alkanol: Secondary alkanols have two alkyl groups or one hydrogen atom attached to the carbon that

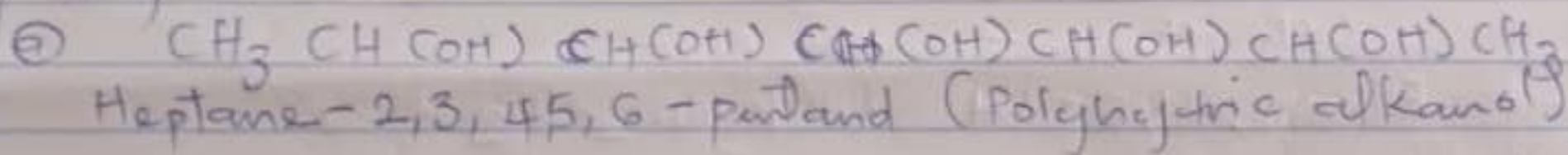
⑥



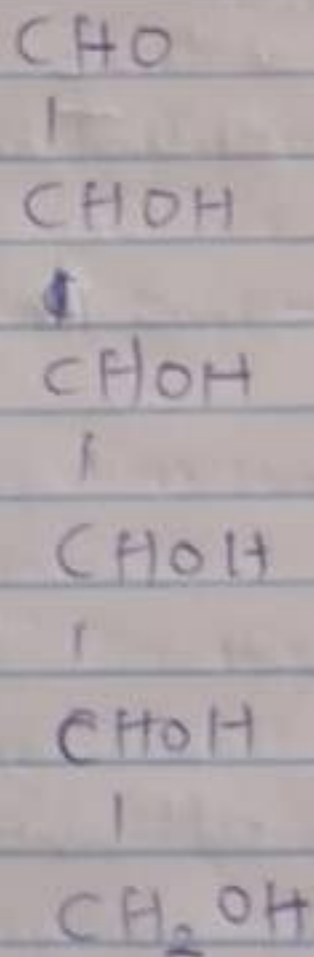
D-glyceraldehyde

1- Polyhydric alcohols: Polyhydric alcohols or polyols are those alcohols having more than three hydroxyl groups in the alcohol structure.

e.g.



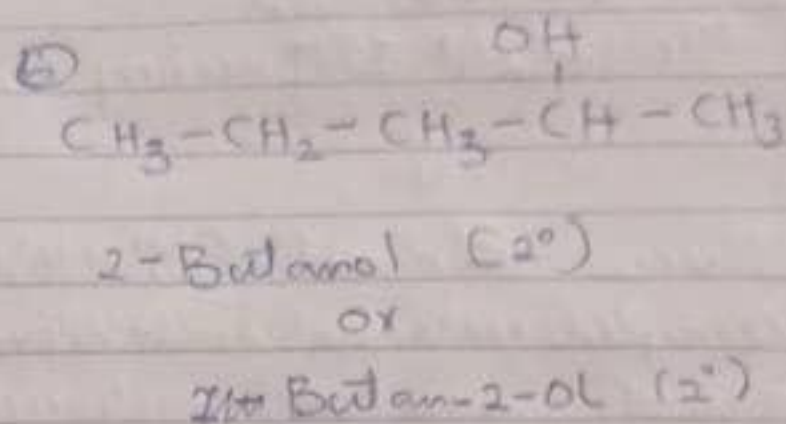
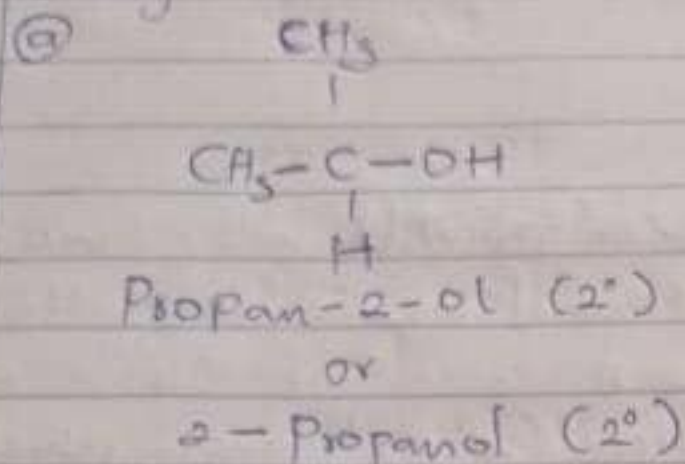
⑥



L-(-)-Talose

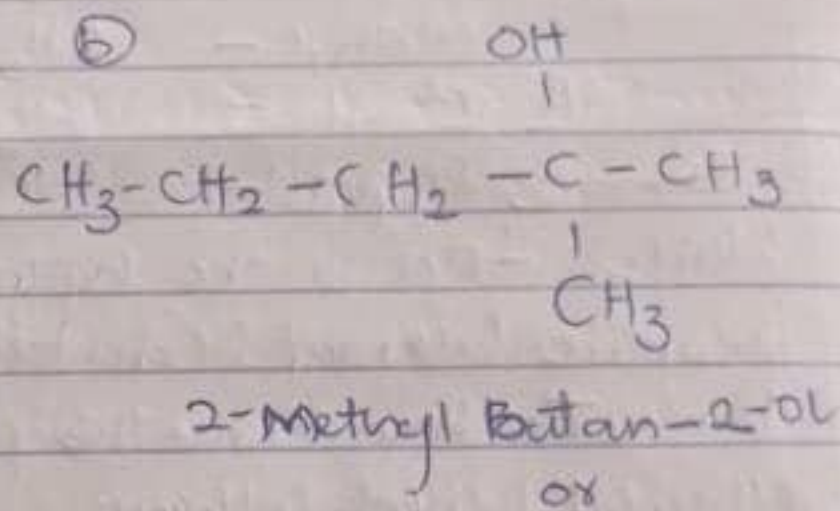
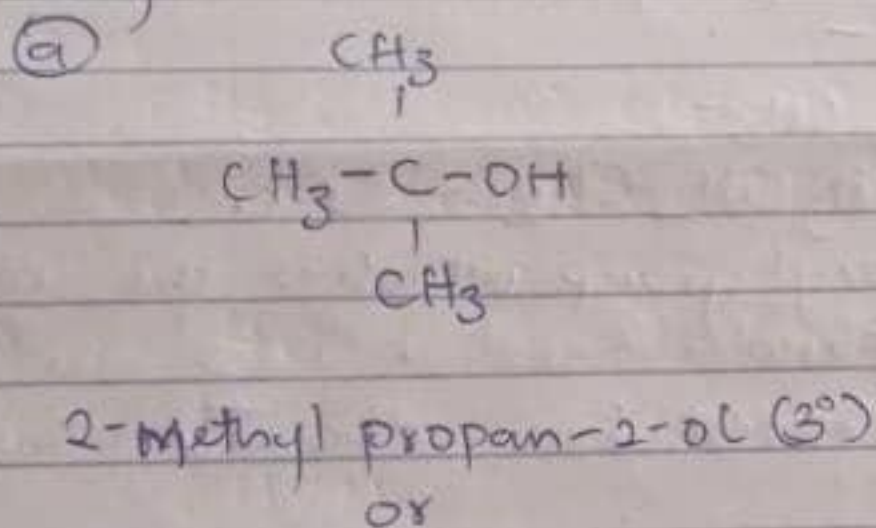
Carries the hydroxyl group.

e.g



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

e.g



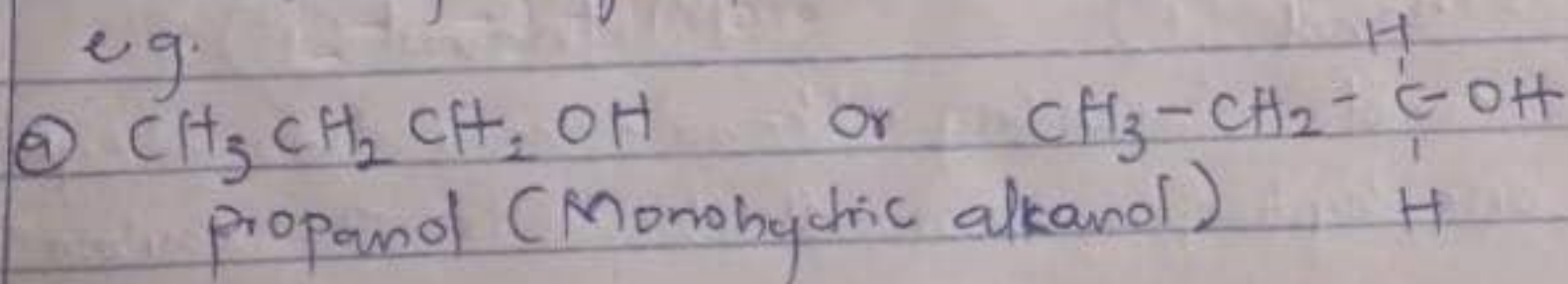
2 Classification based on the number of hydroxyl groups they possess.

Note: The hydroxyl group has a general formula " $-\text{OH}$ ".

Therefore based on this classification, alkanols can be classified as follows:

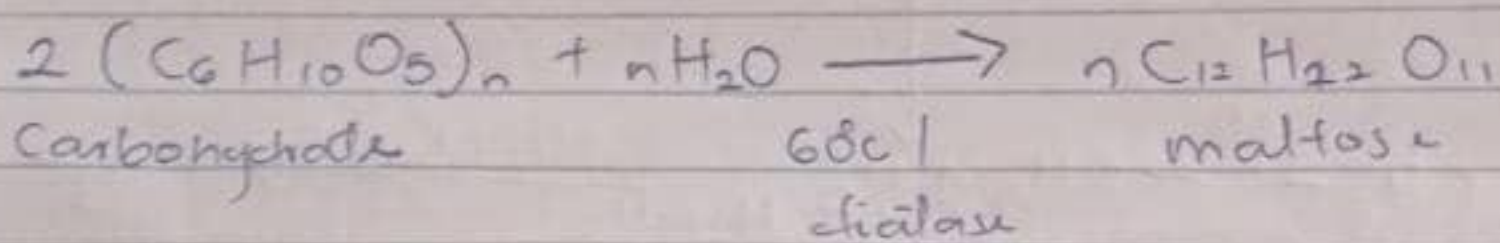
i Monohydric alkanols: Monohydric alkanols have ~~only~~ ^{only} one hydroxylic group ($-\text{OH}$) present in the alkanol structure.

e.g.

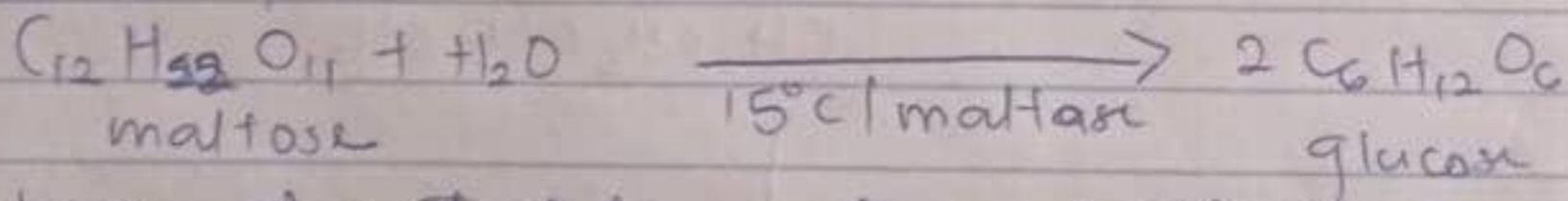


5 Discuss the industrial manufacture of ethanol showing all the reactions equations and necessary enzymes and temperature of reaction.

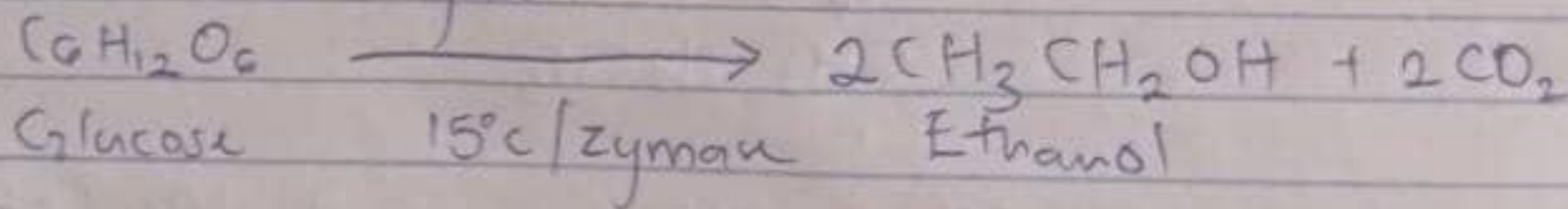
Carbohydrates such as starch are major group of natural compounds that can be made to yield ethanol by the biological process of fermentation. The biological catalysts, enzymes found in yeast break down the carbohydrate molecules into ethanol to give a yield of 95%. The starch containing materials include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

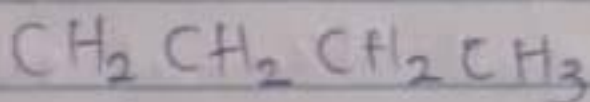
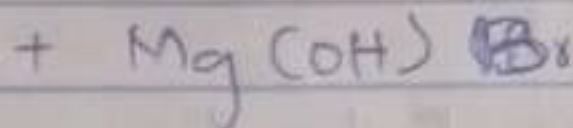
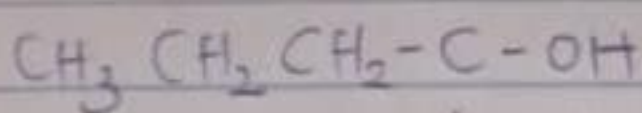
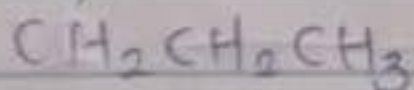
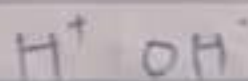
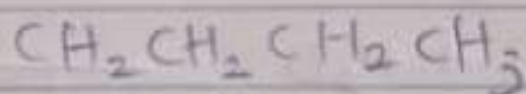
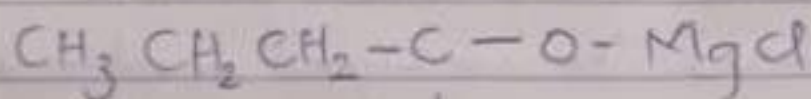
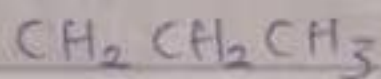
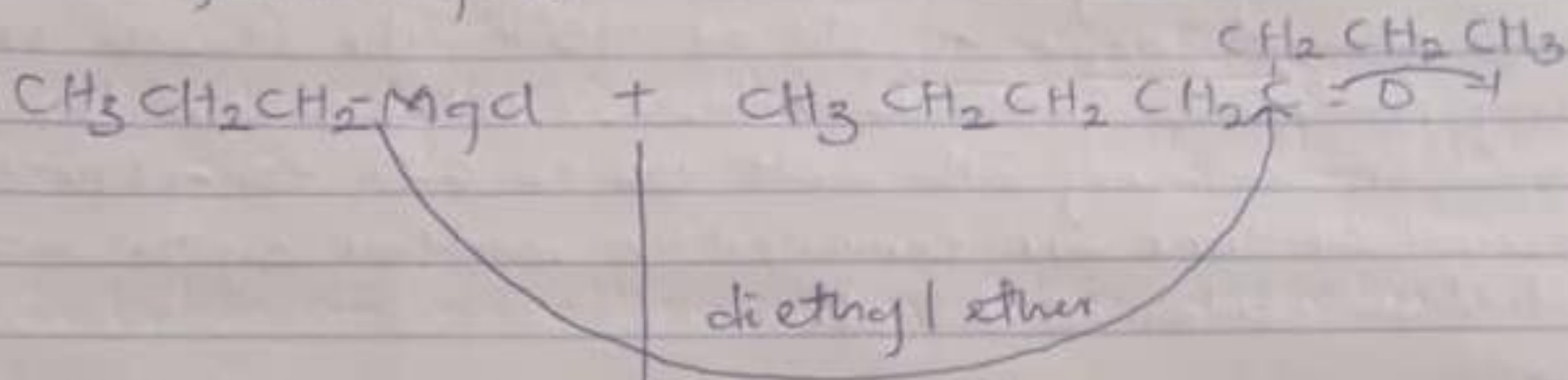
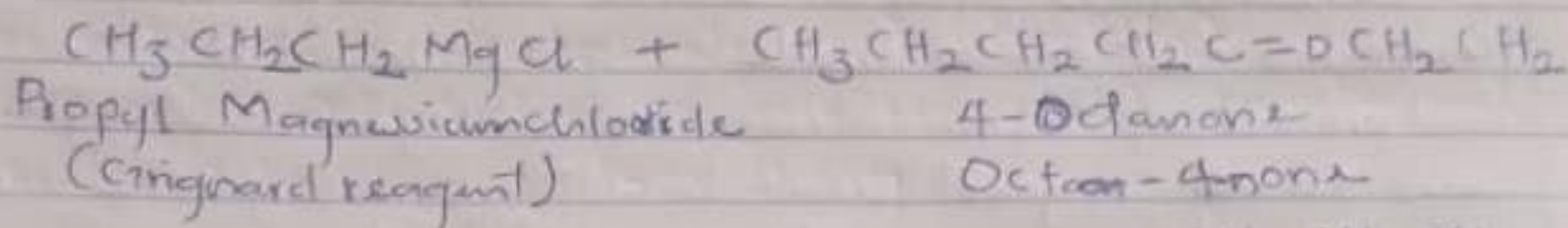


The glucose at constant temperature of 15°C is then converted into alcohol (ethanol) by the enzyme Zymase contained also in yeast.



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.

2 In the Grignard synthesis of alkanols, react named Grignard reagent with $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{C}=\text{OCH}_2\text{CH}_2\text{CH}_3$. $\text{CH}_3\text{CH}_2\text{CH}_2\text{MgCl}$. Show the reaction steps.



4-Propyl-4-Octanol

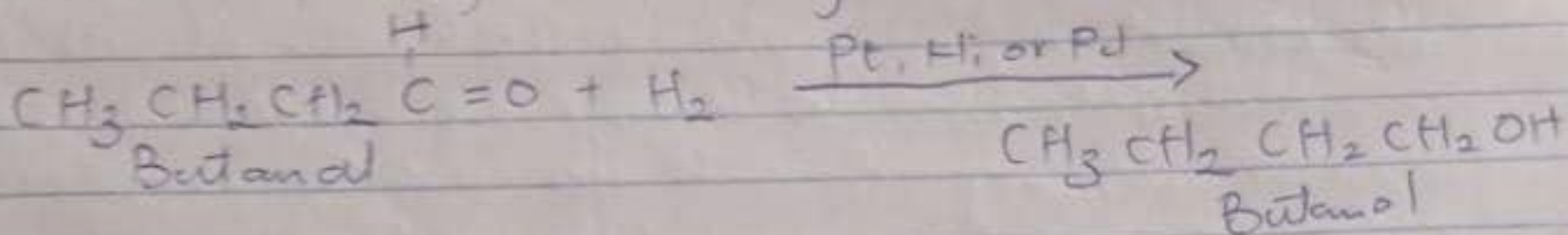
or

4-Propyloctan-4-ol

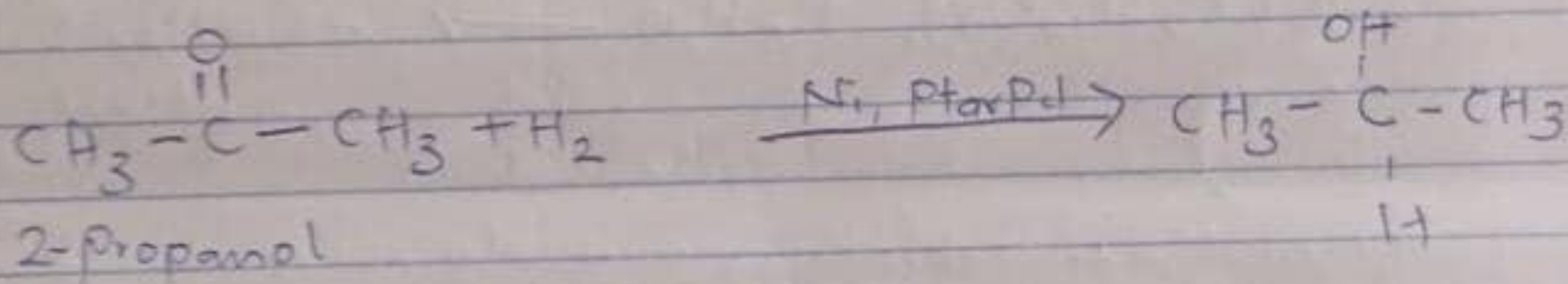
Magnesium hydroxy
bromide

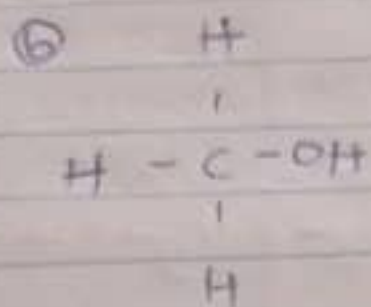
Alkanals and alkanones are reduced to primary and secondary alcohol by hydrogenation of carbon-oxygen double bond in the presence of a catalyst such as platinum (Pt), nickel (Ni), Palladium (Pd) catalyst or with sodium tetrahydride (III) (NaBH_4).

Examples: (i) Reduction of an alkanal yield a primary alcohol e.g



(ii) Reduction of an alkanone yield a secondary alcohol e.g

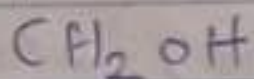
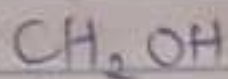
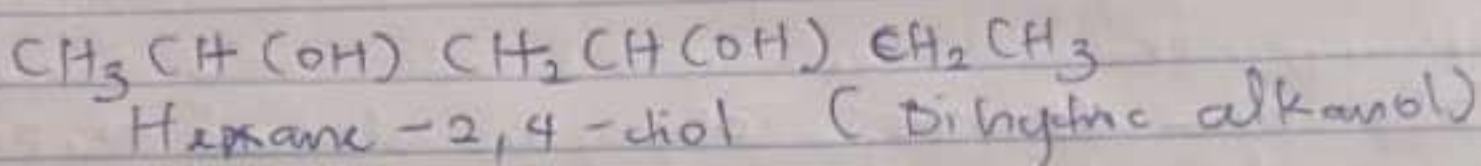




Ethanol (Monohydric alcohol)

ii Dihydric alcohols: Dihydric alcohols are also called Glycols have two hydroxyl group present in the alcohol groups present in the alcohol structure.

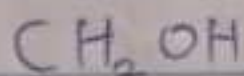
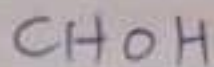
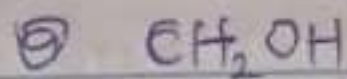
eg



Ethane-1,2-diol (Dihydric alcohols)

iii Trihydric alcohol: Trihydric alcohol or triols are alcohols that have three hydroxyl groups present in the alcohol structure.

eg



Propane-1,2,3-triol (Trihydric alcohol)