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Course: ~~AM~~ CHM 102

Assignment

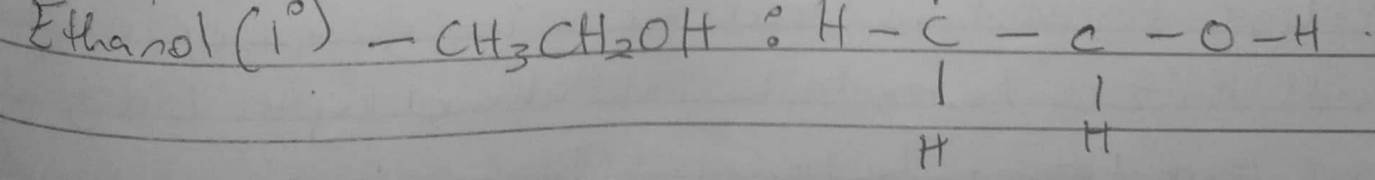
7.) Alcohols are very important organic compounds. Discuss briefly their classification and give one (1) example each.

Answer

(i) Classification based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group.

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 (1°)". In a primary alcohol, the hydroxyl group is attached to a primary/terminal carbon atom in the molecule, it is characterized by $[-CH_2OH]$. If it is one hydrogen atom attached to the carbon atom bearing the hydroxyl group, it is called "Secondary alcohol (2°)". In a secondary alcohol, the $-OH$ group is on a secondary carbon atom, it is characterized by $>[CH-OH]$ and if no hydrogen atom is attached to the carbon atom bearing the hydroxyl group, it is called "tertiary alcohol (3°)". In a tertiary alcohol, the $-OH$ group is on a tertiary carbon atom and is characterized by $>C-OH]$

Example:



(ii) Classification based on the number of hydroxyl groups they possess.
"Monohydric" alcohols have only one hydroxyl group per molecule present in the alcohol structure. "Dihydric" alcohols 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.
Example: $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ - propanol (Monohydric alcohol)

2) Discuss the solubility of alcohols in water, organic solvents.

→ Solubility in water: Lower alcohols with up to three carbon atoms in their molecules are soluble in water because these low alcohols can form hydrogen bond with water molecules. "The water solubility of alcohols decreases with increasing relative molecular mass".

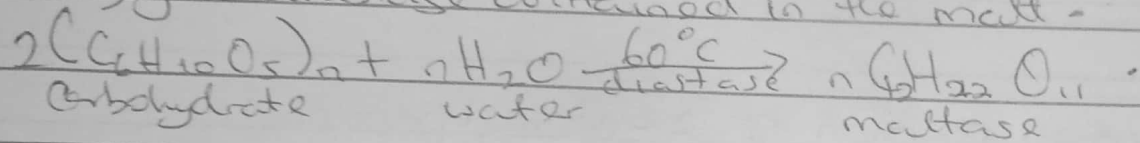
→ Solubility in Organic solvents: All monohydric alcohols are soluble in organic solvents. The solubility of simple alcohols and polyhydric alcohols is largely due to their ability to form hydrogen bonds with water molecules.

3) Show the three steps in the industrial preparation of ~~alcohol~~ ethanol, equations of reaction are mandatory.

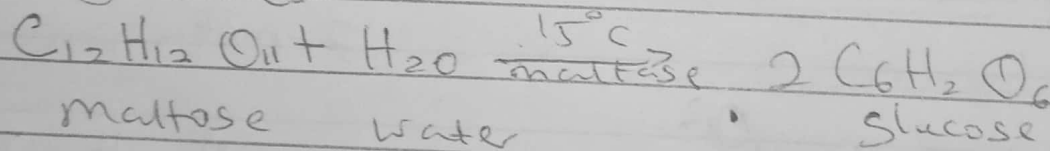
Carbohydrates such as starch are major groups of natural compounds that can be made to yield ethanol by the biological process of fermentation. The biological catalysts/enzymes found

in yeast breakdown the carbohydrate molecules into ethanol to give a yield of 95%

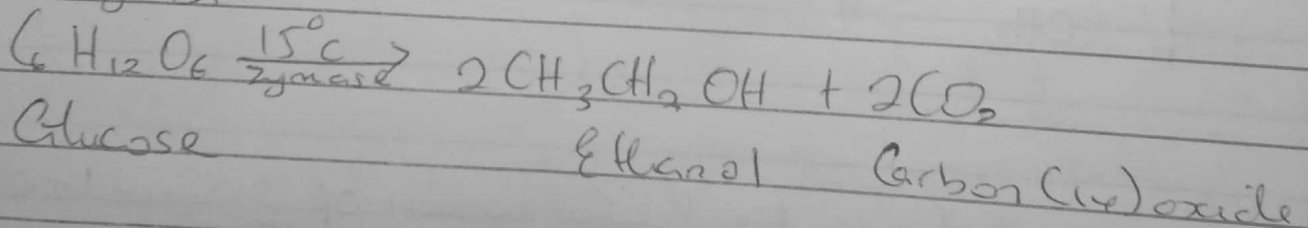
Step 1: The starch containing materials include molasses, potatoes, cereals, rice and so on which are warmed with malt to 60°C for a specific period of time are converted into "maltose" by the enzyme diastase contained in the malt.



Step 2: The maltose is broken down into glucose on addition of yeast which contains the enzyme maltase and at a temperature of 15°C is then converted into alcohol by the enzyme zymase.



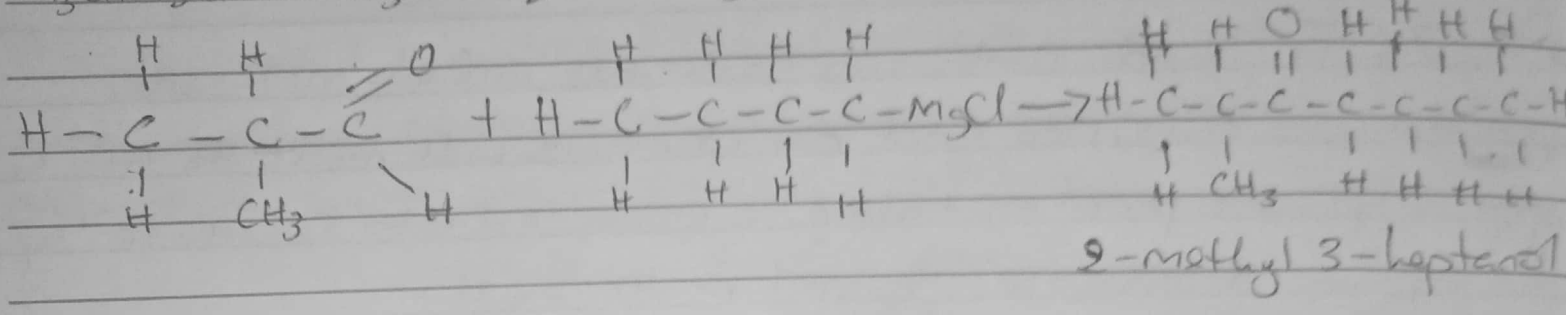
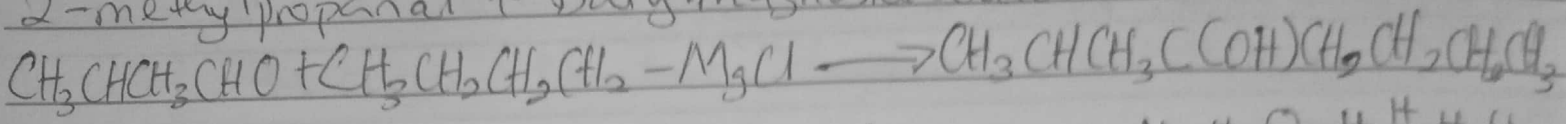
Step 3: The glucose at constant temperature of 15°C is then converted into alcohol by the enzyme zymase contained also in yeast.



We show the reaction between 2-methyl propanal and butylmagnesium chloride. That is Grignard synthesis.

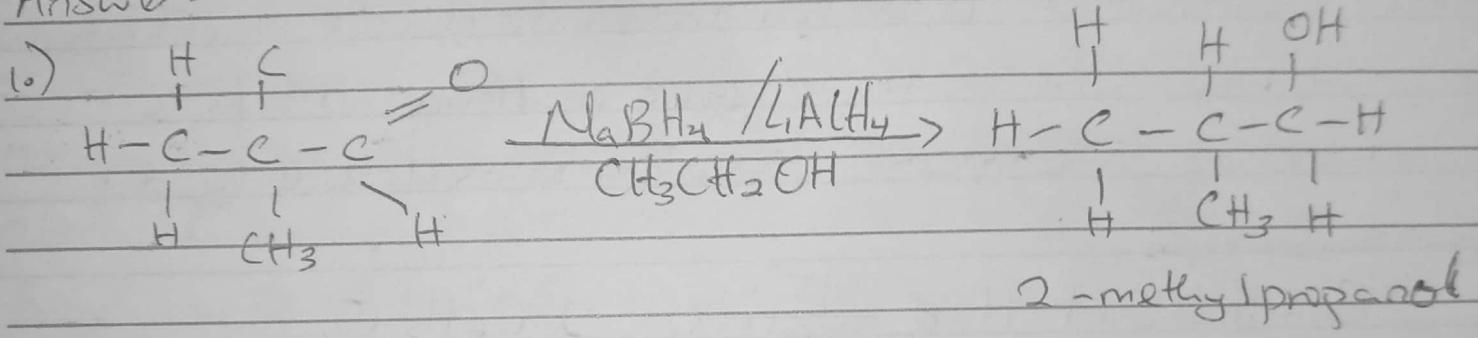
Answer.

2-methylpropanal + Body Magnesium chloride \rightarrow ?

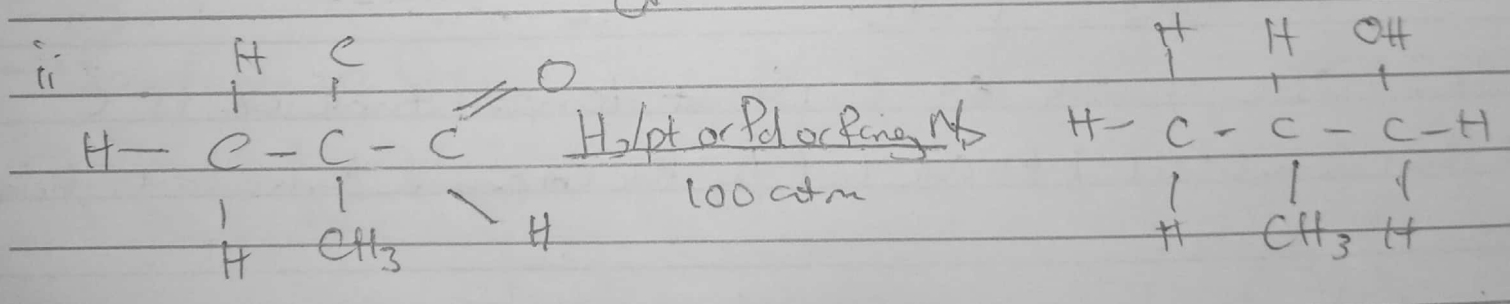


7. Show the reduction reaction of 2-methylpropanal.

Answer.

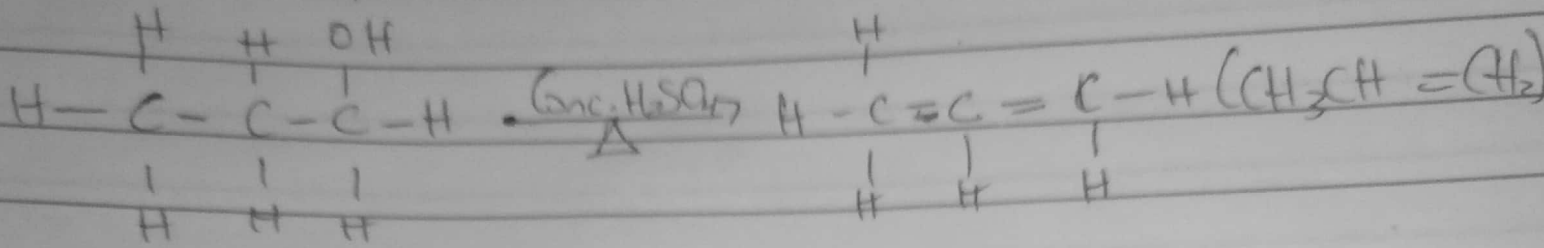


OR



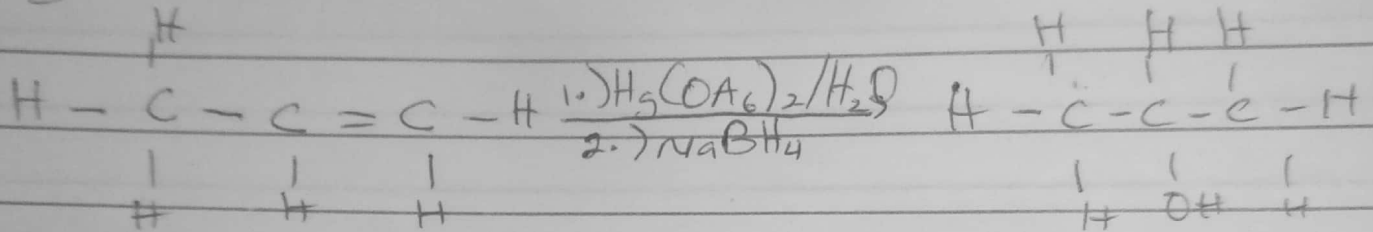
8.) propose a scheme for the conversion of propan-1-ol to propan-2-ol

Step 7 → Dehydration of propan-1-ol to propene using
 Conc. H₂SO₄



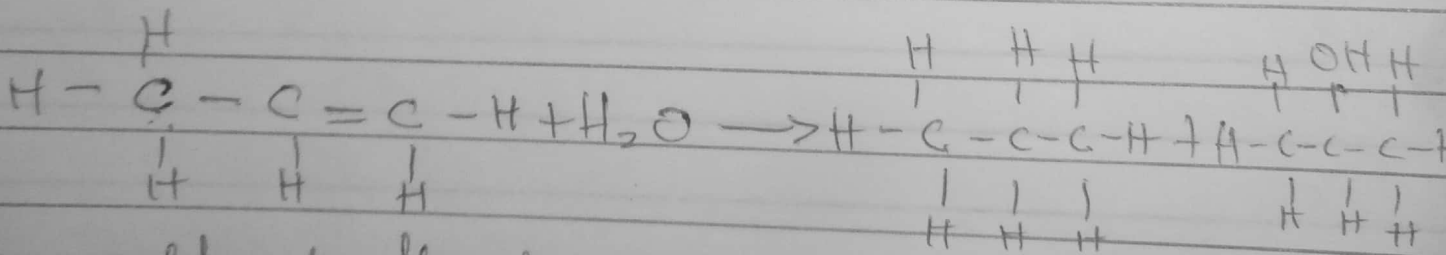
Step 2 → You can use either

A. Oxymercuration - Demercuration



Preferable

B. Since propene is asymmetrical, on hydrolysis or addition of water, using a markovnikov procedure, propan-2-ol can be obtained.



You would actually get 2 products: propan-1-ol & propan-2-ol
 But following markovnikov's rule, propan-2-ol would be the major product