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Q1) Discuss the two major classification of alcohols. Give example each for each class.

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a) Based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group; we have;

- Primary alcohol: It occurs if the numbers of hydrogen atoms attached to the carbon atom bearing hydroxyl group are two or three

e.g.  $\text{CH}_3\text{OH}$  (Methanol)

$\text{H} | \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{OH} | \text{H}$  pentan-1-ol

- Secondary alcohol: If the numbers of hydrogen atoms attached to the carbon atom is just one, it is called a secondary alcohol

e.g.  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$  propan-2-ol

$\text{OH} | \text{CH}_2 - \text{CH}_2 - \text{C} - \text{CH}_2 - \text{CH}_3 | \text{H}$  pentan-3-ol

- Tertiary alcohol: If no hydrogen atom is attached to the carbon atom bearing the hydroxyl group, it is called a tertiary alcohol ( $3^\circ$ ) e.g. methyl propan-2-ol  
Methyl-3-pentanol

b) Based on the number of hydroxyl groups they possess

- Monohydric alcohols have one hydroxyl group present in the alcohol structure.

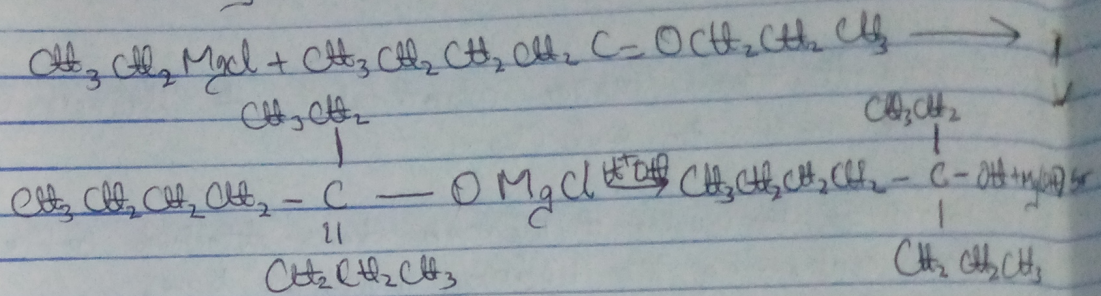
E.g. - propanol, methyl alcohol

- Dihydric alcohols (Glycols): They have two hydroxyl group present in the alcohol structure

E.g. Ethane-1,2-diol, Hexane-2,4-diol



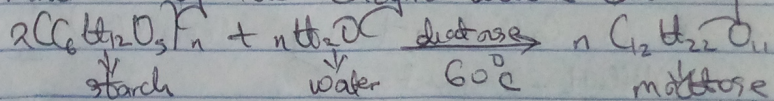
② In the Grignard Synthesis of alcohols react a named Grignard reagent with  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{C}=\text{OCH}_2\text{CH}_2\text{CH}_3$   
 Grignard reagent =  $\text{CH}_3\text{CH}_2\text{MgCl}$  (ethyl magnesium chloride)



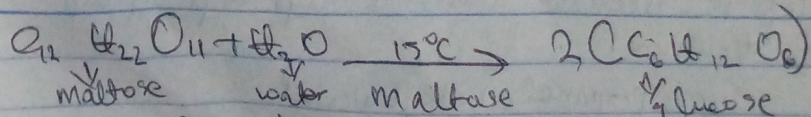
③ Describe the industrial manufacture of ethanol showing all reaction equations and necessary enzymes and temperature of reaction

④ Starch are major group of natural compounds that yield ethanol by fermentation, the biological catalysts break down the carbohydrate into ethanol to give 95% yield.

Starch containing materials like cereals warmed with malt to  $65^\circ\text{C}$  for a specific period of time, all is converted to maltose by the enzyme diastase containing malt



The maltose is then broken down to glucose by adding yeast which contains maltase (enzyme) at a temp of  $15^\circ\text{C}$



Glucose is converted to alcohol to a constant temperature of  $15^\circ\text{C}$  by an enzyme zymase which is found in yeast

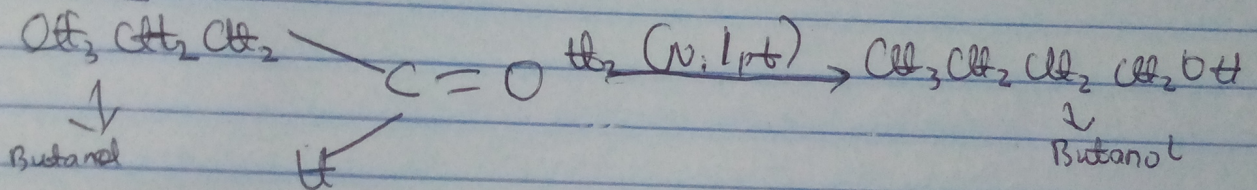


7) Determine the product obtained in the reduction of alkanal and Alkanoal. Use a specific example for each and show the eqn of reaction

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Using Meerwein-Ponndorf reaction

Alkanoal



Alkanoal

