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COURSE<sup>o</sup>. Chem 102

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## 1 CLASSIFICATION OF ALKANOLS: This is

i the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group. If the number of hydrogen atoms attached to the carbon atom bearing the hydroxyl group are three or two, it is called primary alcohol ( $1^\circ$ ). If it is one hydrogen atom, it is called secondary alcohol ( $2^\circ$ ) and if no hydrogen atom is attached to the carbon atom bearing the hydroxyl group, it is called a tertiary alcohol ( $3^\circ$ )

Examples: (i)  $\text{CH}_3\text{OH}$  — methanol ( $1^\circ$ )

(ii)  $(\text{CH}_3)_3\text{C-OH}$  — 2-methylpropan-2-ol ( $3^\circ$ )

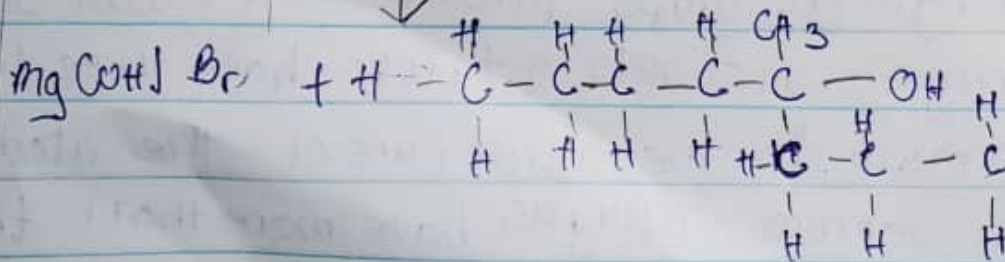
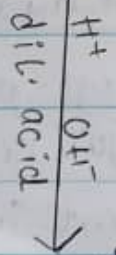
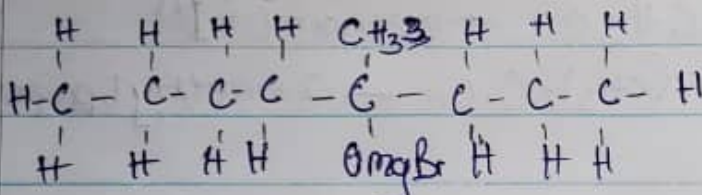
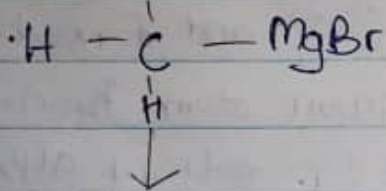
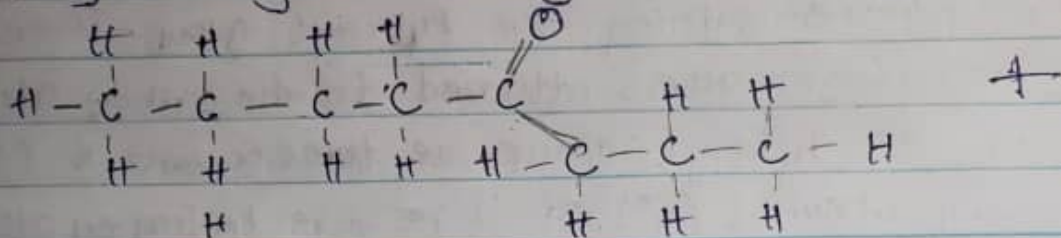
ii This is based on the number of hydroxyl groups they possess. Monohydric alcohols have one hydroxyl group present in the alcohol structure. Dihydric alcohols are also called Glycols have two hydroxyl groups present in the alcohol structure while trihydric alcohols or triols have three hydroxyl groups present in the structure of the alcohol. Polyhydric alcohols or polyols have more than three hydroxyl groups.

Examples: (i)  $\text{HOCH}_2\text{CH}_2\text{OH}$  — ethane-1,2-diol (dihydric alcohol)

(ii)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$  — Propanol (monohydric alcohol)

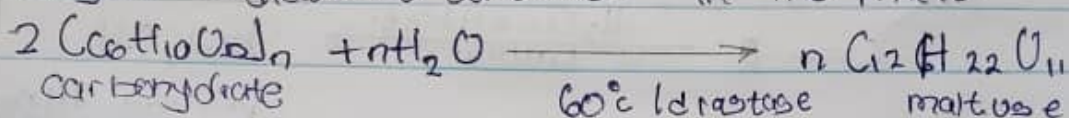
## 2 GRIGNARD SYNTHESIS OF ALKANALS

Grignard Agent:  $\text{CH}_3\text{MgBr}$  (methyl magnesium bromide)

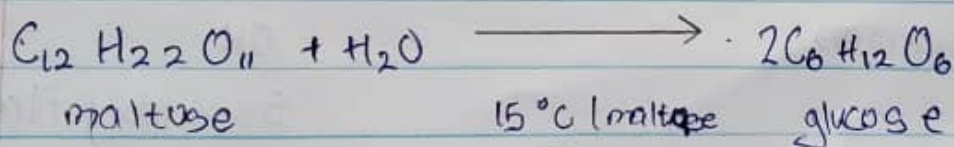


### 3 INDUSTRIAL MANUFACTURE OF ETHANOL

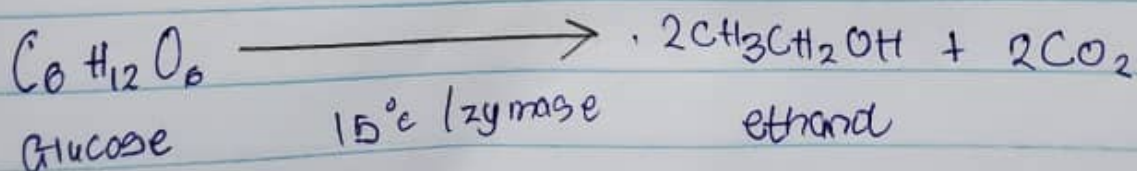
Carbohydrates such as starch are major group of natural compounds that can be made to yield ethanol by the biological process of fermentation. The biological catalysts, enzymes found in yeast breakdown the carbohydrate molecules into ethanol to give a yield of 95%. The starch containing materials include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



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

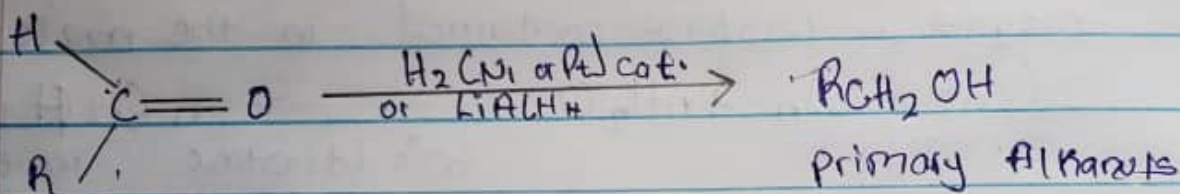


The glucose at constant temperature of 15°C is then converted into alcohol by the enzyme zymase contained also in yeast.

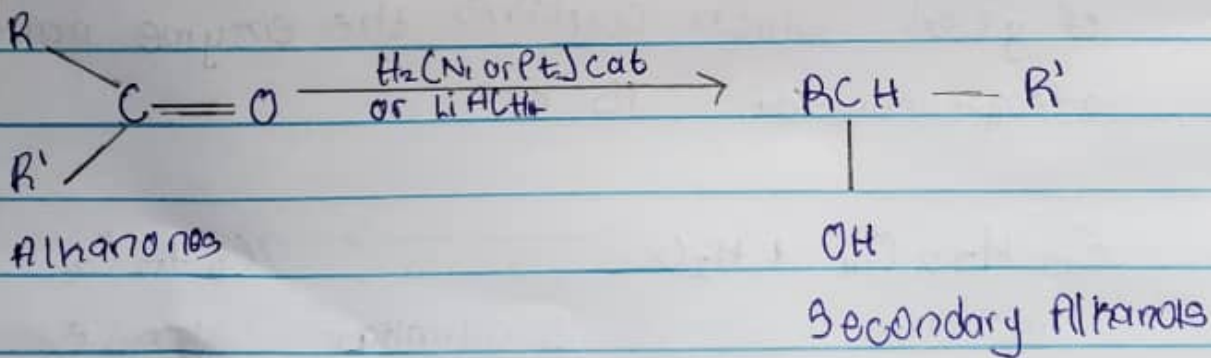


#### 4. REDUCTION OF ALKANOLES AND ALKANALS

Alkanols and Alkanones are reduced to primary and Secondary Alkanols respectively by reaction with hydrogen in the presence of a 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)  $[NaBH_4]$ .

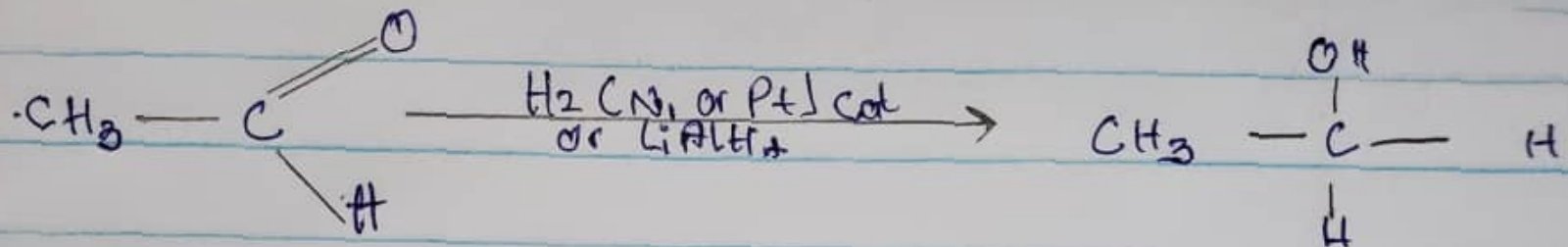


Alkanols



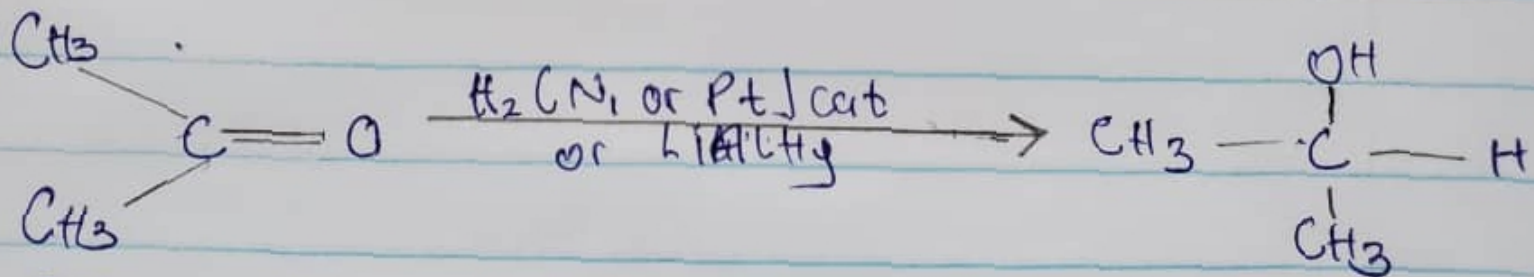
Alkanones

SPECIFIC EXAMPLES:



Ethanal

ethanol



Propanone

propan-2-ol