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Mechatronics Engineering
19/ENG05/058
CHEM 102

1. a) Alkanols are classified based on 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 groups are two or three, it is called a primary alcohol. If it is one hydrogen atom, it is called a secondary alcohol and if no hydrogen atom is attached to the carbon atom bearing the hydroxyl group, it is called a tertiary alcohol. Eg.

CH_3CH_2OH - Ethanol — Primary alcohol

$CH_3CH(OH)CH_3$ — Secondary alcohol.

b) They can also be classified based on the number of hydroxyl groups they possess. Monohydric alcohols have one hydroxyl group present in the alcohol structure. Dihydric or glycols and Trihydric or triols have two and three hydroxyl groups present in their alcohol structures respectively. Polyhydric alcohols or polyols have more than three hydroxyl groups e.g.

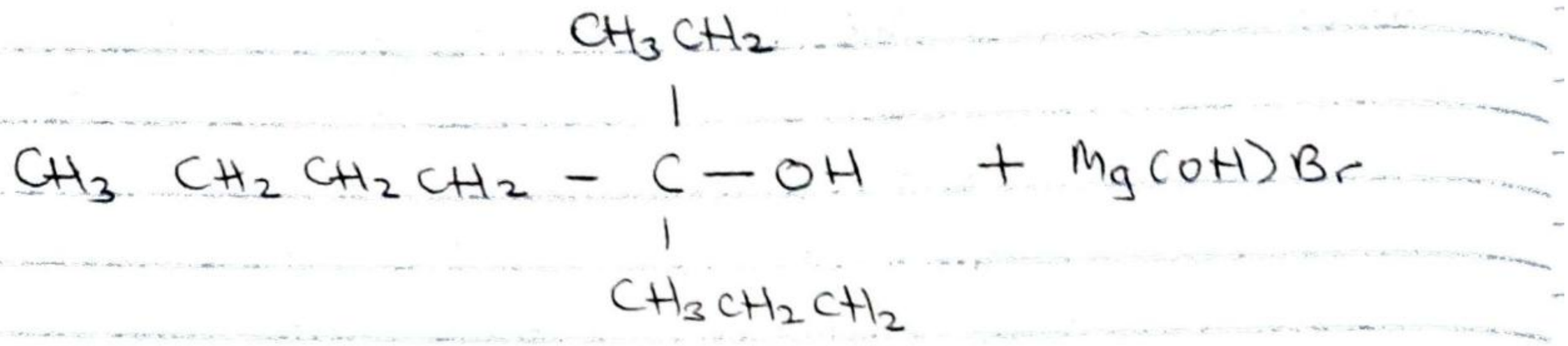
$CH_3CH_2CH_2OH$ propanol — Monohydric

$CH_3CH(OH)CH_2CH(OH)CH_2CH_3$ — dihydric alcohol

2. $CH_3CH_2CH_2CH_2C{=}OCH_2CH_2CH_3 + CH_3CH_2MgBr$

ethyl magnesium bromide.

$CH_3CH_2CH_2CH_2-C(CH_2CH_2CH_3)(OMgBr)-CH_3CH_2CH_2$



3 Carbohydrates such as starch are major groups of natural compounds that can be maste to yield ethanol by the biological process of fermentation. The biological catalysts, enzymes found in yeast break down the carbohydrate molecule 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 into maltose by the enzymes diastatese contained in the malt.

$2\,(C_6H_{10}O_5)_n + nH_2O \longrightarrow nC_{12}H_{22}O_{11}$

carbohydrate. 60°C / diastase maltose

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

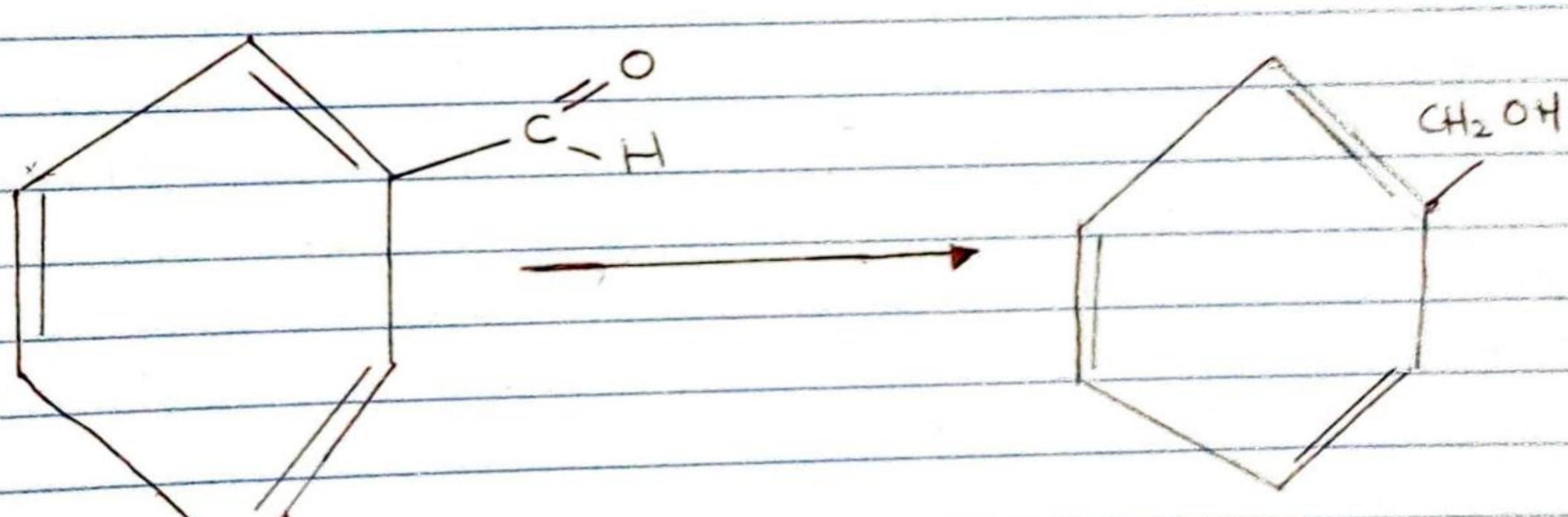
$C_{12}H_{22}O_{11} + H_2O \longrightarrow 2C_6H_{12}O_6$

maltose 15°C / maltase glucose

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

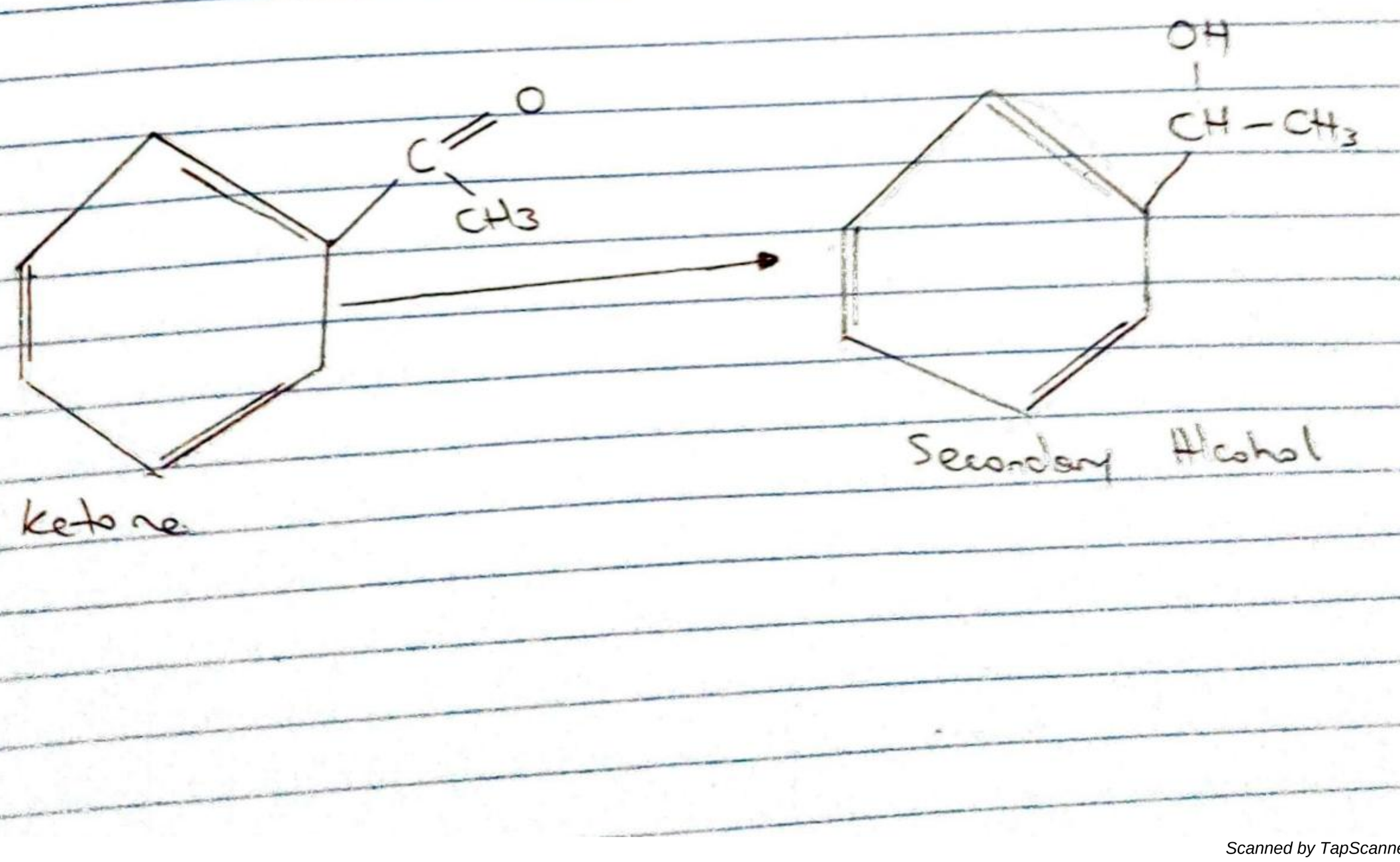
$C_6H_{12}O_6 \longrightarrow 2CH_3CH_2OH + 2CO_2$

4. Aldehydes and ketones are reduced to primary and secondary alcohols respectively by reacting with hydrogen in the presence of a platinum or nickel catalyst or with aluminium isopropoxide or with complex metal hydride, such as lithium tetrahydridoaluminate(III) or sodium tetrahydridoborate(III)



Aldehyde

Primary Alcohol



Ketone

Secondary Alcohol