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Mechatronics Engineering
Chemistry 102 Assignment
19/ENG05/020

Classification of Alkanols

This is based on the number of hydrogen atoms attached to the carbon atom containing the hychonyl group. If the number of hydrogen atoms attached to the carbon atom bearing the hydroxyl group are 3 or 2, it's called primary alkanol (1°). If it's 1 hydrogen atom it's called secondary alkanol (2°) & if no hydrogen atom is attached to the carbon atom bearing the hydroxyl group, it's called a tertiary alkanol (3°). Eg:- CH_3OH - Methanol (1°)

$(CH_3)_3C-OH$ - 2 methylpropan-2-ol (3°)

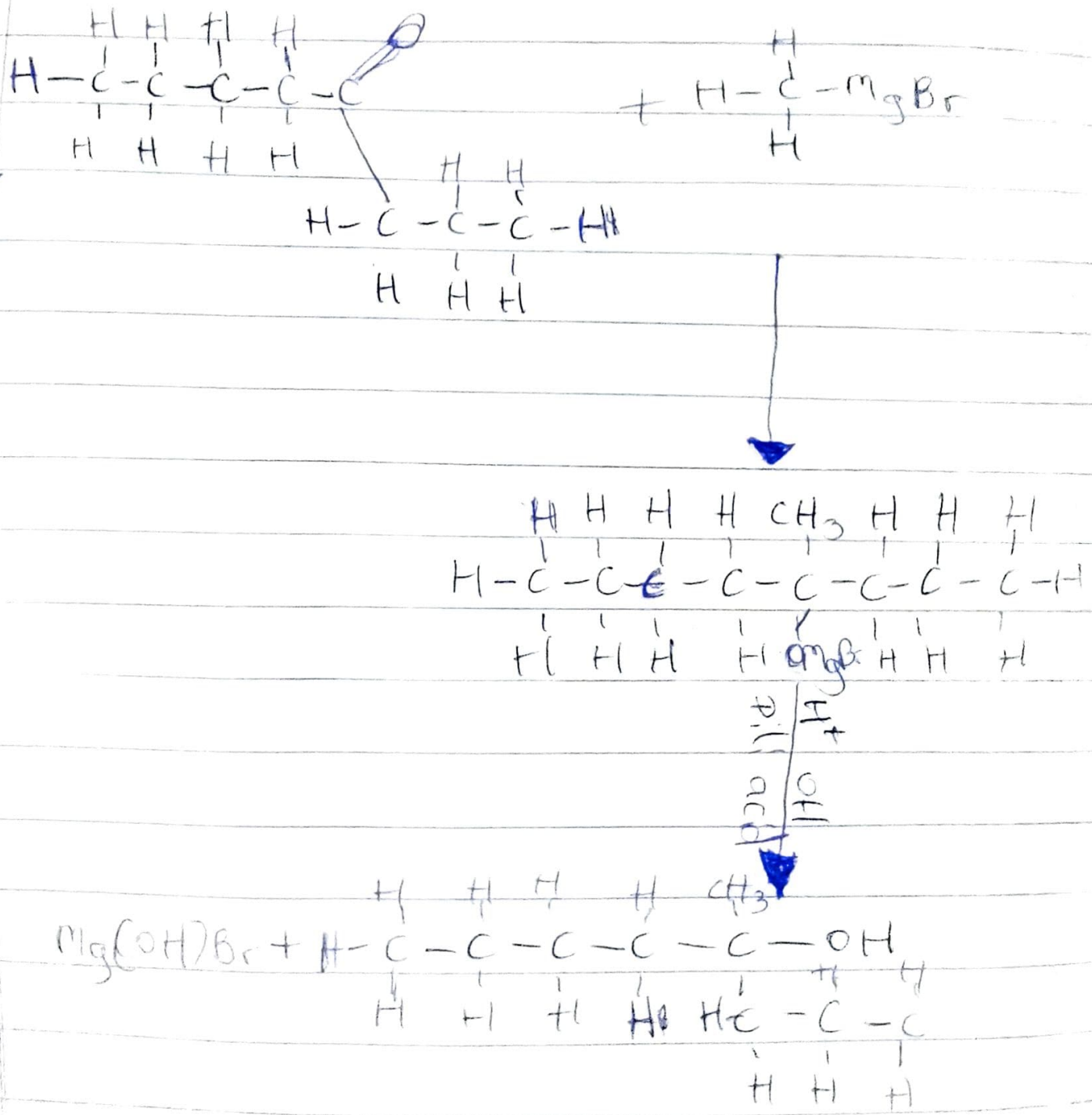
This is based on the number of hydroxyl groups they possess. Monohydric alcohols have one hydroxyl group present in the alcohol structure. Dihydric alcohols are also called Glycols have 2 hydroxyl groups present in the structure of the alcohol. Polyhydric alcohols or polyols have more than 3 hydroxyl groups.

$HOCH_2CH_2OH$ Ethane-1,2-diol (dihydric alcohol)

$CH_3CH_2CH_2OH$ Propanol (monohydric alcohol)

2. Grignard Synthesis of Alkanols

Grignard Agent - CH_3MgBr (methyl magnesium bromide)



Industrial Manufacture of Ethanol

Carbohydrates like 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 & on warming with malt to 60°C for a specified period of time are converted into maltose by the enzyme diastase 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 broken down into glucose on addition of yeast which contains the enzyme maltose & at 15°C temperature

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

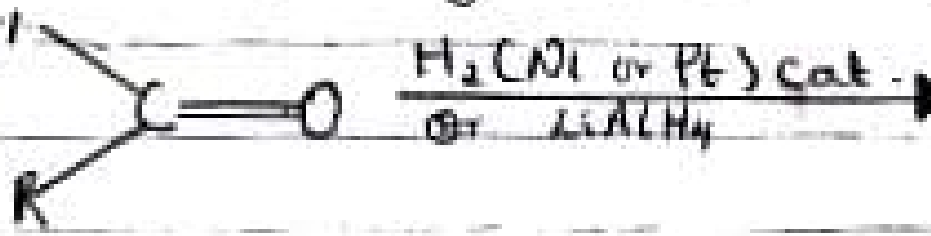
Maltose 15°C/maltose glucose

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

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

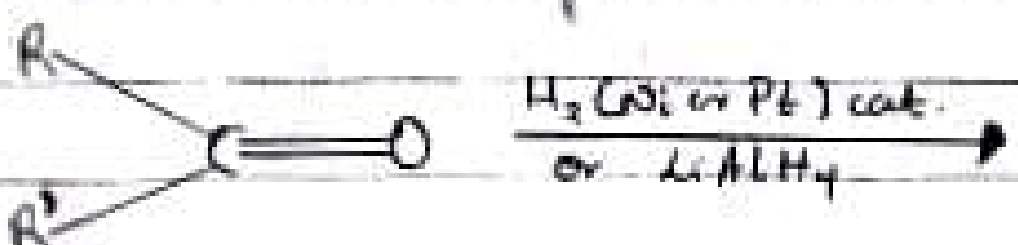
glucose 15°C/zymase Ethanol

Alkanals 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) ($NaBH_4$).



Alkanals

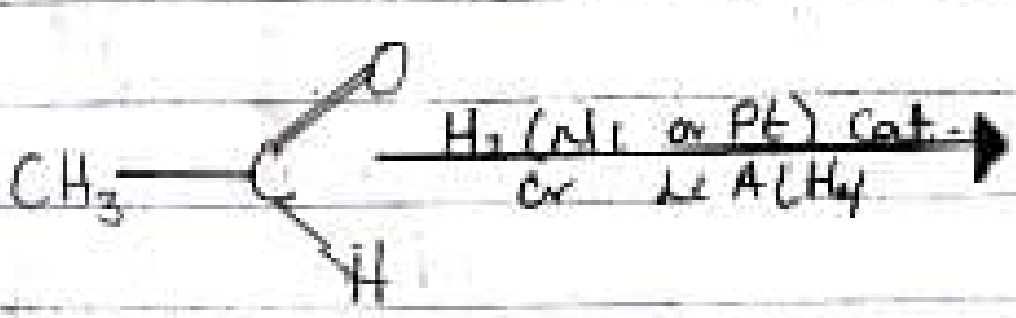
Primary Alkanols



Alkanones

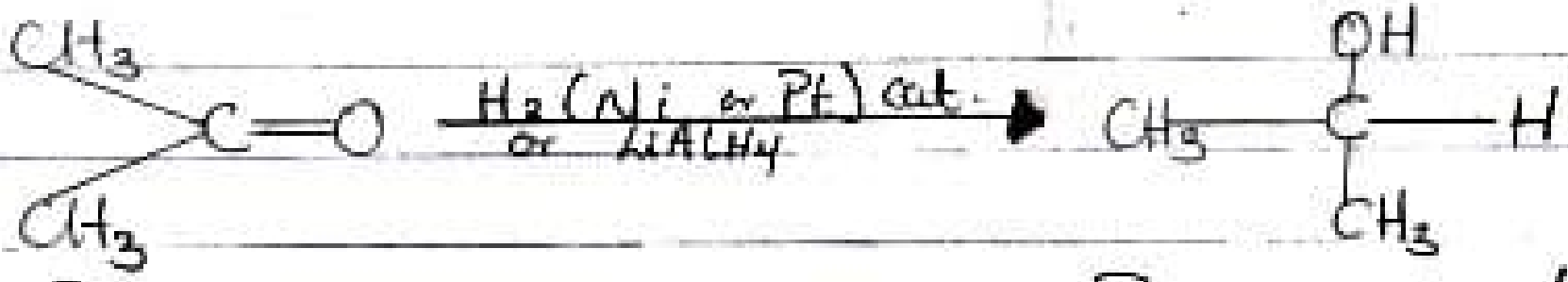
Secondary Alkanols

Specific Examples:



Ethanal

Ethanol



Propanone

Propan-2-ol