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SUBJECT: CHEMISTRY (course code: CHM102)
DEPARTMENT: MEDICINE AND SURGERY (MBBS)
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a) CLASSIFICATION OF ALCOHOLS

i) In the first classification, we have the primary alcohol (1°), secondary alcohol (2°) and tertiary alcohol (3°). This is based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group. If the number of hydroxyl atoms attached to the carbon atom bearing the hydroxyl group are three or two, it is called primary alcohol (1°). If the number of hydroxyl atom attached to the carbon atom is one, it is called secondary alcohol, and if no hydrogen atom is attached to the carbon atom bearing the hydoxyl group, it is called tertiary alcohol (3°).

example: CH_3OH methanol (1°) primary alcohol
$CH_3CH(OH)CH_3$ propan-2-ol (2°) secondary alcohol
$(CH_3)_3C-OH$ 2-methyl propan-2-ol (3°) tertiary alcohol

b) 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 are: $CH_3CH_2CH_2OH$ propanol (monohydric alcohol).
$HOCH_2CH_2OH$ ethane-1,2-diol (Dihydric alcohol)
$OHCH_2CH(OH)CH_2OH$ propane-1,2,3-triol (Trihydric alcohol)

2) i) Solubility of alcohols in water: lower alcohols with up to three carbon atoms in their molecules are soluble in water because those lower alcohols can form hydrogen bond with water molecules. Solubility of alcohols in water decreases with increasing molecular mass.

ii) Solability of alcohols 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) PRODUCTION OF ETHANOL INDUSTRIALLY

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 break down 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 of time are converted into maltose by the enzymes 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 maltase and a temperature of 15°c

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow{15°c/\text{maltase}} 2C_6H_{12}O_6$$

maltose glucose

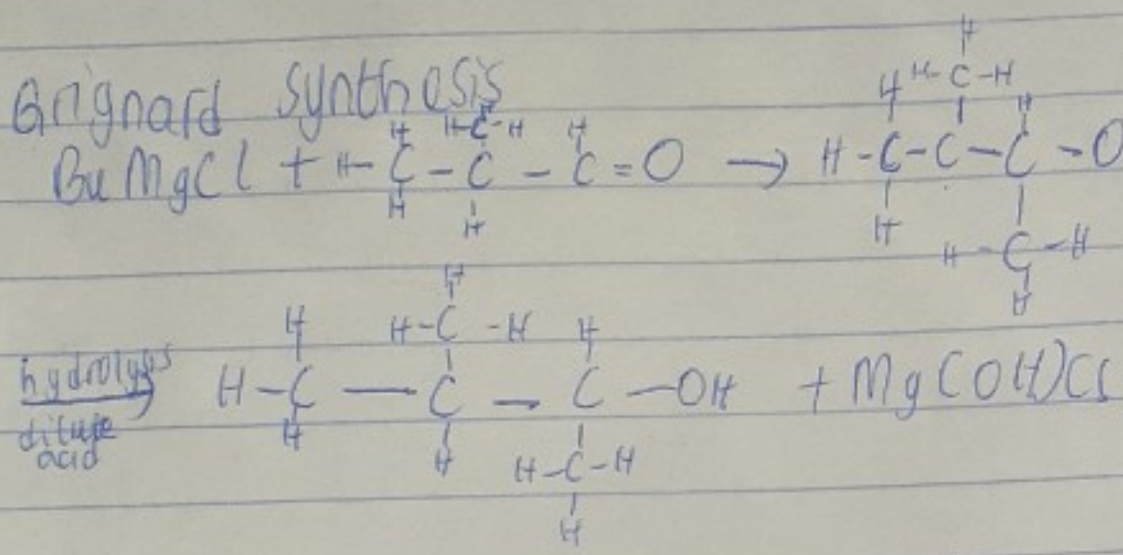
The glucose at constant temperature of 15°c is then converted into alcohol by the enzyme Zymase contained

also in yeast:

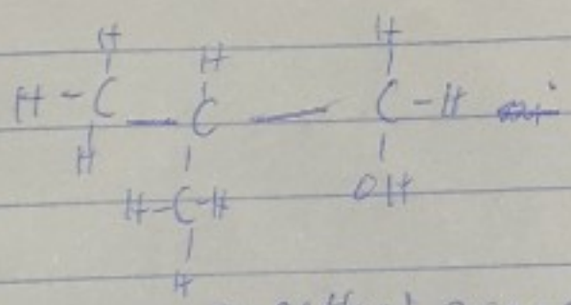
$C_6H_{12}O_6 \longrightarrow 2\,CH_3CH_2OH + 2CO_2$

Glucose 15°C zymase Ethanol

4) Grignard synthesis



7) $C_4H_8O + 2H \rightarrow$



2 methyl propan-1-ol

8) propan-1-ol to propan-2-ol

$CH_3CH_2CH_2OH + H_2SO_4 \rightarrow CH_3CH_2CH_2OH_2OSO_3H$

$\xrightarrow{-H_2O} CH_3CH_2CH_2OSO_3H \xrightarrow{-H_2SO_4} CH_3CH=CH_2$

$\xrightarrow{H^+OH} CH_3CH(OH)CH_3$ (propan-2-ol)