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M1882
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1) Alcohols are very important organic compounds. Discuss briefly their classification and give one example each.

A) This is 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 group are three or more, it is called a primary alcohol (1°). If it is one hydrogen atom, it is called secondary (2°) and if no hydrogen atom is attached to the carbon atom bearing the hydroxyl group, it is called tertiary alcohol (3°).

E.g. CH₃OH Methanol (1°)

B) This is based on the Number of hydroxyl groups they possess. Monohydric alcohols have one hydroxyl group present in the alcohol structure. Polyhydric alcohols are also called glycols. They 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. E.g. CH₃CH₂CH₂OH Propanol (Monohydric Alcohol)

2. Discuss the Solubility of Alcohols in water, organic solvents.

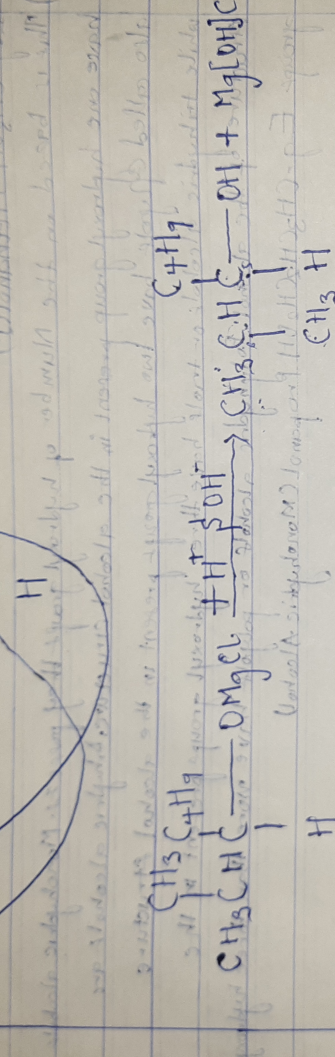
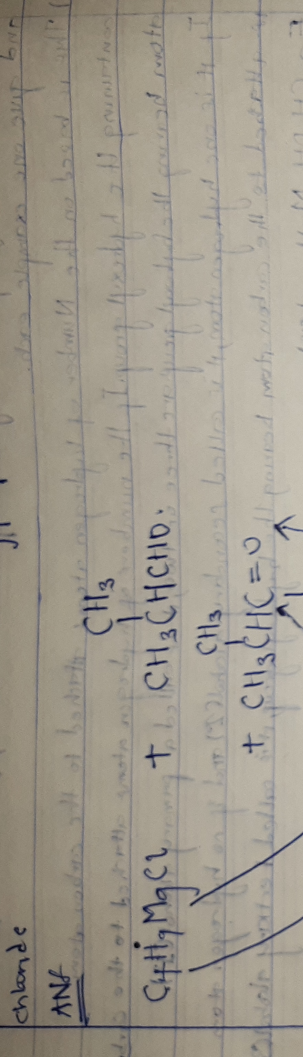
Lower Alcohols with up to three carbon atoms in their molecules are soluble in water because these lower alcohols can form hydrogen bond with water molecules. The water solubility of alcohols decreases with increasing relative molecular mass.

All Monohydric alcohols are soluble in organic solvents. The solubility of simple alcohols are polyhydric alcohols is largely due to their ability to form hydrogen bonds with water molecules.

3) Show the three steps in the industrial manufacture of ethanol. Equations of reaction are mandatory.

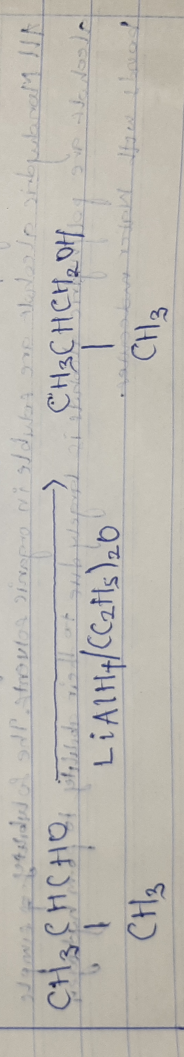
$2(C_6H_{10}O_5)_n + nH_2O \rightarrow nC_{12}H_{22}O_{11} + nH_2O$ (invertase)
 Carbohydrate \rightarrow 60°C Diastase Maltose
 $C_{12}H_{22}O_{11} + H_2O \rightarrow 12C_6H_{12}O_6$
 Maltose \rightarrow 150°C Maltase \rightarrow 12C₆H₁₂O₆ \rightarrow 2C₂H₅OH + 2CO₂ (yeast)
 $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$ (yeast)
 Glucose \rightarrow 10-5-napion \rightarrow Ethanol

4) Show the reaction between 2-methylpropanal and Methyl Magnesium chloride



6-methylheptan-5-ol

7) Show the reduction rxn of 2-methylpropanal



2-methylpropanol

8) Propose a scheme for the conversion of propanal to propan-2-ol

