(8) Classification based on the number of hydroxyl groups they possess

Monohydric alcohols ~~also called~~ have only one hydroxyl group per molecule present in the alcohol structure. Dihydric alcohols also called Glycols have two hydroxyl groups present in the alcohol structure. While trihydric or triols have three hydroxyl groups present in the structure of the alcohol. Polyhydric alcohols or polyols have more than three hydroxyl groups.

Example: $CH_3CH_2CH_2OH$ - propanol (monohydric alcohol)

(9) Discuss the solubility of alcohols in water, organic solvent

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

⇒ Solubility in Organic solvent: All monohydric alcohols are soluble in organic solvent. The solubility of simple alcohols and polyhydric alcohols is largely due to their ability to form hydrogen bonds with water molecules

(10) Show the three steps in the Industrial Manufacture of ethanol. Equation of reaction are mandatory

Industrial Manufacture of Ethanol

Carbohydrates such as starch are major groups of natural compounds that can be made to yield ethanol by biological fermentation. The biological catalysts, enzymes

found in yeast breakdown the carbohydrate molecules into ethanol give a yield of 95%

⇒ STEP I: The starch containing materials include potatoes cereals, molasses, 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

$$\cancel{2C\ 2(C_6H_{10}O_5)_n + nH_2O \xrightarrow[\text{diastase}]{60°C} 2C_6H_{12}O_6}$$

Carbohydrate Water glucose

$$2(C_6H_{10}O_5)_n + nH_2O \xrightarrow[\text{diastase}]{60°C} nC_{12}H_{22}O_{11}$$

Carbohydrate water Maltose

⇒ STEP II: The maltose is broken down into glucose on ~~addit~~ addition of yeast which contain the enzyme Maltase and at a temperature of 13°C

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow[\text{maltase}]{13°C} 2C_6H_{12}O_6$$

maltose water glucose

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

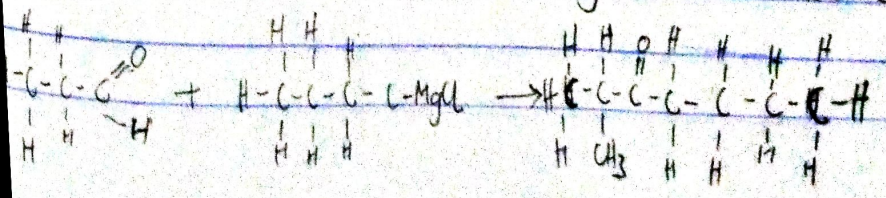
$$C_6H_{12}O_6 \xrightarrow[\text{Zymase}]{15°C} 2CH_3CH_2OH + 2CO_2$$

glucose Ethanol Carbon (IV) oxide

① Show the ~~the~~ reaction between 2-methylpropanal and butyl magnesium chloride

Answer

$$CH_3CHCH_3CHO + CH_3CH_2CH_2CH_2\text{-}MgCl \longrightarrow CH_3CHCH_3C(OH)CH_2CH_2CH_2CH_3$$



2-methyl-3-heptanol

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Assignment

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

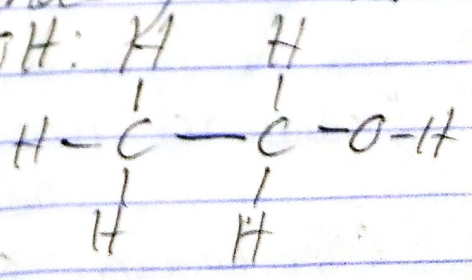
Answer

Classificat of Alcohols

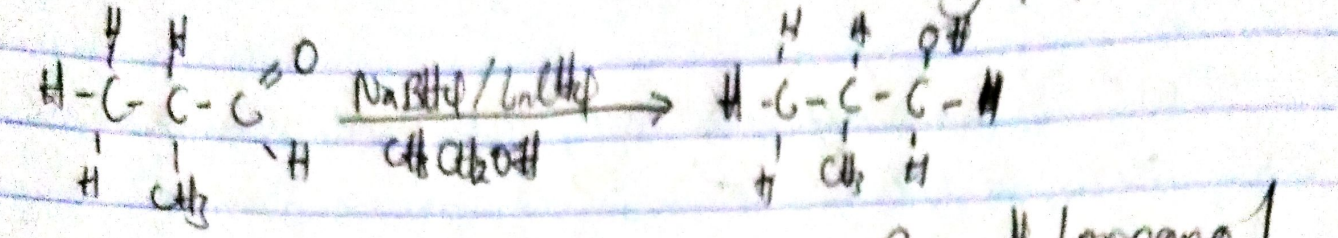
a) Classification based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group

If the number of hydrogen atom attached to the carbon atom bearing the hydroxyl group are three or two, it is called a primary alcohol (1°) [In a primary alcohol the hydroxyl group is attached to a primary (or terminal) carbon atom in a molecule, it characterised by $-CH_2OH$] If it is one hydrogen atom attached to the carbon atom bearing the hydroxyl group. It is called "Secondary alcohol (2°)" [In a Secondary, the -OH group is on a secondary carbon atom; It is characterised by $>CHOH$] and if no hydrogen atom is attached to the carbon atom bearing the hydroxyl group, it is called "tertiary alcohol (3°)." [In a tertiary alcohol, the -OH group is on a tertiary carbon atom. It is characterised by $>C-OH$]

Example Ethanol (1°). CH_3CH_2OH:



(7) Show the reduction reaction of 2-methylpropanol

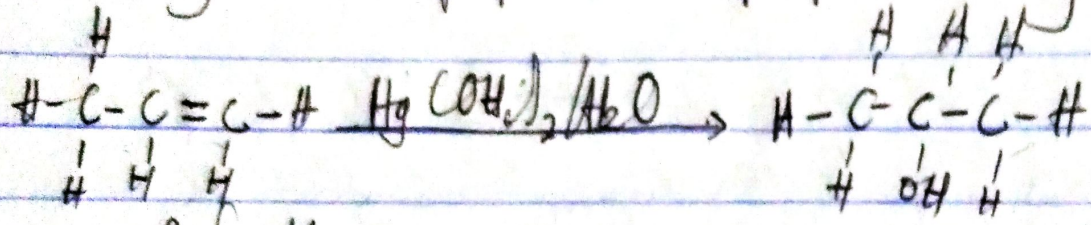


2-methylpropanol

8 Propose a scheme for the conversion of propan-1-ol to propan-2-ol

Answer

Step 1: Dehydration of propan-1-ol to propene using Conc H_2SO_4



Preferably

Since propene is asymmetrical on hydrolysis or addition of water, using a Markovnikov procedure, propan-2-ol can be obtained