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COURSE CODE: CHNA 102

(i) This is based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group. So the number of hydrogen atoms attached to the carbon atom bearing the hydroxyl group are three or more, it is called primary alcohol (1°). If it is one hydrogen atom, it is called secondary alcohol (2°) and if no hydrogen atom is attached to the carbon atom bearing the hydroxyl group, it is called tertiary alcohol (3°).
Example are: $\text{C}_2\text{H}_5\text{OH}$ Methanol (1°)

(ii) This is based on the number of hydroxyl groups in the molecule. Monohydric alcohols have one hydroxyl group present in the alcohol structure. Dihydric alcohols are also called glycols. They have two hydroxyl groups present in the alcohol structure or the molecule while trihydric alcohols or triols have three hydroxyl groups present in the structure of the alcohol. Polyhydric alcohol or polyols have more than three hydroxyl groups.
Example are: $\text{C}_2\text{H}_4(\text{OH})_2$ Propenal (monohydric alcohol)

(3) 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

$\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ - Propanol (Monohydric alcohol)

2. Discuss the solubility of alcohols in water, organic solvents.

SOLUBILITY OF ALCOHOLS IN WATER, ORGANIC SOLVENTS.

→ Solubility in Water: 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".

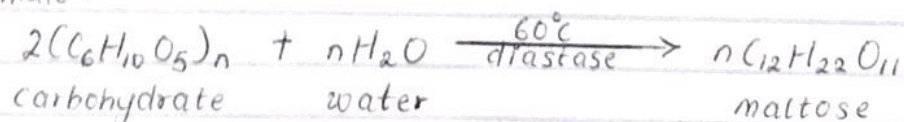
→ Solubility in Organic Solvents: All monohydric alcohols are soluble in organic solvents. The solubility of simple alcohols and polyhydric alcohols is largely due to their ability to form hydrogen bonds with water molecules.

3. Show the three steps in the industrial manufacture of ethanol.
Equations 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 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%.

STEP 1: 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 enzyme diastase contained in the malt.



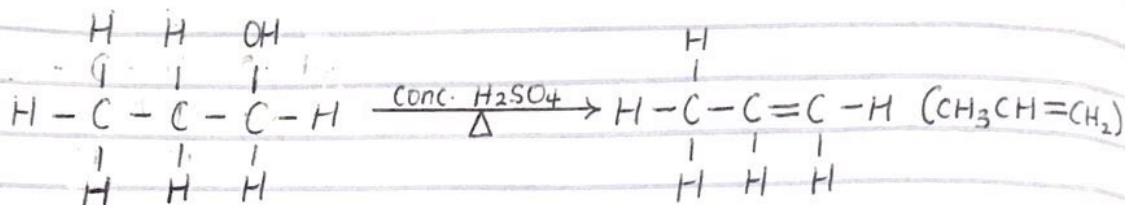
STEP 2: The maltose is broken down into glucose on addition of yeast

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

ANSWER

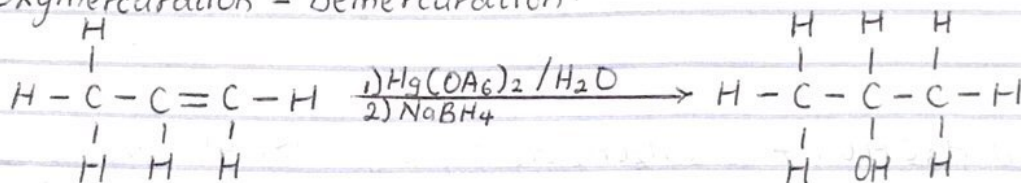
SCHEME

STEP 1: Dehydration of Propan-1-ol to propene using conc. H_2SO_4



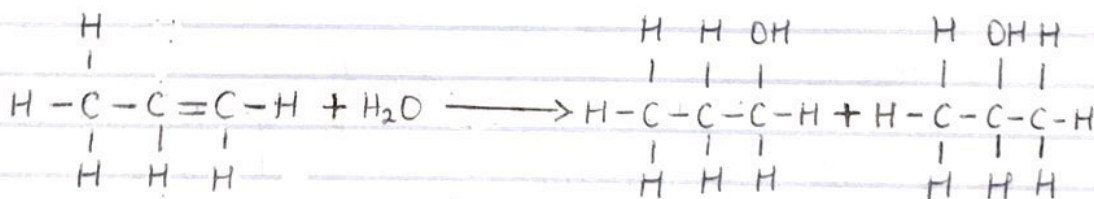
STEP 2: You can use either,

A. Oxymercuration - Demercuration.



Preferable

B. Since propene is asymmetrical, on hydrolysis or addition of water, using a markovnikov procedure. Propan-2-ol can be obtained



You would actually get the 2 products: Propan-1-ol Propan-2-ol

But following markovnikov's rule, Propan-2-ol would be the major product.