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1. Alkanols (also known as Alcohols) are majorly classified into two major classes under which sub classes are found. The major classifications are:

A. CLASSIFICATION BASED ON THE NUMBER OF HYDROGEN ATOMS ATTACHED TO A CARBON ATOM CONTAINING THE HYDROXYL GROUPS:

i. Primary Alcohol: These are alcohols that have two or three hydrogen atoms attached to the carbon atom containing the hydroxyl group. It is denoted by "1°". A good example is Propan-1-ol.

ii. Secondary Alcohol: These alcohols have only one hydrogen atom attached to the carbon atom containing the hydroxyl group. It is denoted by "2°". An example of this alcohol is Pentan-3-ol.

iii. Tertiary Alcohol: These alcohols are characterized by the absence of hydrogen atoms from the carbon atom attached to the hydroxyl group. It is denoted by "3°". An example is 2-methylbutan-2-ol.

B. CLASSIFICATION BASED ON THE NUMBER OF HYDROXYL GROUPS PRESENT IN THE COMPOUND [ALCOHOL STRUCTURE]

i. Monohydric Alcohols: These alcohols have one hydroxyl group in their alcohol structure. Eg Methanol

ii. Dihydric Alcohols: These alcohols have two hydroxyl groups in their structure. They are also called glycols. Eg Ethane-1,2-diol.

iii. Trihydric Alcohols: These alcohols have three hydroxyl groups in their structure. They could be equally referred to as triols. Example of this is Propan-1,2,3-triol.

iv. Polyhydric Alcohols: They have more than three hydroxyl groups in their alcohol structure. Example neopentyl.

2. SOLUBILITY OF ALCOHOLS IN WATER

Methanol, Ethanol and Propanol dissolve very easily in water. This is because these molecules have the ability to form hydrogen bonds with the water molecules via the hydroxyl groups present in them. As the relative molecular mass and hydrocarbon chain length increase, solubility of the molecules decreases. This is why the higher alcohols are much more difficult to dissolve in water than the lower alcohols.

SOLUBILITY OF ALCOHOLS IN ORGANIC SOLVENT

Alcohols, due to their non polarity dissolve easily, and readily in organic solvents. This could also be attributed to the fact that generally, organic solvents eg toluene are non polar solvents. The non polarity (present in the alkyl group) allows the molecule to interact with the solvents' non polar organic molecules.

3. INDUSTRIAL MANUFACTURE OF ALCOHOL - THE STEPS

i. Starch containing foods are crushed and treated with steam. They (the starchy food materials eg barley) is warmed with malt. Malt contains the enzyme diastase, which converts the carbohydrate in the barley to maltose. The reaction is maintained at 60°C.

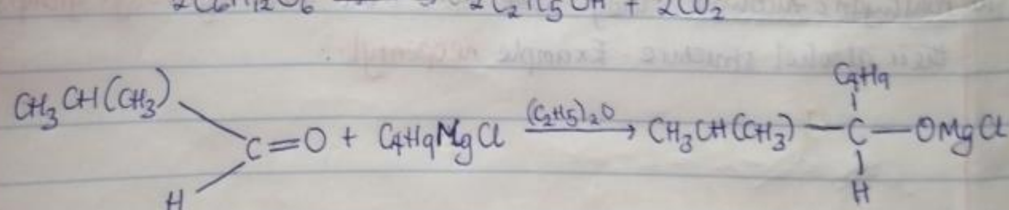
$$2(C_6H_{10}O_5)_n + nH_2O \xrightarrow{diastase} nC_{12}H_{22}O_{11}$$

ii. The maltose obtained is mixed with yeast (contains the enzyme maltase) which helps break maltose down to glucose. The reaction occurs at a controlled temperature of 15°C:

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

iii. The glucose derived undergoes further chemical reaction, while still mixed with yeast, as another enzyme zymase, is activated, to convert glucose to ethanol. This occurs at 15°C:

$$2C_6H_{12}O_6 \xrightarrow{zymase} 2C_2H_5OH + 2CO_2$$

4. 

$$CH_3CH(CH_3)-\underset{H}{\overset{C_4H_9}{C}}-OMgCl \xrightarrow[\text{dil. acid}]{H_2O} CH_3CH(CH_3)-\underset{H}{\overset{C_4H_9}{C}}-OH + Mg(Cl)OH$$

7 $CH_3CH(CH_3)(H)C=O \xrightarrow[\text{or } LiAlH_4]{H_2\ (Ni + Pt)} CH_3CH(CH_3)CH_2OH$

8 CONVERSION OF PROPAN-1-OL TO PROPAN-2-OL

i Propan-1-ol is heated with concentrated tetraoxosulphate (vi) acid at a temperature of 170°C, to dehydrate it and convert it to Prop-1-one.

$$CH_3-CH_2-CH_2-OH \xrightarrow[170^\circ C]{\text{conc } H_2SO_4} CH_3-CH=CH_2$$

Approach 1

ii Propene is then hydrolyzed to propan-2-ol, following Markownikoff's addition. Water, is used as the unasymmetrical reagent, and attaches itself (OH^-) to propene's carbon atom [from "CH" in $CH_3CH_2=CH_2$]

$$CH_3-CH=CH_2 \xrightarrow[\text{/ } OH^-]{H_2O} CH_3-CH_2-OH-CH_3$$

Approach 2

iii Prop-1-ene is converted to a haloalkane, by reaction with a hydrohalide eg: HBr, thus:

$$CH_3CH=CH_2 \xrightarrow{HBr} CH_3CH(Br)CH_3$$

prop-1-ene 2-bromopropane

iv 2-bromopropane is then hydrolysed using potassium hydroxide (KOH) to give Propan-2-ol

$$CH_3CH(Br)CH_3 \xrightarrow{(KOH)_{aq}} CH_3-CH_2-OH-CH_3$$