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1. Alcohols is classified 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 two, it is called primary alcohol (1°). If it has one hydrogen atom it is called secondary alcohol (2°). If it has no hydrogen atom attached to the carbon atom bearing the hydroxyl group it is called tertiary alcohol.

Examples:- CH_3-CH_2-OH [ethanol] - Primary alcohol

$CH_3-CH(OH)-CH_3$ [propan-2-ol] - secondary alcohol

$CH_3-C(OH)(CH_3)-CH_3$ [2methylpropan-2-ol] - Tertiary alcohol

2nd classification

This is based on the number of hydroxyl group they posses. Monohydric alcohol structure. Dihydric alcohols are also called Glycols which 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 alcohol (polyps) have more than three hydroxyl groups

Examples:- CH_3-CH_2-OH [Ethanol] - monohydric alcohol

$CH_2(OH)-CH_2(OH)$ [1,2-Ethandiol] - Dihydric alcohol

$CH_2(OH)-CH(OH)-CH_2(OH)$ [1,2,3-Propantriol] - Polyhydric alcohol

Solubility of Alcohols in water

Lower alcohols with up to three carbon atoms in their molecules are soluble in water because they can form hydrogen bond with water molecules. The solubility of alcohols in water decreases with increasing relative molecular mass (R.M.M)

Solubility of alcohols in Organic Solvents

All monohydric alcohols are soluble in organic solvents. The solubility of some dihydric and polyhydric alcohols is due to their ability to form hydrogen bonds.

5 Steps in manufacture of Ethanol

Carbohydrates such as starch are major groups of natural compounds that can be made to yield ethanol through a biological process called fermentation. The biological catalyst, enzymes found in yeast break down carbohydrate molecules into ethanol to give yield of 95%. The starch containing materials include, potatoes, rice etc and on warming with malt to 60°C for a specific period of time are converted into maltose by the enzyme diastase contained in malt

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

Carbohydrate 60°C / diastase maltose

This then broken down into glucose on addition of yeast which contains the enzyme maltase and at the temperature 15°C

$$C_{12}H_{22}O_{11} + H_2O - 2C_6H_{12}O_6$$

maltose 15°C / maltase glucose

The glucose is then converted into alcohol by enzyme zymase at temperature of 15°C

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

7 $CH_3CH_2CH_3HC=O + CH_3CH_2CH_2CH_2MgCl$

$C_4H_9CH_3CH_2CH_3HC-OMgCl$

$+ H^+ OH^-$

$C_4H_9CH_3CH_2CH_3HC-OH + Mg(OH)Cl$

6. Reduction of 2-methylpropanone $[CH_3CH_2CH_3C=O - CH_3CH_2CH_3CHOH]$ is a secondary alcohol hence we would use either $LiAlH_4$ or $(C_2H_5)_2O$ as reducing agent

7 Reduction of 2-methylpropanal $[CH_3CH_2CH_3CHO - CH_3CH_2CH_3CH_2OH]$ is a primary alcohol and we would still use $LiAlH_4$ or $(C_2H_5)_2O$ as reducing agent

8. Conversion of propan-1 to propan-2-ol

$CH_3CH_2CH_2OH - CH_3CH=CH_2$

Propan-1-ol

$CH_3CH=CH_2 + H_2O - CH_3CHO\ HCH_3$