1. Discuss the two major classifications of alcohols and give two examples for each class.

**ANSWERS**

* The first classification is based on the number of hydrogen atoms attached to the carbon atom holding the functional group which is the hydroxyl group (OH-). They are classified into primary alcohols, secondary alcohols and tertiary alcohols. If the number of hydrogen atom attached to carbon atom bearing the functional group is more are two or three, then it is a primary alcohol. If the hydrogen atom attached to the carbon atom bearing the functional group is one then it is a secondary alcohol but, if there are no hydrogen atom on the carbon bearing the functional group then it is tertiary alcohol.

EXAMPLES:

1. Primary alcohol: CH3OH (methanol)
2. Secondary alcohol: CH3CH(OH)CH3 (Ethanol), CH3CH(OH)CH3 (propan-2-ol)
3. Tertiary alcohols: (CH3)3C-OH (2-Methylpropan-2-ol)
* The second classification is based on mono, di- , tri and polyhydric, depending on the number of hydroxyl groups (OH) they possess. Alcohols containing one hydroxyl group are monohydric, those containing two hydroxyl groups are dihydric or glycol or diol and those containing three (OH) group are triols or trihydric alcohols and those that are more than three are under polyols or polyhydric.

EXAMPLES

1. MONO HYDRIC: CH3-CH2CH2OH (propanol)
2. DI HYDRIC: HOCH2CH2OH (ethane-1,2-diol)
3. TRI HYDRIC: HOCH2CH (OH) CH2OH (propane-1, 2, 3-triol).
4. In the Grignard synthesis of alcohols, react the named Grignard reagent with CH3CH2CH2CH2C=OCH2CH2CH3.

 CH3MgBr (Grignard reagent) + CH3CH2CH2CH2C=OCH2CH2CH3 (octane-4-ene) ttggggggggggggggggggggggggggggggggggggggggggggggggggggggg Mg (Br) CL + CH3CH2CH2CH2C(OH)(CH3 CH2CH2CH3 (tertiary alcohols).

1. Discuss the industrial manufacture of ethanol showing all reaction equations and necessary enzymes and temperature of reaction.

ANSWERS

Carbohydrates such as starch are major group of natural compounds that can be made to yield ethanol by the biological process of fermentation. The biological catalyst, enzymes found in yeast break down the carbohydrate molecules into ethanol to give a yield of 95%. 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 DIATASE contained in malt

 DIATASE

 2(C6H10O5) +NH20 Nc12H22O11

 $60°c$

The maltose is broken down into glucose on addition of yeast, which contains the enzyme MALTASE and at a temperature of $15°c$

 MALTASE

 C12H22O11 +H20 2C6H12O6 (glucose)

 $15℃$

The glucose at constant temperature of 15$℃$ is then converted into alcohol by the enzyme ZYMASE also contained in yeast.

 ZYMASE

 C6H12O6 2CH3CH2OH + 2CO2

 15$℃$ ethanol carbohydrate

1. Determine the product obtained in the reduction of alkanone and alkanal. Use a specific example and show equation of reaction.

ANSWERS:

Alkanone are reduced to primary and alkanal to secondary

For alkanal: (Ni or pt) cal.

 CH3CH=O + 2[H] CH3CH2OH

Ethanal + hydrogen + (Ni or pt catalyst) ethanol (primary alcohol)

For alkanone: (Ni or pt) catalyst

 CH3CH3C=O +2[H] CH3CH(OH)CH3

 LiALH4

 Propane + hydrogen + Ni catalyst propan-2-ol (secondary alcohol)