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Course:-Chem 102

1) Discuss the two major classifications of alkanols.Give two examples each of each class.

a) This is based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group. If the numbers of hydrogen atom attached to the carbon atom bearing the hydroxyl group are two or three, It’s called a primary alcohol (1º).If it is one hydrogen atom, it is called secondary alcohol (2º) and if no hydrogen atom is attached to the carbon atom bearing the hydroxyl group, it is called tertiary alcohol (3º), examples include CH2OH methanol (1º) CH3CH (OH) CH3 propan-2-ol (2º).

b) This is based on the number of hydroxyl groups they possess. Monohydric alcohols have one hydroxyl group present in the alcohol structure. Dihydric alcohols are also called glycols which have two hydroxyl groups present in the alcohol structure of the alcohol.Polyhridic alcohols or polyols have more than three hydroxyl groups.

Examples include CH3CH2CH2OH Propanol (Monohydric alcohol), HOCH2CH2OH Ethane-1,2-diol (Dihydric alcohol).

2)In the Grignard synthesis of alkanols,react a named Grignard reagent with CH3CH2CH2CH2C=OCH2CH2CH3,show the reaction steps.

C3H7

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CH3CH2CH2CH2-C=OCH2CH2CH3+C2H5MgBr →C4H9 –C – OMgBr

|

C3H7 C2H5

H2O |

dilute acid C4H9 – C– OH +Mg(OH)Br

|

C2H5

3) Discuss the industrial manufacture of ethanol showing all reaction equations and necessary enzymes and temperature of reaction

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 catalysts, enzymes found in the yeast breakdown 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 60ºc for a specific period of time are converted into maltose by the enzyme diastase contained in the malt.

2(C6H1OO5) n + nH2O → nC12H22O11

Carbohydrate 60ºc/diastase maltose

The maltose is broken down into glucose on addition of yeast which contains the enzyme maltase and at a temperature of 15ºc

C12H22O11 + H2O → 2C6H12O6

Maltose 15ºc/maltase glucose

The glucose at constant temperature of 15ºc is then converted into alcohol by the enzyme zymase contained also in yeast

C6H12O6  → 2CH3CH2OH + 2CO2

Glucose 15ºc/zymase ethanol

4) Determine the product obtained in the reduction of alkanone and alkanal.use a specific example of each and show the equation of reaction.

Reduction of an aldehyde leads to a primary alcohol while reduction of a ketone leads to a secondary alcohol.

Example

Reduction of an aldehyde

C2H4O + 2[H] → CH3CH (OL)CH3

Ethanal LiAlH4  Ethanol

Reduction of a ketone:-

C3H6O + 2[H] → CH3CH(OL)CH3

Propanone LiAlH4  propan-2-ol