19/MHS01/440

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MEDICINE AND SURGERY.

CHEM 102 ASSIGNMENT

1. Discuss the two major classification of Alkanols, give two examples each.
2. In the Grignard synthesis of alkanols, react a named Grignard reagent with CH3CH2CH2C=OCH2CH2CH3. Show the reaction steps.
3. Discuss the industrial manufacture of ethanol showing all reaction equations and necessary enzymes and temperature of reaction
4. Determine the product obtained in the reduction of Alkanone and Alkanal. Use a specific example for each and show the equation of reaction.

 ANSWERS.

1. Alkanols , popularly known as alcohols, can be majorly classified into two which are:
2. Classification based on the number of hydrogen atoms attached to the carbon atom bearing the hydroxyl group. If the numbers of hydrogen attached to the carbon atom bearing the hydroxyl group are three or two, it is called a 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 a tertiary alcohol (3°). Examples include; CH3OH (methanol,1°), CH3CH(OH)CH3 (propan-2-ol,2°).
3. Classification based on the number of hydroxyl group they possess. Monohydric alcohols have only one hydroxyl group present in the alcohol structure. Dihydric alcohols, also known as glycol, have two hydroxyl groups present in the alcohol structure while trihydric alcohols or triols have three hydroxyl groups present in the structure. Polyhydric alcohols have more than three hydroxyl groups. Examples include; CH3CH2CH2OH (propanol, monohydric), HOCH2CH2OH (ethane-1,2-diol, dihydric).
4. Grignard reagent; CH3CH2CH2MgBr

Ketone; CH3CH2CH2C=OCH2CH2CH3 CH2CH2CH3

CH3CH2CH2MgBr + CH3CH2CH2—C$=$O $⟶$ CH3CH2CH2—C—OMgBr

 CH2CH2CH3 CH3CH2CH2

 H+ OH-

 CH2CH2CH3

 CH3CH2CH2—C—OH + Mg(OH)Br

 CH3CH2CH2

1. Ethanol fermentation, also called alcoholic fermentation, is a biological process which converts sugars such as glucose, fructose and sucrose into cellular energy, producing ethanol and carbon dioxide as by-products. Starch is carbohydrate and is an important source of ethanol. Generally potato, rice, maize or barley are used as source of starch. The starch containing materials are mashed and on warming with malt to 60°C for a specific period of time are converted into maltase by enzyme diastase contained in malt.

 2(C6H1005) + nH2O nC12H22O11

Carbohydrate 60°C/diastase maltose

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

 C12H22011 + H2O 2C6H12O6

 15°C/ maltase

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

 2C6H1206  2CH3CH2CH2OH + 2CO2$\uparrow $

1. Alkanone is reduced to a secondary alcohol by the usual reducing agents such as lithium tetrahydridoaluminate(III) (LiAlH4) in ethoxyethane(C2H5)2 Lithiumtetrahydridoaluminate(III) in ethoxyethane (LiBH4) and sodiumtetrahydridoaluminate(III) in water or methanol.

 CH3COCH2CH3 CH3CH(OH)CH3

 Propanone LIAlH4/(C2H5)2O propan-2-ol

 Alkanal is reduced to a primary alcohol by the usual reducing agents such as lithium tetrahydridoaluminate(III) (LiAlH4) in ethoxyethane (C2H5)2,OLithiumtetrahydridoaluminate(III) in ethoxyethane (LiBH4) and sodiumtetrahydridoaluminate(III) in water or methanol.

 CH3CH2CHO CH3CH2CH2OH

 Propanal LIAlH4/(C2H5)2O propanol