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DEPARTMENT: MBBS

COURSE: CHM 102

MATRIC NO: 19/MHS01/385

1 Discuss the two major classification of Alkanol. Give two examples each for each class

A Classification based on the number of hydroxy groups possessed by them

Monohydric alkanols have only one hydroxyl group per molecules present in the alkanol structure. Glycols / Dihydric alkanols have two hydroxyl groups present in the alkanol structure, while the triols / trihydric alkanols have three hydroxyl groups present in the structure of the alkanol and Polyols / polyhydric alkanols have more than three hydroxyl groups.

E.g i) $CH_3CH(OH)CH_2CH(OH)CH_2CH_3$ – Hexane-2, 4-diol [Dihydric alkanol]

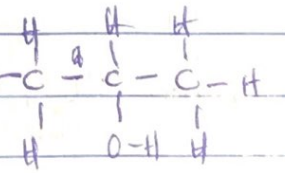
ii) $CH_3CH_2CH_2OH$ – Propanol (Monohydric alkanol)

B Classification based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group:

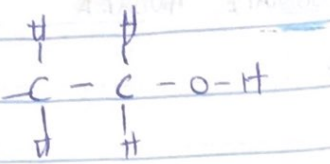
If the numbers of hydrogen atoms attached to the carbon atom bearing the hydroxyl group are three or two it is called a primary alkanol (1°) [In a primary alkanol, the hydroxy group is attached to a primary or terminal carbon atom in the molecule and it is characterize by CH_2OH]. If it is one hydrogen atom attached to the carbon atom bearing the hydroxyl group it is called secondary alkanol (2°) [In a secondary alkanol, the –OH group is on a secondary carbon atom. It is characterized by >[HOH]] and if no hydrogen atom is attached to the carbon atom bearing the hydroxyl group, it is called a "tertiary alkanol (3°) [In a tertiary alkanol, the –OH is on a tertiary carbon. It is characterized by >C–OH]

Examples :-

i) $CH_3CH(OH)CH_3$ – Propan-2-ol (2°) →



ii CH_3CH_2OH - Ethanol (C²) -



2 In the Grignard synthesis of Alkanol, react a named Grignard reagent with $CH_3CH_2CH_2CH_2C{=}OCH_2CH_2CH_3$. Show the reaction steps

Grignard reagent : CH_3CH_2MgCl [ethyl magnesium chloride]

$$CH_3CH_2MgCl + CH_3CH_2CH_2CH_2C{=}OCH_2CH_2CH_3 \longrightarrow$$

$$CH_3CH_2CH_2-\underset{CH_2CH_2CH_3}{\overset{CH_3CH_2}{C}}-OMgCl \xrightarrow[\text{dil. Acid}]{H^+\ OH^-} CH_3CH_2CH_2CH_2-\underset{CH_2CH_2CH_3}{\overset{CH_3CH_2}{C}}-OH + Mg(OH)Br$$

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

For the industrial manufacture of ethanol : Carbohydrates such as starch are major groups of natural compound that can be made to yield ethanol by the biological process of fermentation. The biological catalysts, enzymes found in yeast break down the carbohydrate molecules into ethanol to give a yield of 95%

Step 1: The starch containing materials include potatoes, cereals, rice and on warming with malt to 60°C for a specific period of time are converted into maltose by the enzyme diastase contained in the malt.

$$\underset{\text{carbohydrate}}{2(C_6H_{10}O_5)_n} + nH_2O \xrightarrow[\text{diastase}]{60^\circ C} \underset{\text{maltose}}{nC_{12}H_{22}O_{11}}$$

Step 2 : The maltose is broken down into glucose on addition of yeast which contains the enzyme maltase and at a temperature of 15°C

$$\underset{\text{maltose}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow[\text{maltase}]{15^\circ C} \underset{\text{glucose}}{2C_6H_{12}O_6}$$

Step 3: The glucose at constant temperature of 15°C is then converted into alcohol by the enzyme Zymase contained also in yeast

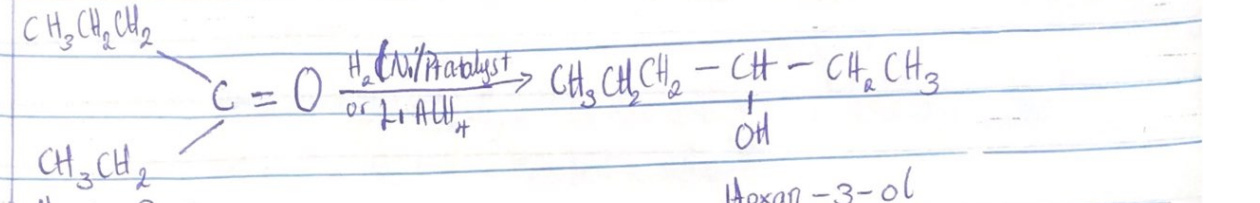
$$C_6H_{12}O_6 \xrightarrow[\text{Zymase}]{15^\circ C} 2CH_3CH_2OH + 2CO_2 \uparrow$$

Glucose — Ethanol — carbon (iv) oxide

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

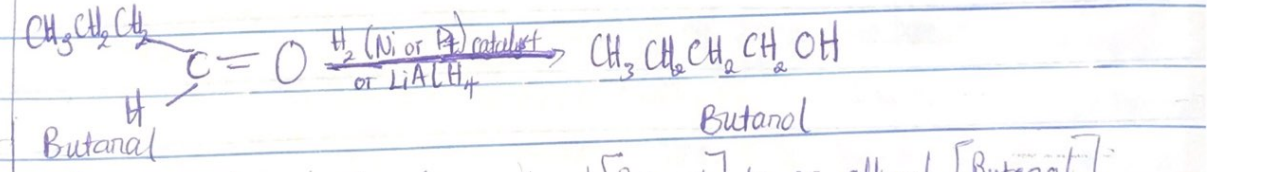
The reduction of alkanone and alkanal using ME ERWEIN - PONNDORF REACTION

For alkanone



This shows the reduction of an alkanone [Hexan-3-one] to an alkanol [Hexan-3-ol]

For alkanal



This shows the reduction of an alkanal [Butanal] to an alkanol [Butanol]