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19/MHS01/300
Medicine and Surgery
CHM 102

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

a) The classification based on the number of hydrogen atoms attached to the carbon atom containing the OH functional group. If the numbers of hydrogen atoms attached to the carbon atom bearing the OH group is two, it is called a Primary alchol (1°). If it is one hydrogen atom, it is called a Secondary alchol (2°) and if no hydrogen atom is attached to the carbon atom bearing the OH group, it is called a tertiary alchol (3°).

Examples are:

$CH_3CH(OH)CH_3$ Propan-2-ol (2°)

$(CH_3)_3C-OH$ 2-Methyl Propan-2-ol (3°)

(b) Classification based on the number of OH functional groups present in the structure of the alkanol. Monohydic alchols have one hydroxyl group present in the alkanol structure. Dihydic alchols have two hydroxyl groups present in the alchol structure. Trihydic alchols have three hydroxyl groups present in the alkanol structure. Polyhydic alchols have more than three hydroxyl groups.

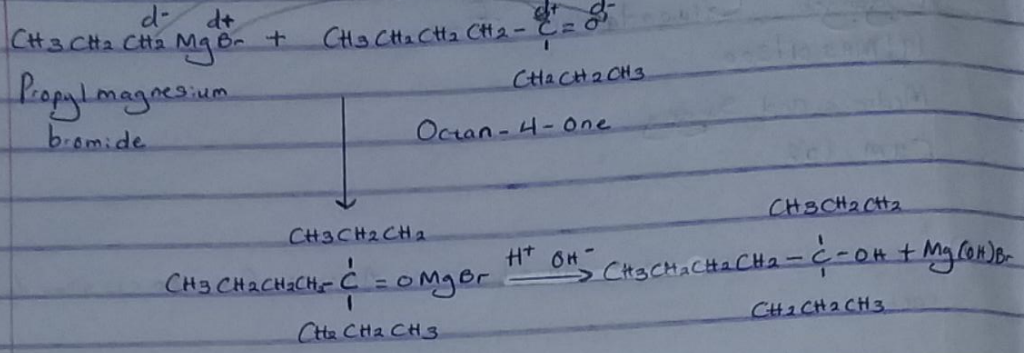
Examples are:

$HOCH_2CH_2OH$ Ethane-1,2-diol (Dihydic alchol)

$OHCH_2CH(OH)CH_2OH$ Propane-1,2,3-triol (Trihydic alchol)

2) In the Grignard Synthesis of Alkanols, react a named Grignard reagent with $CH_3CH_2CH_2CH_2C=OCH_2CH_2CH_3$. Show the reaction steps

Let Grignard reagent be: $CH_3CH_2CH_2MgBr$ (Propyl magnesium bromide)



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

Step I

The starch containing materials 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.

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

Carbohydrate — Maltose

Step II

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

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow{15^\circ C / \text{maltase}} 2C_6H_{12}O_6$$

Maltose — Glucose

Step III

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

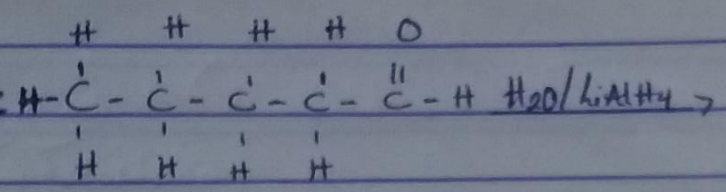
$$C_6H_{12}O_6 \xrightarrow{15^\circ C / \text{Zymase}} 2CH_3CH_2OH + 2CO_2$$

Glucose — Ethanol

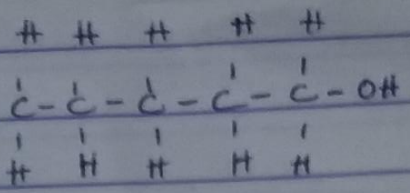
4) Determine the product obtained in the reduction of Alkanone and Alkanal. Use a specific example for each and show the equation of reaction.

Product for reduction of an Alkanone is: a secondary alcohol

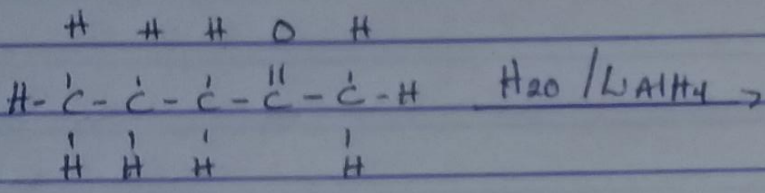
" " " " " Alkanal is: a Primary alcohol

e.g: 

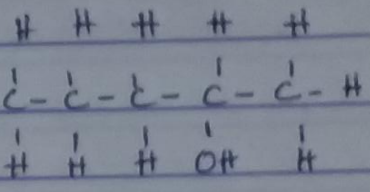
Pentanal



Pentanol



Pentan-2-one



Pentan-2-ol