CHM 102 Monday 6th April 2020
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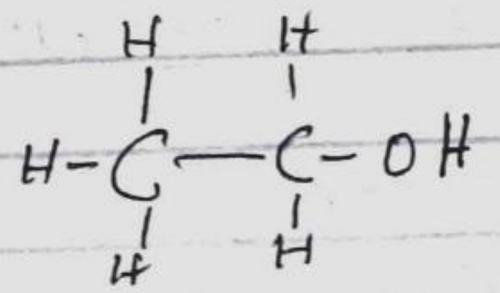
MECHATRONICS ENGINEERING
19/ENG05/1014

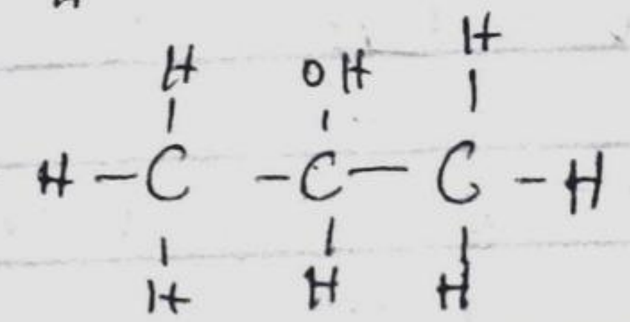
1 Discuss the major two classification of Alkanols. Give two examples each for each class.

a Classification based on the number of hydrogen atoms attached to the carbon containing the hydroxyl group.
- Primary alcohol (1°) - This is when the number of hydrogen atom attached to the carbon bearing the hydroxyl group are three or two e.g methanol.
- Secondary alcohol (2°) - When the number of hydrogen atom attached is only one e.g propan-2-ol.
- Tertiary alcohol (3°) - When there is no hydrogen atom attached to the carbon atom bearing the hydroxyl group. e.g Methylpropan-2-ol.

Examples
Ethanol (1°) =



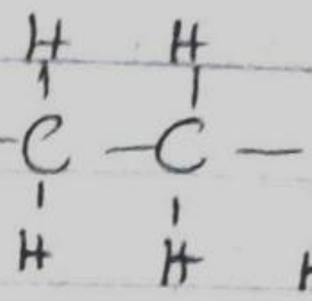
Propan-2-ol (2°) =

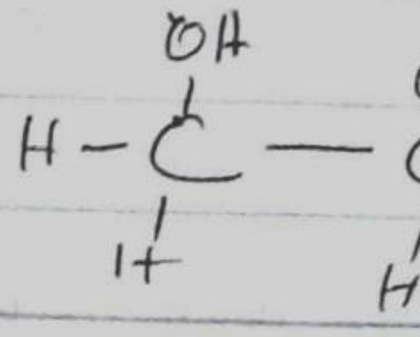


b Classification based on the number of hydroxyl groups they possess.
- Monohydric alcohols have one hydroxyl group present in the alcohol structure.
- Dihydric alcohols have two hydroxyl group present in the alcohol structure. They are also called Glycol
- Trihydric alcohols or triols have three hydroxyl groups

present in the structure of the alcohol.
- Polyhydric alcohols or polyols have more than three hydroxyl groups.

Examples

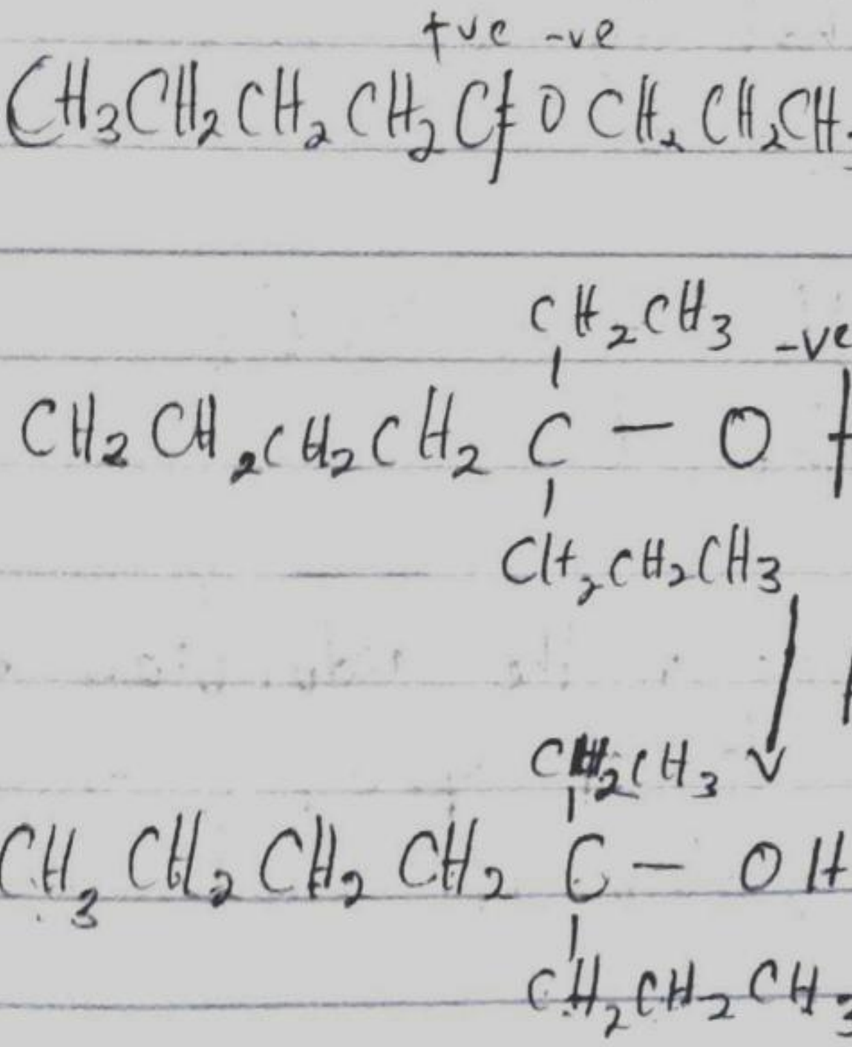
Propanol -  (monohydric ~~ol~~ alcohol)

Ethane-1,2-diol =  (Dihydric alcohol)

2 In the Grignard synthesis of Alkanals, react a named grignard reagent with $CH_3CH_2CH_2CH_2C=OCH_2CH_2CH_3$. Show the steps

$CH_3CH_2CH_2CH_2C=OCH_2CH_2CH_3 + CH_3CH_2MgCl$

Octan-4-none ethyl magnesium chloride.



4 ethyl octan-4-ol + Magnesium hydroxide chloride

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

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

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

carbohydrate — maltose

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

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

maltose — glucose

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

$C_6H_{12}O_6 \xrightarrow[\text{Zymase}]{15^\circ C} 2C_2H_5OH + 2CO_2$

glucose — ethanol

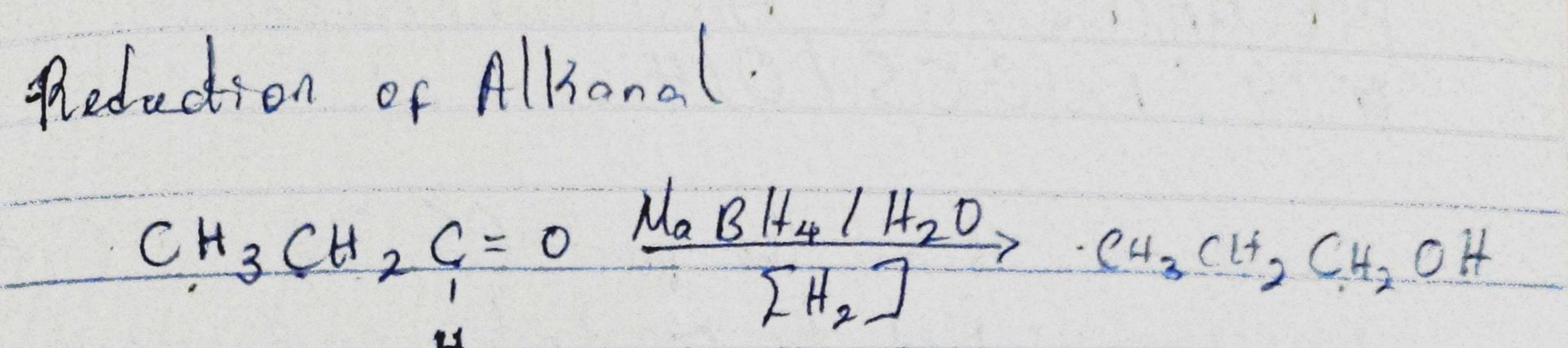
4 Determine the product obtained in the reduction of Alkanone and Alkanal. Use of specific example for each and show the equation of reaction.

Reduction of Alkanone

$CH_3CH_2\overset{\overset{O}{\|}}{C}-CH_2CH_3 \xrightarrow[[H_2]]{LiBH_4(C_2H_5)_2O} CH_3CH_2-\overset{\overset{OH}{|}}{\underset{\underset{H}{|}}{C}}-CH_2CH_3$

pentan-2-one — pentan-2-ol

Reduction of Alkanal.



Propanal ..... Propanol