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MECHATRONICS ENGINEERING
19/ENG05/1043
CHEM 102.

1) Classification of Alkanols:

i) Based on the number of hydrogen atoms attached to the hydroxyl group.

- Primary alkanols have 2 or 3 hydrogen atoms attached.
- Secondary alkanols have 1 hydrogen atom attached.
- Tertiary alcohols have no hydrogen atom attached.

Primary Alcohols (1°)

CH_3CH_2OH (Ethanol)

$CH_3CH_2CH_2OH$ (Propan-1-ol)

Secondary Alcohols (2°)

$CH_3CH(OH)CH_3$ (Propan-2-ol)

$CH_3CH(OH)CH_2CH_3$ (Butan-2-ol)

Tertiary Alcohols (3°)

$(CH_3)_3C-OH$ (2-Methyl propan-2-ol)

$CH_3CH_2C(CH_3)_2C-OH$ (2-methyl butan-2-ol)

ii) Based on the number of hydroxyl groups the compound possesses.

- Monohydric alkanols have one hydroxyl group.
- Dihydric alkanols have two hydroxyl groups
- Trihydric alkanols have three hydroxyl groups
- Polyhydric alkanols have more than three hydroxyl groups.

Monohydric Alcohols

$CH_3CH_2CH_2OH$ (Propanol)

$CH_3CH_2CH_2CH_2OH$ (Butanol)

Dihydric Alcohols

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

$CH_3CH(OH)CH_2CH(OH)CH_2CH_3$ (Hexane-2,4-diol)

Trihydric Alcohols

~~$HO CH_2 CH_2 OH$ (ethane-1,2-diol)~~ $OH CH_2 CH(OH) CH_2 OH$ (Propane-1,2,3-triol)

~~$CH_3 CH(OH)$~~ $OH CH_2 CH(OH) CH(OH) CH_3$ (1,2,3-buntantriol).

Polydric Alcohols

$CH_3 CH(OH) CH(OH) CH(OH) CH(OH) CH(OH) CH_3$

- (heptane-2,3,4,5,6-pentayol

~~$CH_3 OH COH$~~ $CH_3 CH(OH) CH(OH) CH(OH) CH(OH) CH_3$

- (hexane-2,3,4,5-butaol).

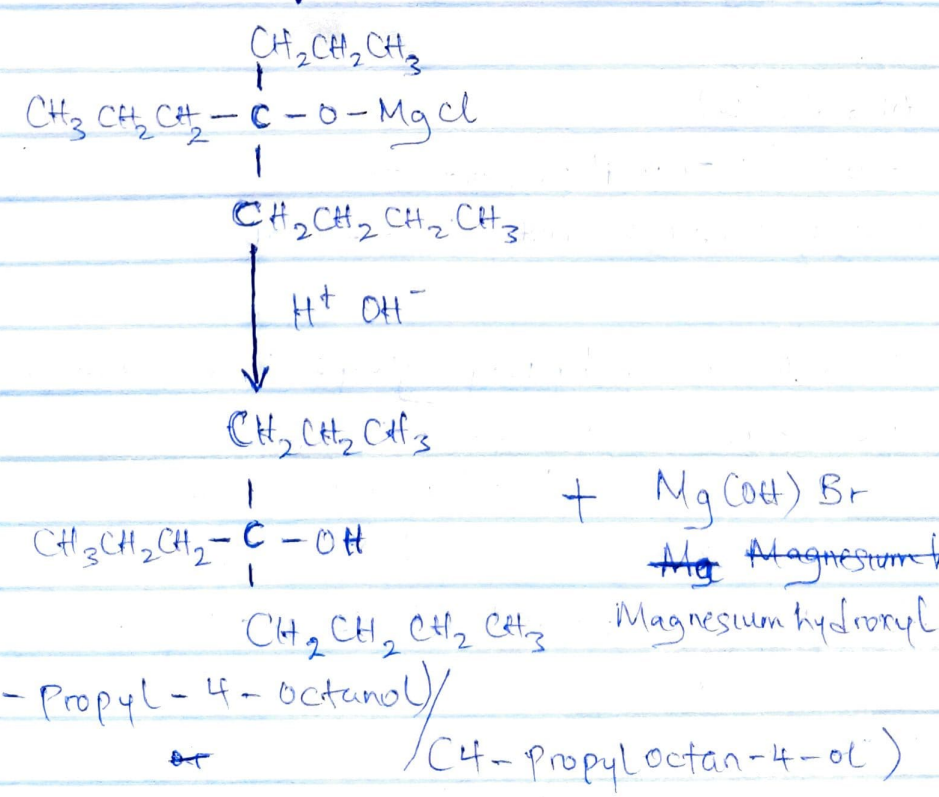
2) Grignard Synthesis of Alkanols.

~~CH~~

$CH_3 CH_2 CH_2 MgCl$ + $CH_3 CH_2 CH_2 C=O \; CH_2 CH_2 CH_2 CH_3$

Propyl magnesium chloride (Grignard Reagent)

4-Octanone. (Octa-4-none).



~~Mg~~ ~~Magnesium hyd.~~

Magnesium hydroxyl Bromide

(4-Propyl-4-octanol)/ ~~or~~ (4-Propyloctan-4-ol)

3) Carbohydrates such as Starch are major group of natural components that can be made to yield ethanol by the biological process of fermentation.

The biological catalyst enzymes found in yeast breaks down the carbohydrates to produce ethanol. The starch materials on warming with malt to 60°C for a specific period of time are converted to maltose by the enzyme diastase contained in malt

$$2(C_6H_{10}O_5)_n + (H_2O)_n \xrightarrow[\text{diastase}]{60^\circ C} n(C_{12}H_{22}O_{11})$$

Carbohydrate — water — maltose

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

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

Maltose — water — Glucose

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

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

Glucose — ethanol — Carbon(IV) oxide

4) Reduction of Alkanal

$$CH_3-C(=O)-H \xrightarrow[\text{or } LiAlH_4]{Ni, Pt, \text{or } Pt} CH_3-CH(H)-OH$$

Ethanal — Primary alkanol (ethanol)

Reduction of Alkanone.

$$CH_3-C(=O)-CH_3 \xrightarrow[\text{or } LiAlH_4]{Ni, Pt, \text{or } Pt} CH_3-CH(OH)-CH_3$$

Propanone — Secondary alkanol (Methylethanol)