ASSIGNMENT

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

- Based on the number of hydrogen atoms attached to the carbon atom that is carrying the hydroxyl (-OH) group.

a Primary alcohol (1°) - If the number of hydrogen attached to the carbon carrying the (OH) group are two or three.

E.g $CH_3OH$ (methanol), $CH_3CH_2CH_2OH$ (Propanol)

b Secondary alcohol (2°) - This is obtained if the hydrogen atom attached to the carbon carrying the hydroxyl group is one.

E.g $CH_3CH(OH)CH_3$ - propan 2 ol, $CH_3CH(OH)CH_2CH_3$ - 2-hydroxyl butanol

c Tertiary alcohol (3°) - This is formed when there is no hydrogen atom attached to the carbon atom carrying the hydroxyl group.

E.g $(CH_3)_3-C-OH$ - 2 Methyl propan-2-ol

$C_5H_3-C(CH_3)(OH)-CH_3$ - 3 methyl butan-2-ol

- Based on the number of hydroxyl group they possess

a Monohydric alcohol - Presence of one hydroxyl group

E.g methanol, $CH_3OH$, $CH_3CH_2OH$ (Butanol)

b Dihydric alcohol - They have two hydroxyl groups

E.g $OH\,CH_2\,CH_2OH$ - Ethan-1,2-diol

$CH_3CH(OH)CH_2(OH)CH_3$ - Butan-2,3-diol

c Trihydric alcohol - Presence of more than three hydroxyl groups.

E.g $CH_3CH(OH)CH(OH)CH(OH)CH(OH)CH_2(OH)CH(OH)CH_3$

- ~~Hexan-2,3,4,5,6~~ Octan

- Octan-2,3,4,5,6,7-hexanol

* $CH_3CH(OH)CH(OH)CH(OH)CH(OH)CH(OH)CH_3$ - Heptan-3,3,4,5,6-pentanol

2 In Grignard synthesis of Alkanols react a named Grignard reagent with $CH_3CH_2CH_2CH_2C=OCH_2CH_2CH_3$ Show the reaction steps

Grignard reagent - $CH_3MgCl$

$$CH_3CH_2CH_2CH_2C=OCH_2CH_2CH_3 + CH_3MgCl \longrightarrow CH_3CH_2CH_2CH_2-C(CH_3)(CH_2CH_2CH_3)-O=MgCl$$

~~4 mangi~~ octan-4-one Grignard reagent ~~4 mangi~~

$$CH_3CH_2CH_2CH_2-C(CH_3)(CH_2CH_2CH_3)-O=MgCl \xrightarrow[\text{dil acid}]{H^+\ OH^-} CH_3CH_2CH_2CH_2-C(CH_3)(CH_2CH_2CH_3)-OH + Mg(OH)Cl$$

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

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

starch maltose

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow[15^\circ C]{\text{maltase}} 2C_6H_{12}O_{6(aq)}$$

maltose Glucose

$$C_6H_{12}O_{6(aq)} \xrightarrow[15^\circ C]{\text{Zymase}} 2C_2H_5OH_{(aq)} + 2CO_{2(g)}$$

Glucose Ethanol

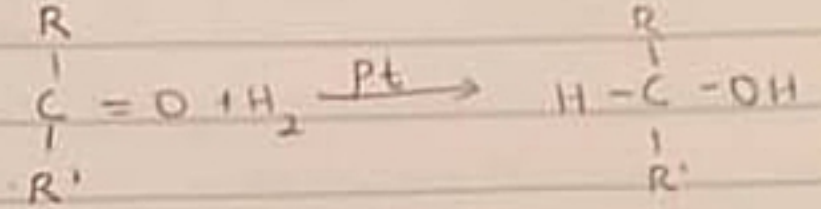
4 Determine the product obtained in the reduction of Alkanons and Alkanal use a specific example for each and show the equation of reaction

Alkanal $R-C(H)=O + H_2 \xrightarrow{Ni} R-C(H)(H)-OH$

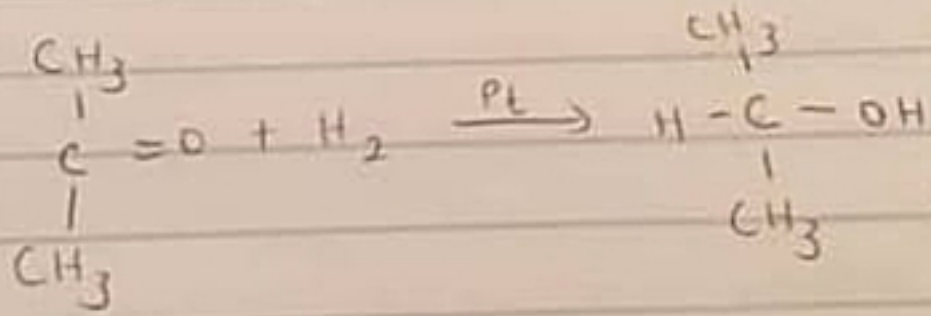
Example $CH_3CH=O + H_2 \xrightarrow{Ni} CH_3-C(H)(H)-OH$ primary alkanol

Ethanal Ethanol

Alkanol



Example



propan-2-ol

Propanal