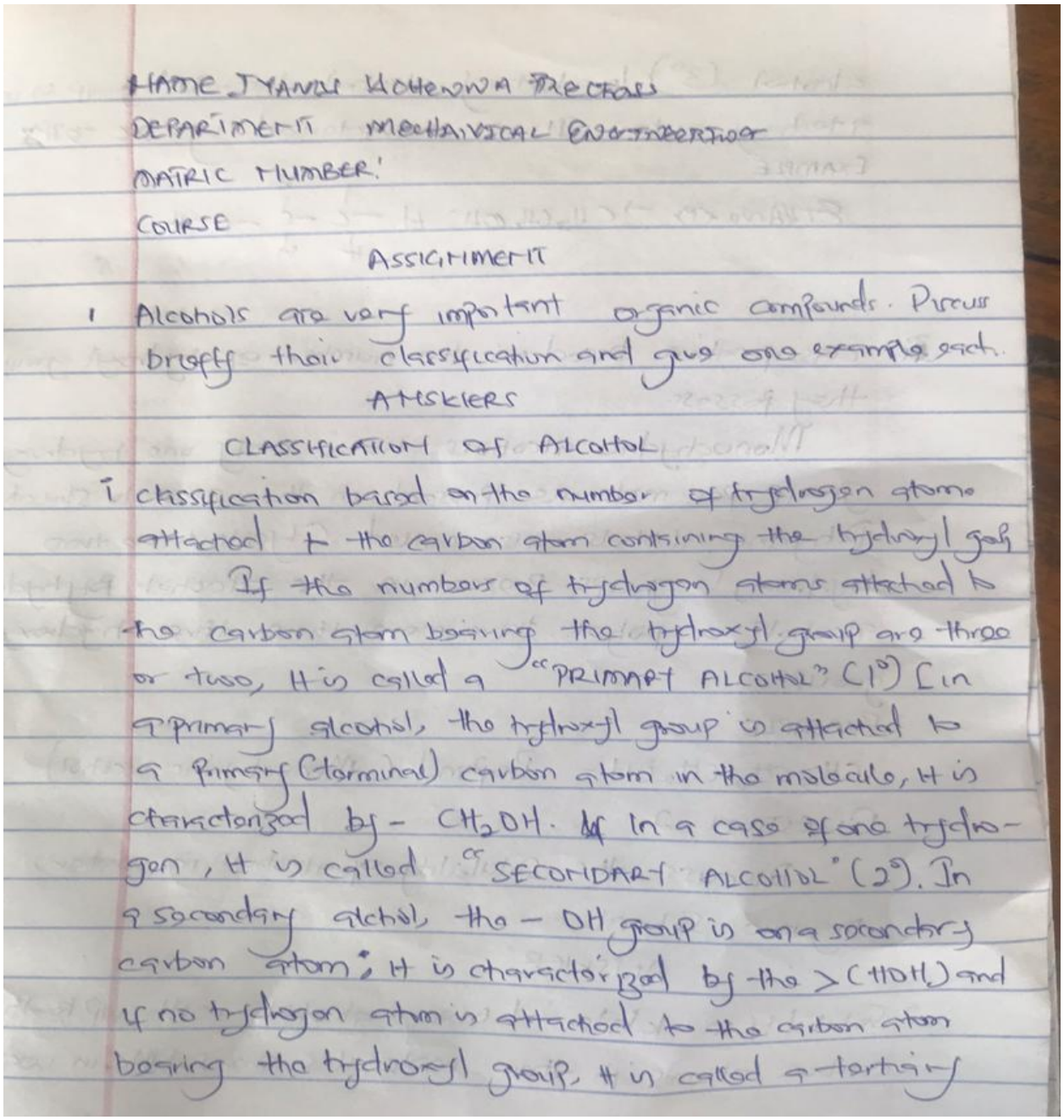
IYAMU UCHENNA PRECIOUS

19/ENG06/031

MECHANICAL ENGINEERING

CHM102



NAME: IYAMU UCHENNA PRECIOUS
DEPARTMENT: MECHANICAL ENGINEERING
MATRIC NUMBER:
COURSE

ASSIGNMENT

1 Alcohols are very important organic compounds. Discuss briefly their classification and give one example each.

ANSWERS

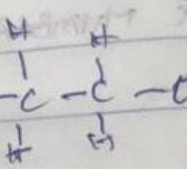
CLASSIFICATION OF ALCOHOL

i 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 ALCOHOL" (1°) [in a primary alcohol, the hydroxyl group is attached to a Primary (terminal) carbon atom in the molecule, it is characterized by - CH_2OH. In a case of one hydrogen, it is called "SECONDARY ALCOHOL" (2°). In a secondary alcohol, the - OH group is on a secondary carbon atom; it is characterized by the >(HOH_2) and if no hydrogen atom is attached to the carbon atom bearing the hydroxyl group, it is called a tertiary

alcohol (3^0). In a tertiary alcohol, the –OH group is on a tertiary carbon. It is characterized by >C–OH

EXAMPLE

ETHANOL → CH_3CH_2OH: 

Classification based on the number of hydroxyl groups they possess.

Monohydric alcohols have only one hydroxyl group per molecule present in the alcohols structure. Dihydric alcohols also called Glycols have two hydroxyl groups present in the alcohol. Polyhydric alcohols or polyols have more than three hydroxyl groups.

EXAMPLE

$CH_3CH_2CH_2OH$ – Propanol (Monohydric alcohol)

QUESTION 2

Discuss the solubility of alcohols in water, organic solvents.

ANSWER

i Solubility in water: Lower alcohols with up to three carbon atoms in their molecules are soluble in water

because these lower alcohols can form hydrogen bond with water ~~because~~ molecules. "The water solubility of alcohol decreases with increasing relative molecular mass".

ii Solubility in organic solvents:- All monohydric alcohols are soluble in organic solvents. The solubility of simple alcohols are ~~poly hi~~ polyhydric alcohols is largely due to their ability to form hydrogen bonds with water molecules.

QUESTION 3

Show the three steps in the industrial manufacture of ethanol. Equations of reaction are mandatory.

INDUSTRIAL MANUFACTURE OF ETHANOL

Carbohydrates such as starch are major groups of natural compounds 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 maize, potatoes, cereals, rice and on warming with ... to 60°C for a specific period of time are conver-

had into "maltose" by the enzyme diastase contained in the malt.

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

carbohydrate. water. maltose

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

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

maltose water. Glucose

STEP 3: the glucose of constant temperature of 15°C is then converted into alcohol by the enzyme zymase contained also in yeast

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

Glucose ethanol carbon(iv) oxide.

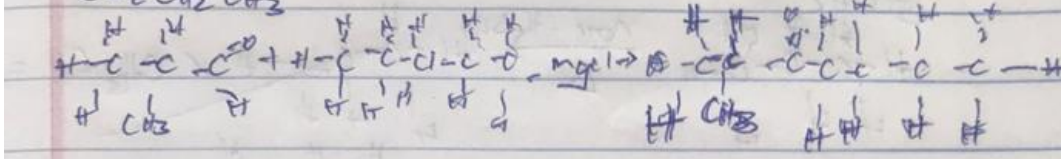
QUESTION 4

Show the reaction between 2 methylpropanal and butyl-magnesium chloride. Hint: Grignard synthesis.

ANSWER

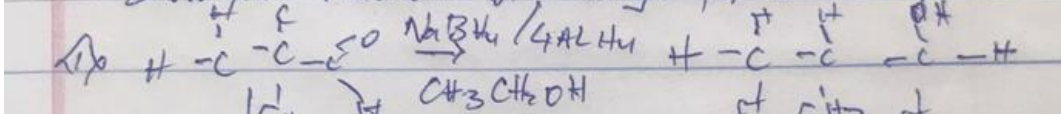
2-methyl propanal + Butyl magnesium chloride → ?

$CH_3CH(CH_3)CHO + CH_3CH_2CH_2CH_2CH_2-MgCl \rightarrow CH_3CH(CH_3)C(OH)CH_2CH_2CH_2CH_3$

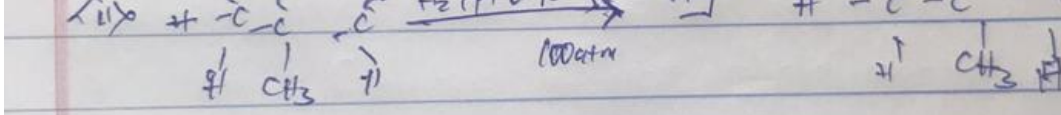


2-methyl 3-heptanol

i. Show the reaction of 2 methyl propanol

(i) 

2 methyl Propanol

(ii) 

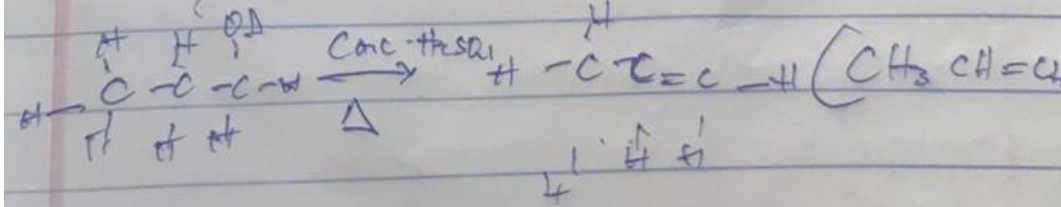
8 Propose a scheme for the conversion of Propan-1-ol to propan-2-ol

Answer

SCHEME

STEP 1: DEHYDRATION OF PROPAN-1-OL TO PROPENE

Using conc. H_2SO_4



Oxymercuration – Demercuration

Step 2