

CHM 102 ASSIGNMENT

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DEPT: PETROLEUM ENGINEERING

MATRIC NO: 19/ENG07/018

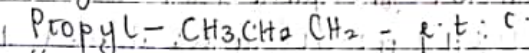
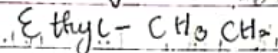
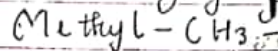
ANSWERS

(1)

Classification of Alkanols

i) Classification based on the number of alkyl group or hydrogen atom.

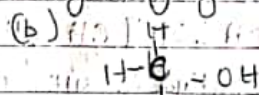
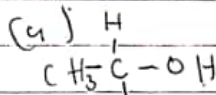
Note: Alkanol has the general molecular formula $R-OH$ where "R" is the alkyl group. e.g



while "OH" is the hydroxyl group which is the main functional group of alkanols.

Alkanols can be classified as follows:

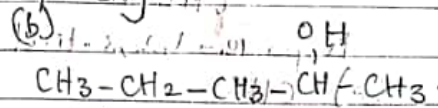
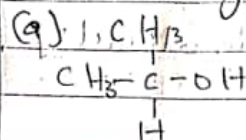
(i) Primary alkanol: Primary alkanols have only one alkyl group or three or two hydrogen atoms attached to the atom that carries hydroxyl group. e.g



Ethanol [1°]

Methanol [1°]

(ii) Secondary alkanol: Secondary alkanols have two alkyl groups or one hydrogen atom attached to the carbon that carries the hydroxyl group. e.g



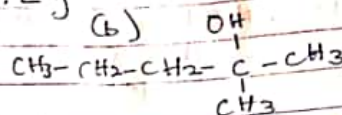
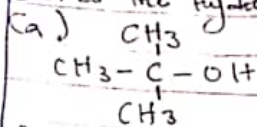
2-Butanol [2°]

Propan-2-ol [2°]

Butan-2-ol [2°]

2-Propanol [2°]

(iii) Tertiary alcohol: Tertiary alcohols have three alkyl groups and no hydrogen atom attached to the carbon atom that carries the hydroxyl group. e.g.



2-Methyl propan-2-ol [3°]

2-Methyl Butan-2-ol

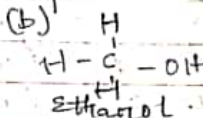
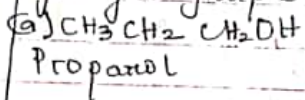
2-Methyl-2-propanol [3°]

2-Methyl-2-Butanol

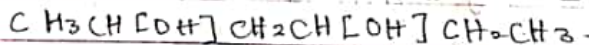
(2) Classification based on the number of hydroxyl groups they possess.

It can be classified as follows:

(i) Monohydric alcohols: Monohydric alcohols have only one hydroxyl group [-OH] present in the alcohol structure. e.g.

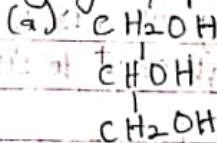


(ii) Dihydric alcohols: Dihydric alcohols are also called glycols having two hydroxyl groups present in the alcohol structure. e.g.

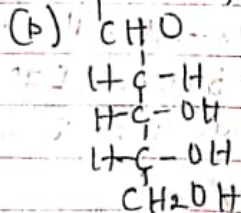


Hexane-2,4-diol [Dihydric alcohols]

(iii) Trihydric alcohol: They are also called triols. They have three hydroxyl groups present in the alcohol structure. e.g.

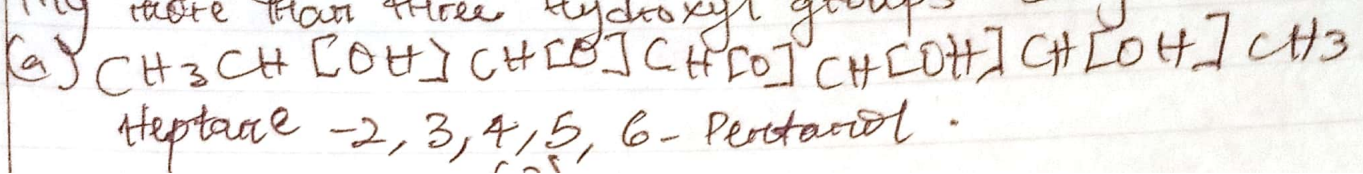


Propane-1,2,3-triol [Trihydric alcohols]



D-glyceral aldehyde

(iv) Polyhydric alcohols: Polyhydric alcohols are those ones having more than three hydroxyl groups e.g.



2. Discuss the solubility of alcohols in water, organic solvents.

SOLUBILITY OF ALCOHOLS IN WATER, ORGANIC SOLVENTS.

→ 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 molecules. "The water solubility of alcohols decreases with increasing relative molecular mass"

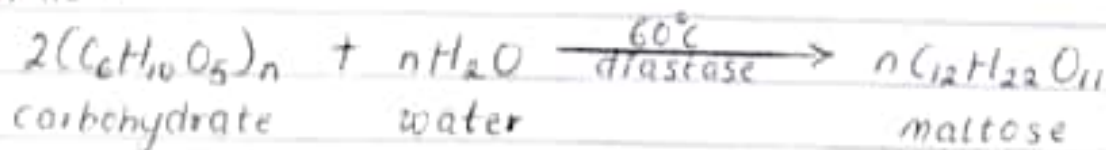
→ Solubility in Organic Solvents: All monohydric alcohols are soluble in organic solvents. The solubility of simple alcohols and polyhydric alcohols is largely due to their ability to form hydrogen bonds with water molecules.

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

INDUSTRIAL MANUFACTURE OF ETHANOL

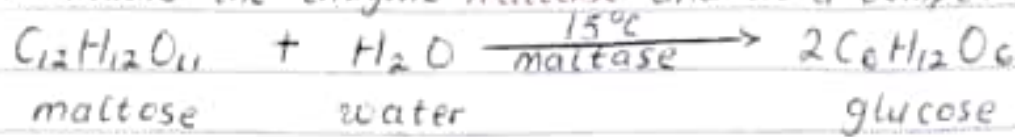
Carbohydrates such as starch are major groups of natural compounds that can be made to yield ethanol by the biological process of fermentation. The biological catalysts, enzymes found in yeast break down the carbohydrate molecules into ethanol to give a yield of 95%.

STEP 1: The starch containing materials include molasses, potatoes, cereals, rice and 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.

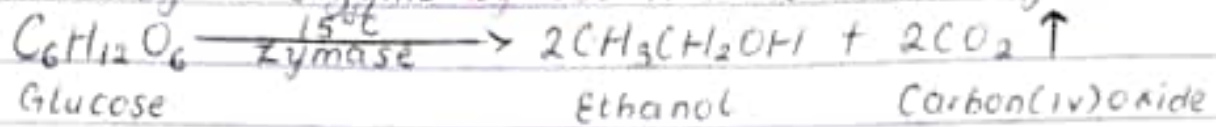


STEP 2: The maltose is broken down into glucose on addition of yeast

which contains the enzyme maltase and at a temperature of 15°C.

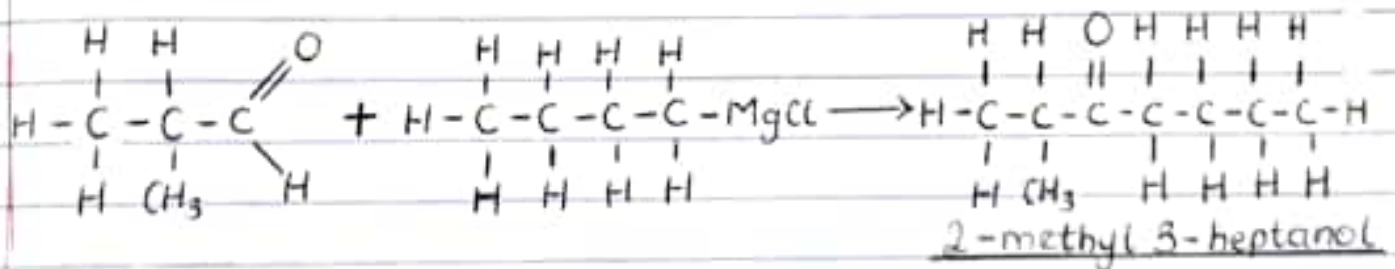
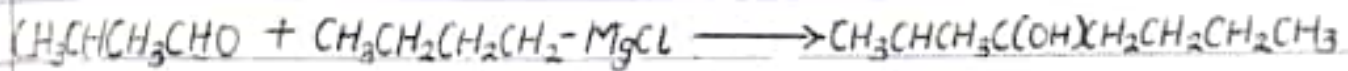
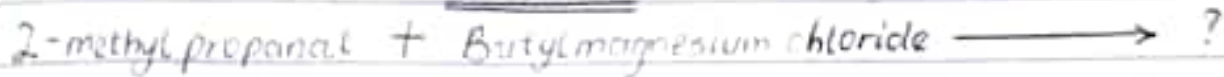


STEP 3: The glucose at constant temperature of 15°C is then converted into alcohol by the enzyme zymase contained also in yeast.



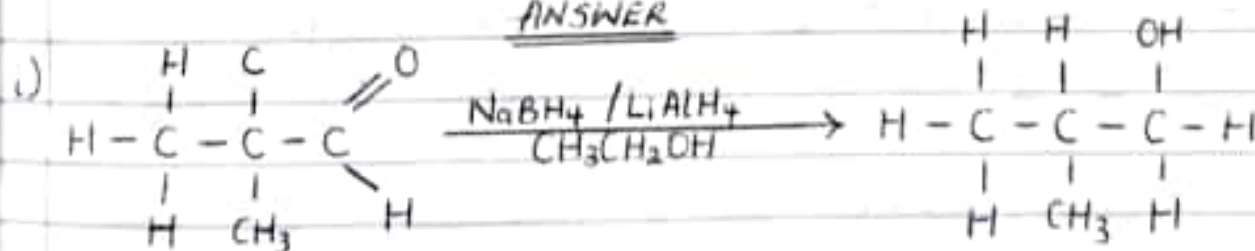
4 Show the reaction between 2-methylpropanal and butylmagnesium chloride. Hint: Grignard synthesis.

ANSWER



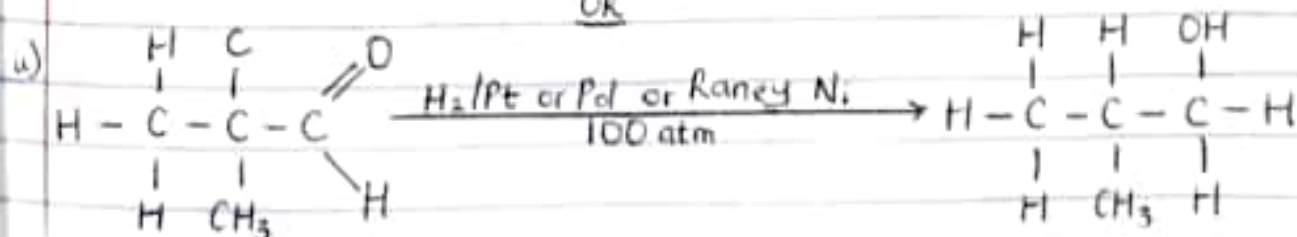
7 Show the reduction reaction of 2-methylpropanal.

ANSWER



2-methyl propanol

OR

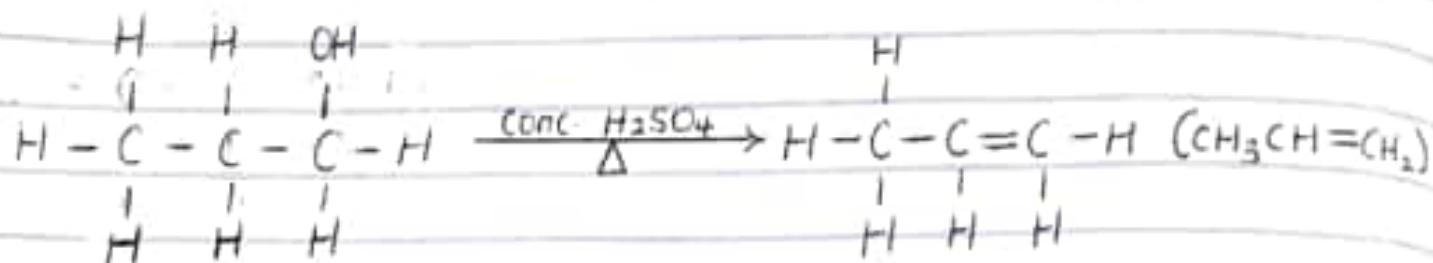


8 Propose a scheme for the conversion of propan-1-ol to propan-2-ol.

ANSWER

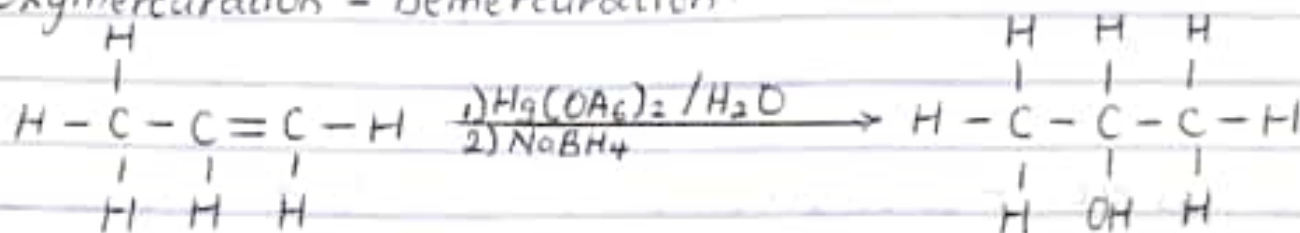
SCHEME

STEP 1: Dehydration of Propan-1-ol to propene using conc. H_2SO_4



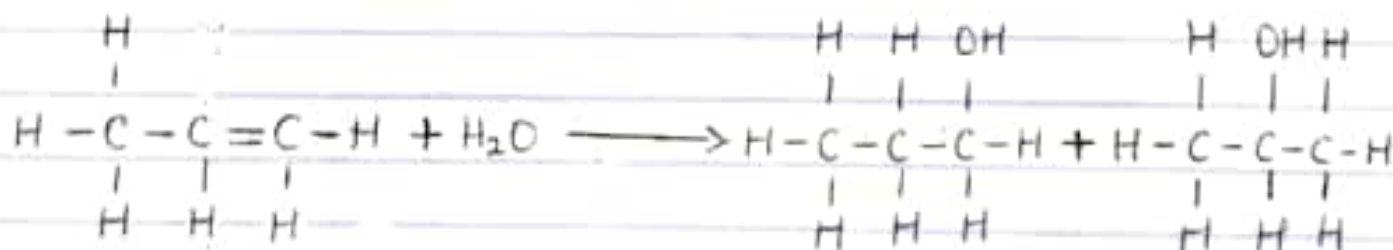
STEP 2: You can use either,

A. Oxymercuration - Demercuration.



Preferable

B. Since propene is asymmetrical, on hydrolysis or addition of water, using a markovnikov procedure. Propan-2-ol can be obtained!



You would actually get the 2 products: Propan-1-ol Propan-2-ol

But following markovnikov's rule, Propan-2-ol would be the major product.