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DEPARTMENT: MEDICINE AND SURGERY
COURSE: CHM 102

ASSIGNMENT

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

ANSWER

CLASSIFICATION OF ALKANOLS

- a) This is based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl groups
If the number of hydrogen atoms attached to the carbon atom bearing the hydroxyl group are three or two, it is called a
* PRIMARY alcohol (1°). If it is one hydrogen atom, it is called
* SECONDARY alcohol (2°) and if no hydrogen atom is attached to the carbon atom bearing the hydroxyl group, it is called a
* TERTIARY alcohol (3°).

EXAMPLES

- i) $\text{CH}_3\text{CH}_2\text{OH}$ - Ethanol (1°) ii) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ - Propanol (1°)
iii) $(\text{CH}_3)_3\text{C}-\text{OH}$ - 2-Methylpropan-2-ol (3°)
iv) $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$ (Propan-2-ol) v) $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_3$ (Butan-2-ol)

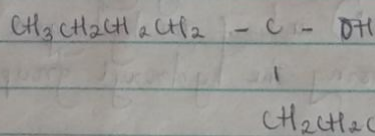
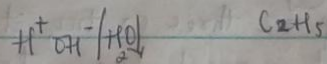
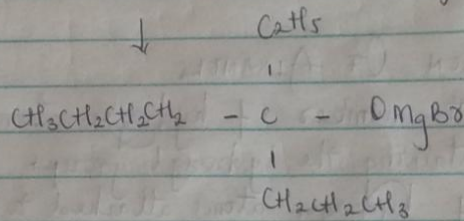
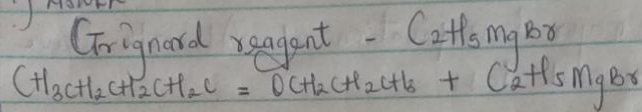
- b) This is based on the number of hydroxyl groups they possess.
- Monohydric alcohols have one hydroxyl group present in the alcohol structure.
- Dihydric alcohols are also called DIOLS have two hydroxyl groups present in the alcohol structure
- Trihydric alcohols or TRIOLS have three hydroxyl groups present in the structure of the alcohol.
- Polyhydric alcohols or POLYOLS have more than three hydroxyl groups.

EXAMPLES

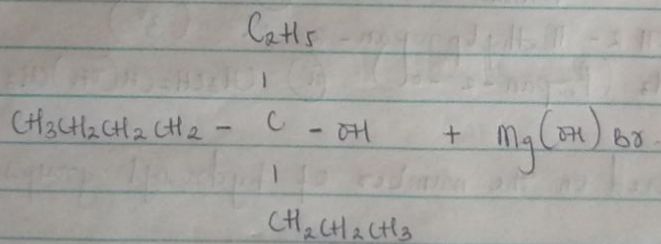
- i) $\text{HOCH}_2\text{CH}_2\text{OH}$ - Ethane-1,2-diol (Dihydric alcohol)
ii) $\text{OHCH}_2\text{CH}(\text{OH})\text{CH}_2\text{OH}$ - Propane-1,2,3-triol (Trihydric alcohol)
iii) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ - Propanol iv) $\text{CH}_3\text{CH}_2\text{OH}$ - Ethanol (Monohydric alcohol)

2) In the Grignard synthesis of Alkanols, react a named Grignard reagent with $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{C}=\text{OCH}_2\text{CH}_2\text{CH}_3$. Show the reaction steps.

ANSWER



The final product is



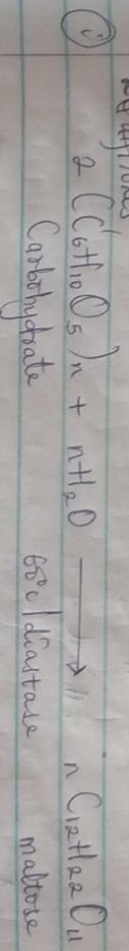
8) Discuss the industrial manufacture of ethanol showing all reaction equations and necessary enzymes and temperatures of reaction.

1) MALT

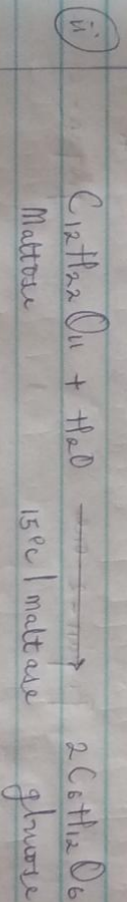
INDUSTRIAL FERMENTATION OF GLUCOSE (C₆H₁₂O₆)
Carbohydrates such as starch are major group of natural compounds that can be made to yield ethanol by the biological process of fermentation.

The biological catalyst, enzymes found in yeast break down the carbohydrate molecules into ethanol to give a yield of 95%. The starch containing materials include molasses, potatoes, cereals and on roasting with malt to 65°C for a specific period of time are converted into maltose by the enzyme diastase contained in the malt.

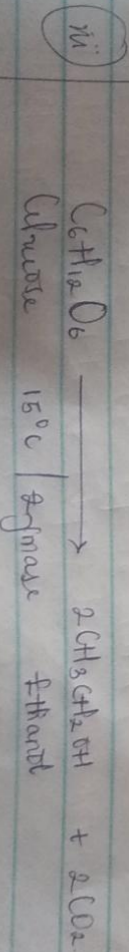
Equations



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



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

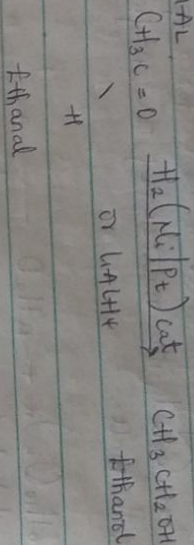


4) Determine the product obtained in the reduction of Alkanone and Alkanal. Use a specific example for each and show the equation of reaction.

- Alkanals

Alkanones and Alkanals are reduced to Primary and Secondary alcohols respectively by reaction with hydrogen in the presence of a platinum or nickel catalyst or with aluminium isopropoxide (the merrifield - Pinner's reaction) or with complex metal hydride, such as lithium tetrahydridoaluminate (LiAlH₄) or sodium tetrahydridoborate (III) (NaBH₄)

- Alkanal



- Alkanone

