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MAT. NO 19/MHS 02/035

COURSE CHM 102

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

Classification of Alkanols.

⇒ Primary Alkanol: Primary alcohols are those alcohols where the carbon atom of the hydroxyl group (OH) is attached to only one single alkyl group.

Examples are;

⇒ Ethanol $\text{CH}_3 - \text{CH}_2 - \text{OH}$

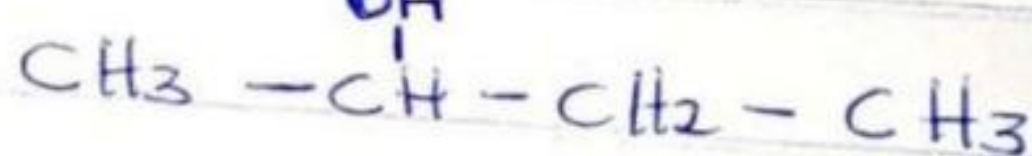
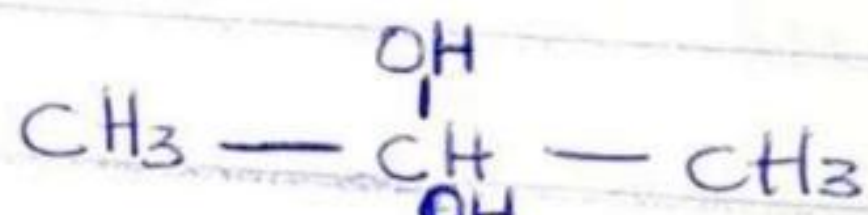
⇒ Propan-1-ol $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{OH}$

⇒ Secondary Alkanol: Secondary alcohols are those where the carbon atom of the hydroxyl group is attached to two alkyl groups on either side.

Examples are;

⇒ Propan-2-ol

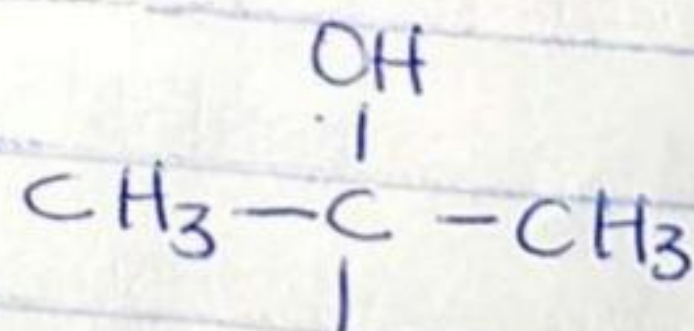
⇒ Butan-2-ol



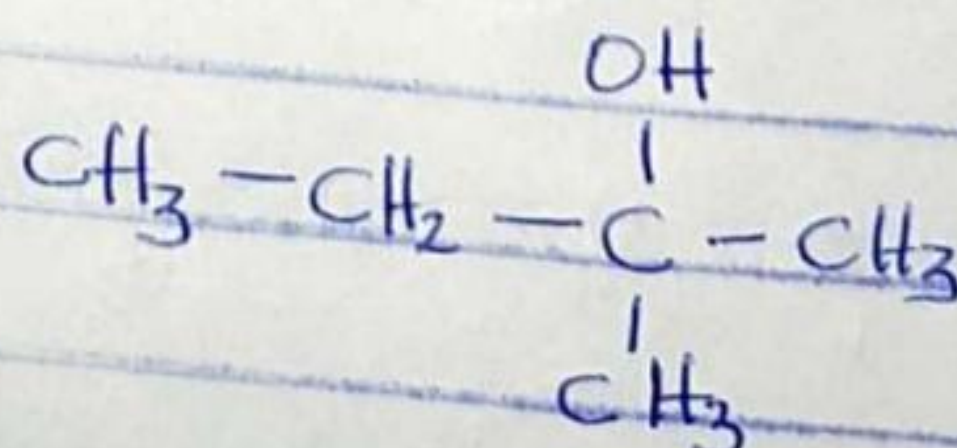
⇒ Tertiary Alkanols: Tertiary alcohols are those which feature hydroxyl group attached to the carbon atom which is connected to 3-alkyl groups.

Examples are;

⇒ 2-methylpropan-2-ol

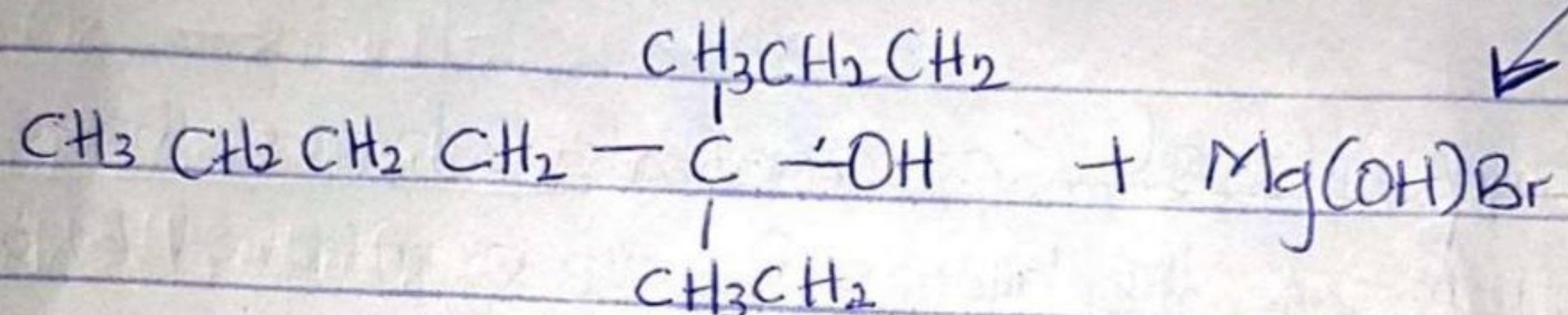
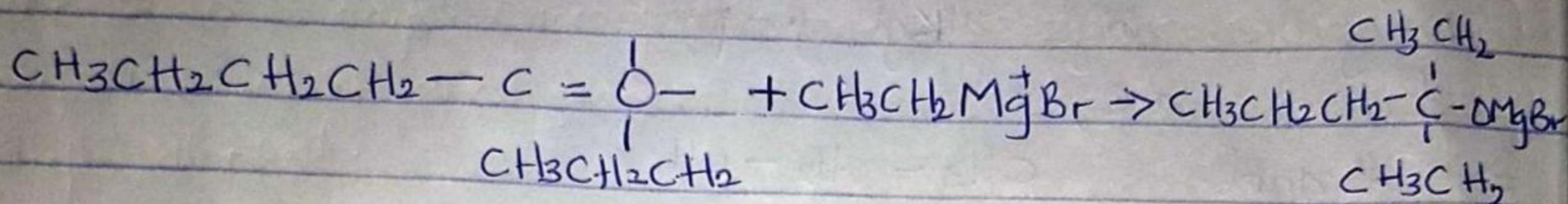
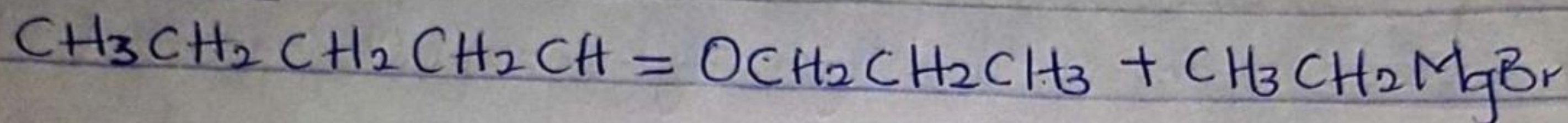


⇒ 2-methylbutan-2-ol



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:



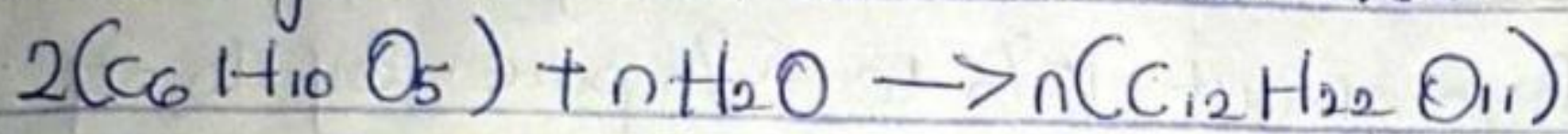
$\swarrow \text{OH} / \text{H}^+$

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

⇒ Industrial manufacture of ethanol.

→ Extraction of starch : The crushed potato is steamed at 1400°C to 1500°C under pressure to prepare starch solution known as MASH. GERMINATION Before hydrolysis, starch is first undergo germination at ~~100~~¹⁰ $^{\circ}\text{C}$ to 13°C for few days. This germinated starch is called MALT.

HYDROLYSIS OF STARCH : Starch is hydrolysed to maltose by an enzyme known as ~~diastase~~ diastase.

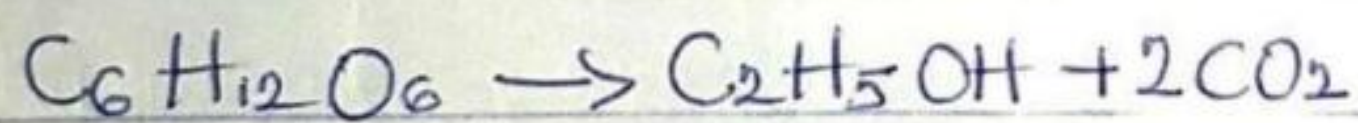
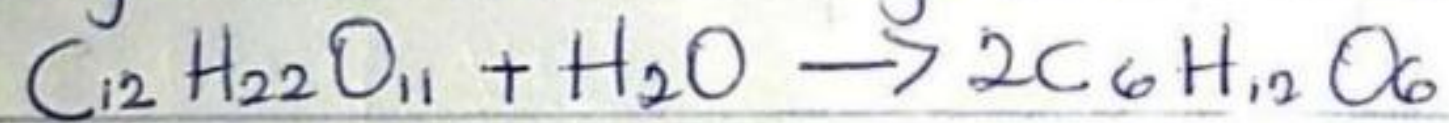


starch maltose

FERMENTATION : finally yeast is added to maltose. Yeast secretes two enzymes:

1. Maltase : convert maltose into glucose.

2. Zymase : converts glucose into ethanol



⇒ By the fermentation of molasses

What is molasses? On industrial scale, ethanol can be prepared by the fermentation of molasses. Molasses is the mother liquor left after the crystallization of sugarcane juice. It is a dark coloured viscous liquid. Molasses contains about 60% fermentable sugar.

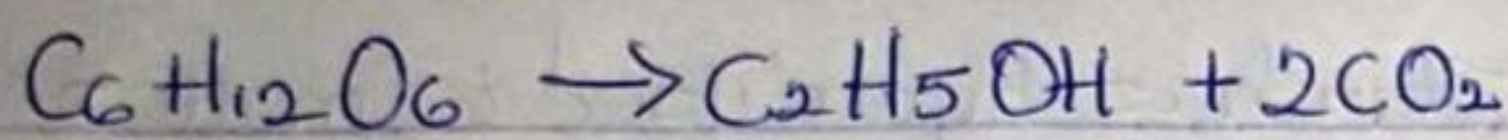
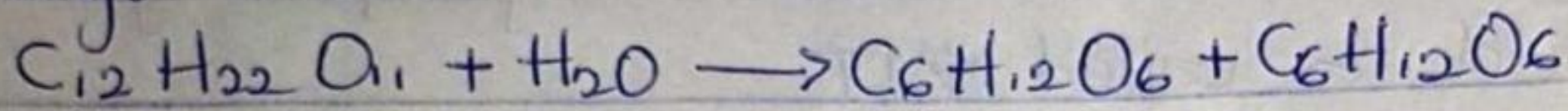
Method of preparation : Following steps are involved in the preparation of ethyl alcohol.

Dilution of molasses : Molasses is first diluted with water in 1:5 (molasses : water) ratio by volume.

Addition of ~~ammonium~~ sulphate : Fortified solution of molasses is then acidifies with small quantity of sulphuric acid. Addition of acid favours the growth of yeast but unfavours the growth of useless bacteria.

Addition of ~~sulphuric acid~~ ^{ammonium sulphate} - If nitrogen content of molasses is small, it is now fortified with ammonium sulphate to provide adequate supply of nitrogen to yeast.

Fermentation - The resulting solution is received in a large tank and yeast is added to it at ~~30°C~~ ^{30°C} and kept for 2 to 3 days. During this period, enzymes sucrase and Zymase which are present in yeast, convert sugar into ~~ethyl~~ ethyl alcohol.



Fractional distillation - Alcohol obtained by the fermentation is called WASH, which is about 15% to 18% pure. By using fractional distillation technique, it is converted into 92% pure alcohol which is known as rectified spirit or Commercial alcohol.

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

Answer:

Aldehydes & Ketones are most readily reduced with hydride reagents. The reducing agents $LiAlH_4$ & $NaBH_4$ act as a source of $4 \times H^-$ (hydride ions)

Reductions of Aldehydes & Ketones

