

CHM 102

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19/ENG-05/014

Mechatronics Engineering

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

→ Classification based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group.

Primary Alcohol (1°) - If the numbers of hydrogen atoms attached to the carbon atom bearing the hydroxyl group are three or two.

Secondary Alcohol (2°) - When the number of hydrogen atoms attached ~~is one~~ is one.

Tertiary Alcohol (3°) - When the number of hydrogen atoms attached to the carbon atom bearing the hydroxyl group is zero or when there is no hydrogen atom.

Example:

Methanol - CH_3OH (1°)

Propan-2-ol - $\text{CH}_3(\text{CH}(\text{OH}))\text{CH}_3$ (2°)

Methyl propan-2-ol - $(\text{CH}_3)_3\text{C-OH}$ (3°)

→ Classification based on the number of hydroxyl groups they possess

Monohydric Alcohol - Have only one hydroxyl group present in the alcohol structure.

Dihydric Alcohol - They have only two hydroxyl groups present in the alcohol structure.

Trihydric Alcohol - They have three hydroxyl groups present in the alcohol structure.

Polyhydric Alcohol - They have more than three and above hydroxyl groups present in the alcohol structure.

Example

Methanol - CH_3OH (Monohydric alcohol)

Ethane 1-2 diol - $\text{OHCH}_2\text{CH}_2\text{OH}$ (Dihydric alcohol)

Hexane

Propane 1,2,3 triol - $\text{OHCH}_2\text{CH}(\text{OH})\text{CH}_2\text{OH}$ (Trihydric alcohol)

$\text{CH}_3\text{CH}(\text{OH})\text{CH}(\text{OH})\text{CH}(\text{OH})\text{CH}(\text{OH})\text{CH}_2\text{CH}_3$

Heptane 3,3,4,5,6 pentaol (Polyhydric alcohol)

2 Discuss the solubility of alcohol in water, Organic solvents

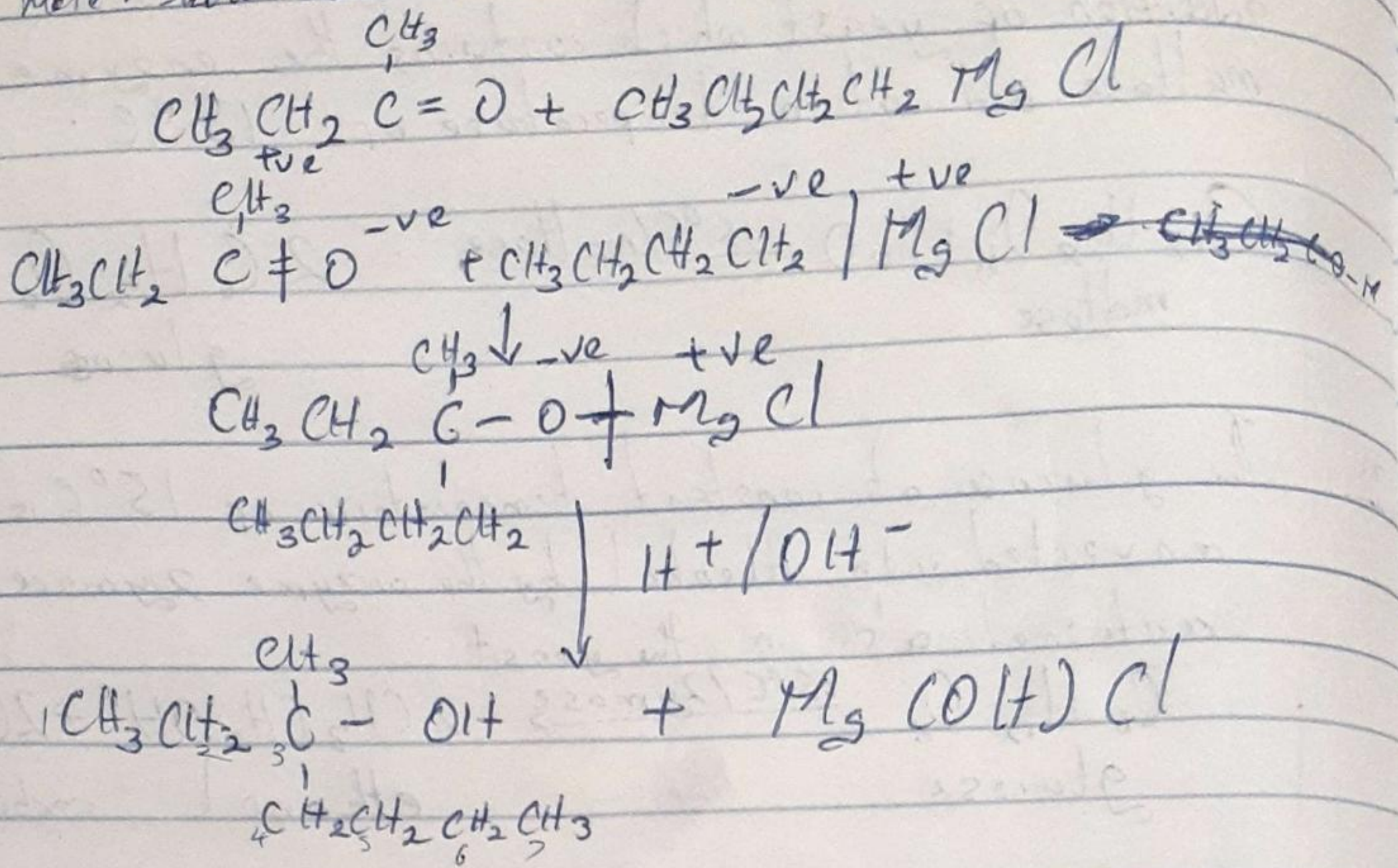
Solubility in water: Lower alcohols with up to three carbon atoms in their molecules are soluble in water because these lower alcohols can form hydrogen bond with water molecules. The water solubility of alcohols decreases with increasing relative molecular mass.

Solubility in Organic Solvents: All monohydric alcohols are soluble in organic solvents. The solubility of simple alcohols also serve as organic solvents for other organic substances.

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

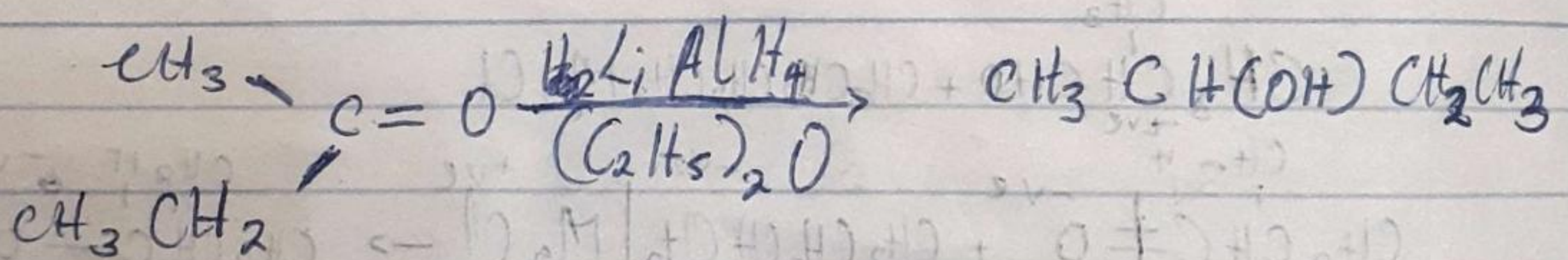
I The starch containing materials include molasses, potatoes, cereals, rice and on warming with malt to 60°C for a period of time are converted into maltose by the enzyme diastase contained in the malt.

5 Show the reaction between 2 methyl propanone and butyl magnesium chloride Hint: Grignard Synthesis
 Note: Show all structures

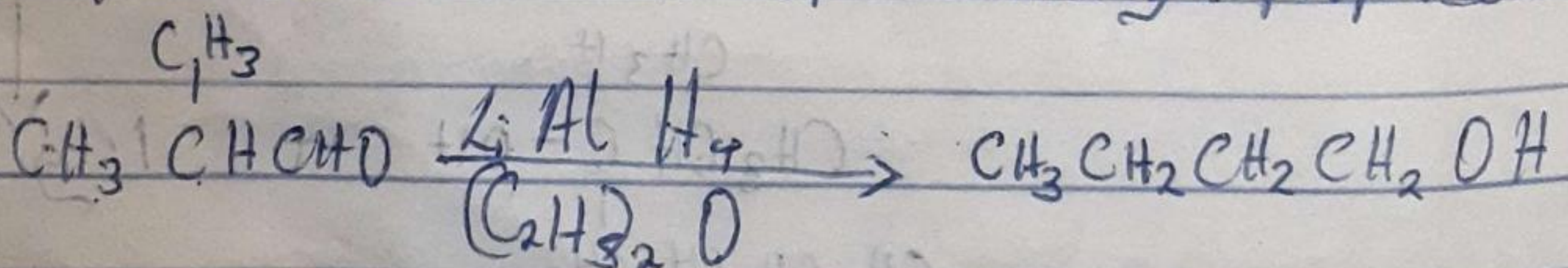


3-methyl heptan-3-ol Magnesium hydroxide chloride

6 Show the reduction reaction of 2 methyl propanone



7 Show the reduction reaction of 2 methyl propanal



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

