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COURSE; CHEM 102
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1 CLASSIFICATION OF ALCOHOLS

i This is based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group. Under this classification, we have; Primary alcohol, Secondary alcohol and Tertiary alcohol.

a Primary alcohol(1°); When the hydrogen atoms attached to the carbon atom bearing hydroxyl group are three or two. E.g. CH_3OH Methanol (1°).

b Secondary alcohol (2°); When there is 1 hydrogen atom attached to the carbon atom bearing hydroxyl group. E.g: $CH_3CH(OH)CH_3$ Propan-2-ol (2°).

c Tertiary alcohol (3°); When there is no hydrogen atom attached to the carbon atom bearing hydroxyl group. E.g. $(CH_3)_3C-OH$ 2-Methylpropan-2-ol (3°).

ii This is based on the number of hydroxyl groups they possess. Under this classification, we have; Monohydric alcohols, Dihydric alcohols, Trihydric alcohols and Polyhydric alcohols.

a Monohydric alcohols; They have only one hydroxyl group present. E.g. $CH_3CH_2CH_2OH$ Propanol.

b Dihydric alcohols; They have only two hydroxyl groups E.g. $HOCH_2CH_2OH$. They are also called 'glycols'

c Trihydric alcohols; They have three hydroxyl groups E.g. $OHCH_2CH(OH)CH_2OH$. They are also called 'triols'

d Polyhydric alcohols; They have more than three hydroxyl groups. E.g. $CH_3CH(OH)CH(OH)CH(OH)CH(OH)(CH(OH)CH_3$. They are also called 'polyols'

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WATER;

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

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 i] By warming starch containing materials with malt to $60^{o}C$ for a specific period of time are converted into maltose by the enzyme diastase contained in the malt.

$$2(C_6H_{10}O_5)_n + nH_2O \longrightarrow nC_{12}H_{22}O_{11}$$

carbohydrate — $60^{o}C$/diastase — maltose

ii] The maltose is broken down into glucose on addition of yeast which contains the enzyme maltase and at a temperature of $15^{o}C$.

$$C_{12}H_{22}O_{11} + H_2O \longrightarrow 2C_6H_{12}O_6$$

maltose — $15^{o}C$/maltase — glucose

iii] The glucose at constant temperature of $15^{o}C$ is then converted into alcohol by enzyme zymase contained also in yeast.

$$C_6H_{12}O_6 \longrightarrow 2CH_3CH_2OH + 2CO_2$$

glucose — $15^{o}C$/zymase — ethanol

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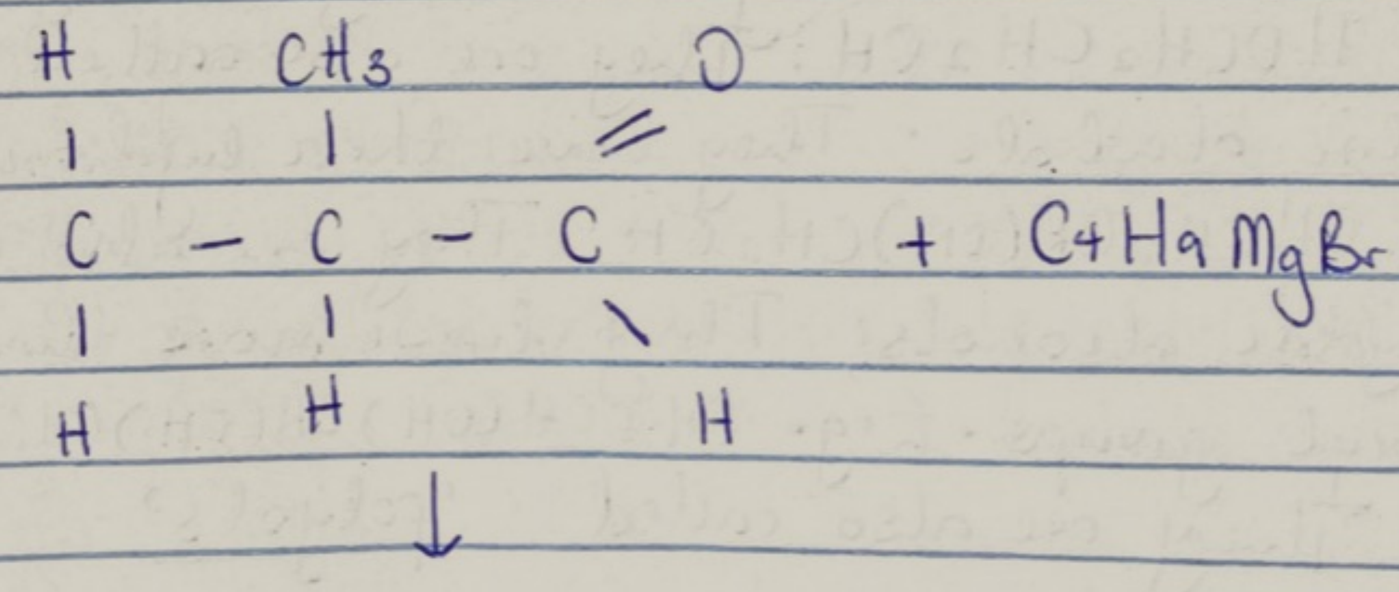

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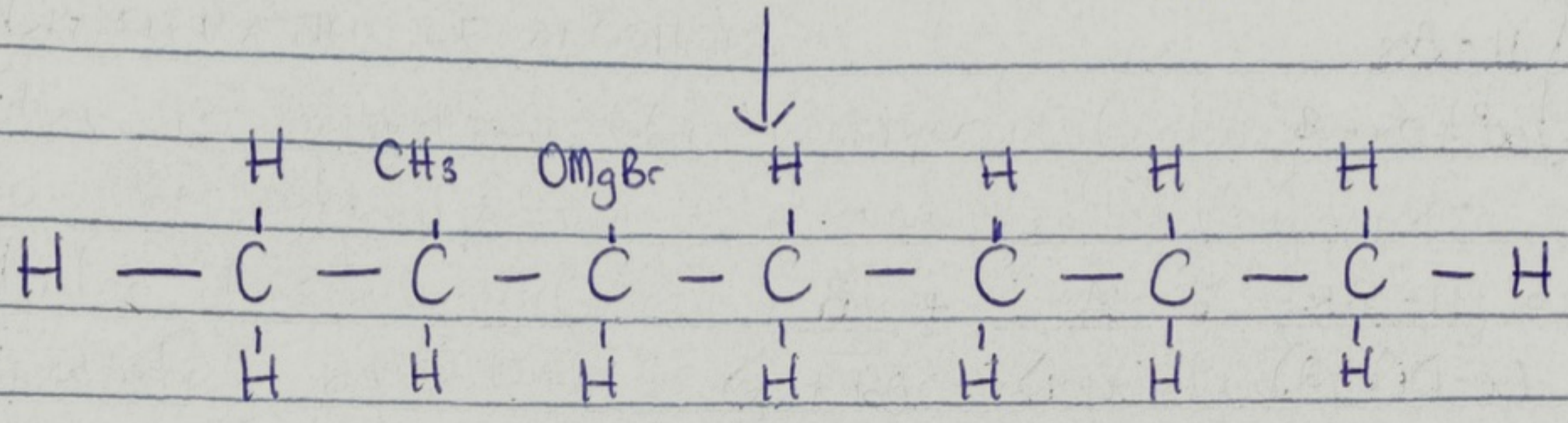

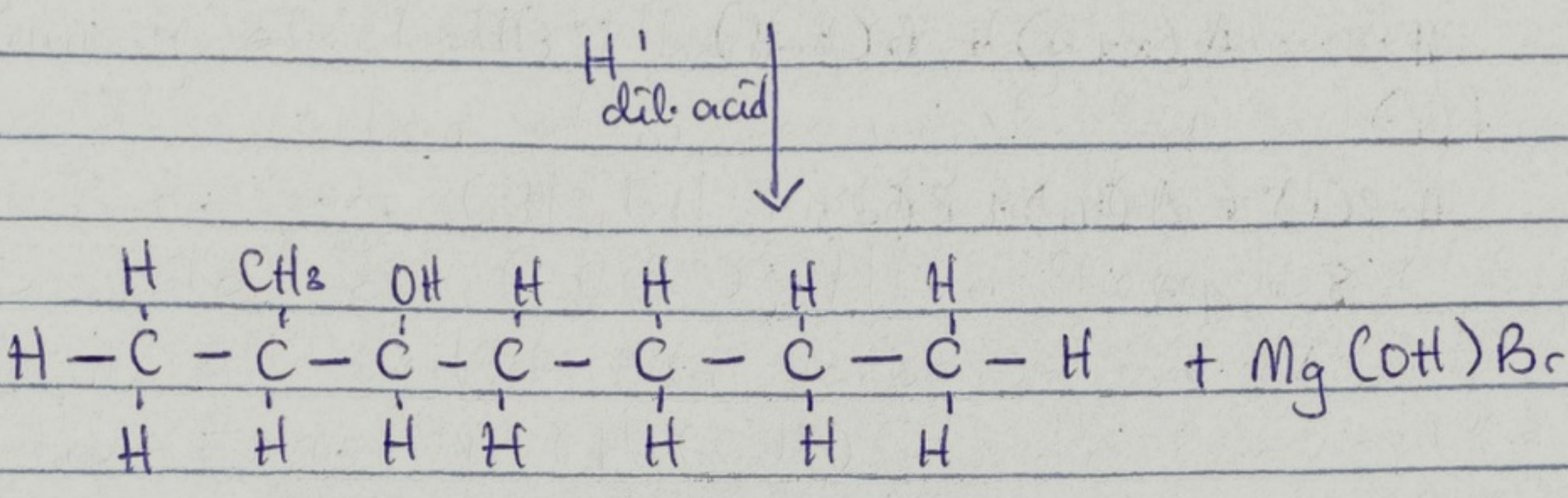

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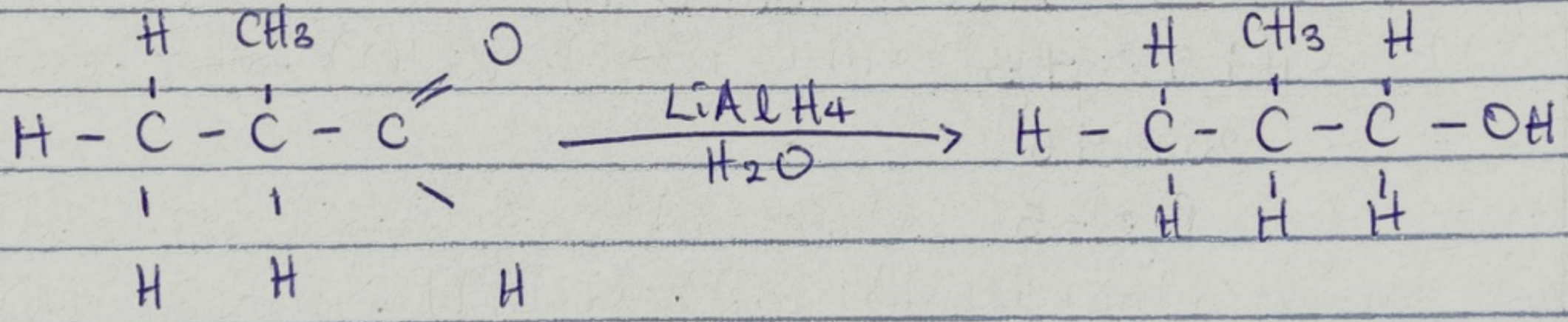

2 methyl propanal — 2 methyl propanol

8 a] Dehydration of propan-1-ol to propan-2-ol

When propan-1-ol is treated with concentrated sulfuric acid (H_2SO_4) the phenomenon called dehydration occurs due to which a water molecule from propan-1-ol gets eliminated.

Due to this propan-1-ol gets converted into propene. The reaction involved is as follows;

$CH_3CH_2CH_2OH \xrightarrow{conc.\ H_2SO_4} CH_3CH=CH_2$

propan-1-ol — propene.

b Hydrolysis of propene to propan-2-ol

Propene can be hydrolysed to propan-2-ol in accordance with a mechanism called 'Markownikoffs reaction which states that when an unsymmetrical reagent the negative part of the reagent gets attached itself to the carbon atom of the alkene which has less number of hydrogen atoms.

In this case, the unsymmetrical reagents used in H_2O which is composed of H^+ and OH^- part. Due to hydrolysis of water, the negative part attaches itself to the propene and thus converts it as propan-2-ol. The reaction is as follows;

$$\underset{\text{propene}}{CH_3 - CH = CH_2} \xrightarrow{H_2O} \underset{\text{propan-2-ol}}{CH_3 - CH_2 - OH - CH_3}$$