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DEPT: MECHATRONICS

MATRIC NO: 19/ENG05/042

COURSE CODE: CHEM 102

ASSIGNMENT

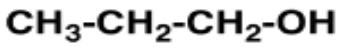
1.

I. Primary alcohols

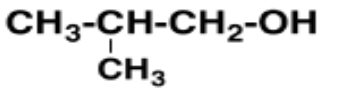
In a primary (1°) alcohol, the carbon atom that carries the -OH group is only attached to one alkyl group.

Some examples of primary alcohols are shown below:

ethanol



propan-1-ol



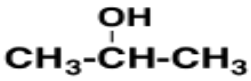
2-methylpropan-1-ol

Notice that the complexity of the attached alkyl group is irrelevant. In each case there is only one linkage to an alkyl group from the CH_2 group holding the -OH group. There is an exception to this. Methanol, CH_3OH, is counted as a primary alcohol even though there are no alkyl groups attached to the the -OH carbon atom.

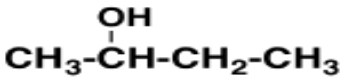
II. Secondary alcohols

In a secondary (2°) alcohol, the carbon atom with the -OH group attached is joined directly to two alkyl groups, which may be the same or different.

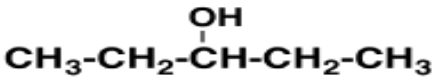
Examples include the following:



propan-2-ol



butan-2-ol

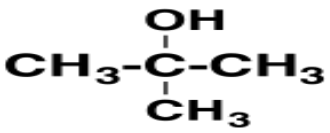


pent-3-ol

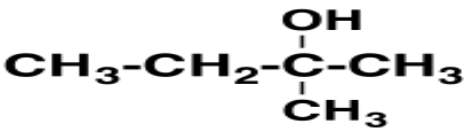
III. **Tertiary alcohols**

In a tertiary (3°) alcohol, the carbon atom holding the -OH group is attached directly to three alkyl groups, which may be any combination of the same or different groups.

Examples of tertiary alcohols are given below:



2-methylpropan-2-ol



2-methylbutan-2-ol

2.

Alcohols contain two groups of different polarities. The alkyl group is a chain of one or more carbon atoms and some hydrogen atoms--this is a non-polar group of atoms. The other group is an -OH, which is the polar end of the molecules.

The non-polar alkyl group enables alcohols to interact with non-polar organic molecules. The polar group interacts with polar water molecules, and can also hydrogen bond with water.

As the size of the alkyl group gets larger, alcohols become less soluble in water. Alcohols with 2 (ethanol) or 3 (n-propanol and isopropanol) carbon atoms are miscible with water and are great solvents for non-polar organic compounds.

3.

The chemical equations below summarize the fermentation of sucrose ($C_{12}H_{22}O_{11}$) into ethanol (C_2H_5OH). Alcoholic fermentation converts one mole of glucose into two moles of ethanol and two moles of carbon dioxide, producing two moles of ATP in the process.

The overall chemical formula for alcoholic fermentation is:

$$C_6H_{12}O_6 \rightarrow 2\ C_2H_5OH + 2\ CO_2$$

I. Sucrose is a dimer of glucose and fructose molecules.

In the first step of alcoholic fermentation, the enzyme inverse cleaves the glycosides between the glucose and fructose molecules.

$$C_{12}H_{22}O_{11} + H_2O + \text{inverses} \rightarrow 2\ C_6H_{12}O_6$$

II. Next, each glucose molecule is broken down into two pyruvate molecules in a process known as glycolysis.

Glycolysis is summarized by the equation:

$$C_6H_{12}O_6 + 2\ ADP + 2\ P_i + 2\ NAD^+ \rightarrow 2\ CH_3COCOO^- + 2\ ATP + 2\ NADH + 2\ H_2O + 2\ H^+$$

CH_3COCOO^- is pyruvate, and P_i is inorganic phosphate.

III. Finally, pyruvate is converted to ethanol and CO_2 in two steps, regenerating oxidized NAD+ needed for glycolysis:

1. $CH_3COCOO^- + H^+ \rightarrow CH_3CHO + CO_2$

Catalysed by pyruvate decarboxylase

2. $CH_3CHO + NADH + H^+ \rightarrow C_2H_5OH + NAD^+$

This reaction is catalysed by alcohol dehydrogenase (ADH1 in baker's yeast)

As shown by the reaction equation, glycolysis causes the reduction of two molecules of NAD+ to NADH. Two ADP molecules are also converted to two ATP and two water molecules via substrate-level phosphorylation.

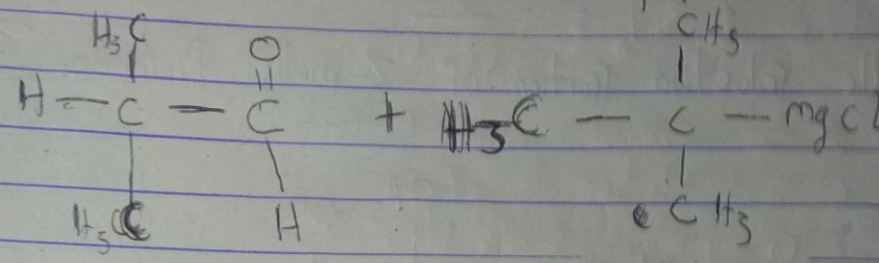
4. – 7.

(4) Show the reaction between 2-methyl Propanal and butylmagnesium chloride Solution

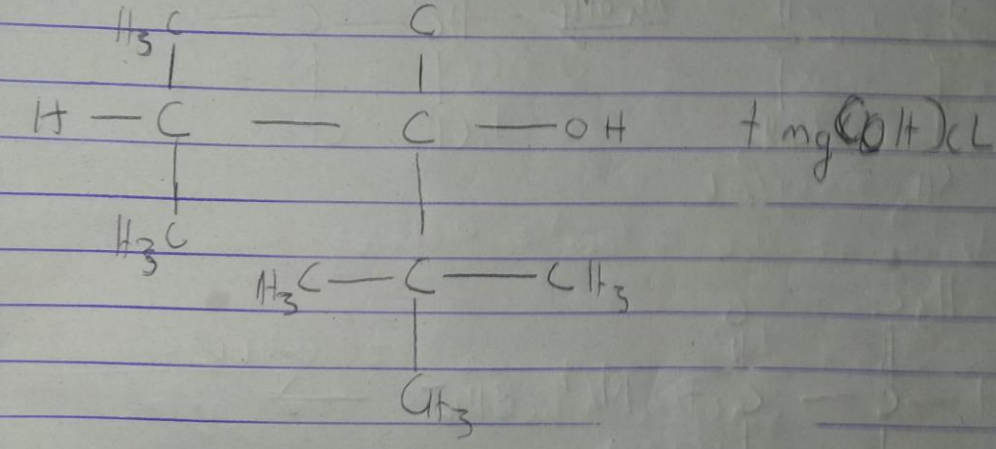
2-methyl Propanal → C_4H_8O

Butylmagnesium chloride → C_4H_9MgCl

(i)

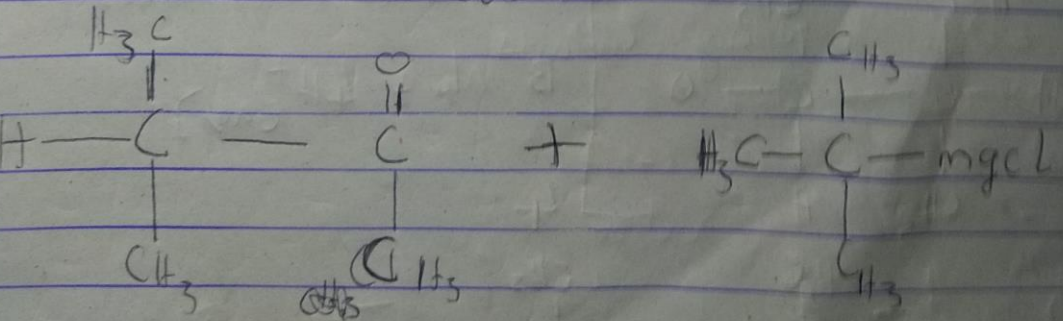


(ii)

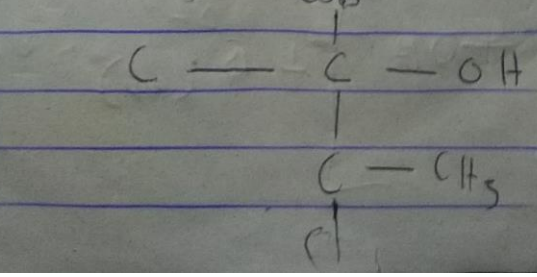


(5) Show the reaction between 2-methyl Propanone and butylmagnesium chloride Solution

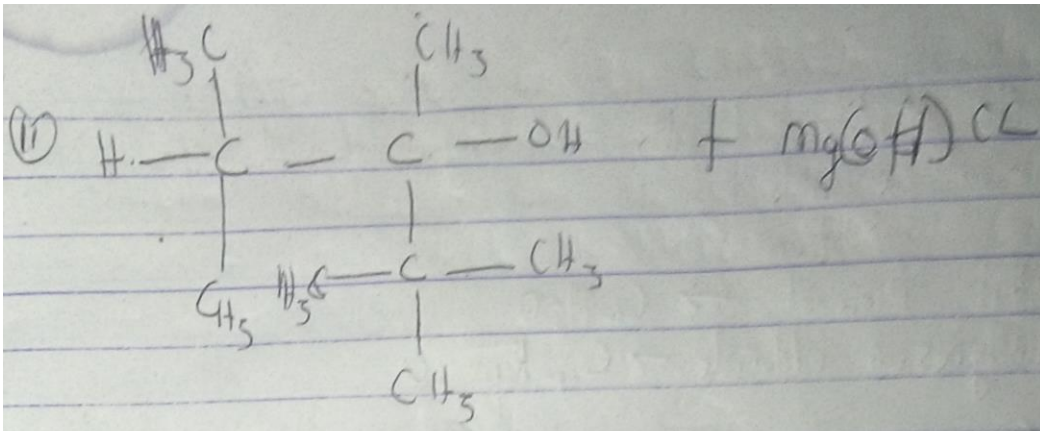
(i)



(ii)

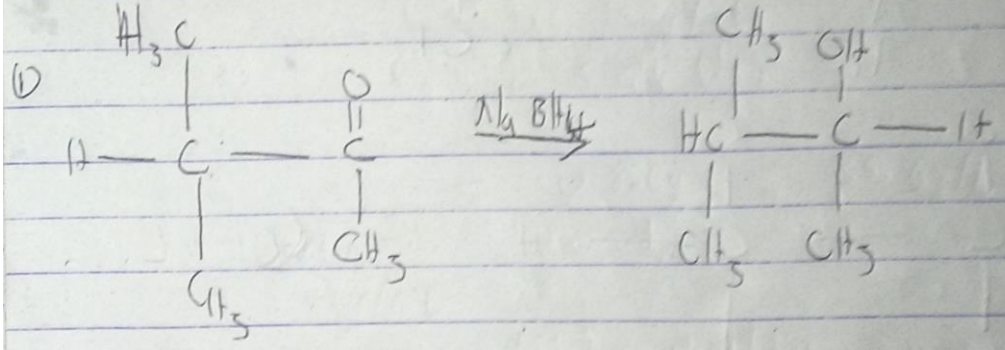


(ii)

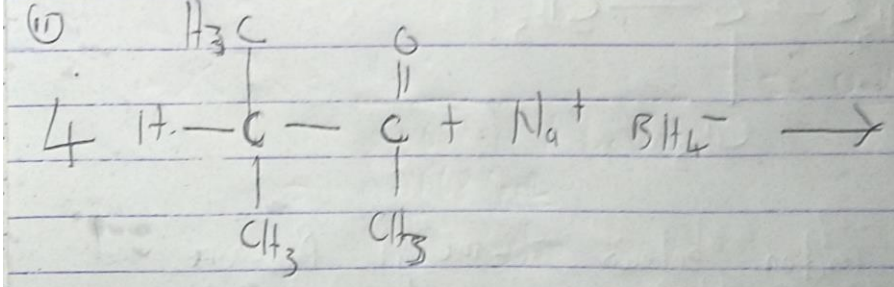


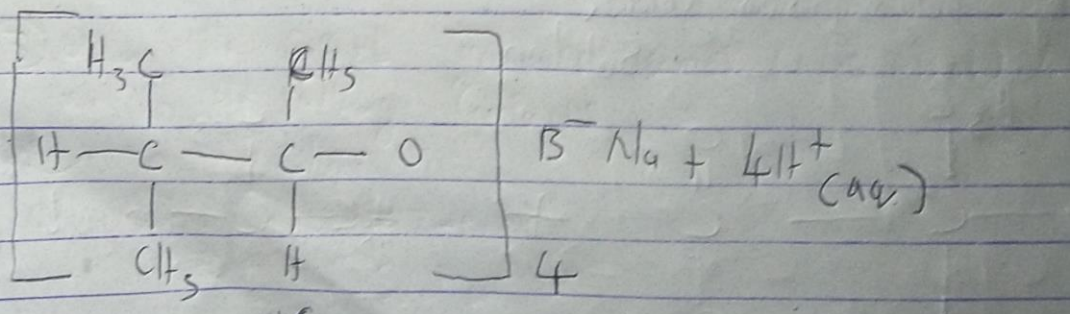
(6) Show the reduction reaction of 2-methyl Propanone

(i)



(ii)





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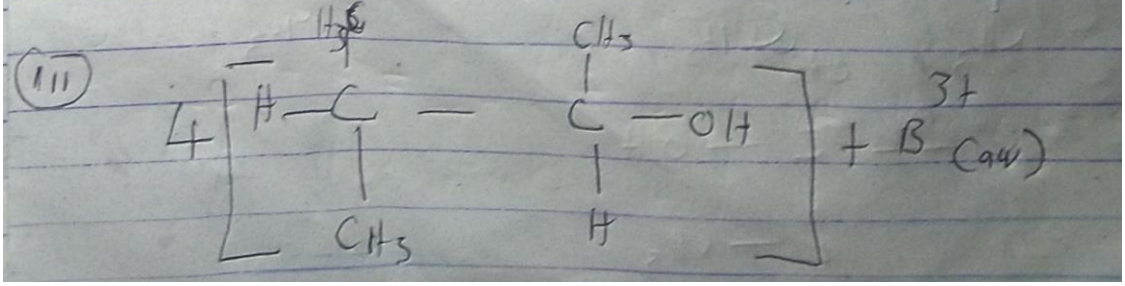

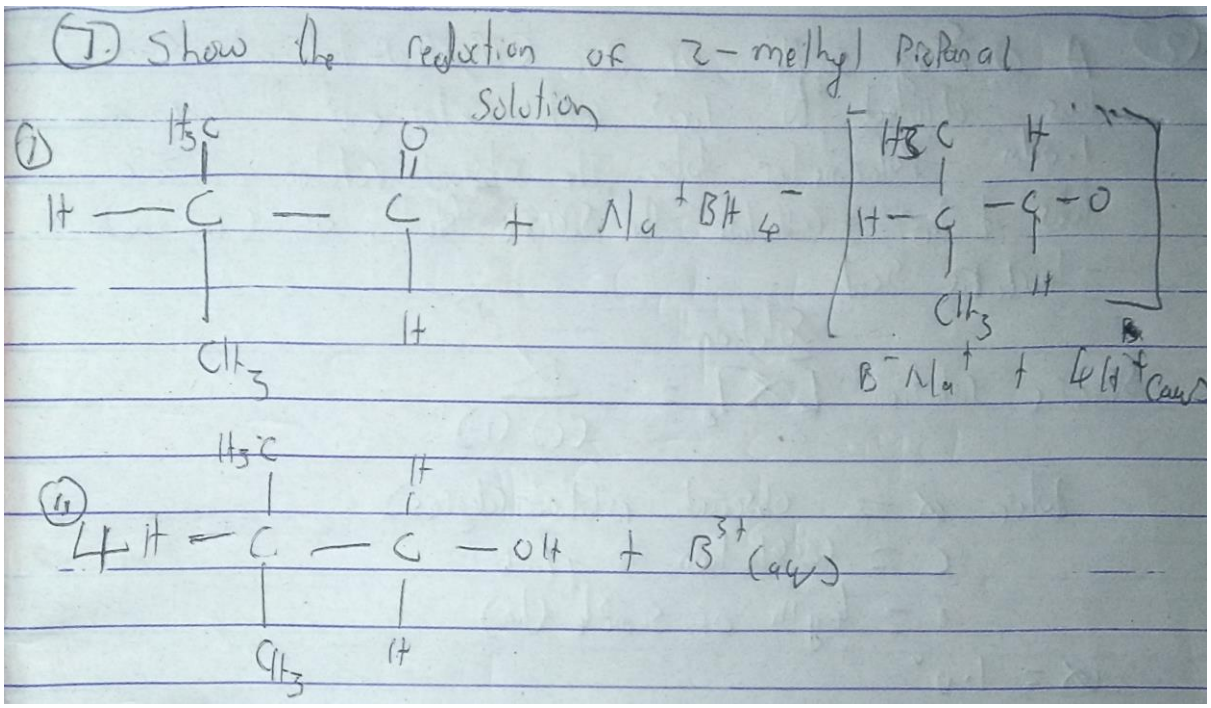

8.

Things required:

I. Concentrated sulfuric acid

II. Water

Process involved:

I. Dehydration of propan-1-ol to propene.

II. Hydrolysis of propene to propan-2-ol

Steps:

I. Dehydration of propan-1-ol to propene.

When propan-1-ol is treated with concentrated sulfuric acid 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:

II. Hydrolysis of propene to propan-2-ol

Propene can be hydrolysed to propan-2-ol in accordance with mechanism called as Markownikoffs addition.

It 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 reagent used in which is composed of and part.

Due to hydrolysis of water, the negative part attaches itself to the propene and thus converts it as propan-2-ol.

The reaction involved is as follows: