4. Show the reaction between 2-methylpropanal and butylmagnesium chloride. Hint: Grignard synthesis

$CH_3CH(CH_3)CHO + CH_3CH_2CH_2CH_2MgCl \longrightarrow$

$CH_3CH(CH_3)-C(H)(CH_2CH_2CH_2CH_3)-OMgCl \xrightarrow{H^+\ OH^-}$

$CH_3CH(CH_3)-C(H)(CH_2CH_2CH_2CH_3)-OH + Mg(OH)Cl$

2-methyl heptan-3-ol

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

$CH_3CH_2COCH_3 + CH_3CH_2CH_2CH_2MgCl \longrightarrow$

$CH_3CH_2C(CH_3)(CH_2CH_2CH_2CH_3)-OMgCl \xrightarrow{H^+\ OH^-}$

$CH_3CH_2C(CH_3)(CH_2CH_2CH_2CH_3)-OH + Mg(OH)Cl$

3-methyl heptan-3-ol

6. Show the reduction reaction of 2-methyl propanone (Butanone)

~~$CH_3CH(CH_3)CHO \xrightarrow[H_2O]{LiAlH} CH_3CH(CH_3)CH_2OH$~~

$CH_3CH_2COCH_3 \xrightarrow[H_2]{Ni} CH_3CH_2C(OH)(H)-CH_3$

7) Show the reduction of 2-methyl propanal.

$CH_3CH(CH_3)CHO \xrightarrow[H_2O]{LiAlH} CH_3CH(CH_3)CH_2OH$

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

Alkyl hydroxy fission (Dehydration reaction).

$CH_3CH_2CH_2OH + H_2SO_4 \longrightarrow CH_3CH_2CH_2OHOSO_3^+$

$\downarrow -H_2O$

$CH_3CH=CH_2 + H_2SO_4 \longleftarrow CH_3CH_2CH_2OSO_3^-$

$+$

$H^+OH^- \longrightarrow CH_3C^+(H)-CH_3$

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

a) This is based on the number of hydrogen atoms attatched to the carbon containing the hydroxyl group. It can be further classified into primary, secondary, and tertiary alcohol. If they are two or more hydrogen atom it is a ~~secondary~~ Primary alcohol and if it's just one hydrogen atom it is a secondary alcohol and if there is no hydrogen atom attatched to it, then it is a tertiary alcohol. Example: Methanol (CH_3OH) - Primary.

b) This is based on the hydroxyl groups they possess. Monohydric have one hydroxyl group. Dihydric has two hydroxyl group. Trohydric has three hydroxyl groups.
Example: Ethane-1,2-diol ($HOCH_2CH_2OH$).

2. Discuss the solubility of alcohols in water, organic solvents.
Lower alcohols with upto three carbon atoms in their molecules are soluble because these lower alcohols can form hydrogen bond with water molecules. The water solubility of alcohols decreases with increasing relative molecular

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

Production of ethanol

Carbohydrate such as starch are major group of natural compound that can be made to yield ethanol by the biological process of fermentation

Step 1: Using a starch material like Potato warm with malt to 60°C and it will be converted to maltase cause of the enzyme diastase.

$$2(C_6H_{10}O_5)_n + nH_2O \xrightarrow[\text{Diastase}]{60^\circ C} nC_{12}H_{22}O_{11}$$

Step 2: The maltose is broken down into glucose on addition of yeast which contains the enzyme maltase and at a temperature 15 °C.

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow[15^\circ C]{\text{maltase}} 2C_6H_{12}O_6$$

Maltose

Step 3: The glucose at constant temperature of 15°C is then converted to alcohol by enzyme Zymase contained in yeast.

$$C_6H_{12}O_6 \xrightarrow[\text{Zymase}]{15^\circ C} 2CH_3CH_2OH + 2CO_2$$

Glucose Ethanol.