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CHEM 102 ASSIGNMENT

1. Alcohols are classified on two different bases; one is based on the number of hydrogen atoms attached to the carbon atom bearing the hydroxyl group and the other is based on the number of hydroxyl groups it possesses.

Based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group, there are three types of alcohols; primary (10), secondary (20) and tertiary (30) alcohols.

Primary alcohols have to hydroxyl groups attached to the carbon atom, secondary have only one attached and tertiary have no hydroxyl groups attached.

Examples of alcohols based on this classification are; CH3CH2OH (primary), CH3CH(OH)CH3 (secondary) and (CH3)3COH (tertiary)

Based on the number of hydroxyl groups in the alcohol, there are four types of alcohols; monohydric, dihydric, trihydric and polyhydric.

Monohydric alcohols have one hydroxyl group present in their structures, dihydric have two present, trihydric have three and polyhydric have four or more hydroxyl groups present in their structures.

Examples of alcohols based on this classification are; CH3CH2CH2OH (Monohydric), HOCH2CH2OH (Dihydric), OHCH2CH(OH)CH2OH (Trihydric) and CH3CH(OH)CH(OH)CH(OH)CH(OH)CH3 (Polyhydric)

1. Alcohols are soluble in water and in organic solvents, but not without conditions for solubility. Generally, water solubility of alcohols decreases with increasing relative molecular mass. And monohydric alcohols are all soluble in organic solvents. Solubility of alcohols largely depends on their ability to form hydrogen bonds with water molecules.
2. Industrial Preparation of Ethanol; Ethanol is produced via the natural process of fermentation of carbohydrates such as starch. The entire process of fermentation is shown in the following steps:

Step 1;

2(C6H10O5)n + nH2O Diastase; 600c n(C12H22O11)

Step 2;

n(C12H22O11) + H2O Maltase; 150c 2C6H12O6

Step 3;

C6H12O6 Zymase; 150c 2C2H5OH + CO2

1. Grignard reagent; CH3CH2CH2CH2MgCl

Aldehyde; CH3C(CH3)HCHO

Step1; Grignard Reagents react with Aldehyde to produce an intermediate

 CH2CH2CH2CH3

CH3CH2CH2CH2MgCl + CH3C(CH3)HCHO CH3C(CH3)H C OMgCl

Grignard Reagent Aldehyde H

Step 2; Dilute acid is added to the intermediate to form an alcohol

 CH2CH2CH2CH3 CH2CH2CH2CH3

 CH3C(CH3)H C OMgCl H2O; H+, OH- CH3C(CH3)H  C OH + Mg(OH)Cl

 H H

7. Aldehydes can be reduced with Lithium tetrahydridoaluminate (III) (LiAlH4)

 CH3C(CH3)H

 C O H2; LiAlH4 CH3C(CH3)HCH2OH

 H

8. Conversion of Propanol to Propan-2-ol

Step 1; propanol is dehydrated with H2SO­4

CH3CH2CH2OH + H2SO4 CH3CH2CH2OH2OSO3H

Step 2; the resultant product is then heated to remove H2O and form propyl hydrogen sulphate.

CH3CH2CH2OH2OSO3H -H2O CH3CH2CH2OSO3H

 Propyl hydrogen sulphate

Step 3; H2SO4 is then removed from propyl hydrogen sulphate to form propene

CH3CH2CH2OSO3H -H2SO4 CH3CH=CH2

 Propene

Step 4; water is added to the propene to form propan-2-ol

CH3CH=CH2  +H2O CH3C(OH)HCH3

 Propan-2-ol