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**19/MASII/062**

**PHARMACY**

**CHEM 102 ASSIGNMENT**

**ANSWERS**

Question 1

1. **Primary alcohol**

Primary alcohols are those alcohols where the carbon atom of the hydroxyl group (OH) is attached to only one single alkyl group. Some of the examples of these primary alcohols include methanol (propanol, ethanol, etc. The complexity of this alkyl chain is unrelated to the classification of any alcohol considered as primary. The existence of only one linkage among –OH group and an alkyl group and the thing that qualifies any alcohol as a primary.

CH3-CH2-OH CH3-CH2-CH2-OH CH3-CH-CH2-OH

Ethanol Propan-1-ol 2-methylpropan-1-ol

Primary alcohols examples.

1. **Secondary alcohol**

Secondary alcohols are those where the carbon atom of the hydroxyl group is attached to two alkyl groups on either side. The two alkyl groups present may be either structurally identical or even different some of the examples of secondary alcohols are given below.

OH OH OH

CH3-CH-CH3  CH3-CH-CH2-CH3 CH3-CH2-CH-CH2-CH3

Propan-2-ol butan-2-ol pentan-3-ol

1. **Tertiary alcohol**

Tertiary alcohols are those which feature hydroxyl group attached to the carbon atom which is connected to 3-alkyl groups. The physical properties of these alcohols mainly depend on their structure. The presence of this –OH group allows the alcohols in the formation of hydrogen bonds with their neighboring atoms. The bonds formed are weak and this makes the boiling points of alcohols higher than its alkanes.

The examples of tertiary alcohols include;

OH OH

CH3-C-CH3 CH3-CH2-C-CH3

CH3 CH3

2-methylpropan-2-ol 2-methylbutan-2-ol

**Question 2**

In the Grignard synthesis of alcohols reacts a named Grignard reagent with CH3 CH2 CH2 CH2 C=OCH2 CH2 CH show the reaction steps.

Compound given= CH3 CH2 CH2 CH2 C=OCH2 CH2 CH2 + C2H5MgBr4-ethyloctan-4-OL.

**Question 3**

**Industrial manufacture of alcohol (Ethanol)**

Carbohydrate is converted into maltose at a temperature of 60oC and by the enzyme diastase.

2[C6H10O5]n + nH2O nC12H22O11

60oc/Diastase maltose

Maltose is broken into glucose on addition of yeast which contains the enzymes maltase at 15 0c

G2H22O11 + H2O C6H12O6

15oC/maltose

Glucose at constant temperature 15oC is converted into alcohol with enzyme zymase also in yeast.

C6H12O6 2ZH3CH2OH + CO2

15oC/zymase

**Question 4**

**Reduction of Alkanones and Alkanals.**

Both Alkanals and Alkanones can undergo reduction using hydrogen and a catalyst, or a metal hydride reducing reagent.

In effect we are adding a hydrogen atom (H) to the carbon of carbonyl functional group, (c=o) to produce a new functional group, the hydroxyl functional group (OH).

When we do this an Alkanal R-CHO the hydroxyl group will be present, not at the end of a chain, but somewhere between the ends of the chain, R-CH(OH)-r’ The hydroxyl group will be present on a carbon atom which is itself covalent bonded to 2 other carbon atoms therefore this will be a secondary alkanol .

* The reduction of an alkanal produces a primary alkanol
* The reduction of alkanone produces a secondary alkanol. For example, using a platinum catalyst with hydrogen gas under pressure, we can convert butanol to butan-1-01, and we can convert butanone to butan-2-01 using a nickel catalyst as shown below

Butanal hydrogen/catalyst butan-1-01

(butyl aldehyde) pressure  (butyl alcohol)

H H H H H2/PT  H H H H

H-C-C-C-C = O pressure H-C-C-C-C-OH

H H H H H H H

Alkanal(aldehyde) Primary alkanol(Primary alcohol)

Butanone hydrogen/catalyst butan-2-01

(ethylmethyl ketone) pressure  (2-butanol)

H H O H H2/NI H H HO H

H-C-C-C-C-H pressure H-C-C-C-C-H

H H H H H H H

Alkanone secondary alkanol

(Ketone) (Secondary alcohol)