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DEPARTMENT: PHARMACY

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 HOLIDAY ASSIGNMENT

1. CLASSIFICATION OF ALCOHOLS

Alcohols can be classified based on the following;

1. Based on the number of hydrogen atom attached to the carbon atom containing the hydroxyl group. We have;
2. PRIMARY ALCOHOL: this is an alcohol in which the number of hydrogen atom attached to the carbon carrying the –OH group are three or two. Examples are; CH3OH (Methanol) and CH3CH2OH (Ethanol)
3. SECONDARY ALCOHOL: This are alcohol which the number of hydrogen atom attached to the carbon atom carrying the –OH group is one. Examples are; CH3CH(OH)CH3 – Prapan-2-ol

CH3CH2CH (OH)CH3 - 2-Butanol

1. TERTIARY ALCOHOL: These are alcohols with no hydrogen atom attached to the carbon atom carrying the –OH group. Examples are;

(CH3)3C-OH 2-Methylpropan-2-ol

(CH3)3CH2C-OH -2-Methylbutan-2-ol.

 Ii Based on the number on hydroxyl group they possess;

1. MONOHYDRIC ALCOHOL: this are alcohols that have one hydroxyl group present in the alcohol structure. E.g. CH3CH2OH Ethanol

 CH3CH2CH2OH Propanol

1. DIHYDRIC ALCOHOL: this are alcohols containing two hydroxyl group presents in their alcohol structure. E.g. OHCH2CH2OH Ethane -1,2-diol

 OHCH2CH2CH2OH Propan-1, 3-diol

 C. TRIHYDRIC ALCOHOL: These are alcohol with three hydroxyl group present in their alcohol structure. E.g. OHCH2CH(OH)CH2OH Propan-1,2,3-triol OHCH2CH(OH)CH(OH)CH3 Butan-1,2,3-triol

 d. POLYHYDRIC ALCOHOL: These are alcohol with more than three hydroxyl group present in the structure. E.g. CH3CH(OH)CH(OH)CH(OH)CH(OH)CH(OH)CH3 Heptane-2,3,4,5,6-pentaol

 OHCH2CH2CH (OH) CH2CH (OH) CH2CH (OH) CH3  Octane-1, 3, 5, 7- butanol

1. In the Grignard synthesis of alkanols, read or name 1 Grignard reagent with CH3CH2CH2CH2C=OCH2CH2CH3. Show the reaction step.

CH3CH2CH2MgBr + CH3CH2CH2CH2C=OCH2CH2CH3

Propyl Magnesium Bromide 4-octanone/octan-4-none

 d- d+ d+ d-

CH3CH2CH2MgBr + CH3CH2CH2CH2C=OCH2CH2CH3

 CH2CH2CH3

 CH3CH2CH2 – C -O-MgBr H+  OH-

 |

 CH2CH2CH2CH3

 CH2CH3CH2c

 |

 CH3CH2CH2 –C− OH + Mg (OH) Br

 | Magnesium hydroxyl Bromide

 CH3CH2CH2CH2

 4-propyl Octan-4-ol.

1. INDUSTRIAL PREPARATION OF ETHANOL

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

1. The starch containing materials include molasses, potatoes, cereals, rice etc. warming with malt to 600C for a specific period of time and converted into maltose by the enzyme **diastase** contained in malt.

2(C6H10O5) n + nH20 nC12H22O11

Carbohydrate 60oC/ diastase Maltose

1. The maltose is broken down into glucose on the addition of yeast which contains the enzyme **maltase** and a temperature of 15oC.

 C12H22O11 + H2O 2C6H12O6

Maltose 150C/maltase glucose

1. The glucose at constant temperature of 150C is then converted into ethanol by an enzyme **zymase** contained in yeast.

C6H12O6  2CH3CH2OH + 2CO2

Glucose 150C/ zymase Ethanol carbon (iv) oxide

1. REDUCTION OF ALKANALS AND ALKANONES (CARBONYL COMPOUNDS)

 Aldehydes and ketones are reduced to **primary** and **secondary** alcohols respectively using reducing agents such as lithiuntetrahydridoaluminate (III) in ethoxyethane (LiAlH4/ (C2H5)2O), Lithiumtetrahydridoborate (III) in ethoxyethane (LiBH4/ (C2H5)2O) and Sodiumtetrahydridoborate (III) (NaBH4) in water or methanol.

RCHO RCH2OH

Aldehyde LiAlH4 / (C2H5)2O Primary alcohol

 RR’ C=O RR’ CHOH

 Ketone LiBH4/ (C2H5)2O Secondary alcohol.

SPECIFIC EXAMPLE:

ALKANAL/ ALDEHYDE:

 H H

 | |

CH3CH2O+ LiAlH4 H – C- C –OH

 ethanal | |

 H H

 Ethanol

ALKANONE / KETONE:

 O OH

 || LiAlH4/ (C2H5)2O |
CH3──C ── CH3 CH3──CH──CH3

 Propanone 2-propanol