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DEPARTMENT: Nursing

MATRIC NO:19/mhs02/052

Chemistry 102 Assignments

1. CLASSIFICATION OF ALCOHOLS

- I. Classification based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group. If the numbers of hydrogen atoms attached to the carbon atom bearing the hydroxyl group are three or two, it is a primary alcohol (1⁰). If it is one hydrogen atom, it is called a secondary alcohol (2⁰) and if no hydrogen atom is attached to the carbon atom bearing the hydroxyl group, it is called a tertiary alcohol (3⁰). Example: CH_3CH_2OH ethanol(1⁰)
- II. Classification based on the number of hydroxyl groups they possess. Monohydric alcohols have one hydroxyl group present in the alcohol structure. Dihydric alcohol or Glycols have two hydroxyl groups present in the alcohol structure while trihydric alcohols or triols have three hydroxyl groups present in the alcohol structure. Polyhydric alcohols or polyols have more than three hydroxyl groups. Example: CH₃CH₂CH₂OH propanol (monohydric alcohol).

2. SOLUBILITY OF ALCOHOLS IN WATER AND ORGANIC SOLVENTS

In water, lower alcohols with up to three carbon atoms in their molecules are soluble in water because these lower alcohols can form hydrogen bond with water molecules. The water solubility of alcohols decreases with increasing relative molecular mass.

In organic solvents, all monohydric alcohols are soluble in organic solvents. The solubility of simple alcohols and polyhydric alcohols is largely due to their ability to form hydrogen bonds with water molecules.

3. INDUSTRIAL PREPARATION OF ETHANOL

i) Carbohydrate such as starch is broken down by diastase contained in malt at a temperature of 60°c to give maltose.

Equation: $2(C_6H_{10}O_5)_n + n H_2O \longrightarrow n C_{12}H_{22}O_{11}$ carbohydrate $60^0c/diastase$ maltose

 Maltose is broken down into glucose by maltase found in yeast at a temperature of 15^oc to give glucose.

Equation: $C_{12}H_{22}O_{11} + H_2O \longrightarrow 2C_6H_{12}O_6$

Maltose 15^oc/maltase glucose

iii) Glucose is converted to ethanol at constant temperature of 15^oc by enzyme zymase also contained in yeast.

Equation: $C_6H_{12}O_6 \longrightarrow 2CH_3CH_2OH + 2CO_2$ Glucose $15^{\circ}c/zymase$ Ethanol

which contains the enzyme maltase and at a temperature of 15°C. CI2HI2OLI + H2O maltase > 2CeH12Oc maltose water glucose STEP 3 ? The glucose at constant temperature of 15°C is then converted into alcohol by the enzyme zymase contained also in yeast. Cottiz OG Zymase -> 2CH3CH2OH + 2CO2 1 Glucose Ethanol Carbon(IV) Oxide 4 Show the reaction between 2-methylpiopanal and butylmagnesiumchloride. Hint & Grignard synthesis. ANSWER ? 2-methyl propanal + Butyl magnesium chloride -(HaCHCHaCHO + CHaCH2CH2CH2-MgCL -->CH3CHCH3C(OH)CH2CH2CH2CH3 ОНННН H HH 0 НННН 11 C-C-MgCL-C HHH H CH3 H H H H H CH3 2-methyl 3-heptano 7 Show the reduction reaction of 2-methylpropanal. ANSWER ET. H OH H C 0 NaBHy /LiAlly C - C - C - H H-C C-C CH3CH2 DH H CH3 H H CH3 2-methyl propanal OR H OH H C H 0 i Halpt or Pd or Raney N C - C - C - HH - C - C -100 atm 1 ١ H CH3 H H CH3

4.

| SCHEME STEP 1: Dehydration of Propan-1-ol to propene using conc H H OH H -9 1 1 H - C - C - C - H Conc H2SO4 \rightarrow H - C - C = C - H (cH3C) 1 1 1 H H H H STEP 2: You can use either, A. Oxymercuration - Demercuration H H H H - C - C = C - H $\frac{DH_{3}(OA_{6})_{2}/H_{2}D}{D} \rightarrow$ H - C - C - C - F H H H H - C - C = C - H $\frac{DH_{3}(OA_{6})_{2}/H_{2}D}{D} \rightarrow$ H - C - C - C - F H H H H - C - C = C - H $\frac{DH_{3}(OA_{6})_{2}/H_{2}D}{H} \rightarrow$ H - C - C - C - F H H H H - C - C = C - H $\frac{DH_{3}(OA_{6})_{2}/H_{2}D}{H} \rightarrow$ H - C - C - C - F H H H H H - C - C = C - H $\frac{DH_{3}(OA_{6})_{2}/H_{2}D}{H} \rightarrow$ H - C - C - C - F H H H H H - C - C = C - H $\frac{DH_{3}(OA_{6})_{2}/H_{2}D}{H} \rightarrow$ H - C - C - C - F H H H H H H - C - C = C - H $\frac{DH_{3}(OA_{6})_{2}/H_{2}D}{H} \rightarrow$ H - C - C - C - F H H H H H H H H H H H | he conversion of propan-2-ol to propan NSWER | -2- |
|--|--|-----------|
| $\begin{array}{c} H & H & GH & H \\ \hline G & I & I \\ H - C - C - C - H & \hline CONC & H_2SO_4 \rightarrow H - C - C = C - H (CH_3C) \\ \hline H & H & H \\ \hline H & C - C = C - H & \underline{)}_{Hg}(OA_6)_2 / H_2 D \\ \hline H & - C - C = C - H & \underline{)}_{Hg}(OA_6)_2 / H_2 D \\ \hline H & H & H \\ \hline H & H$ | Proper-1-of to propere using conc. H. | SO |
| $H - C - C - C - H \xrightarrow{Conc. H_{2}SO_{4}} H - C - C = C - H (CH_{3}C)$ $H - C - C - C - H \xrightarrow{H} H H$ $H - H H$ $H - H H$ $H - H H$ $H - C - C = C - H \xrightarrow{M_{9}OA_{6}} H - C - C - C - C - F$ $H - H H$ $H - C - C = C - H \xrightarrow{M_{9}OA_{6}} H + C - C - C - C - F$ $H - H H$ $H - H H$ $H - H H$ $H - H H$ $H - C - C = C - H \xrightarrow{M_{9}OA_{6}} H + C - C - C - C - F$ $H - H H$ $H - C - C = C - H \xrightarrow{M_{9}OA_{6}} H + C - C - C - C - F$ $H - H H$ $H - C - C = C - H + H_{2}O \xrightarrow{H} H - C - C - C - C - F$ | Tropan - co to p - recent | 204 |
| H H H H H H STEP 2: You can use either, A. Oxymercuration - Demercuration H H H H - C - C = C - H $\frac{H_{3}(OA_{6})_{2}/H_{2}O}{2NABH_{4}} \rightarrow H - C - C - C - C - F$ H H H H H H B. Since propene is assymetrical, on hydrolysis or addition of using a markovnikov protecture. Propen - 2-ol can be obtain H H OH H H - C - C = C - H + H_{2}O - + C - C - C - H + H - C - C - C - C - H + H - C - C - C - H + H - C - C - C - C - H + H - C - C - C - H + H - C - C - C - H + H - C - C - C - H + H - C - C - C - H + H - C - C - C - H + H - C - C - C - H + H - C - C - C - H + H - C - C - C - H + H - C - C - C - H + H - C - C - C - H + H - C - C - C - H + H - C - C - C - H + H - C - C - C - H + H - C - C - C - H + H - C - C - C - H + H - C - C - C - H + H - C - C - C - H + H - C - C - C - H + H - C - C - C - C - H + H - C - | FI I | |
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| using a markovnikov protecture. Propan -2-ol can be obtain $H \qquad \qquad H \qquad \qquad H \qquad H \qquad H \qquad 0 \qquad \qquad H \qquad H \qquad 0 \qquad \qquad H \qquad H$ | referable | |
| using a markovnikov protecture. Propan -2-ol can be obtain $H \qquad \qquad H \qquad \qquad H \qquad H \qquad H \qquad 0 \qquad \qquad H \qquad H \qquad 0 \qquad \qquad H \qquad H$ | <u>- 11, M+ 2+ 2+ 2+ 2+ 1+ (+ 2+ 2+ 2+ 2+ 2+ 2+ 2+ 2+ 2+ 2+ 2+ 2+ 2+</u> | 1 |
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| $H - C - C = C - H + H_2 O \longrightarrow H - C - C - C - H + H - C - C$ | Н Н ОН Н ОНН | 1 |
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| You would actually get the 2 products : Propan - 1 - 01 Propan | 0 ——>H-C-C-C-H+H-C-C-C Н Н Н Н Н Н Н | 1 |
| But following markovnikov's rule, Propan-2-ol would be | о — → н-с-с-с-н+н-с-с-с н н н н н н н | 1 |

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