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Chemistry 102

Department:Pharmacy

Matric no:19/mhs11/028

QUESTION 1-DISCUSS THE TWO MAJOR CLASSES OF ALKANOLS AND GIVE TWO EXAMPLEES EACH FOR EACH CLASS.

ANSWER-[1]; CLASSOFICATION BASED ON THE NUMBER OF HYDROXYL FUNCTIONAL GROUP (OH) PRESENT.

E.G (I) MONOHYDRIC ALKANOL- THEY HAVE ONE (OH) GROUP ATTACHED TO THE ALKYL CHAIN E.G METHANOL, ETHANOL.

(ii)POLYHYDRIC ALKANOLS- CONTAIN MORE THAN ONE HYDROXYL GROUP (OH) ATTACHED TO THE ALKYL CHAIN.

I.E IF THERE ARE TWO (OH) GROUP IT IS CONSIDERED AS A DIHYDRIC ACID, WHILE IF THERE ARE THREE (OH) GROUP IT IS KNOWN AS A TRIHYDRIC ACID.

[2]; BASED ON THE POSITION OF THE CARBON ATOM HOLDING THE HYDROXYL Group(OH).

E.G (I) PRIMARY ALKANOLS – IF THE CARBON ATOM HOLDING THE HYDROXYL Group(OH) OF THE ALKANOL IS ATTACHED TO ONLY ONE CARBON ATOM NEXT TO IT IS A PRIMARY ALKANOL. E.G METHANOL, ETHANOL ETC.

(ii) SECONDARY ALKANOLS-IF THE CARBON ATOM HOLDING THE HYDROXYL GROUP (OH) OF THE ALKANOL IS ATTACHED TO TWO OTHER CARBON ATOMS NEXT TO IT THEN IT IS A SECONDARY ALCHOL. E.G BUTAN-2-OL.

QUESTION 2- IN THE GRINGARD SYNTHESIS OF ALKANOLS REACT A NAMED GRINGARD REAGENT WITH $CH_3CH_2CH_2CH_2C{=}OCH_2CH_2CH_3$. SHOW THE REACTION STEPS

ANSWER- COMPOUND GIVEN = $CH_3CH_2CH_2CH_2C{=}OCH_2CH_2CH_3$ (OCTAN-4-ONE)

IT WILL REACT WITH A GRINGARD REAGENT E.G (ETHYL MAGNESIUM BROMIDE) C_2H_5MgBr TO GIVE A TERTIARY ALANOL.

$CH_3CH_2CH_2CH_2C{=}OCH_2CH_2CH_3 + C_2H_5MgBr \longrightarrow$ 4-ETHYLOCTAN-4-OL

QUESTION 3- DISCUSS THE INDUSTRIAL MANUFACTURE OF ETHANOL SHOWING ALL REACTION EQUATIONS AND THE NECESSARY ENZYMES AND TEMPERATURE OF REACTION.

ANSWER- ETHANOL IS MANUFACTURED INDUSTRIALLY BY THE FORMATOIN OF STARCH IN THE PRESENCE OF SUITABLE MICROORGANISMS WHICH PRODUCES OXYGEN THAT ACTS AS A CATALYST. STARCH IS A POLYSACCHARIDE CARBOHYDRATE AND AN IMPORTANCE SOURCE OF ETHANOL.

PROCESS 1 – EXTRACTION OF STARCH-(USING POTATO)- THE POTATO IS STEAMED AT A TEMPERATURE OF 140°C TO 150°C UNDER PRESSURE TO PREPARE A STARCH SOLUTION KNOWN AS MASH.

PROCESS 2- GERMINATION-BEFORE HYDROLYSIS STARCH FIRST UNDERGO GERMINATION AT

10°C TO 13°C FOR A FEW DAYS. THIS GERMINATED STARCH IS KNOWN AS MALT.

PROCESS 3- HYDROLYSIS OF STARCH- STARCH IS HYDROLYZED TO MALTOSE BY AN ENZYME KNOWN AS DIASTASE AT A 60°C.

$2(C_6H_{10}O_5) + nH_2O \xrightarrow{60°C\ DIASTASE} n(C_{12}H_{22}O_{11})$

STARCH + WATER CATALYST MALTOSE

PROCESS 4- FERMENTATION-THE YEAST IS FINALLY ADDED TO MALTASE. YEAST SECRETS TWO ENZYMES (MALTASE-CONVERTS MALTOSE TO GLUCOSE AND ZYMASE- CONVERTS GLUCOSE TO ETHANOL).

$C_{12}H_{22}O_{11} + H_2O \xrightarrow{15°C\ MALTASE} 2C_6H_{12}O_6$

MALTOSE + WATER YEAST ENZYME GLUCOSE

$C_6H_{12}O_6 \xrightarrow{15°C\ ZYMASE} C_2H_5OH + CO_2$

GLUCOSE YEAST ENZYME ETHANOL + CARBON (iv) OXIDE

QUESTION 4- DETERMINE THE PRODUCT OBTAINED IN THE REDUCTION OF ALKANONE AND ALKANAL. USE A SPECIFIC EXAMPLE FOR EACH AND SHOW THE EQUATION OF REACTION.

ANSWER- REDUCTION OF ALKANONE YEILDS SECONDARY ALCHOL WHILE THE REDUCTION OF AN ALKANAL OR AN ALDEHYDE YEILDS A SECONDARY ALKANOL. THE REDUCING AGENT USED IN THIS PROCESS IS LITHIUM ALUMINIUM HYDRIDE ($LIALH_4$) OR SODIUM BORO HYDRIDE ($NABH_4$)

*REDUCTION OF ALKANONES TO GIVE SECONDARY ALKANOL

$CH_3C_2H_5\text{-}C{=}O \xrightarrow{LIALH_4} CH_3C_2H_5CHOH$

*REDUCTION OF ALKANALS TO GIVE PRIMARY ALKANOL

$CH_3CH_2CH{=}O \xrightarrow{LIALH_4/\ H_2O} CH_3CH_2CH_3OH$