NO. 1

1. Alcohols are very important organic compounds. Discuss briefly their classification and give one example each

(a) CLASSIFICATION BASED ON;

i) Number of hydrogen atoms attached to the carbon atom containing the hydroxyl group.

- Primary alcohol (1°) : If the no. of hydrogen atoms attached to the carbon bearing the hydroxyl are three or two
- Secondary alcohol (2°) : If the no. of hydrogen atoms attached to the carbon bearing the hydroxyl is one
- Tertiary alcohol (3°) : If there's no hydrogen atom attached to the carbon bearing the hydroxyl group

Examples

* Primary alcohol (1°) → Ethanol
* Secondary alcohol (2°) → Propan-2-ol
* Tertiary alcohol (3°) → 2-methyl propan-2-ol

ii) Number of hydroxyl groups they posess.

- Monohydric alcohol : They have one hydroxyl group present in their alcohol structure. eg propanol
- Dihydric alcohol : They have two hydroxyl groups present in their alcohol structure. e.g Ethane-1, 2, di
- Trihydric alcohol : They have three hydroxyl groups present in their alcohol structure. e.g Propane-1, 2, 3-

2. Discuss the solubility of alcohols in water, organic solvents

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.

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

3. Show the three steps in the industrial preparation of ethanol. Equations of reactions are mandatory.

i) Conversion of carbohydrate to maltose by enzyme diastase at 60°C

carbohydrate → Maltase

$$2(C_6H_{10}O_5)_n + H_2O \xrightarrow[60°C]{\text{diastase}} Mo\ nC_{12}H_{22}O_{11}$$

ii) Conversion of maltose to glucose by enzyme maltase at 15°C.

Maltose → Glucose

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow[15°C]{\text{maltase}} 2C_6H_{12}O_6$$

iii) Conversion of glucose to ethanol by enzyme zymase at 15°C

Glucose → Ethanol

$$C_6H_{12}O_6 \xrightarrow[15°C]{\text{zymase}} 2CH_3CH_2OH + 2CO_2$$

No. 4

4. Reaction between 2-methyl propanal and butyl magnesium chloride

Grignard synthesis

$$(CH_3)_2CHCH + CH_3CH_2CH_2CH_2MgCl \xrightarrow[\text{ether}]{(C_2H_5)_2O}$$

2 methyl propanal — butyl magnesium chloride

$$CH_3CH_2CH_2CH_2-\underset{\underset{OMgCl}{|}}{\overset{\overset{H}{|}}{C}}-(CH_3)_2CH$$

$$\Big\downarrow H_3O^+$$

$$(CH_3)_2CHC\overset{OH}{H}CH_2CH_2CH_2CH_3$$

4-octanol

16, 5C, 475,

NO. 7

7) Reduction of 2-methyl propanal

$$(CH_3)_2CH\overset{O}{\overset{\|}{C}}H \xrightarrow[\text{Pt catalyst}]{H_2} (CH_3)_2CH\overset{OH}{\overset{|}{C}}H_2$$

2-methyl propanal Butanol

NO. 8

8.) Propose a scheme for the conversion of propan-1-ol to propan-2-ol

1st reaction :

1 Dehydration of propan-1-ol using conc. H_2SO_4 to propene.

$$CH_3CH_2CH_2OH \xrightarrow{\text{conc. } H_2SO_4} CH_3CH=CH_2$$

2nd Propan-1-ol propene

2nd reaction :

Hydrolysis of propene to propan-2-ol

Due to hydrolysis of water the negative part attaches itself to the propene and thus convert it as propan-2-ol

This reaction is called Markonikoff's reaction

$$CH_3-CH=CH_2 \xrightarrow{H_2O} CH_3-CH_2OHCH_3$$

Propene propan-2-ol