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1. a. They have two different ways of classification
They are classified based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group.
→ If it is more than two hydrogen atoms → 1° (Primary alcohol)
→ If it is just one hydrogen atom → 2° (secondary alcohol)
→ If it is none → 3° (Tertiary alcohol)
Example: CH_3OH (1° primary alcohol)

b. They are classified based on the number of hydroxyl group they possess.
→ Monohydric alcohol → If there is only one hydroxyl group
Dihydric alcohol → If there are two hydroxyl groups
Trihydric alcohol → If there are three hydroxyl groups
Polyhydric alcohol → If there are more than three hydroxyl groups
Example: $HOCH_2CH_2OH$ (Ethane-1,2-diol) (dihydric alcohol)

2. For water: All lower alcohols with up to three carbon atoms in their molecules are soluble because they can form hydrogen bond with water molecules

For organic solvents: All monohydric alcohols are soluble in organic solvents.

3. $2(C_6H_{10}O_5)_n + nH_2O \xrightarrow{60°C\ diastase} nC_{12}H_{22}O_{11}$

Carbohydrate — maltose

The maltose is broken down into glucose on addition of yeast which contains the enzymes maltase and at a temperature of 15°C

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

Maltose — Glucose

The glucose at constant temperature of 15°C is then converted into alcohol by the enzyme zymase contained also in yeast.

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

Glucose — Ethanol

4. $CH_3CH_2CH_2CH_2MgCl + CH_3-CHCH=O$

$CH_3-C(H)(CH_2)_3(CH_3)_2CH + OMgCl \xrightarrow[H^+, OH]{NH_4Cl}$

$CH_3-C(H)-OH + Mg(OH)Cl$

5. $(CH_3)_2CH(CHO \xrightarrow{LiAlH_4/H_2O}$ $CH_3CH_2CH_2(CH_2OH)$

(2-methylpropanol) — butanol (1° alcohol)

6 Propan-1-ol

$CH_3CH_2CH_2OH$

Propan-2-ol

$CH_3CH_2OH(CH_3)$

$CH_3CH_2CH_2OH + H_2SO_4 \longrightarrow CH_3CH_2CH_2OH_2OSO_3H$

$CH_3CH_2CH_2OH_2OSO_3H \xrightarrow{-H_2O} CH_3CH_2CH_2OSO_3H$

$CH_3CH_2CH_2OSO_3H \xrightarrow{-H_2SO_4} CH_3CH=CH_2$

$CH_3CH=CH_2 \xrightarrow{+H^+\ OH^-} CH_3CH_2(OH)CH_3$ //

(propan-2-ol)