CHEMISTRY

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Preparation of Glycol :→

It is Prepared by following method.

(1) By oxidation of ethylene with cold dilute potassium Permagnate solution.

$$CH_2=CH_2 + (H_2O + O) \xrightarrow[KMnO_4]{Cold} \underset{\underset{OH}{|}}{CH_2}-\underset{\underset{OH}{|}}{CH_2}$$

ethylene glycol.

(2) By the hydrolysis of 1,2-dibromomethane with aqueous sodium carbonate solution.

$$\underset{\underset{Br}{|}}{CH_2}-\underset{\underset{Br}{|}}{CH_2} + Na_2CO_3 + 2H_2O \longrightarrow \underset{\underset{OH}{|}}{CH_2}-\underset{\underset{OH}{|}}{CH_2} + 2NaHCO_3 + 2NaBr$$

1,2-dibromoethane — ethylene glycol.

It is laboratory method

(3) By hydrolysis of ethylene chlorohydrin with sodium bicarbonate.

Ethylene chlorohydrin is Prepared by Passing ethylene into aqueous hypochlorous acid.

$$H_2O + Cl_2 \longrightarrow HOCl + HCl$$

$$CH_2=CH_2 + HOCl \longrightarrow \underset{\underset{OH}{|}}{CH_2}-\underset{\underset{Cl}{|}}{CH_2}$$

ethylene chlorohydrin.

$$2\underset{\underset{OH}{|}}{CH_2}-\underset{\underset{Cl}{|}}{CH_2} + NaHCO_3 \rightarrow 2\underset{\underset{OH}{|}}{CH_2}-\underset{\underset{OH}{|}}{CH_2} + NaCl + CO_2.$$

~~It is laboratory method.~~

Teacher's Signature : _____

(4) By the action of ethylene oxide with H_2O at 200°C under Pressure or with dilute H_2SO_4 at 60°C. It is commercial method

$$\underset{\text{ethylene oxide}}{CH_2-CH_2 \ (\text{-O-})} + H_2O \xrightarrow[60^\circ]{H^+} \underset{\text{ethylene glycol}}{\underset{OH}{CH_2}-\underset{OH}{CH_2}}$$

ethylene oxide is made by passing a mixture of ethylene and oxygen over heated silver catalyst

$$CH_2=CH_2 + O_2 \xrightarrow[\Delta]{Ag} CH_2-CH_2 \ (\text{-O-})$$

CHEMICAL PROPERTIES:→

Ethylene glycol molecule contains two -OH groups Its chemical reactions are, therefore, those of Primary alcohols twice over. Generally, one -OH group is attacked completely before the other reacts. More vigorous conditions are sometimes needed for reaction at the two -OH group.

(1) Reaction with Phosphorous trihalide :→

Ethylene glycol reacts with PCl_3 or PBr_3 and formed corresponding halide.

$$\underset{\text{Ethylene glycol}}{\underset{OH}{CH_2}-\underset{OH}{CH_2}} + PBr_3 \longrightarrow \underset{\text{Ethylene bromo hydrin}}{\underset{OH}{CH_2}-\underset{Br}{CH_2}} \xrightarrow{PBr_3} \underset{\text{1,2 dibromo ethane}}{\underset{Br}{CH_2}-\underset{Br}{CH_2}}$$