Dihydric alcohol

Class - B.Sc Part I (Honours)
Subject - chemistry
Paper - IC
Topic - chemical properties of ethylene glycol.

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Ethylene glycol

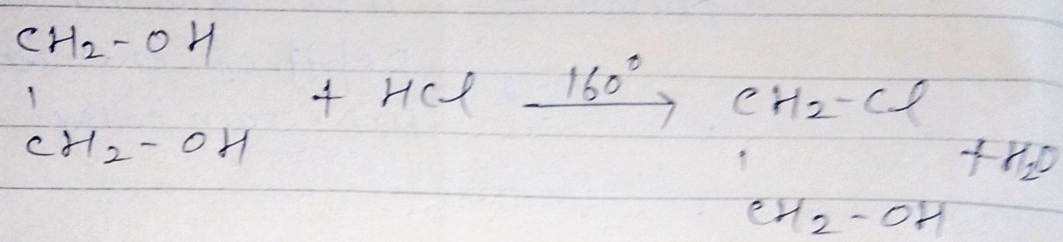
chemical properties :-

Ethylene glycol contains two primary -OH gr. Its reactions are therefore, those of primary alcohols twice over. The two -OH gr. however, are not equally reactive. One gr. always completely reacts before the other is attacked.

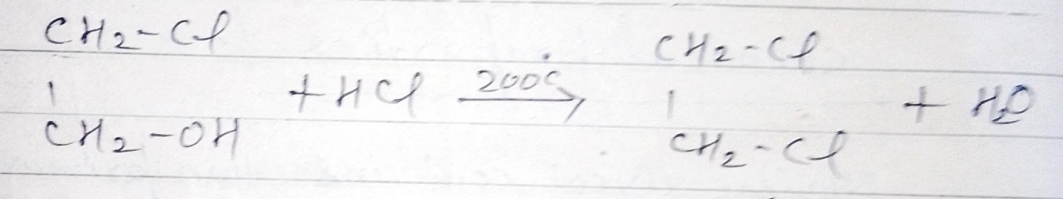
(i) **Reaction with Sodium :-** Ethylene glycol reacts with Sodium at 50°c to give monoalkoxide and dialkoxide when temp. is 160° c.

$$\underset{\text{ethylene glycol}}{\begin{matrix} CH_2-OH \\ | \\ CH_2-OH \end{matrix}} \xrightarrow[50^\circ c]{Na} \underset{\text{monoalkoxide}}{\begin{matrix} CH_2ONa \\ | \\ CH_2OH \end{matrix}} \xrightarrow[160^\circ c]{Na} \underset{\text{dialkoxide}}{\begin{matrix} CH_2ONa \\ | \\ CH_2ONa \end{matrix}}$$

(ii) **Reaction with HCl :-** When ethylene glycol is treated with HCl it first gives ethylene chlorohydrine ~~and~~ ~~then~~ at 160°c and then 1,2-dichloroethane at 200°c.



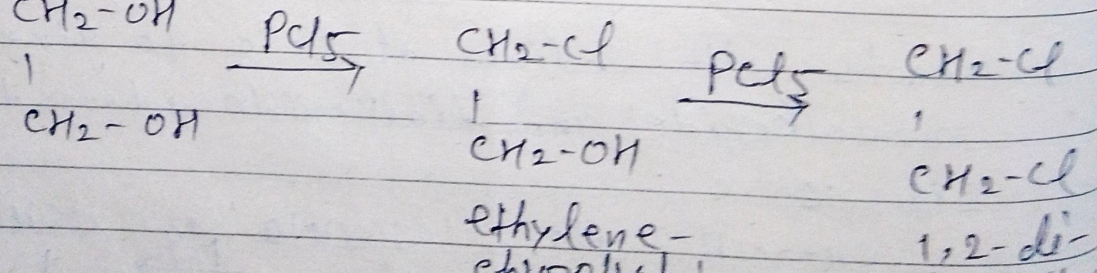
ethylene glycol — ethylene chlorohydrine



1,2-dichloroethane

(iii) **Reaction with Phosphorus pentahalides :-**

On treatment with PCl_5 it first gives ethylene chlorohydrine and then 1,2-dichloroethane.

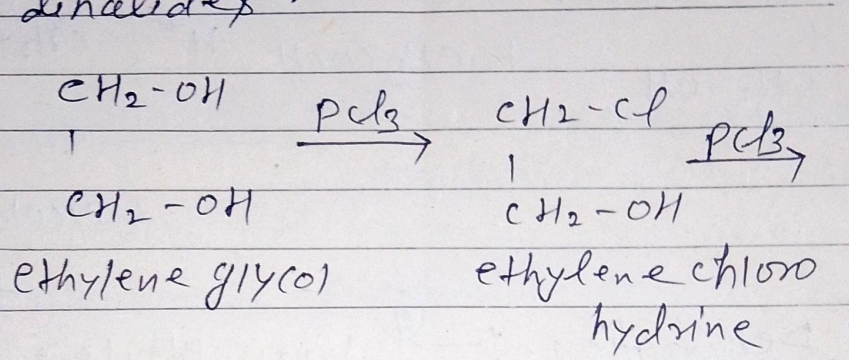


ethylene-chlorohydrine — 1,2-dichloroethane

Note :- Similar reaction with PCl_3

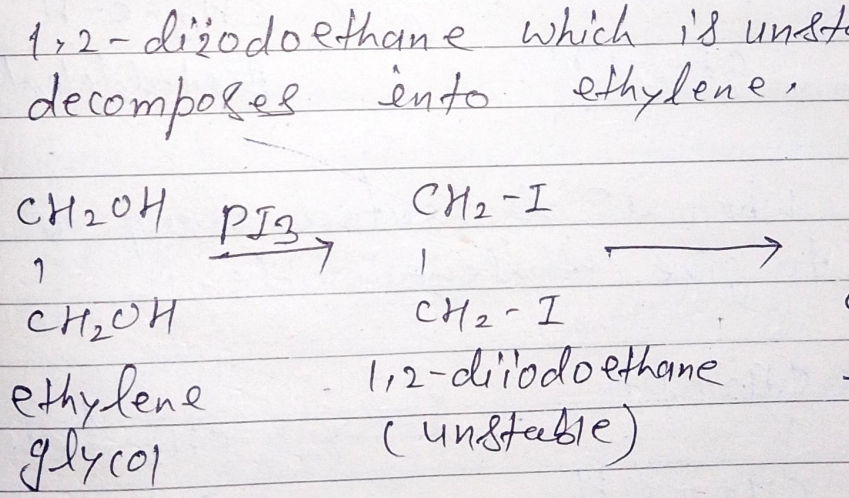
(iv) **Reaction with Phosphorus trihalides :-**

Ethylene glycol reacts with Phosphrus trihalides to give their corresponding dihalides.

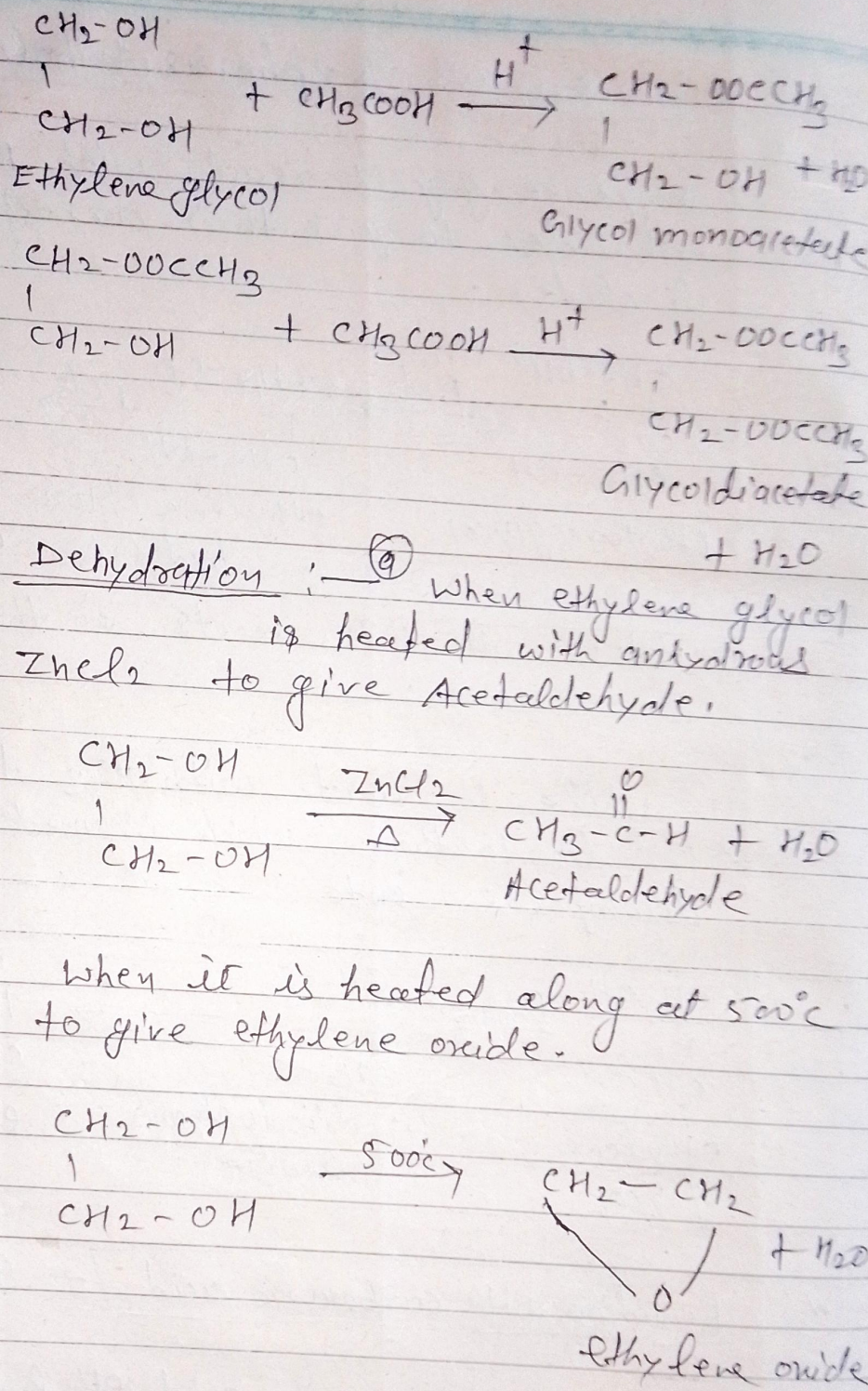


Note :- with PBr_3 reacts in the same way.

While it reacts with PI_3 to give 1,2-diiodoethane which is unstable and decomposes into ethylene.



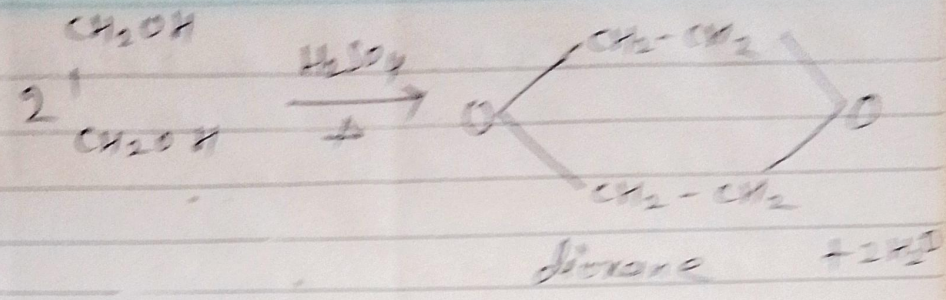
(v) **Reaction with carboxylic acid :-** In the presence of mineral acid ethylene glycol reacts with carboxylic acid to forming their corresponding esters and diesters.



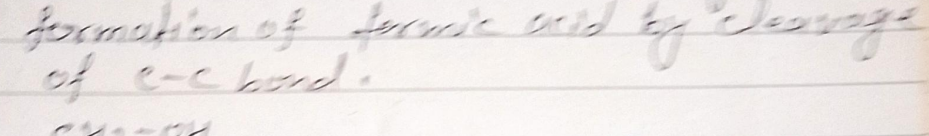
(vi) <u>Dehydration</u> :— (a) When ethylene glycol is heated with anhydrous $ZnCl_2$ to give Acetaldehyde.

(b) When it is heated along at 500°c to give ethylene oxide.

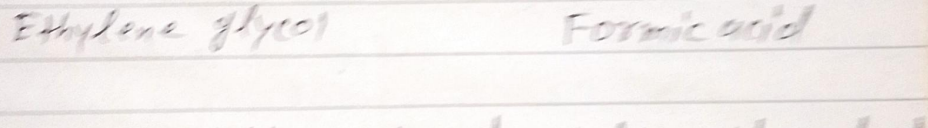
(c) When it is heated with conc. H_2SO_4 gives dioxane. which is an important industrial solvent.



(vii) <u>oxidation</u>:- (a) Ethylene glycol on oxidation with acidic $KMnO_4$ or $K_2Cr_2O_7$ resulting the formation of formic acid by cleavage of C-C bond.



(b) On oxidation with periodic acid or lead tetraacetate it gives formaldehyde



(c) Ethylen glycol on oxidation with HNO_3 gives oxalic acid.