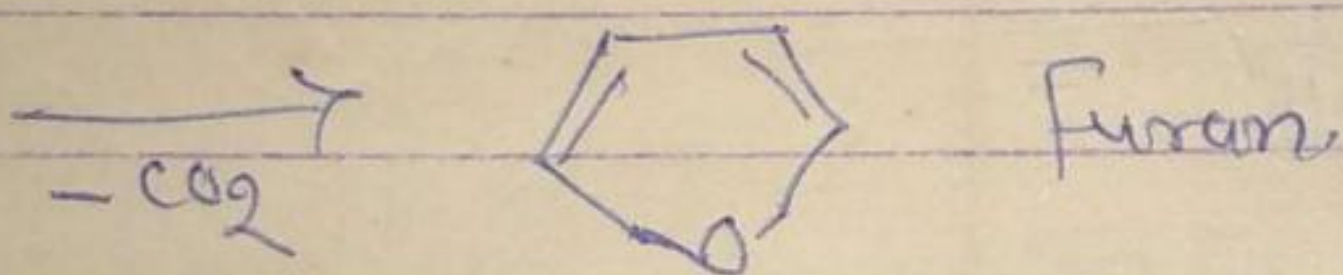
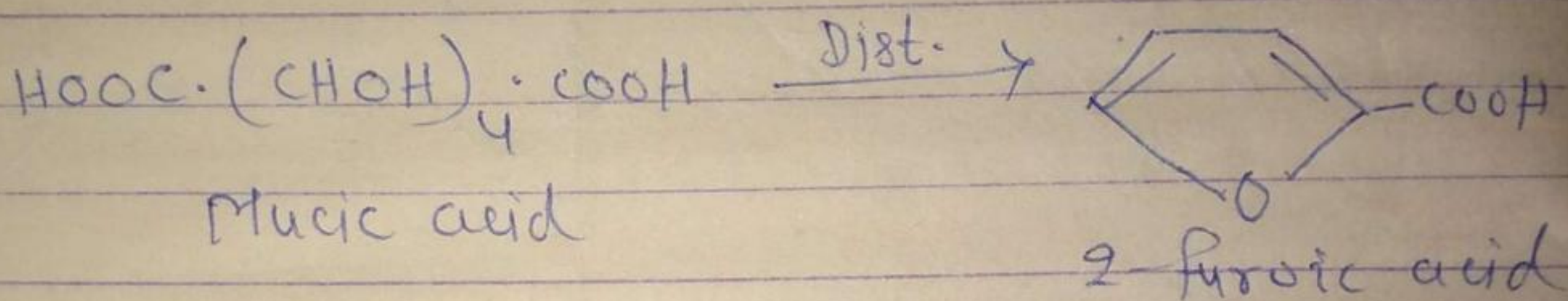


Preparation of furan: →

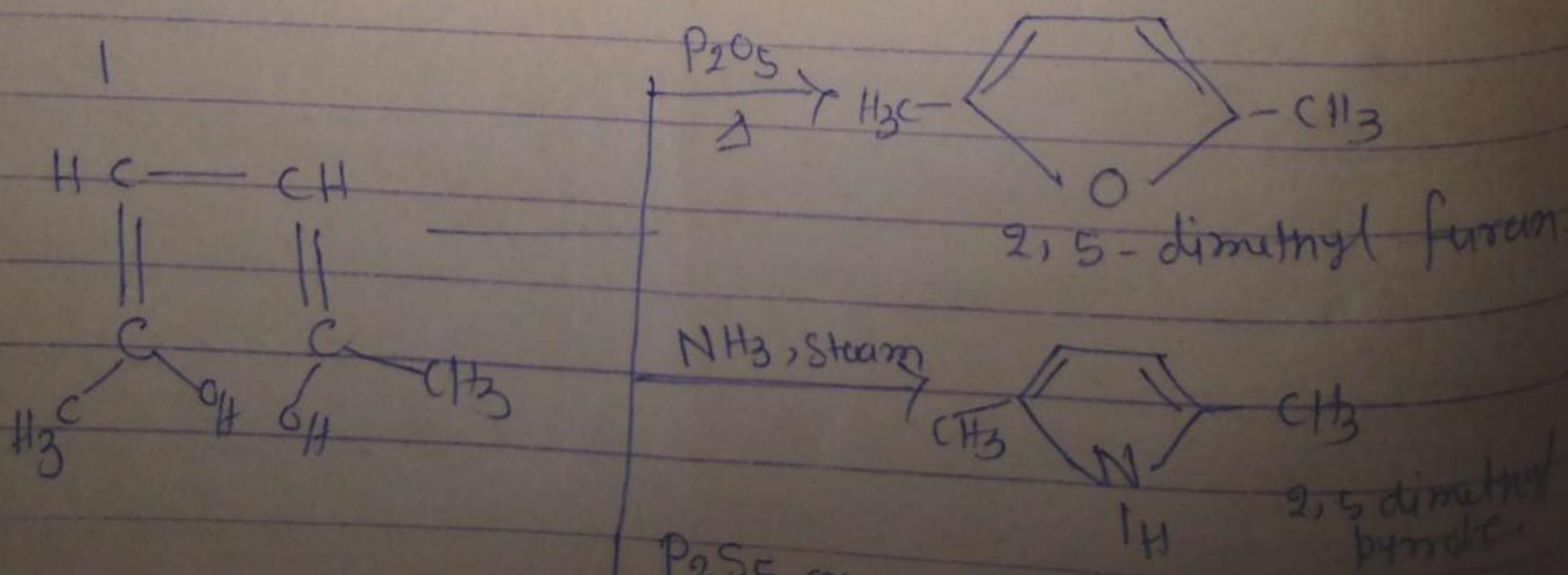
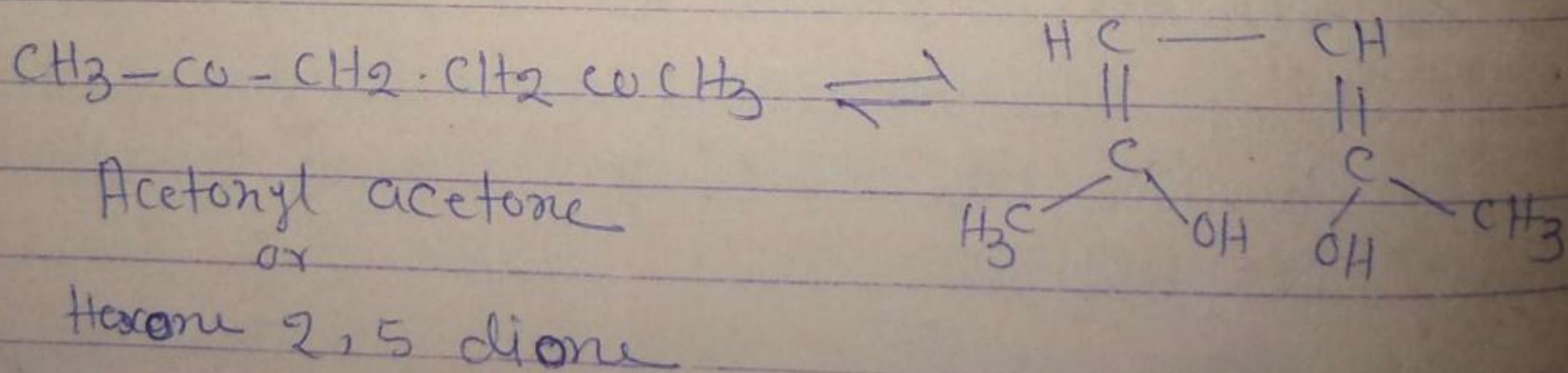
(1) From mucic acid —

It is prepared by the dry distillation of mucic acid. It gives furoic acid which on decarboxylation in quinoline in the presence of copper powder gives furan.

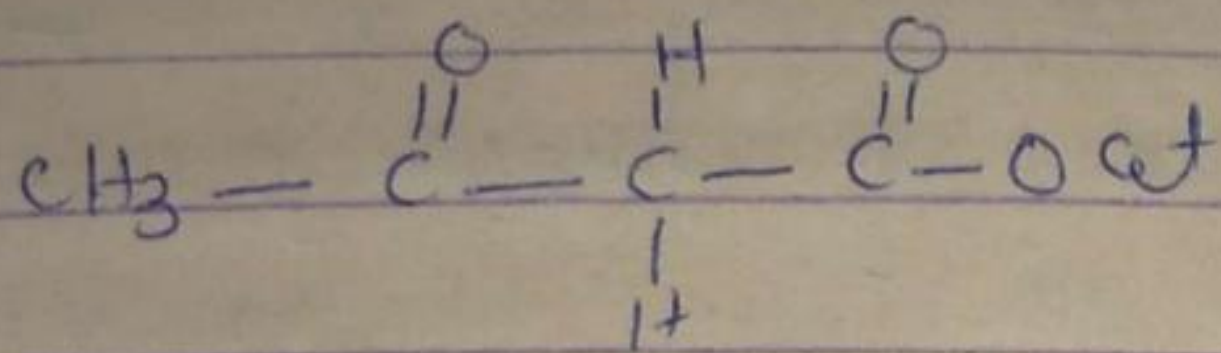
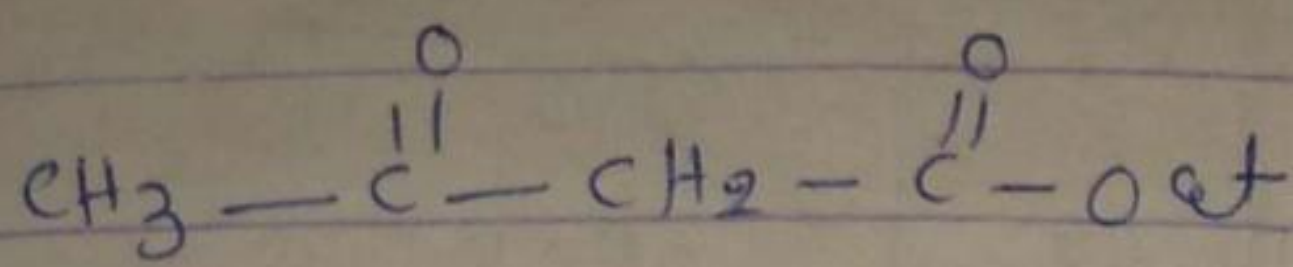


(2) From 1,4-dialdehyde or ketone.

Furan derivatives are prepared by dehydrating 1,4-dialdehyde or ketone with phosphorous pentoxide, sulphuric acid etc.



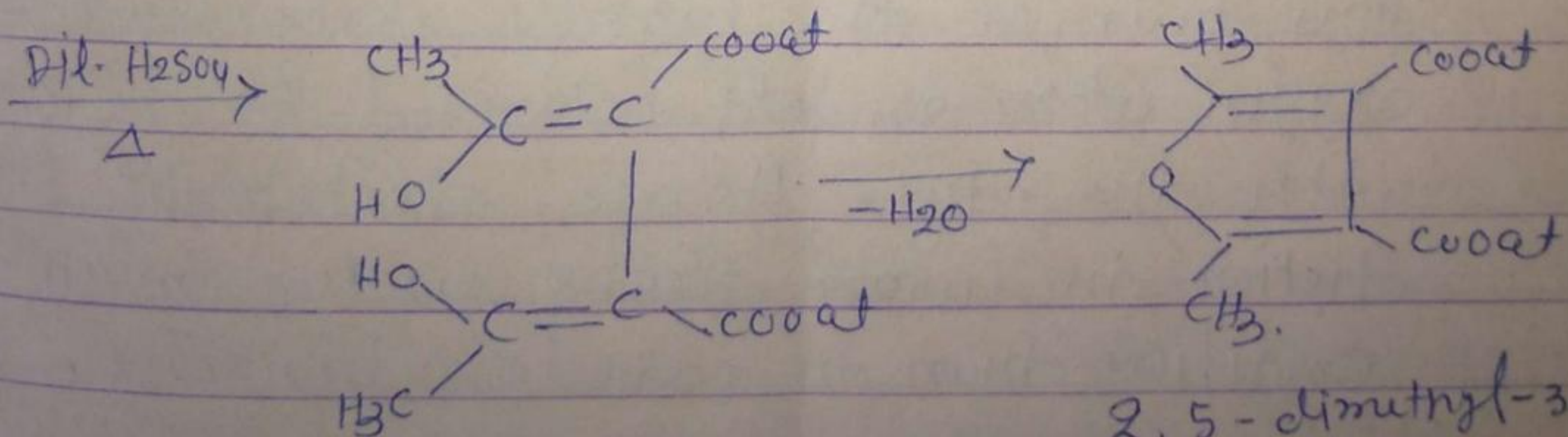
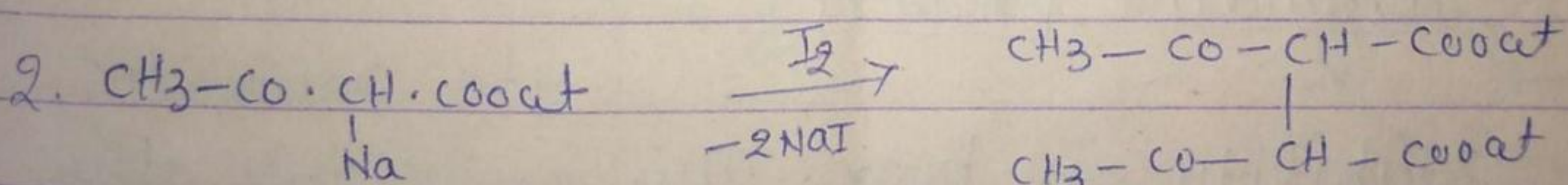
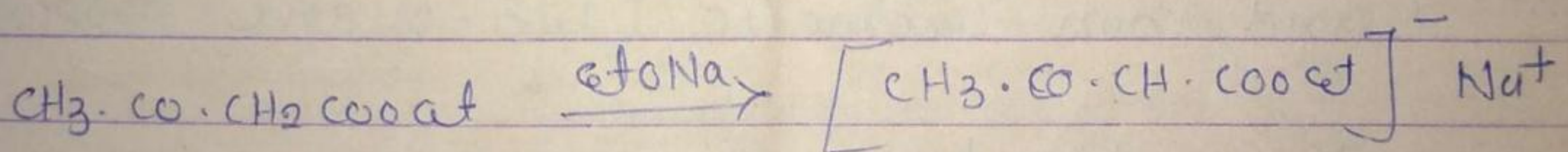
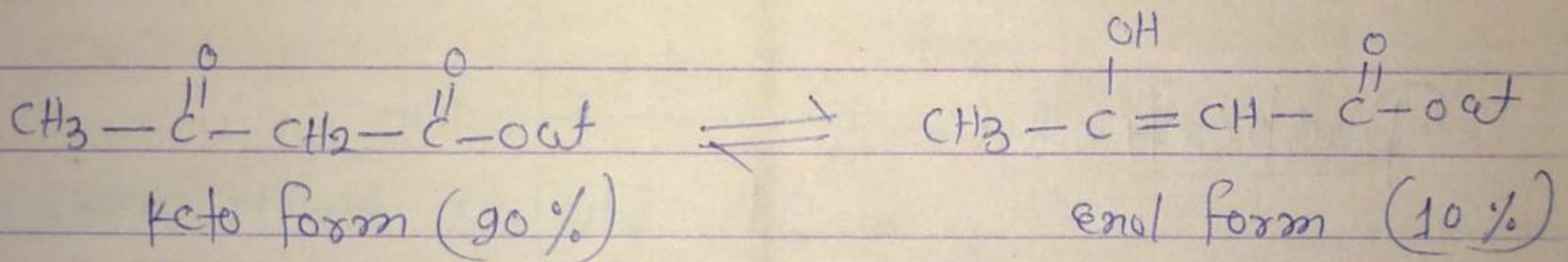
(3) From EAA (ethyl acetoacetate) →



It is a very useful compound to which a lot of compounds can be prepared. This is due to two H-atoms present at 3rd carbon from left.

i.e. CH₂ is active methylene group.

Hence,

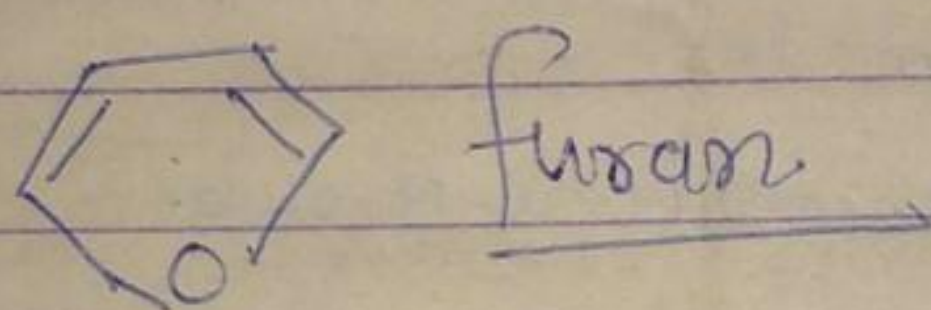
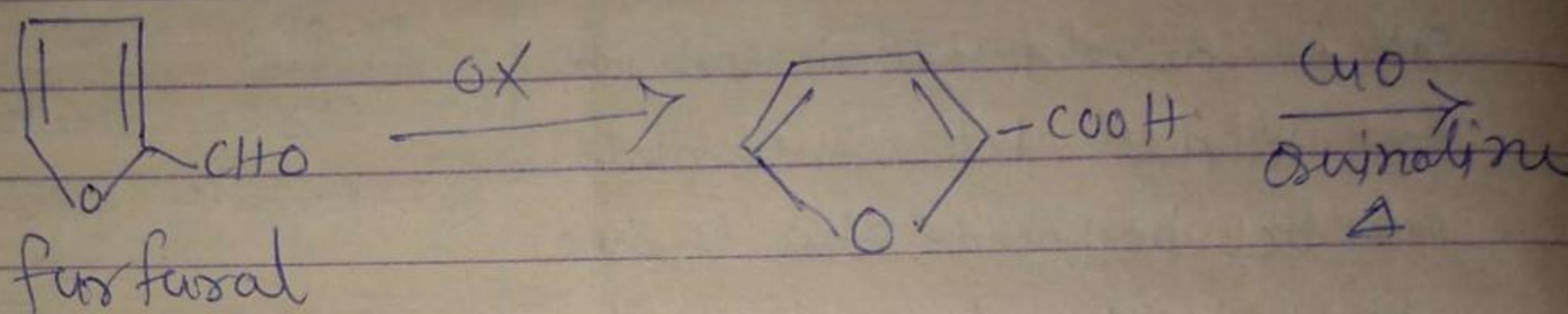
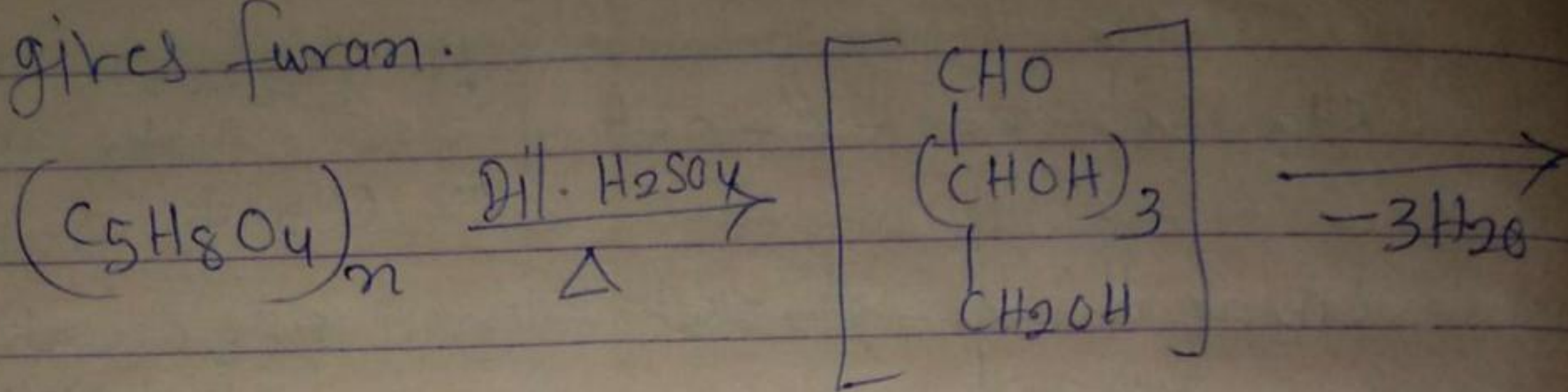


2,5-dimethyl-3,4-dicarboxylic ester furan.

④ From ~~Pentosan~~ Pentosan →

Pentosan is agricultural waste product (aldopentose is intermediate). The Pentosan first forms furfural which on heating

with steam in presence of oxide catalyst gives furan.

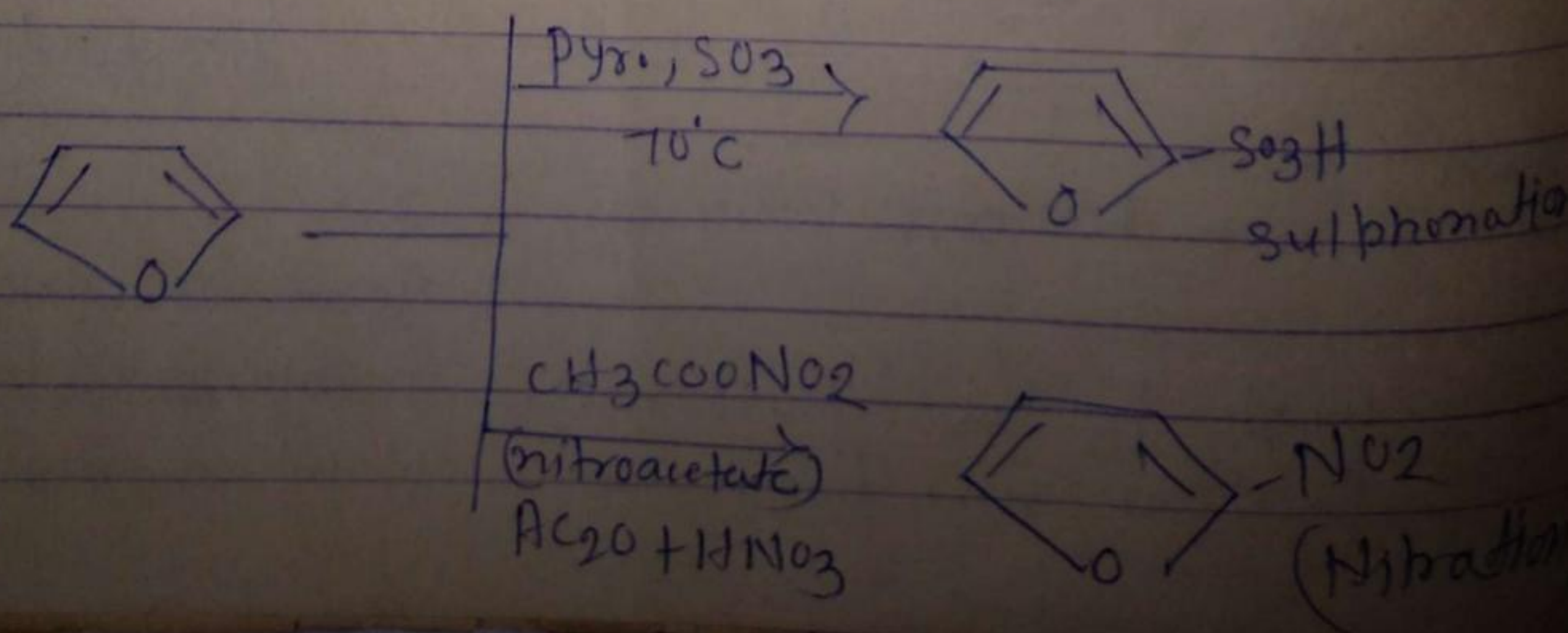


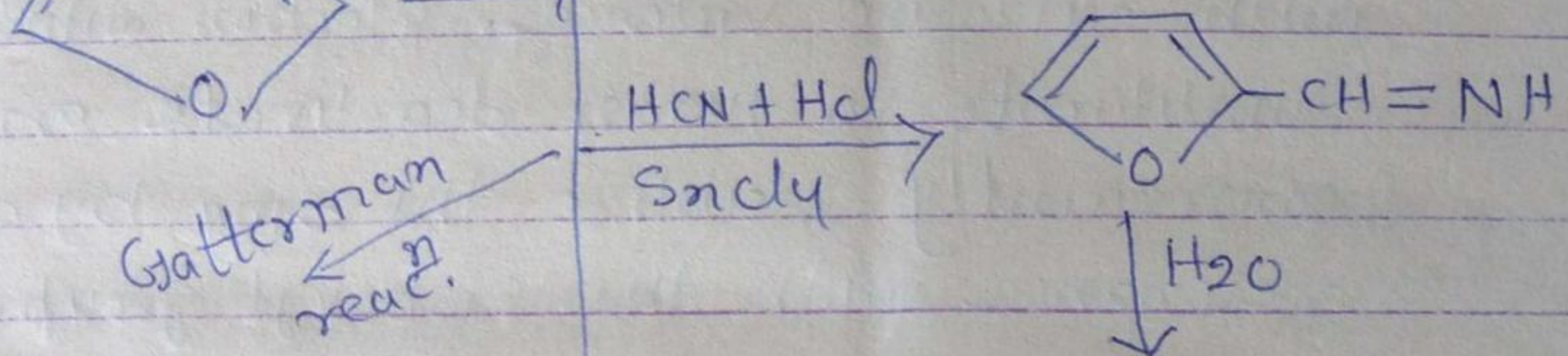
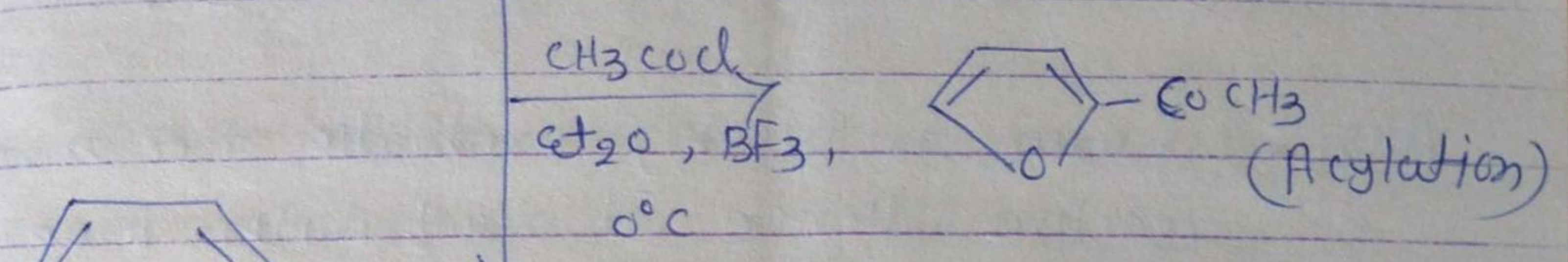
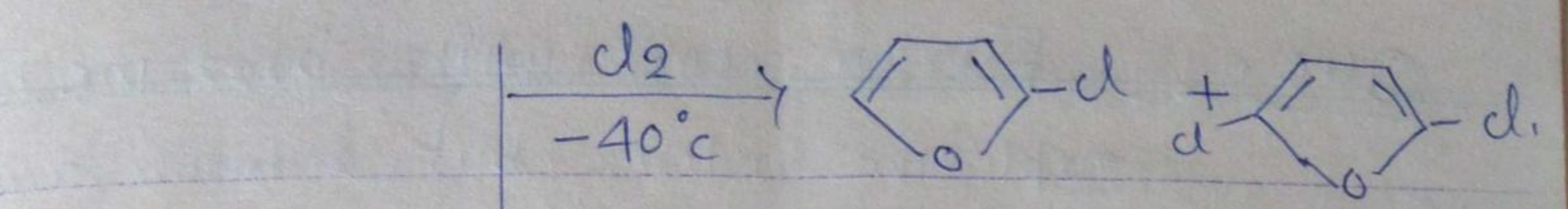
Properties :->

It shows both aromatic and non-aromatic (1,3-diene) properties.

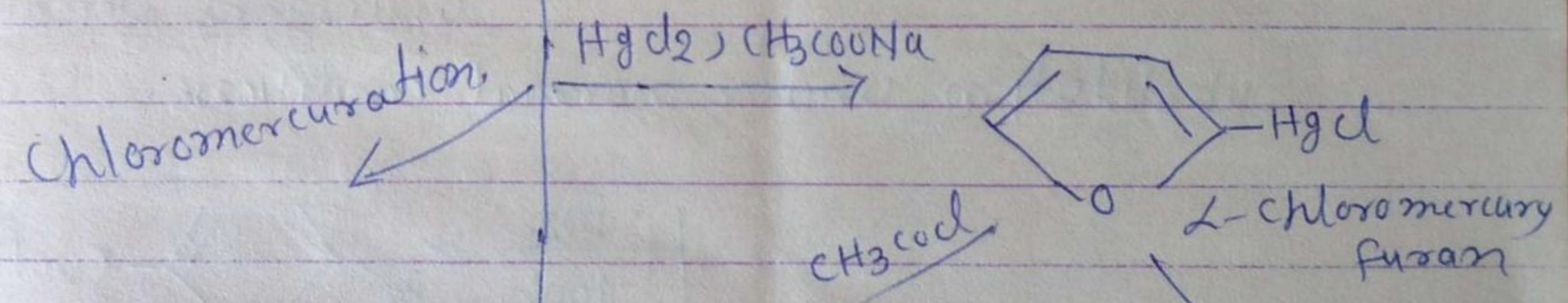
Aromatic property :->

Its aromatic stability is poor. This is because the lone pair of the highly electronegative oxygen atom is less polarised for the interaction with the ring. Hence electrophilic substitution in furan occurs under much milder conditions than in case of benzene.

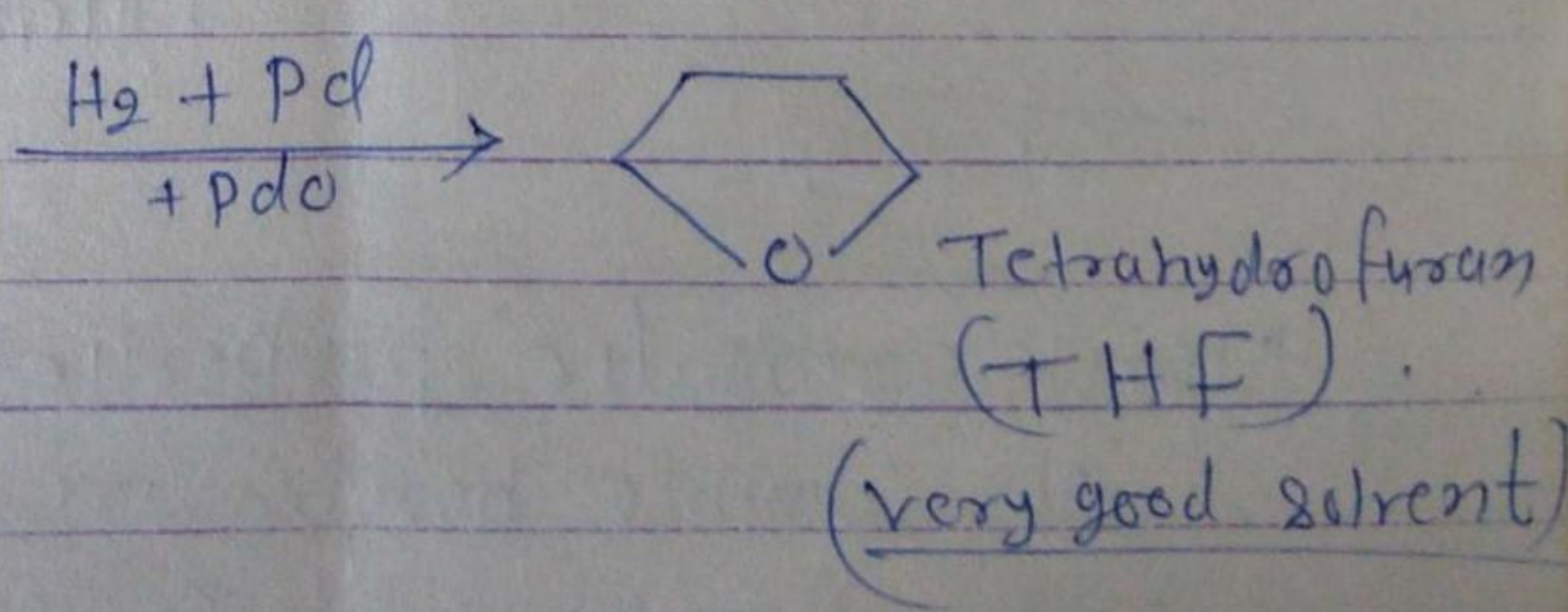
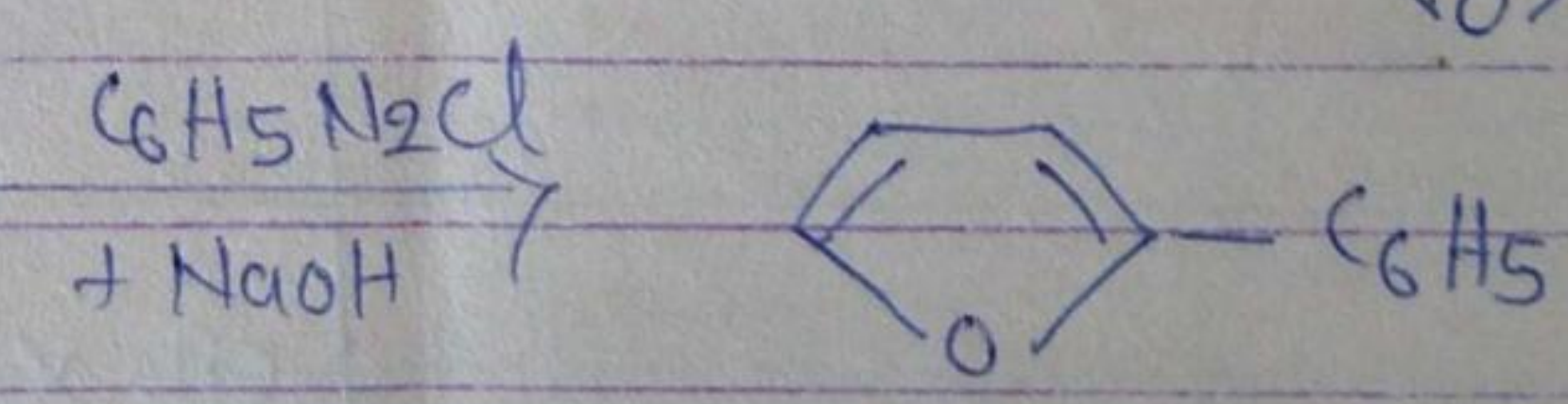
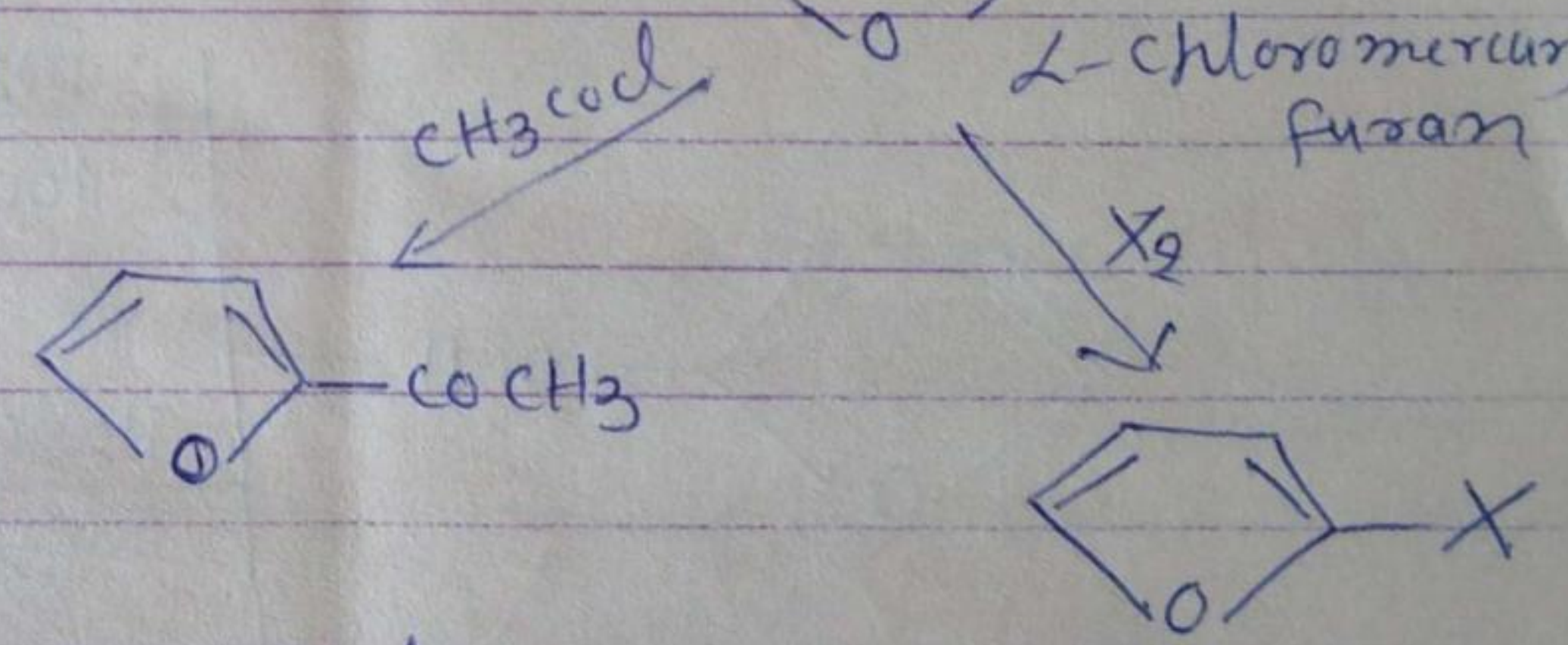




Gatterman
reacⁿ

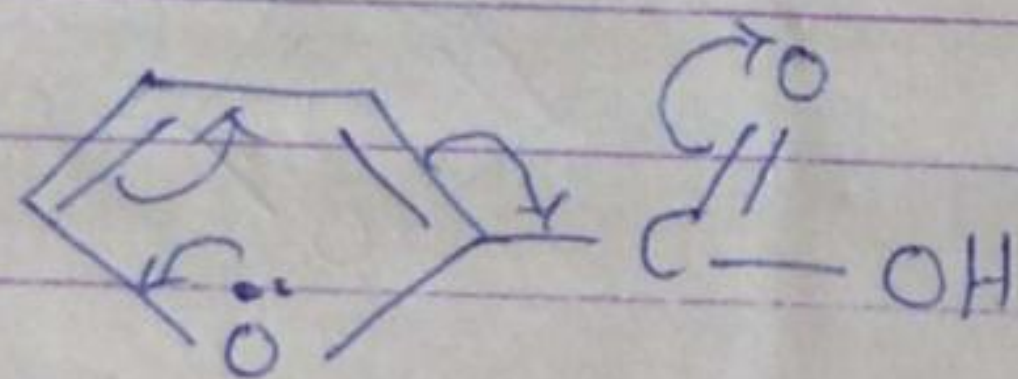


Chloromercuriation

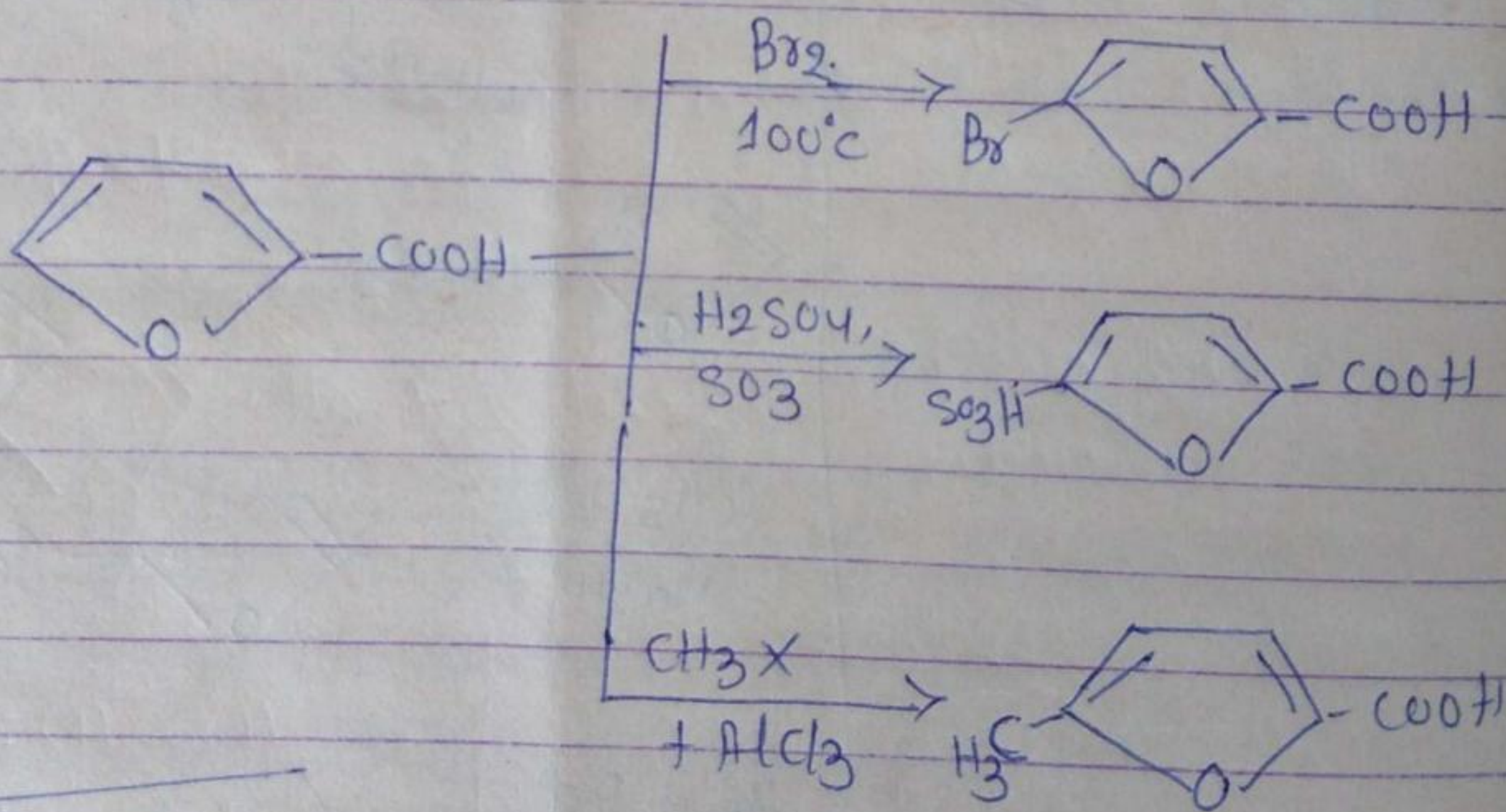


Que. Furan react with bromine with explosive violence but 2-furoic acid is brominated at 100°C. Explain?

Ans. Furan is weakly aromatic i.e. more reactive. Hence it react with bromine with explosive violence. Electron withdrawing substituents in furan deactivate and consequently stabilise the ring by added resonance with the carbonyl group.



Thus furoic acid unlike furan undergoes electrophilic substitution under normal conditions.

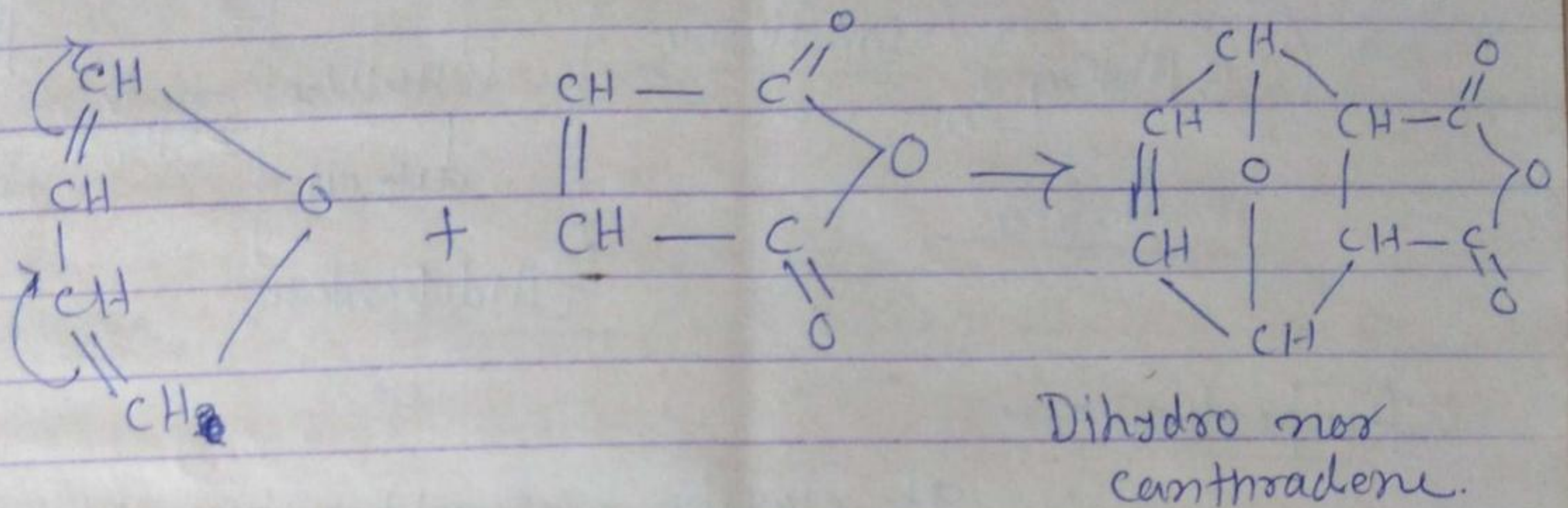


Non-aromatic properties of furan :->

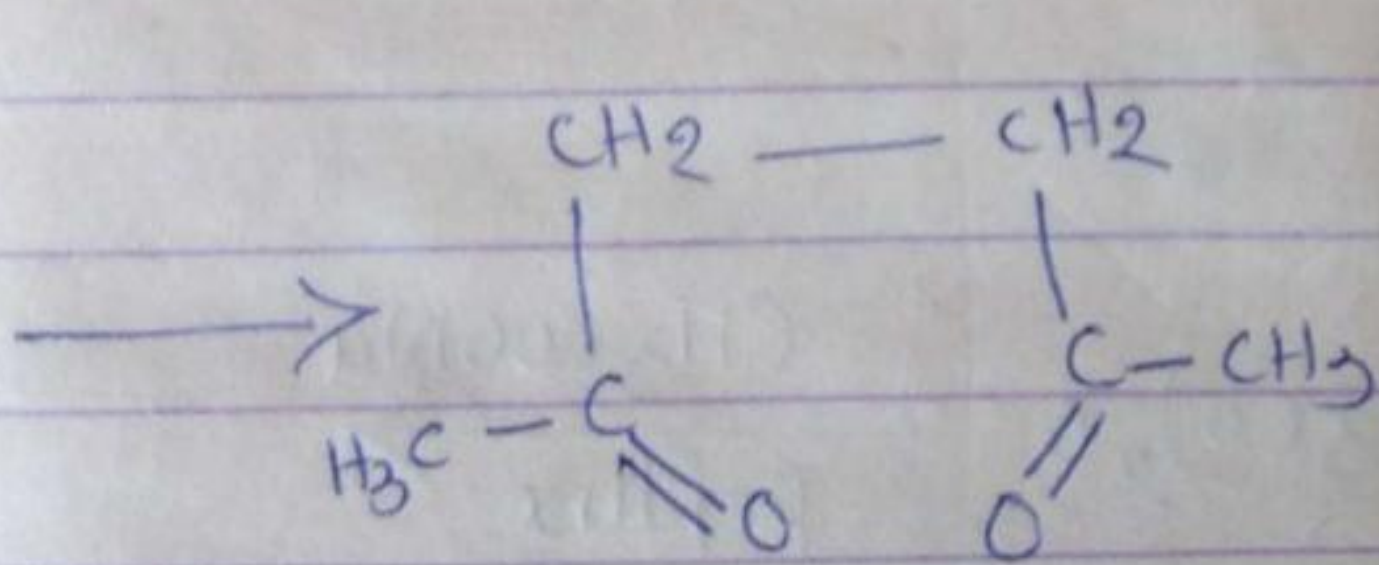
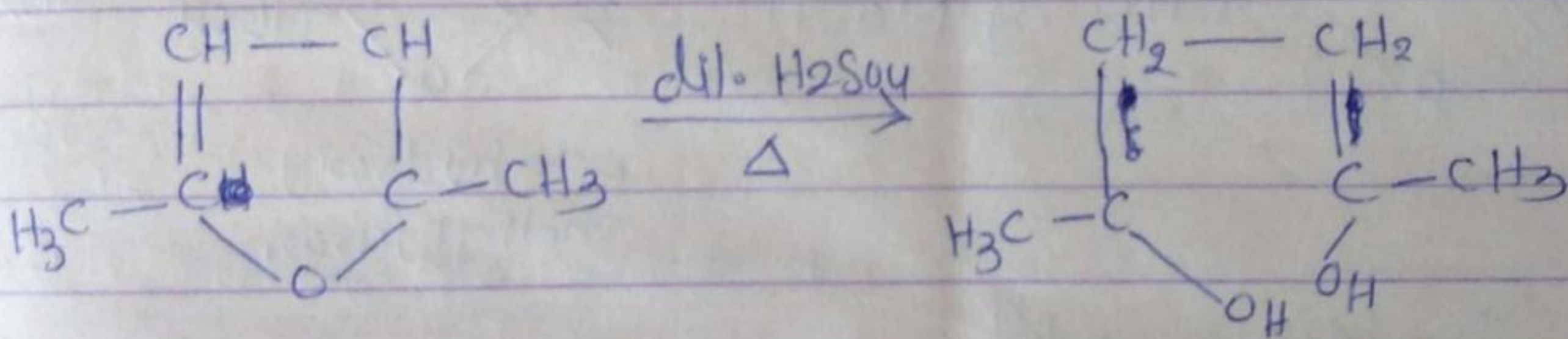
gts double bonds are relatively fixed.
 gts C₂-C₃ and C₃-C₄ bond lengths are similar to those of 1,3 butadiene. This is due to the smaller contribution of the lone pair in the delocalisation. gts

therefore, shows some of the properties of dienes.

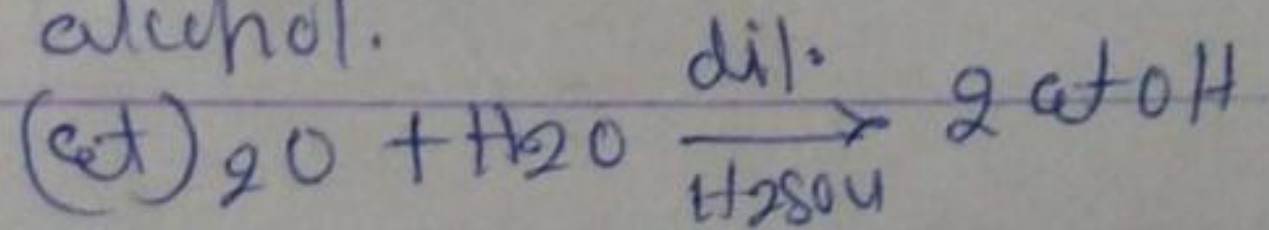
(i) Diels-Alder reaction \Rightarrow



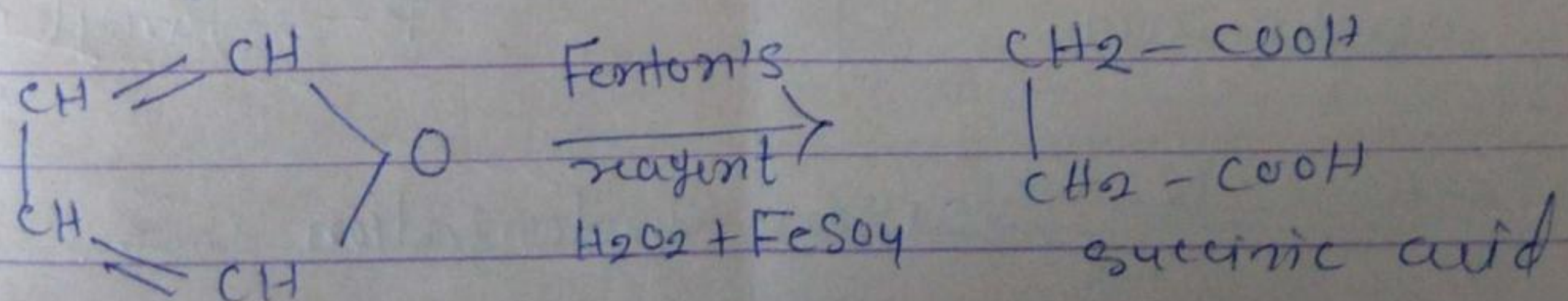
(ii) Its derivative, 2,5-dimethyl furan acetonyl acetone, when warmed with dil. H_2SO_4 . The compound undergoes hydrolysis as in case of ethers.



Note - Hydrolysis of ether with dil. H_2SO_4 gives two moles of ethyl alcohol.



(iii) The ring is smoothly opened by Fenton's reagent.



(iv) Its derivative, 2-furoic acid behaves as an unsaturated acid e.g. it decolorises alkaline $KMnO_4$ solution.