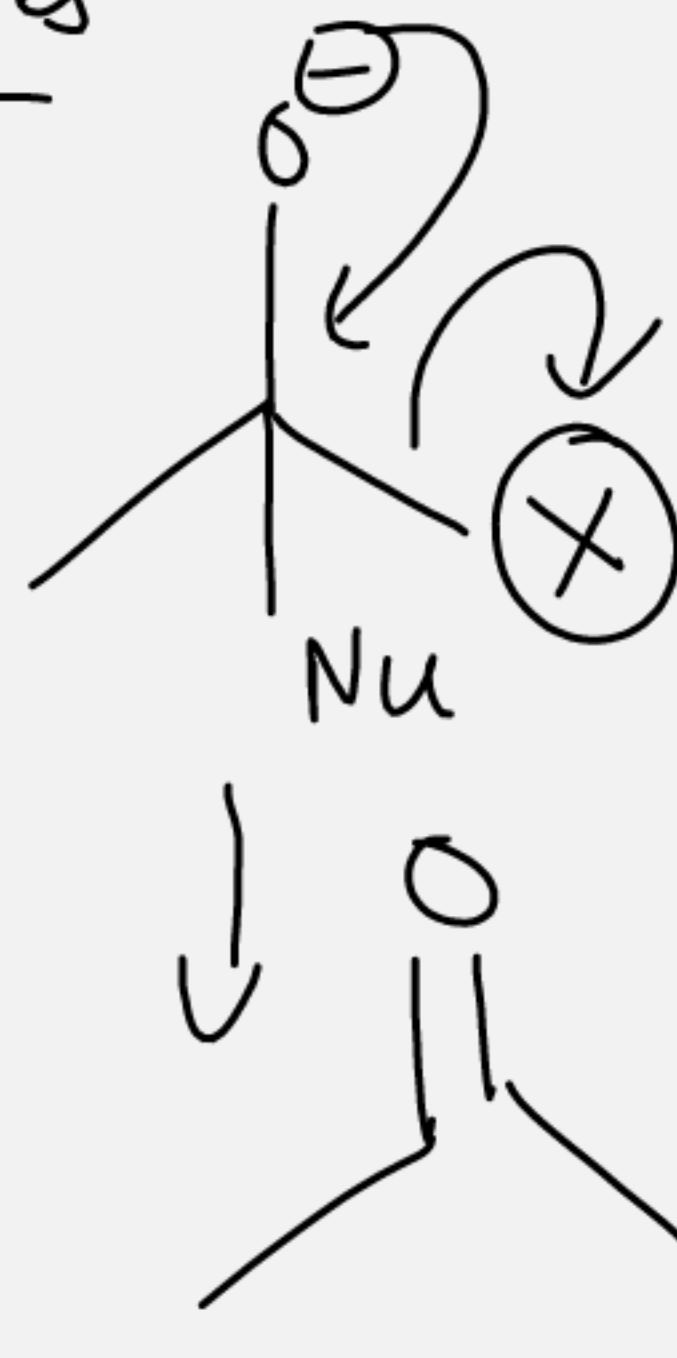
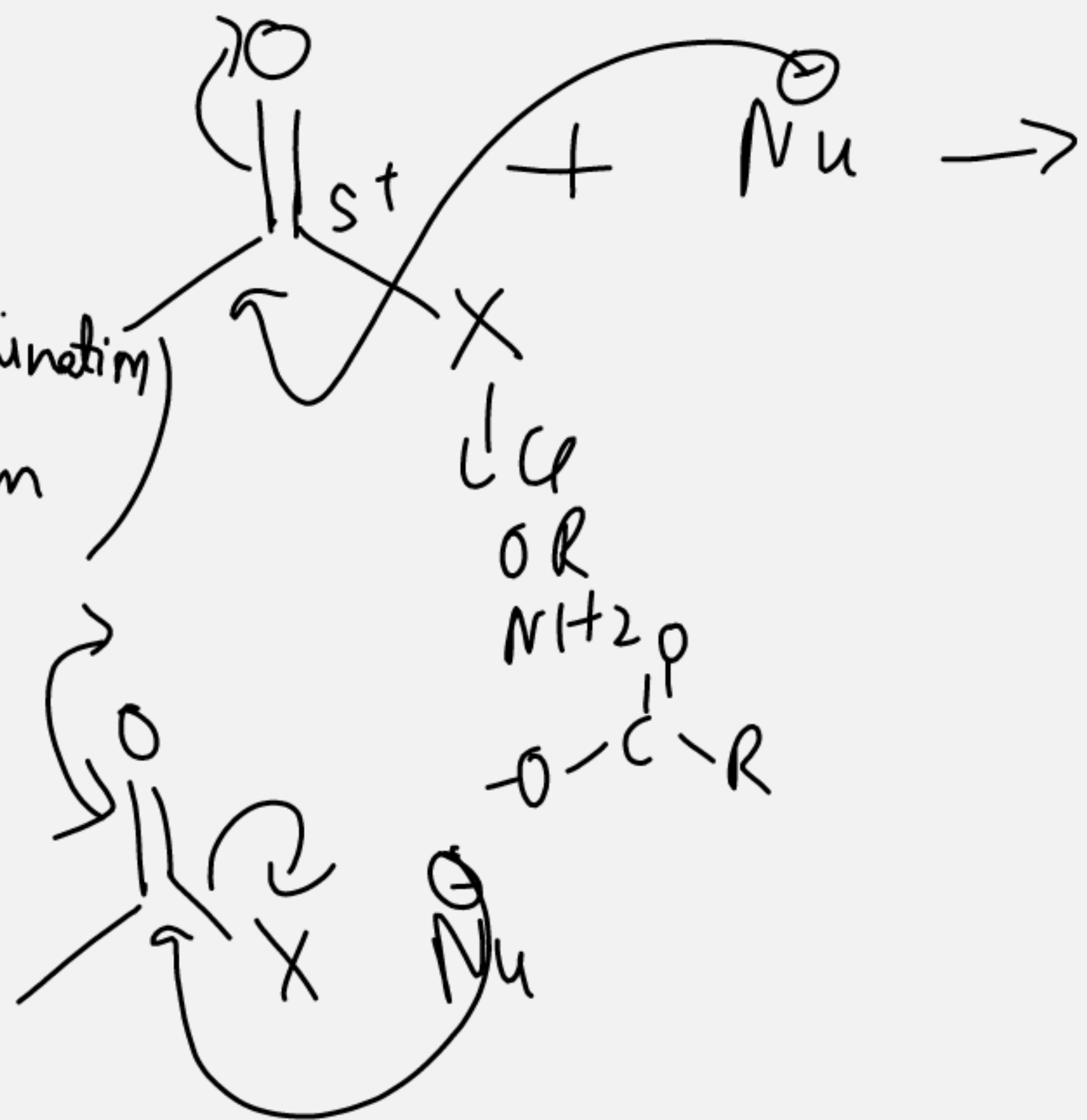


# Carbonylic Acid & Derivatives

Nucleophilic  
Substitution

(Add<sup>tn</sup> - Elimination)  
Mechanism

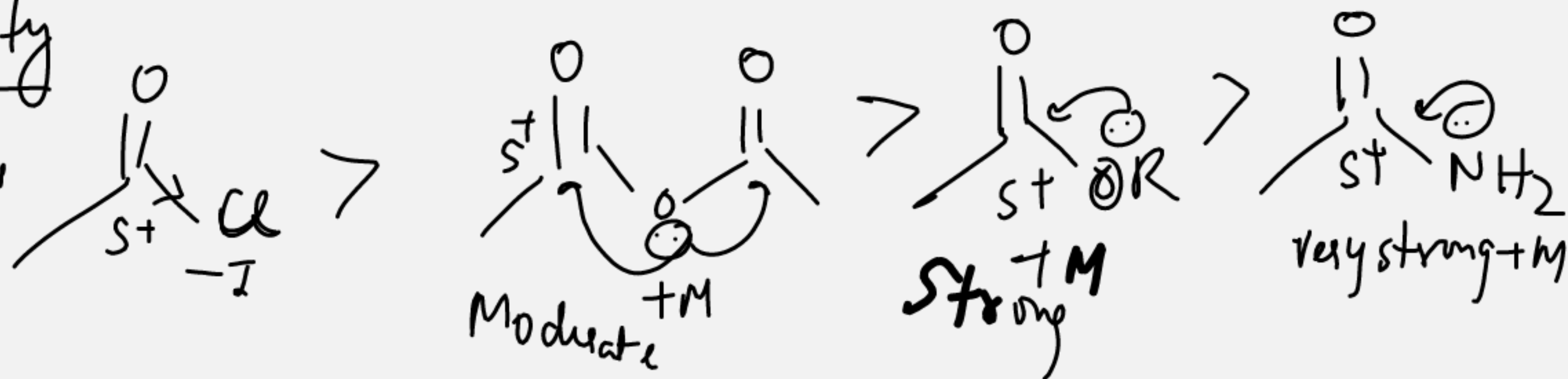
**S<sub>N</sub>AE**



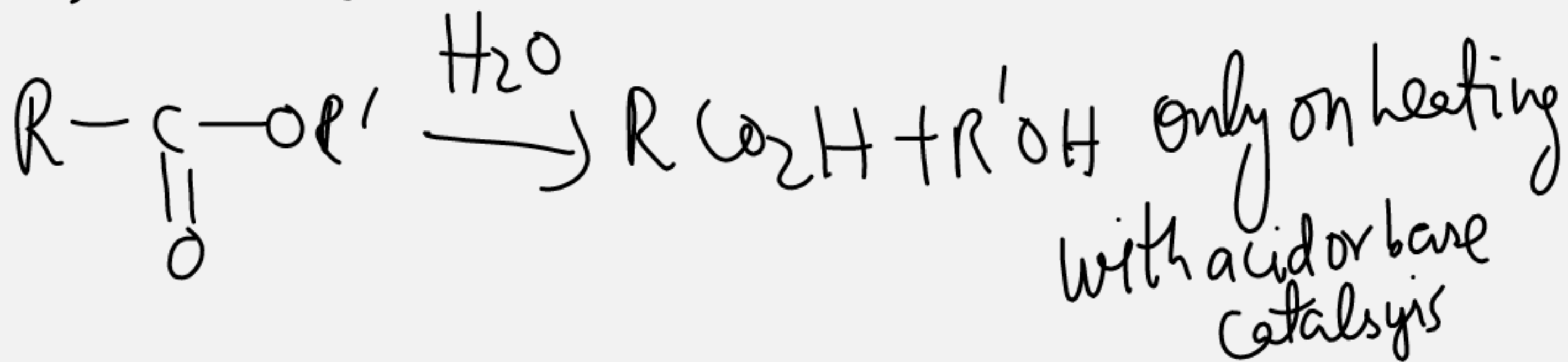
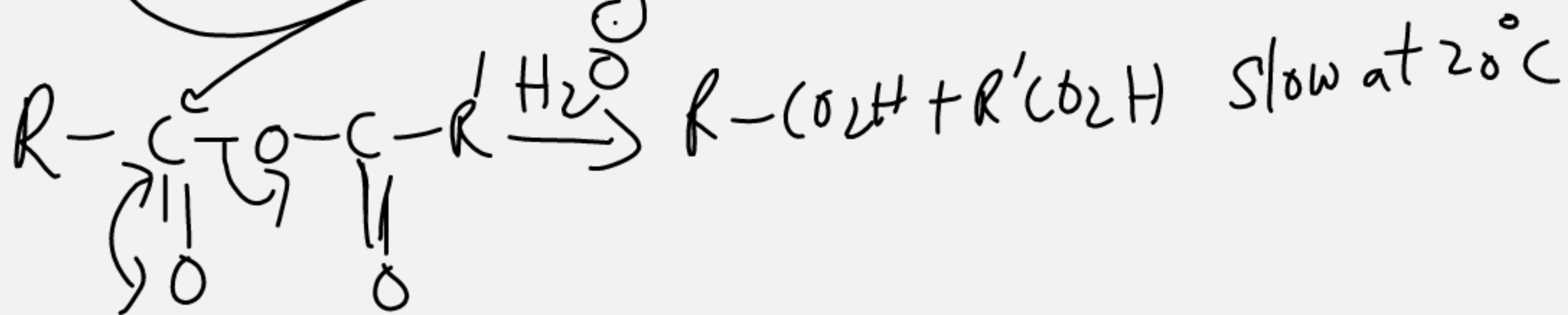
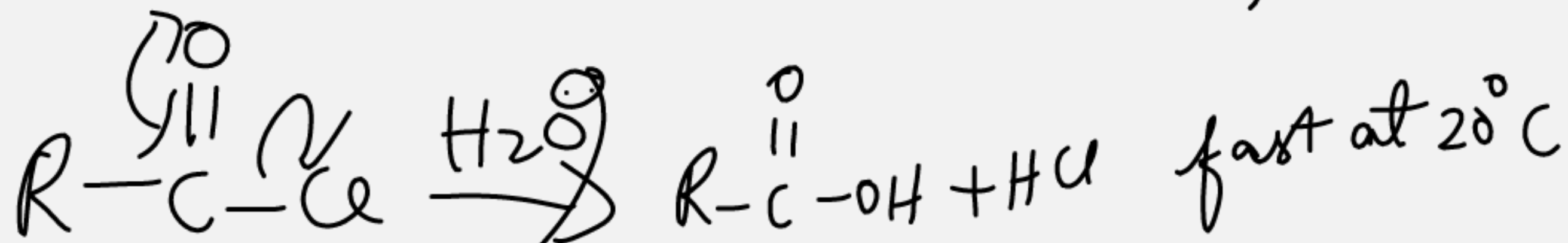
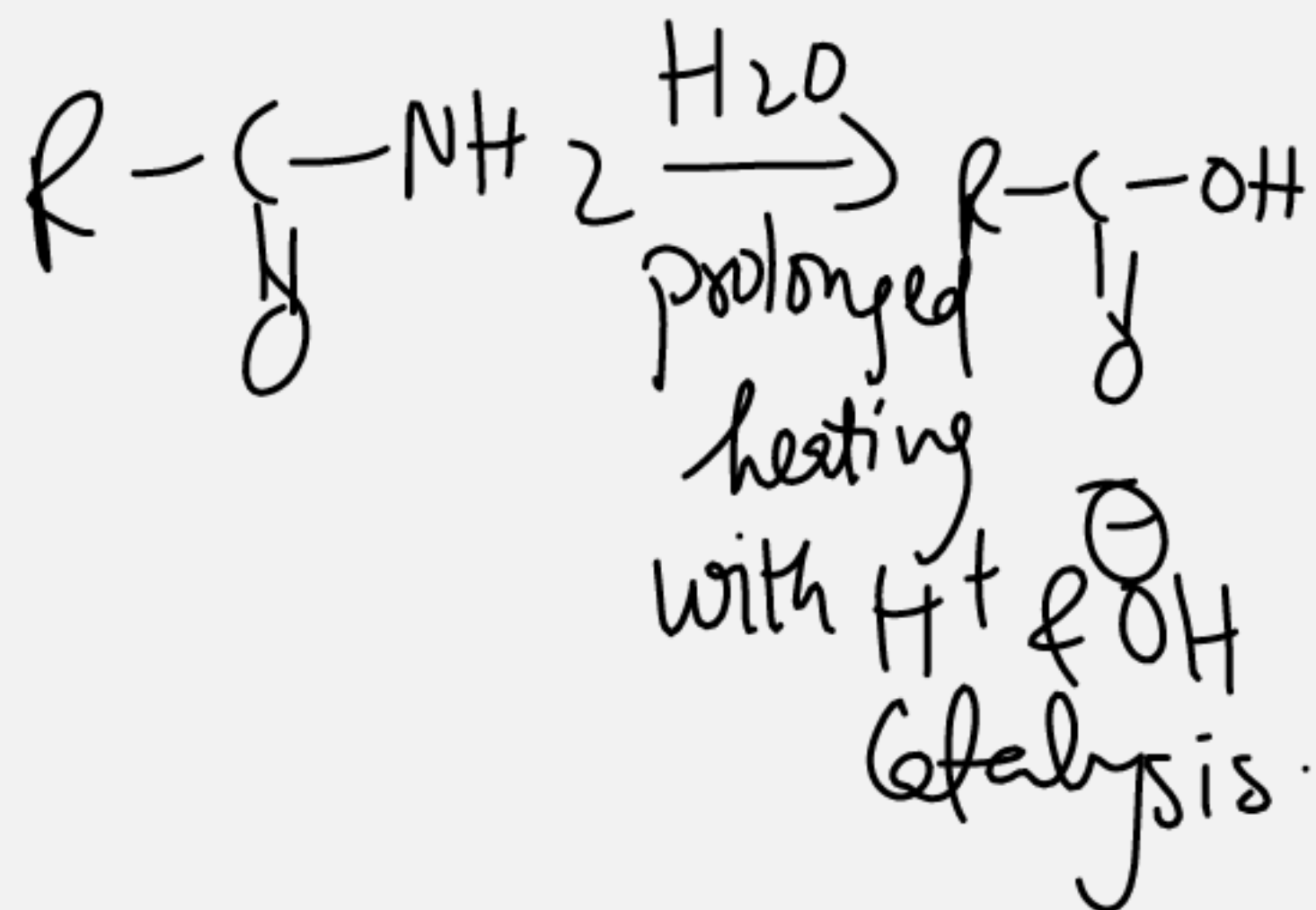
unstable  
tetrahedral  
intermediate

# Order of Reactivity

of Acid derivatives  
towards Nu

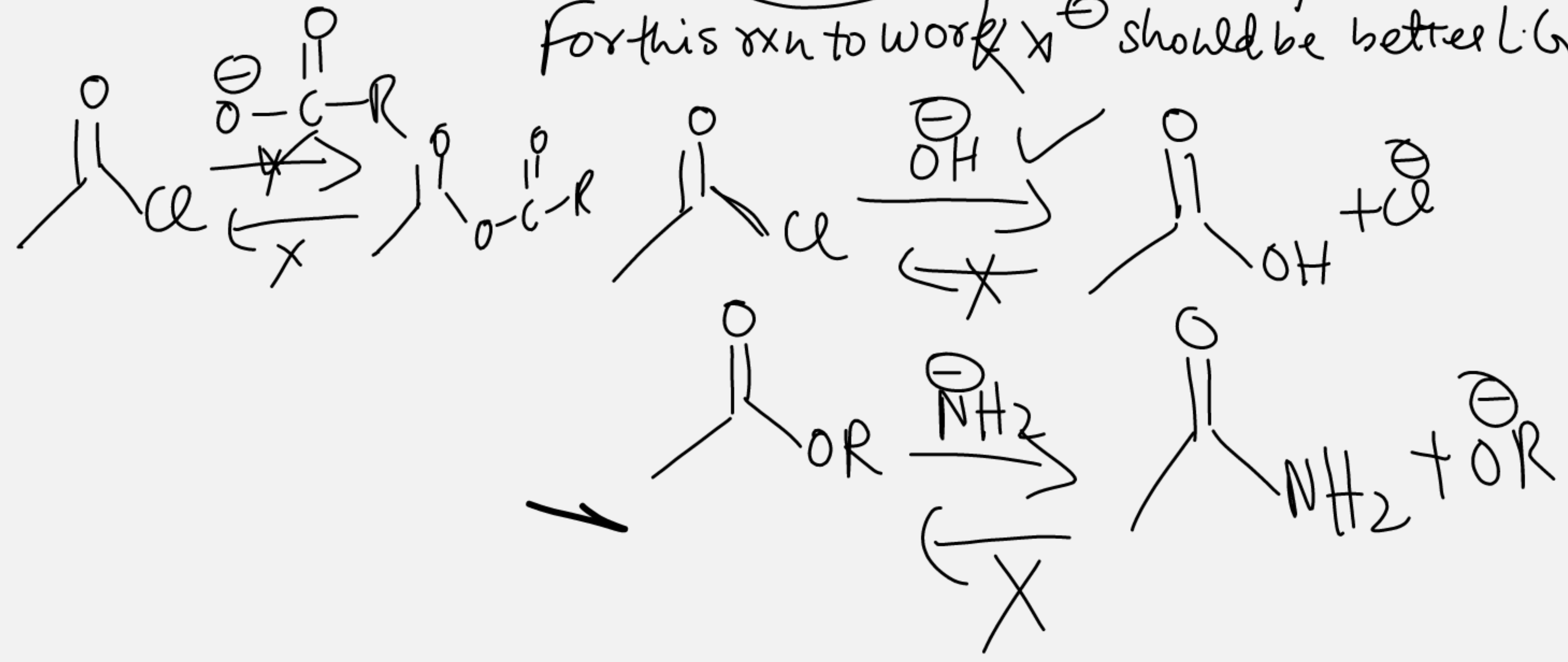


Eg





For this rxn to work  $X^-$  should be better L.G. than  $Y^-$



\* We can make less reactive product from more reactive reactant  
but reverse is not true.

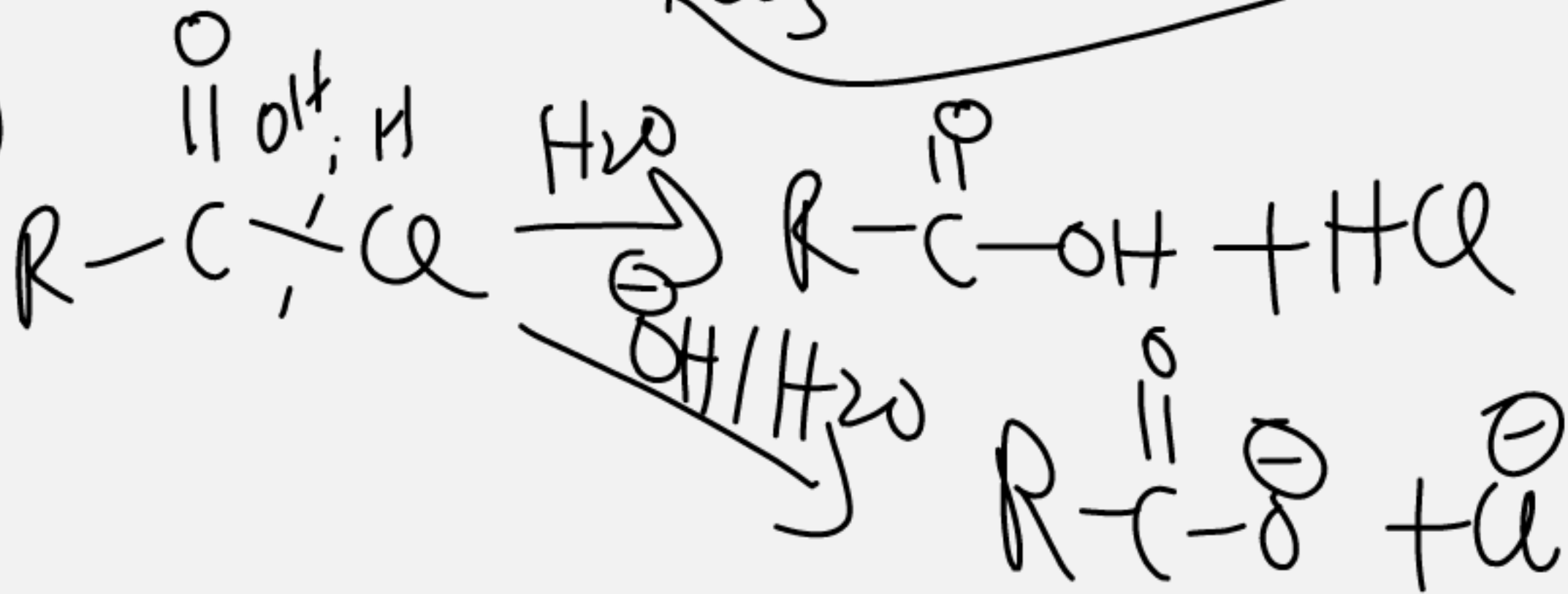
## Reaction of Acid chlorides

Prep<sup>n</sup>

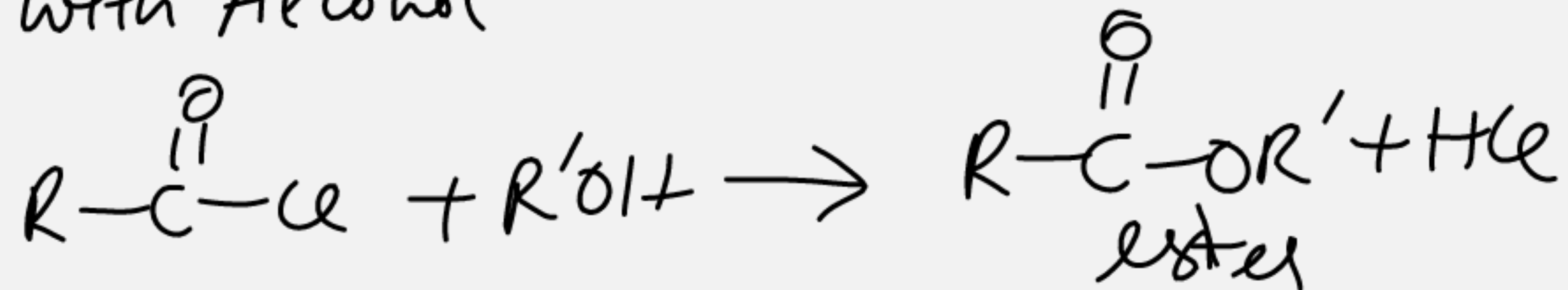


General rxns

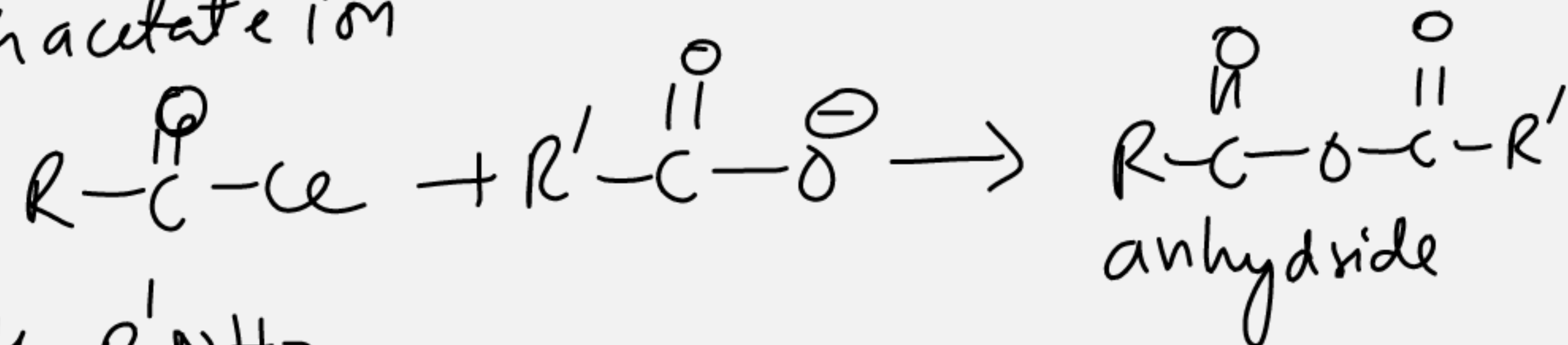
Hydrolysis



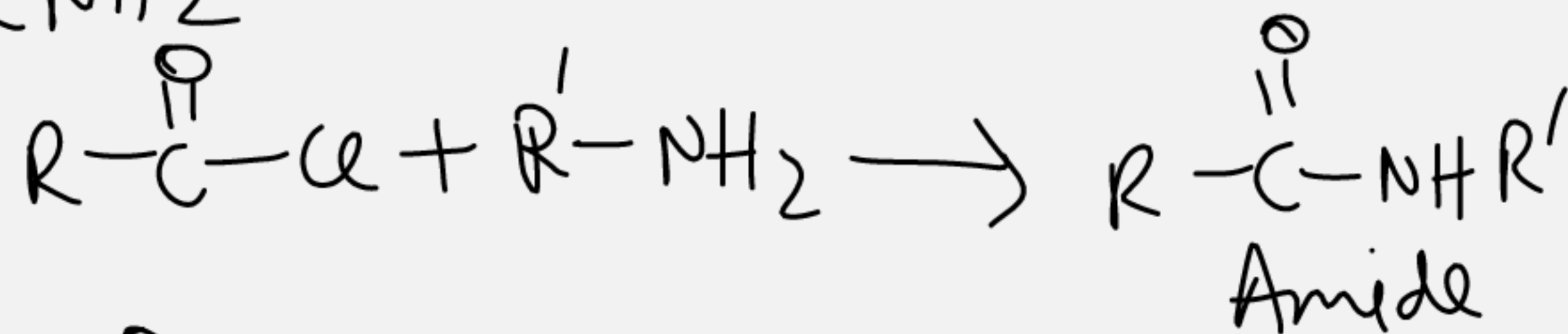
\* Rxn with Alcohol



\* Rxn with acetate ion



\* Rxn with  $R'\text{NH}_2$



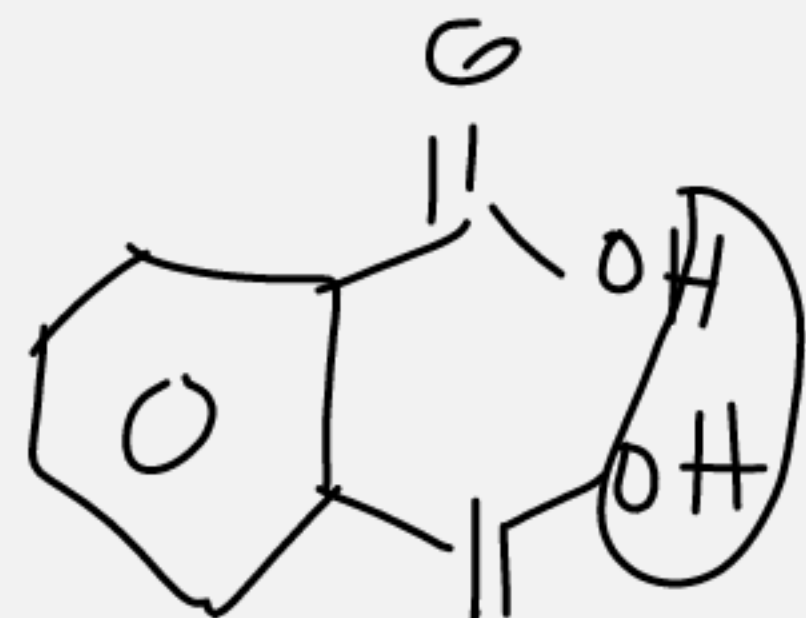
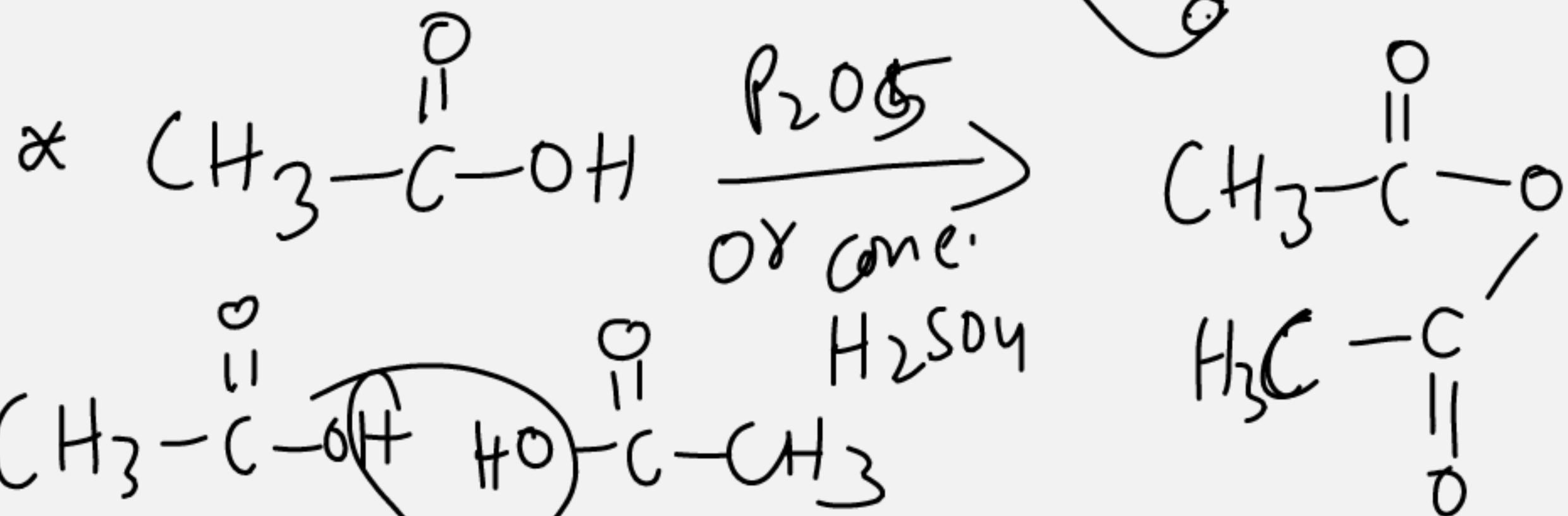
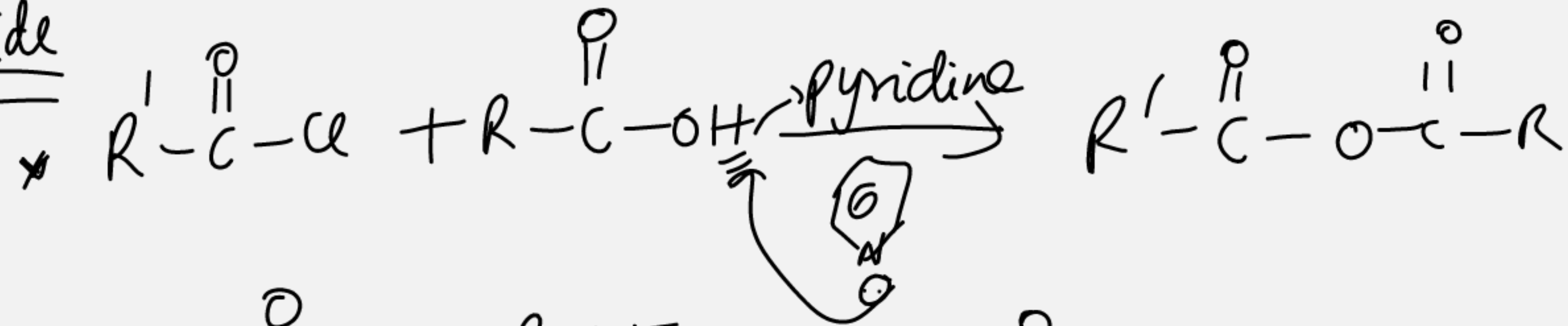
Specific Rxn

Rosenmund  
Reduction

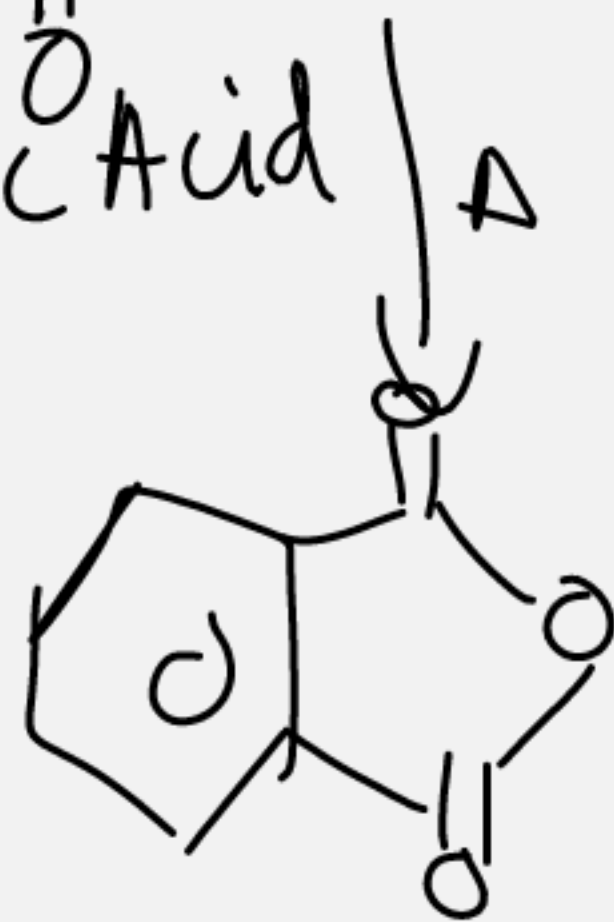


# Anhydride

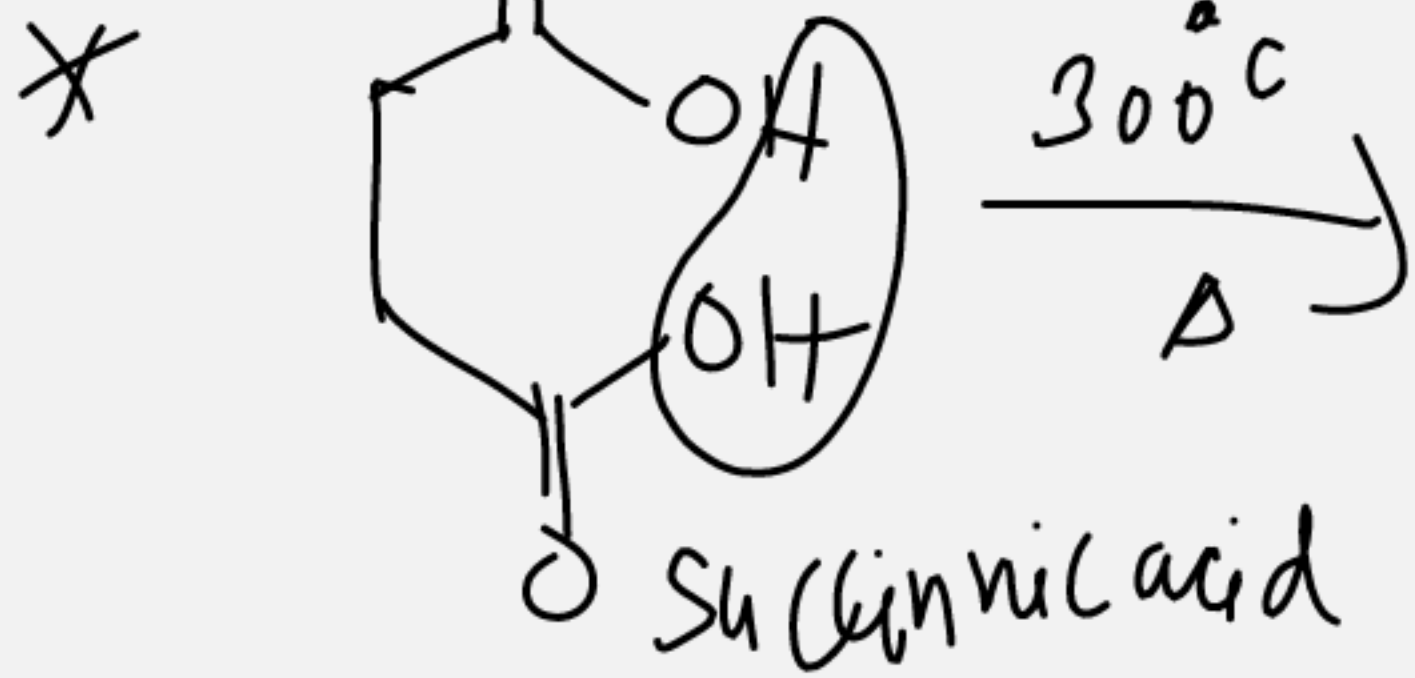
## Preparation



Phthalic Acid



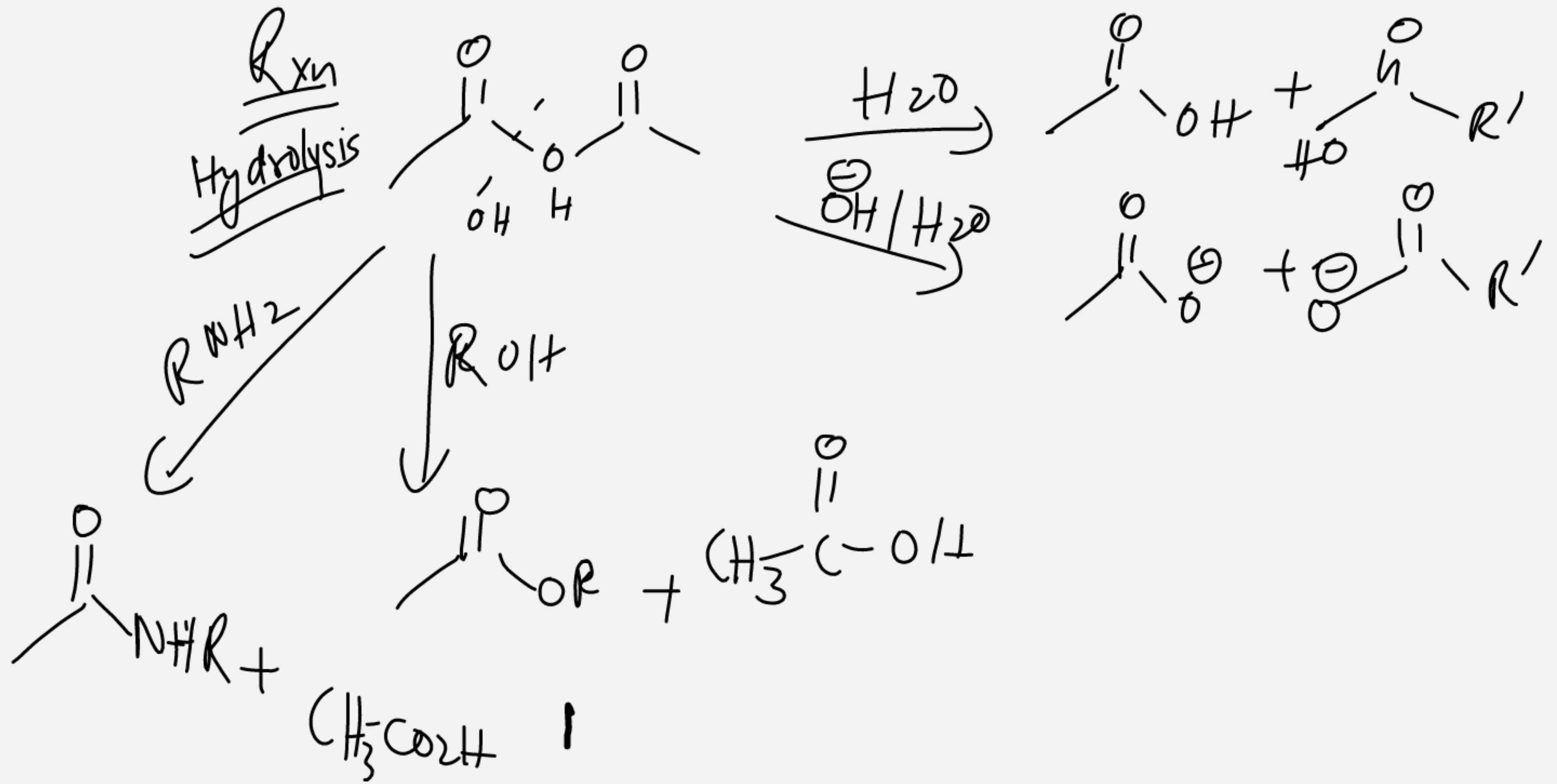
Phthalic Anhydride



Succinic acid



Succinic Anhydride

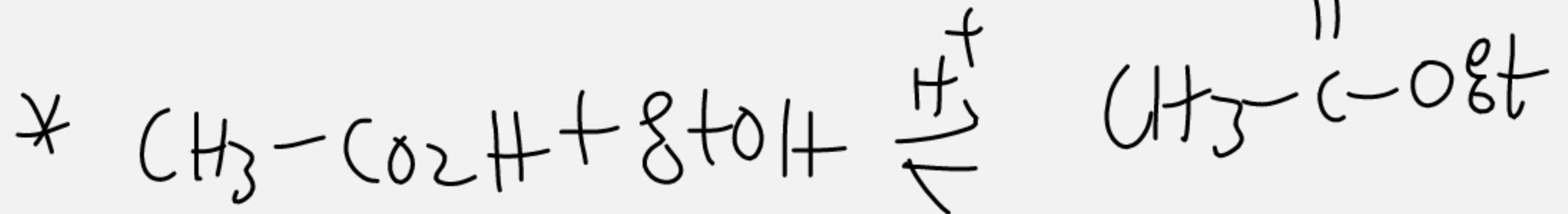
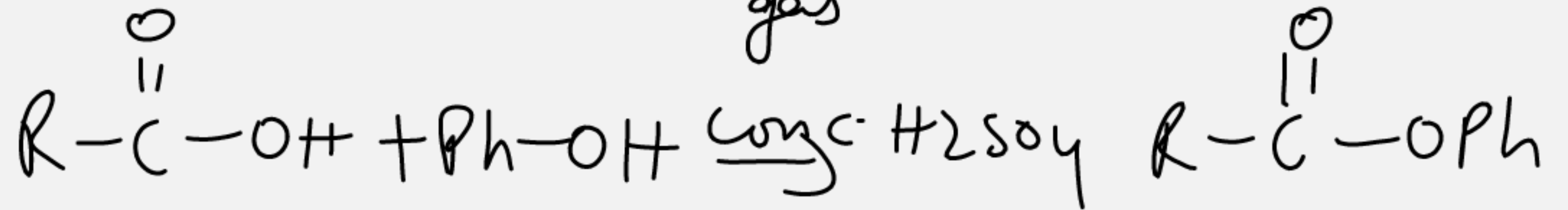


Fruity  
smell

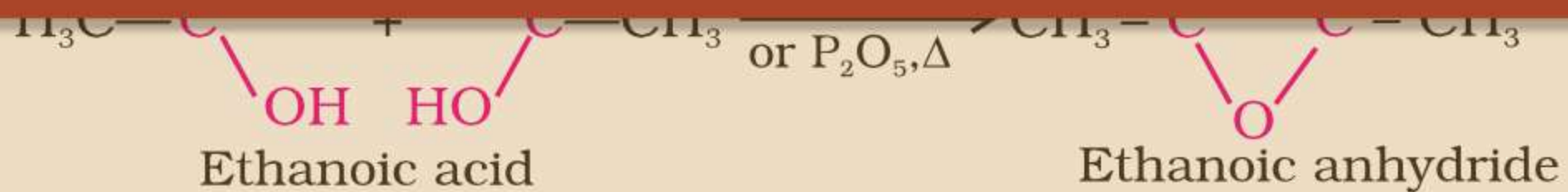
Ester

Preparation

Fischer Esterification Rxn

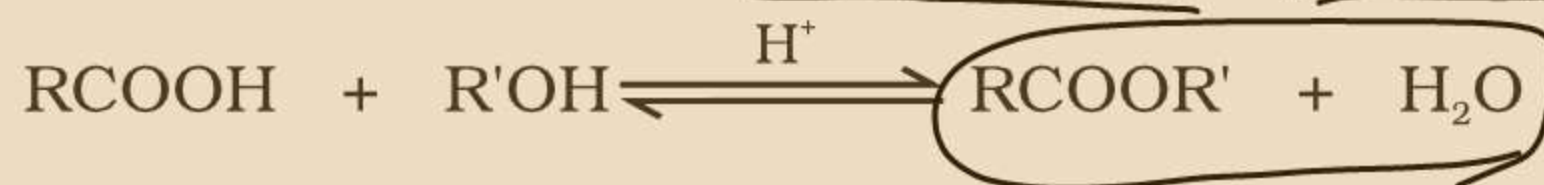






## 2. Esterification

Carboxylic acids are esterified with alcohols or phenols in the presence of a mineral acid such as concentrated  $\text{H}_2\text{SO}_4$  or  $\text{HCl}$  gas as a catalyst.



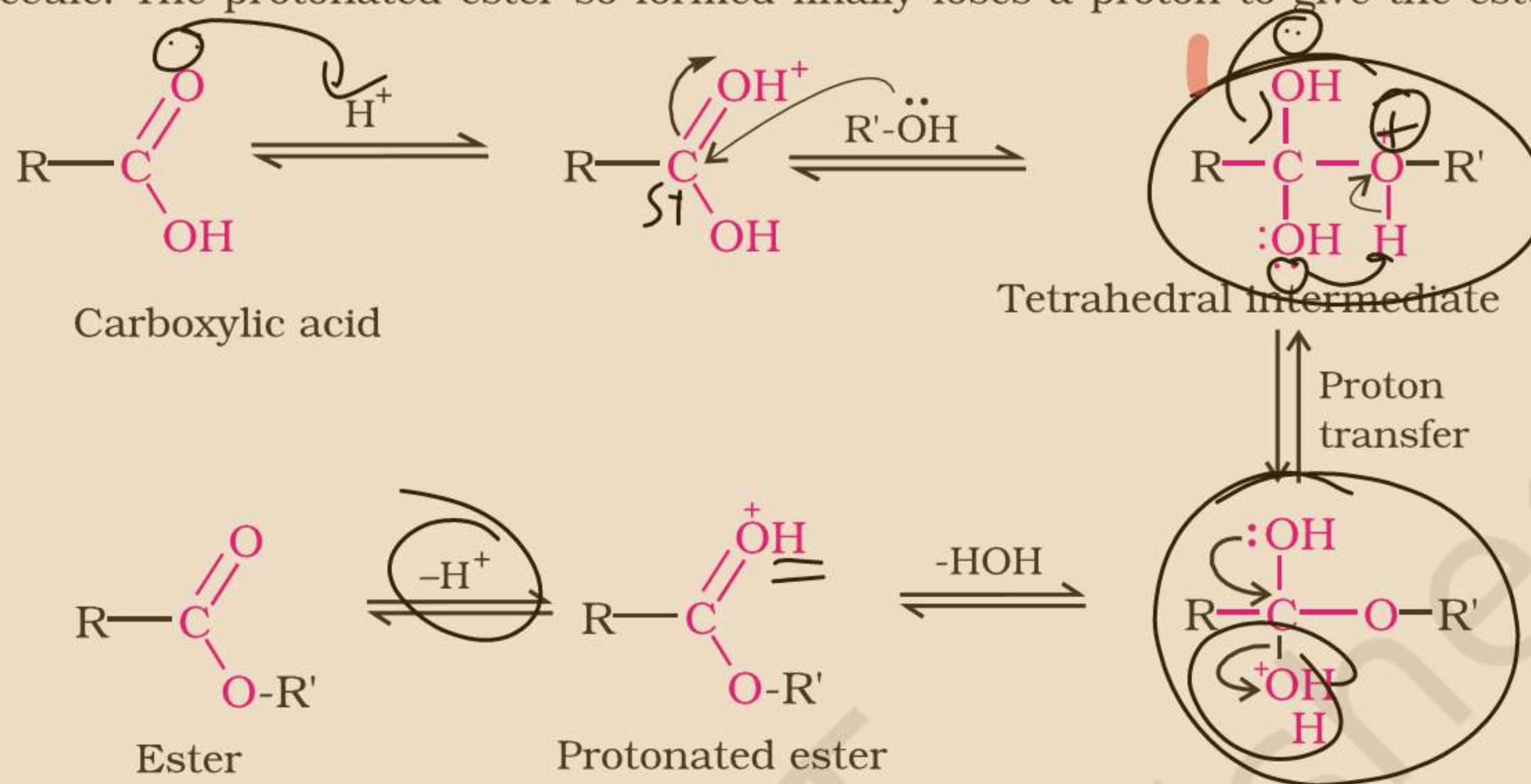
381 Aldehydes, Ketones and Carboxylic Acids

2022-23

**Mechanism of esterification of carboxylic acids:** The esterification of carboxylic acids with alcohols is a kind of nucleophilic acyl substitution. Protonation of the carbonyl oxygen activates the carbonyl group towards nucleophilic addition of the alcohol. Proton transfer in the tetrahedral intermediate converts the hydroxyl group



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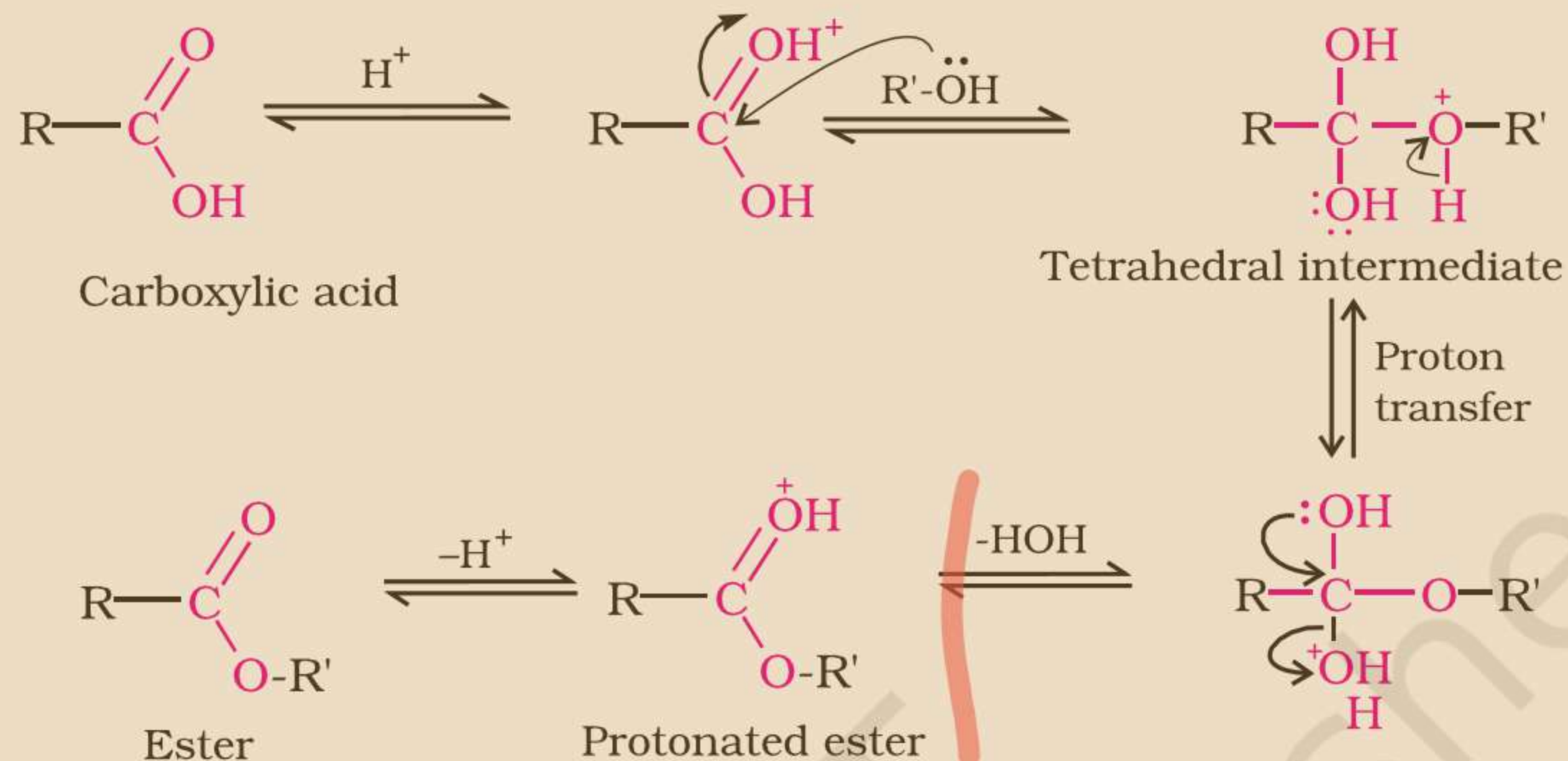
### 3. Reactions with $PCl_5$ , $PCl_3$ and $SOCl_2$

The hydroxyl group of carboxylic acids, behaves like that of alcohols and is easily replaced by chlorine atom on treating with  $PCl_5$ ,  $PCl_3$  or  $SOCl_2$ . This acid chloride ( $COCl_2$ ) is formed and is used for the synthesis of esters.





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(ii) Benzaldehyde, *p*-Tolualdehyde, *p*-Nitrobenzaldehyde, Acetophenone.

*Hint:* Consider steric effect and electronic effect.

**12.5** Predict the products of the following reactions:

