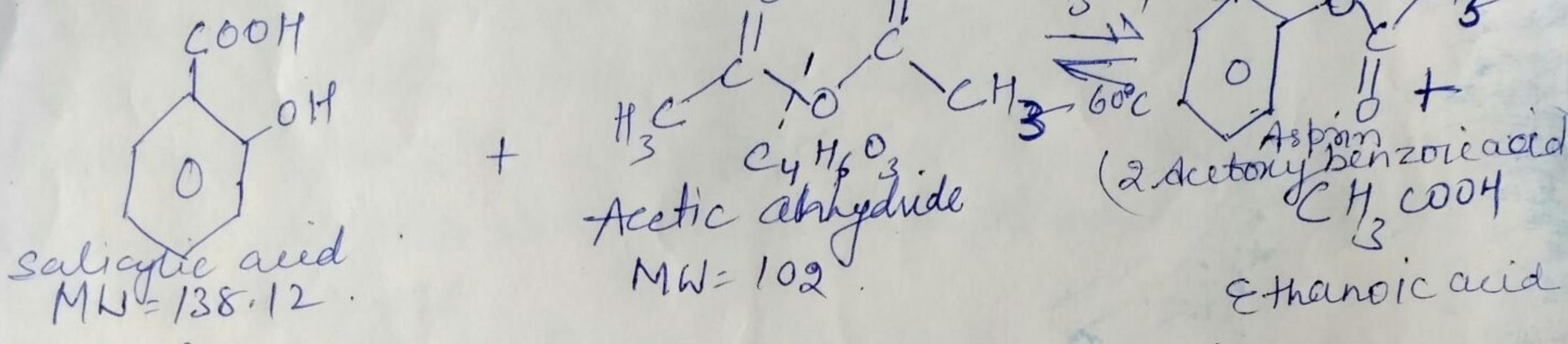
{Synthesis of Aspirin and Paracetamol}

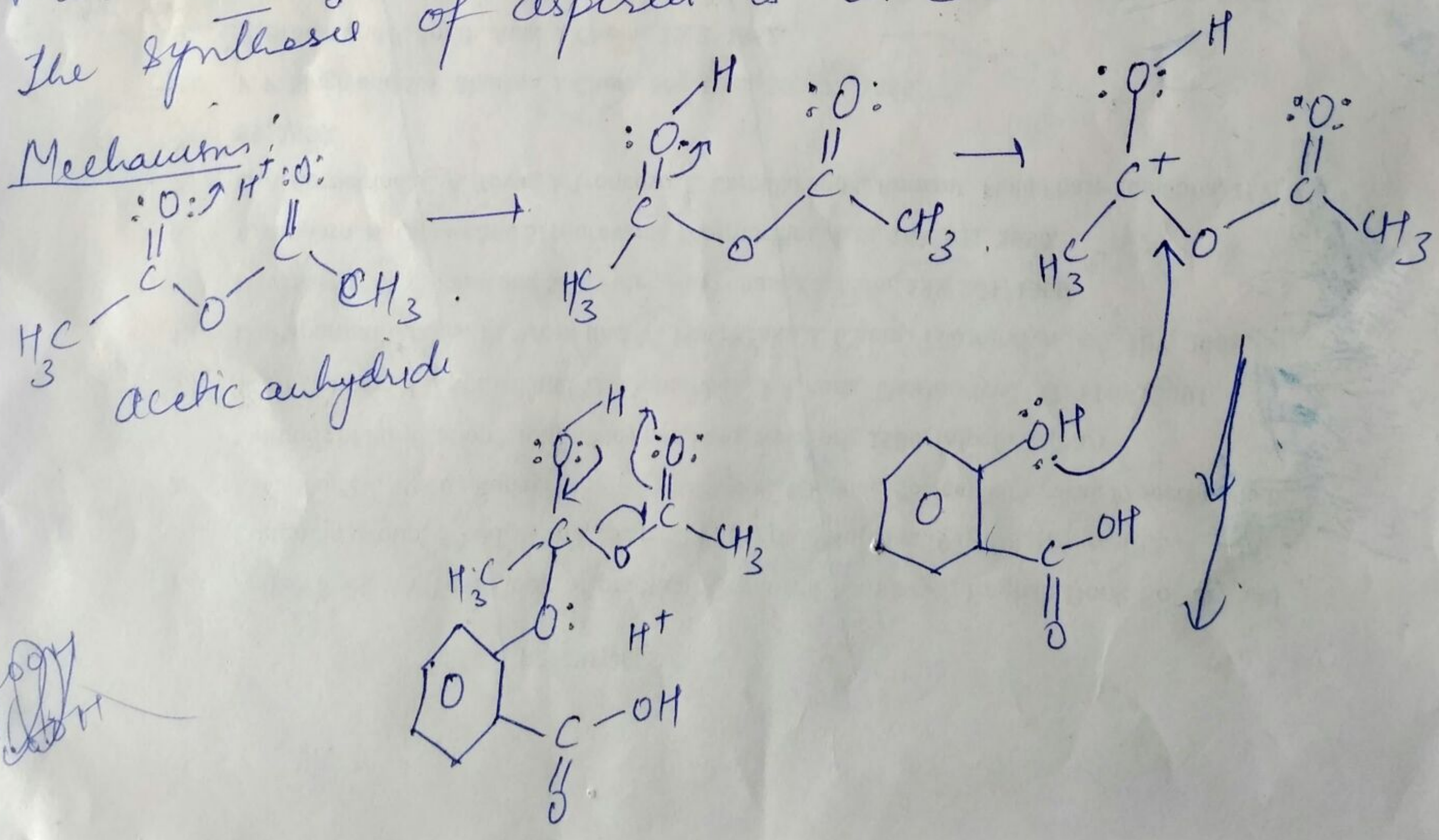
Aspirin :- To prepare aspirin, salicylic acid is reacted with an excess of acetic anhydride. A small amount of a strong acid is used as a catalyst



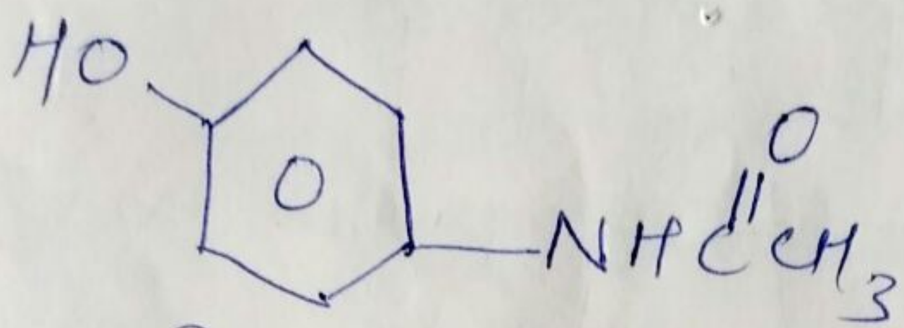
Above rxn also include phosphoric acid also. Phosphoric acid attacks the carbon oxygen bond ie C=O bond of acetic anhydride giving it +ve charge thus acetic anhydride is more prone to Nu:⊖ attacks. Nu:⊖ is salicylic acid.

The synthesis of aspirin is in endothermic rxn.

Mechanism:

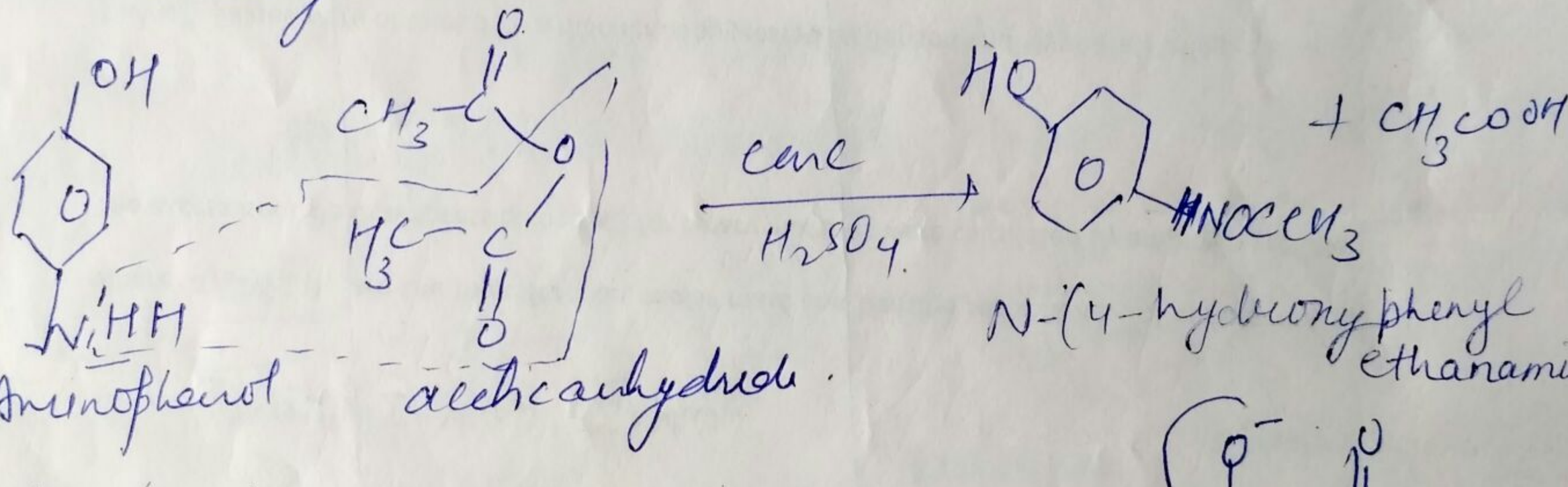


Synthesis of Paracetamol



Paracetamol

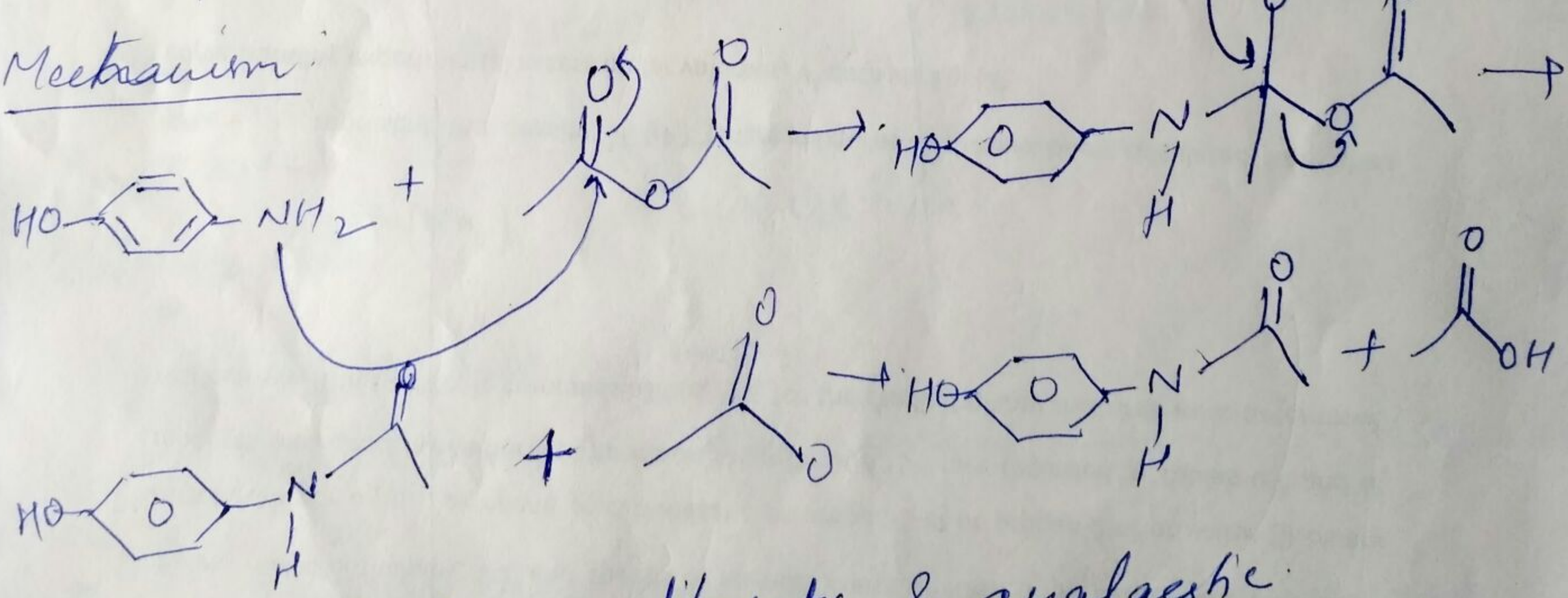
Synthesis of amide essentially just requires heating of the rxn under certain temperature conditions with appropriate catalyst. It is prepared from p-aminophenol by acetylating it with acetic anhydride in presence of H_2SO_4 as a catalyst.



p-Aminophenol — acetic anhydride.

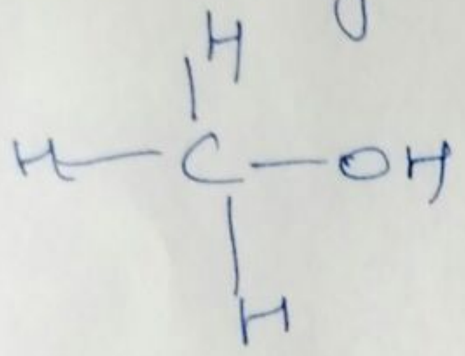
N-(4-hydroxyphenyl ethanamin

Mechanism:

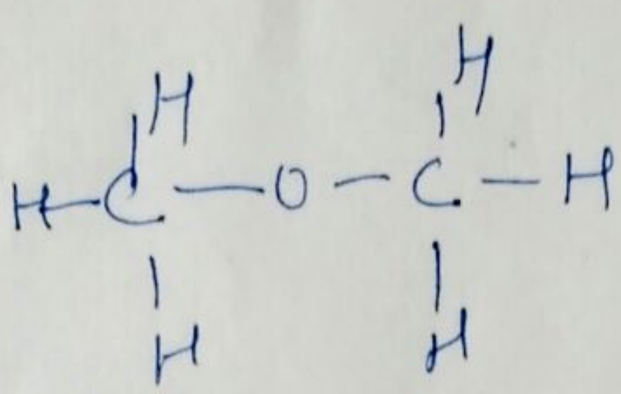


Uses:- Effective antipyretic & analgesic. Useful in diseases accompanied by pain

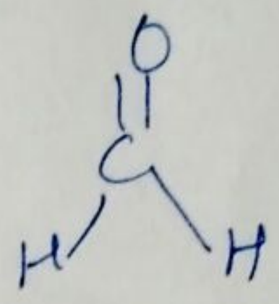
eg C. bonded to alcohol & ether have same oxidation state; aldehydes & their hydrated forms ; carboxylic acids & their derivative forms.



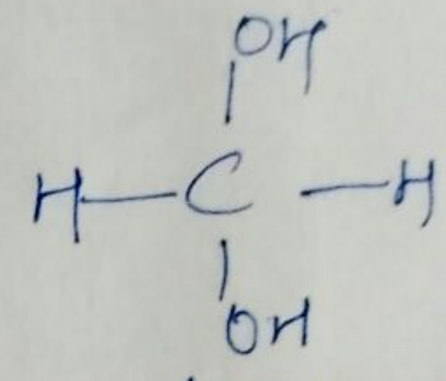
alcohol



Ether



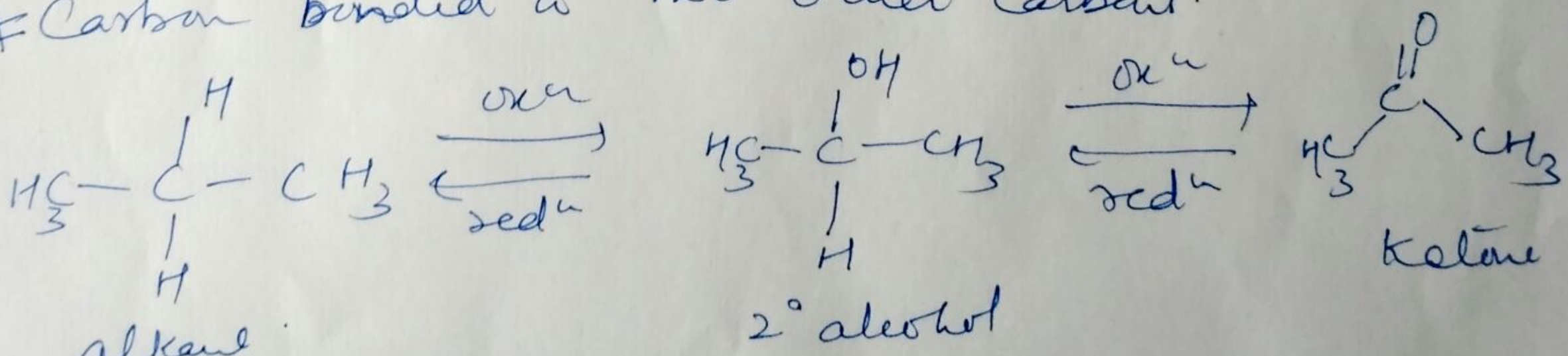
aldehyde



aldehyde hydrate

Now for the molecules having more than one Carbon. As the maximum oxidation state that a Carbon can attain depends on how many Carbons it must remain attached to. for example a molecule with two C atoms could not be oxidized all the way to CO_2 because the C atom in CO_2 must have four bonds to oxygen. leaving no room for bonds to other Carbons. The maximum Oxidation state that a Carbon can attain decreases gradually as the no. of bonds to other C ges. thus maximum oxidation state possible for C that's bonded to one other C is Carboxylic acid stage & so on.

Carbon bonded to two other Carbons.

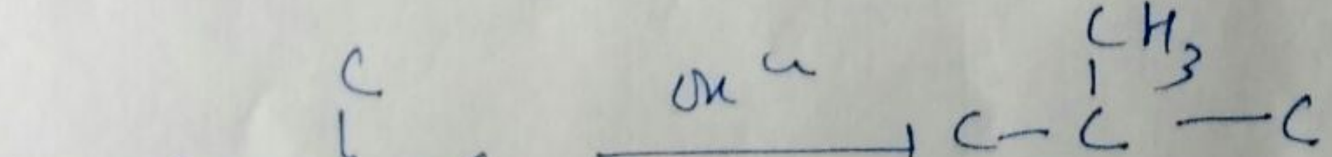


alkane
(2° Carbon)

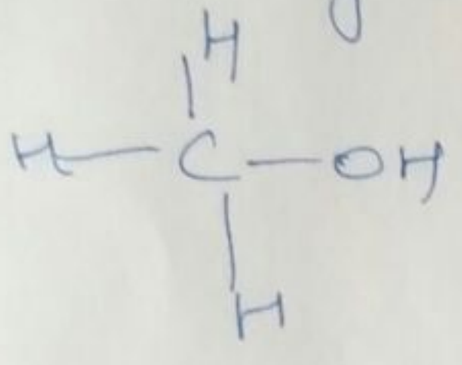
2° alcohol

ketone

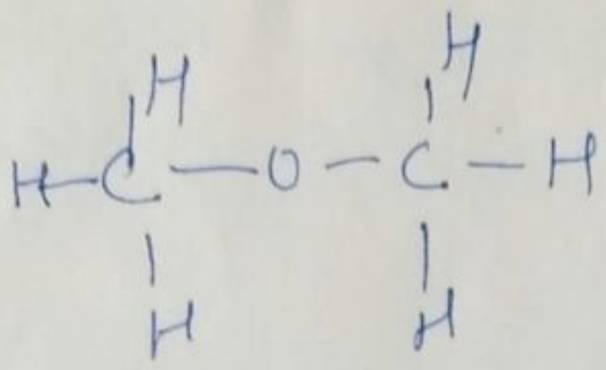
Carbon bonded to three other Carbons



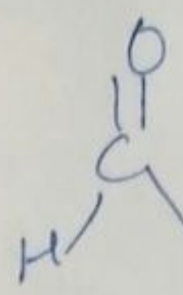
endly, there can be functional groups where central Carbon has same oxidation state. for eg C bonded to alcohol & ether have same oxidation state; aldehydes & their hydrated forms ; carboxylic acids & their derivative forms.



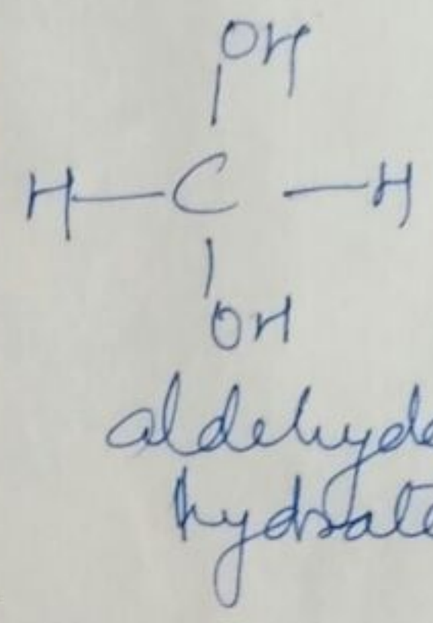
alcohol



Ether



aldehyde



aldehyde hydrate

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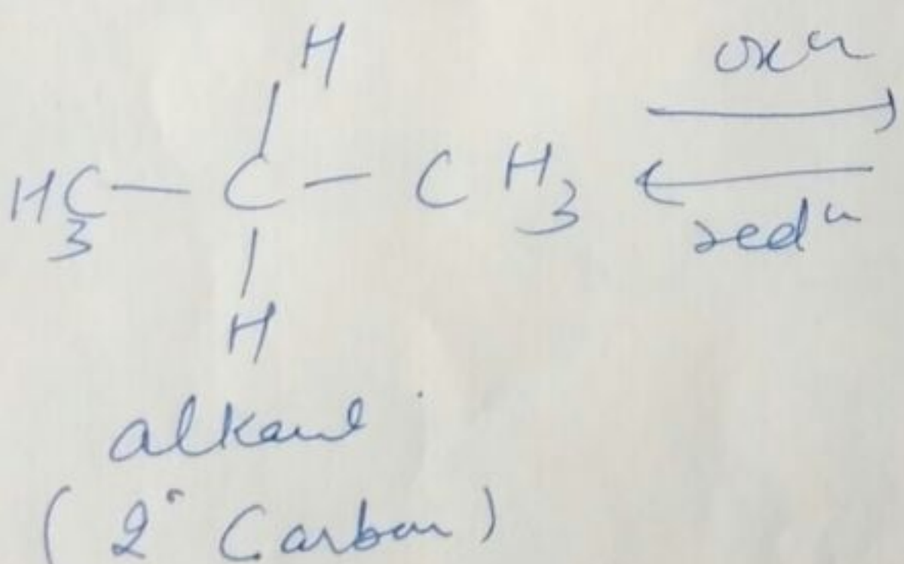
Carbon bonded to two other Carbons.

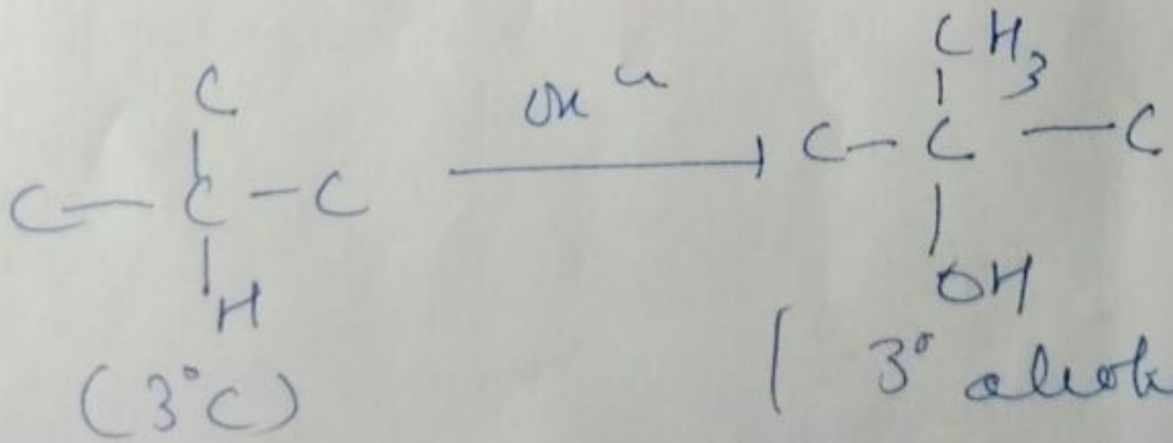


alkane
(2° Carbon)

2° alcohol

Ketone

Carbon bonded to three other Carbons



(3°C)

(3° alcohol)

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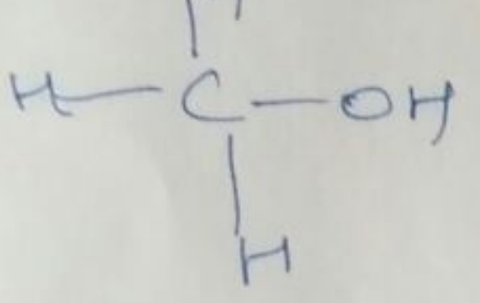
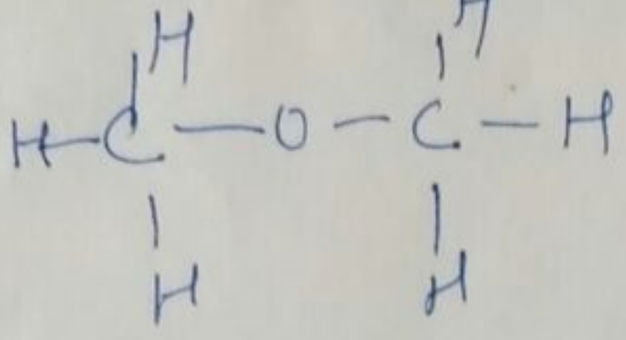
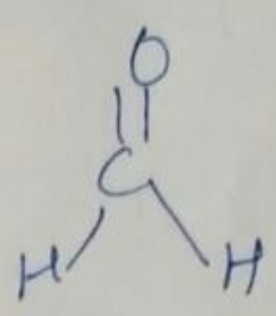


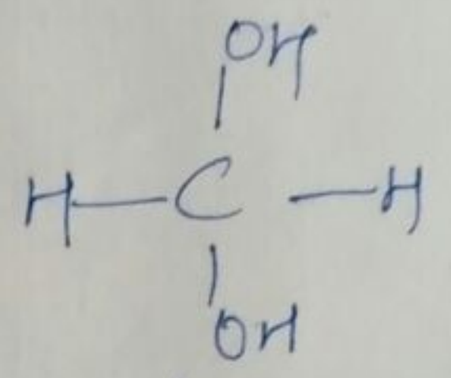
alcohol



Ether



aldehyde



aldehyde hydrate

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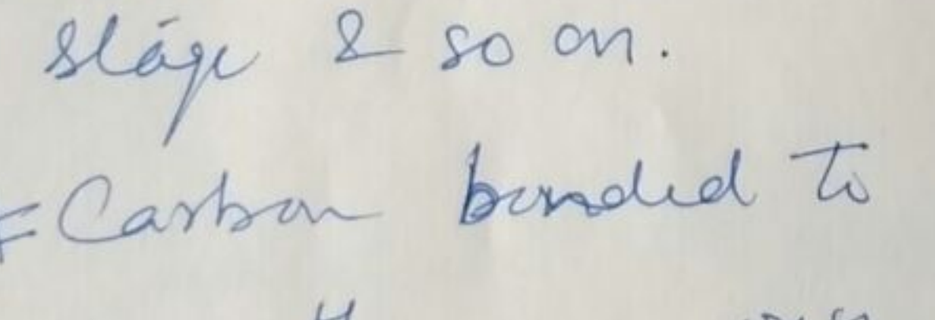
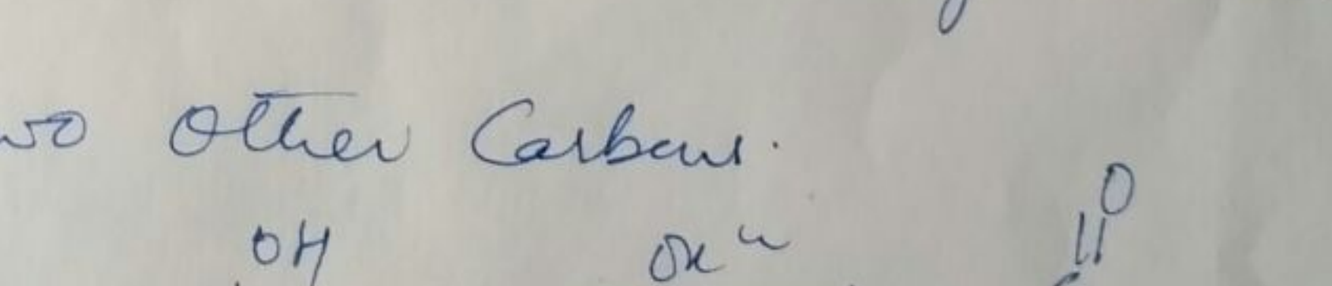
Carbon bonded to two other Carbons.



alkane

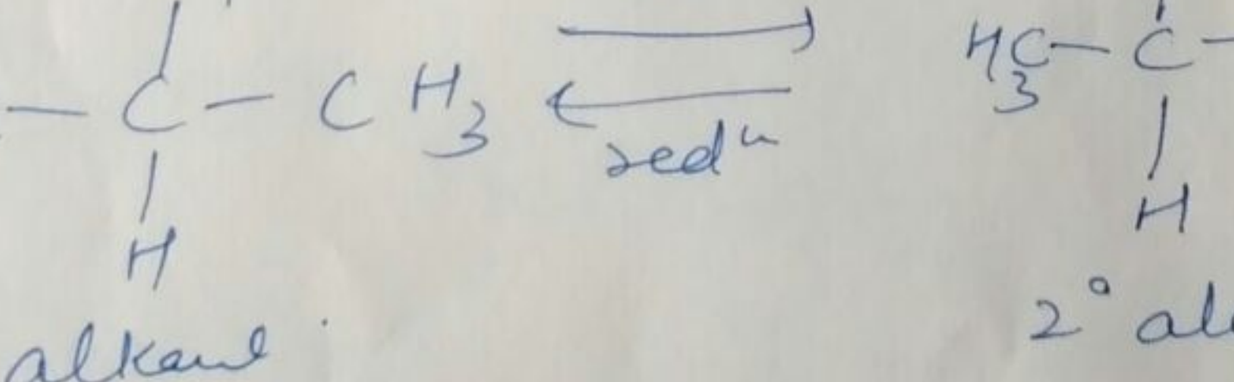


2° alcohol

Ketone

(2° Carbon)

Carbon bonded to three other Carbons



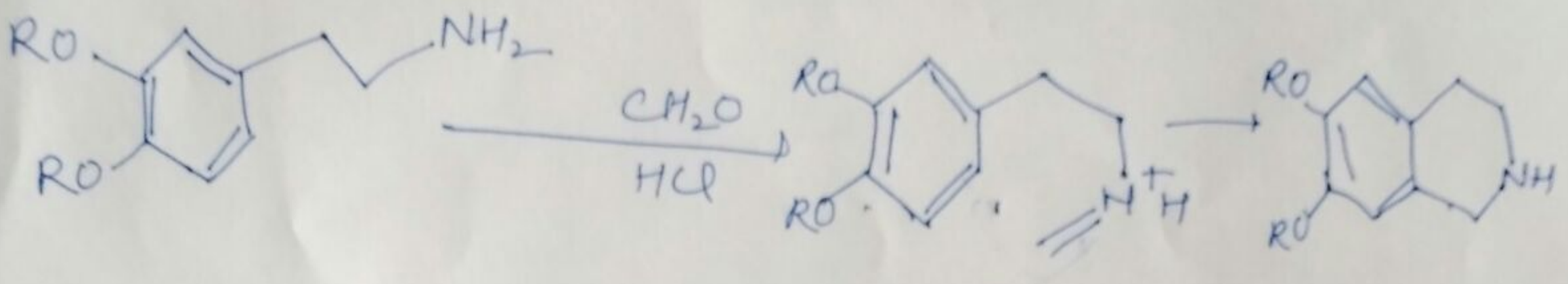
(3°C)

(3° alcohol)

Endo type of Cyclication :-

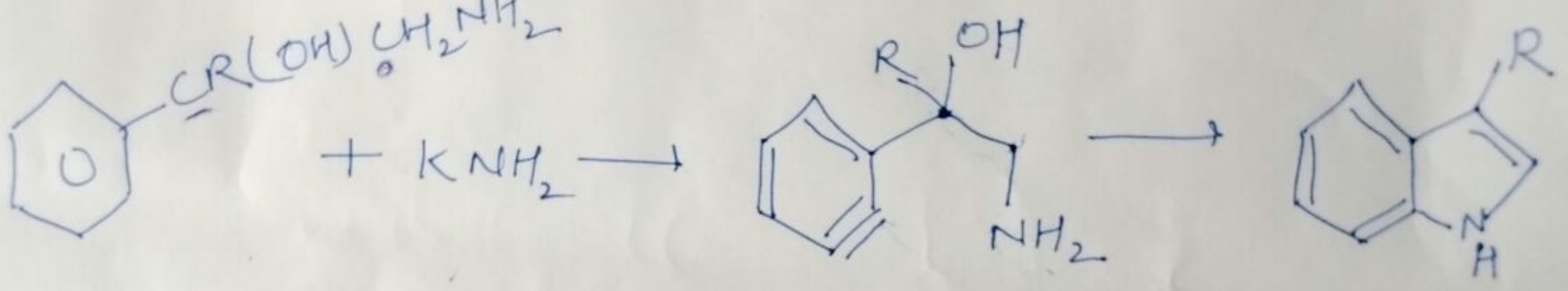
These reactions involve generation and capture by

- Internal $Nu^{\ominus}$: of iminium ions.
- Internal $Nu^{\ominus}$: of N-Acyliminium ion



Iminium ion Isoquinoline

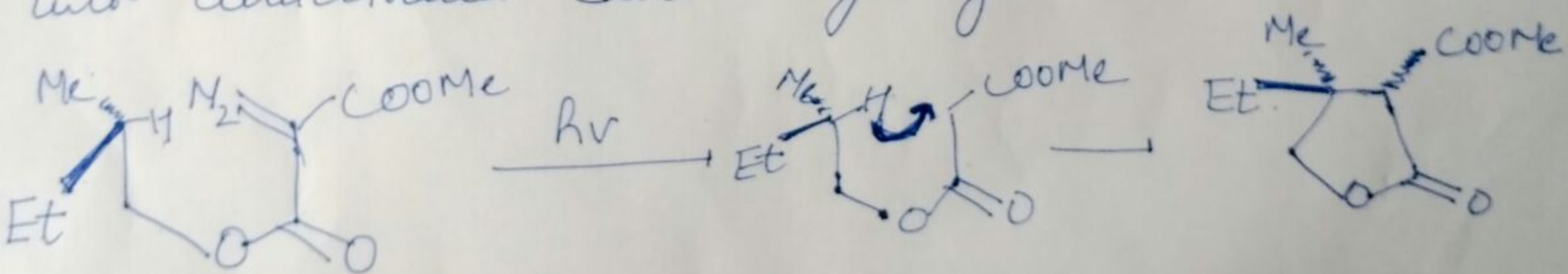
Intramolecular Nu: addn to arynes results in the formation of Benzo fused heterocycles.



Carbene Cyclisation

Carbene is neutral divalent highly reactive Carbon intermediate having 4 electrons.

They undergo addn on to multiple bonds and insert into unactivated Carbon hydrogen bond.



Insertion of Carbene into unactivated sp^3 CH bond.

Nitrene Cyclisation

Nitrene is a neutral monovalent highly reactive Nitrogen intermediate with 6 electrons.

Nitrenes are generated by 2 ways.

Thermolysis or photolysis of azide gp.

$$RNH_3 \xrightarrow{h\nu} \underset{\text{Nitrene}}{RN} + N_2$$

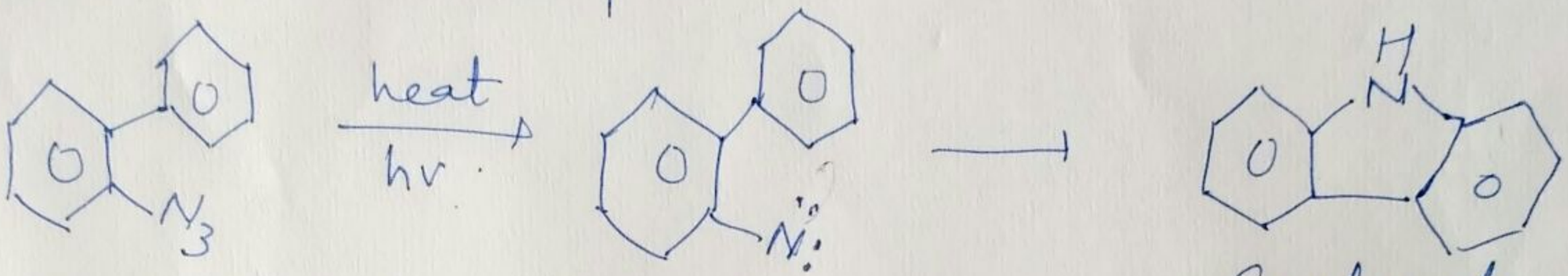
(a) Deoxygenation of nitrogroup.

$$RNO_2 \xrightarrow{-O_2} RN$$

Nitro — Nitrene.

Nitrenes similar to carbenes undergo add^n to multiple bonds and insert into unactivated Carbon-Hydrogen bond.

1) Add^n on to multiple bonds.



2-Azidobiphenyl. Nitrene Carbazole.