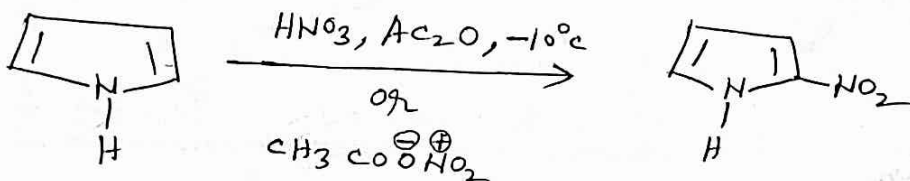


Reactions

Electrophilic Substitution Reactions

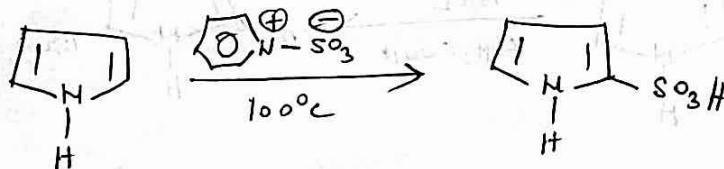
Nitration



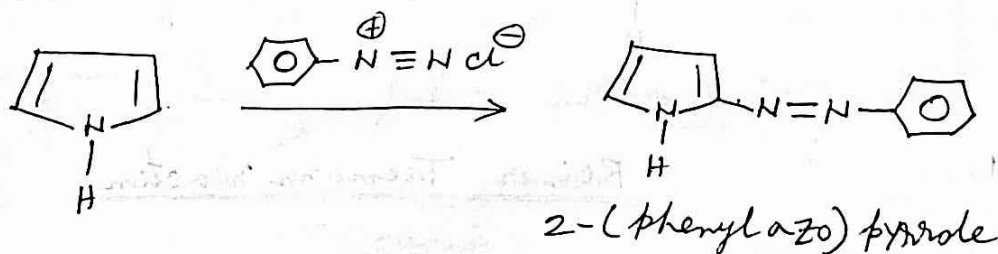
The $\text{HNO}_3/\text{H}_2\text{SO}_4$ nitrating mixture causes extensive decomposition of pyrrole ring resulting in the formation of tar.

Sulfonation

Pyrrole yields resinous material with H_2SO_4 , but in the presence of a mild sulfonating agent such as pyridine-sulfur trioxide complex ($\text{C}_5\text{H}_5\text{N}^+\text{SO}_3^-$) at 100°C pyrrole forms pyrrole-2-sulfonic acid.

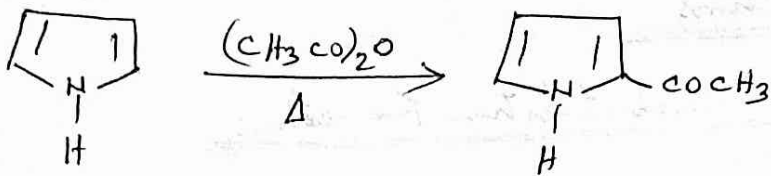


Diazocoupling reaction



Friedel-Crafts reaction

Pyrrole, being more reactive, can be converted to 2-acylpyrrole by the reaction with acid chloride or acid anhydride even in the absence of a catalyst.

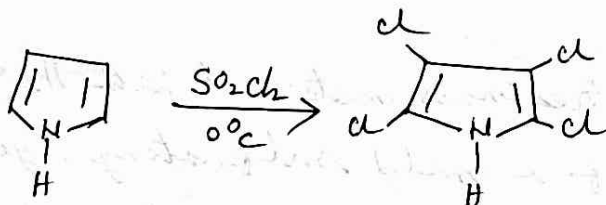


Halogenation

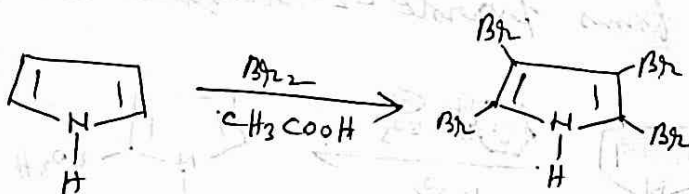
Pyrrole is extremely reactive towards halogens.

Chlorination, bromination and iodination yield the corresponding tetrahalo derivatives.

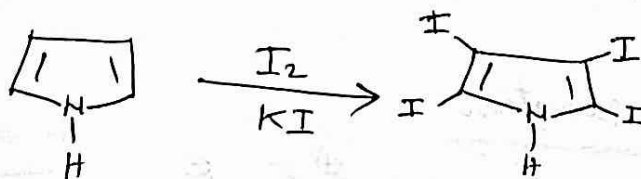
Chlorination



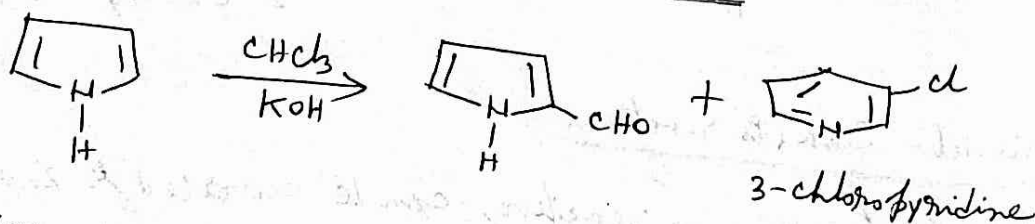
Bromination



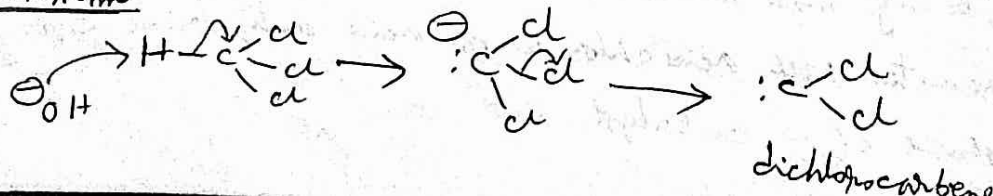
Iodination

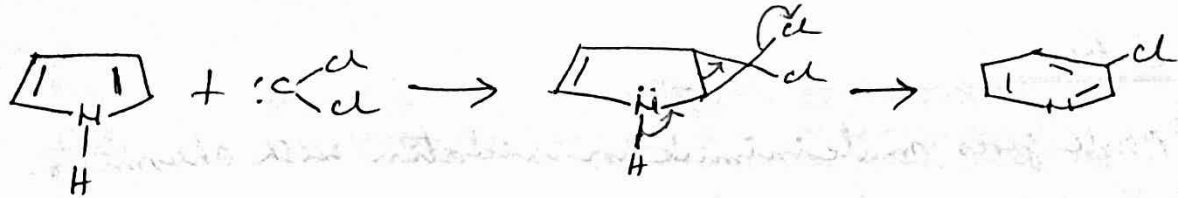


Reimer-Tiemann reaction



Mechanism



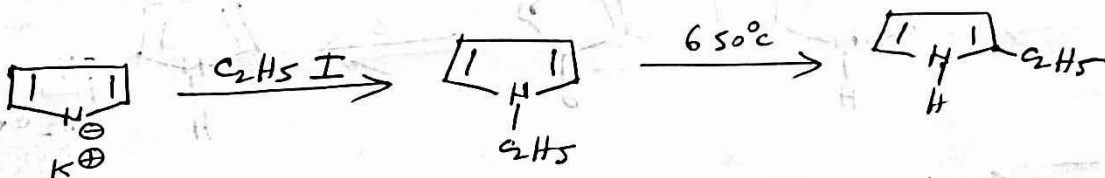


Acidic properties — Reaction with KOH

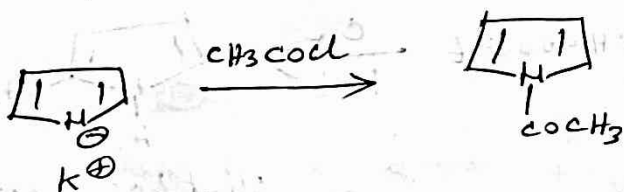
On heating with solid KOH, pyrrole is converted to its potassium salt. This shows the acidic character of the substrate.



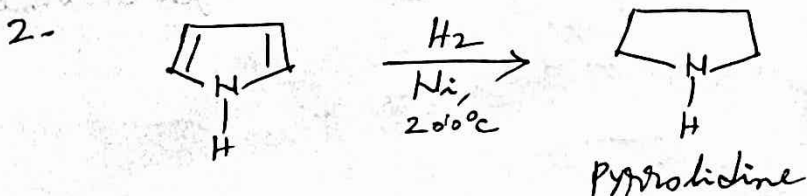
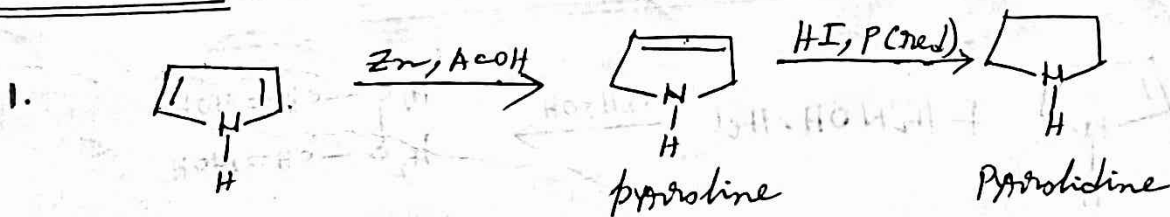
N-Alkyl and N-Acyl pyrrole



N-alkyl pyrrole rearranges to 2-derivative at higher temperature.

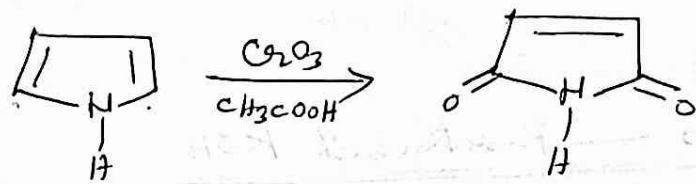


Reduction



Oxidation

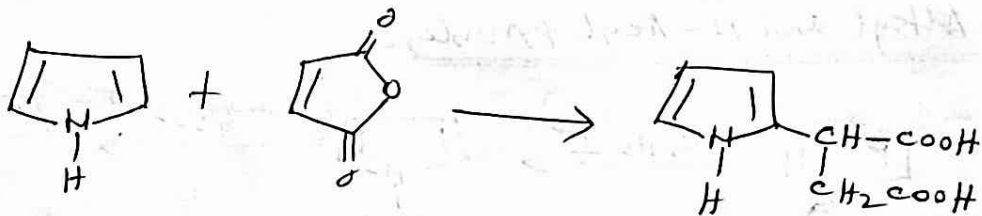
Pyrrrole gives maleinimide on oxidation with chromium trioxide in acetic acid.



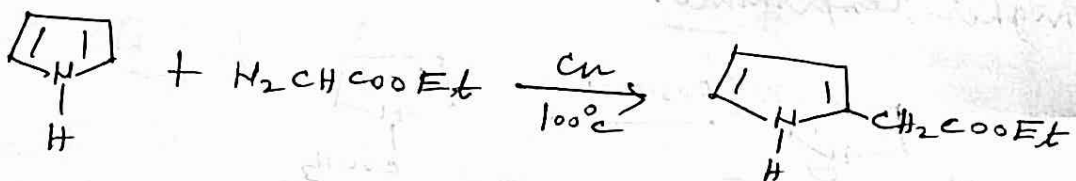
maleinimide

Reaction with maleic anhydride

Pyrrrole gives substitution product with maleic anhydride.

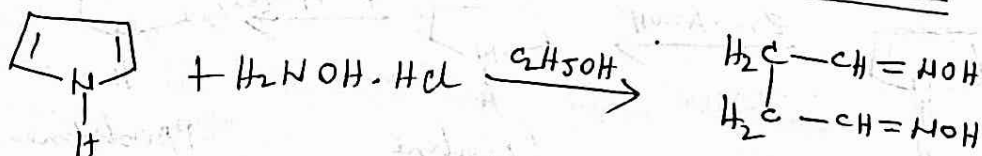


Reaction with carbene



ethyl pyrrole acetate

Ring Cleavage with hydroxylamine hydrochloride



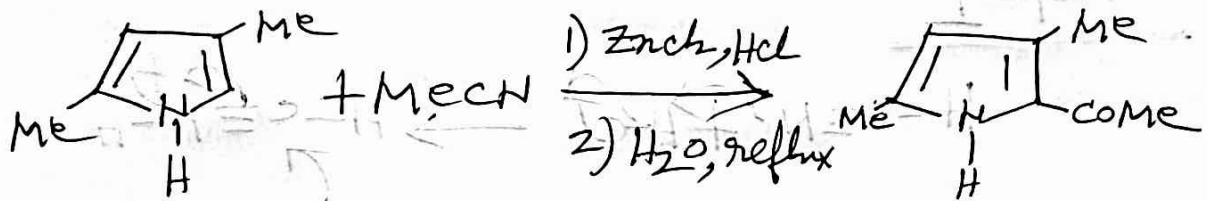
succinaldehyde dioxime

NOTE

1. Pyrrole can undergoes Grattermann, Houben-Hoesch, Vilsmeier reactions.

2. Pyrrole-2-aldehyde does not undergo Cannizzaro reaction and Benzoin condensation.

Houben-Hoesch reaction of Pyrrole

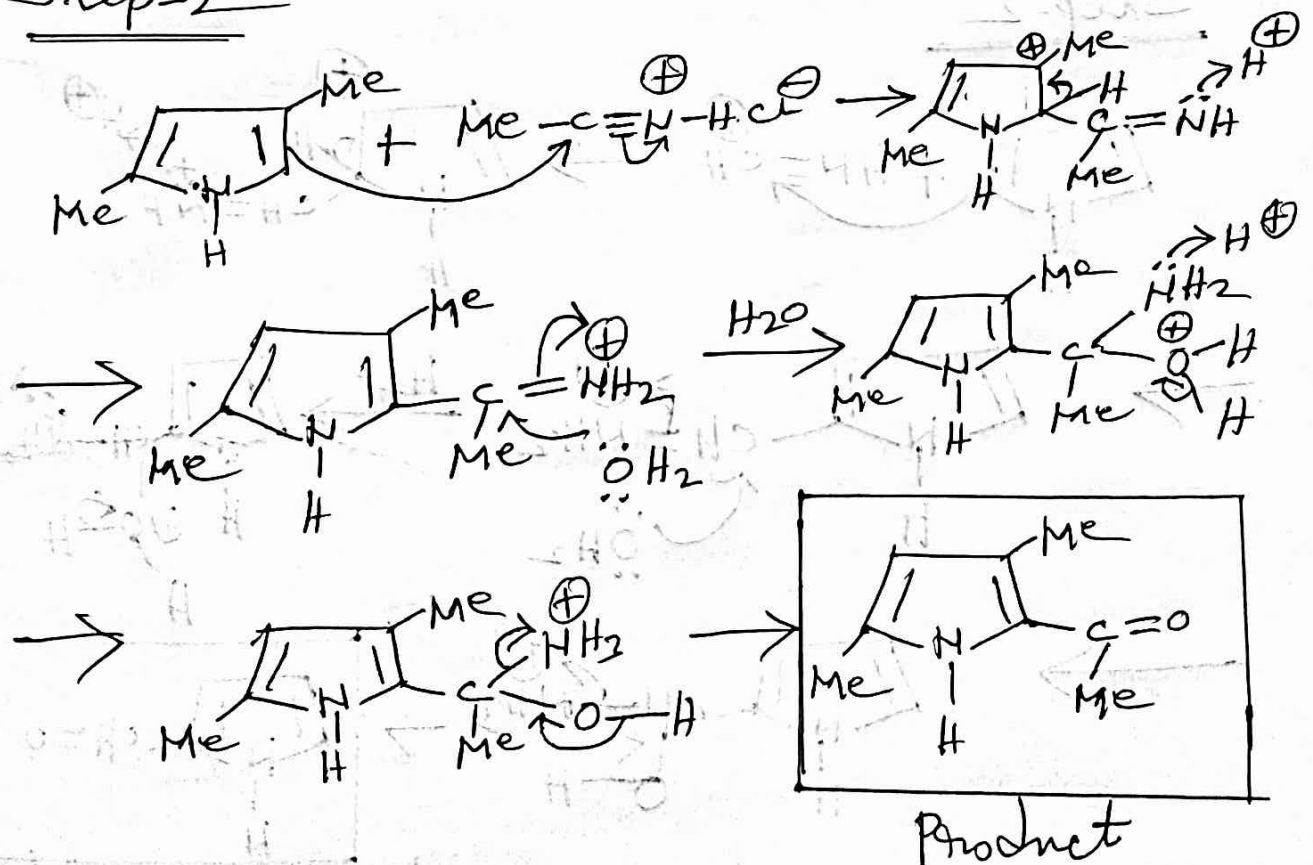


Mechanism

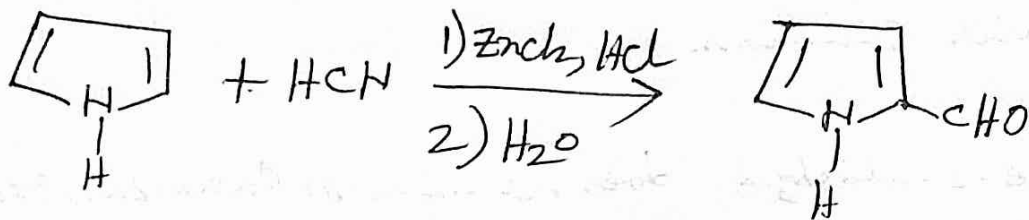
Step-1



Step-2

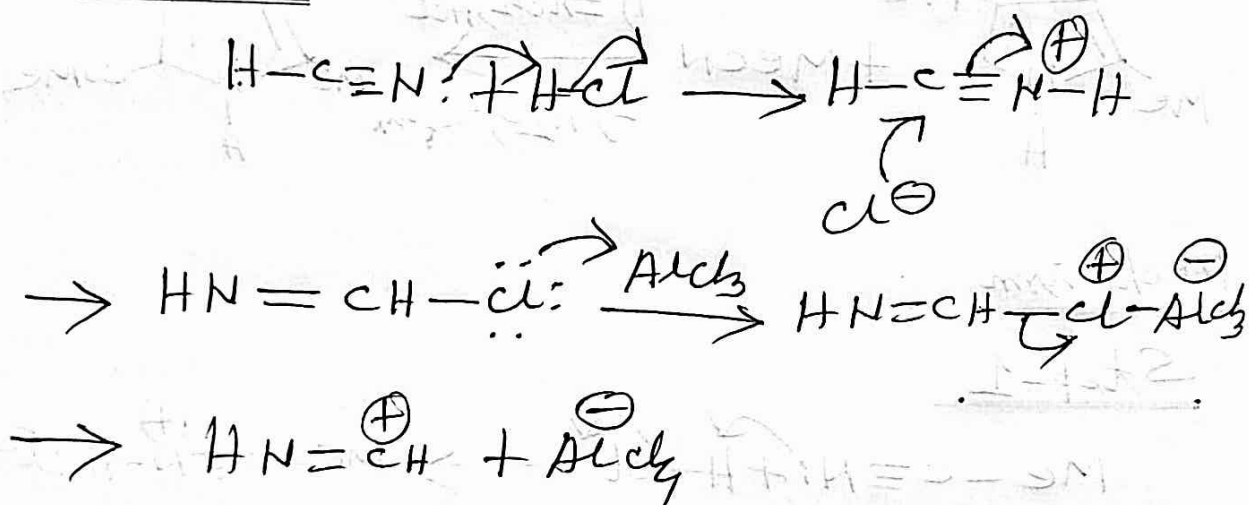


Grattermann reaction of pyrrole



Mechanism

Step-1



Step-2

