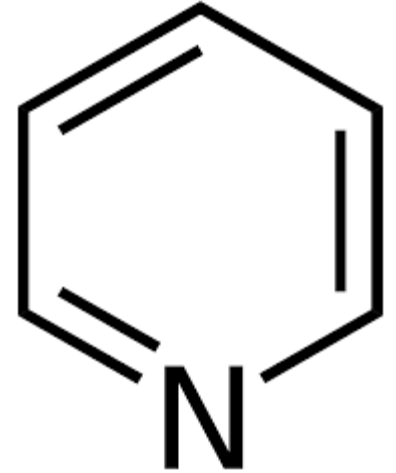


Preparation and Properties of Pyridine

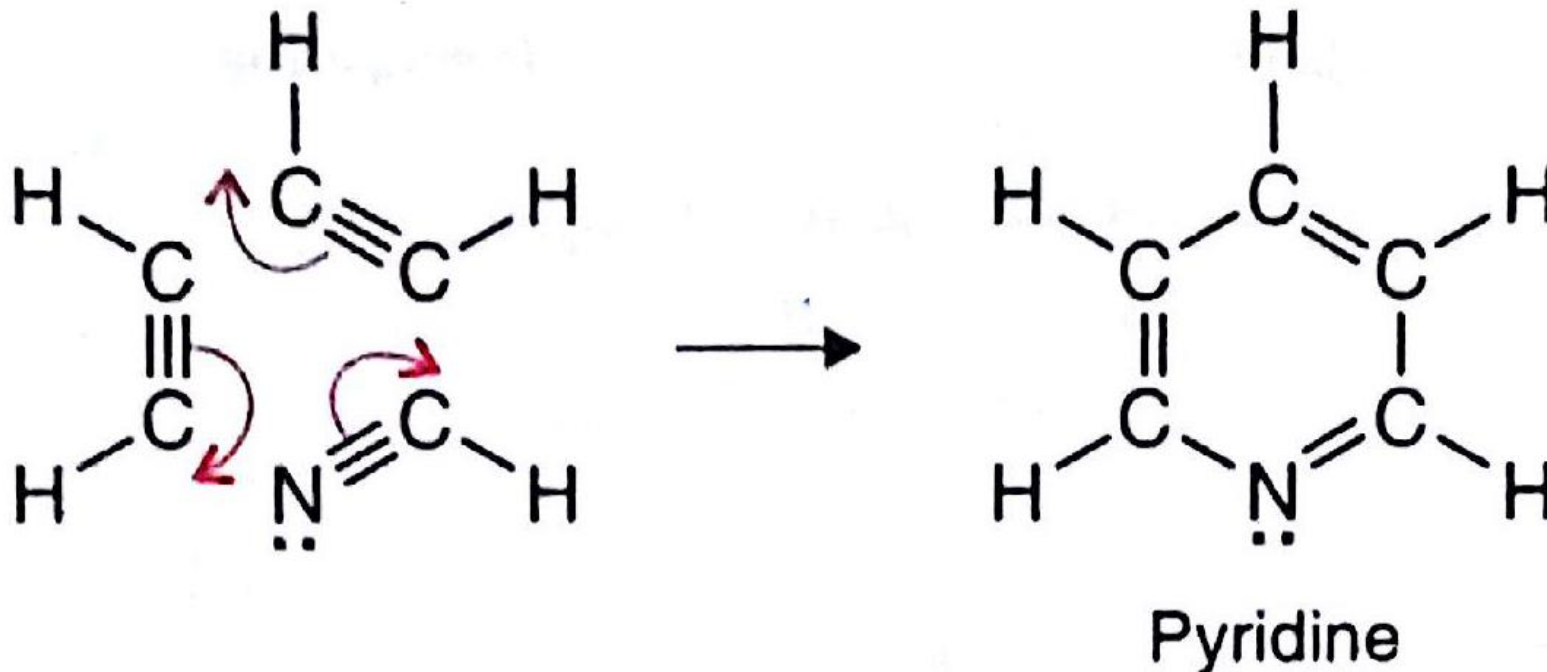
Pyridine

- Pyridine is the most important of the heterocyclic ring systems. It occurs along with pyrrole in bone oil and in the light oil fraction of coal tar (boiling point up to 170 C).
- It can be isolated from the latter by extracting it with dilute sulphuric acid. This removes pyridine and other bases in the acid layer as soluble sulphates.
- The acid layer is then treated with sodium hydroxide when a dark brown liquid separates. Pyridine is obtained from this oily liquid by fractional distillation.

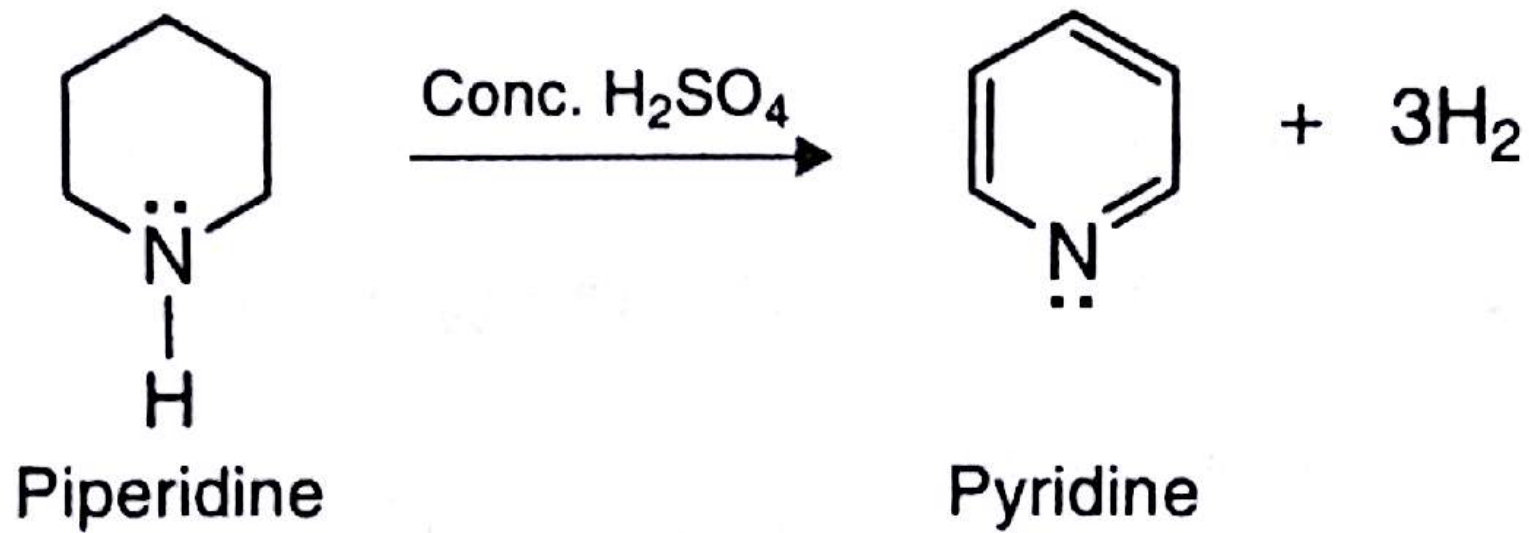


Preparation Methods

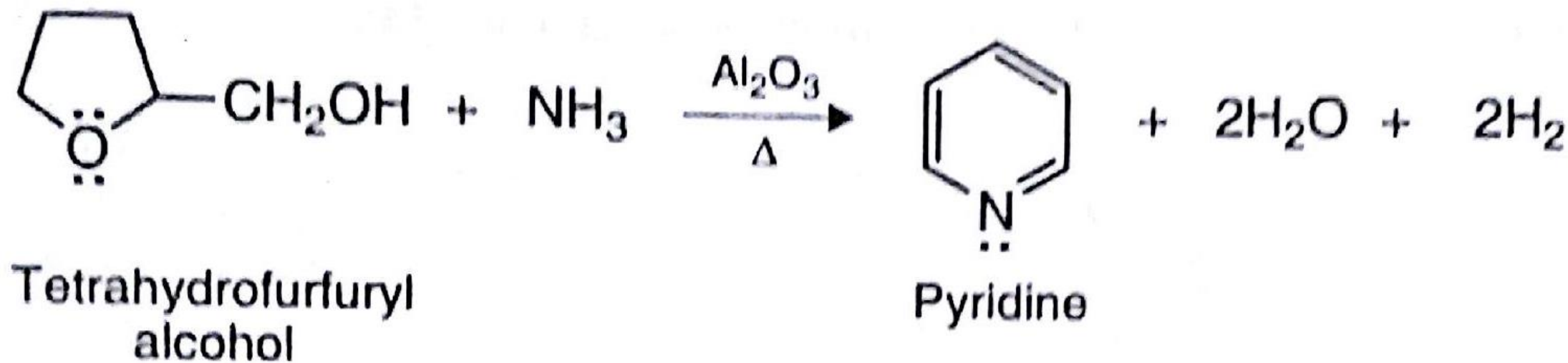
(1) By passing a mixture of acetylene and hydrogen cyanide through a red-hot tube.



(2) By dehydrogenation of piperidine with concentrated sulphuric acid at 300°C or with nitrobenzene at 260°C.



(3) By heating tetrahydrofurfuryl alcohol with ammonia in the presence of aluminium oxide at 500°C. **(Commercial Method of Preparation)**.



Physical properties of Pyridine

Pyridine is a colourless liquid, bp 115C°.

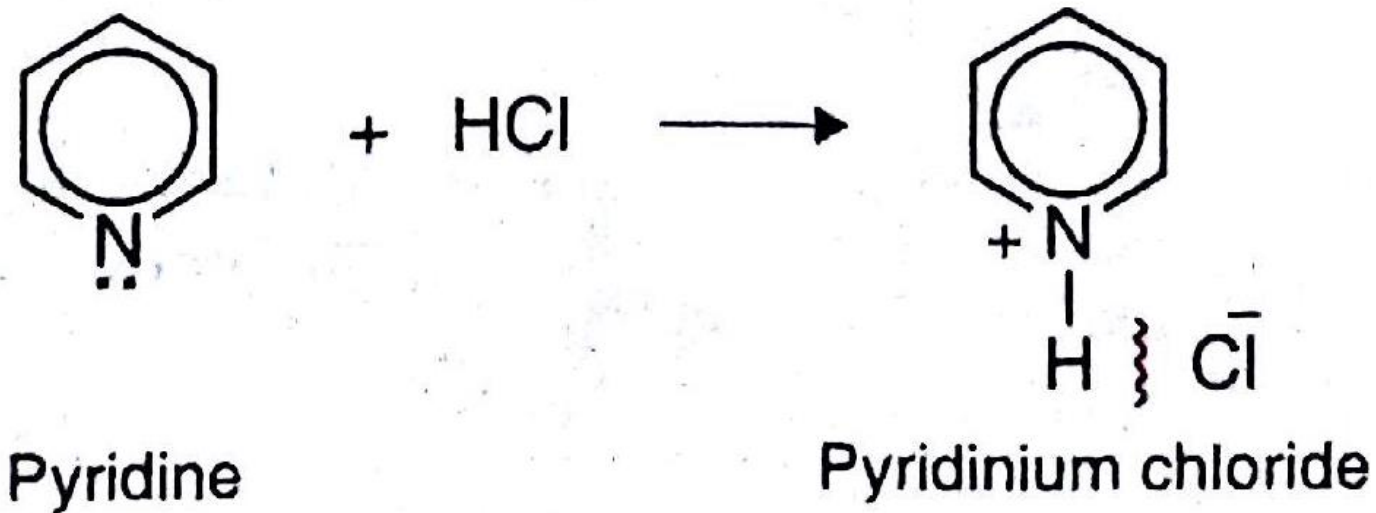
It has a very characteristic pungent and disgusting odour. Pyridine is miscible with water and most organic solvents.

Almost all classes of organic compounds are soluble in pyridine, even many of the high melting solids which scarcely dissolve in solvents such as ethanol and benzene. It is consequently used as a solvent.

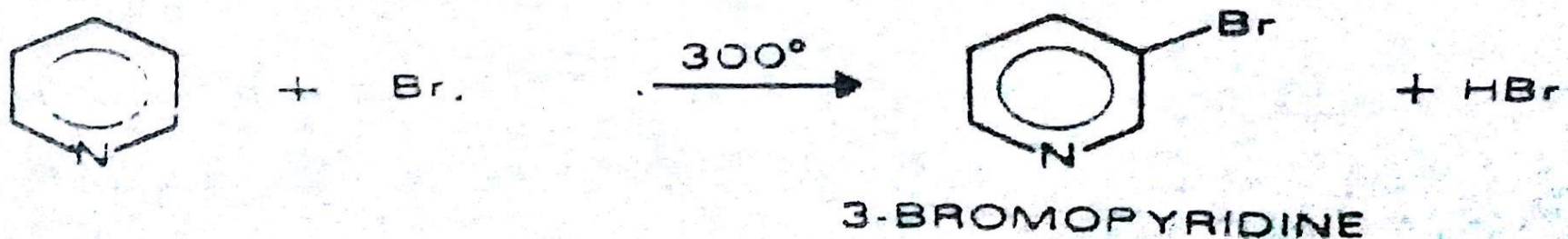
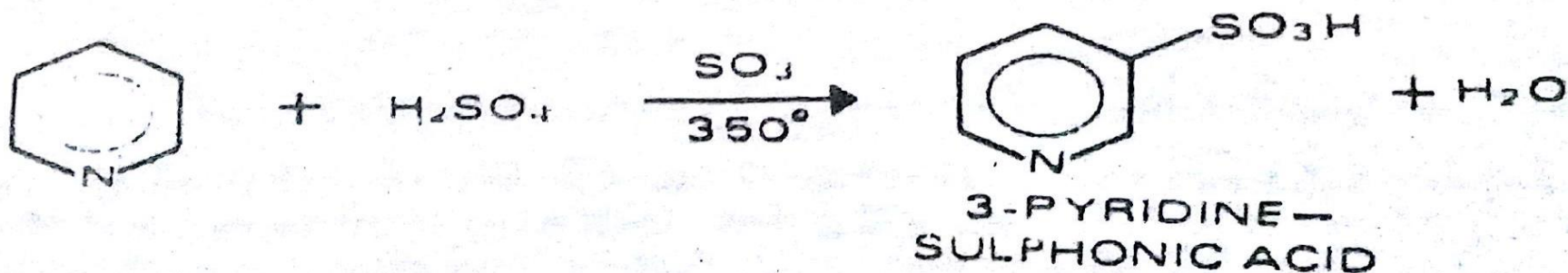
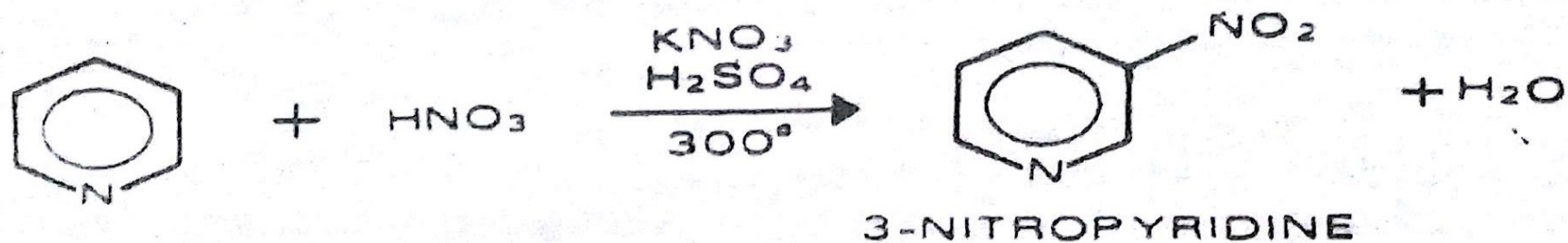
It is very hygroscopic.

Chemical properties of Pyridine

(1) Basic Character: Pyridine behaves as a base. It reacts with acids to form fairly stable salts..



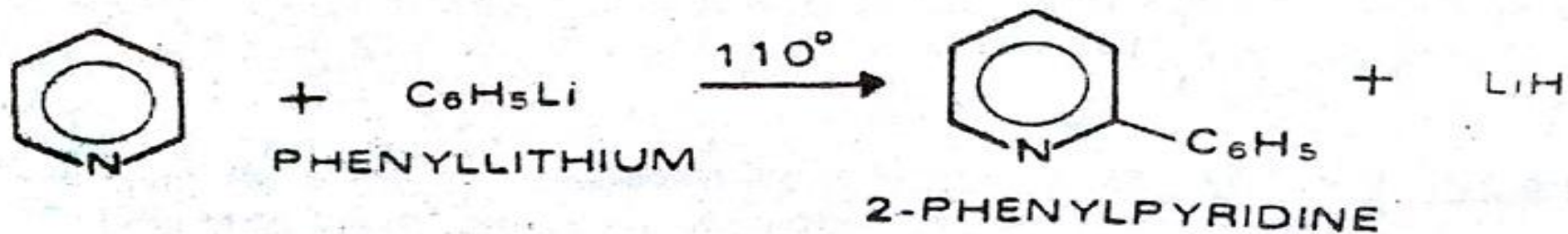
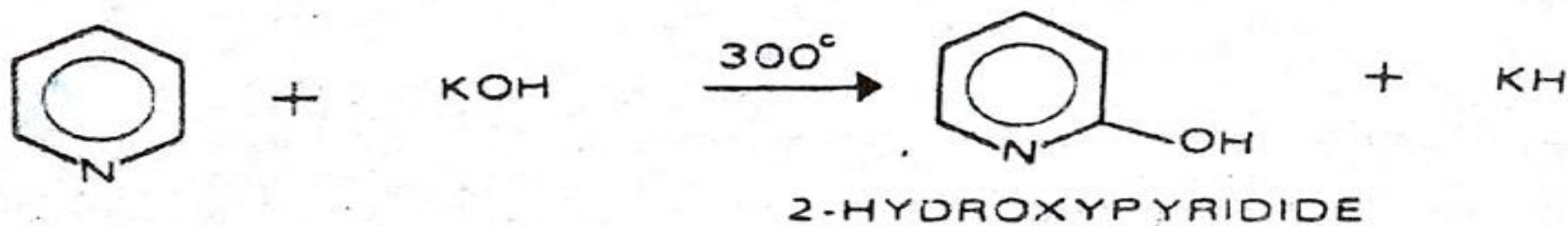
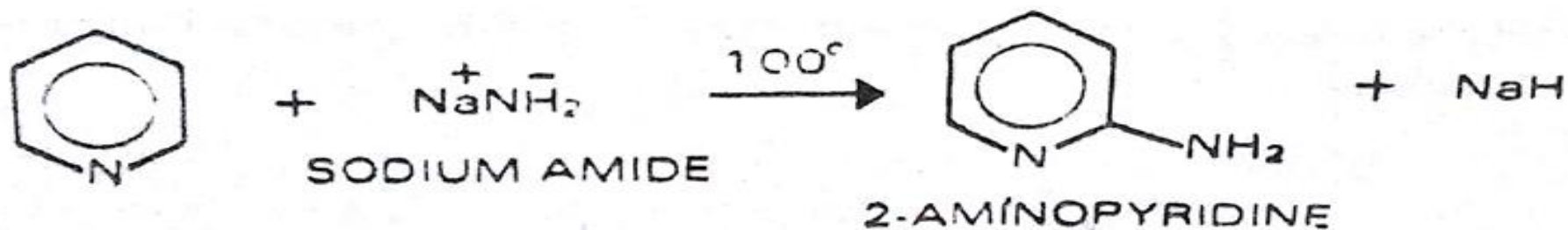
(2) Electrophilic Substitution: Pyridine, however, does undergo electrophilic substitution reactions when extremely vigorous reaction conditions are used. Substitution occurs almost exclusively at **C-3** (β -Position).



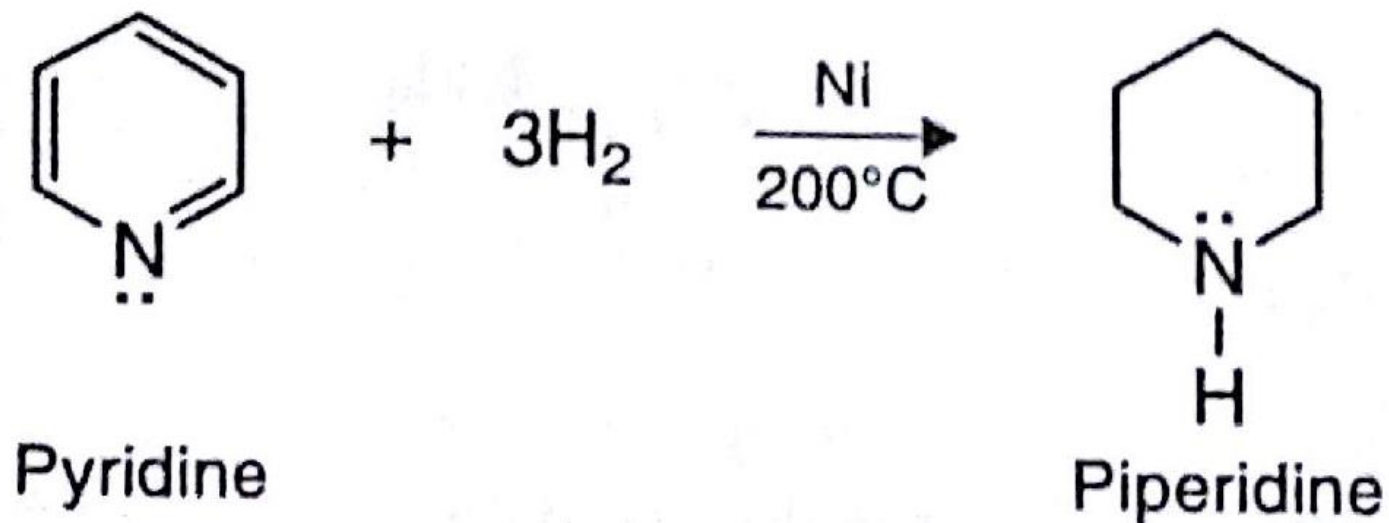
Pyridine does not undergo Friedel-Crafts acylation and alkylation. This is because the Lewis acids (e.g., AlCl_3) which are used as catalysts in these reactions coordinate with the lone pair of electrons on nitrogen.

(3) Nucleophilic Substitution:

Pyridine undergoes nucleophilic substitution reactions mainly at C-2 (or at C-4 if C-2 is blocked)



(4) Reduction: Pyridine undergoes reduction with lithium aluminium hydride (LiAlH₄), or hydrogen in the presence of nickel catalyst to form piperidine.



(5) Oxidation: Like benzene, pyridine is quite stable towards mild oxidizing agents. It does not react with chromic acid or nitric acid. However, it may be oxidized by peracetic acid to give pyridine-*N*-oxide.

