Six Membered Heterocyclic compou

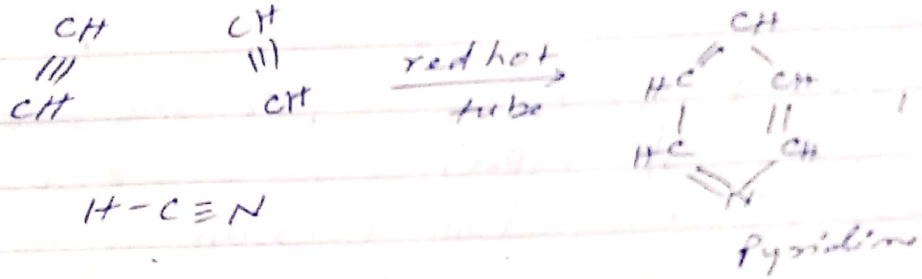
Pyridine

Introduction: Pyridine is the most important of the heterocyclic ring systems

It occurs in bone oil and light oil fraction of coal tar along with pyrrole

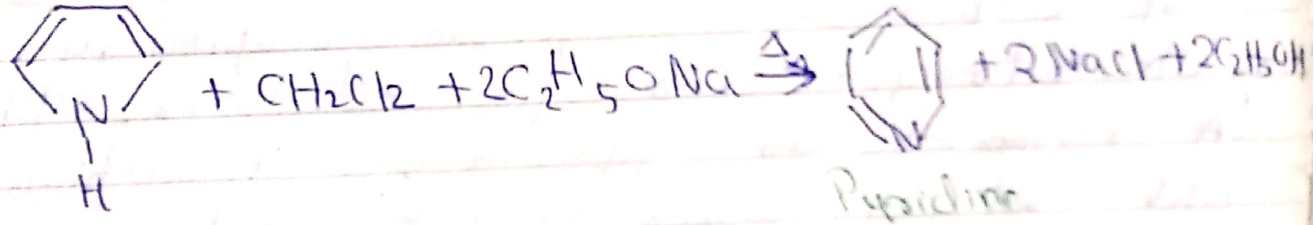
Imp Preparation:

(1) It may be obtained by passing a mixture of acetylene and hydrogen cyanide through a red hot tube.



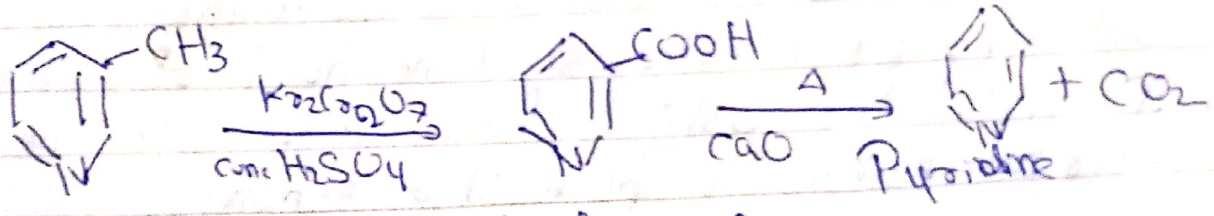
Imp

(2) By heating pyrrole with dichloro methane in the presence of sodium ethoxide.



Imp

(3) From β-picoline - This involves oxidation of β picoline with $K_2Cr_2O_7$ and conc H_2SO_4 to give nicotine acid which on decarboxylation yields pyridine.



β-Picolin Nicotinic acid.

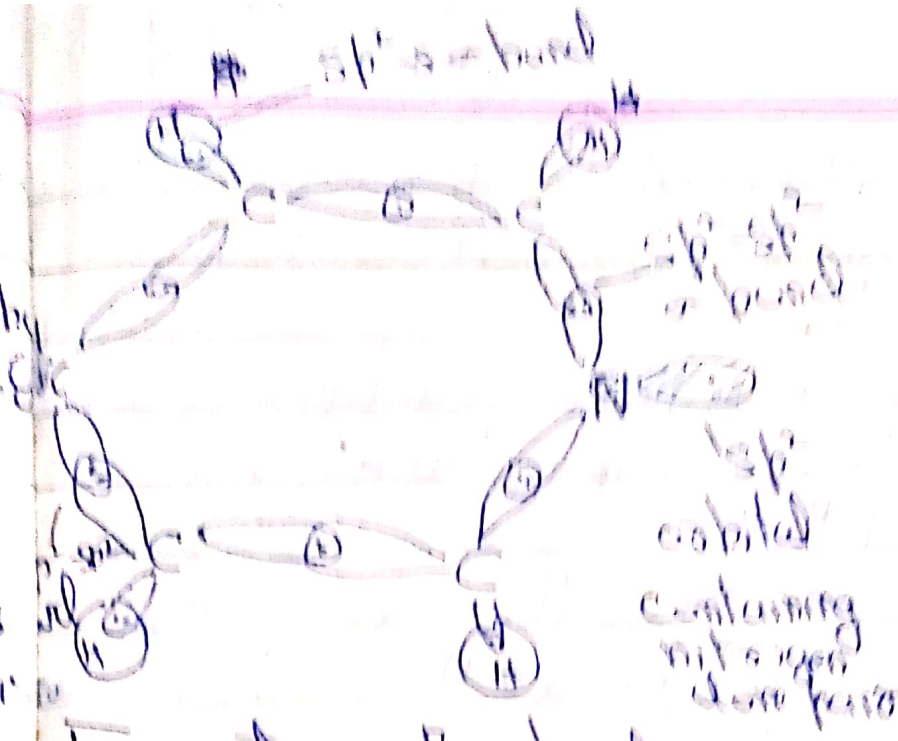
(4) Commercial method — From Light oil Fraction of coal tar.

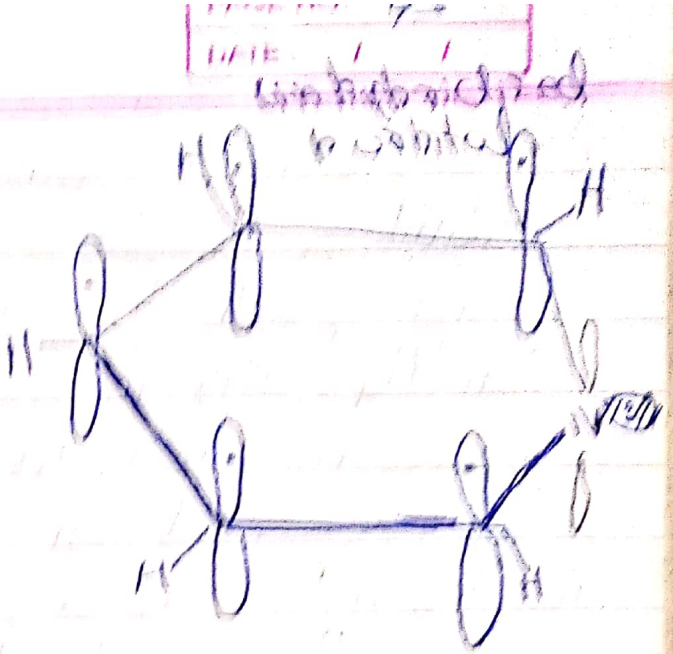
The light oil is treated with dil H_2SO_4 whereby basic compounds like pyridine are dissolved in acid layer and separated as soluble sulphates. This on treatment with NaOH solution liberates the bases and from this pyridine is separated by fractional distillation.

Structure of Pyridine. In pyridine all ring atoms are sp^2 hybridised. Two of sp^2 orbitals on each atom overlap with each other to form the C–C and C–N ~~sigma~~ bonds. The third sp^2 orbitals on each carbon atom overlaps with an s orbital from hydrogen to form the C–H σ bonds. The third sp^2 orbital on nitrogen is occupied by the nitrogen lone pair electrons. All the ~~sigma~~ σ bonds in pyridine lie in one plane and all bond angles are approximately 120°.

Each ring atom in pyridine possesses an un-hybridised p orbital and these are perpendicular to the plane containing the σ bonds.

The lateral overlap of the p orbitals produces a delocalised π molecular orbital containing six electrons. One half of these π molecular orbital lies above and the other half below the plane of σ bonds.





Formation of π bonds in pyridine.

According to the resonance pyridine is considered to hybrid of the following canonical structures.