

"Heterocyclic Chemistry"

Syllabus: 5 and 6-membered rings with one heteroatom; reactivity, orientation, and important reactions (with mechanism) of furan, pyrrole, thiophene and pyridine, synthesis (including retrosynthesis and mechanistic details); pyrrole: Knorr synthesis, Paal-Knorr synthesis, Hinsberg synthesis; pyridine: Hantzsch synthesis; benzo-fused 5 and 6-membered rings with one heteroatom; reactivity, orientation and important reactions (with mechanistic details) of indole, quinoline and isoquinoline; synthesis (including retrosynthesis and mechanistic details): Fischer, Madelung and Reimer; quinoline: Skraup, Doebner-Miller, Friedlander; isoquinoline: Bischler-Napieralski synthesis.

Heterocycles: Heterocyclic compounds are cyclic organic compounds containing at least one heteroatom in the ring.

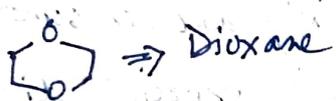
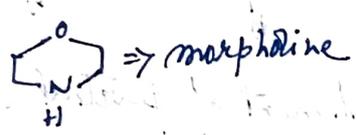
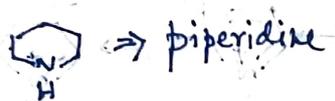
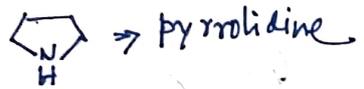
Heteroatom: Heteroatoms are nonmetals having at least one lone pair of electron when it bonded.

Heterocyclic compound

Alicyclic

Aromatic

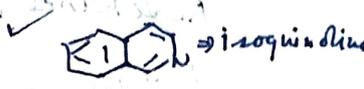
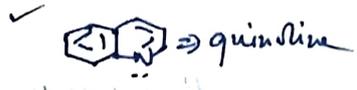
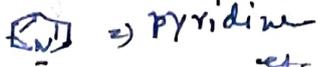
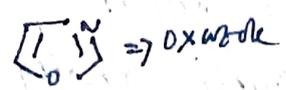
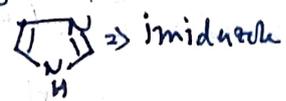
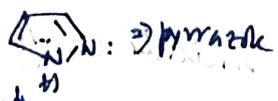
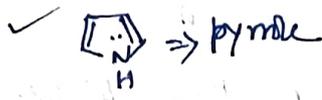
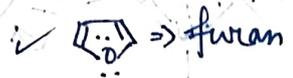
eg



etc

Mononuclear

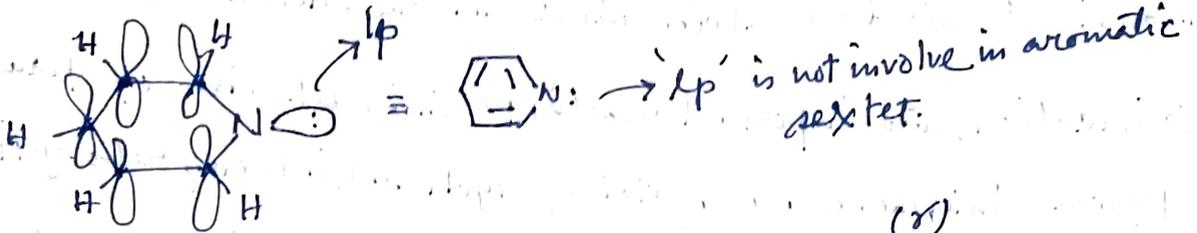
Benzo-fused



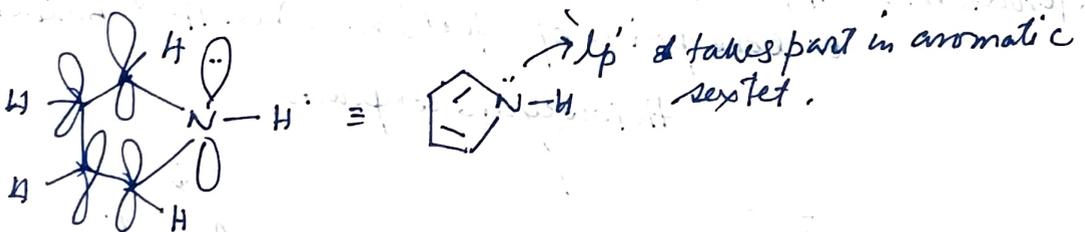
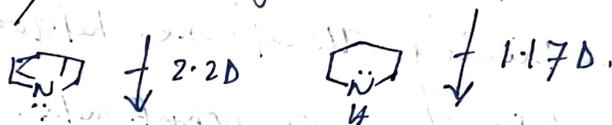
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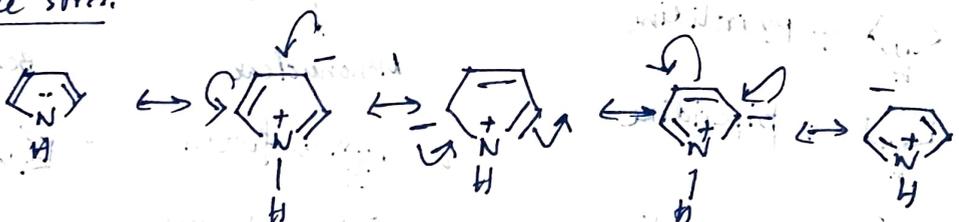
Structures



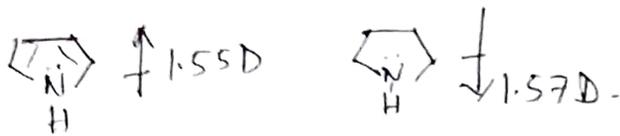
The polarisation resulting from inductive and mesomeric effect are in the same direction in pyridine resulting in a permanent dipole towards the ~~and~~ nitrogen atom. This also means that there are fractional (+)ve charges on the carbons of the ring, located mainly on the α - and γ -positions. So pyridine is electron poor or π -deficient. The dipole moment of pyridine is greater than the alicyclic analog piperidine.



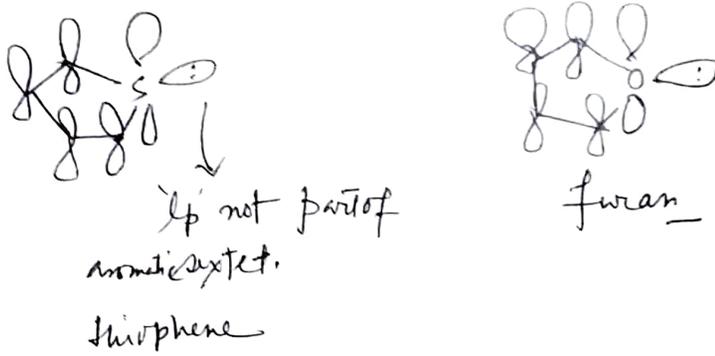
Resonance str.



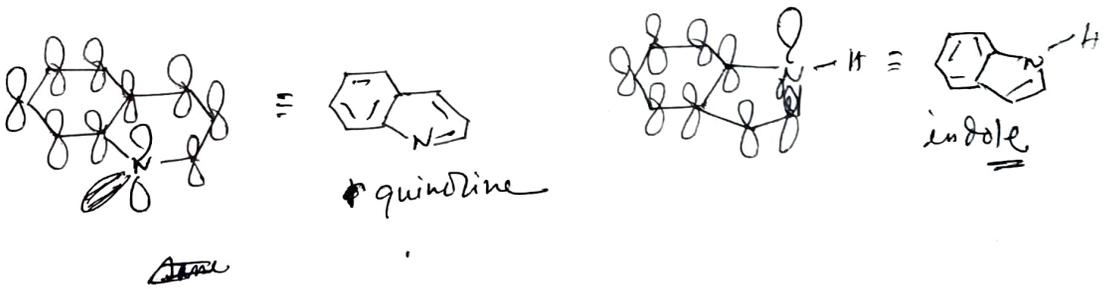
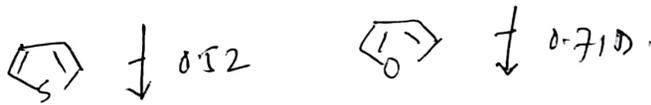
Resonance leads, then, to the establishment of partial (-)ve charges on the α and a partial positive charge on the N. The act of inductive effect (towards N) and mesomeric effect towards α chain operates opposite direction. The dipole moment of pyrrole ~~low~~ is low compare to π -alicyclic analog piperidine.



Pyrrole is referred to as electron rich or π -excessive.



The structure of thiophene and furan are closely analogous. The one 'lp' takes part in aromatic sextet and another not. The resonance str. are analogous to pyrrole and -I effect and +R effect operates opposite to each other. As electro(-)ve nature of 'O' is greater than 'S'. -I effect is greater for furan and size and polarizability of 'lp' in 'S' of thiophene is greater so thiophene is more aromatic than furan.



Resonance Strs:

