

HETEROCYCLIC COMPOUNDS :

BSc. Part III (Hons.)

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Heterocyclics are such cyclic compounds which have at least one polyvalent atom such as N, O, S, etc.

Definition: Heterocyclic compounds are organic compounds that contain a ring structure containing atoms in addition to carbon, such as sulfur, oxygen or nitrogen, as the heteroatom. The ring may be aromatic or non-aromatic

To be classified as aromatic, a compound must have :

1-Cyclic structure

2-Coplanar structure.

3 -Each atom of the ring must have a p orbital to form a delocalized π system i.e. no atoms in the ring can be sp^3 hybridized instead all atoms must be sp^2 hybridized (N.B. carbocation and carbanions are sp^2 hybridized)

4 – Fulfill Huckel's rule i.e. the system must have






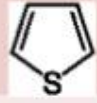
$4n + 2 = \pi$ electrons :

thus by calculating **n** value it will be an integral number


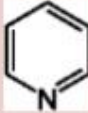
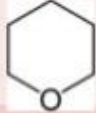
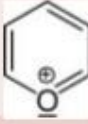
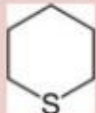
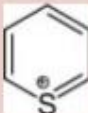
i.e. $n=0, 1, 2, 3$.

Heterocyclics are those 5 or 6 membered ring compounds which are stable and have aromatic character such compounds are mainly of three types : 5 membered heterocyclics, 6 membered hetero- cyclic and fused or condensed heterocyclics.

Five membered ring; one hetero-atom

Hetero-atom	Saturated	Unsaturated
Nitrogen	Pyrrolidine 	Pyrroline, Pyrrole 
Oxygen	Tetrahydrofuran 	Dihydrofuran, furan 
Sulphur	Tetrahydrothiophene 	Dihydrothiophene, Thiophene 
Phosphorus		Phosphole
Silicon		Silole
Arsenic		Arsole

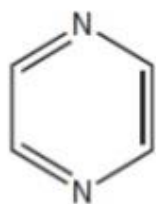
Six membered ring; one hetero-atom

Hetero-atom	Saturated	unsaturated
Nitrogen	Piperidine 	Pyridine 
Oxygen	Tetrahydropyran 	Pyrilium 
Sulphur	Thiane 	Thiopyran 

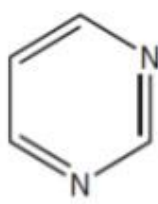
Heterocyclic compounds

Rings with more than one heteroatom

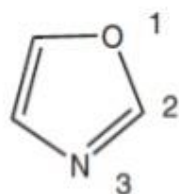
- Examples



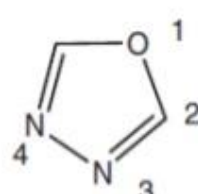
1,4-diazine
(pyrazine)



1,3-diazine
(pyrimidine)



1,3-oxazole



1,3,4-oxadiazole

Heterocyclic compounds

- Similarly, fusing the 2,3-bond of pyrrole onto the b-face of pyridine results in a pyrrolo[2,3-b]pyridine.

