# HETEROCYCLIC COMPOUNDS :

**BSc. Part III (Hons.)**

**Paper : VII , Gr. B**

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Hetrocyclics 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 sp3 hybridized instead all atoms must be sp2 hybridized (N.B. carbocation and carbanions are sp2 hybridized)

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

**4n + 2= π electrons :**

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

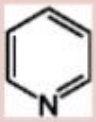
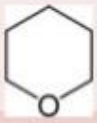
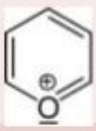
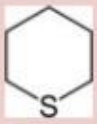
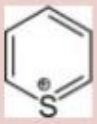
i.e. n=0, 1, 2, 3 .

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 |

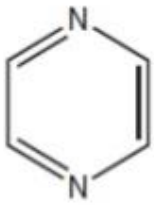
## Six membered ring; one hetero-atom

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

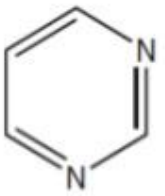
# Heterocyclic compounds

**Rings with more than one heteroatom**

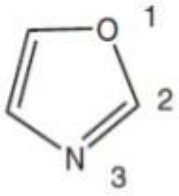
- Examples



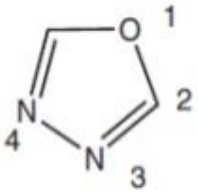

1,4-diazine
(pyrazine)




1,3-diazine
(pyrimidine)



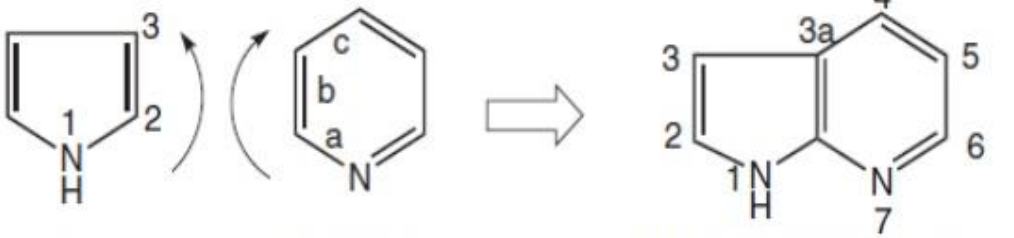

1,3-oxazole




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.




pyrrolo-

pyridine

1H -pyrrolo[2,3-b]pyridine