

1.1.3. Nomenclature

In heterocyclic chemistry, each **individual ring system** has been given a particular name and each compound has been given a specified name according to the **trivial system of nomenclature**. By the trivial name, little or no information regarding the structure of the compound is revealed, but still their use is widespread, while the systematic name is designed so that the structure of compound can be determined. In spite of the systematic names being too lengthy, still this nomenclature is vital and followed. Constant efforts are being made by the **International Union of Pure and Applied Chemistry (IUPAC)** for the systemic naming of heterocyclic compounds.

According to the **IUPAC system**, compounds containing 3- to 10-membered rings are named by addition of suitable prefixes (**table 1.1**), followed by the addition of suffixes (**table 1.2**):

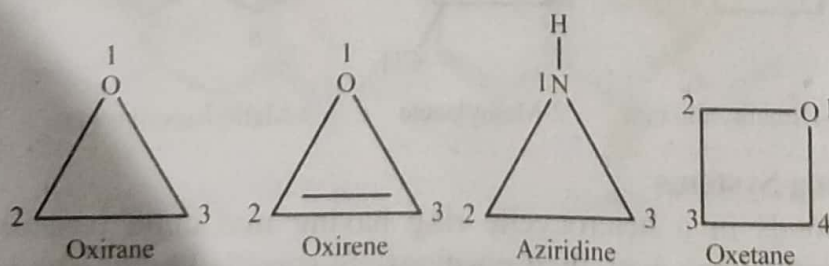
Table 1.1: Prefixes for Hetero Atoms

Hetero Atoms	Valency	Prefixes
O	2	Oxa
N	3	Aza
S	2	Thia
Se	2	Selena
Te	2	Tellura
P	3	Phospha
As	3	Arsa
Si	4	Sila
Ge	4	Germa

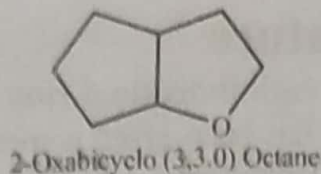
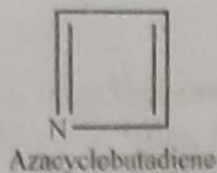
Table 1.2: Common Name Endings for Heterocyclic Compounds

Ring Size	Suffixes for Fully Unsaturated Compounds		Suffixes for Fully Saturated Compounds	
	With N	Without N	With N	Without N
3	-irine	-irene	-iridine	-irane
4	-ete	-ete	-etidine	-etane
5	-ole	-ole	-olidine	-olane
6	-ine	-in		-ane
7	-epine	-epin		-epane
8	-ocine		-ocin	-ocane

The size and hydrogenation state (with or without the presence of nitrogen atom) in the ring can be depicted by the suffixes mentioned in **table 1.2**. Based on the usage of the above tables few compounds are exemplified as:

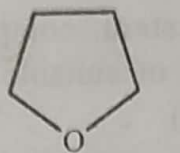
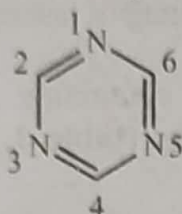


In the above **examples**, letter 'a' has been omitted from the names of the compounds, **e.g.**, aziridine, oxirene, etc., while the **examples** discussed below includes letter 'a' in their names, **e.g.**, azacyclobutadine, etc.



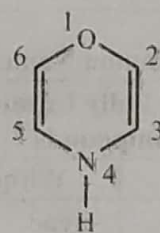
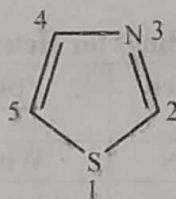
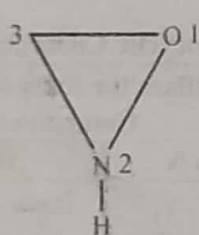
Saturated or Hydrogenated Ring Systems

The naming of such type of ring system is done either by varying their suffixes or by using prefixes like 'dihydro-', 'tetrahydro-', etc. The suffix to be used depends on whether the nitrogen atom is present or absent (**table 1.2**).

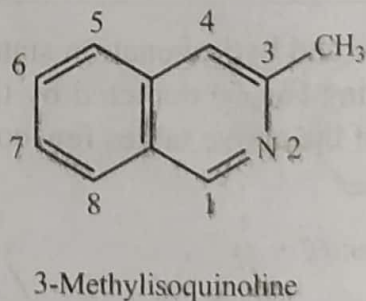
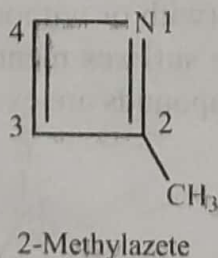
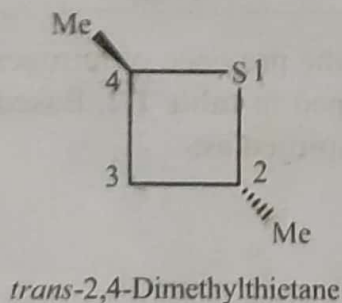


Prefixes such as 'di-', 'tri-', and so on are used when two or more than two similar atoms are present in a single ring. These prefixes are placed just before the 'a' term (**table 1.2**).

In case there are two or more than two different hetero atoms in the ring, their naming is done by using the prefixes and suffixes as given in **tables 1.1** and **1.2**, respectively, in order of preference, like oxygen followed by sulphur and nitrogen. This sequence of preference can be illustrated by the following examples:

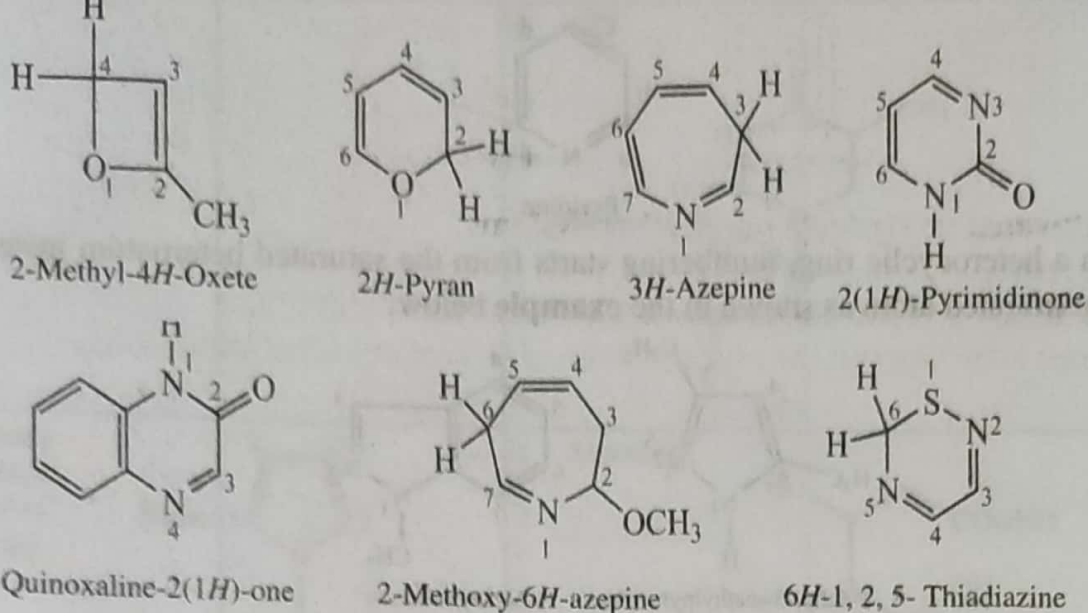


In a monocyclic compound, the numbering is controlled by the position of a single hetero atom, while this do not hold true in case of bicyclic compounds.



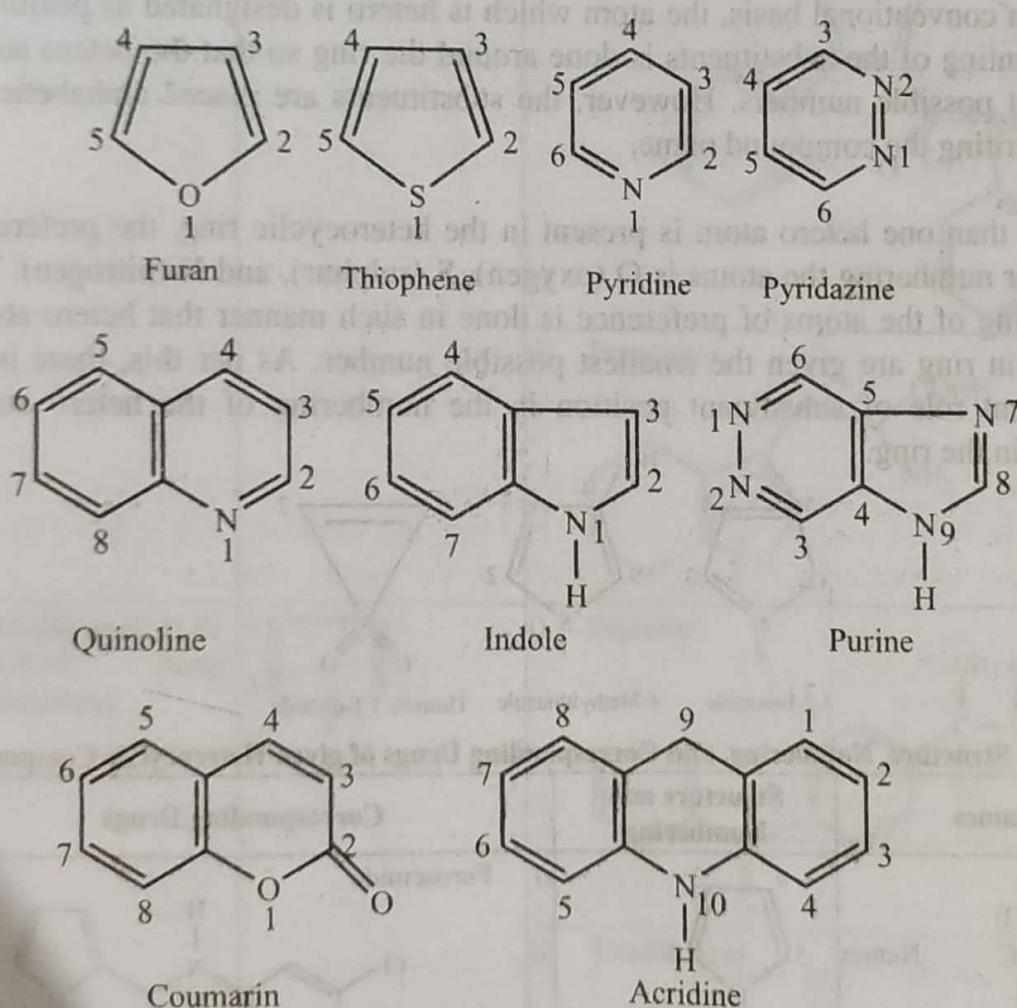
Unsaturated Ring Systems

If the double bonds in a heterocyclic ring having maximum unsaturation is arranged in more than one way, their positions are specified by numbering those nitrogen or carbon atoms which are not multiply-bonded, i.e., bear an extra hydrogen atom, by italic capital '1H', '2H', '3H', etc. The numerals indicate the position of these atoms having the extra hydrogen atom. The following examples illustrate this rule:

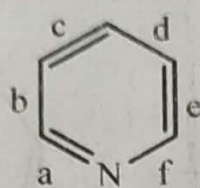


Non-Systematic or Common Name System

There are various compounds containing important ring systems, that do not follow any systematic nomenclature, but instead a non-systematic or their common names are used, such as:

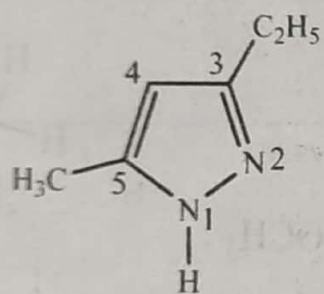


However, the fused rings are also named by another commonly employed system, according to which the side of the heterocyclic ring is labelled by the letters a, b, c, etc., starting from the atom numbered 1. This type of nomenclature is shown in the figure below, where side 'a' is present in between the 1 and 2 atoms, likewise, side 'b' is between 2 and 3 atoms, and this sequence goes on.

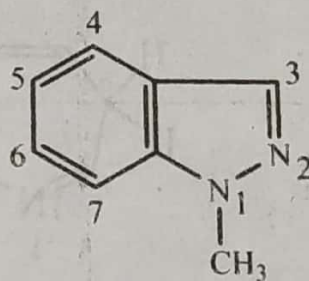


Pyridine

In a heterocyclic ring, numbering starts from the saturated heteroatom instead of unsaturated atom as shown in the **example** below:



3-Ethyl-5-methylpyrazole



1-Methylindazole