

## Quadrant I – Notes (Module 18)

**Programme:** Bachelor of Science ( Third year )

**Subject :** Chemistry

**Paper code:** CHC - 107

**Paper Title:** Organic Chemistry

**Section :** B

**Unit :** 4

**Module name :** Definition and Classification of 3,4, 5 and 6 membered Heterocyclic compounds.

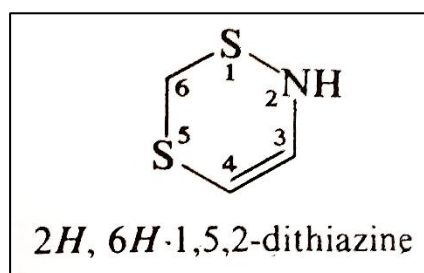
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Heterocyclic compounds are cyclic compounds with the ring containing carbon and other elements, the commonest being oxygen, nitrogen and sulphur.

There are a number of heterocyclic rings which are easily opened and do not possess any aromatic properties, e.g. ethylene oxide,  $\gamma$ - and  $\alpha$ -lactones, etc.

These are not considered to be heterocyclic compounds.

Heterocycles are compounds with five or six-membered heterocyclic rings which are stable, contain conjugated double bonds, and exhibit aromatic character.



### Nomenclature

Many heterocyclic systems have trivial names. The following is the systematic method of nomenclature.

- The names of monocyclic compounds are derived by a prefix (or prefixes) indicating the nature of the hetero-atoms present, and eliding the 'a' where

necessary, e.g. oxygen, **oxa**; sulphur, **thia**; nitrogen, **aza**; silicon, **sila**; phosphorus, **phospha**.

- ii. When two or more of the same hetero-atoms are present, the prefixes di, tri, etc. are used, e.g., dioxa, triaza. If the hetero-atoms are different, their order of citation starts with the hetero-atom of as high a group in the periodic table and as low an atomic number in that group. Thus, the order of naming will be O, S, N, P, Si, e.g. thiaza (S then N).
- iii. The size of a monocyclic ring from 3 to 10 is indicated by a stem: 3, ir (tri); 4, et (tetra); 5, ol; 6, in; 7, ep (hepta); 8, oc (octa); 9, on (nona); 10, ec (deca).
- iv. The state of hydrogenation is indicated in the suffix or by the prefixes dihydro, tetrahydro, etc., or by prefixing the name of the parent unsaturated compound with the symbol *H* preceded by a number indicating the position of saturation.
- v. (a) In a monocyclic compound containing only one hetero-atom, numbering starts at this atom.  
  
(b) The ring is numbered to give substituents or other hetero-atoms the lowest numbers possible. If the hetero-atoms are different, then numbering starts at the atom cited first according to the rule in (i) and proceeds round the ring in order of precedence.

## Fused heterocyclic systems

Only a very elementary account is given here. When one heterocyclic ring is present, this is chosen as the parent compound. If more than one heterocyclic ring is present, the order of preference is given to the nitrogen-containing component (nitrogen ring are the most common).

For a component containing the a hetero-atom other than nitrogen, the order of preference is in that in (i) above (O before S, etc.). When the parent compound has been chosen, its name is prefixed by the name of the fused ring attached, e.g., benz(o), naphth(o). Also, the parent compound chosen is the component containing the largest number of rings and has a simple name.

For the purpose of numbering, the structure is written with the greatest number of rings in a horizontal position and a maximum number of rings above and to the right of the horizontal row. Numbering is then carried out (usually) in a clockwise direction starting with the uppermost ring farthest to right and omitting atoms at ring junctions.

To distinguish isomers, the *peripheral sides of the parent compound* are lettered a, b, c, etc., beginning with a for the side 1,2, b for 2,3, etc. To the letter as early in the alphabet as possible, denoting the side where fusion occurs, are prefixed, if necessary, the numbers indicating the positions of fusion of the other component; their order conforms to the *direction of lettering* of the base component. It should be noted that these numbers apply to the prefixed component (as a separate entity) and *not* to the combined system (which is numbered according to the usual rules).

