

SYMMETRY IN CHEMISTRY: -

A molecule is said to have "symmetry" if part of the molecule can be interchanged without bringing about a distinguishable change in the orientation of the molecule. That means a molecule can have two or more orientations in space which are indistinguishable, then molecules have a symmetry. A body is called symmetric if any real or imaginary operation of rotation or reflection leads to a new orientation which is indistinguishable from the initial one. Such operations which bring the body into coincidence with itself are called the operation of symmetry. The geometrical elements of the body, generating symmetry operations, are called symmetry elements. Symmetry elements may be a point, an axis or a plane, with respect to which the symmetry operations are performed. The description of the symmetry of an isolated molecule is called point of symmetry. It is the set of operations transforming a system about a common point which is generally the centre of gravity of a molecule.

SYMMETRY ELEMENTS: -

If a transformation of coordinates (a reflection, rotation or a combination of these) produces no distinguishable change in the orientation of a molecule, the transformation is a symmetry operation and the molecule possesses a symmetry element. A symmetry element is a point, line or plane about which the symmetry operation is carried out.

There are various symmetry elements and the corresponding symmetry operations are given below:

1. Inversion Centre	i	Centre of symmetry
2. The rotation axis	C _n	Axis of symmetry (a line)
3. The mirror plane	σ	Plane of reflection (a plane)
4. The rotation reflection axis	S _n	Rotation (C _n) about an axis and reflection with respect to the plane perpendicular to the rotation axis
5. The Identity	E	The rotation axis does not arise

1. The centre of symmetry or inversion centre (i):-

A molecule possesses a centre of reflection each of the atoms in the molecule through this centre resulting in its coming into coincidence with an identical configuration, the centre is known as a centre of symmetry. The symbol used to indicate the inversion centre is *i*. For example, if the oxygen atom of the hyponitrite ion moves through the inversion centre an equal distance to the opposite side it comes into coincidence with the other oxygen atom. The same must apply also to both nitrogen atoms if the molecule is to possess a centre of symmetry.

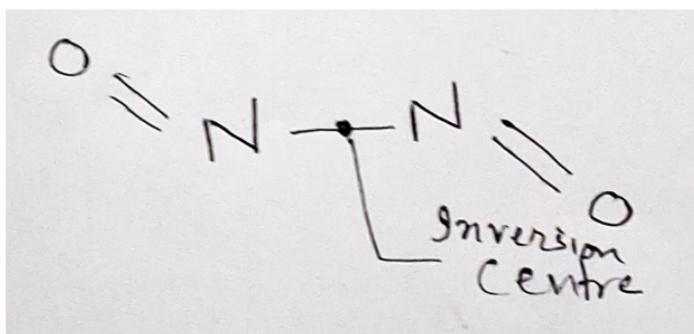


Fig: The centre of symmetry in the Hyponitrite ion

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