1. Identity (E): -

It is the operation of doing nothing.

When we do not do anything and leave the system unchanged and identical to the original system in all respects, the operation is called Identity.

and it is denoted by 'E'.

2. Centre of Symmetry

or

Inversion Centre: -

If a molecule can be brought into an equivalent configuration by changing the co-ordinates (x, y, z) of every atom,

where the co-ordinates origin point lies within at a point in atom,

or

where the origin of co-ordinates lies at a point within the molecule, into $(-x, -y, -z)$, then the point at which origin lies is said to be a Centre of Symmetry or Centre of Inversion.

In other words, this is an imaginary point in the centre of the molecule, though which its the reflection of each atom can be carried out, to result in its coincidence with an equivalent atom.

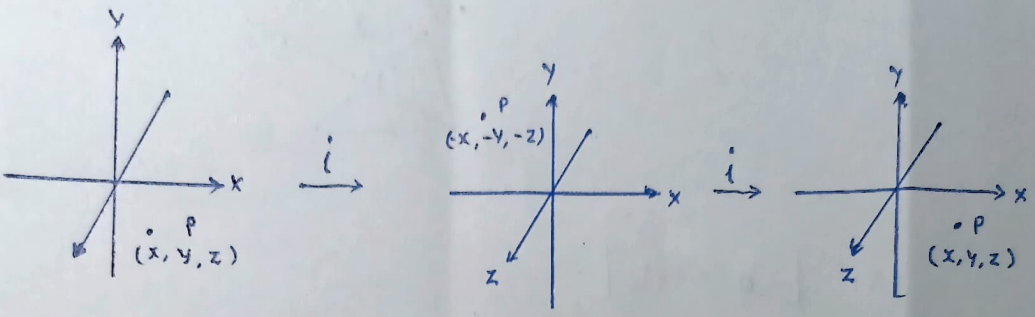
The symbol for the Inversion Centre or for the Operation of Inversion is represented or denoted by 'i' (italic i)

All atoms in the molecule, except the atom at the Centre of Symmetry are inverted during an inversion operation.

The unpaired atom (if any) has to be at the Centre of Symmetry

Thus, a molecule with more than one unpaired atom will not have Centre of Symmetry

Inversion operation can be shown as follows.



On the basis of above structure it is obvious that Repeat of inversion operation (i^2) gives initial representation.

Hence $i^n = E$ (where E is identity)

If n is even

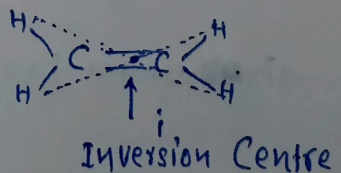
and

$i^n = i$

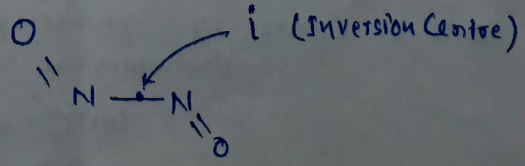
If n is odd.

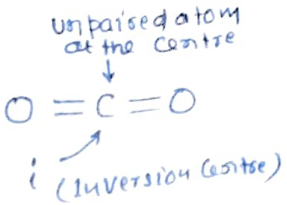
Examples: Molecules have Centre of Symmetry.

(1) C_2H_4

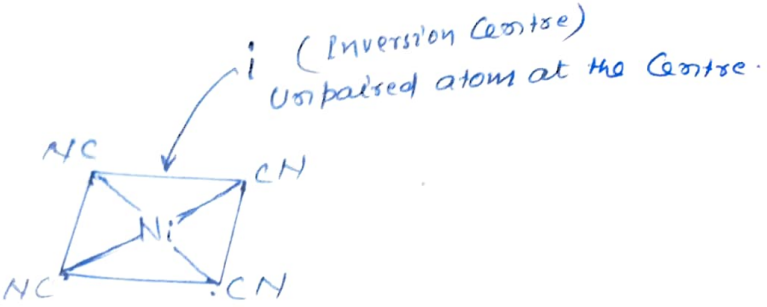


(2) N_2O_2

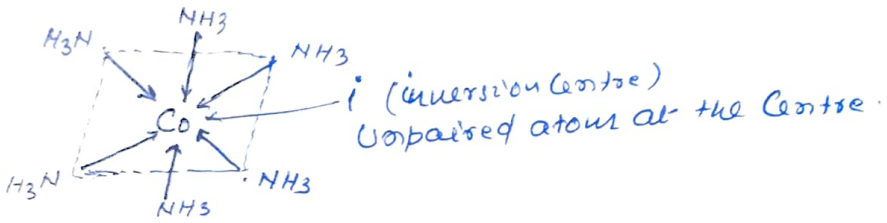




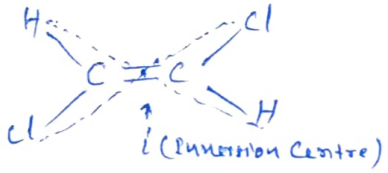
(4) $[Ni(CN)_4]^{2-}$



(5) $[Co(NH_3)_6]$



(6) Trans - $C_2H_2Cl_2$



(7) Benzene :- C_6H_6

(8) P- disubstituted Benzene

However, there are some molecules which do not have a Centre of Symmetry.

Examples are (i) CH_4 (ii) Cis $C_2H_2Cl_2$

(iii) O - disubstituted Benzen

(iv) m - disubstituted Benzene

Its structure may be represented as follows. etc.