exhibit op

Geometrical Isomerism

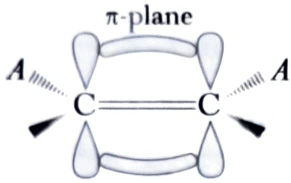
Geometrical isomerism arises due to restricted rotation of atoms or groups about a covalent bond. There are two important classes of organic compounds where rotation about a covalent bonds are restricted, they are (i) compound containing multiple bonds and (ii) cyclic compounds.

Geometrical isomerism is further classified into two categories as *cis-trans* isomerism and $E - Z$ isomerism.

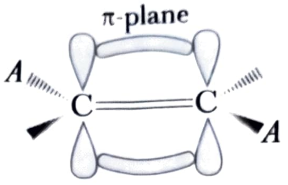
Cis-trans isomerism

(a) ***Cis-trans* isomerism in acyclic compounds** *Cis-trans* isomerism in acyclic compound can be observed due to restricted rotations of atoms or groups about carbon-carbon double bond or in compound containing double bond between carbon and other atoms *viz* "N" or double bond between two atoms which may be similar or different.

- In the compound containing carbon-carbon double bond, if identical atoms or groups lies on the same side of a π-plane, the stereoisomer is known as ***cis*-isomer,** and if identical atoms or groups lies on opposite side of a π-plane, the stereoisomer is known as ***trans*-isomer** as shown below :

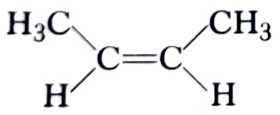


Cis-isomer

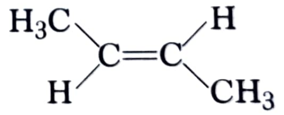


Trans-isomer

In the above shown structures, it is evident that π-plane is perpendicular to the molecular plane. In *cis*-isomer, the identical groups *A* are on same side to the π-plane *i.e.,* behind the π-plane. In the *trans*-isomer the identical groups *A* are on the opposite side of plane *i.e.,* one behind the π-plane and one in the front side of π-plane. *i.e.,*



Cis-2-butene



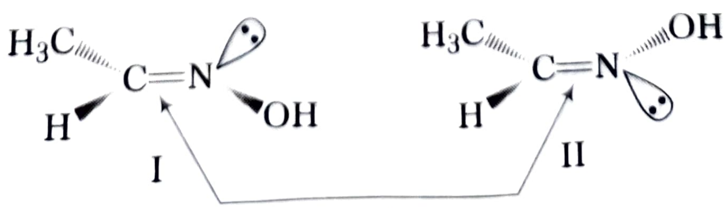
Trans-2-butene

Note The main conditions for geometrical isomerism are.

- The molecule must have a double bond.
- The two atoms or groups attached to the same carbon atom must be different.

- There are several functional groups, when present in a compound, involve geometrical isomerism although they do not contain carbon-carbon double bond. They are :

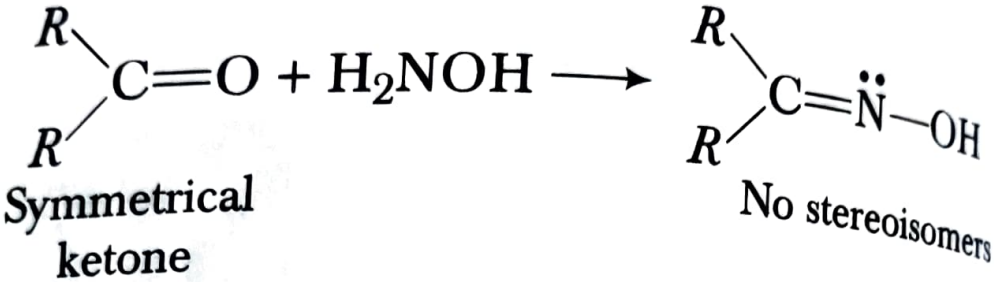
(i) Oximes contain C=N and may give rise to geometrical isomerism. All aldo-oxime (except formaldoxime) show geometrical isomerism.

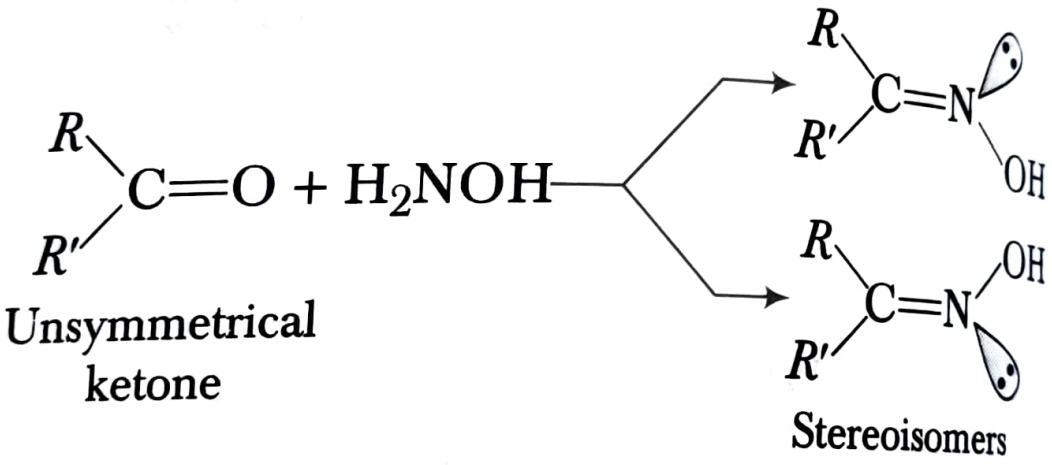


Geometrical isomers

Here, structure I and II represents different configuration and they are non-interconvertible due to restricted rotation about carbon-nitrogen double bond.

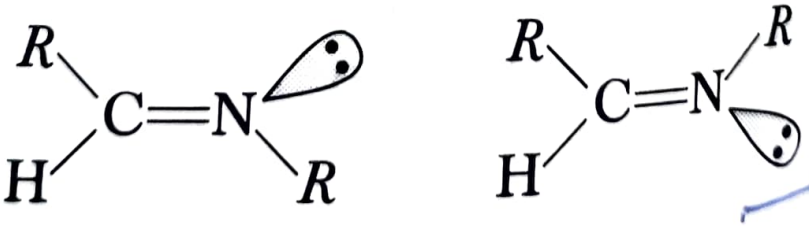
In case of ketones, symmetrical ketones will not form stereoisomers after formation of keto-oxime, but all unsymmetrical ketones will result in the formation of two stereoisomers of keto-oxime after condensation with hydroxyl amine.





(ii) Imines, also contain C=N and may give rise to geometrical isomerism as

Geometrical isomers



Geometrical isomers