NOTES Date

B. Sc. Part I (Hons.)

Paper I C

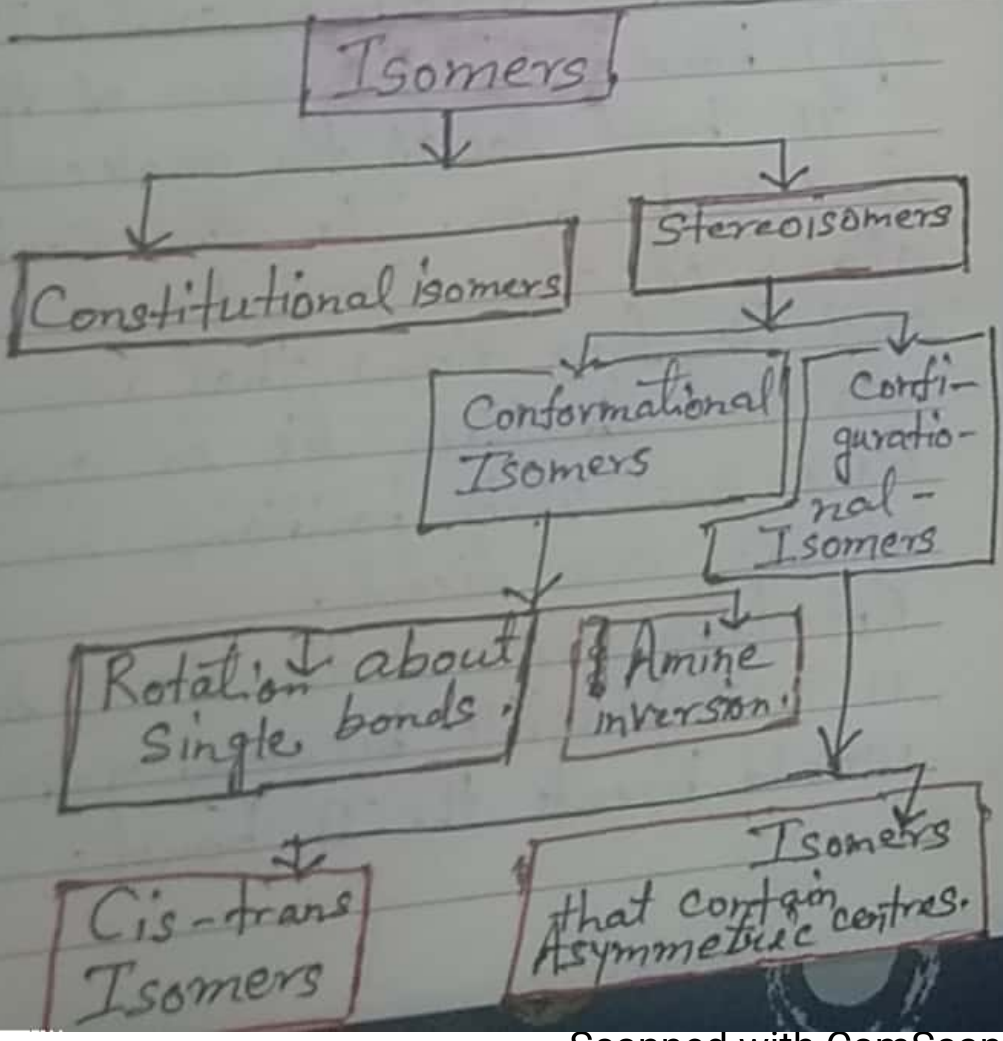
Group A.

Organic chemistry.

STEREOCHEMISTRY

Brief idea of Geometrical and Optical isomerism.

Geometrical or Cis-Trans Isomerism



NOTES Date

Geometrical Isomerism:

Geometrical Isomerism (also called cis-trans isomerism) results from a restriction in rotation about double bonds, or about single bonds in cyclic compounds.

Geometrical Isomerism in Alkenes:

The carbon atoms of the Carbon-Carbon double bond are sp^2 hybridized. The C=C bond consists of a σ (sigma) and a π (pi) bond. The presence of the π bond locks the molecule in one position. The two Carbon atoms of the C=C bond, and the four atoms that are attached to them lie in one plane and their positions in space are fixed.

Rotation around the C=C bond is not possible because rotation would break the π bond.

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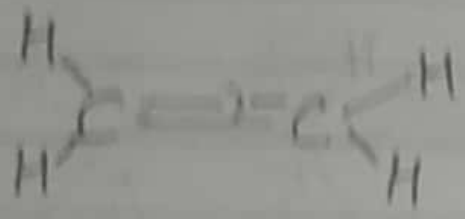
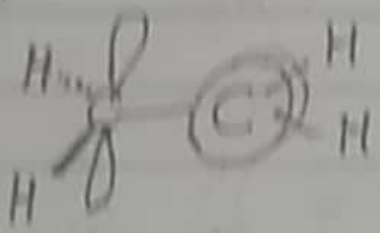


Rotation →



Rotation about π bond is not possible because it would break the π bond.

This restriction of rotation about the carbon-carbon double bond is responsible for the geometrical isomerism in alkenes.

The conversion of cis-isomer into trans-isomer is possible only if either isomer is heated to a high temp. or absorb light. The heat supplies the energy (about 62 Kcal/mole) to break the π bond so that rotation about σ bond becomes possible. Upon cooling, the reformation of the π bond can take place in two ways giving mixtures of trans-2-butene plus cis-2-butene.

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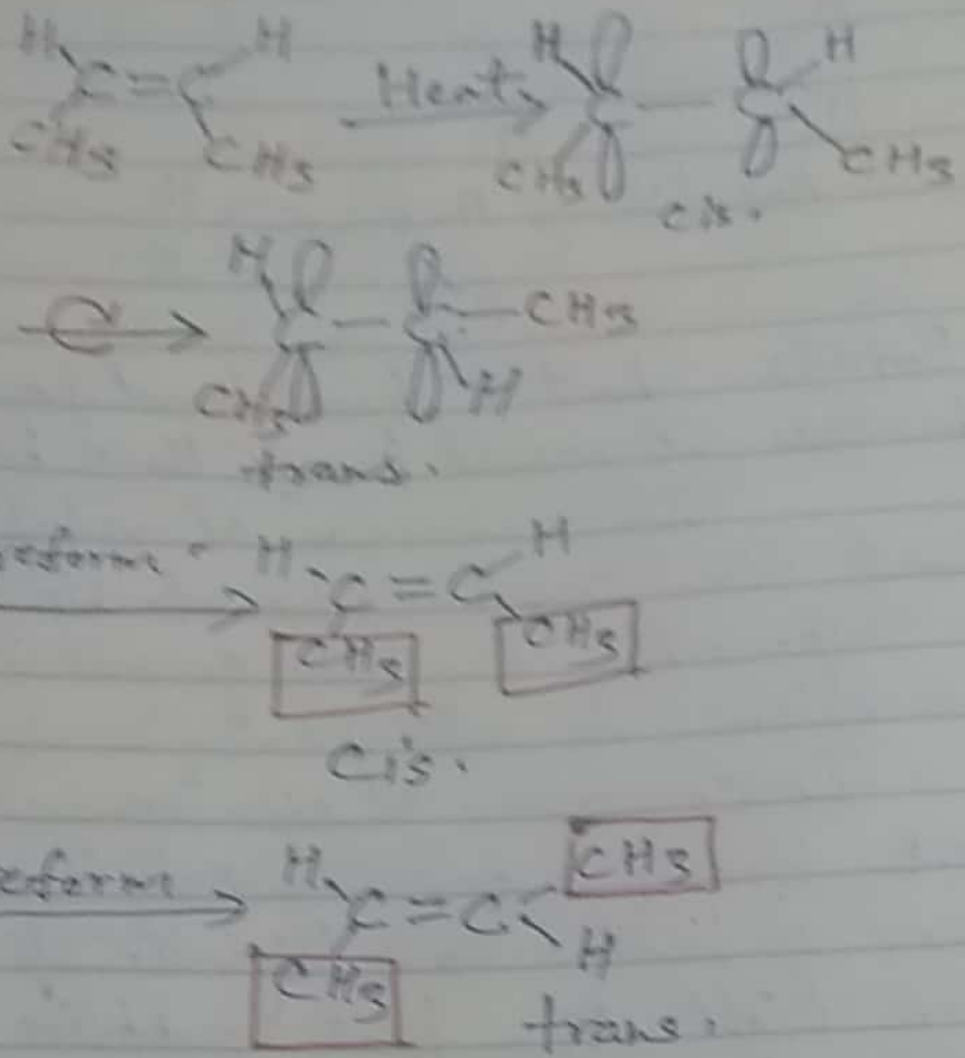


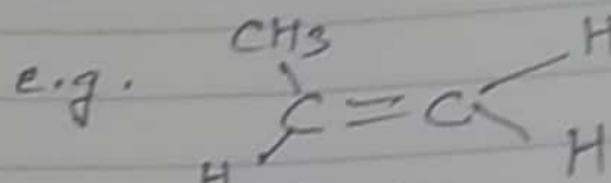
Geometrical isomerism is possible only when each double bonded carbon atom is attached to two differend atoms or groups.

Example.

No geometrical isomers are possible in propene.

NOTES Date

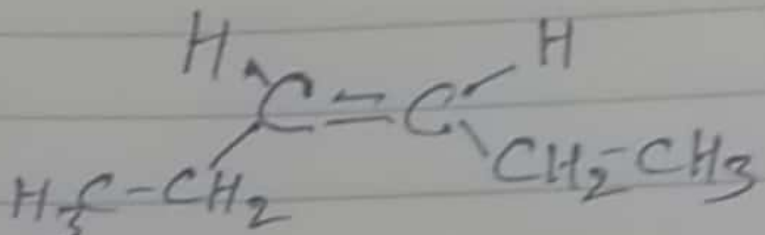
because one of the double bonded carbons has two identical groups. (H-atoms) attached to it.

e.g. 

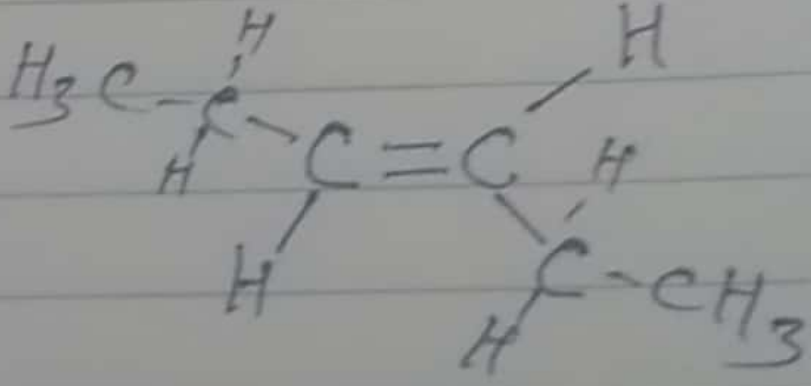
identical atoms/grs. on the same carbon.

Propene.

Geometrical isomers are possible for 3-hexene. This is because each double bonded C-atom is attached to two different groups.



cis 3 Hexene



"Trans. 3-Hexene"