

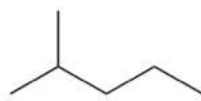
Stereochemistry

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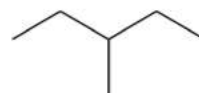
- Introduction
- Types of Stereoisomerism
- Optical Isomerism
 - Concept of Chirality
 - Elements of Symmetry
- Optical Isomerism in tartaric acid, 2, 3 Dihydroxybutanoic acid
- Enantiomerism, Diastereomerism and Meso compounds
- Geometrical isomerism in C=C, C=N and alicyclic compounds.
- Nomenclature of stereoisomers
 - D and L
 - erythro and threo
 - R and S
 - E and Z.

Types of Isomers

Structural (constitutional) Isomers - Compounds of the same molecular formula with different connectivity (structure, constitution)

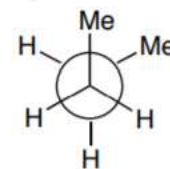
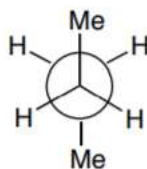


2-methylpentane

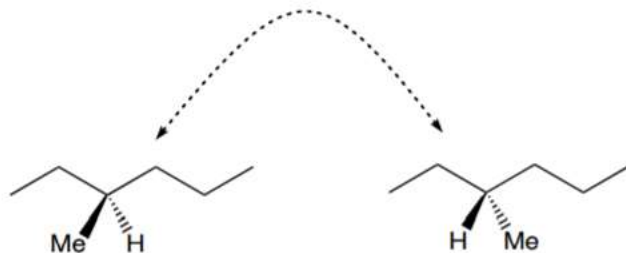


3-methylpentane

Conformational Isomers - Compounds of the same structure that differ in rotation around one or more single bonds



Configurational Isomers or **Stereoisomers** - Compounds of the same structure that differ in one or more aspects of stereochemistry (how groups are oriented in space - enantiomers or diastereomers)

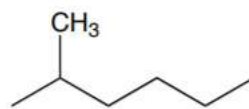


We need a way to describe the stereochemistry!

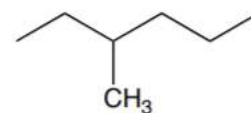
Stereoisomers

- Stereochemistry is the study of relative arrangement of atoms or groups in a molecule in three dimensional space. Stereochemical isomers are molecules, which have the same chemical formula and bond connectivity but different relative arrangement in three dimensional space. In contrast, constitutional isomers have same molecular formula but different bond connectivity.

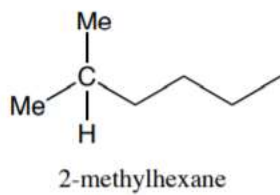
Consider two of the compounds we produced while finding all the isomers of C_7H_{16} :



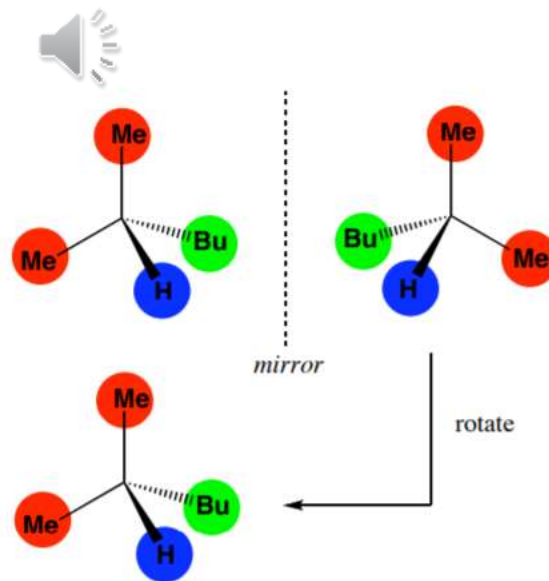
2-methylhexane



3-methylhexane

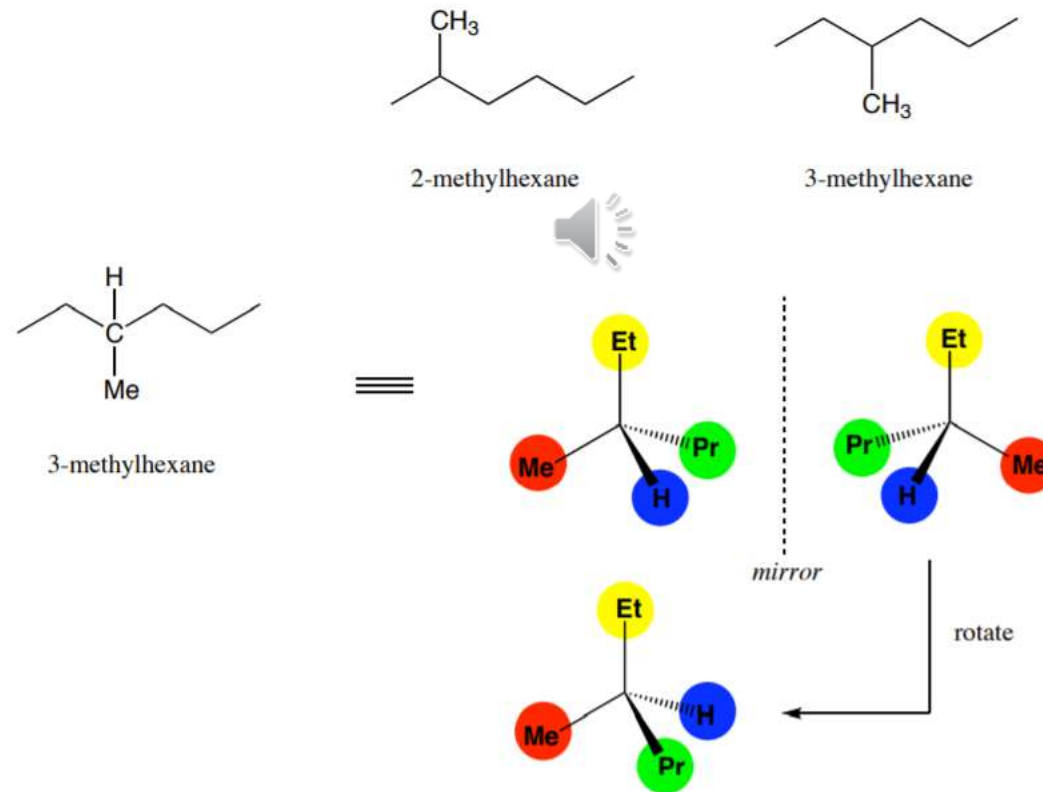


2-methylhexane




3-methylhexane is nonsuperimposable with its mirror image

Consider two of the compounds we produced while finding all the isomers of C_7H_{16} :



In above example, 2-methyl hexane and 3-methyl hexane are structural isomers.

The molecule 2-methyl hexane can be written in two different ways. But the forms are superimposable, hence the two molecules are same.

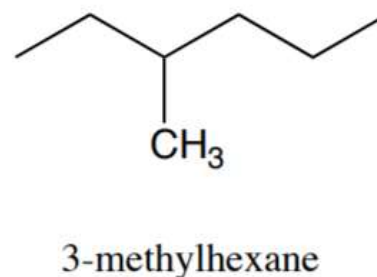
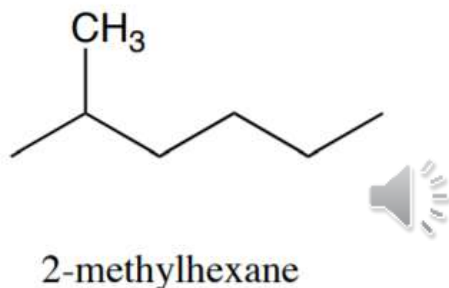
The molecule 3-methyl hexane can be written in two different ways in which the spatial bond connectivities of different groups are different. They are non superimposable mirror images of each other. Hence these are stereoisomers. 

Types of stereoisomers:

1. Optical isomerism
2. Geometrical isomerism



Consider two of the compounds we produced while finding all the isomers of C_7H_{16} :



- Compounds that are not superimposable with their mirror image are called **chiral** (in Greek, chiral means "handed") 3-methylhexane is a chiral molecule.
- Compounds that are superimposable with their mirror image are called **achiral**. 2-methylhexane is an achiral molecule.
- An atom (usually carbon) with 4 different substituents is called a **stereogenic center** or **stereocenter**.