Organic Models

Experiment
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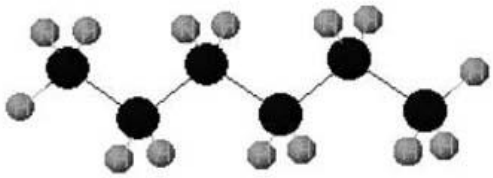
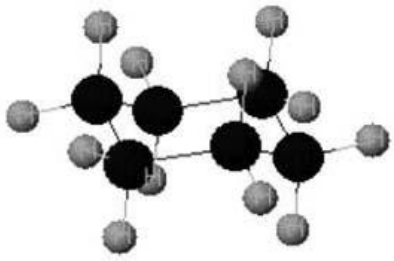
Introduction

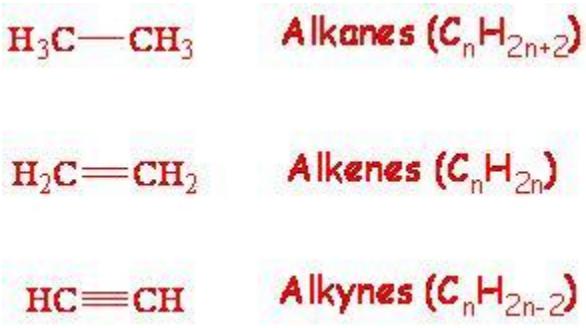
Organic chemistry is the study of carbon containing compounds. Hydrocarbons are compounds composed of hydrogen and carbon. Depending upon the number of carbon atoms, there may be many possibilities for the structures of these compounds.

C_6H_{14}  Linear

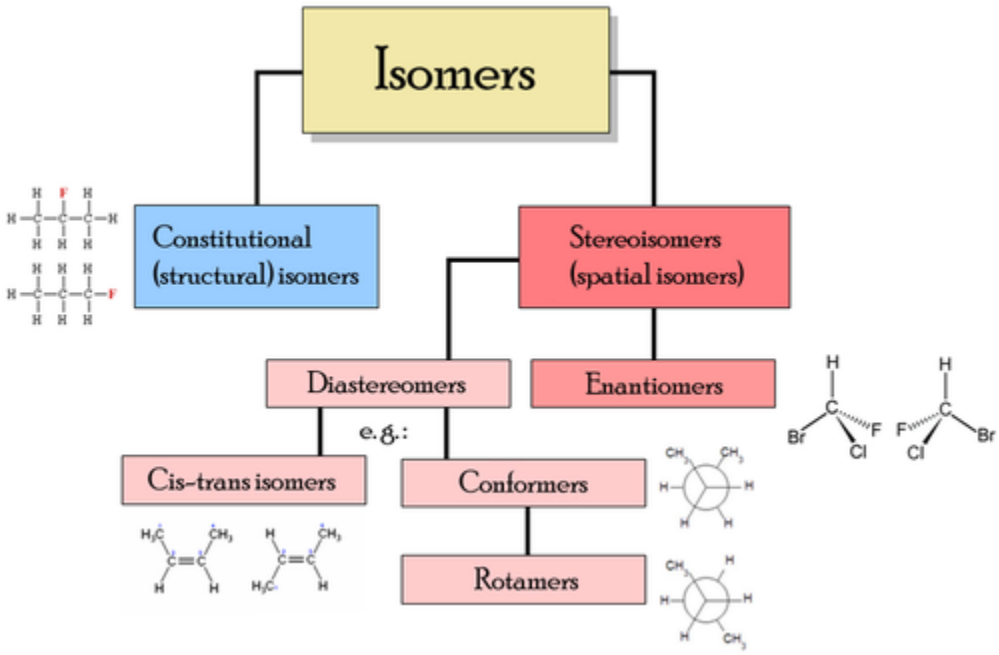
C_6H_{12}  Cyclic

Aliphatic Hydrocarbons

Hydrocarbons are classified as either *aliphatic* or *aromatic*. Aliphatic compounds are broken down by bond types: Alkanes (single bonds), Alkenes (double bonds) and Alkynes (triple bonds). The molecular formula for these hydrocarbons is determined by the following formulas: Alkane (C_nH_{2n+2}), Alkene (C_nH_{2n}), Alkyne (C_nH_{2n-2}).



It is possible to get more than one structure for the same molecular formula. These structures are called *isomers*. A structural isomer is one in which the attachments of the atoms are different than another structure of the same molecular formula. A *stereoisomer* is one that has the same attachment but a different spatial relationship between the atoms (mirror images).



In this lab, you will build organic models and study the effects of bonding in each compound.

Equipment and Materials
Organic Model Kit

Procedure
Obtain an organic model kit.
Part I – Valence Bond Theory
Construct with a molecular model kit and draw the following hydrocarbons:

Alkane C_nH_{2n+2}	Alkene C_nH_{2n}	Alkyne C_nH_{2n-2}
C_2H_6	C_2H_4	C_2H_2

For each:

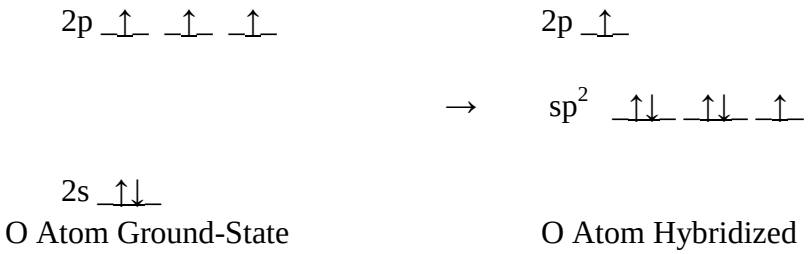
State the electron geometry about the carbon atoms (*linear, trigonal planar, tetrahedral*).

State the expected bond angles.

State the expected hybridization of carbon (sp, sp^2, sp^3).

Use partial orbital diagrams to show how the atomic orbitals of carbon lead to hybridization.

Example: O_2



Molecular Oxygen: O=O

Part II – <u>Isomers</u>

a) Build and draw the possible *structural isomers* of the following hydrocarbons:

C_4H_{10} (2 isomers) C_5H_{12} (3 isomers)

b) Build and draw the possible *stereoisomers* (2 isomers or *enantiomers*) of the following:

CHIBrCl