

Experiment 1 Models Lecture

Objective

Study the structure of saturated and unsaturated hydrocarbons and their isomers.

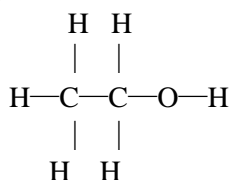
Definition

- Molecular Formula tells the kind and the number of atoms in a molecule but does not show how they are bonded.

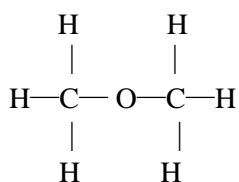
Example: C_2H_6O

- Structural Formula shows how the atoms are bonded to form the molecule.

Possible structures for C_2H_6O



Ethanol



Dimethyl ether

- Structural (constitutional) isomers are molecules that have the same molecular formula but different arrangement.
- Condensed structural formulas show all the atoms and places in them in sequential order.

Ethanol CH_3CH_2OH

Dimethyl Ether CH_3OCH_3

Hydrocarbons

- Carbon Chain
- Types
 - Saturated (single bonded straight chained, branched or ringed)
 - Unsaturated (double or triple bonded straight chained, branched or ringed)
 - Aromatics (benzene ring base)
- Each carbon bonds to 4 other molecules.
- Hydrogen molecules are defined to be equivalent when substitution to any of the hydrogen attached to the same carbon yield the same molecule.
- A hydrogen molecule is replaced by an alkyl group to form a branched hydrocarbon.

Pentane

$CH_3CH_2CH_2CH_2CH_3$

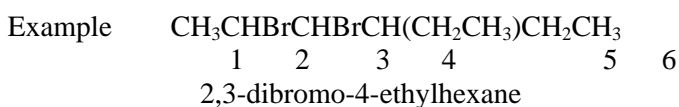
2-methylheptane

$CH_3CH(CH_2CH_2CH_3)CH_2CH_2CH_3$

What are equivalent hydrogens?

Nomenclature

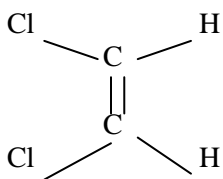
- IUPAC naming of compounds
- Determine the longest continuous chain and name it. Example : methane, ethane, propane, pentane etc.
- Name the substituent, and determine the carbon number that the substituent is attached.
- Substituents that halogens are named first (alphabetically if there is more than 1 halogen substituent. Example: bromo, chloro, iodo, fluoro. Alkyl group substituents are named next also in alphabetical order if there are more than 2 alkyl substituents. Example: methyl, ethyl, propyl etc.
- Number the parent chain to give the smallest number to the carbon bonded to the first substituent group.



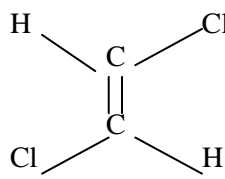
If there are more than 2 of the same substituent, each of the substituent is assigned the parent carbon number and prefixed as di-, tri-, tetra-, penta- etc.

Cis and Tran Isomers

The rotational restriction of groups joined by double bonds causes a new type of isomerism, the cis and trans isomer. One can tell they are different because the isomers are not superimposable.



Cis-1,2-Dichloromethene



Trans-1,2-Dichloromethene

The two compounds above only differ in the arrangement of their atoms in space. Isomers of this kind are classified as stereoisomers.