

Chapter 3 - Organic Compounds: Alkanes and Cycloalkanes

Properties of Alkanes

Alkanes are relatively inert molecules. There are only a few specific reactions that they will undergo. This is largely due to the fact that the bonds are very non-polar and without some polarization of bonds, it is often difficult to break them. Alkanes can be oxidized (combustion) or reacted with very reactive species like chlorine free radicals (chlorine molecules plus light).

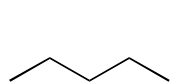
Combustion



Free Radical Chlorination

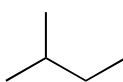


Alkanes are non-polar, or also called hydrophobic (water hating). But they do have some attractive forces that we call van der Waals forces. These van der Waals interactions are sort of like transient small dipoles that result when molecules come close together. These forces are stronger when the alkyl chains are linear (greatest interaction). This is easily observed in the boiling point and melting point of molecules. Generally, the longer the chain, the higher the MP or BP. However, if the molecule is more branched, the BP will decrease. See for example the boiling points of isomers of pentane.



n-pentane

bp 36°C



2-methylbutane

bp 28°C



2,2-dimethylpropane

bp 10°C

Cycloalkanes

Alkanes can be joined at the ends to make ring compounds. In order to do this, two hydrogens must be lost. Thus, the general formula for cycloalkanes is C_nH_{2n} . Cycloalkanes take precedent as the parent of the name if it is the same size or larger than any other alkyl chains in the molecule.

Rule 1: Count the number of C's in the ring. If greater than or equal to the largest substituent chain, the ring is the parent. If a substituent is larger, that is the parent.

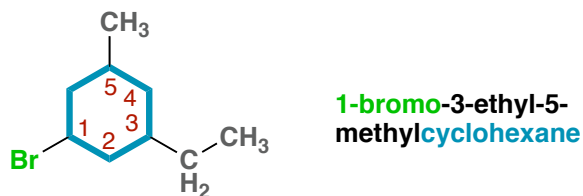
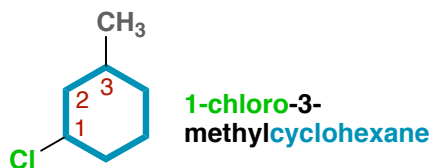


ethylcyclopentane



1-cyclopropylbutane

Rule 2: for multi-substituted rings - start numbering at a point of attachment - number in the direction that gives the lowest numbers (sum the numbers to get a good idea). Substituents are numbered according to their alphabetical priority - halogens included.



p