





Student Summaries for Chapter 4

- Alkane - Hydrocarbon \rightarrow simplest org. compds
- #s for straight/^{branched} chain always $C_n H_{2n+2}$ (one more H for each end)
- Names for # of C's:
 - 1-methane 2-ethane 3-propane 4-butane 5-pentane
 - 6-hexane 7-heptane 8-octane 9-nonane 10-decane
- cyclic alkanes $C_n H_{2n}$ + cyclo- to name (Δ = cyclopropane)
- Bicyclic alkanes $C_n H_{2n-2}$ can be separate  spiro  or fused  or bridged 
 chain cyclic bicyclic
- All constitutional isomers of each type have the same Molec. formula

Chapter 4 outline

Physical properties

- Affected by van der Waals forces
- insoluble in H_2O
- Less dense than H_2O - will float
- surface area and size most important for bp
- state of matter determined by # of C's
 - 1-4 C's - gas, 5-17 C's - liquid, 18 C's - solid
- becomes more viscous as temperature goes up
- IR spec. bands: C-H stretching
C-H₂ bending

Alkanes \rightarrow all hydrocarbons, with single bonds.

\rightarrow Reactions of alkanes

- Naturally very stable

3 common reaction types

1) Combustion - Flammable - combine with O_2 and spark to form $CO_2 + H_2O$

- can form soot, provides energy, can be very dangerous

2) Hydrocracking \rightarrow larger alkanes are separated with high temp and catalyst to form smaller alkanes

3) Halogenation \rightarrow with light or heat, they react with chlorine gas or liquid bromine to produce Alkyl halides.
(not very useful yet)

Nomenclature of Alkanes, Cycloalkanes, and Bicyclic Alkanes.

IUPAC:

- (1) Name gives structure (2) One name per compound

Rules for naming:

- (1) Find the longest continuous carbon chain or ring
 - rings win in ties
 - Most substituents wins in equal lengths
- (2) Number the principle chain
 - Number chain/ring so the highest priority substituent gets the lowest number possible.
 - On rings the highest priority substituent is always #1
 - Two substituents on same carbon get numbered separately.
- (3) Name and Order Substituents and add to the root name
 - substituents are added to root name in alphabetical order.
 - when there are multiple identical substituents add di, tri, tetra, etc...
 - do not include "ane" in middle of name.
 - di - tri, are not part of the alphabetical name but cyclo is.

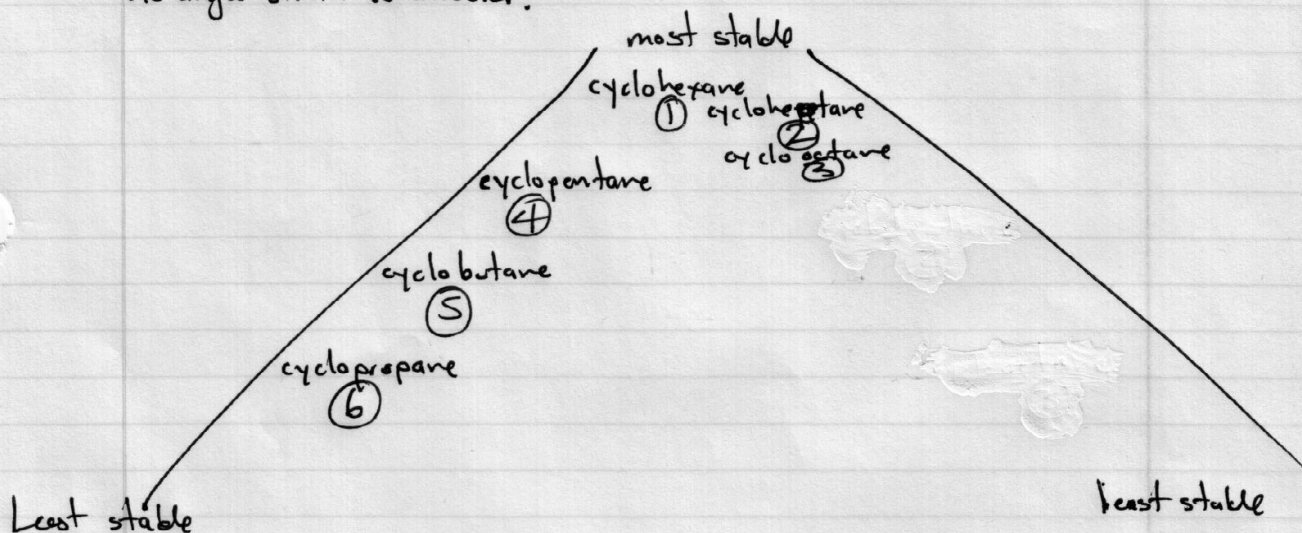
V. Stability of Cycloalkanes

Jahrel
Thompson
Chem 2310

Cyclic alkanes ^{most} stability = gives off most energy when made For the 6 cyclic (prop to oct)
Cyclic alkanes ^{less} stability = require energy to be made
In a ring, the ideal angle (C-C) is 109.5° ; since angles are not close to the ideal angle then it becomes less stable, higher in energy.

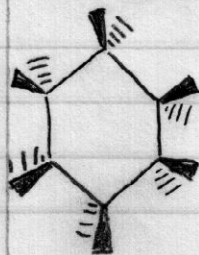
→ Cyclopentane/cyclooctane have a conformation close to 109.5° , not eclipsed but staggered substituents.

→ Cyclohexane is the most stable because its angles are actually 109.5° , no angle strain whatsoever!

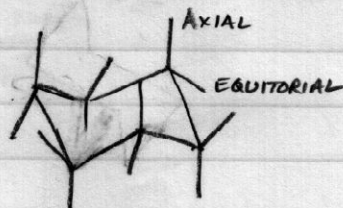


VI. CONFORMATIONS OF CYCLOHEXANE

• CYCLOHEXANS ARE COMMON CONFORMATION IN NATURE



TOP VIEW



SIDE VIEW

AXIAL ARE HIGHER ENERGY
THAN EQUATORIAL

4 - CONFORMATIONS

• BOAT, TWISTED, HALF-CHAIR & CHAIR - CHAIR BEING MOST STABLE.

AXIAL UP \Rightarrow EQUATORIAL UP

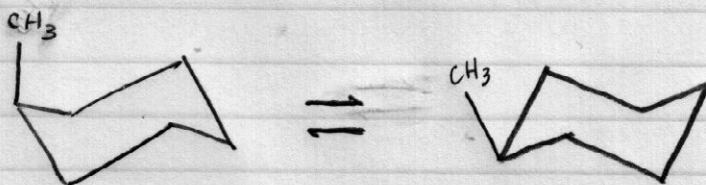
AXIAL DOWN \Rightarrow EQUATORIAL DOWN

EQUATORIAL UP \Rightarrow AXIAL UP

EQUATORIAL DOWN \Rightarrow AXIAL DOWN

* UP STAYS UP

DOWN STAYS DOWN



- 2 CONFORMATIONS -