The dihedral angle is the angle between the two-methyl groups.



Cycloalkane Conformations

Eg) Cyclopropane –bond angle 60°





Eg) Cyclopentane – bond angles nominally 108°



Eg) Cyclohexane – bond angles actually 109° not 120° as in flat hexagon



108⁰

With envelope conformation there are still bad H-H interactions.





Another way to draw cyclohexane:



Vertical Lines in Axial Position

Cyclohexane Conformations – How to draw:



Substituted Cyclohexanes - Draw most stable conformation



- Largest (bulkiest group close to ring) group generally placed equatorial – otherwise get unfavorable 1,3-diaxial interactions

- 1,3-diaxial interaction (steric effect) makes this conformation less stable.

Most Stable Conformation of Methylcyclohexane - 6 drawings of same molecule below



Polysubstituted cyclohexane

Isomers - different compounds with same molecular formula

Conformers – different shapes of the same molecule

Example: 1,2-dimethylcyclohexane and 1,4-dimethylcyclohexane



Example: 1-tert-butyl-3-methyl-cyclohexane



Note that the largest substituent (tert-butyl) is placed in the equatorial position to avoid destabilizing 1,3 diaxial interactions and the methyl is placed *syn* to the tert-butyl group.

Bicyclic structures

Trans-decalin:



Cis-decalin:





Norbornane



Adamantane



Steroid Backbone



Cholesterol



Testosterone - Male Hormone



Estradiol Female Hormone