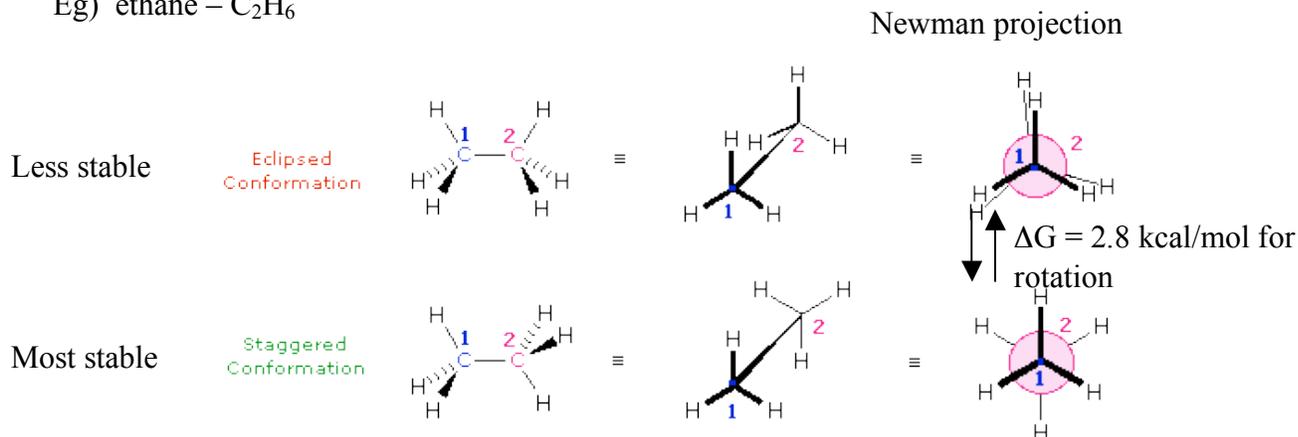


Conformations:

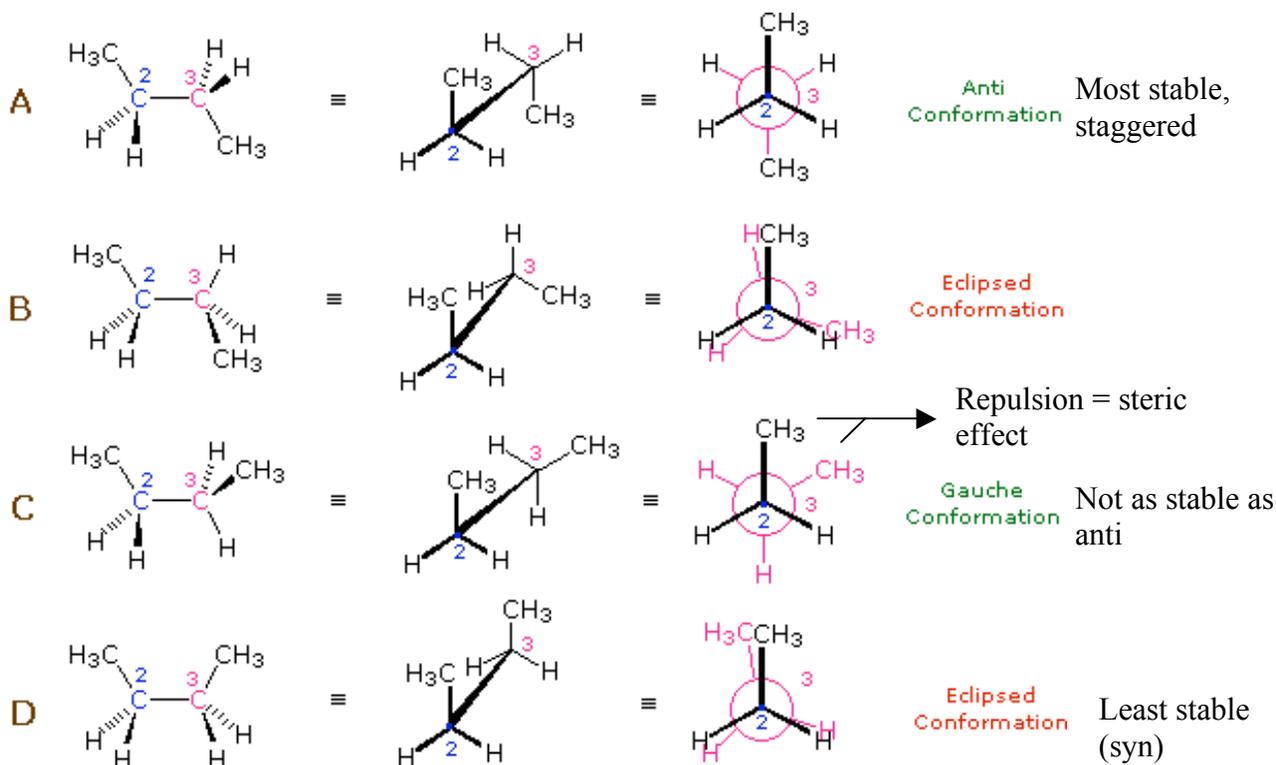
- Different 3-D shapes a molecule can assume by rotation around single bonds.

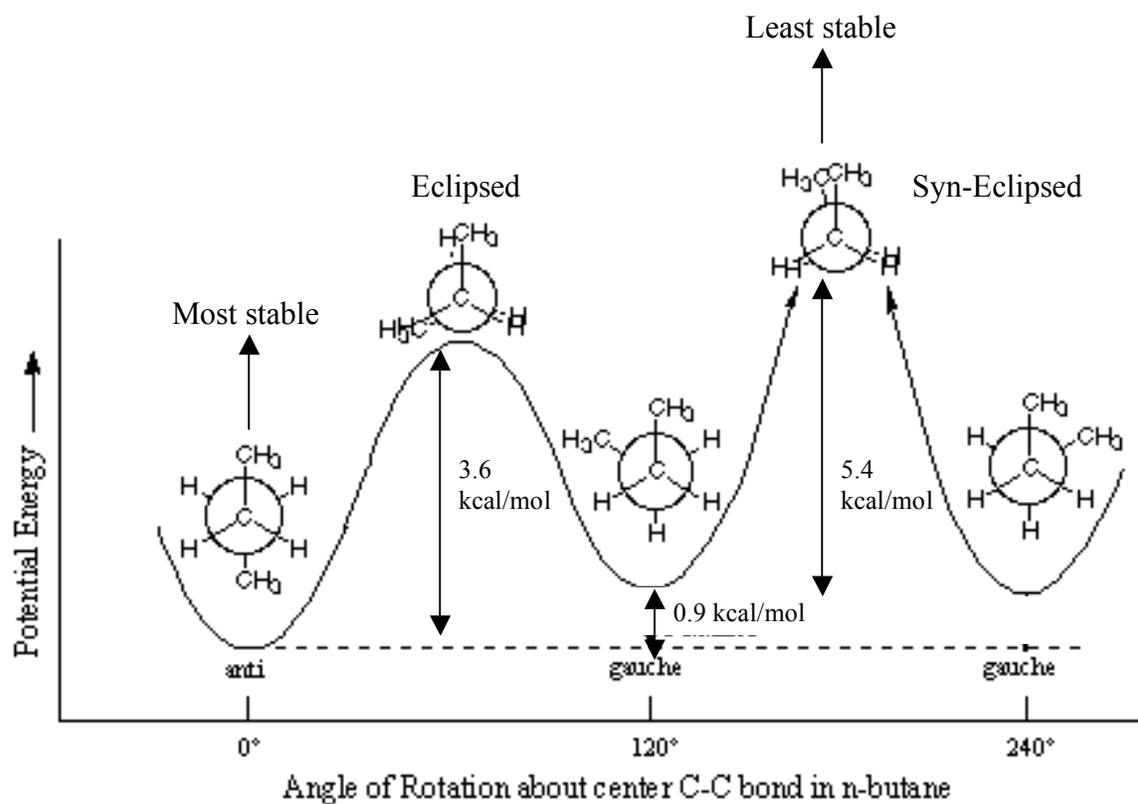
Eg) ethane – C_2H_6 

- Rotation occurs rapidly at room temperature.
- Room temperature = $\sim 15\text{-}20 \text{ kcal/mol}$ of energy available.

Eg) n-butane (C_4H_{10}) – rotation around all bonds still very rapid

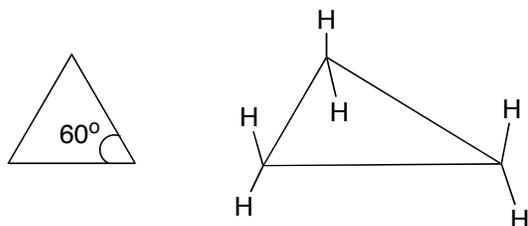
- most stable (most populated conformation) is called anti and has groups as far away as possible



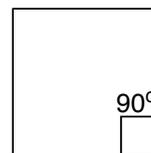


Cycloalkane Conformations

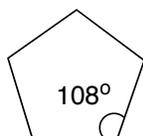
Eg) Cyclopropane – bond angle 60°



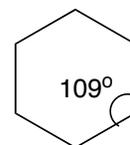
Eg) Cyclobutane – bond angle close to 90°



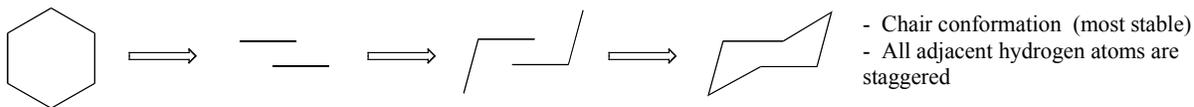
Eg) Cyclopentane – bond angles nominally 108°



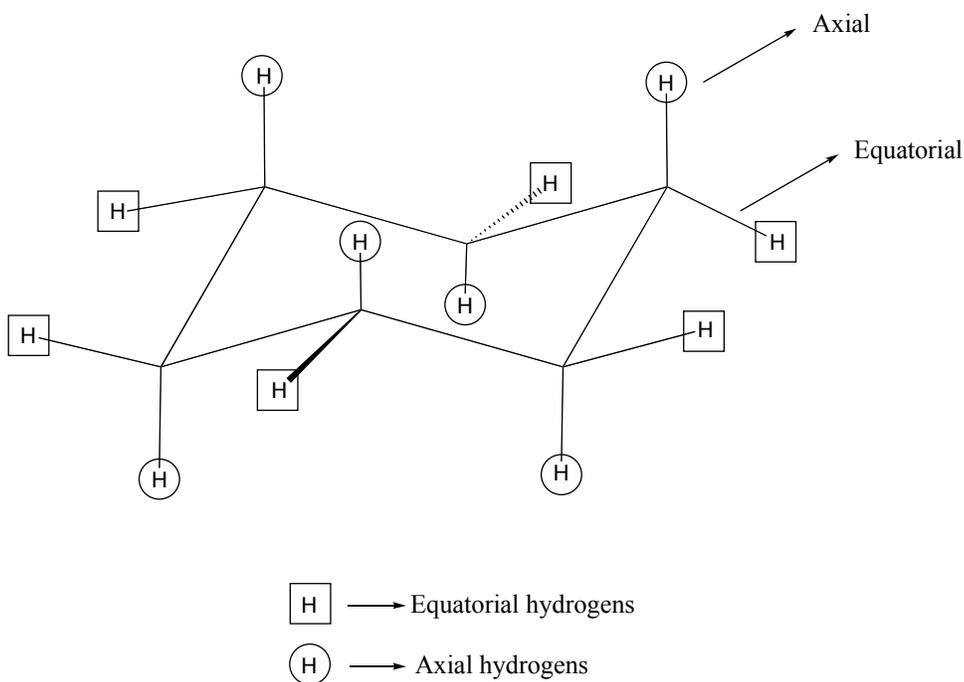
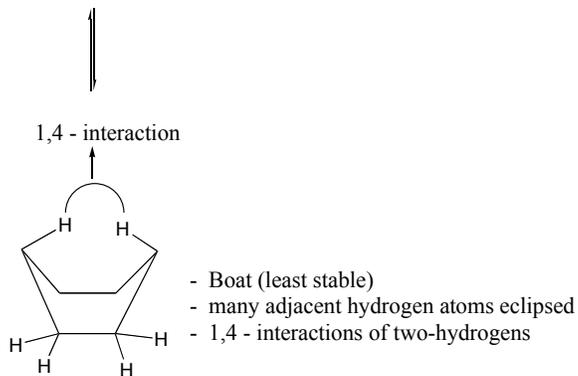
Eg) Cyclohexane – bond angles actually 109° not 120° as in flat hexagon



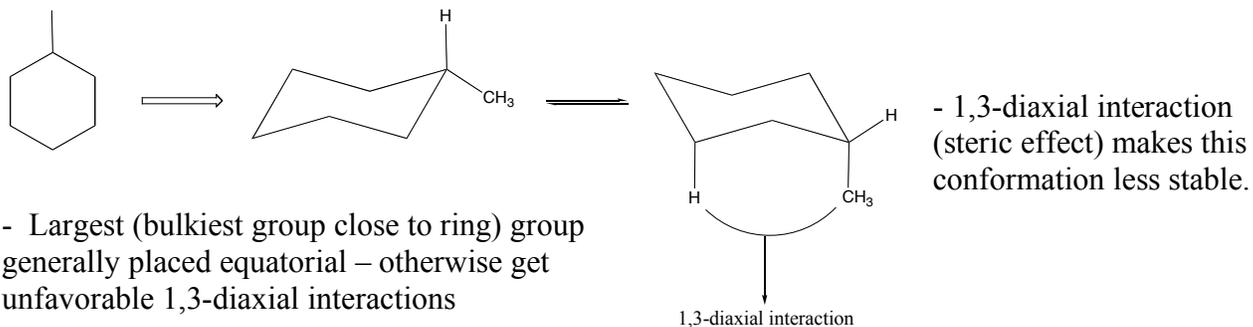
Cyclohexane Conformations – How to draw and what they mean



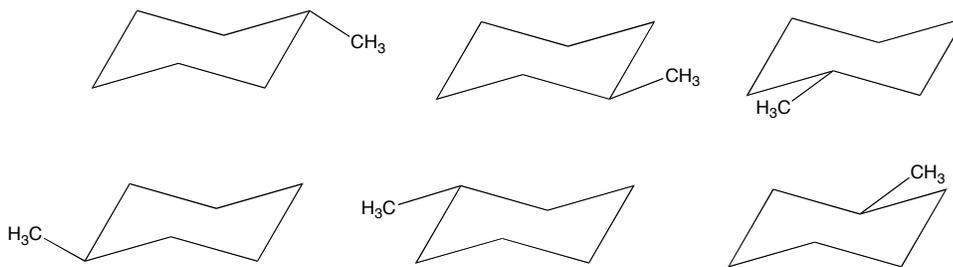
- 99% of the time cyclohexane is in chair conformation – but interconversion of conformations is rapid at room temperature



Substituted Cyclohexanes – Draw most stable conformation

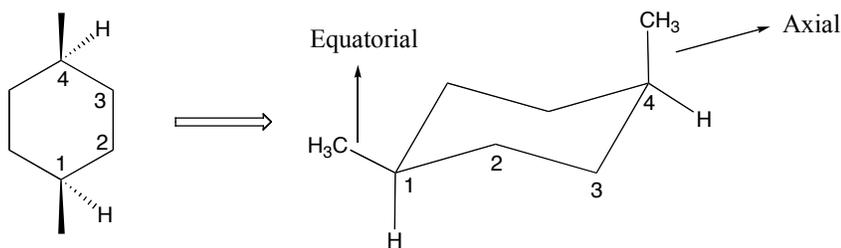


Most Stable Conformation of Methylcyclohexane – 6 drawings of same molecule below



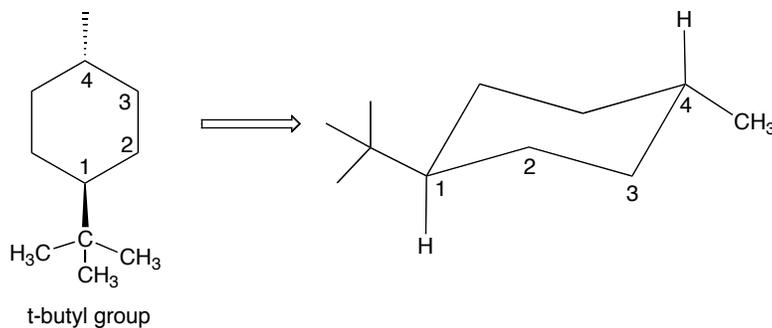
Substituted Cyclohexanes – draw most stable conformation

Eg #1 – cis-1,4-dimethylcyclohexane



1,4 - dimethylcyclohexane

Eg #2 – a trans-1,4-disubstituted cyclohexane

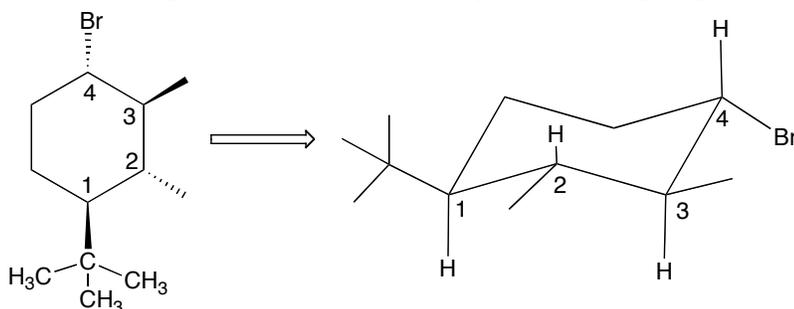


Generally, draw a chair, add the most bulky group at one end in equatorial position. The determine where the next group should go (which carbon and whether axial or equatorial) – remember: the given flat drawing geometry determines the 3D orientation

Eg. # 3 – A poly-substituted cyclohexane – most stable conformation ?

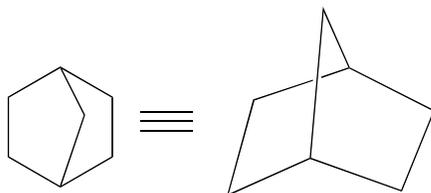
First draw chair conformation, then place bulkiest (largest) group (e.g. t-butyl) equatorial at one end.

Then work on which orientation the remaining substituents have based on the given “flat” geometry picture. So for position 2, the **methyl** must be below the hydrogen at the same carbon because at position 1 the **t-butyl group** is above the hydrogen at position 1 and trans geometry (opposite sides) is required for the relationship of the two groups (methyl and t-butyl). Etc.

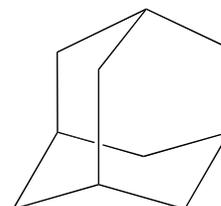


Other ring systems – see additional graphics pages at our web site

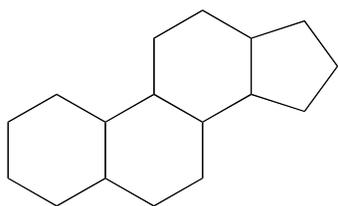
Norbornane



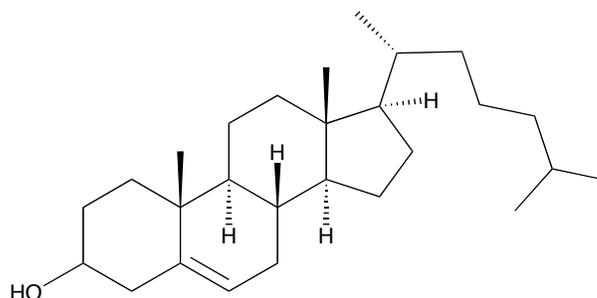
Adamantane
(part of diamond structure)



Adamantane



Steroid



cholesterol