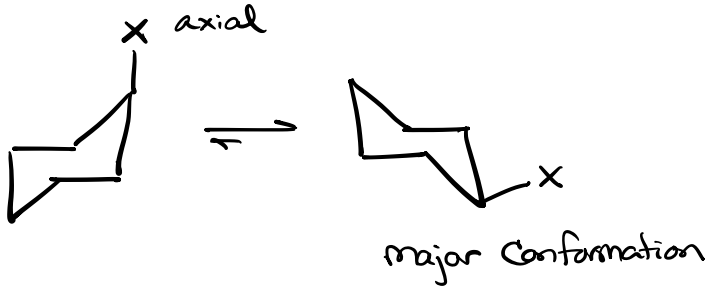
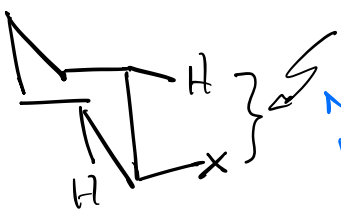
Six Member Ring Conformations



Two reasons

① 

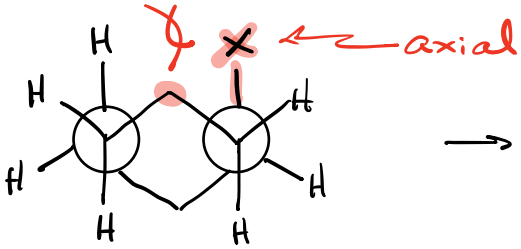
1,3-diaxial Steric interactions
Raise the energy of System

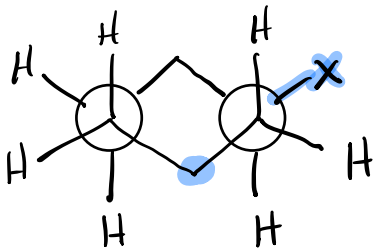


larger than 1,3-diaxial

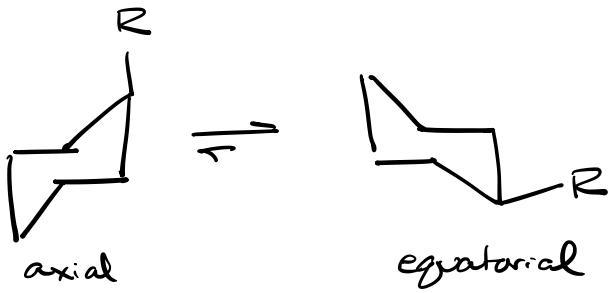
Now there are no 1,3-diaxial with the substituent

② Gauche





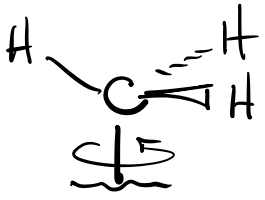
anti to ring Carbon and is lower energy



R	% equatorial @ RT
$-CH_3$	95%
$-F$	60%
t-butyl	99.99%
isopropyl	97%
$-Cl$	70%
$-OH$	83%
ethyl	96%

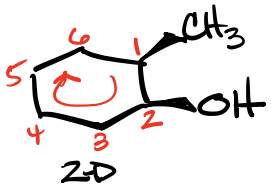
The larger the group the higher the % in equatorial position.

95% in eq



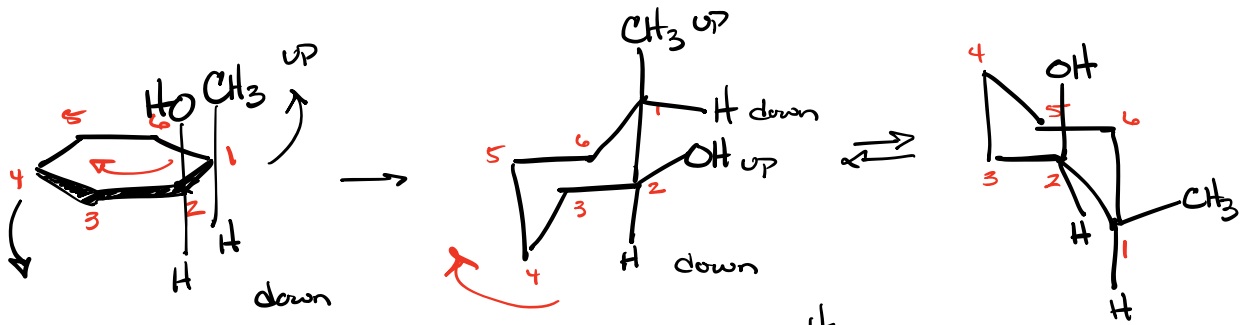
83% in eq

Smaller than a methyl

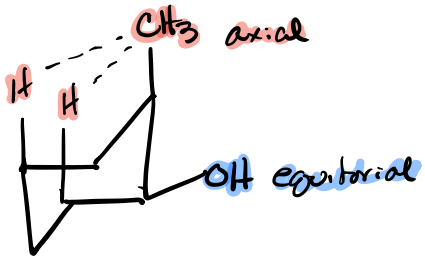


What is the lowest energy conformation?

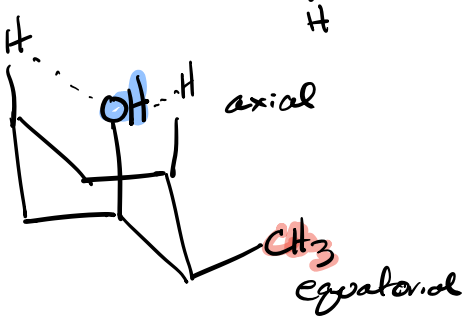
2-D → 3-D → Draw both conformations & analyze



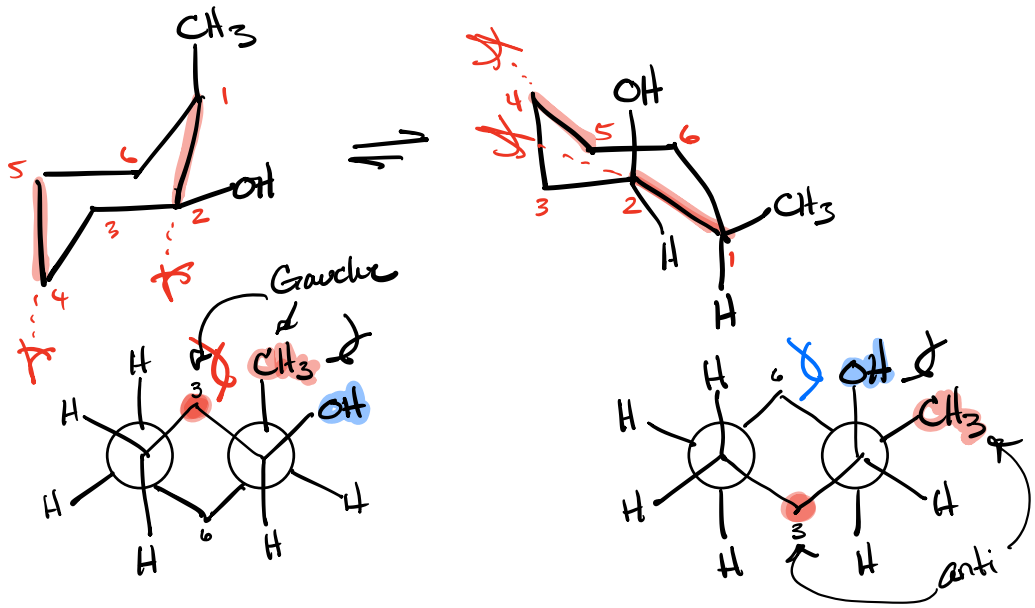
①



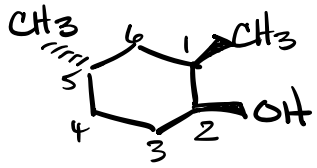
- Strong 1,3-diaxial w/ large group (methyl)
- Small group equatorial



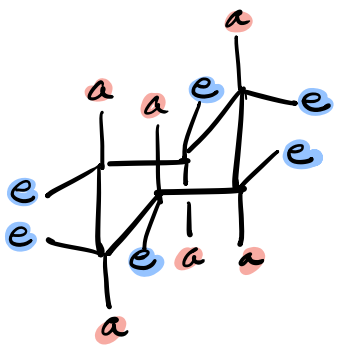
- lower 1,3-diaxials
- larger group in eq

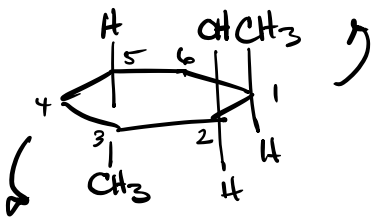


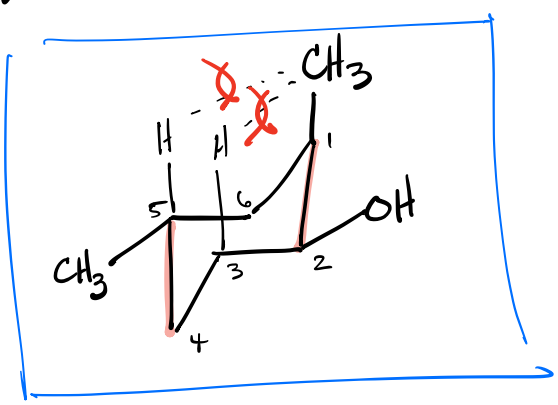
3 Substituents



lowest energy Conformation ?

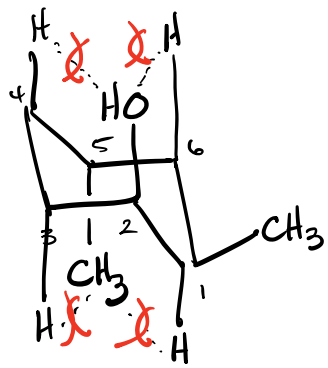






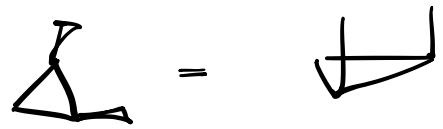
axial = 1 methyl
equatorial = 2 methyl, hydroxyl

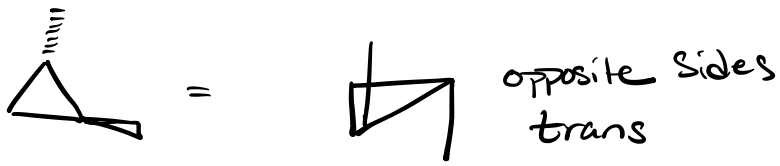
Lower energy

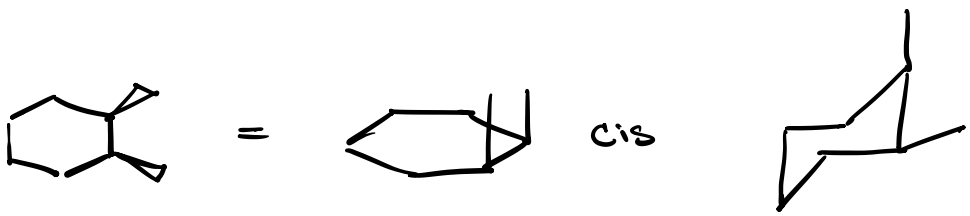


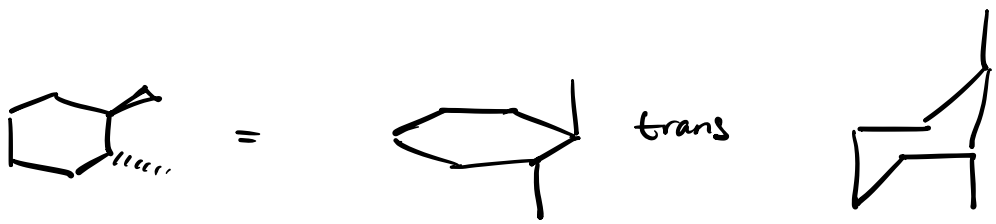
axial = 2 methyl, hydroxyl
equatorial = 1 methyl
Higher 1,3-diaxial
Higher energy

Stereochemistry



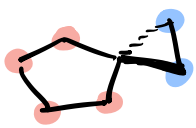






Multiple Rings — Joined Rings

Spiro Compounds



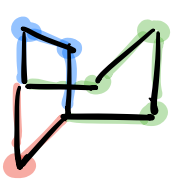
5 Carbons total
pentane

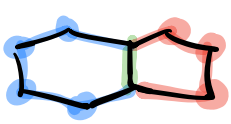
Spiro [2,2] pentane

Spiro [2,4] heptane

#'s go in increasing order

Bicyclo



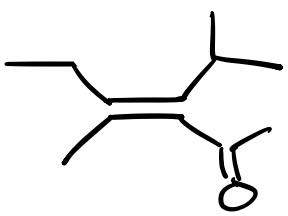


Bicyclo [3,2,1] octane

Bicyclo [4,3,0] nonane

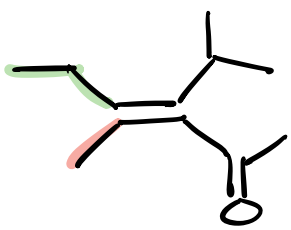
#'s go in decreasing order

Stereochemistry of alkenes

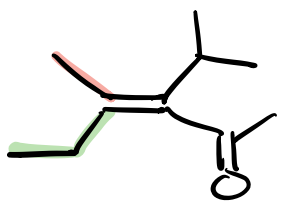


Cis or trans ?

not well described by cis & trans



isomers



(E) vs (Z)

(E) Entgagen = "opposite" trans

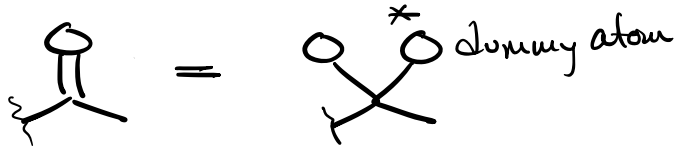
(Z) Zusammen = "Together" cis

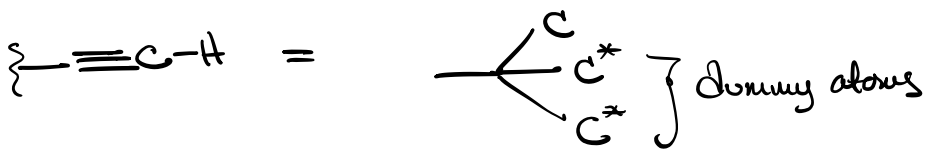
Cahn-Ingold-Prelog Rules

Assignment of priorities of Substituents

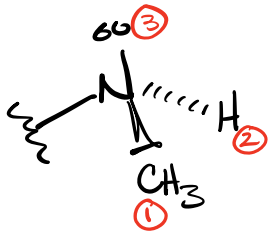
① The higher the atomic # at first point of difference, the higher the priority

② Use dummy atoms for double bonds & tripple bonds

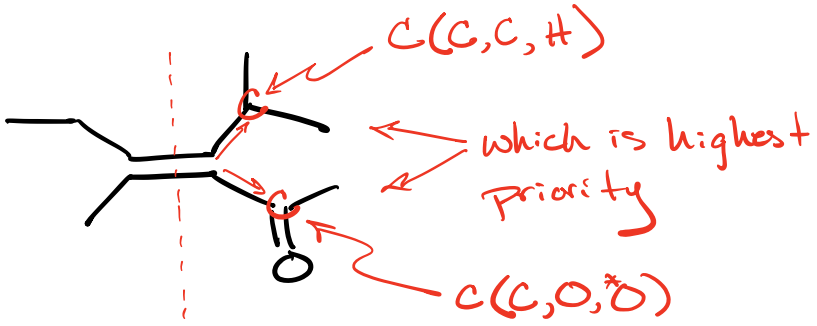




③ Lone pairs have lowest priority as a group



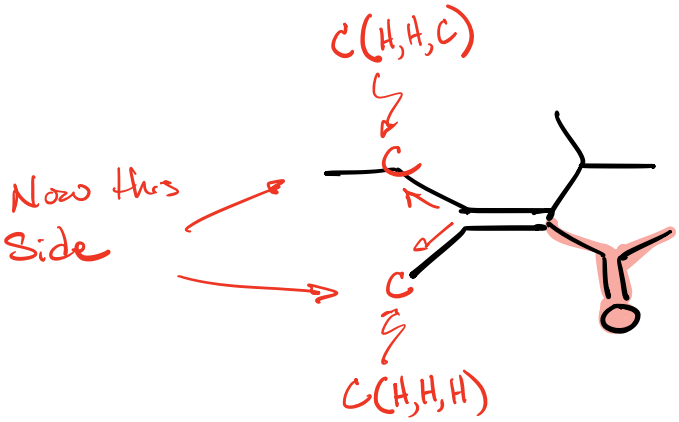
C > H > ∞



- Both Carbons have same atomic #

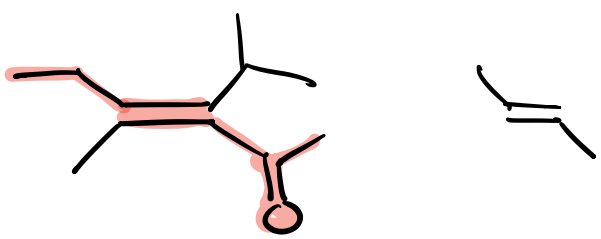
- C(C,C,H) vs C(C,O,*O)

Higher atomic # priority

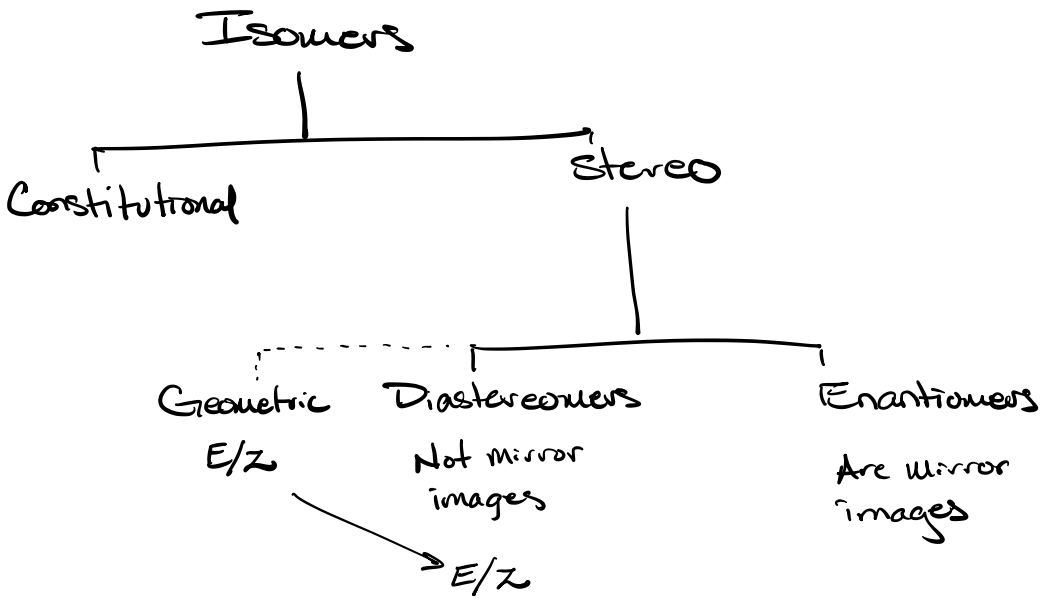


C(H,H,H) vs. C(C,H,H)

Carbon higher atomic # Priority



(E) alkene



If Rotation makes two molecules the same
⇒ Different Conformations of same molecule

If you need to break a bond and reconnect in new pattern to make two molecules the same
⇒ Isomers