

Today
Chap 3

Finish Nomenclature

Sections 3.8 – 3.10
Structures and properties of organic molecules

Sections 3.11 – 3.15
Rotation about single C–C bonds and
conformations of cyclohexanes

~~Next Class~~

Monday

Sections 3.11 – 3.15
Rotation about single C–C bonds and
conformations of cyclohexanes

Sections 4.1 and 4.2
Isomers and the stereoisomers of alkenes

Test on Chap 1 and 2 on Friday, October 14

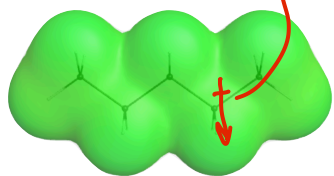
Review Session on Thursday, October 13, from 7:30 to 9:00 in Wilson 130 and in Zoom space. This is not a prepared presentation it is a question and answer period.

Wednesdays lab will be doing the Caffeine Extraction lab. Website will be updated shortly.

Intermolecular Interactions

Section 3.9, 3.10

pentane



or spontaneous random dipole can interact with other molecules

slightly positive outside and slightly negative inside

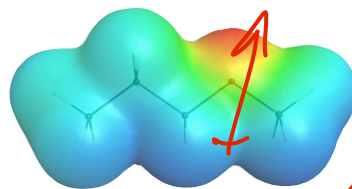
BP 35.9 °C
 H C
 eneg difference 2.1 vs 2.5
 is relatively low
 less strongly attracted to each other

only LDF

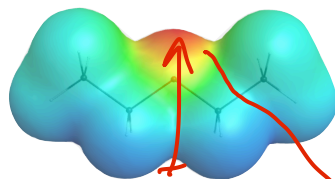
heptane 101 °C

IMF: London Dispersion Forces

methoxy butane



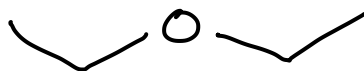
slightly polar



40.2 °C

36.4 °C

ethoxy ethane

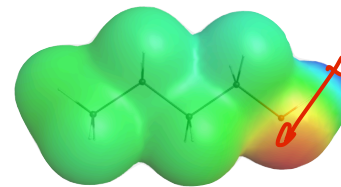


red means e⁻ rich

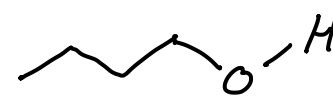
blue is electron poor

LDF + dipole-dipole

1-butanol



polar functional group



117 °C

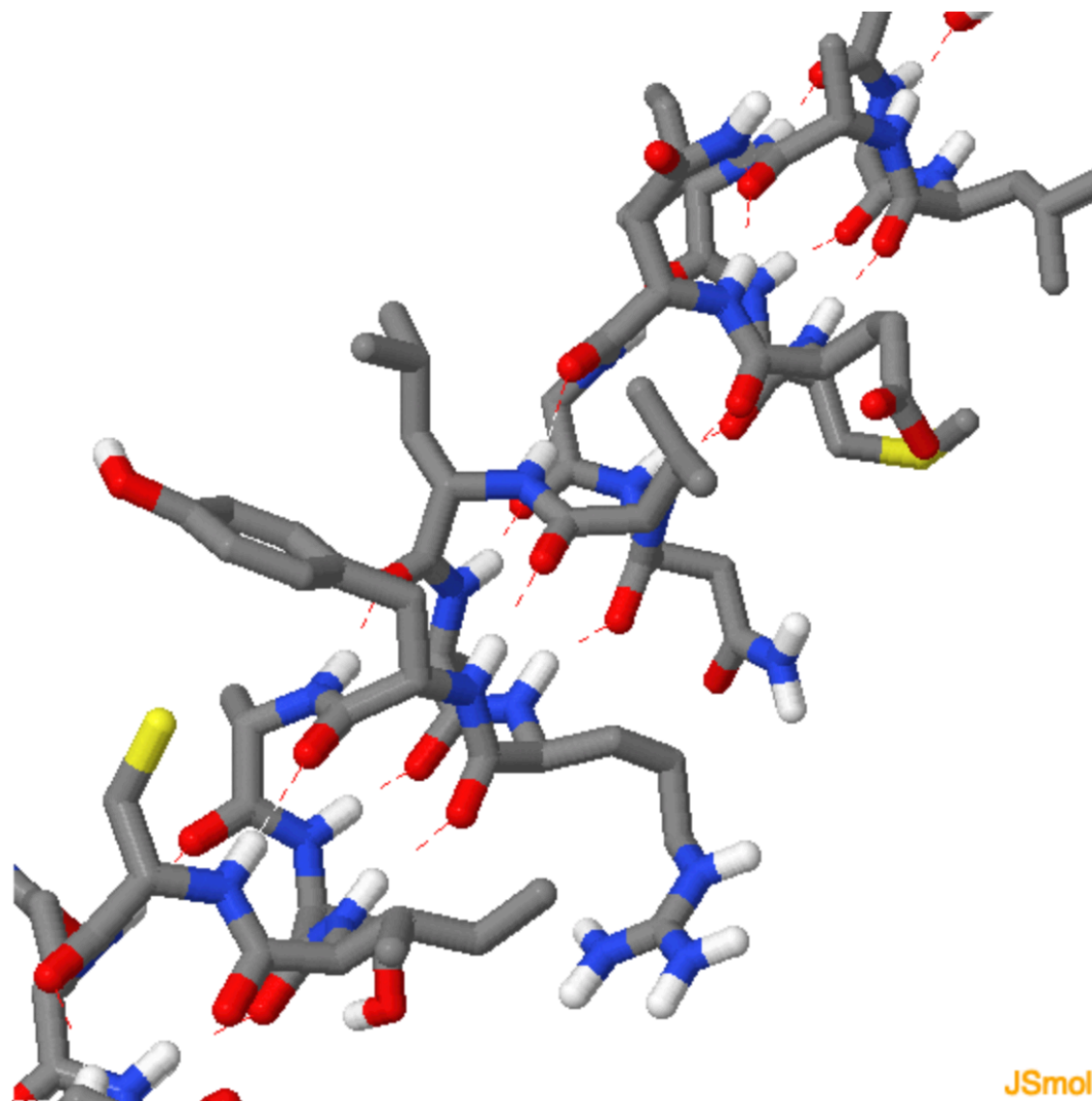
relatively high BP

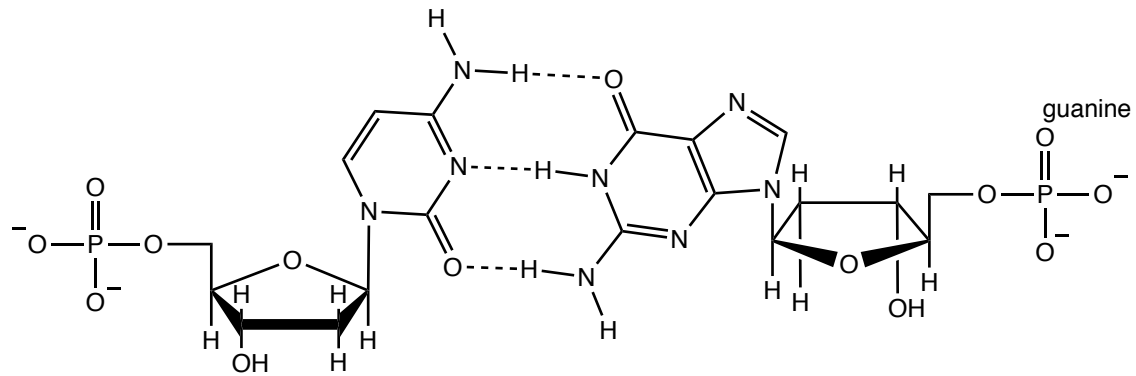
molecules are strongly attracted to each other

LDF +

dipole-dipole

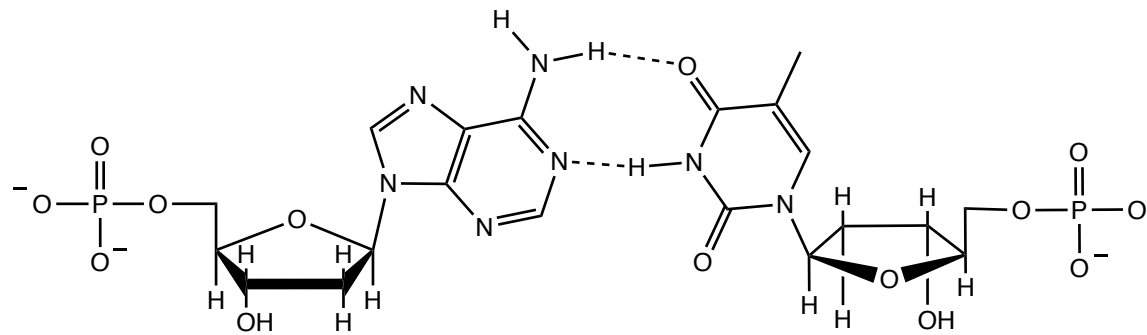
H-bonding





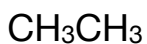
deoxycytidine monophosphate

deoxyguanosine monophosphate

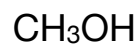


deoxyadenosine monophosphate

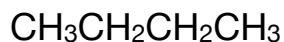
deoxythymidine monophosphate



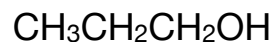
vs



vs



vs



} miscible in any proportion

0.038 g in
1 L of H2O



vs

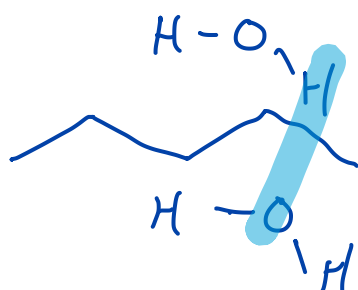


10 g 100 mL

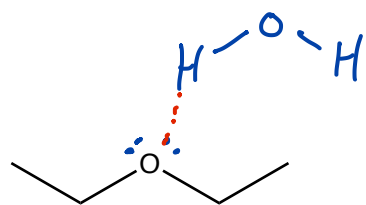
100 g 1 L

(an OH group can drag nonpolar alcohol groups into aqueous solution

not soluble because these alkanes interfere with H-bonding in H2O

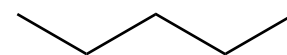


to dissolve in H2O the alkanes would have to disrupt the H-bonding interactions



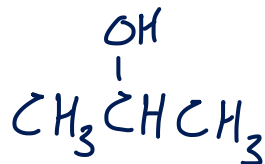
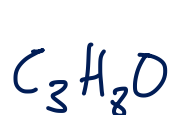
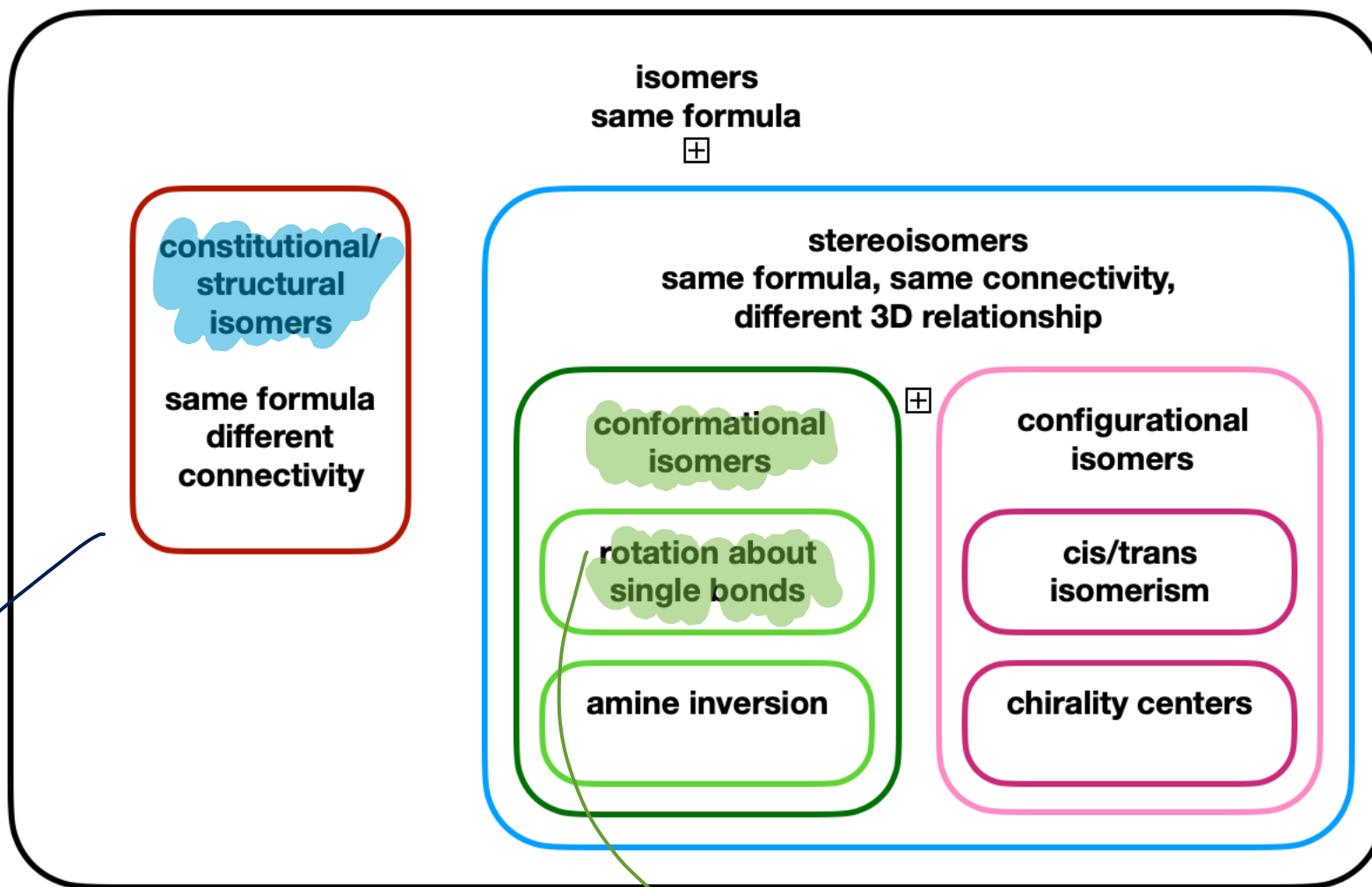
60 g in 1 L H_2O

not an H bond
donor... but it
is an H bond
acceptor



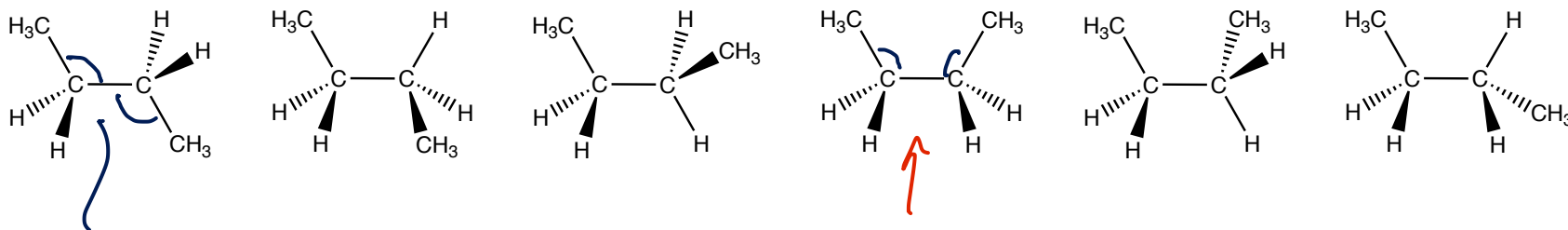
0.038 g in 1 L 1

Isomers



today's
topic

these are rotamers



bond angles were 112°

bond angles were 116°

$e^- - e^-$ repulsion causes the angle to be greater than 109.5°

$e^- - e^-$ repulsion even greater here + pushes bond angles even further

orbitals don't overlap as well as the bond angles get further from ideal

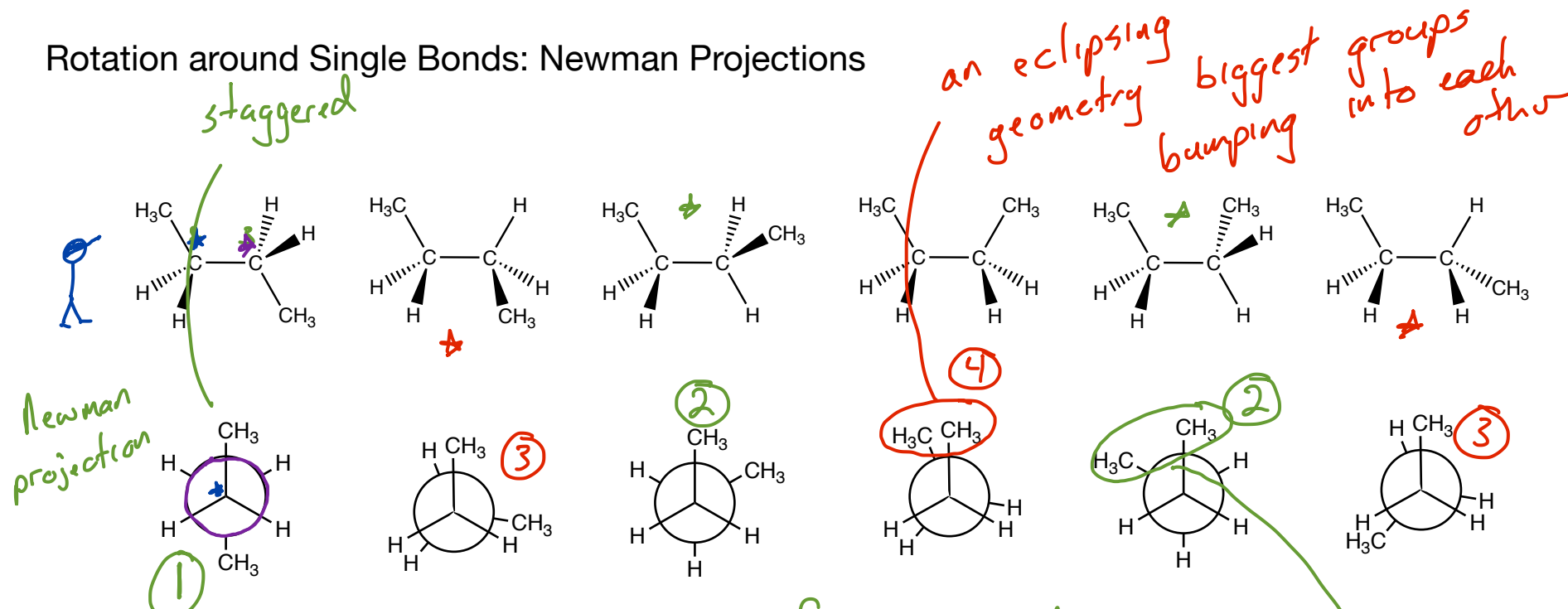
higher in energy

<https://www.westfield.ma.edu/PersonalPages/cmasi/organic/newman/newman-plain.html>

lower in E

Rotation around Single Bonds: Newman Projections

3.11



look at the molecule along 1 of the bonds
 the C atom in front is at the intersection of the 3 bonds
 the 2nd C atom on the bond is drawn as a circle
 & the 3 lines represent the 3 bonds

gauche interactions raise the E of these rotomers

staggered geometries where the large groups are close... we have gauche interaction

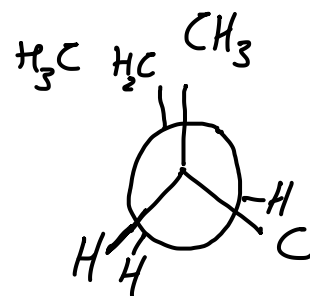
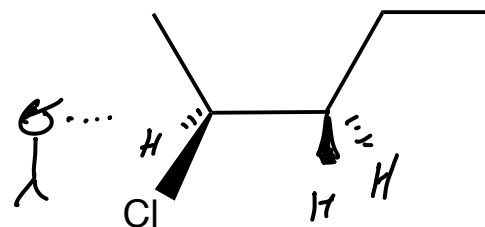
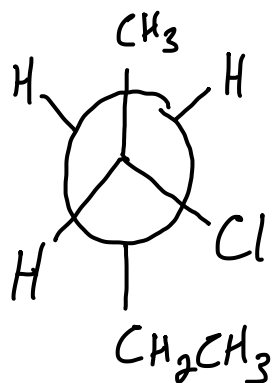
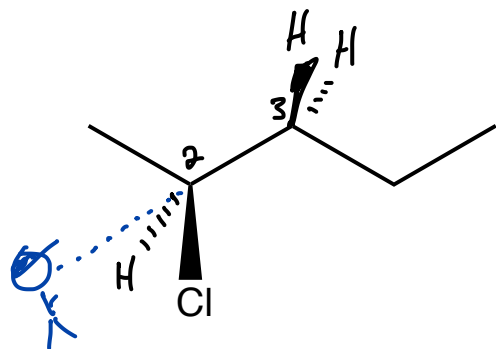
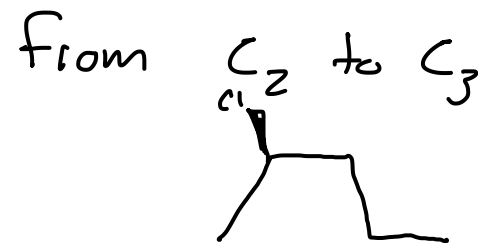
Showing 3-D Relationships (stereochemistry) Using Newman Projections

Section 3.11

Drawn as though one is looking along a bond

Front carbon is a where three bonds come together

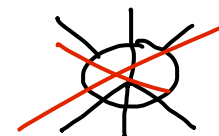
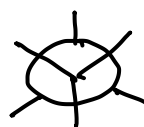
Back carbon is a large circle



Zig Zag skeletal structures
give staggered geometries

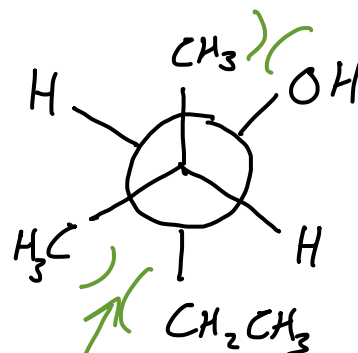
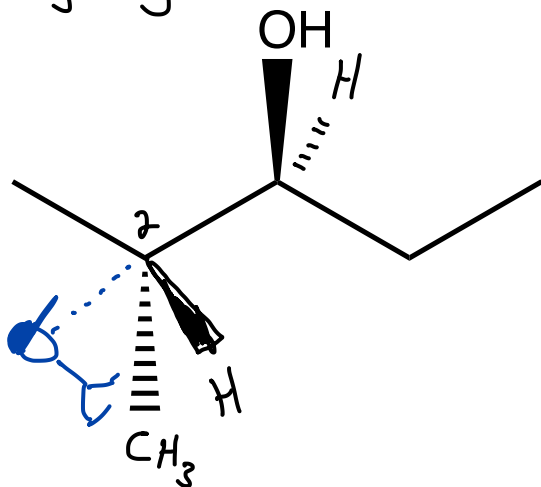


or



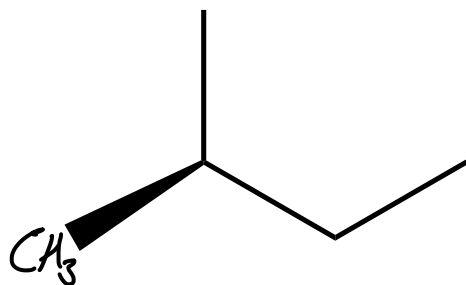
Draw the Newman projection along the C₂ to C₃ bond in the following structure

Zig Zag = Staggered



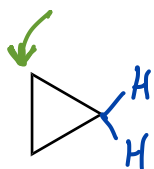
gauche interaction

Draw the Newman projection along the C₃ to C₂ bond in the following structure



Ring Strain and the Structure of Cycloalkanes

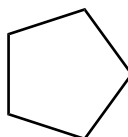
Section 3.12



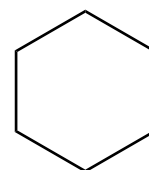
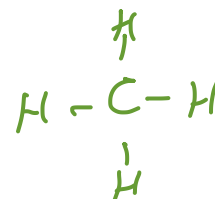
60



90



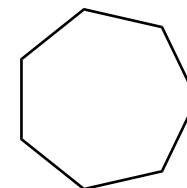
108



~~120~~

111°

very stable



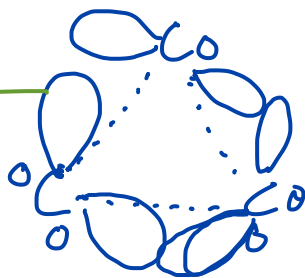
~~128~~

112 ish

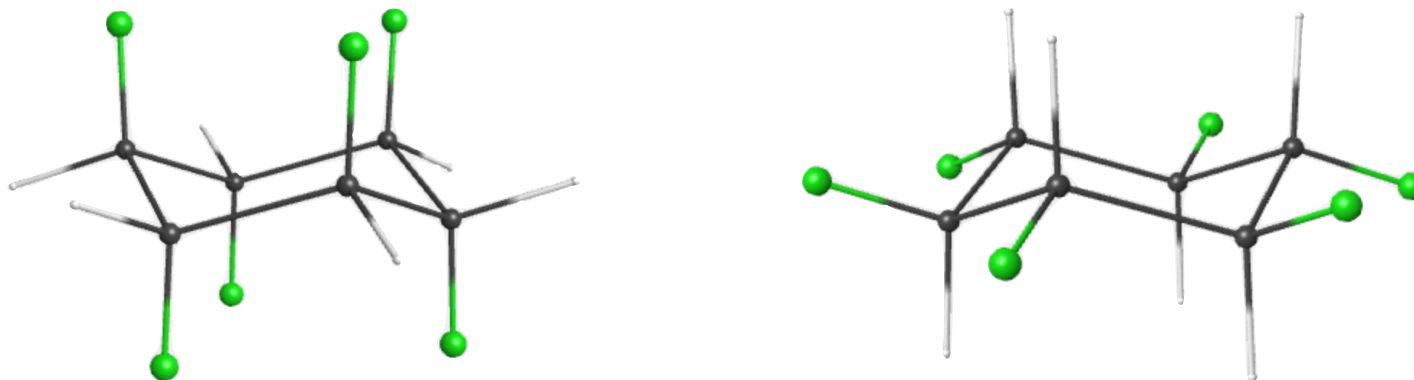
- these are also very reactive
- all of the 's' eclipse the 't's' on the next C

The C atoms in these alkanes are sp^3 which means orbitals point out at 109.5ish degrees

the e^- 's aren't directly between nuclei "banana bonds"



much more stable because bond angles more closely match the 109.5° sp^3 hybridized orbitals



Isomers

