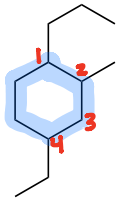
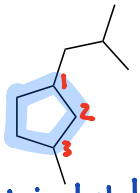
Answer Key

Chemistry 233
Chapter 4 Problem Set

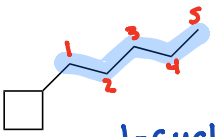
1) Determine the systematic (IUPAC) name for each alkane compound below.



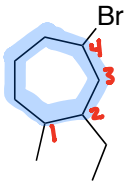
4-ethyl-2-methyl-1-propylcyclohexane



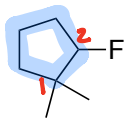
1-isobutyl-3-methylcyclopentane
or
1-methyl-3-(2-methylpropyl)cyclopentane



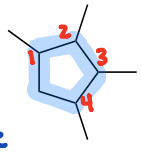
1-cyclobutylpentane



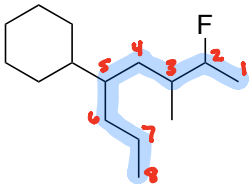
4-bromo-2-ethyl-1-methylcycloheptane



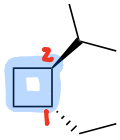
2-fluoro-1,1-dimethylcyclopentane



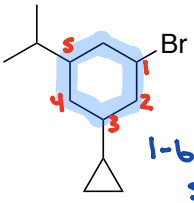
1,2,3,4-tetramethylcyclopentane



5-cyclohexyl-2-fluoro-3-methyloctane



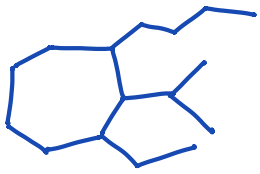
trans-1-ethyl-2-isopropylcyclobutane



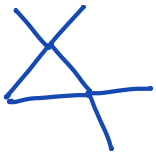
1-bromo-3-cyclopropyl-5-isopropylcyclohexane

2) Draw the structure that corresponds to each name below.

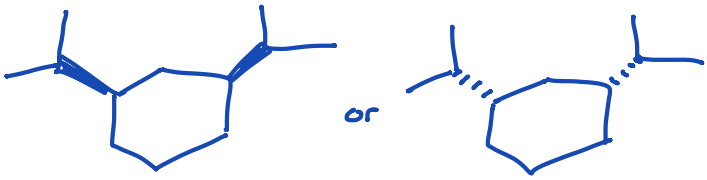
1-butyl-3-ethyl-2-isopropylcycloheptane



1,1,2,2-tetramethylcyclopropane

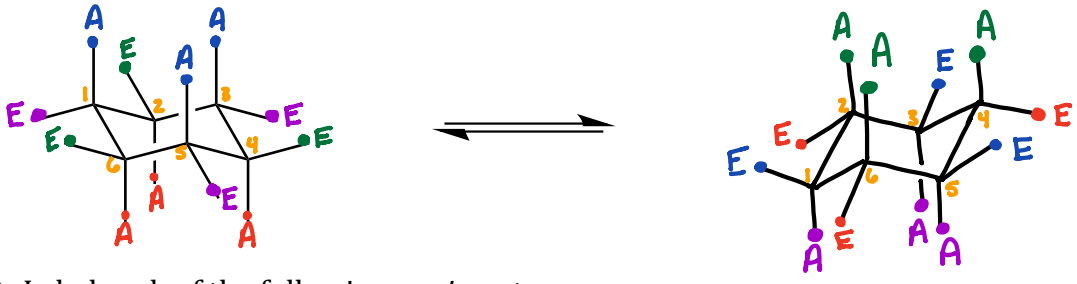


cis-1,3-diisopropylcyclohexane

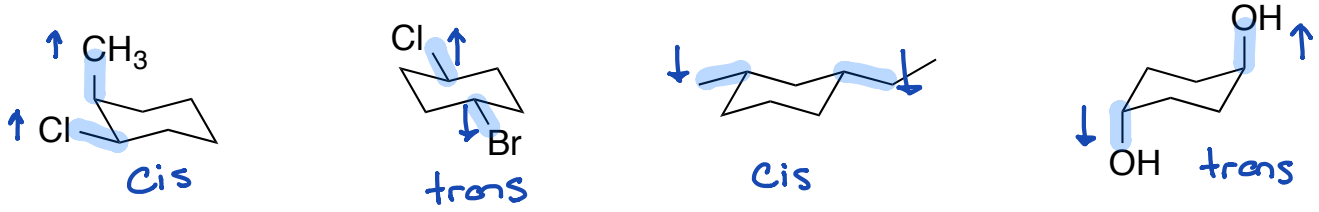


trans-1-ethyl-2-methylcyclobutane

3) Draw the ring flipped conformation then label every axial and every equatorial position on both.

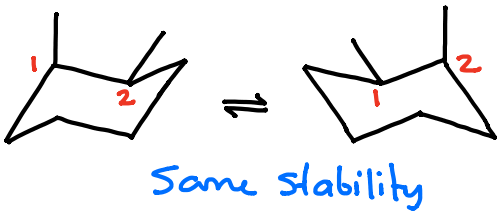


4) Label each of the following as *cis* or *trans.*



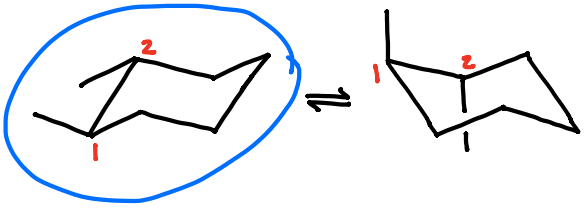
5) Draw both chair conformations for each of the following compounds. Circle the conformation that is more stable. you can choose any C on the ring as C#1.

cis-1,2-dimethylcyclohexane

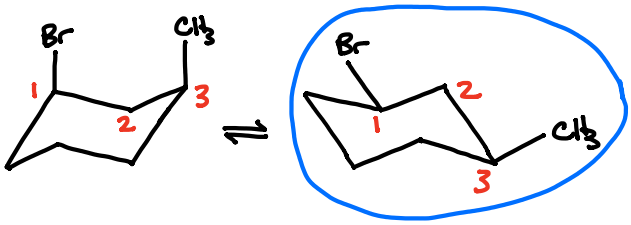


Same stability

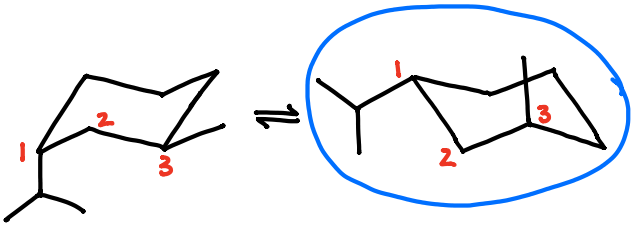
trans-1,2-dimethylcyclohexane



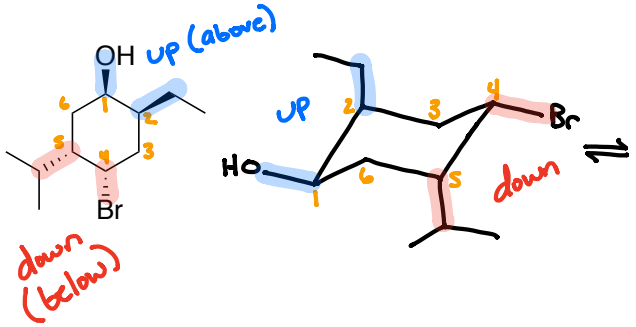
cis-1-bromo-3-methylcyclohexane

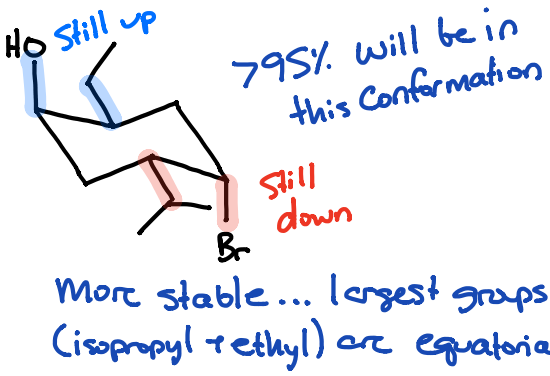


trans-1-isopropyl-3-methylcyclohexane



6) For the compound shown below: (a) draw both chair conformations, (b) determine which one is more stable, (c) determine the conformation that >95% of the molecules will be in at equilibrium.

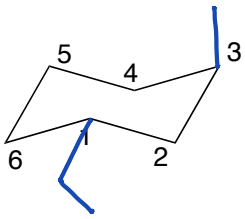




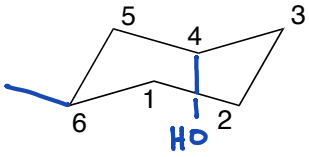
795% will be in this conformation

More stable... largest groups (isopropyl + ethyl) are equatorial

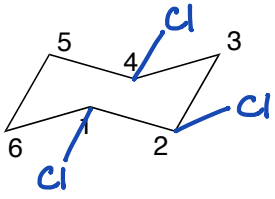
7) Using the chair below as a template, draw a structure that meets the following criteria.
   a) Axial methyl at C3, equatorial ethyl at C1



   b) Equatorial methyl at C6 and axial OH at C4



   c) Equatorial Cl groups at C1, C2, and C4

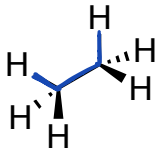


Deviation from ideal bond angle

Eclipsing atoms separated by 3 bonds

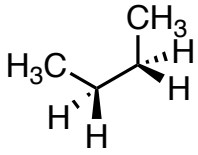
Interacting groups w/ > 3 bond separation (do not have to be eclipsed)

8) Identify the types of strain present (angle, torsional, or steric) in each of the following.



3 x H/H eclipses

Torsional Strain

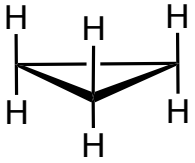


C/C eclipse

2 x H/H eclipses

Torsional Strain

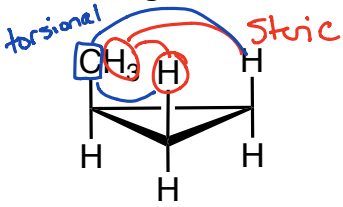
Steric strain b/t the H's in the two methyl groups



6 x H/H eclipses

Torsional Strain

Angle Strain due to the small ring



4 x H/H eclipses

2 x C/H eclipses

Torsional Strain

Steric strain b/t the H's on the two methyl and H's of the ring.

Angle Strain due to the small ring