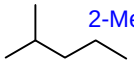
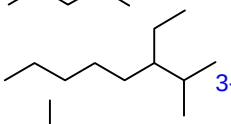
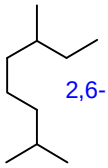
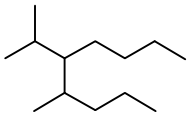
CHM 1321A
Assignment #2 Answers

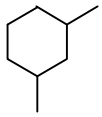
1) Provide names for the following compounds

a)  2-Methylpentane

b)  3-Ethyl-2-methyloctane

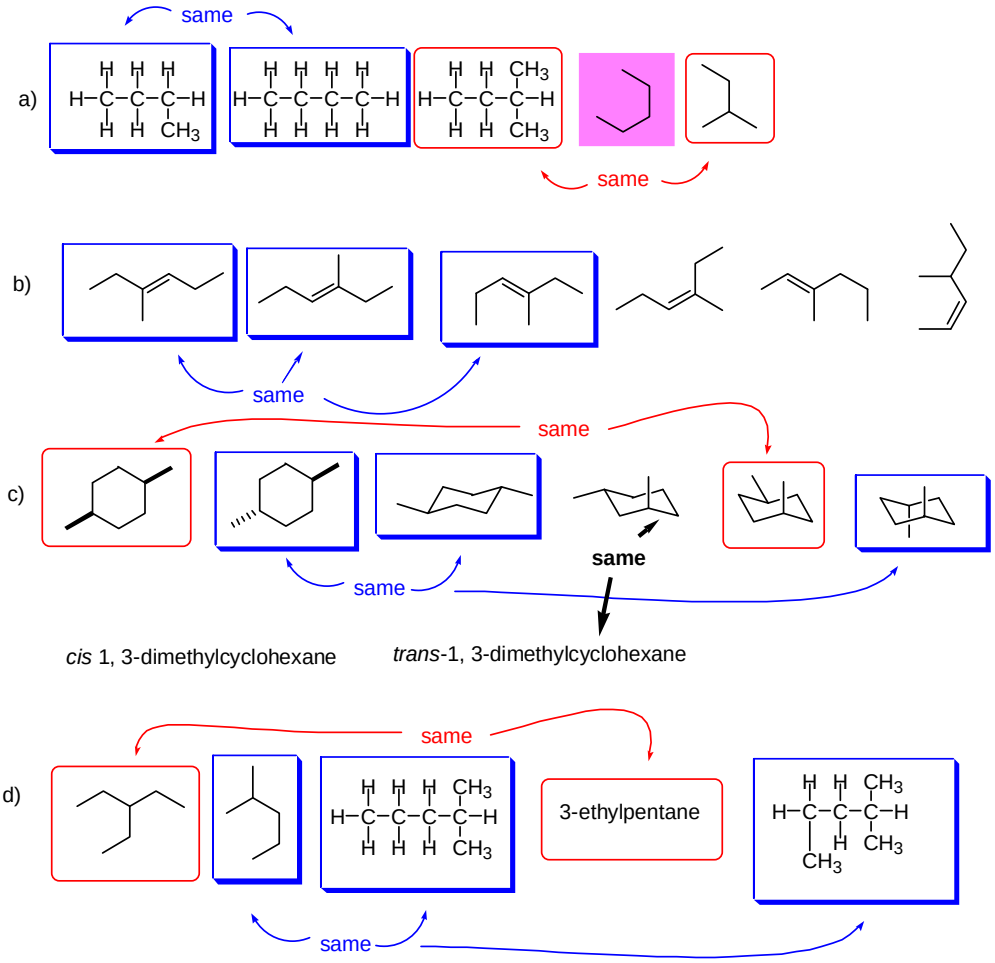
c)  2,6-Dimethyloctane

d)  4-Methyl-5-(1-methylethyl)nonane
or
4-methyl-5-isopropylnonane

e)  1,3-Dimethylcyclohexane

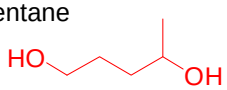
2) Which of the following represent different compounds? Which represent the same compound?
(This question is easier to do if you use models, especially for the cyclic structures.)

(molecules that are the same in each part are grouped with similar shaped and colored boxes)

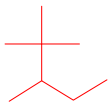


3) Draw the following molecules using line notation.

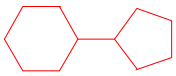
a) 1,4-dihydroxypentane



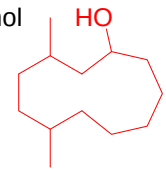
b) 2,2,3-trimethylpentane



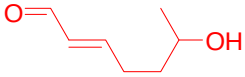
c) cyclopentylcyclohexane



d) 3,6-dimethylcycloundecanol



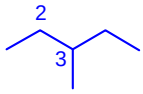
e) $CH_3CHOHCH_2CH_2CHCHCHO$



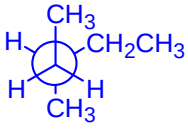
4) Use a Newman projection, about the indicated bond, to draw the most stable conformer for each compound. What is the least stable conformer of each?

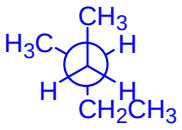
(Only one set of answers are shown for each question. This is because there are many ways to draw a Newman projection. For example, it does not matter which side of the bond you draw the projection from. The angle of the front carbon on the paper does not matter. What is important is whether groups are eclipsed or staggered, the attachment of substituents to the bond in question, and the proper angles between substituents on a given carbon. If you are unsure, check with your TA or Prof.)

a) 3-methylpentane about the C2-C3 bond.

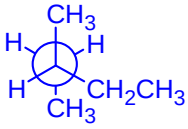


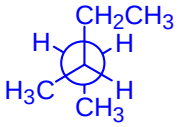
Newman projections C2 in front



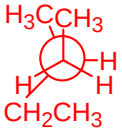


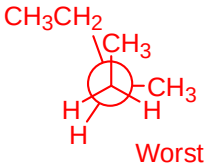
Newman projections C2 in back

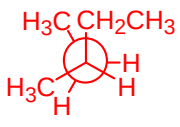


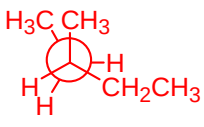


Best conformers (Anti Staggered)
(Energies similar,
but slight preference for ethyl in anti position)



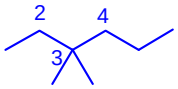






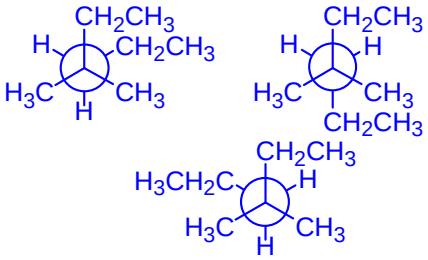
Worst conformers (Alkyl groups eclipsed)
(Energies similar)

b) 3, 3-dimethyl hexane about the C3-C4 bond

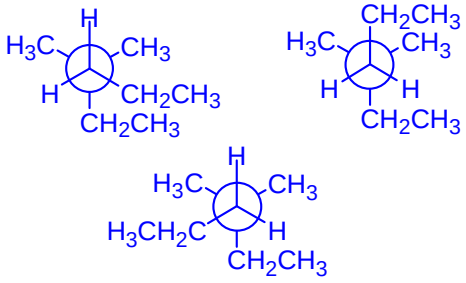


Best conformers (Anti Staggered)
(Energies similar)

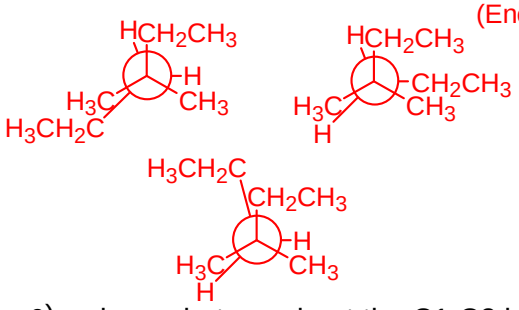
Newman projections C3 in front

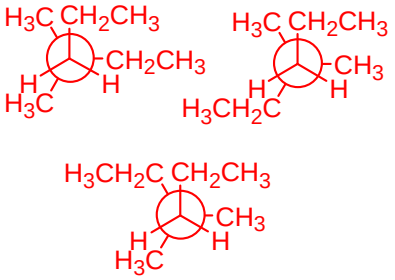


Newman projections C3 in back

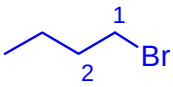


Worst conformers (Alkyl groups eclipsed)
(Energies similar)

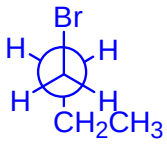




c) bromobutane about the C1-C2 bond

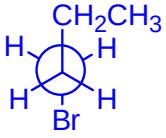


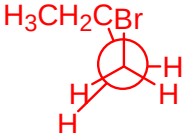
Newman projections C1 in front



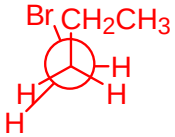
Best conformer (Anti Staggered)

Newman projections C1 in back

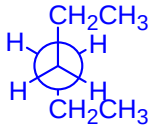




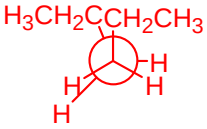
Worst conformer (large groups eclipsed)



d) 

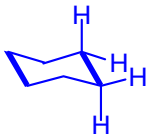


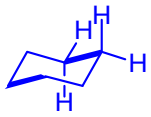
Best conformer (Anti Staggered)

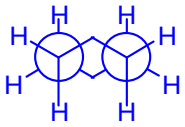


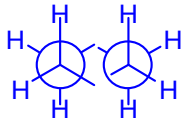
Worst conformer (large groups eclipsed)

e) 

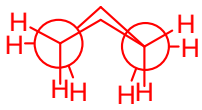






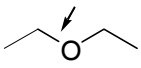


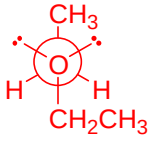
Best conformers (Staggered)
Chairs



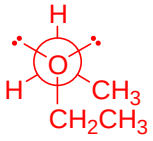
Worst conformer (eclipsed)
(Boat, view is of bond shown)

5) Use a Newman projection, about the indicated bond, to draw the most stable conformer for each compound. Draw the least stable conformer of each. Draw the conformer that has the second-lowest energy.

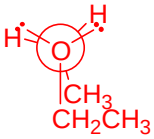
a) 



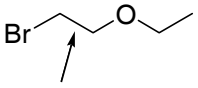
anti staggered
most stable

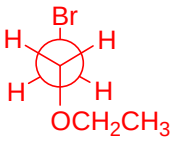


gauche staggered
second most stable

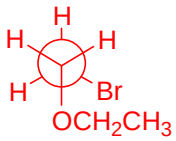


eclipsed
least stable

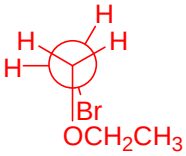
b) 



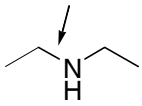
anti staggered
most stable

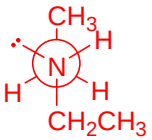


gauche staggered
second most stable

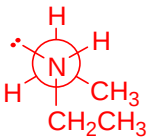


eclipsed
least stable

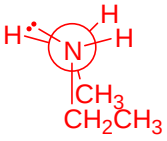
c) 



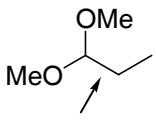
anti staggered
most stable

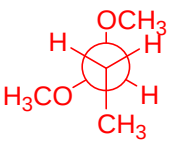


gauche staggered
second most stable

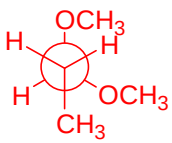


eclipsed
least stable

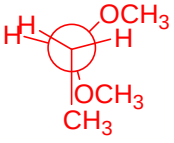
d) 



staggered
most stable



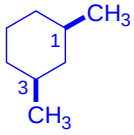
staggered
second most stable

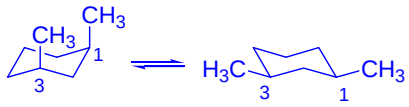


eclipsed
least stable

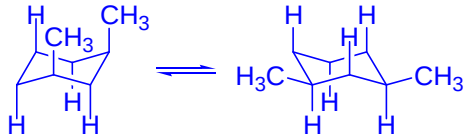
6) Consider cis-1, 3-dimethylcyclohexane.

a) Draw the two chair conformations using line notation.

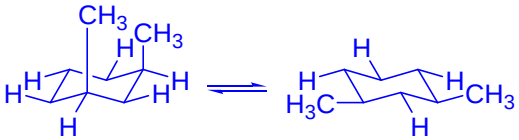




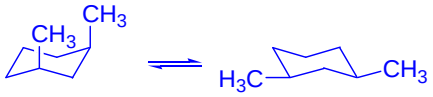
b) Re-draw the two chair conformations showing all the axial hydrogens.



c) Re-draw the two chair conformations showing all the equatorial hydrogens.



d) Label the high and low energy conformers in part a

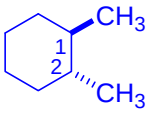


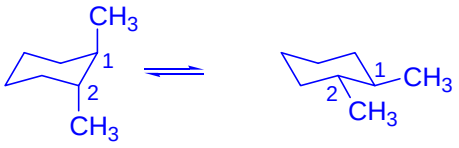
High Energy
(Both Me's axial)

Low Energy
(Both Me's equatorial)

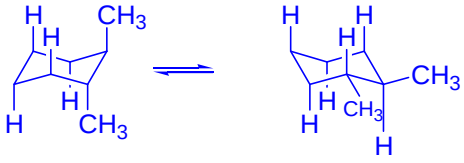
note: Me = CH_3

7) Repeat question 9 for trans-1, 2-dimethylcyclohexane.

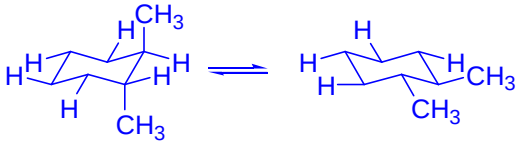




Axial H's



Equatorial H's

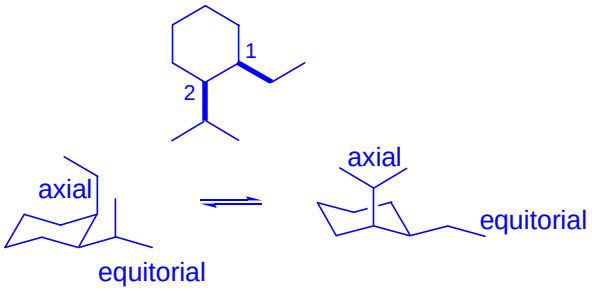


High Energy
(Both Me's axial)

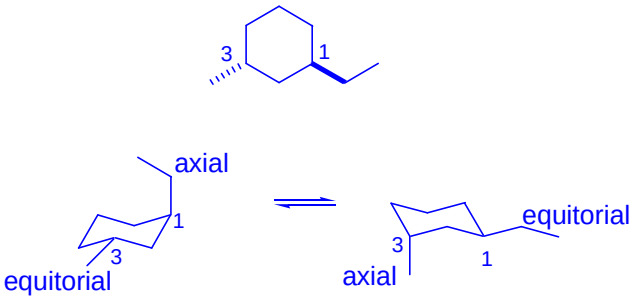
Low Energy
(Both Me's equatorial)

8) Draw the two chair conformations of each compound listed below. For each structure, label the substituents (groups other than hydrogen) as being axial and equatorial.

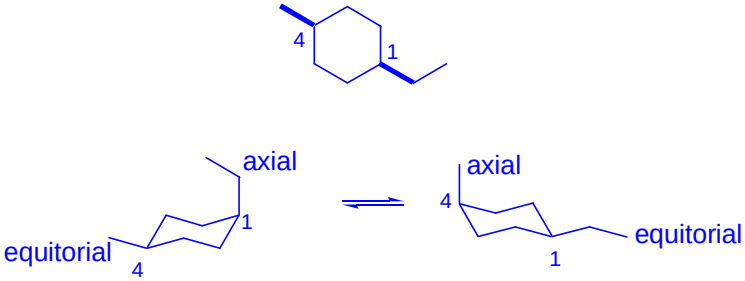
a) *cis*-1-ethyl-2-isopropylcyclohexane



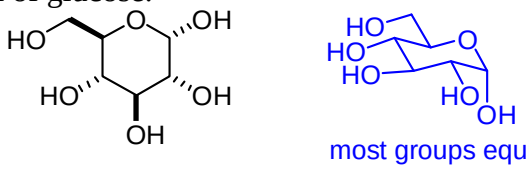
b) *trans*-1-ethyl-3-methylcyclohexane



c) *cis*-1-ethyl-4-methylcyclohexane



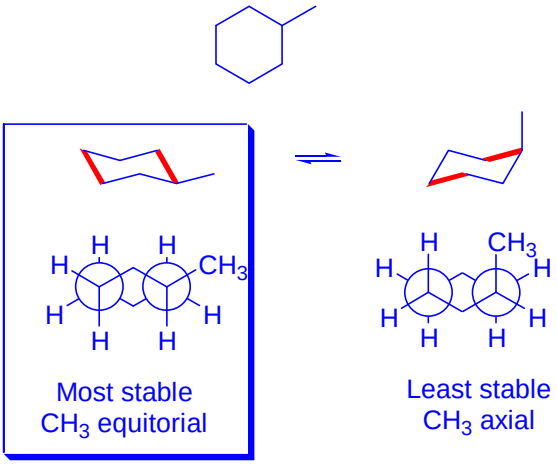
9) Draw the most stable form of glucose.



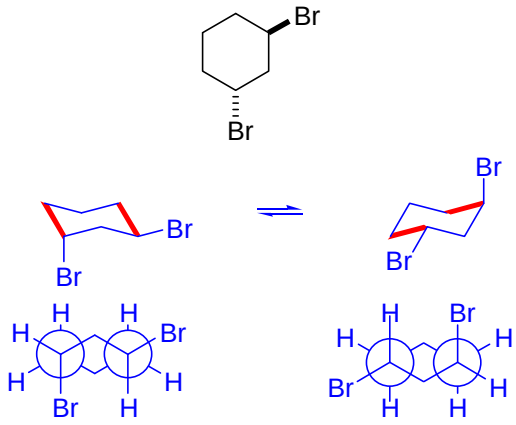
most groups equitorial

10) Draw the Newman projection of methylcyclohexane about the C1-C2 bond for the most stable and least stable chair conformers. Clearly identify which is which, and briefly justify your choice.

(Bonds in Newman projection are shown in red on the chairs. Note that these are the same bonds in each structure)



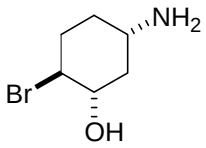
11) Draw the Newman projections of the two chair conformations of trans-1, 3-dibromocyclohexane (hint check out figure 4-6). Identify the most and least stable conformers (if any).

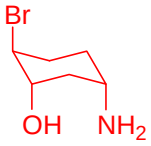


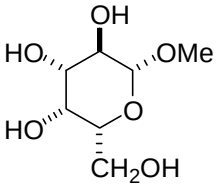
Chairs equal energy - each has 1 equatorial and 1 axial bromine

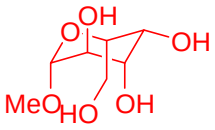
Note: heavy bonds are shown in projections above

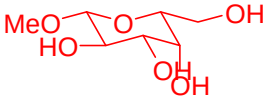
12) Draw each of the following structures in both chair forms.

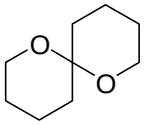
a) 



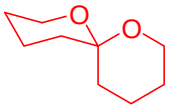
b) 

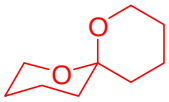


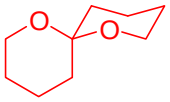


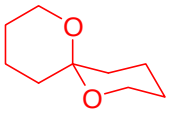
c) 

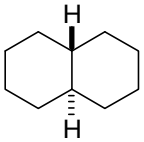
(more than 2 structures are possible)





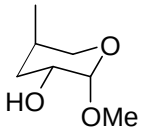


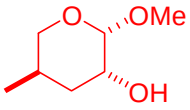


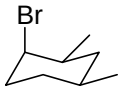
d) 

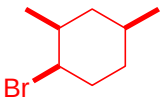
(only 1 structure is possible)

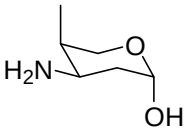
13) Draw each of the following using line notation indicating stereochemistry

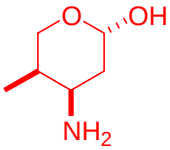
a) 

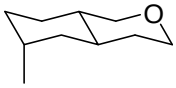


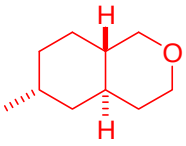
b) 



c) 



d) 



Note: it is common to show hydrogens at positions where rings fuse