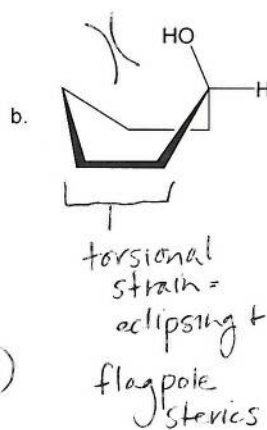
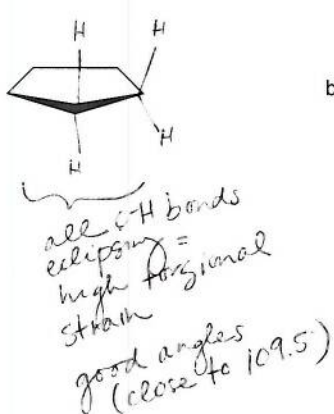
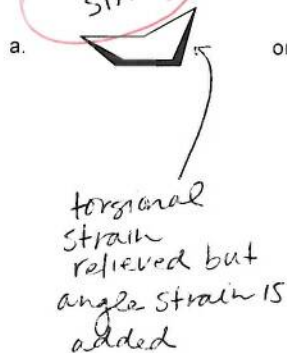
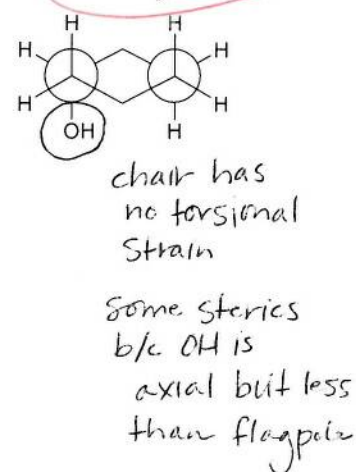


1. (20 pts) For each pair of molecules shown, circle the more stable structure. Provide a description of the origin(s) of the difference in stability, using words, labels, and drawings as needed.

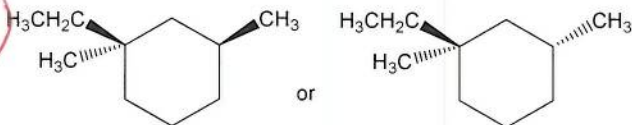
**MORE STABLE**



**MORE STABLE**

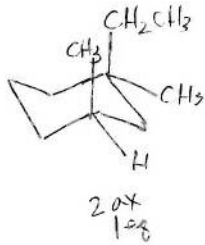
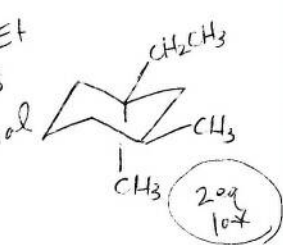


**MORE STABLE**

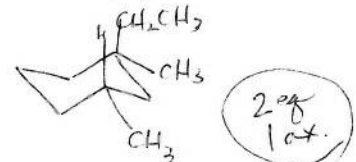
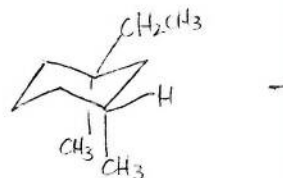


you must draw the relevant chair conformations to receive credit

bigger Et group is equatorial

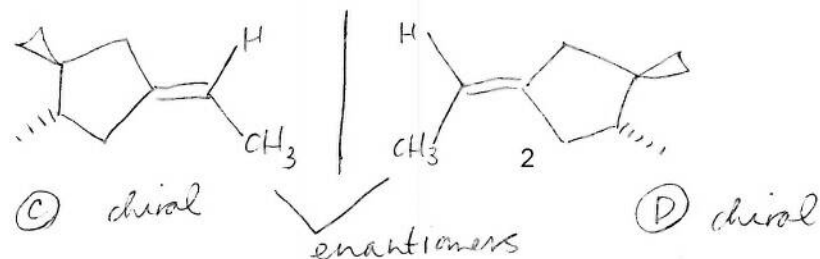
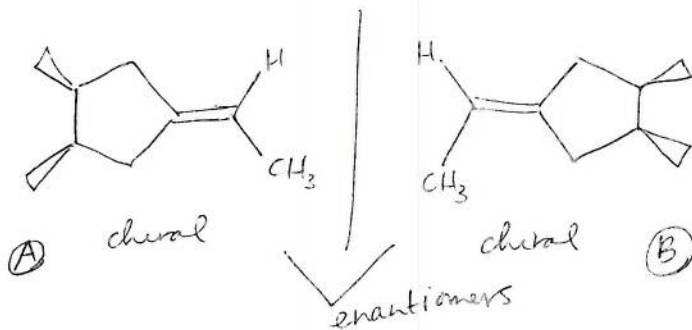
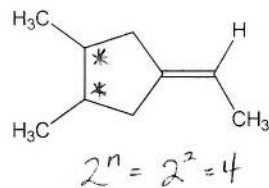


$2 \text{ ax } 1 \text{ eq}$



bigger Et group is axial

2. (10 pts) For the molecule shown to the right, draw all stereoisomers. Label each structure as chiral, achiral, or meso. Give the relationship between the stereoisomers (enantiomers, diastereomers).



A/C, A/D } diastereomer  
B/C, B/D }

3. (11 pts) Shown below is the structure of prostaglandin (+)-PGE<sub>2</sub>.

a. The total number of stereoisomers for this molecule (including the isomer shown) is \_\_\_\_\_  $2^{4+2} = 2^6$

b. Assign the absolute configuration, *R* or *S*, for the chirality center that is indicated by the asterisk. You must show priorities.

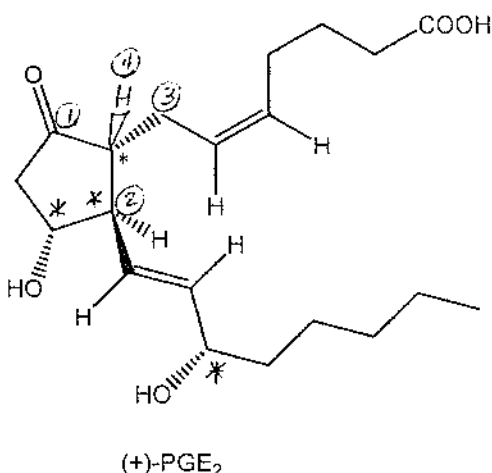
*R*

c. If the chirality center indicated by the asterisk is inverted (the dashed bond becomes a wedge), the resulting compound would have what relationship to (+)-PGE<sub>2</sub>?

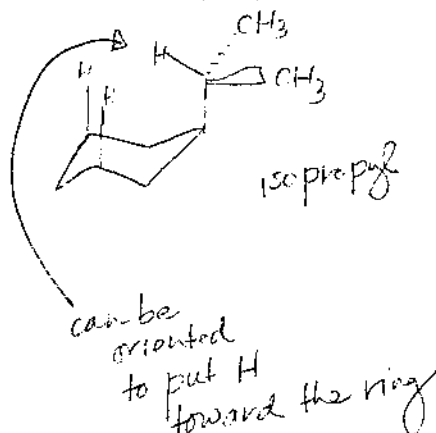
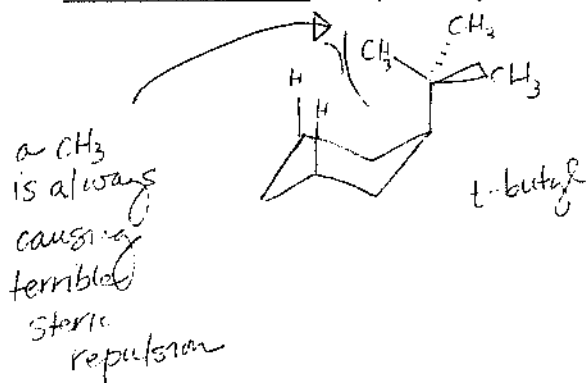
*diastereomer*

d. Would the resulting compound (from part c) be dextrorotatory or levorotatory?

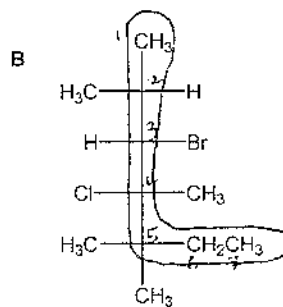
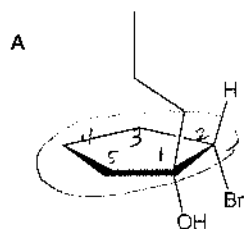
*can't tell*



4. (12 pts) The difference in energy between the chair conformations for axial methyl, ethyl, isopropyl, and *tert*-butyl are 7.6, 8.0, 8.8, and 23.4 kJ/mol respectively. The energy jump between isopropyl and *tert*-butyl seems disproportionately large when analyzing the series of numbers. Use a combination of structures and words to explain why there is such a big difference between isopropyl versus *tert*-butyl.



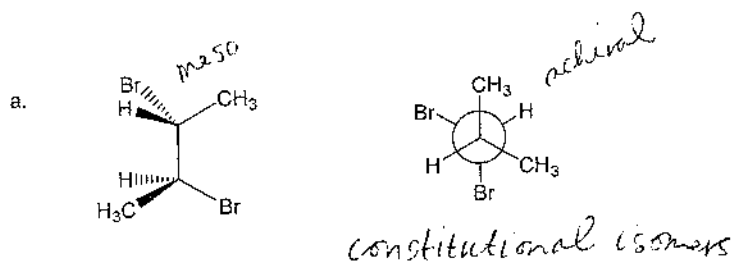
5. (14 pts) Write the full IUPAC name for each of the following molecules.



*(1R,2S) - 2-bromo - 1-propyl cyclopentanol*

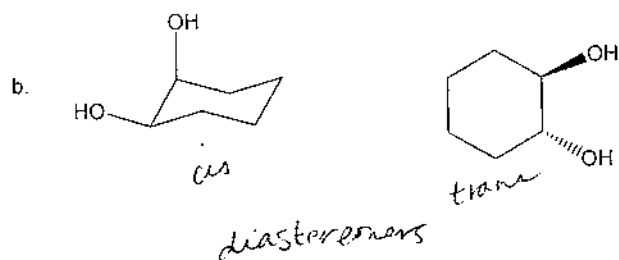
*(3S,4S) - 3-bromo - 4-chloro - 2,4,5,5-tetra methyl heptane*

6. (7 pts each) Indicate whether each of the following pairs of compounds are non-isomeric, constitutional isomers, identical (but not conformers), conformers, enantiomers, or diastereomers. Then decide whether a 50:50 mixture of each pair would rotate plane polarized light and briefly explain why or why not.



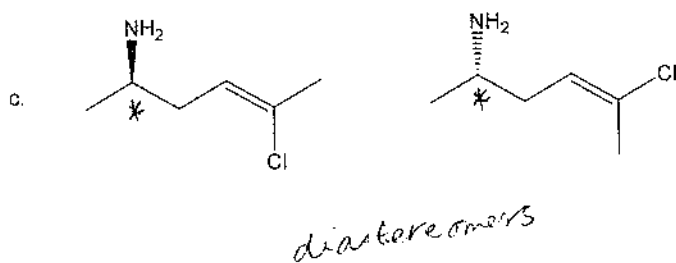
Likely to rotate plane-polarized light? *No.*

Reason for your yes/no choice. *both achiral*



Likely to rotate plane-polarized light? *yes*

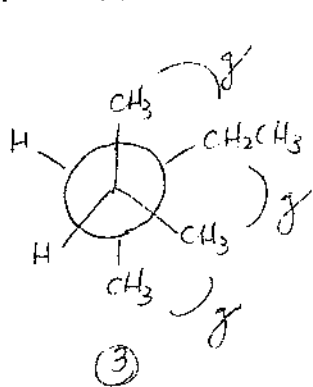
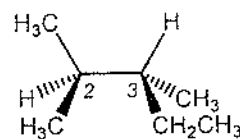
Reason for your yes/no choice.  
*cis won't be optically active but trans is chiral. optically active*



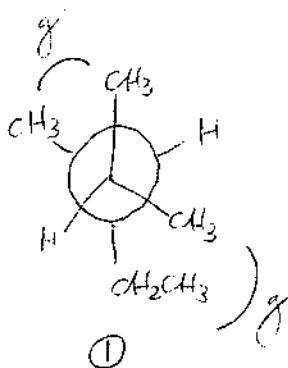
Likely to rotate plane-polarized light? *yes*

Reason for your yes/no choice.  
*both chiral but not enantiomers*

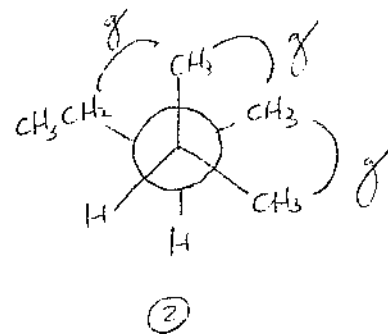
7. (12 pts) (a.) For the molecule shown to the right, draw the three possible staggered conformations about the C<sub>2</sub>-C<sub>3</sub> bond as Newman projections. (b.) Label the lowest energy conformation as (1), the next most stable as (2), etc. Assign such a number to each conformation; use the same number if two conformations have the same energy. Justify your energy assignments.



*3 gauche and the biggest group Et is involved in 2 of 3.*



*most stable, only two gauche interactions*



*3 gauche*