KEY

Conformational Analysis
Week 3 Problem Set
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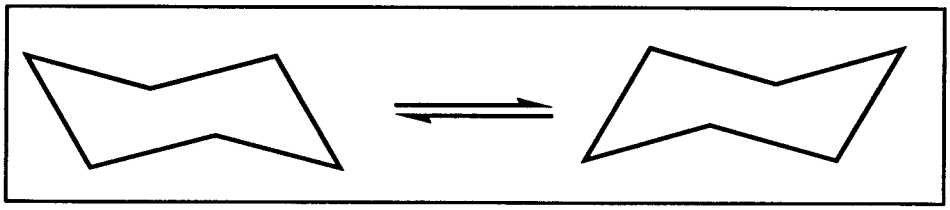
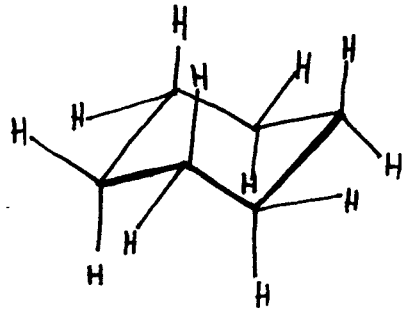
1. Draw each chair 5 times each. Include all axial and equatorial hydrogens.

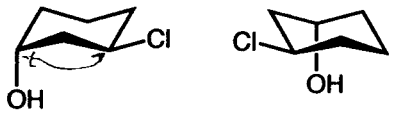


Ex



2. Identify each pair as *structural*, *conformational*, *same*, or *unrelated* structures.

(a)

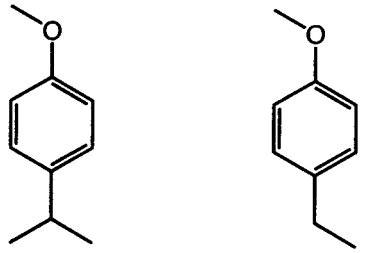


SAME

(b)

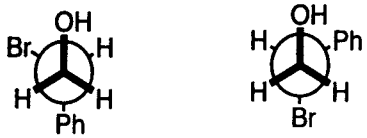
STRUCTURAL

(c)



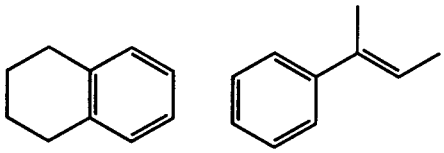
UNRELATED

(d)



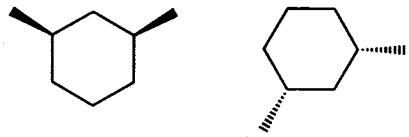
CONFORMATIONAL

(e)



STRUCTURAL

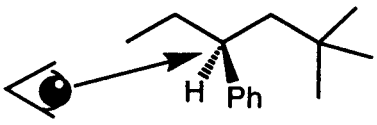
(f)

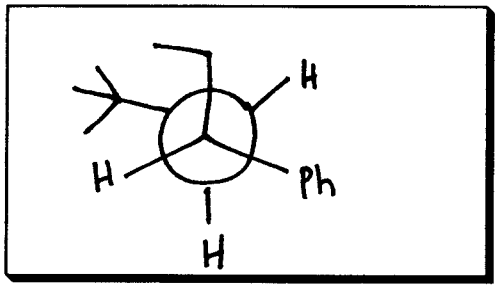


SAME

3. Draw a Newman projection of the most stable staggered conformation of the structures below from the viewpoint of the eye.

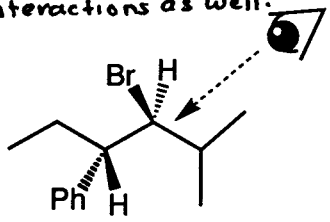
(a)

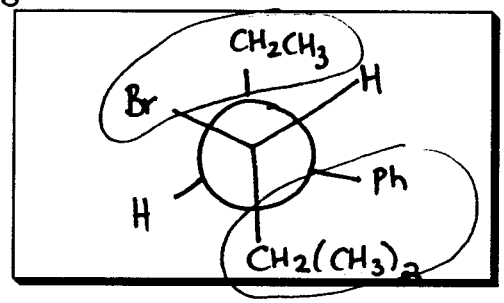




(b)

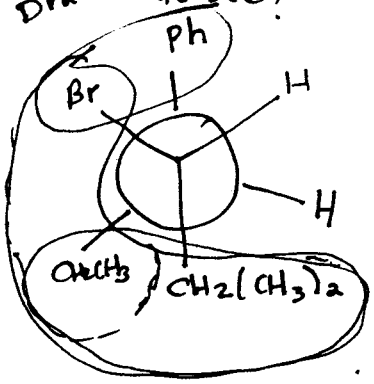
Note: anti is better than syn. however count # of bad interactions as well.





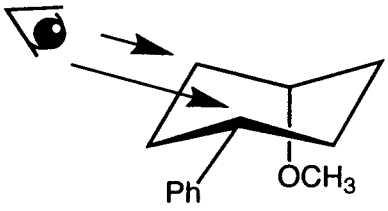
2 bad interactions

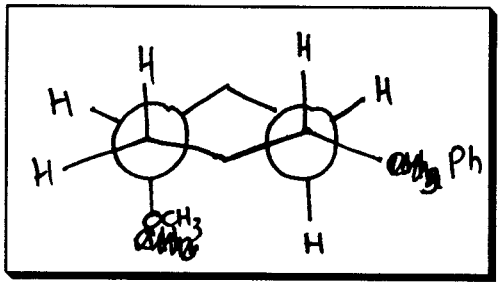
Draw alternative CDnf. to see!



3 bad interactions

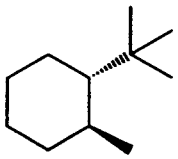
(c)



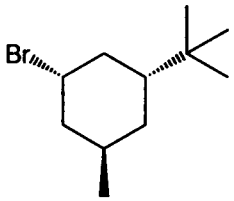


4. Draw the following substituted cyclohexanes in the *most stable* chair conformations.

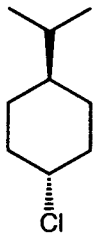
(a)



(b)

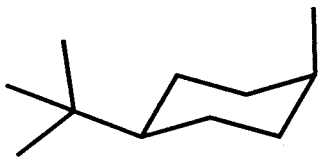


(c)

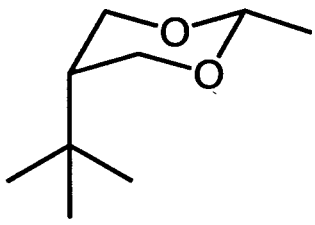


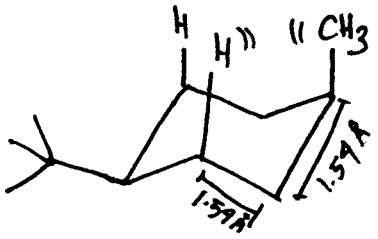
5. The substituted cyclohexane **A** has an equatorial tert-butyl group and an axial methyl substituent in its lowest energy conformation. The 1,3-dioxane **B** has an axial tert-butyl group and an equatorial methyl group in its lowest energy conformation. Rationalize why **B** is different from **A**. *Hint: draw all hydrogens.*

A

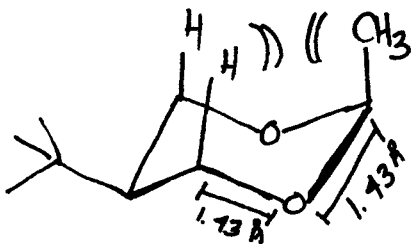


B





~ 1.54 Å C-C BOND DISTANCE



~ 1.43 C-O BOND DISTANCE

OXYGEN IS MORE EN THAN CARBON, ∴ C-O BONDS ARE SHORTER THAN C-C BONDS (1.54 vs 1.43 Å, RESPECTIVELY)

⇒ GREATER 1:3 DIAXIAL INTERXNS BETWEEN AXIAL METHYL AND HYDROGENS DUE TO SHORTER BOND LENGTH.