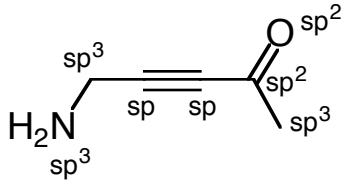
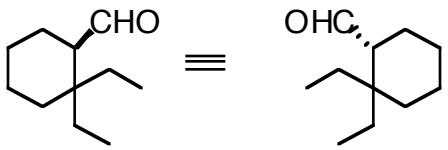
Chem 331; 2002 Exam 1 (10/4/02) answers

1. Give the hybridization for each non-H atom (10 points)



2. Draw the structure (16 points each)

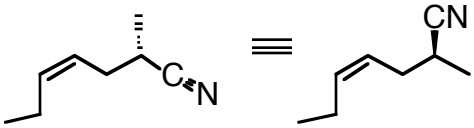
2a. (1R)-2,2-diethylcyclohexanecarboxaldehyde



16 pts 16 pts

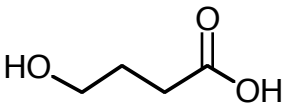
b. (2S, 4Z)-2-methyl-4-heptenenitrile

16 pts



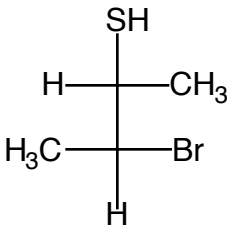
3. Give IUPAC names for each molecule (16 points each)

a.



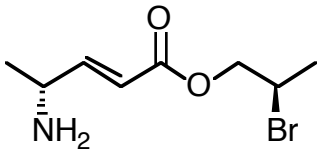
4-hydroxybutanoic acid

b.



(2R,3S)-3-bromo-2-butanethiol

c.

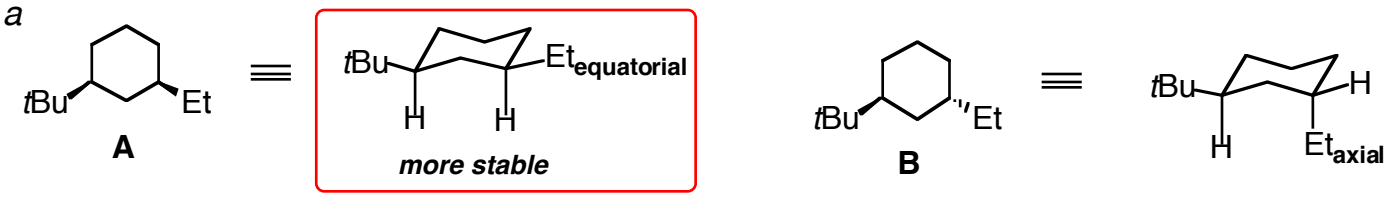


(2R)-2-bromopropyl (2E,4R)-4-amino-2-pentenoate

Chem 331; 2002 Exam 1 (10/4/02) answers

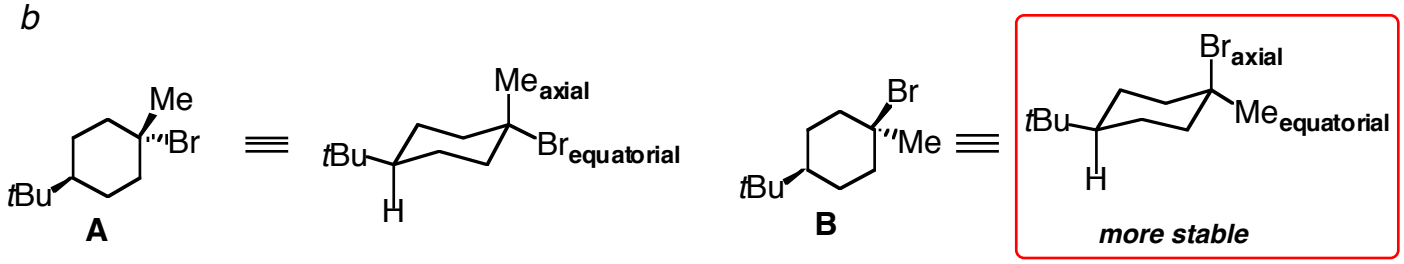
4. (20 points each) For each pair of cyclohexanes, which is more stable. Explain your reasoning in detail (no credit for a correct guess, only a correct explanation)

a



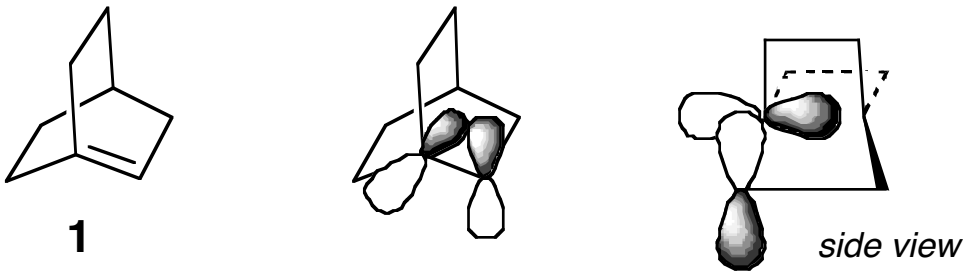
For both A and B, the favored conformation has the t-Bu groups in the equatorial positions. This places the Et group of A in the equatorial position, and the Et group of B in the axial position.

b



For both **A** and **B**, the favored conformation has the t-Bu groups in the equatorial positions. **A** has an axial methyl group, which 'costs' 1.70 kcal (Table 4-3 on pg 142 in V&S). **B** has an axial bromine, which costs 0.55 kcal/mol. **B** is more stable.

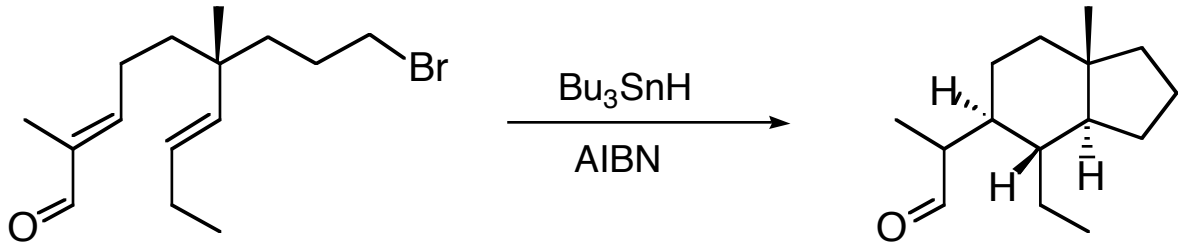
6. The 'bridgehead' alkene **1** is extremely unstable. Use a clear orbital picture and less than 15 words to explain why. Hint: the answer has to do with the π-bond.



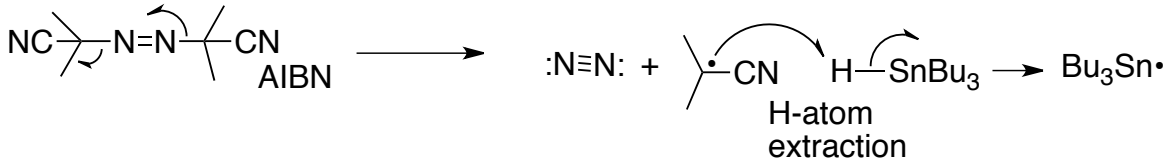
The σ framework holds the p orbitals at a ~90 °. They cannot overlap and therefore cannot bond.

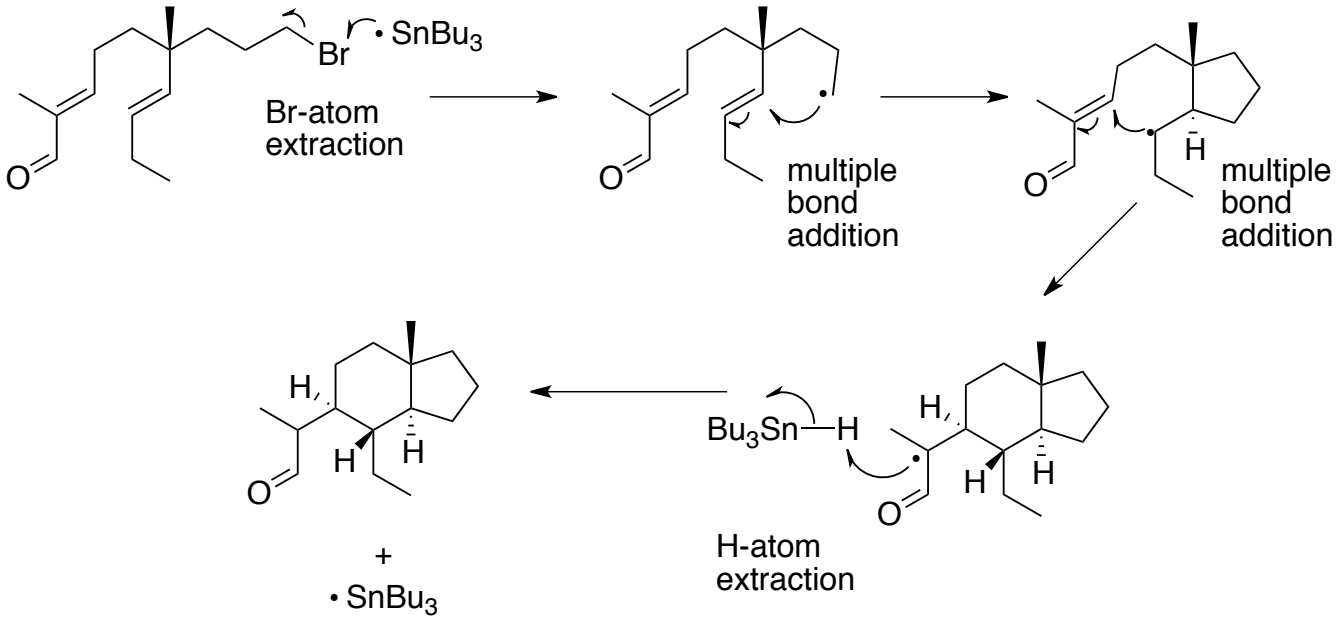
NAME _____

5. Provide a detailed arrow pushing mechanism for the following reaction



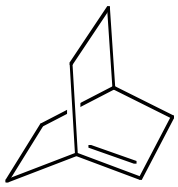
Initiation



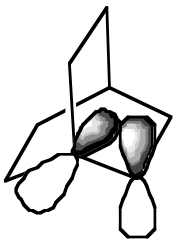


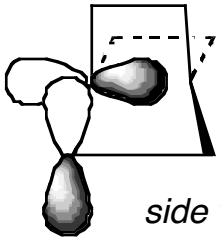
NAME _____

6. The 'bridgehead' alkene **1** is extremely unstable. Use a clear orbital picture and less than 15 words to explain why. Hint: the answer has to do with the π-bond.



1





side view

The σ framework holds the p orbitals at a ~90 °. They cannot overlap and therefore cannot bond.