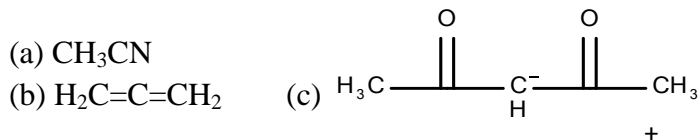


## Organic Chemistry Practice Problems

### Organic Chemistry I Practice Set #5 (Chapters 2-4 – Carey)

- 1) For each of the following, draw a three-dimensional structural formula using lines, solid wedges and dashed wedges.



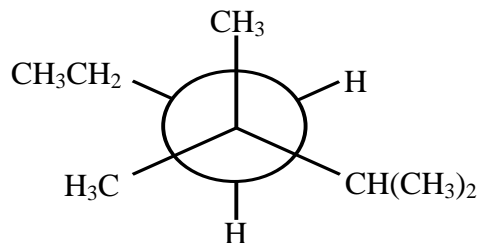
- 2) (a) What is the hybridization of N in  $(\text{CH}_3)_2\text{C}=\text{NHCH}_3$  ?  
 (b) What is the hybridization of the C in  $\text{HN}=\text{C}=\text{NH}$  ?

- 3) Carefully consider *3-ethylheptane*.

- a. Viewing down the **C3-C4 bond of 3-ethylheptane**, draw Newman projection formulas for each of the eclipsed and staggered conformations resulting from rotation about the C3-C4 bond. Clearly label each of the conformations with a letter.
- b. Draw an approximate potential energy diagram for rotation about the C3-C4 bond in 3-ethylheptane. Start with an eclipsed conformation that has the highest energy as the first conformation on the left in your diagram. Label each maximum and minimum on your diagram with the letter that corresponds to the conformation that you gave in *part a* of this problem. Carefully show the relative energies of the conformations. Label axes appropriately.

- 4) (a) Provide a structural formula for 3-isopropyl-2,4,5-trimethylhexane  
 (b) Viewing down the **C3-C4 bond of 3-isopropyl-2,4,5-trimethylhexane**, draw a Newman projection for each of the staggered conformations. Put a **circle** around the highest energy staggered conformation.  
 (c) Give a sawhorse formula for each of the eclipsed conformations viewing down the C3-C4 bond. Put a **circle** around the highest energy eclipsed conformation.

- 6) Give a name for the molecule represented to the right.



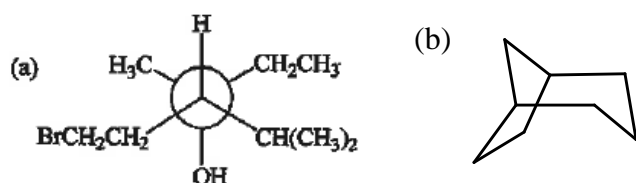
- 7) Which compound has the larger heat of combustion:

(a) propylcyclopropane *or* (b) cyclohexane ?

- 8) (a) Clearly draw a chair conformation of cyclohexane **with Hs in the axial positions and Ds in the equatorial positions**.

(b) Clearly draw the chair conformation of cyclohexane that is in equilibrium with the one that you gave in *part a* of this problem. Be sure to put the Hs and Ds in the correct positions.

- 9) For each of the compounds given to the right, provide

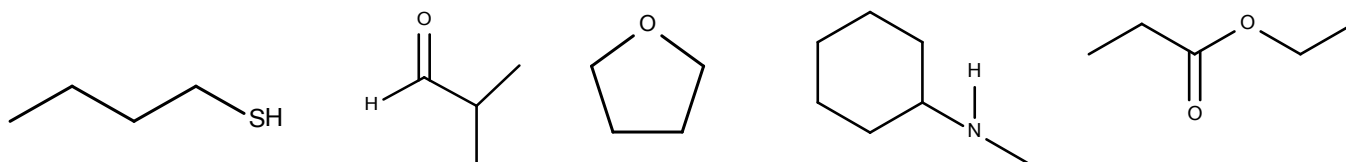


## Organic Chemistry Practice Problems

10) For each of the following, provide a structural formula. Be sure to identify stereoisomers properly.

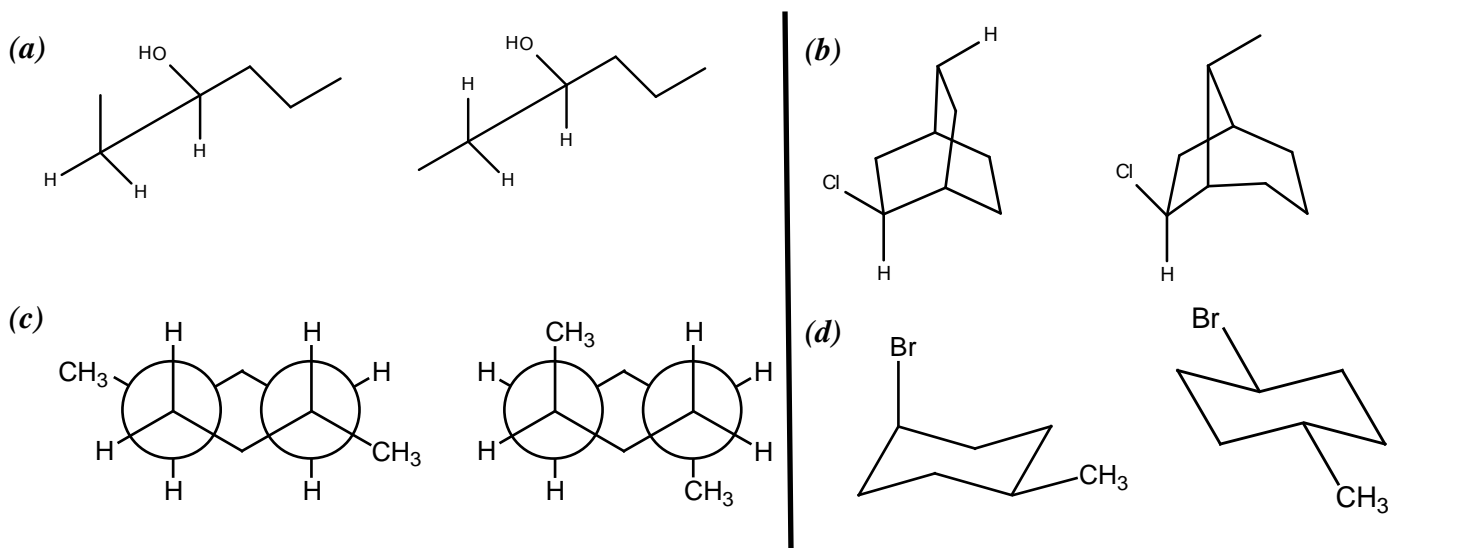
(a) tetrahydrofuran      (b) spiro[2.4]heptan-1-ol

11) Give the name of the functional group class for each of the compounds given below. Be as specific as possible. Note that *carbonyl group* is **NOT** an acceptable answer.

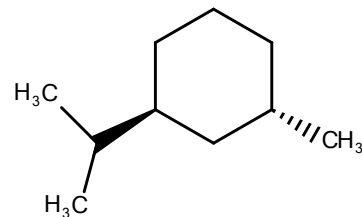


12) For each of the pairs shown below, give the best answer which describes the relationship between each molecule in the pair.

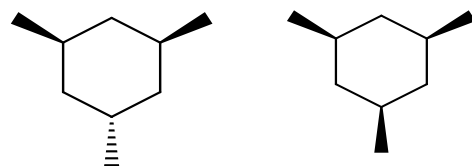
Choose from: (i) *constitutional isomers* (ii) *different conformations of the same compound*  
(iii) *stereoisomers that cannot be interconverted by rotation about single bonds*



13) Clearly give the two chair conformations for the molecule shown to the right. **Put a circle around the more stable chair conformation.**



14) Which one of the two stereoisomers shown below is thermodynamically *less* stable: **compound A** or **compound B**? Draw the two chair conformations for each stereoisomer and provide a clear, concise explanation for your choice.

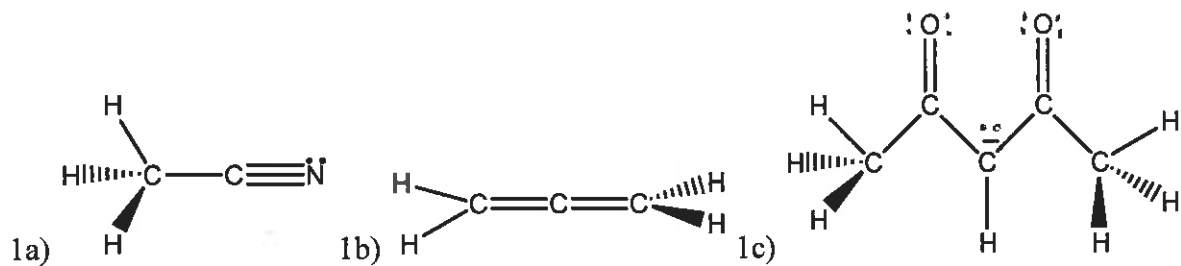


**Compound A**

**Compound B**

# Organic Chemistry Practice Problems

## Organic Chemistry I Answers to Practice Set #5 (Chapters 2-4 – Carey)

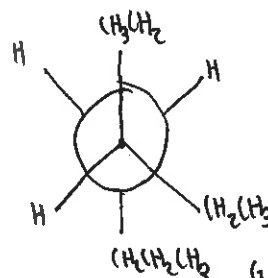
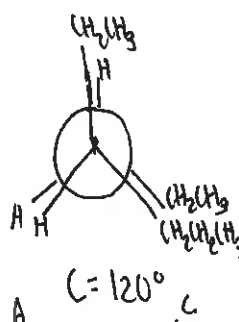
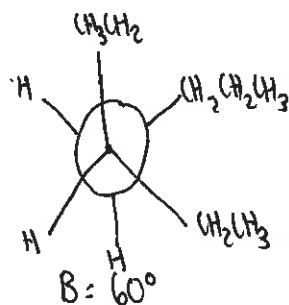
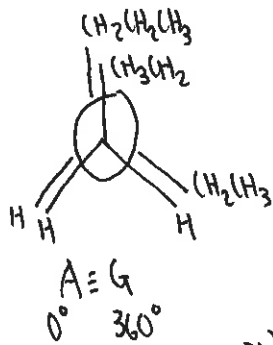


2a)  $sp^2$  2b)  $sp$

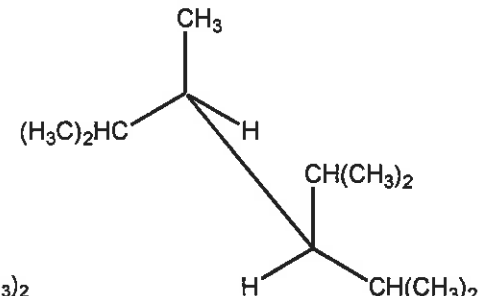
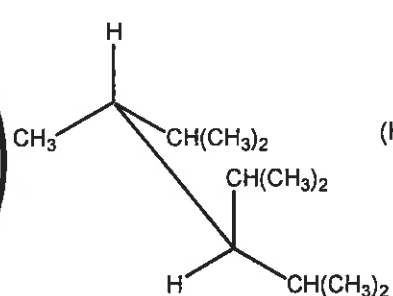
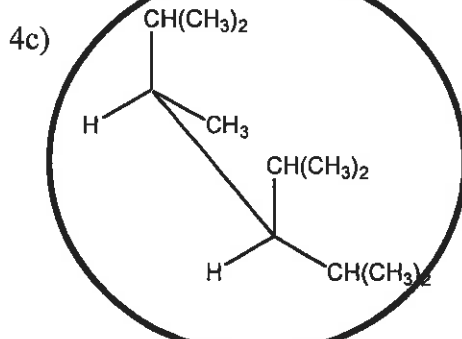
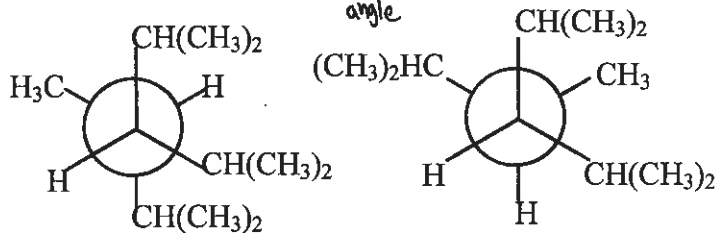
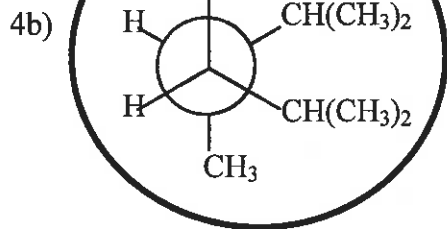
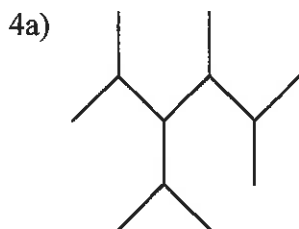
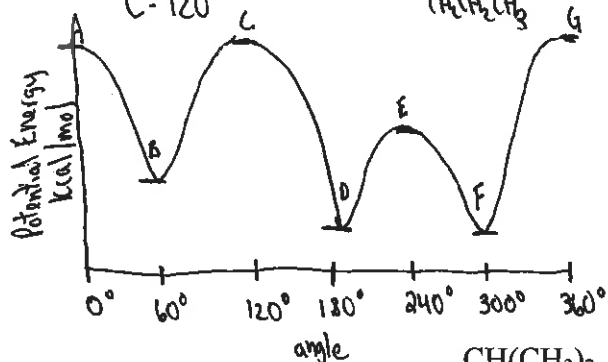
3a) 

on (3)  
ethyl  
ethyl  
H

on (4)  
propyl  
H  
H



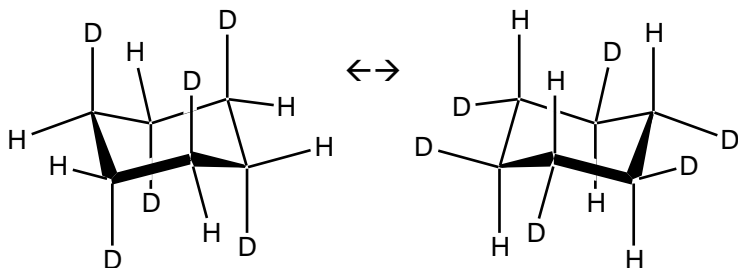
3b) Relative Energies  
eclipsed  $A = C = G > E$   
staggered  $B > D = F$



## Organic Chemistry Practice Problems

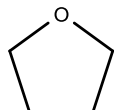
6) 2,3,3-trimethylhexane 7) a

8 a and b)

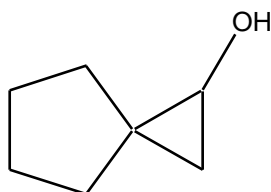


9a) 6-bromo-4-isopropyl-3-methylhexan-3-ol 9b) bicyclo[3.2.1]octane

10a)



10b)

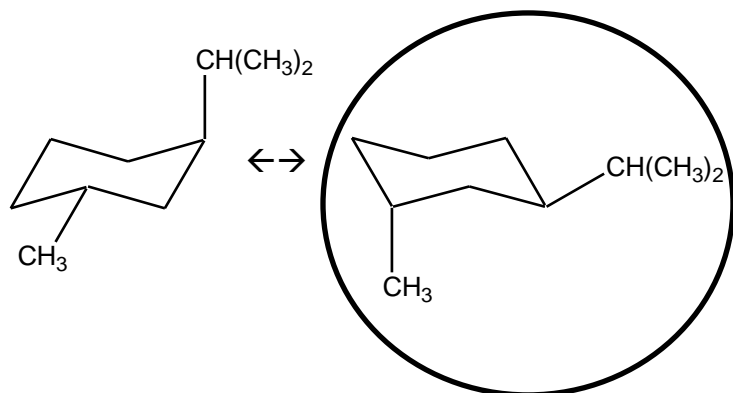


11a) thiol 11b) aldehyde 11c) ether

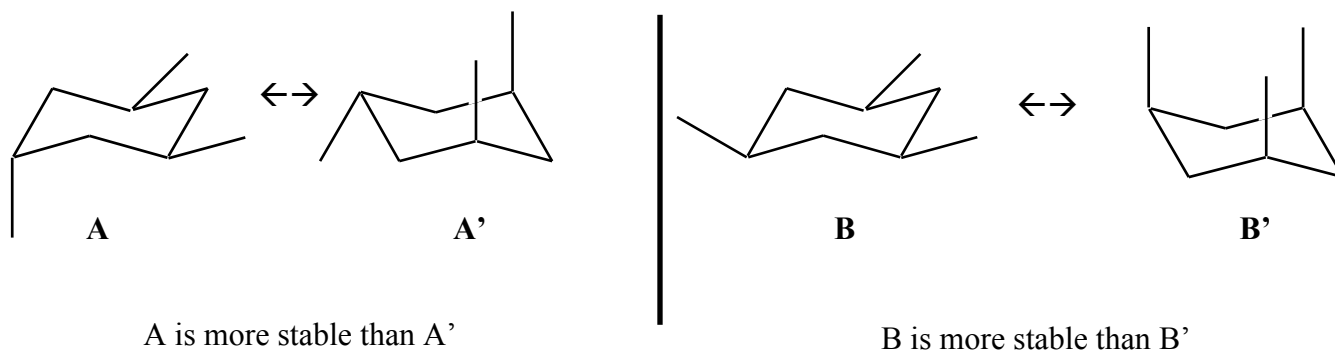
11d) secondary amine 11e) ester

12a) ii 12b) i 12c) ii 12d) iii

13)



14)



B is more stable than A. Therefore, compound A is the less stable stereoisomer.