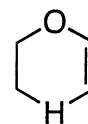
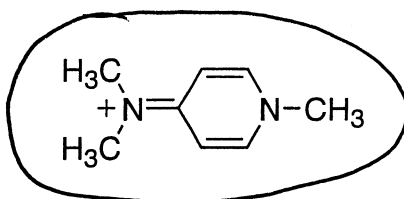
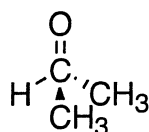


Test 1 (104 points)

1. Which of the following structures represent permissible organic molecules under the rules of bonding and connectivity covered in this course? (3 points)



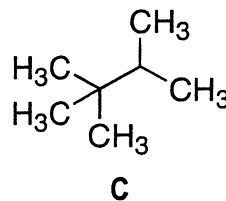
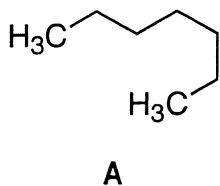
2. Choose ONE compound for each of the following questions: (8 points)

- (a) Which compound is MOST acidic?



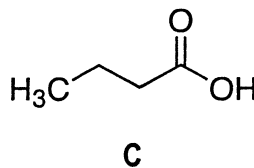
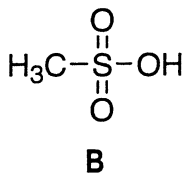
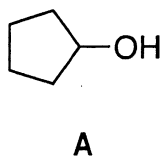
B

- (b) Which compound has the HIGHEST boiling point?



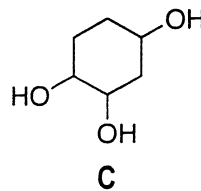
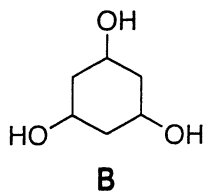
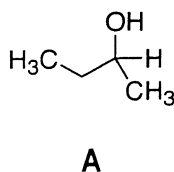
A

- (c) Which compound has the LOWEST pKa?



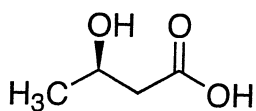
B

- (d) Which compound has the MOST possible stereoisomers?

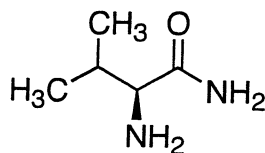


C

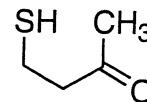
3. Name the functional groups found in each of the following molecules. (12 points)



alcohol
carboxylic acid

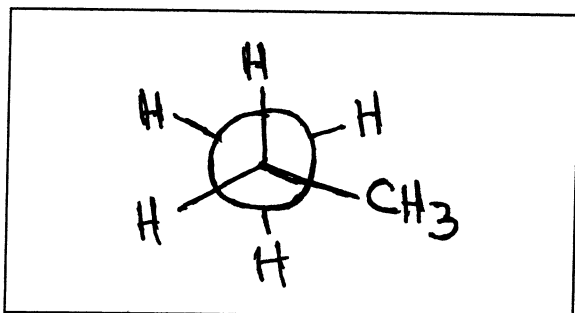


amine
amide

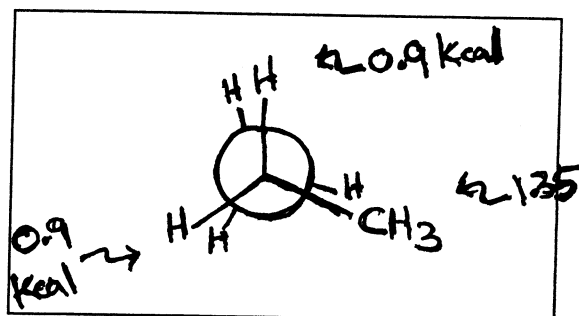


thiol
ketone

4. Draw Newman projections for the following conformers of propane. (6 points)



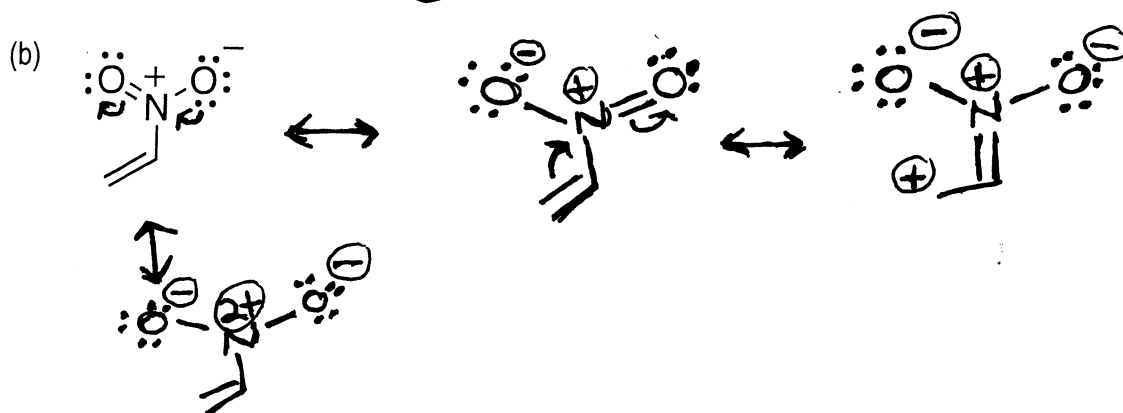
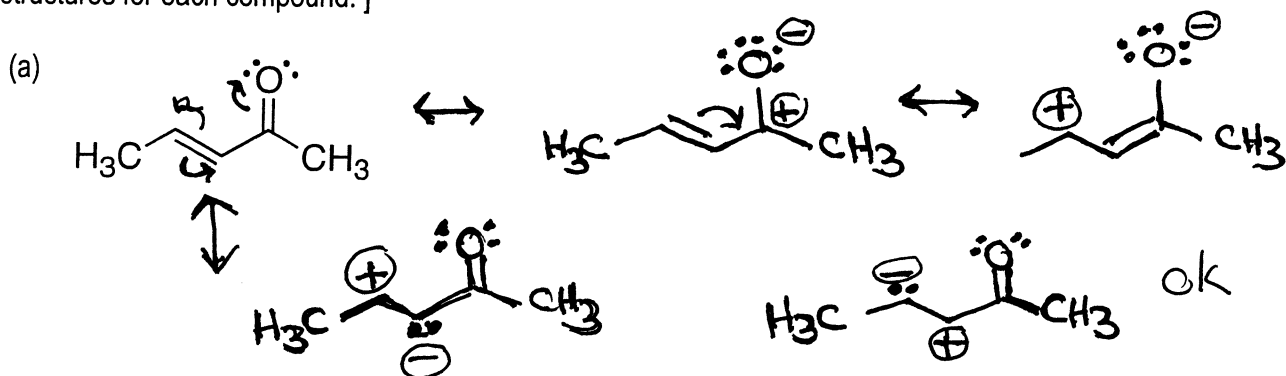
(a) staggered



(b) eclipsed

- (c) What is the energy difference between these two conformers? ~~3.2~~ 3.2 kcal/mol

5. Draw resonance structures for the following compounds. Be sure to clearly indicate electron pairs, formal charges, and arrows. (12 points) [Hint: There are at least three possible resonance structures for each compound.]



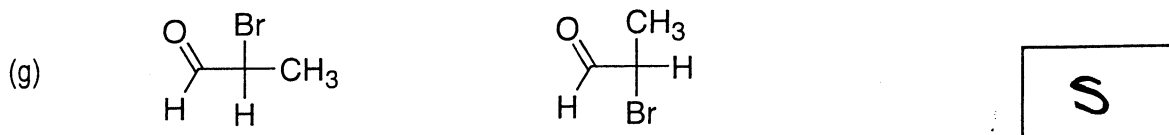
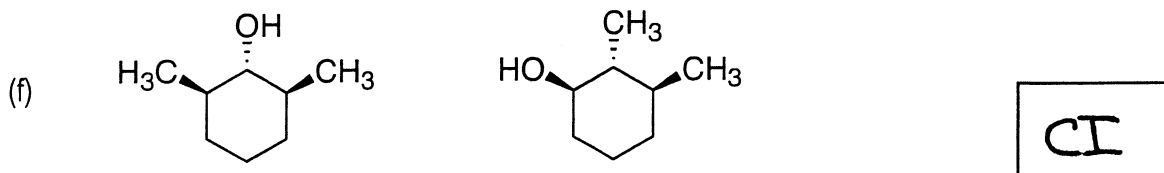
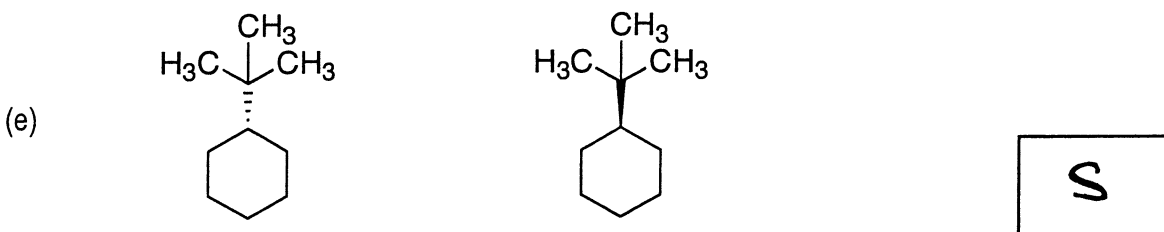
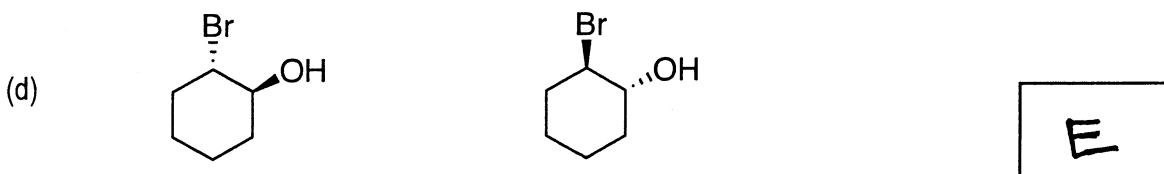
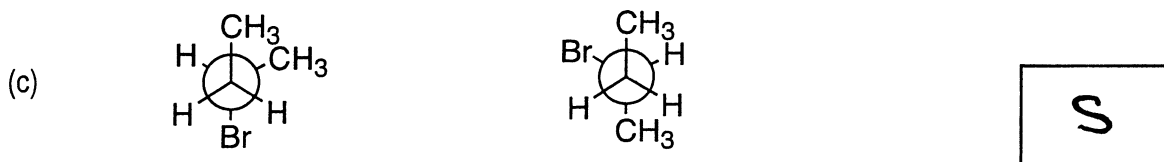
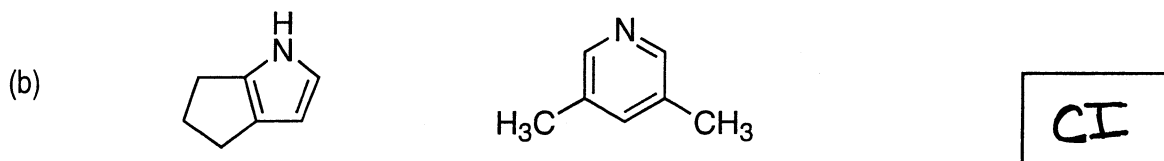
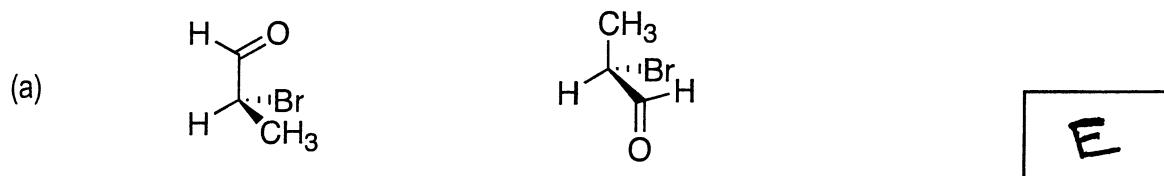
6. Label the relationship between each of the pairs of compounds as one of the following: (14 points)

D: diastereomers

E: enantiomers

CI: constitutional isomers

S: same compound

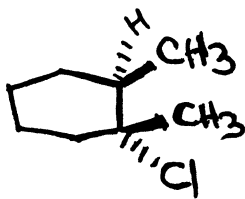


7. Draw structures for the following compounds, showing the proper stereochemistry: (9 points)

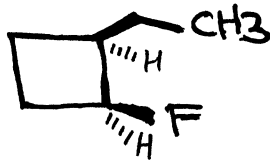
(a) (*R*)-3-bromoheptane



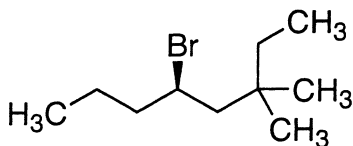
(b) ^{1 2 1,2 2} (*ZS, R*)-~~2,3~~-dimethyl-~~2~~-chlorocyclohexane



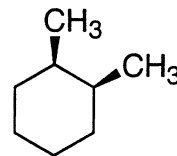
(c) *cis*-2-ethyl-1-fluorocyclobutane (either enantiomer is acceptable)



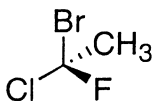
8. Give IUPAC names for the following compounds, including stereochemistry, if any. (8 points)



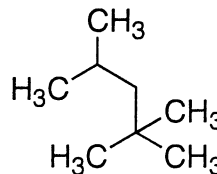
(a) (*R*)-5-bromo-3,3-dimethyl
Octane



(b) (meso) *cis*-1,2-dimethyl cyclohexane



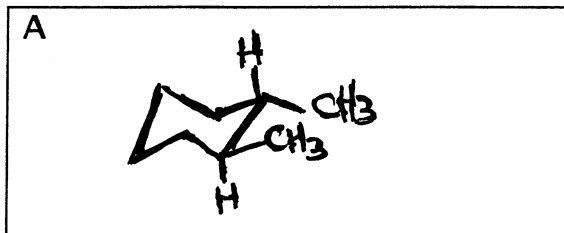
(c) (*S*)-1-bromo-1-chloro-1-
fluoroethane



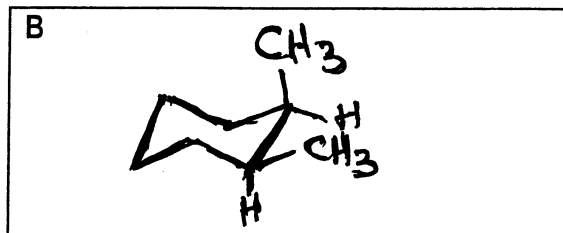
(d) 2,2,4-trimethyl pentane

9. Draw the following representations of 1,2-dimethylcyclohexane (remember, there are two diastereomers): (12 points)

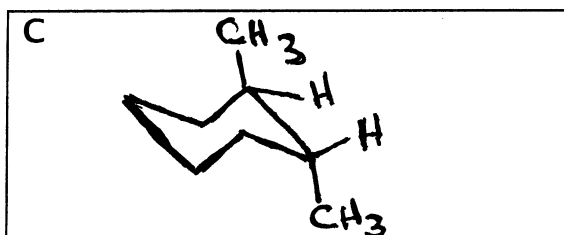
(a) The most stable conformer of the *trans*-diastereomer.



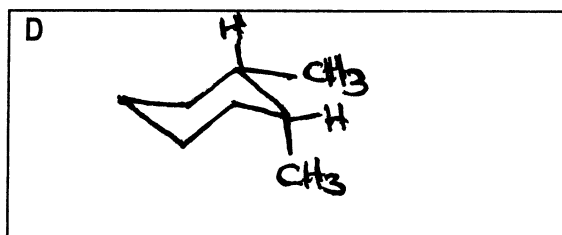
(b) The most stable conformer of the *cis*-diastereomer.



(c) The ring flipped conformer of the *trans* conformer drawn above.



(d) The ring flipped conformer of the *cis* conformer drawn above.



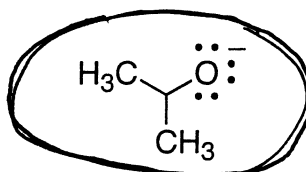
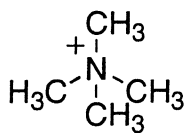
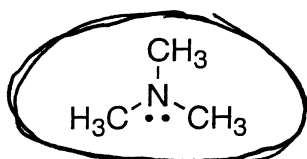
(e) Estimate the relative population of conformer A to conformer C at equilibrium.

A: 99 % C: 1 %

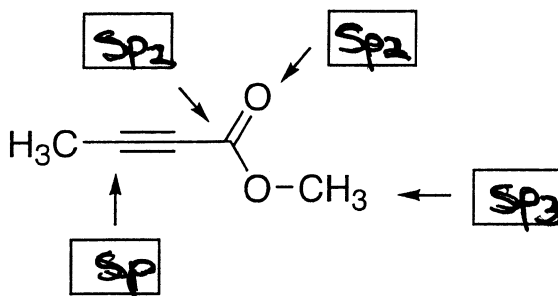
(f) Estimate the relative population of conformer B to conformer D at equilibrium.

B: 50 % D: 50 %

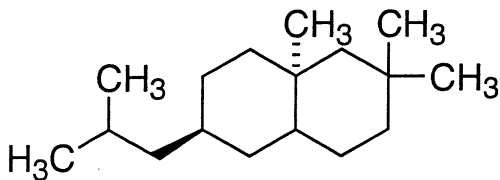
10. Which of the following compounds are nucleophiles? (4 points)



11. Identify the hybridization (i.e. sp_3 , sp_2 , etc.) of each of the indicated atoms in the following molecule. (4 points)



12. How many of each carbon types does the following molecule have? (4 points)



(a) Primary

5

(b) Secondary

7

(c) Tertiary

2

(d) Quaternary

2

13. Draw a picture of $\text{H}_2\text{C}=\text{CH}_2$ showing all of the orbitals on the carbons, with their correct shapes. Label the orbital types and clearly show the pi and sigma bonds. (8 points)

