

**Chemistry 116 Sec. A (2:00-5:00)**  
**Final Exam**  
**“Organic Chemistry - Fall 2000”**  
**December 12, 2000**

**Instructions:** You have until 5:00 p.m. to complete the exam. At that time, I will request that all remaining test takers cease writing, turn their exams over, and pass them to their rightmost isle. If you finish before 4:55 p.m. you may turn in the exam at the front of the room prior to leaving. If you finish within the final 5 min. of class, please turn your exam over and remain seated until I call for the remaining exams to be turned in. *In fairness to all, anyone still working on the exam after “time” is called will receive a grade of zero!*

Be sure to read the instructions for each question. It may be helpful to skim the entire exam and solve the easier questions first.

**Restroom Policy:** Only one person at a time will be allowed to go to the restroom. If you need to go, bring your exam down to the front of the room and pick it up when you return.

**Exam Agreement:** I, \_\_\_\_\_, have read and agree to

(Please print)

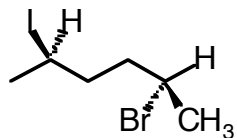
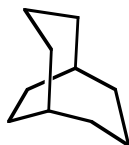
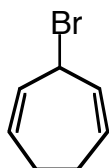
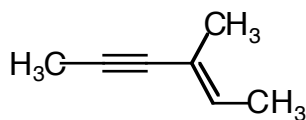
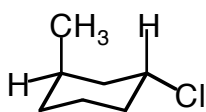
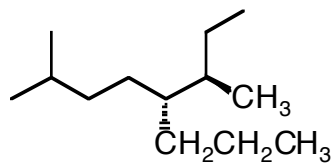
abide by the instructions above. On my honor, I have neither given nor accepted any help during this exam.

**Signature:** \_\_\_\_\_

**College:** \_\_\_\_\_

**DO NOT OPEN THIS EXAM UNTIL  
INSTRUCTED TO DO SO**

1. Provide an unambiguous (IUPAC or common) name for each of the following compounds. Be sure to indicate stereochemistry where appropriate. (18 points)



2. Fill in the boxes below. *Note: any answers outside of the boxes will not be graded.* (24 points)

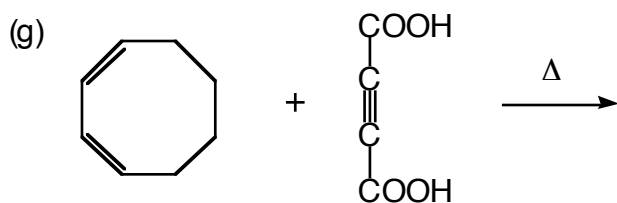
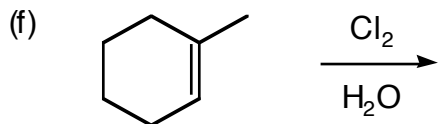
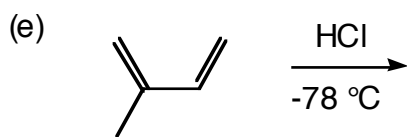
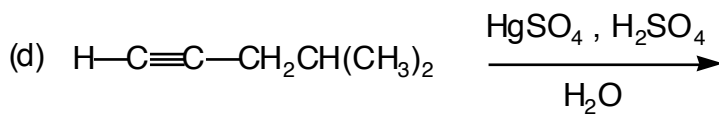
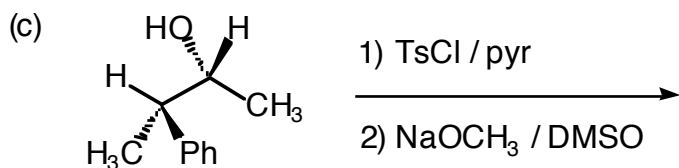
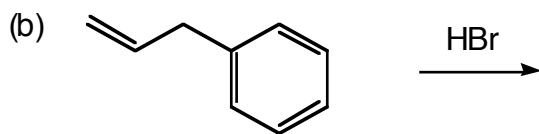
|                                     | <b>Definition</b> | <b>Example</b> |
|-------------------------------------|-------------------|----------------|
| <i>An optically active molecule</i> |                   |                |
| <i>Diastereomers</i>                |                   |                |
| <i>Lewis Base</i>                   |                   |                |
| <i>Conformers</i>                   |                   |                |
| <i>Hyperconjugation</i>             |                   |                |
| <i>Polar Aprotic Solvent</i>        |                   |                |

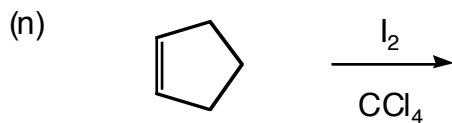
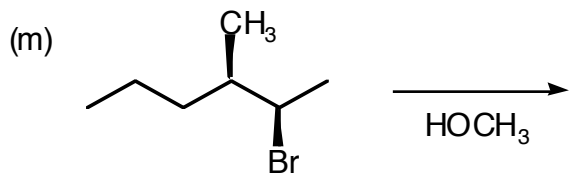
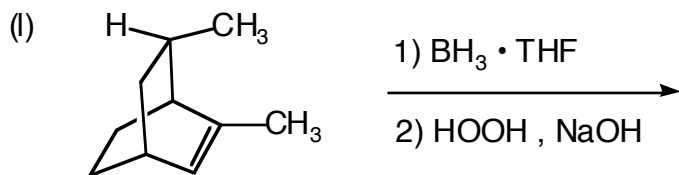
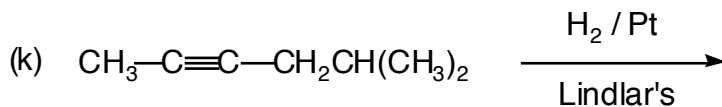
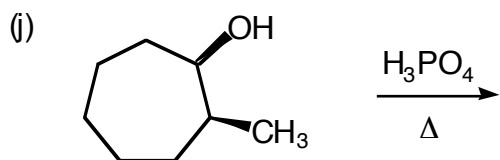
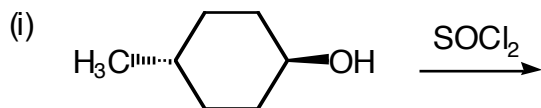
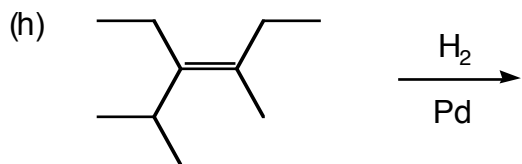
3. Draw a Newman projection of the *most stable conformer* of (S)-2-phenylbutane looking down the C<sub>2</sub>-C<sub>3</sub> bond. (5 points)

4. Draw the **major product** of each of the following reactions. *Be sure to include stereochemistry in your answers where appropriate.* (4 points each)



**Balance this equation**





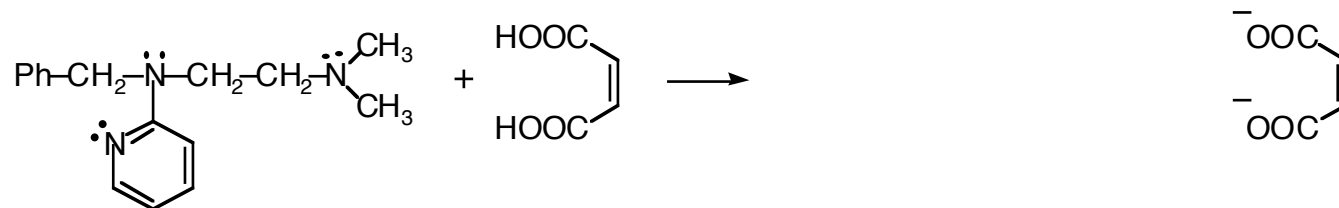
5. Consider a molecule with the following condensed structural formula:



a) Draw the three most stable resonance contributors for this molecule and rank them according to their stability (1=most stable, 3=least stable). For full credit, you must show all lone pairs of electrons and formal charges. (8 points)

b) Provide an accurate orbital picture for the major resonance contributor. For full credit, clearly label each of the orbitals and bond angles in your picture. (5 points)

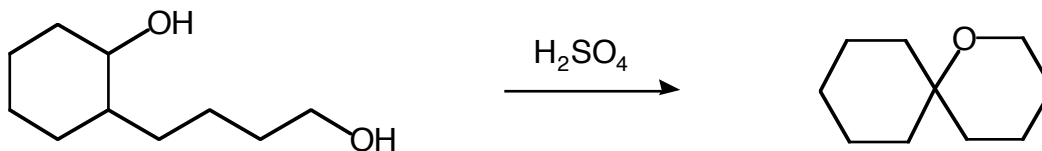
7. Tripeleminamine is a powerful antihistamine. However, in its neutral form it is nearly insoluble in water. In order to get the drug into the body, pharmaceutical companies react tripeleminamine with maleic acid in a double acid-base reaction to form an extremely soluble complex. Draw the cationic part of the complex in the space provided below: (4 points)



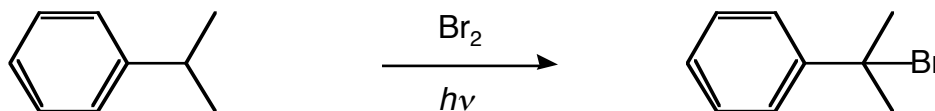
**Tripeleminamine**

One of the nitrogens in tripeleminamine is not very basic. Circle it and provide an explanation for your decision using words or pictures (4 points).

8. Propose a mechanism for the following reaction. For full credit, show the products of each step and any formal charges. (8 points)



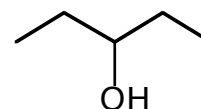
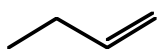
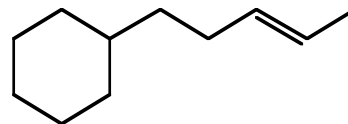
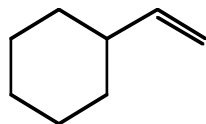
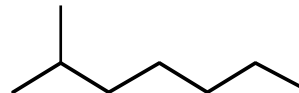
9. *Read these instructions carefully before proceeding.* Provide a mechanism for the following radical substitution reaction, paying close attention to the following details: (10 points)
- label the three major steps of the reaction (initiation, propagation, and termination),
  - include any intermediates and their *resonance structures* in your mechanism,
  - provide at least 3 plausible termination steps



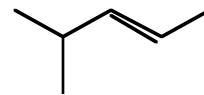
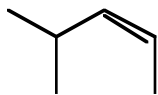
10. (Choose 4 out of 6) Propose a synthesis (sequence of reactions) that will accomplish each of the following transformations. *Be sure to include the products of each step.* Clearly indicate which four you wish for me to grade. If no indication is made, I will grade the first four. (8 points each)

**Alkenes of 4  
carbons or less**

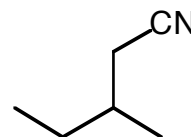
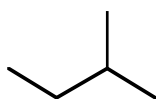
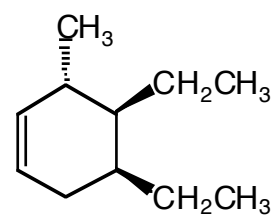
You must show how a reagent is made  
from 4 carbon alkenes if it contains carbon.



synthesis (cont'd)...

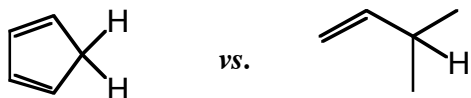


Any Alkyne of 6  
carbons or less

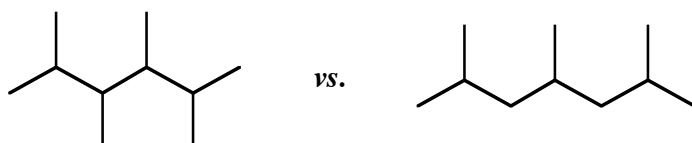


11. For each pair of molecules shown, circle the one that best fits the accompanying description and provide a concise rationale for your choice. Pictures *may* be required for full credit! (3 points each)

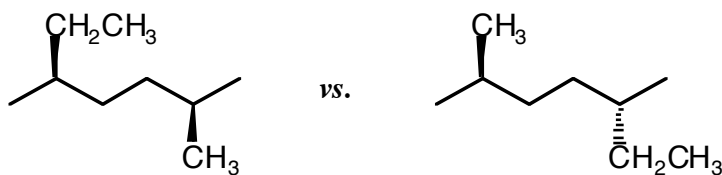
**Most acidic molecule**



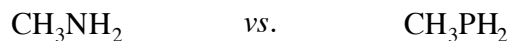
**Highest melting point**



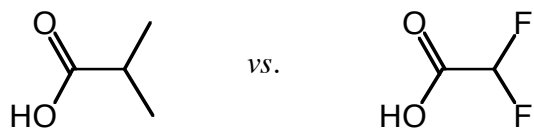
**Rotates plane polarized light**



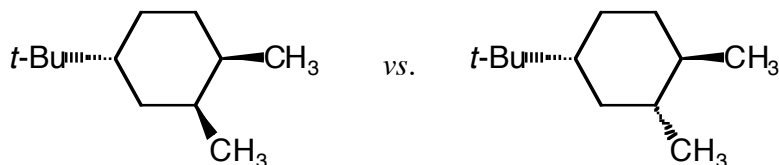
**The better nucleophile in water**



**Most acidic molecule**



**Least stable molecule**



## Grading Summary

| <b>Page</b> | <b>Point Value</b>   | <b>Points Earned</b> |
|-------------|----------------------|----------------------|
| 2           | 18                   |                      |
| 3           | 24                   |                      |
| 4           | 13                   |                      |
| 5           | 28                   |                      |
| 6           | 28                   |                      |
| 7           | 21                   |                      |
| 8           | 18                   |                      |
| 9 & 10      | 32                   |                      |
| 11          | 18                   |                      |
|             | <b>Total Score =</b> |                      |