

# Chem 331, Spring 2006

William Jenks

Name Key

PLEASE ALSO WRITE YOUR NAME ON THE TOP OF THE BACK OF YOUR EXAM

Please check off which recitation section you are registered for:

Monday, 2:10 p.m.

Tuesday, 9:00 a.m.

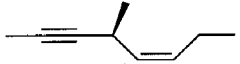
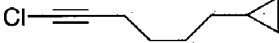
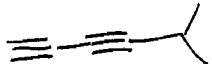
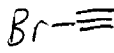
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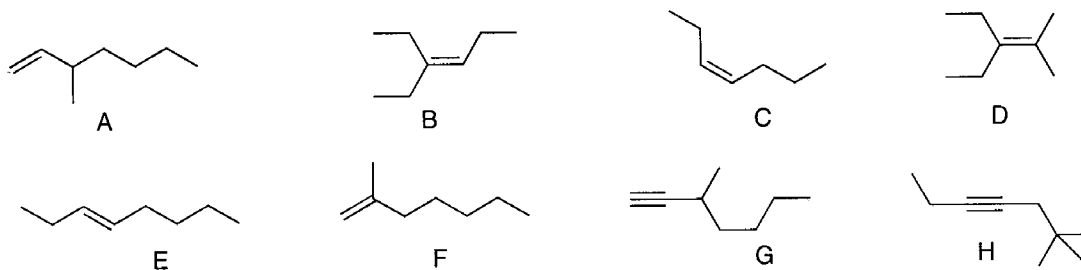
MIDTERM 3  
8 March, 2006

Problem (max score)	Score
I (12)	
II (20)	
III (20)	
IV (18)	
V (21)	
VI (10)	
Total (101)	

- I. 12 points. Nomenclature. Provide the name or structure, as appropriate. Remember to indicate stereochemistry (e.g., R/S, *cis/trans*, or *E/Z* in names and hash/wedge in drawings) as needed.

 <p><i>(E)</i>-1,5-octadiene-4-methyl</p>	 <p>1-chloro-6-cyclopropyl-1-hexyne</p>
<p>5-methyl-1,3-hexadiyne</p> 	<p>bromoacetylene</p> 

- II. 20 points total. Consider the following alkenes and alkynes when answering the following questions. The same compound can be an answer to more than one question, and some questions may require more than one answer to be fully correct.



Which compound(s) would provide synthetically useful product mixture(s) when treated with HCl? ABFG

Which compound(s) produce an aldehyde on hydroboration? G

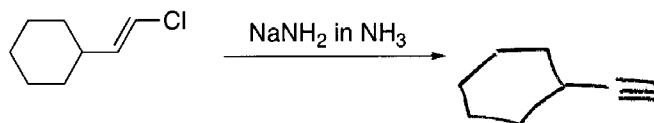
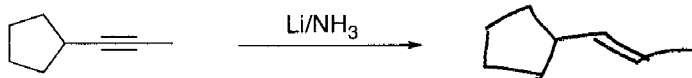
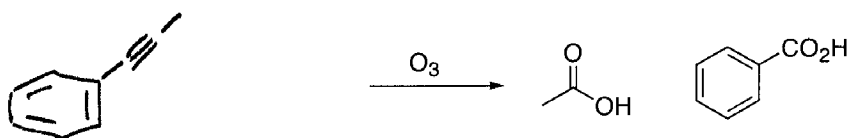
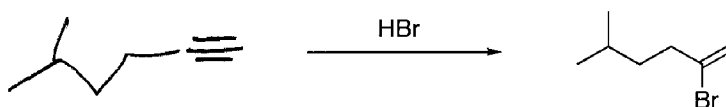
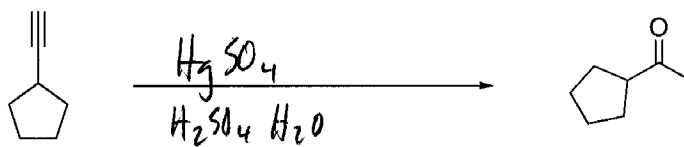
Which alkene(s) require the *E/Z* or *cis/trans* nomenclature? CE

Which alkene(s) are considered "disubstituted"? CEF

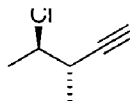
Which alkene(s) or alkyne(s) are "terminal"? AFG

Which pair of compounds produces the same product on exhaustive hydrogenation with Pd on C as catalyst? AG

- III. 20 points, 4 points each. Provide structures corresponding to the Starting Materials, reagents, or major organic products, as appropriate. You do not need to indicate small-molecule byproducts like NaCl or H<sub>2</sub>O. If you provide starting materials, be sure to choose something that will lead to the given product as a single major product, not a bad mixture.



IV. 18 points. Consider this alkyne:



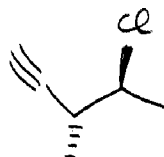
Give the proper IUPAC name, including R/S nomenclature:

(3S, 4R)-4-chloro-3-methyl-1-pentyne

Draw a compound that is its enantiomer:

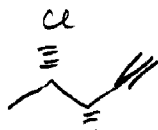


or

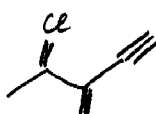


are easiest drawings  
(same compound!)

Draw a diastereomer of the illustrated alkyne:

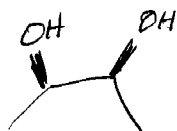


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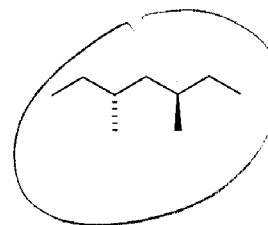
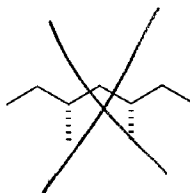
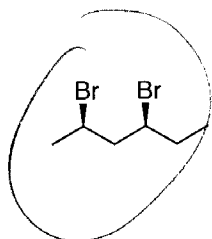
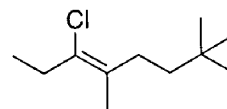
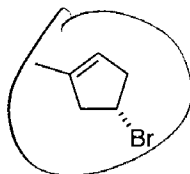
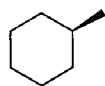


Now answer these additional questions regarding stereochemistry

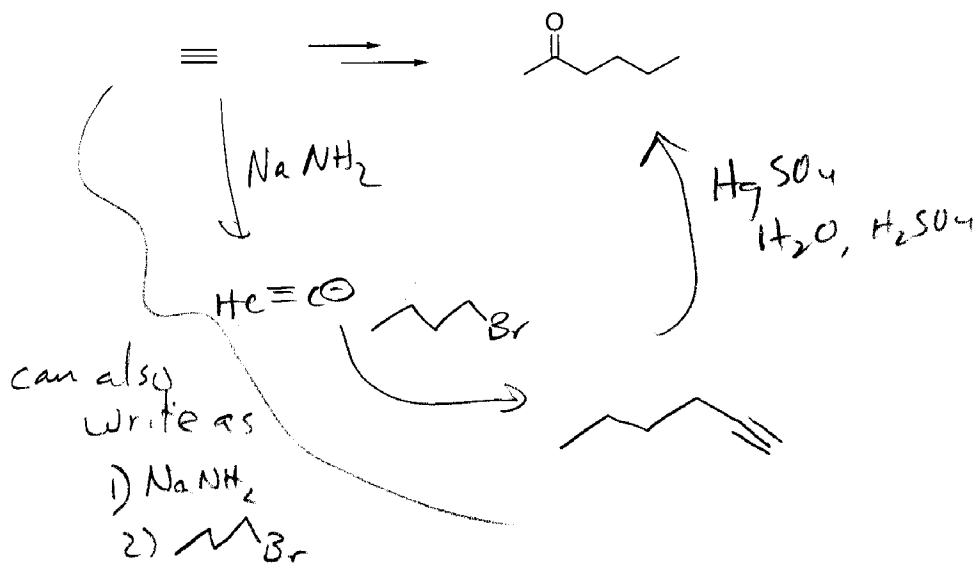
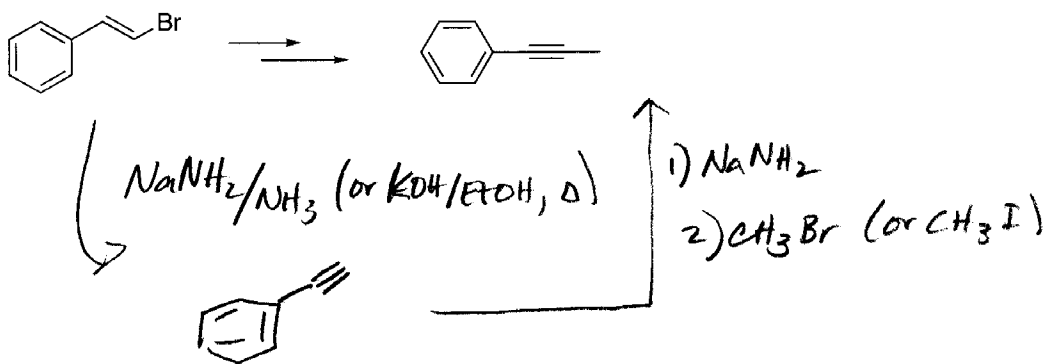
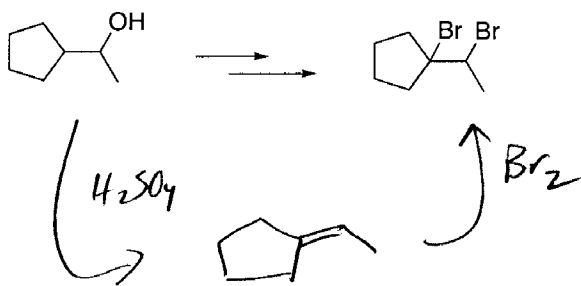
Draw an isomer of  $C_4H_{10}O_2$  that is a *meso* compound:



Circle the chiral compounds. Cross out those that are *meso*.



- V. 21 points. The following transformations require 2-3 steps. Show how to accomplish each transformation. You may use any necessary reagent containing 4 carbon atoms or fewer. To maximize your chances for partial credit, show the products obtained after each step. (Mechanisms are NOT necessary!)



VI. 10 points. Indicate whether the following statements are true or false by circling T or F.

- T  F a. The (+) optical isomer of a compound corresponds to (*R*) absolute stereochemistry.
- T  F b. The (+) optical isomer of a compound corresponds to (*S*) absolute stereochemistry.
- T F c. The (+) optical isomer might be either (*R*) or (*S*), depending on the molecule.
- T F d. Racemic mixtures are always optically inactive (i.e., have an optical rotation of zero).
- T  F e. Equimolar mixtures of diastereomers are always optically inactive.
- T  F f. Racemic mixtures of solid materials can usually be resolved into enantiomers by recrystallization.
- T  F g. A solid compound always has the same ideal melting point as any of its diastereomers.
- T  F h. It is not possible to have a chiral compound unless it has an  $sp^3$ -hybridized carbon atom.
- T  F i. We can predict the  $[\alpha]$ -value for a compound from that of one of its diastereomers.
- T  F j. Every compound with a stereogenic center (= "chirality center") is chiral.

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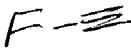
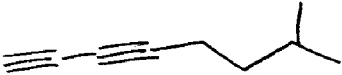

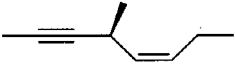
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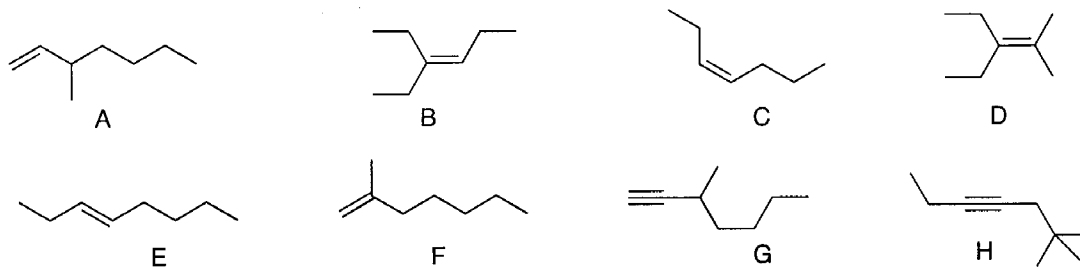
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- I. 12 points. Nomenclature. Provide the name or structure, as appropriate. Remember to indicate stereochemistry (e.g., R/S, *cis/trans* or *E/Z* in names and hash/wedge in drawings) as needed.

fluoroacetylene  	7-methyl-1,3-octadiyne  
 1-chloro-6-cyclopropyl-1-hexyne	 (S)-(E)-4-methyl-4-octen-2-yne

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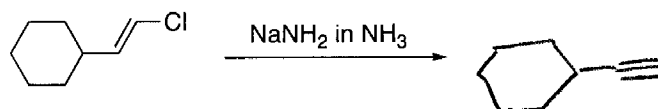
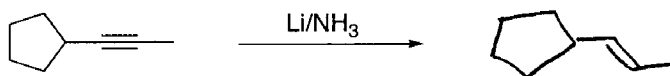
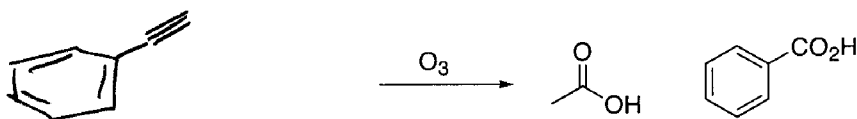
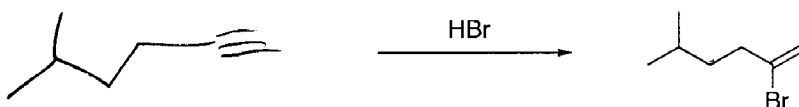
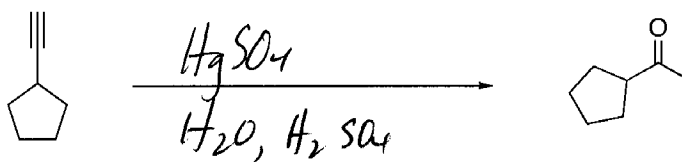
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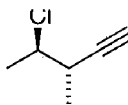
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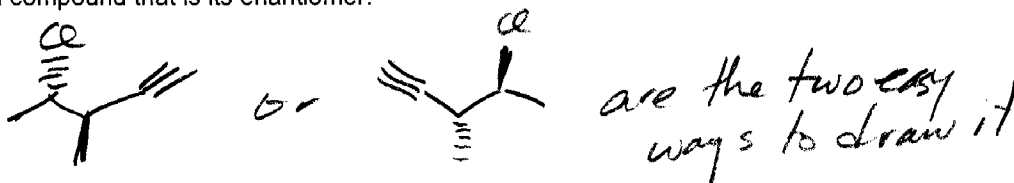
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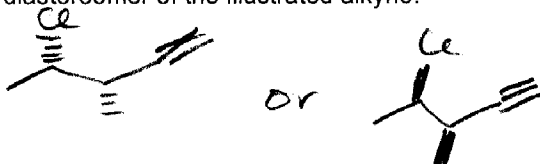
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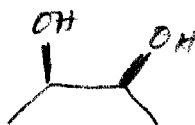


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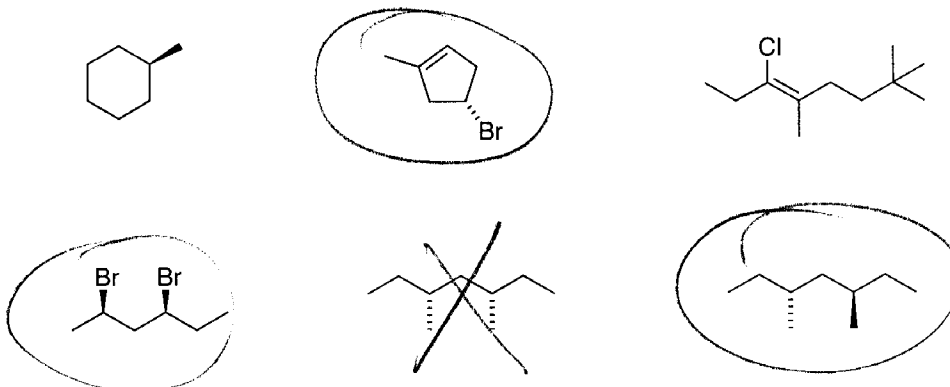


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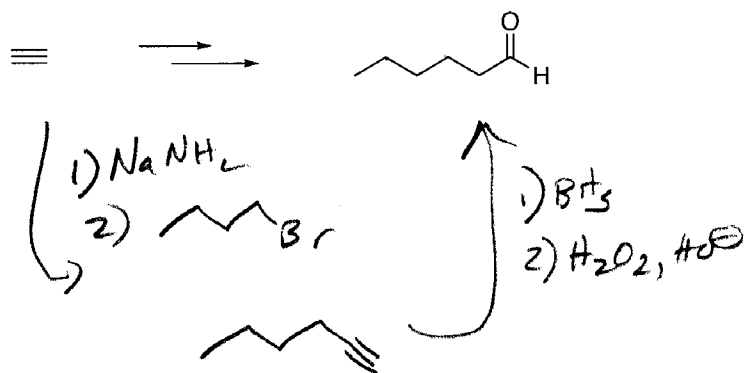
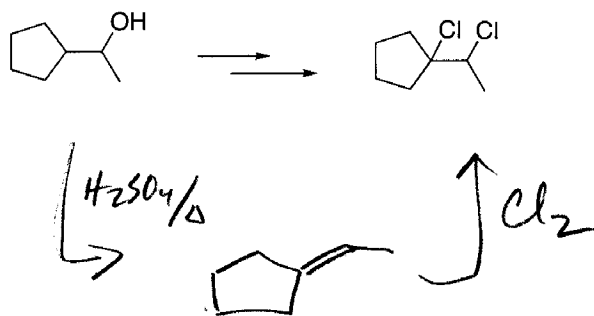
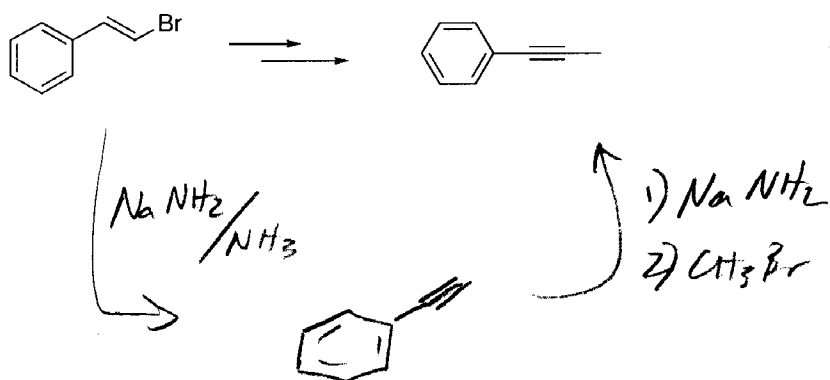
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