

Chemistry 118 B
Spring 2011
First Midterm
Fri. April 22rd, 2011
Instructor: Lievens

This exam contains seven (7) pages and eight (8) problems. Please make sure that your copy contains all seven pages. If there is a problem, please tell the exam administrator prior to beginning. Please answer all questions. Remember that UCDavis Code of Academic Conduct applies to this exam and all other graded work in this class. Please no calculators, notes, books, models, or other aids.

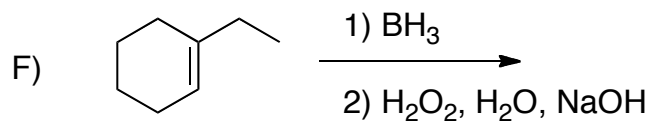
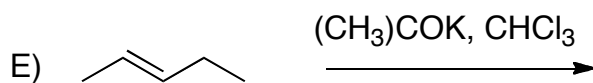
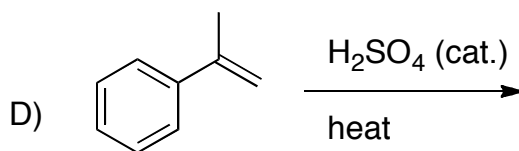
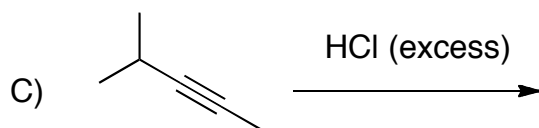
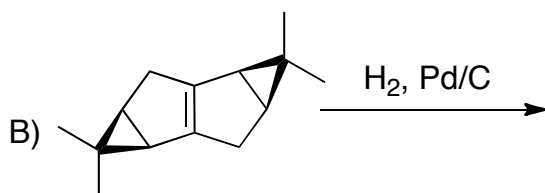
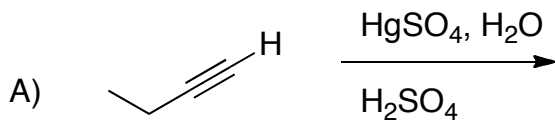
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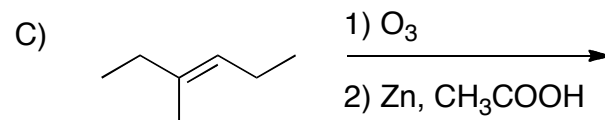
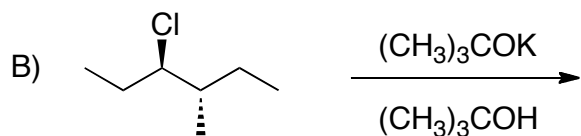
T.A./ Lab Section: _____

Page #	Points
2	
3	
4	
5	
6	
7	
Total (112)	

1. **Reactions:** (24 pts). Draw the structure of the expected organic product(s) formed in the following reactions *including correct relative stereochemistry*, if the reaction is racemic indicate this by either drawing both enantiomers or drawing one and writing racemic. Assume all reagents listed are present in *excess* unless otherwise noted. If no reaction occurs, state 'No Reaction'.



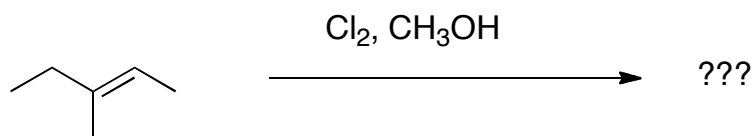
2. **Reactions:** (12 pts). Draw the structure of the expected organic product(s) formed in the following reactions *including correct relative stereochemistry*, if the reaction is racemic indicate this by either drawing both enantiomers or drawing one and writing racemic. Assume all reagents listed are present in *excess* unless otherwise noted. If no reaction occurs, state 'No Reaction'.



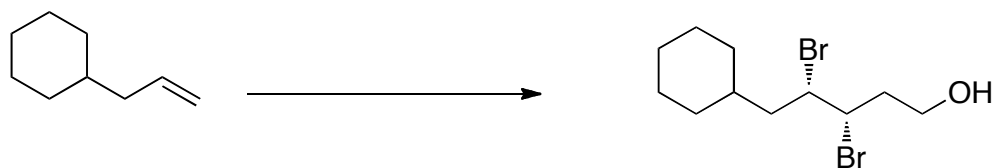
3. **Vocabulary:** (13 pts) Fill in the blanks with the appropriate vocabulary word. If two words are given circle the correct one.

- A) The pKa of an alkyne H is about _____ while the pKa of an alkene H is about _____ this is due to greater _____ character in the orbitals.
- B) An E₂ elimination with a hindered base will give the **more / less** substituted alkene which demonstrates _____ regioselectivity.
- C) When new groups are added to opposite faces of an alkene the reaction is considered to be **syn / anti**.
- D) **True / False** In ¹³C NMR an alkene generally shows up around 120 ppm.
- E) A carbene generally has _____ electrons around the central carbon.
- F) **True / False** Additional substituents around an alkene make it less stable.
- G) A trans alkene is **always / sometimes / never** an E alkene, and a Z alkene is **always / sometimes / never** a cis alkene.
- H) Addition of an alcohol to an alkene in strong acid proceeds by _____ regioselectivity and **syn / anti / mixed** stereoselectivity.

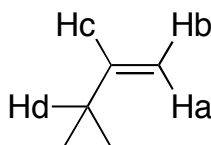
4. **Mechanism:** (12 pts.). Show detailed reaction mechanism for the following reaction. Include the structure of the expected products and appropriate stereochemistry for all steps. Assume all reagents are in excess.



5. **Synthesis:** (16 pts) Show how you would carry out the following synthesis. Include the reagents you would need for each step and the structure of the intermediate products formed in each step. You may use any inorganic reagents you need and organic reagents of five or fewer carbons.

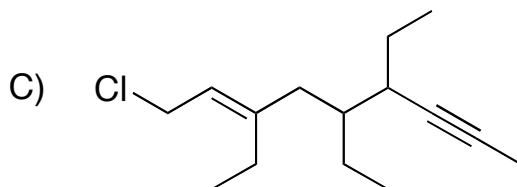
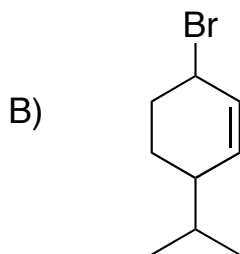
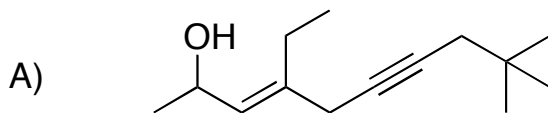


6. **Coupling:** (7 pts). In each case indicate which proton is described A, B, C, D or none of the above.



- A) The coupling between H_C and H_B is a _____ type coupling with a _____ orientation. It generally has a range of _____ Hz. Couplings of this type will be **always** / **sometimes** / **never** give a doublet at H_C .
- B) The coupling between H_A and H_D is a _____ type coupling with a _____ orientation. It generally has a range of _____ Hz. Couplings of this type will be **always** / **sometimes** / **never** give a doublet at H_A .

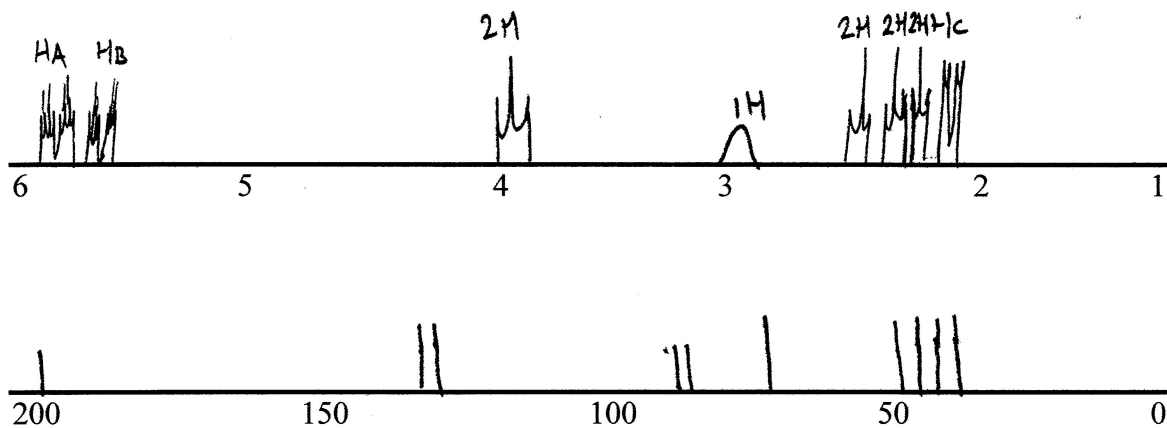
7. **Nomenclature:** (8 pts.) Provide the systematic names or structure of each of the following compounds include E/Z or R/S where relevant.



- D) (1E,3Z)-2-bromo-5-butyl-8,8-dimethylcycloocta-1,3-diene

8. **Spectroscopy:** (20 pts.) The unknown compound A ($C_{10}H_{14}O_2$) gives the following proton and carbon NMR spectra. Significant IR peaks were also observed.

What is compound A?



IR: 3342 (broad), 3098, 2947, 2207, 1700, 1645, 1210 and fingerprint cm^{-1} .

$H_a = 1H, J = 16$ Hz (d), 7 Hz (q)

$H_b = 1H, J = 16$ Hz (d), 2 Hz (q),

$H_c = 3H, J = 7$ Hz (d), 2 Hz (d)