Chemistry 118 B
Spring 2010
First Midterm
Fri. April 23rd, 2010
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.

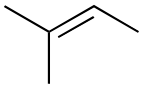
Name: _____
Last First MI

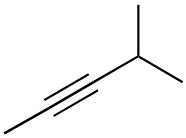
Student ID. # _____

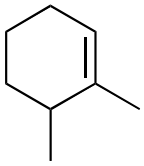
T.A./ Lab Section: _____

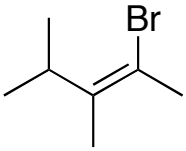
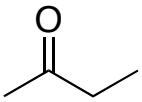
Page #	Points
2	
3	
4	
5	
6	
7	
Total (104)	

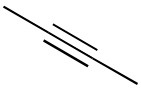
1. **Reactions:** (24 pts). Draw the structure of the expected organic product(s) formed in the following reactions *including correct relative stereochemistry,* if the reaction is racemic indicate this by either drawing both enantiomers or drawing one and writing racemic. Assume all reagents listed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

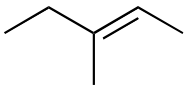
A)  Cl_2, CH_3OH

B)  $HgSO_4$, H_2O / H_2SO_4

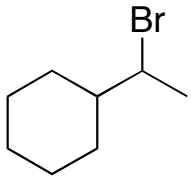
C)  1) O_3 / 2) Zn, HCl

D)  1) Mg / 2)  / 3) H_3O^+

E)  HI (excess)

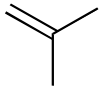
F)  CH_3SH / ROOR

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'.

A) 

CH_3CH_2ONa
CH_3CH_2OH

B) 
Br_2 (1 eq)
LiBr (xs)

C) 
H_2SO_4 (cat.)

3. Vocabulary: (11 pts) Fill in the blanks with the appropriate vocabulary word. If two words are given circle the correct one.

A) Generally an **alkane / alkene / allyl** system is the most acidic due to _____.

B) Alkanes with **more / less** substituents are more stable and are generally **electron rich / electron poor.**

C) Generally a Markovnikov addition adds so the nucleophile is on the **more / less** substituted side of the alkene and the two new groups are **always / sometimes / never** anti.

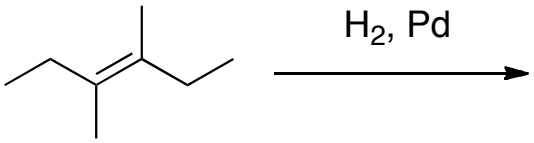
D) When both new groups are added to the same face of an alkene the reaction is considered to be **syn / anti**. Give an example _____.

E) **True / False** Allyl and alkane couplings can be doublets, triplets or quartets.

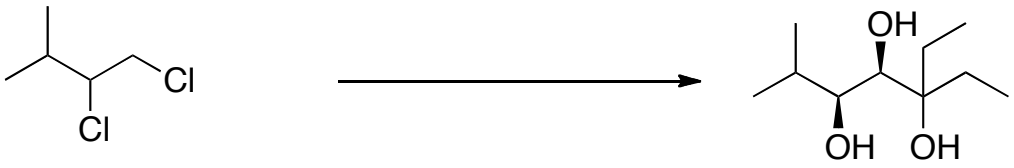
F) **True / False** In ^{1}H NMR an internal alkene is upfield of a terminal alkene.

G) A _____ is a six electron carbon that adds to an alkene to form cyclopropane.

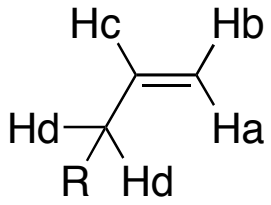
4. **Mechanism:** (12 pts.). Show detailed reaction mechanisms for the following reaction. Include the structure of the expected products and appropriate stereochemistry for all steps. Assume all reagents are in excess.



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 less carbons.



6. **Coupling:** (4 pts). In each case indicate which proton is described A, B, C, D or none of the above.

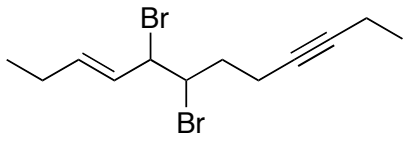


A) A proton has a chemical shift of δ 5.06 ppm with the couplings *J*= 16 Hz (d), 3 Hz (d), and 2 Hz (t). Which is it? _____

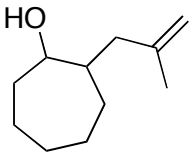
B) A proton has a chemical shift of δ 5.02 ppm with the couplings *J*= 10 Hz, (d), 3 Hz (d), and 1 Hz (t). Which is it? _____

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

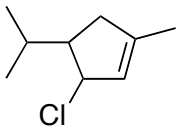
A)



B)



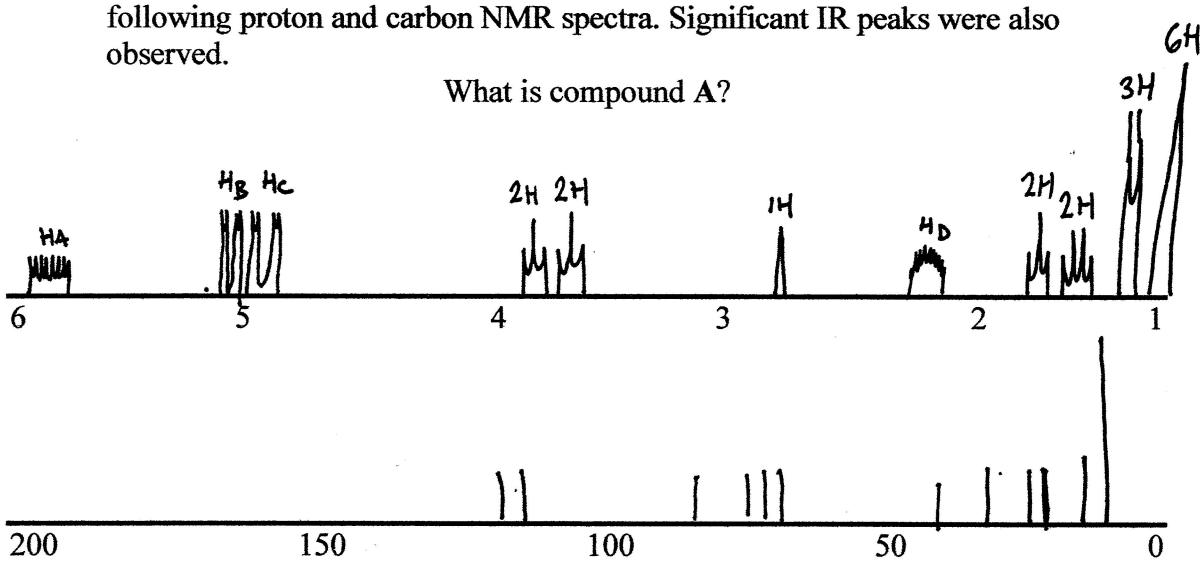
C)



D) 2Z,9E-3-bromo-9-methyl-4-(1-methylpropyl)-undec-2,9-dien-7-yn-5-ol

8. **Spectroscopy:** (20 pts.) The unknown compound **A** ($C_{13}H_{22}O$) gives the following proton and carbon NMR spectra. Significant IR peaks were also observed.

What is compound **A**?



IR: 3313 (sharp) 3102, 2952, 2210, 1651, 1210 and fingerprint cm^{-1}.

H_a = 1H *J*= 16 Hz (d), 9 Hz (d), 6 Hz (d)
H_b = 1H *J*= 9 Hz (d), 3 Hz (d), 1 Hz (d)
H_c = 1H, *J* = 16 Hz (d), 3 Hz (d), 2 Hz (d)
H_d = 1H, *J* = 8 Hz (t), 7 Hz (q), 6 Hz (d), 2 Hz (d), 1 Hz (d)