

Chemistry 334

Examination #1

October 9, 2006

Professor Charonnat

Name: _____

Be certain that your examination has six (6) pages including this one.

Put your name on **each** page of this examination booklet.

By putting your name on this examination booklet you agree to abide by California State University, Northridge policies of academic honesty and integrity.

Molecular models are allowed for this examination. All electronic devices, including calculators, are unnecessary and are not allowed.

Name: _____

1. (30 points)

Circle the number that corresponds to the correct answer for each of the following six (6) questions.

A. The stability of the allyl radical is closest to that of a

1. primary radical
2. secondary radical
3. tertiary radical

B. The allylic carbocation that is formed by heterolysis of the C-Br bond of *trans*-1-bromopent-2-ene

1. is more stable than the allyl carbocation
2. is less stable than the allyl carbocation
3. has the same stability as the allyl carbocation

C. Mechanistically, the Williamson ether synthesis is

1. an acid-base reaction followed by an S_N2 reaction
2. an E2 reaction followed by an S_N2 reaction
3. an E2 reaction followed by an S_N1 reaction

D. Epoxides are reactive primarily due to

1. the polarity of each C-O bond
2. angle strain
3. torsional strain

E. Allylic halides react very readily in S_N2 reactions due to

1. transition-state stabilization due to conjugation
2. favorable sterics
3. both factors

F. Which diene is the most reactive in Diels-Alder reactions?

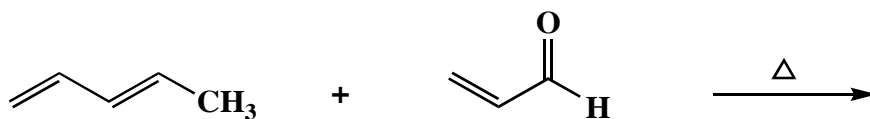
1. (*cis, cis*)-hexa-2,4-diene
2. (*trans, trans*)-hexa-2,4-diene
3. (*cis, trans*)-hexa-2,4-diene

Name: _____

2. (25 points)

Draw the structure of the expected major organic product for each of the following five (5) questions. Clearly specify stereochemistry, if relevant.

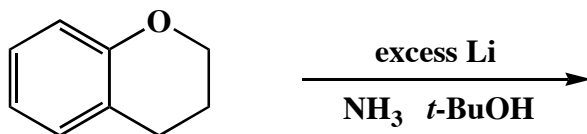
A.



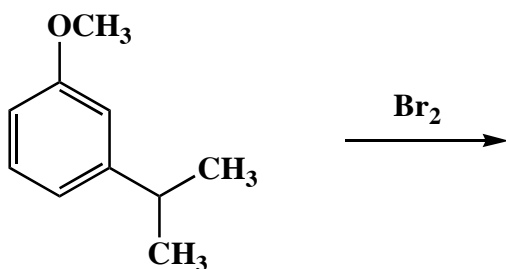
B.



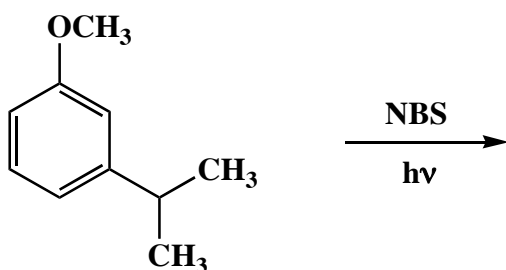
C.



D.



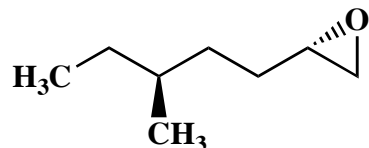
E.



Name: _____

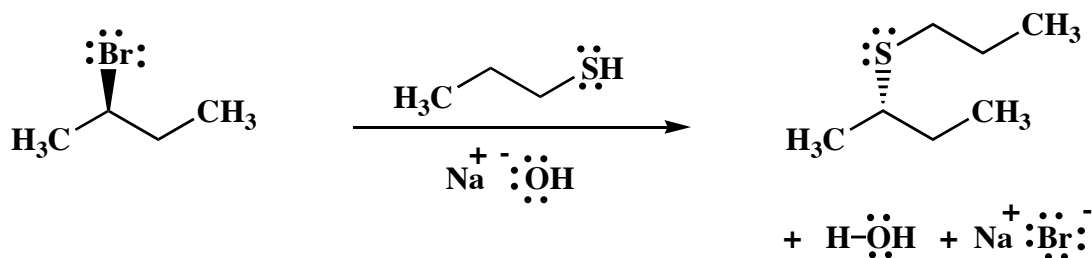
3. (10 points)

Use IUPAC nomenclature to write the systematic name of the following epoxide.



4. (15 points)

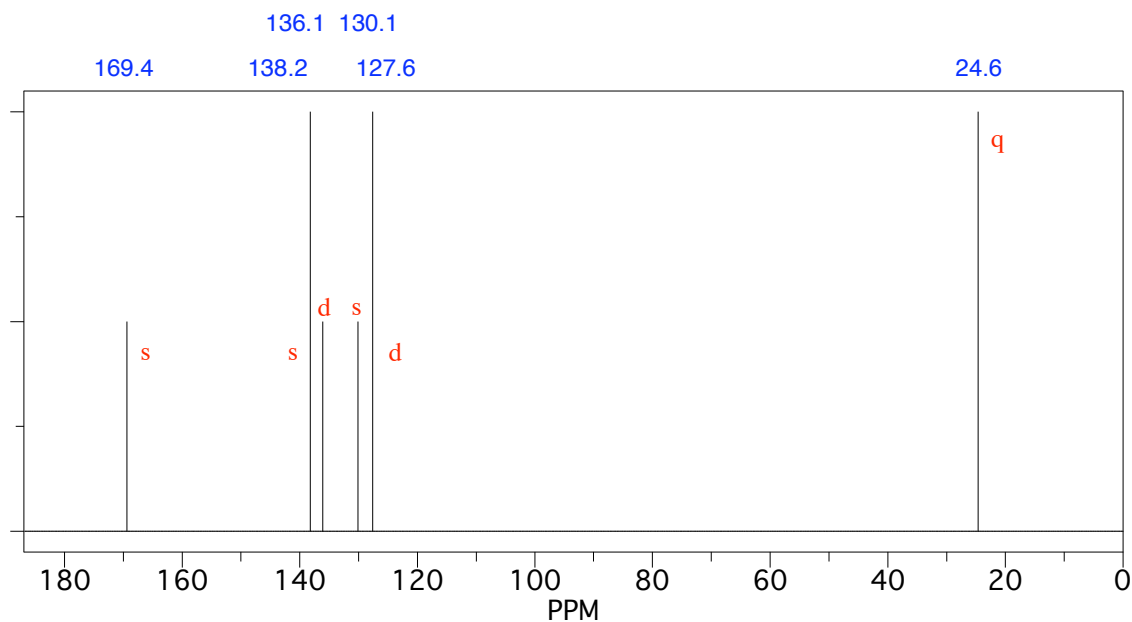
Draw the mechanism of the following reaction, using the curved-arrow notation to indicate the reorganization of electron density. Show all intermediates and denote all unshared electrons, formal charges and countercharges where appropriate. Finally, explain concisely and clearly why the observed stereochemical result is obtained.



Name: _____

5. (20 points)

The broadband proton-decoupled ^{13}C NMR spectrum of an unknown organic compound ($\text{C}_9\text{H}_{10}\text{O}_2$) is shown below. The labels next to each of the resonances signify the multiplicities observed in the corresponding off-resonance proton-decoupled ^{13}C NMR spectrum (s = singlet, d = doublet, q = quartet). Use this spectroscopic evidence to determine the identity of the compound. Make clear assignments of all resonances to explain your reasoning. (A ^{13}C NMR correlation table is included separately.)



Name: _____

5. (continued)

^{13}C NMR assignments:

chemical shift (ppm)	assignment	explanation of multiplicity
169.4		
138.2		
136.1		
130.1		
127.6		
24.6		

labeled structure:

Congratulations!

1	/30
2	/25
3	/10
4	/15
5	/20
<hr/> Total:	<hr/> /100