

Chemistry 333

Examination #3

July 8, 2008

Professor Charonnat

Name: _____

Be certain that your examination has seven (7) 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.

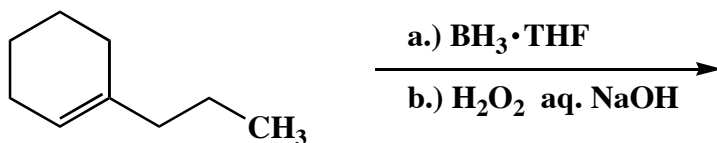
Molecular models are allowed for this examination. All electronic devices, including calculators, are unnecessary and are not allowed.

Name: _____

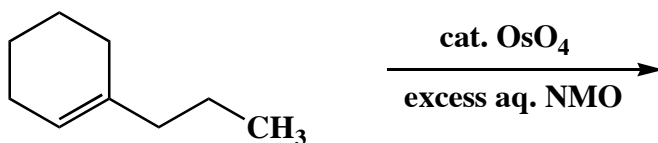
1. (25 points)

Draw the major organic product for each of the following five (5) reactions. Specify stereochemistry clearly, if relevant.

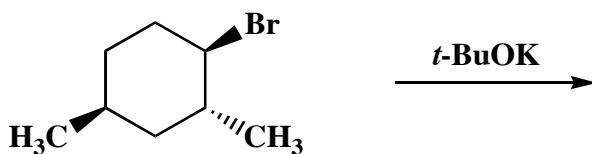
A.



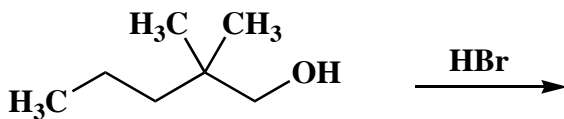
B.



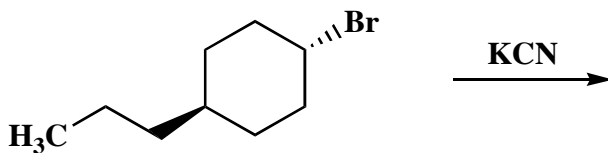
C.



D.



E.



Name: _____

2. (30 points)

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

A. According to the VSEPR rules, an atom with three hybrid orbitals has a

1. linear orientation of its orbitals
2. tetrahedral orientation of its orbitals
3. trigonal orientation of its orbitals

B. The first step in a typical E1 reaction is

1. endothermic
2. exothermic
3. neither

C. The mass spectrum of a saturated hydrocarbon has an M+1 peak that is 23% the intensity of the molecular ion peak. How many carbon atoms does a molecule of this hydrocarbon possess?

1. 20
2. 21
3. 23

D. How are (2*R*, 3*R*, 4*S*)-3-bromo-2,4-dichlorohexane and (2*R*, 3*S*, 4*R*)-3-bromo-2,4-dichlorohexane related to each other?

1. enantiomers
2. diastereomers
3. regioisomers

E. Rank the following species from most to least stable.

1. eclipsed propane, eclipsed ethane, staggered propane
2. staggered propane, eclipsed propane, eclipsed ethane
3. staggered propane, eclipsed ethane, eclipsed propane

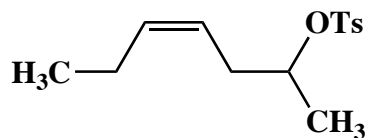
F. Based upon reduced-mass considerations, the infrared absorption of an S-H bond is expected to occur at a wavenumber that is

1. lesser than the corresponding O-H absorption
2. greater than the corresponding O-H absorption
3. the same as the corresponding O-H absorption

Name: _____

3. (25 points)

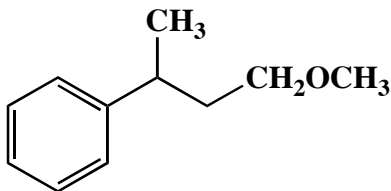
Design a synthesis of the following unsaturated tosylate from acetylene, *para*-toluenesulfonyl chloride, any inorganic reagents and any organic compounds that contain three carbons or less. Write **specific** reagents and denote each step carefully. Show all stable, synthetic intermediate compounds in the route. (**N.B.** Do not draw mechanisms!)



(racemic)

4. (20 points)

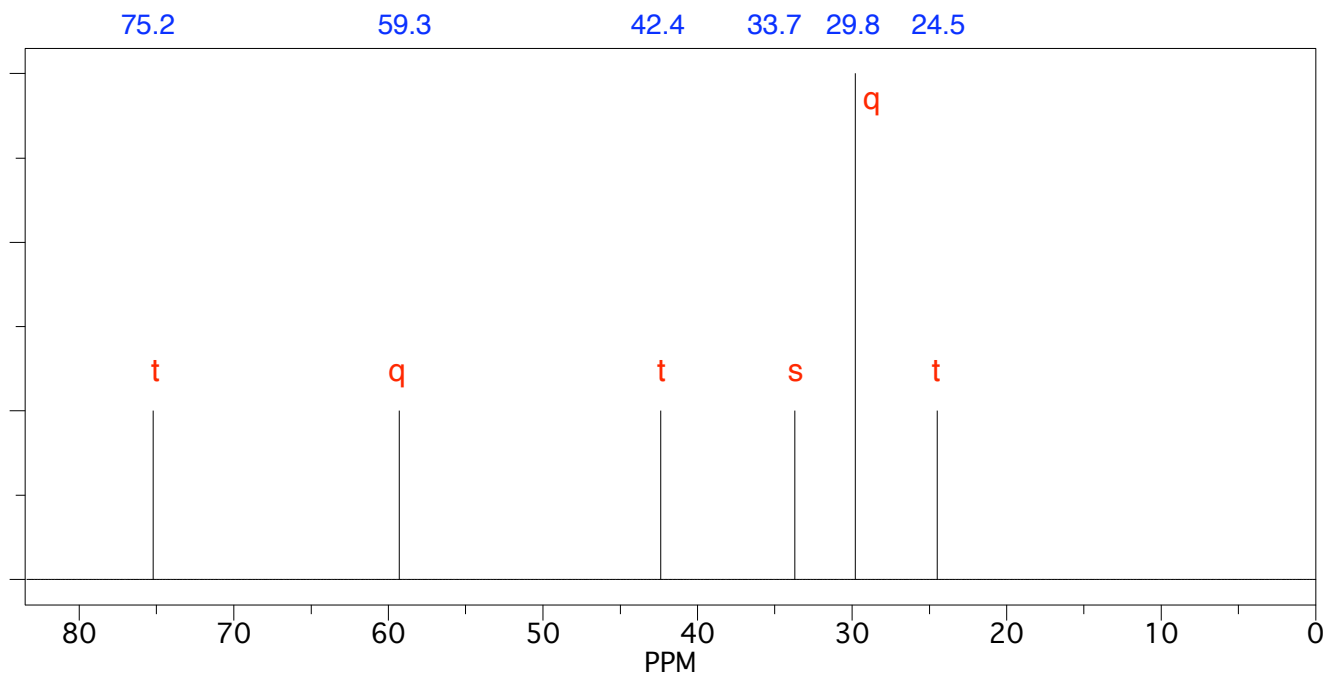
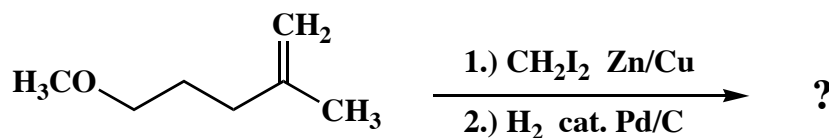
Use letters to label all the sets of chemically equivalent protons in the following racemic ether. Then draw an annotated tree diagram to show the multiplicity of the highlighted methylene group. Specify, but do not quantify all appropriate coupling constants in the tree diagram.



Name: _____

5. (25 points)

Draw the major organic product that is formed from the following reaction sequence. The broadband proton-decoupled ^{13}C NMR spectrum of the product 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, t = triplet, 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

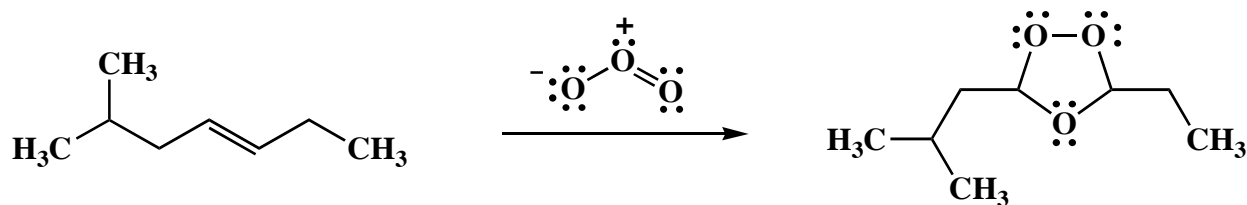
explanation of multiplicity



Name: _____

6. (25 points)

Draw the mechanism of the following reaction, using the curved-arrow notation to indicate the reorganization of electron density. Denote **all** intermediates, lone pairs, nonzero formal charges and countercharges. Is the product chiral? If so, is it optically active?



Congratulations!

1	/25
2	/30
3	/25
4	/20
5	/25
6	/25
<hr/> Total:	<hr/> /150