

Chemistry 334

Examination #1

July 28, 2000

Professor Charonnat

Name: _____

Be certain that your examination has nine (9) pages including this one.

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

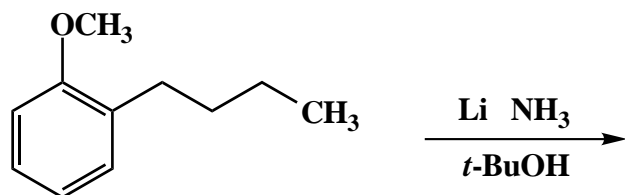
By putting your name on this examination booklet you agree to abide by California State University, Northridge policies of academic honesty and integrity.

Name: _____

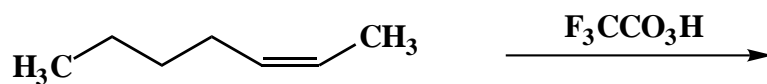
1. (25 points)

For each of the following five (5) questions, draw the structure of the expected major organic product. If relevant, explicitly specify absolute and/or relative stereochemistry.

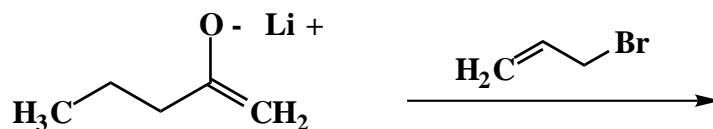
A.



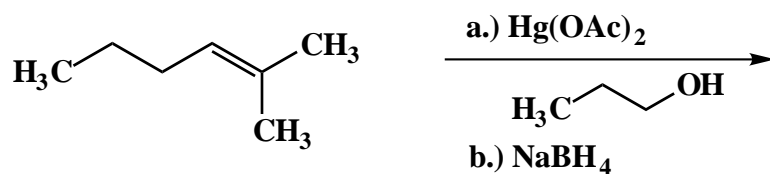
B.



C.



D.



E.

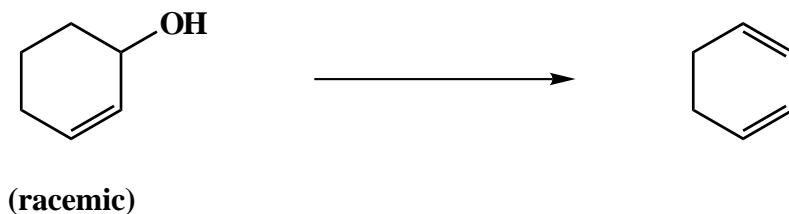


Name: _____

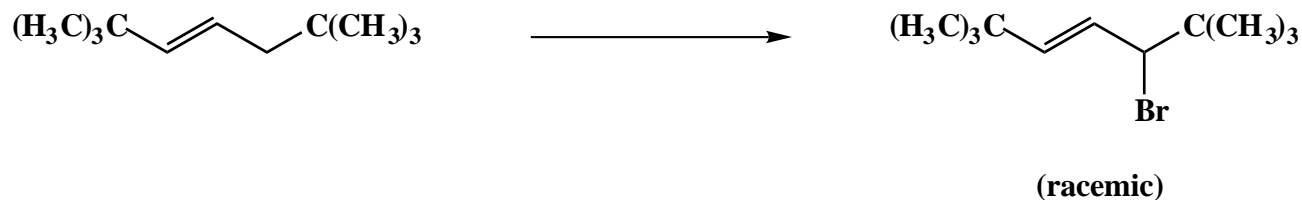
2. (25 points)

For each of the following five (5) questions, draw the specific reagent(s) necessary to effect the transformation shown. If more than one reaction is involved in an answer, be certain to distinguish the individual steps clearly.

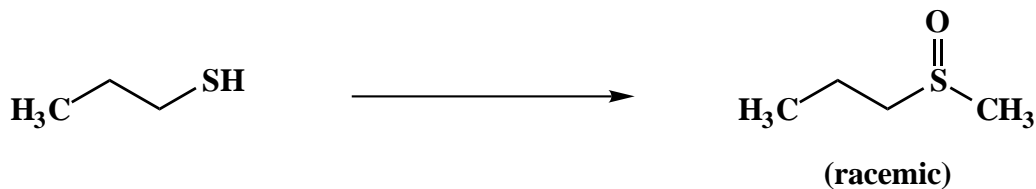
A.



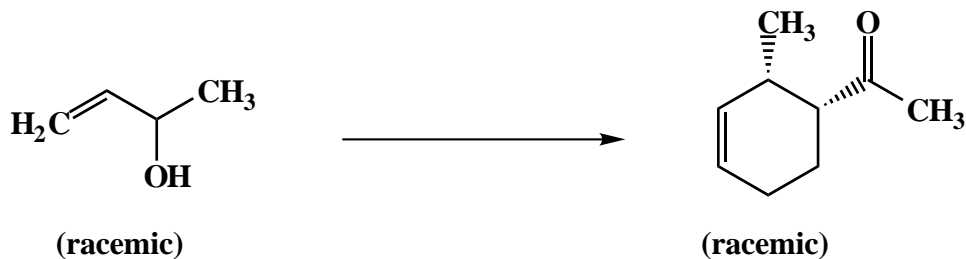
B.



C.



D.



E.



Name: _____

3. (25 points)

For each of the following five (5) questions, circle the number that corresponds to the correct answer.

A. The reaction of S-adenosylmethionine with biochemical nucleophiles occurs via

1. an S_N1 pathway
2. an S_N2 pathway
3. an E2 pathway

B. An ether

1. is more polar than the corresponding alcohol
2. is less polar than the corresponding alcohol
3. has the same polarity as the corresponding alcohol

C. Which of the following species is a conjugated system?

1. 1,3-octadiene
2. 1,4-octadiene
3. 1,5-octadiene

D. The epoxidation of alkenes with peroxycarboxylic acids occurs via

1. a radical pathway
2. an ionic pathway
3. a concerted pathway

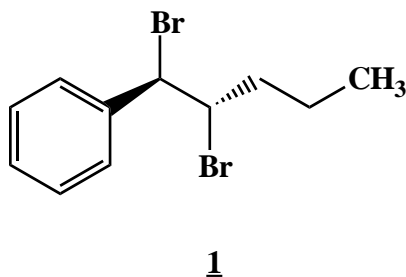
E. A compound with increased conjugation has

1. a larger λ_{max} value in its ultraviolet/visible spectrum
2. a smaller λ_{max} value in its ultraviolet/visible spectrum
3. the same λ_{max} value in its ultraviolet/visible spectrum

Name: _____

4. (20 points)

Design a synthesis of the racemic 1,2-dibromide **1** from benzene, organic compounds that contain five or fewer carbons, and any additional inorganic reagents that are necessary. Show all reagents and stable synthetic intermediate compounds.



5. (10 points)

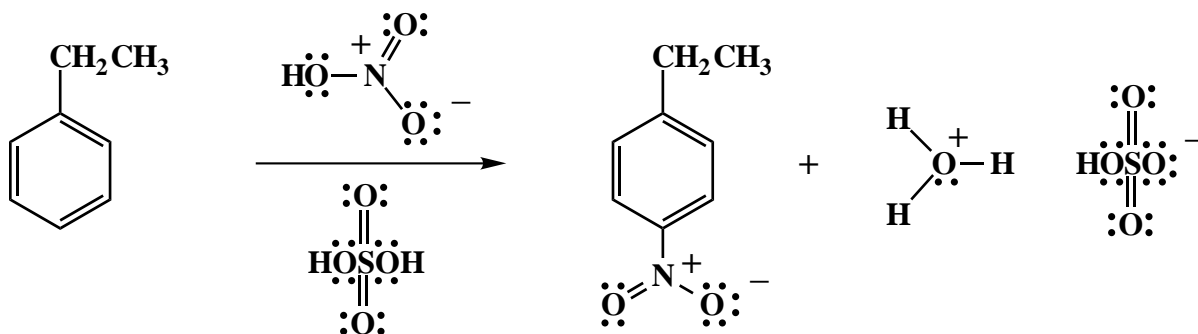
Use IUPAC nomenclature to write the systematic name of the following epoxide.



Name: _____

6. (25 points)

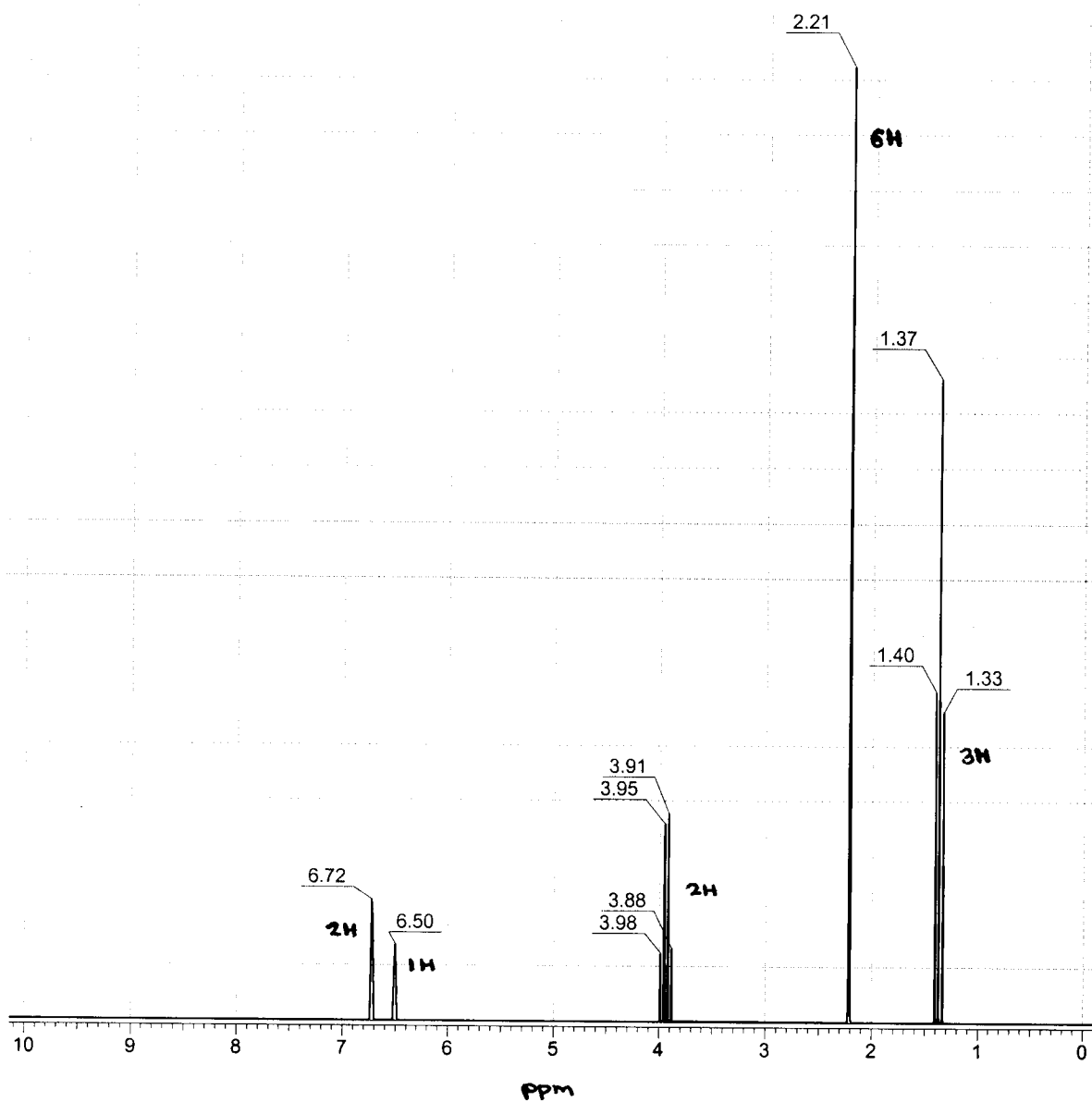
Draw the mechanism of the following reaction, using the curved-arrow notation to indicate the reorganization of electron density. Show all intermediates and denote all unshared electrons, formal charges and countercharges where appropriate. Draw all important resonance contributors for intermediates. Mark the rate-determining step with a star.



Name: _____

7. (20 points)

The ^1H NMR spectrum of compound A ($\text{C}_{10}\text{H}_{14}\text{O}$) is shown below. Clearly assign all the resonances and draw the structure of compound A. (A ^1H NMR correlation table is included on page 9.)



Name: _____

7. (continued)

¹H NMR assignments:

chemical shift (ppm)

assignment

explanation of multiplicity

structure of compound A:

Congratulations!

1	/25
2	/25
3	/25
4	/20
5	/10
6	/25
7	/20
<hr/> Total:	<hr/> /150

SELECTED ¹H NMR CORRELATIONS

structural type	chemical shift range (ppm)
cyclopropyl	0.0 - 0.9
RNH ₂ R ₂ NH	0.5 - 5.0 ^a
-CH ₃ (saturated)	0.7 - 1.3
$\text{H}_3\text{C}-\overset{\text{ }}{\underset{\text{ }}{\text{C}}}-\overset{\text{ }}{\underset{\text{ }}{\text{C}}}-\text{X}$ (X = halogen, O, N, carbonyl)	0.9 - 1.2
$-\overset{\text{ }}{\text{CH}_2}$ (saturated)	1.2 - 1.3
$-\overset{\text{ }}{\text{CH}}$ (saturated)	1.4 - 1.6
$\text{H}_3\text{C}-\overset{\text{ }}{\text{C}}-\text{X}$ (X = halogen, O, N, carbonyl)	1.0 - 2.0
ROH	1.0 - 5.0 ^a
$\text{H}_3\text{C}-\text{C}=\text{C}$	1.6 - 1.9
$\text{H}_3\text{C}-\text{C}\equiv\text{C}-$	1.8 - 2.2
$\text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}$	1.9 - 2.6
H ₃ C-Ar	2.1 - 2.6
$\text{H}_3\text{C}-\text{N}$	2.1 - 3.0
-C≡C-H (nonconjugated)	2.0 - 2.6
-C≡C-H (conjugated)	2.8 - 3.1
H ₃ C-X (X = halogen, O)	2.6 - 4.4
Ar-NH ₂ Ar ₂ NH	3.0 - 5.0 ^a
H ₃ C-O-	3.3 - 4.2
ArOH	4.0 - 10.0 ^a
$\text{H}_2\text{C}=\text{C}$ (nonconjugated)	4.6 - 5.0
$\overset{\text{H}}{\text{C}}=\text{C}$ (nonconjugated)	5.1 - 5.9
$\text{H}_2\text{C}=\text{C}$ (conjugated)	5.3 - 6.3
$\overset{\text{H}}{\text{C}}=\text{C}$ (conjugated)	5.3 - 7.7
ArH	6.0 - 9.5
$\overset{\text{O}}{\parallel}{\text{R}-\text{C}-\text{H}}$ $\overset{\text{O}}{\parallel}{\text{Ar}-\text{C}-\text{H}}$	9.5 - 10.5
$\overset{\text{O}}{\parallel}{\text{R}-\text{C}-\text{OH}}$ $\overset{\text{O}}{\parallel}{\text{Ar}-\text{C}-\text{OH}}$	9.7 - 13.2