

Chemistry 333

Final Examination

May 22, 2006

Professor Charonnat

Name: _____

Be certain that your examination has ten (10) 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.

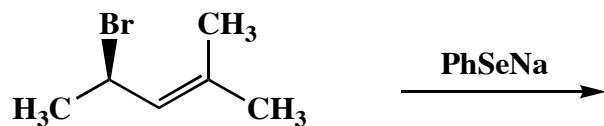
Molecular models are allowed for this examination. All electronic devices, including calculators, are unnecessary and are not allowed.

Name: _____

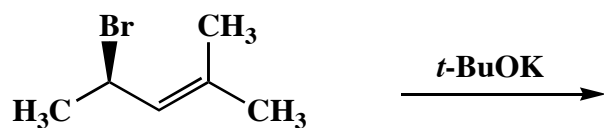
1. (25 points)

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

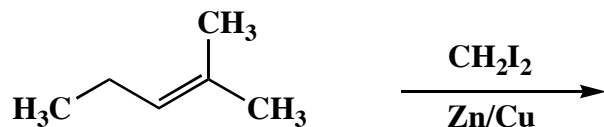
A.



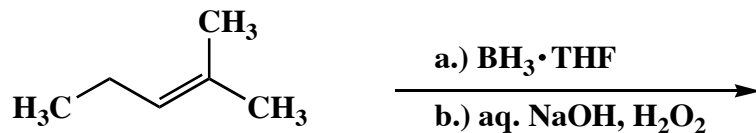
B.



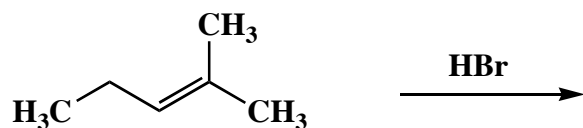
C.



D.



E.

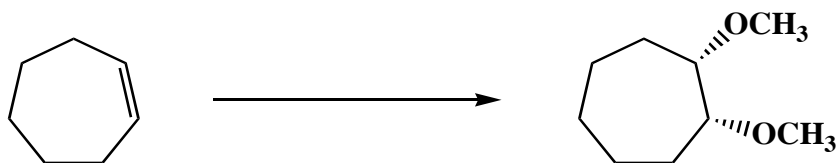


Name: _____

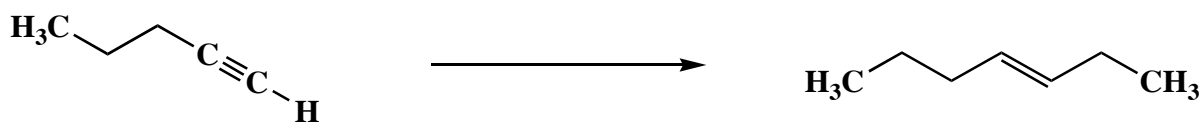
2. (25 points)

Draw the specific reagent(s) necessary to effect the following three (3) transformations. If more than one reaction is involved in an answer, be certain to distinguish the individual steps clearly. Specify the relative stoichiometry of all reagents, also.

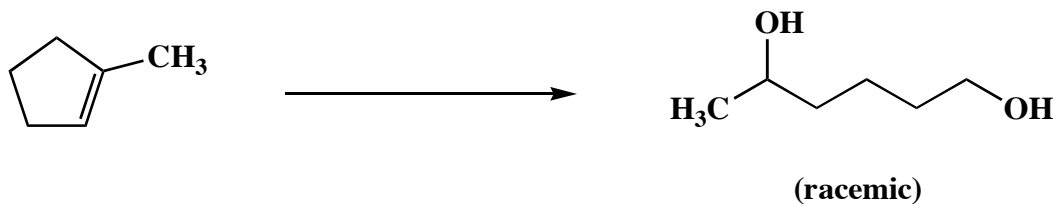
A.



B.



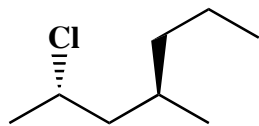
C.



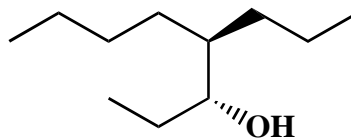
3. (20 points)

Use IUPAC nomenclature to write the systematic names of the following two (2) compounds.

A.



B.



Name: _____

4. (25 points)

Circle the number that corresponds to the correct answer for each of the following five (5) questions.

A. The intensity of the C-C triple-bond stretch of non-4-yne is

1. strong
2. medium
3. weak

B. Which technique can be used to determine the molecular formula of a compound directly?

1. infrared spectroscopy
2. ultraviolet-visible spectroscopy
3. high-resolution mass spectrometry

C. The alkene, (*E*)-2-methyloct-3-ene, has

1. eight sets of chemically equivalent protons
2. nine sets of chemically equivalent protons
3. ten sets of chemically equivalent protons

D. The mass spectrum of a hydrocarbon has an M+1 peak that is 20% of the molecular ion's intensity. The hydrocarbon contains

1. ten carbons
2. eighteen carbons
3. twenty carbons

E. A compound has a molecular ion at $m/z = 140$, and fragments at $m/z = 125$, 111 and 97. The compound likely contains

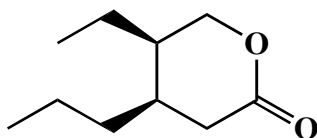
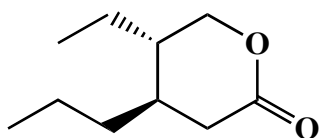
1. an amino group
2. a hydroxyl group
3. a propyl group

Name: _____

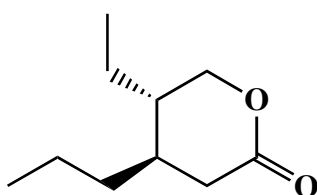
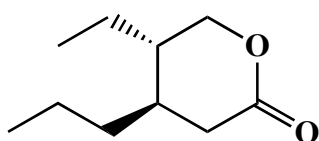
5. (30 points)

State the relationship between each of the following six (6) pairs of structures (identical, enantiomers, diastereomers, structural isomers, conformational isomers, different compounds that are not isomeric).

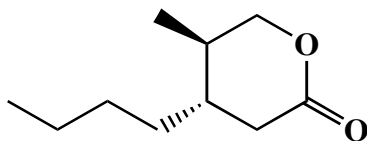
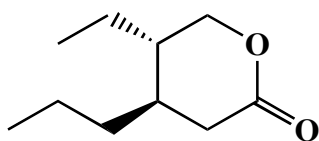
A.



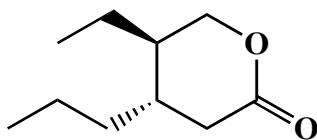
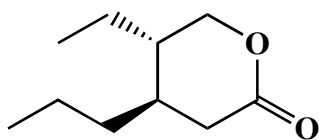
B.



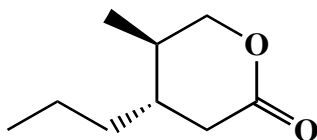
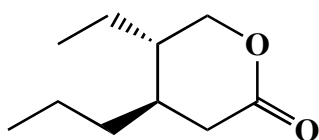
C.



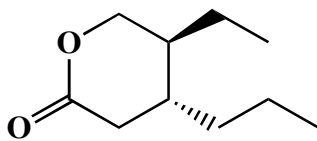
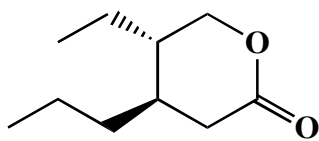
D.



E.



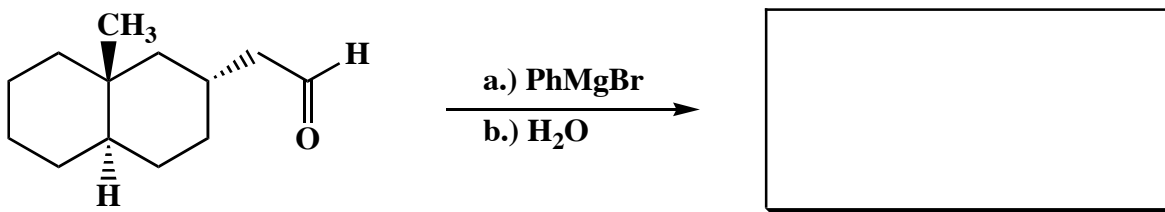
F.



Name: _____

6. (25 points)

When the following reaction was run, a product was isolated that showed infrared absorptions at 3500, 3025, 2975, 1600, 1495, 1305 and 1130 cm^{-1} . Draw the structure of the product. Use the infrared spectroscopic evidence to support your answer. Make clear assignments of all absorptions to explain your reasoning. (An IR correlation table is included separately.)



infrared assignments:

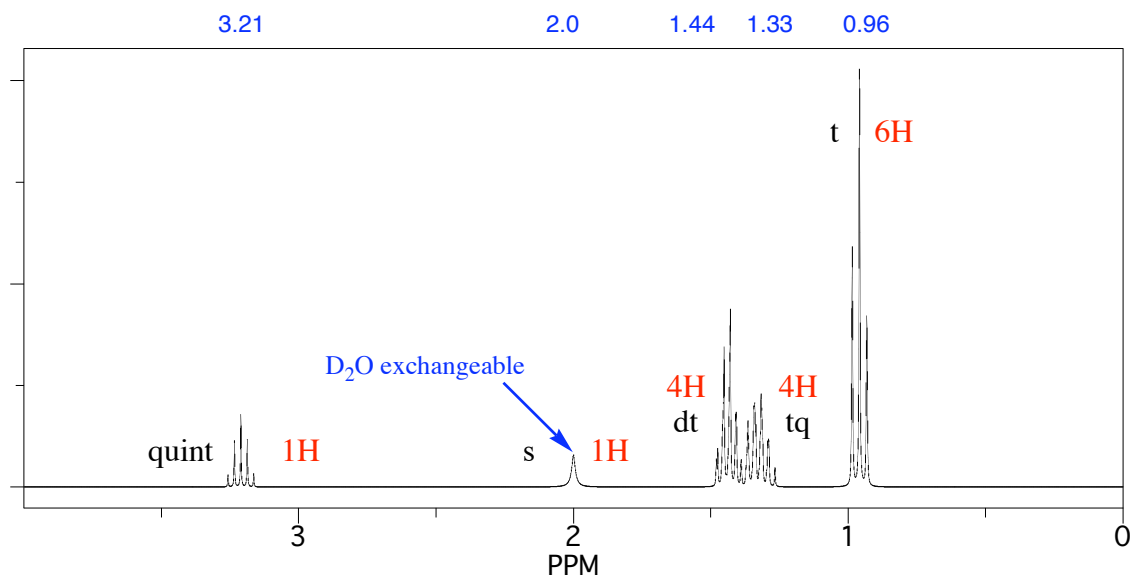
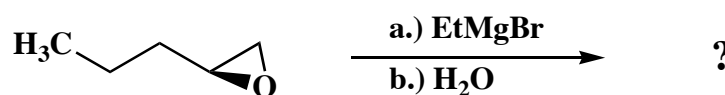
absorption

assignment

Name: _____

7. (25 points)

Draw the major organic product that is formed from the following reaction. The ^1H NMR spectrum of the product is shown below. The labels next to each of the resonances signify the multiplicities observed in the spectrum (quint = quintet, s = singlet, dt = doublet of triplets, tq = triplet of quartets, t = triplet). Use this spectroscopic evidence to identify the compound. Make clear assignments of all resonances to explain your reasoning. (A ^1H NMR correlation table is included separately.)



Name: _____

7. (continued)



¹H NMR assignments:

chemical shift (ppm)

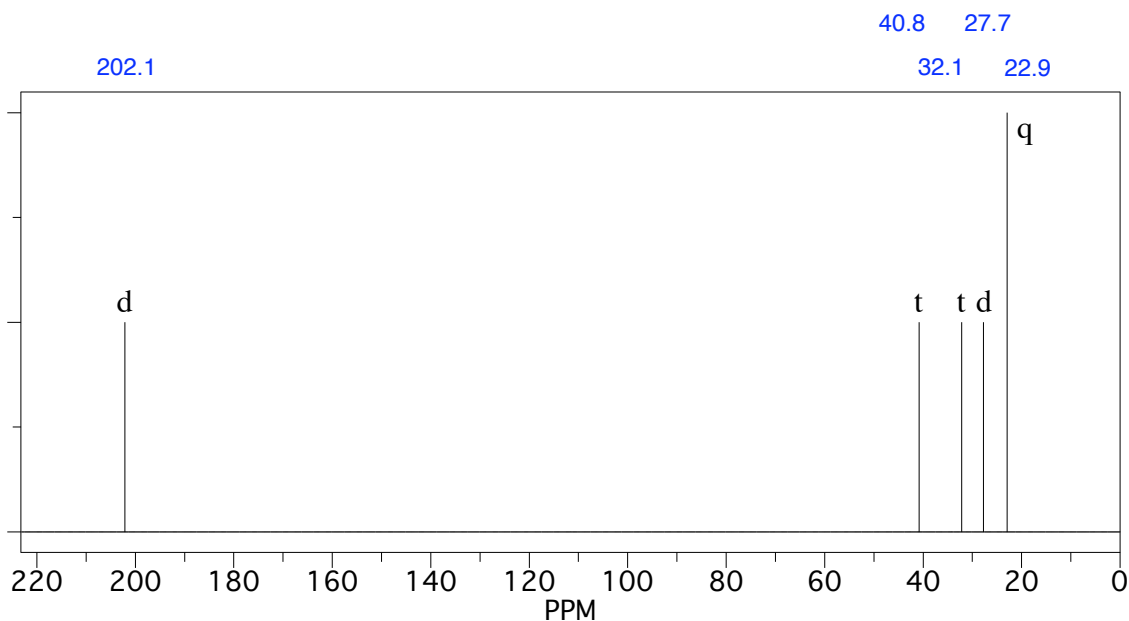
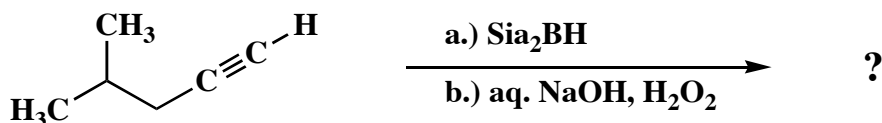
assignment

explanation of multiplicity

Name: _____

8. (25 points)

Draw the major organic product that is formed from the following reaction. 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 (d = doublet, t = triplet, q = quartet). Use this spectroscopic evidence to identify the compound. Make clear assignments of all resonances to explain your reasoning. (A ^{13}C NMR correlation table is included separately.)



Name: _____

8. (continued)



^{13}C NMR assignments:

chemical shift (ppm)

assignment

explanation of multiplicity

Congratulations!

1	/25
2	/25
3	/20
4	/25
5	/30
6	/25
7	/25
8	/25
<hr/>	
Total:	/200