

Chemistry 333

Final Examination

December 18, 2006

Professor Charonnat

Name: \_\_\_\_\_

Be certain that your examination has eleven (11) 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.

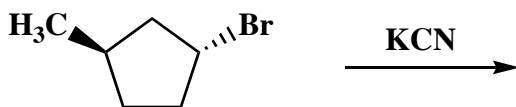
Molecular models are allowed for this examination. All electronic devices, including calculators, are unnecessary and are not allowed.

Name: \_\_\_\_\_

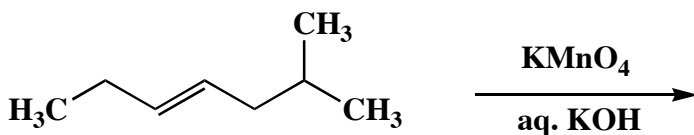
1. (50 points)

Draw the structure of the expected major organic product for each of the following ten (10) questions. Clearly specify stereochemistry, if relevant.

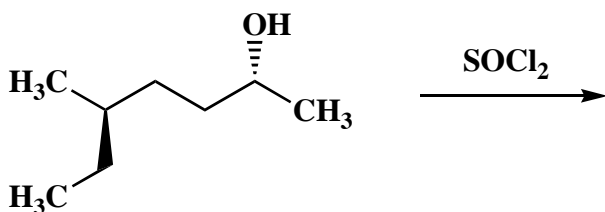
A.



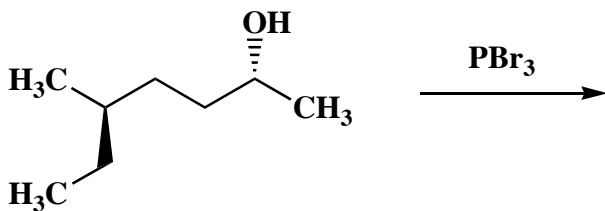
B.



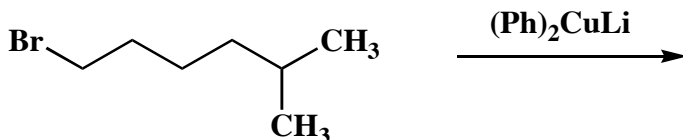
C.



D.



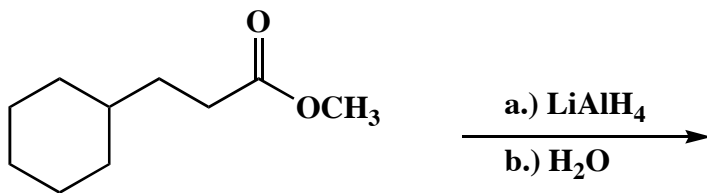
E.



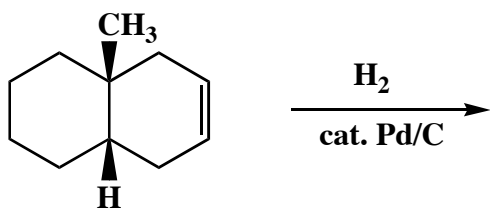
Name: \_\_\_\_\_

1. (cont.)

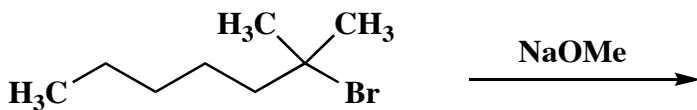
F.



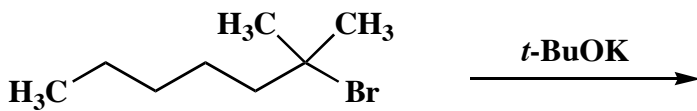
G.



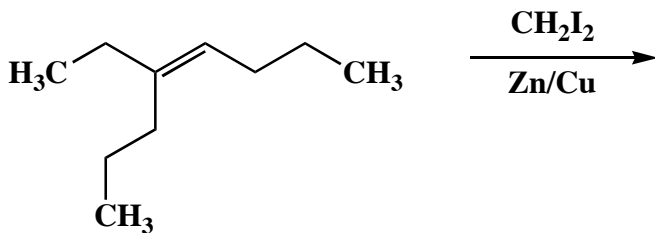
H.



I.



J.

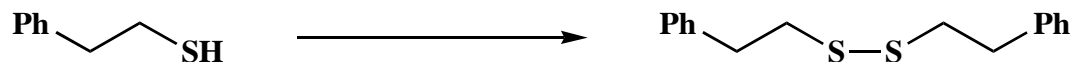


Name: \_\_\_\_\_

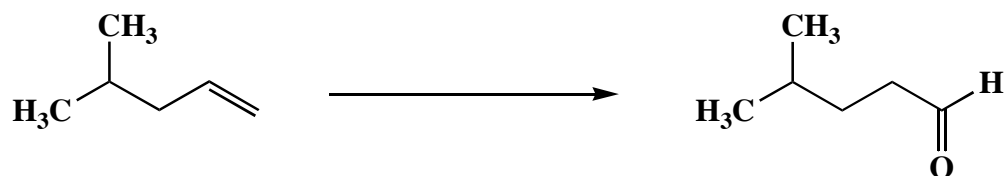
2. (30 points)

Draw the specific reagent(s) necessary to effect the following five (5) transformations. If more than one reaction is involved in an answer, be certain to distinguish the individual steps clearly.

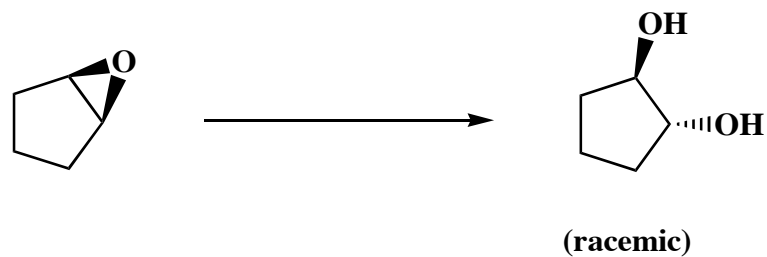
A.



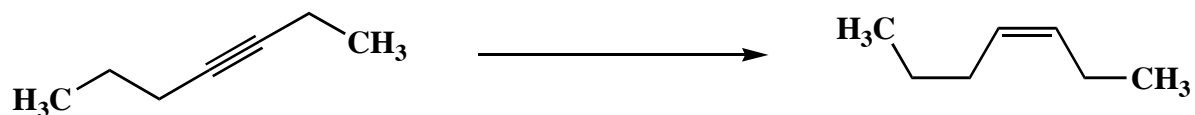
B.



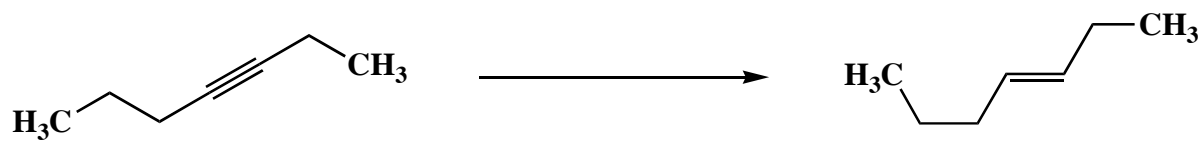
C.



D.



E.



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3. (25 points)

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

A. If a carbon resonance appears in neither a DEPT 90 nor a DEPT 135 spectrum, then the carbon is a

1. quaternary carbon
2. methine carbon
3. methyl carbon

B. The mass spectrum of an organic compound has a molecular ion at  $m/z = 198$ , and an intense signal at  $m/z = 155$ . The compound most likely contains a

1. propyl group
2. chlorine
3. bromine

C. Which of the following is the least stable conformation of *n*-butane?

1. gauche
2. anti
3. eclipsed

D. The rate of an E1 reaction is a function of

1. base concentration only
2. substrate concentration only
3. both base and substrate concentration

E. Which functional group has the most intense infrared absorption?

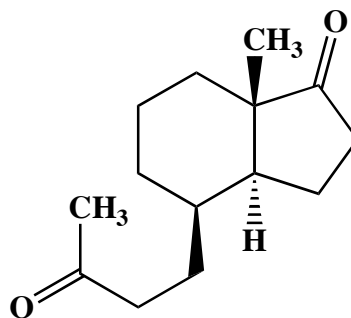
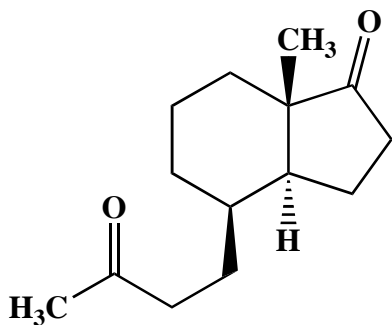
1. C=C
2. C≡C
3. C≡N

Name: \_\_\_\_\_

4. (20 points)

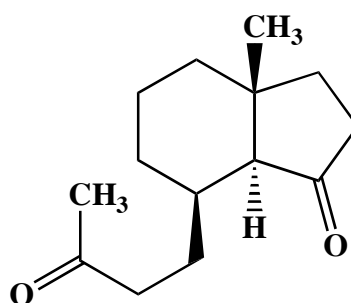
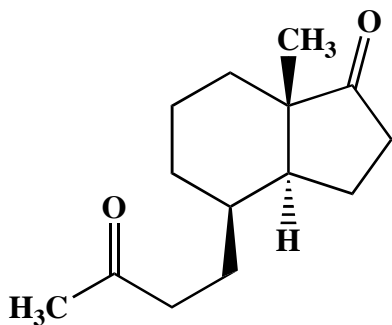
State the relationship between each of the following four (4) pairs of structures (identical, enantiomers, diastereomers, structural isomers, conformational isomers, different compounds that are not isomeric).

A.



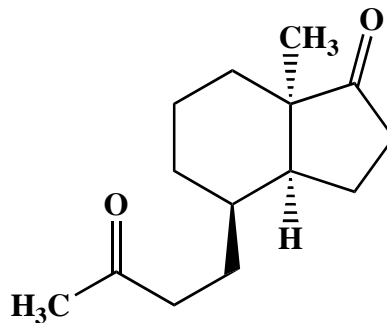
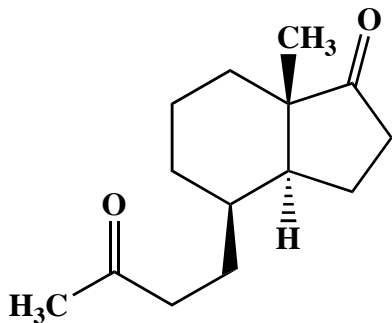
\_\_\_\_\_

B.



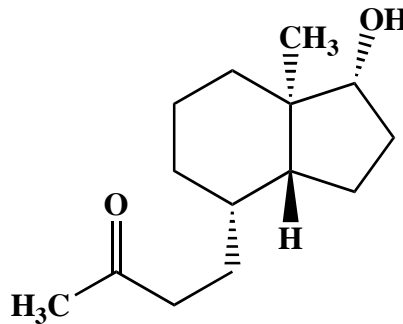
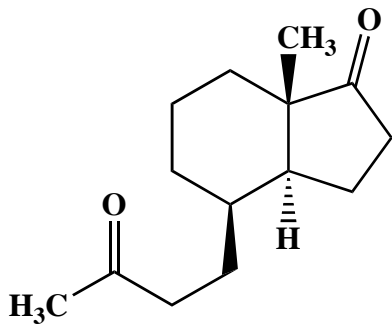
\_\_\_\_\_

C.



\_\_\_\_\_

D.

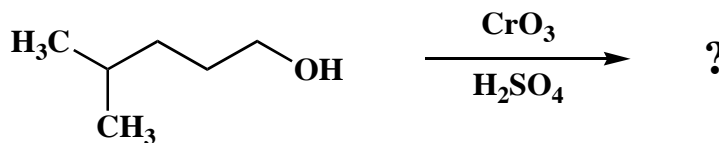


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5. (25 points)

The product from the following reaction shows infrared absorptions at  $1210\text{ cm}^{-1}$ ,  $1375\text{ cm}^{-1}$ ,  $1710\text{ cm}^{-1}$ ,  $2915\text{ cm}^{-1}$ , and a broad absorption from  $2900\text{--}3300\text{ cm}^{-1}$ . 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 ( $\text{cm}^{-1}$ )**

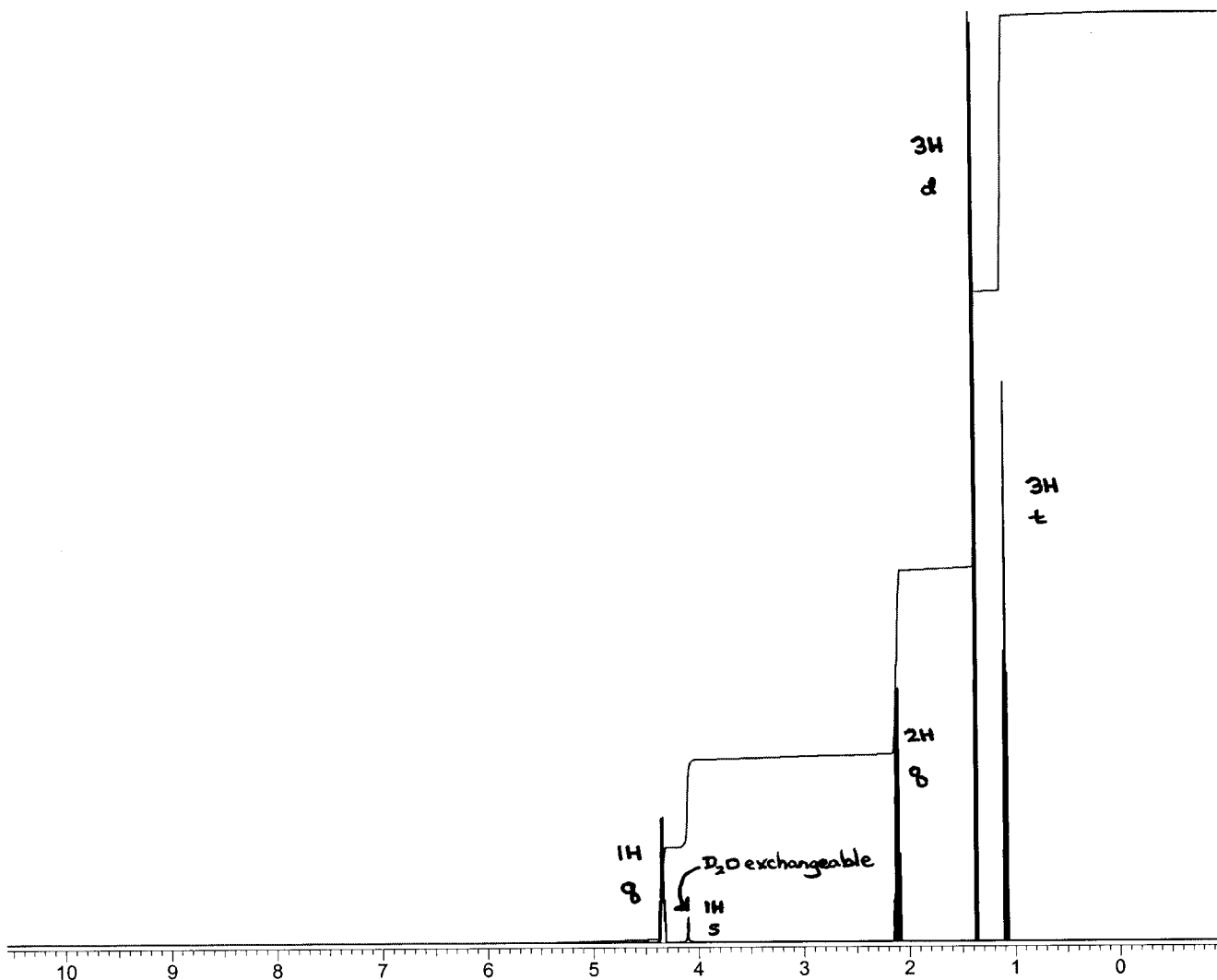
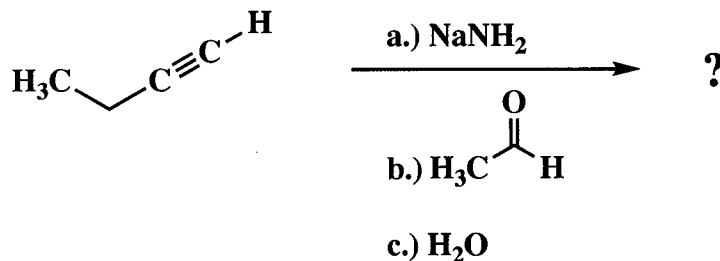
**assignment**



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6. (25 points)

Draw the major organic product that is formed from the following reaction. The  $^1\text{H}$  NMR spectrum of the product is shown below. The labels next to each of the resonances signify the integrals and multiplicities observed in the spectrum (s = singlet, d = doublet, 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  $^1\text{H}$  NMR correlation table is included separately.)



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6. (continued)

**$^1\text{H}$  NMR assignments:**

**chemical shift (ppm)**

**assignment**

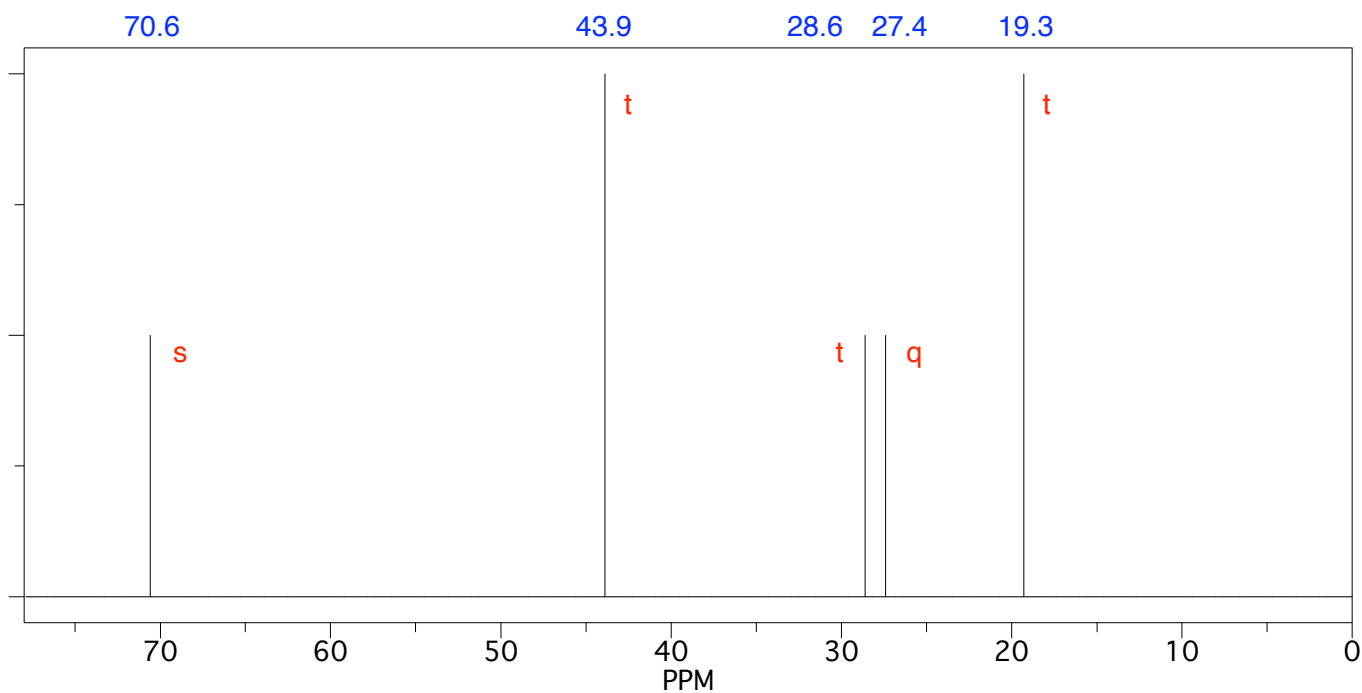
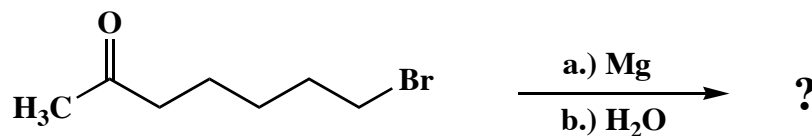
**explanation of multiplicity**



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7. (25 points)

Draw the major organic product that is formed from the following reaction. The broadband proton-decoupled  $^{13}\text{C}$  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  $^{13}\text{C}$  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  $^{13}\text{C}$  NMR correlation table is included separately.)



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7. (continued)

**$^{13}\text{C}$  NMR assignments:**

**chemical shift (ppm)**

**assignment**

**explanation of multiplicity**



**Congratulations!**

1	/50
2	/30
3	/25
4	/20
5	/25
6	/25
7	/25
Total:	/200