

Name: _____

EXAM #1 **WEDNESDAY, SEPTEMBER 26, 2007**
ORGANIC CHEMISTRY II **4:122**

Instructions: Print your name in the spaces provided on every sheet of the exam. Failure to do so will lead to loss of credit.

Make sure that you do the problems on the front and back of every sheet.

On multiple choice questions, clearly circle the answer that you think is correct.

Exams that are done in pencil, red ink, erasable ink, or that have white-out on them will not be regraded.

Question #	Possible Points	Points Scored
1	30	_____
2	12	_____
3	8	_____
4	30	_____
5	12	_____
6	8	_____

	100	

TOTAL

FERPA CONSENT FORM FOR POSTING OF GRADE

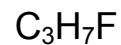
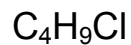
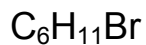
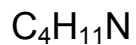
I give permission to **Dan Quinn** to post my scores for exams and quizzes, using the last five digits of my Student ID number as my personal identifier.

Student Signature

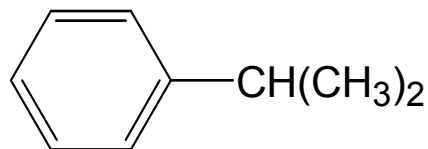
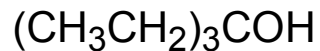
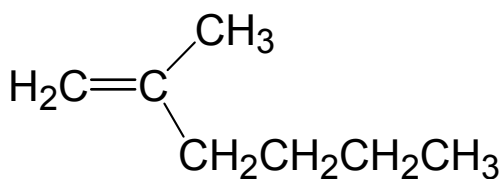
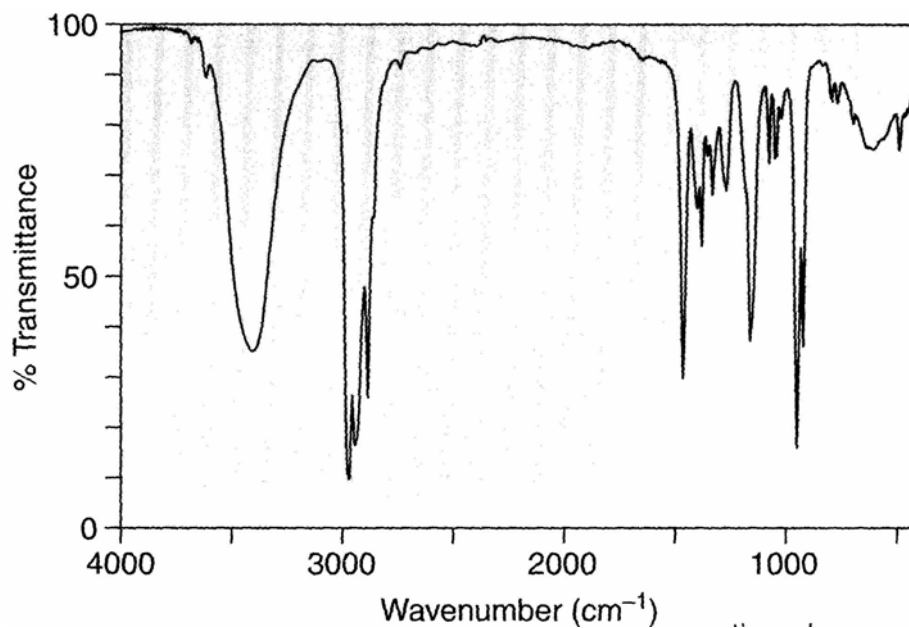
Date

1. Multiple Choice Questions. Clearly circle your chosen answer. (30 points; 3 apiece)

a) Which compound gives M and M+2 peaks in the mass spectrum in a 3:1 ratio, respectively? (Problem 14.4, p 484)



b) Which compound gives the following IR spectrum? (Problem 14.32, p 501)

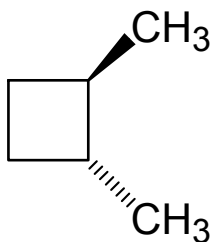


Name: _____

- c) How many IR absorptions does an amino group, -NH_2 , give between 3000 cm^{-1} and 3500 cm^{-1} ?

4 3 2 1

- d) How many ^1H NMR signals does the following compound give? (Problem 15.33d, p 537)



5 4 3 2

- e) Which statement is not true?

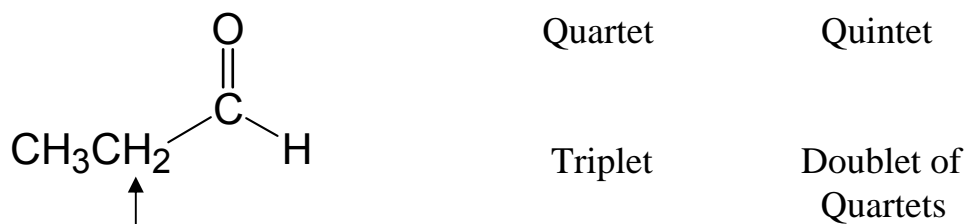
Addition of HBr to 1,3-butadiene gives a mixture of products.

The Diels-Alder reaction is stepwise.

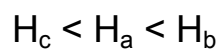
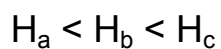
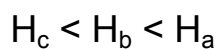
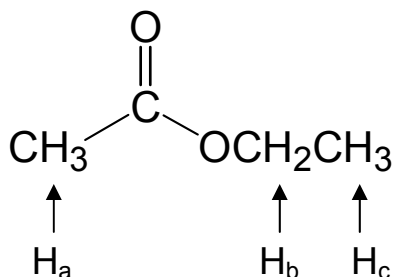
The Diels-Alder reaction is a thermal reaction.

E-1,3-pentadiene is more stable than 1,4-pentadiene.

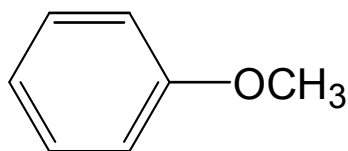
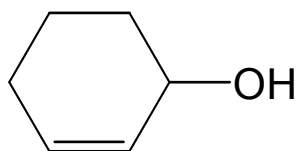
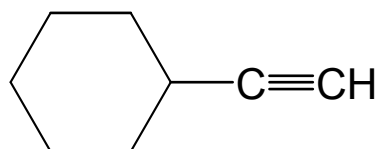
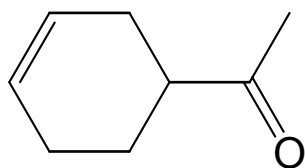
- f) Which statement characterizes the spin splitting of the indicated protons in the following compound? (Problem 15.40i, p 538)



- g) Rank the indicated protons in the following molecule in order of increasingly downfield chemical shift? (Problem 15.11b, p 516)

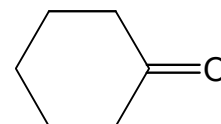
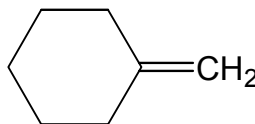
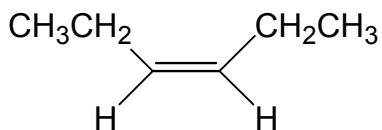
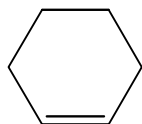


- h) Which molecule gives IR absorptions at 3400 cm^{-1} (strong and broad) and at 1650 cm^{-1} ? (Problem 14.29, p 501)

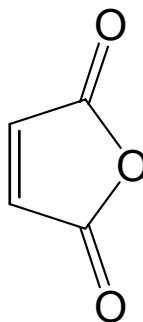
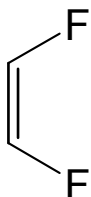
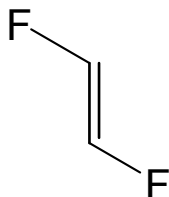


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- i) Which compound gives the greatest number of signals in its ^{13}C NMR spectrum?
(Problem 15.54, p 542)



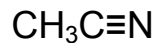
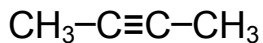
- j) Which dienophile gives a chiral product on Diels-Alder reaction with cyclopentadiene?



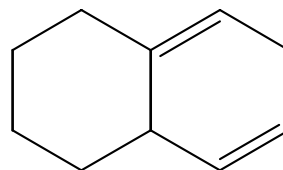
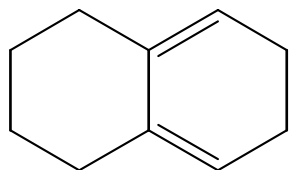
none of these

2. Comparison Questions. Clearly circle your chosen answer. (12 points; 2 apiece)

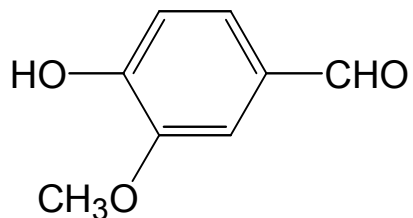
- a) Which compound has an IR absorption at $\sim 2250\text{ cm}^{-1}$?



- b) Which compound has the higher heat of hydrogenation? (Problem 16.37a, p 574)



c) How many ^1H NMR signals does vanillin give? (Problem 15.34, p 537)

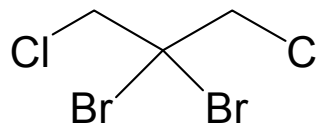
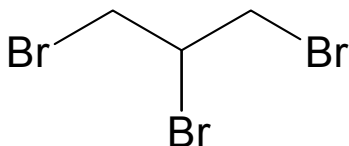


vanillin

4

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d) Which compound gives one singlet in the ^1H NMR spectrum? (Problem 16.38, p 838)

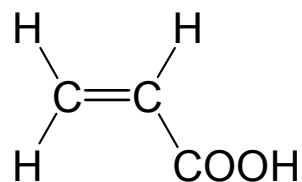
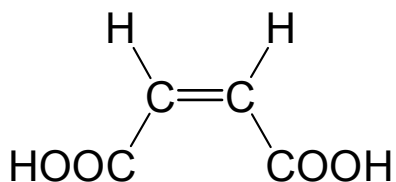


e) Which of the following has the higher energy per photon? (Problem 14.10b, p 489)

IR light of $\lambda = 10 \mu\text{m}$

IR light of $\lambda = 20 \mu\text{m}$

f) Which dienophile is more reactive in Diels-Alder reactions? (Problem 16.19, p 564)



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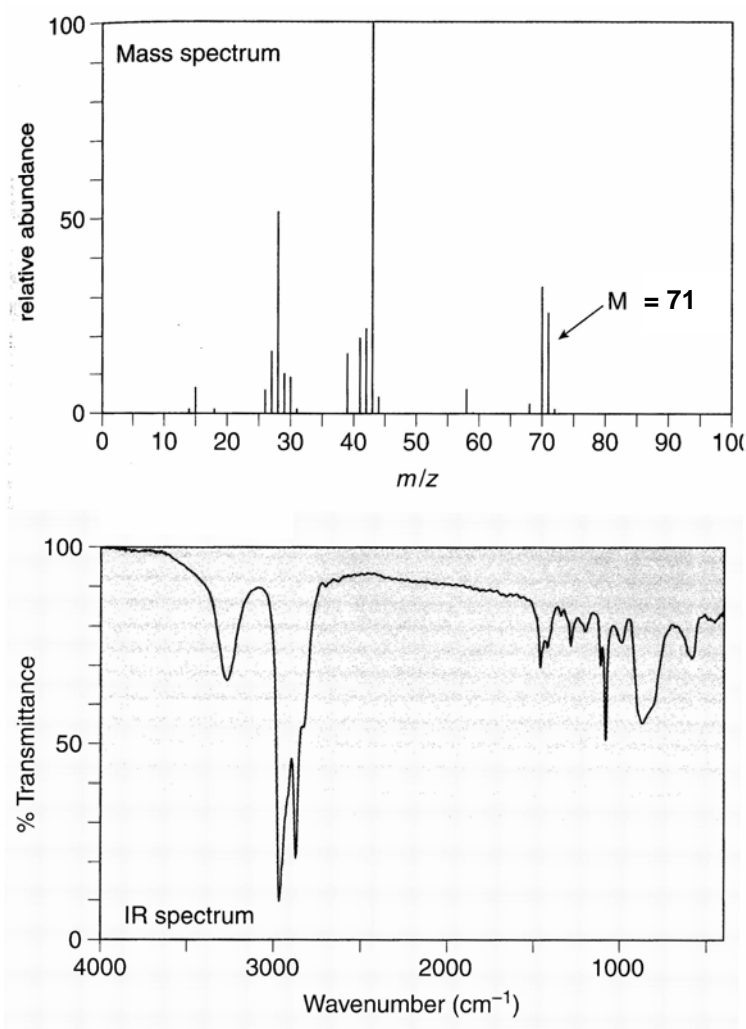
3. Draw structures of the following compounds. (8 points; 4 apiece)

a) The *Z,Z* stereoisomer of 2,4-heptadiene (Problem 16.35, p 574)

b) (*3E,5Z*)-3,5-nonadiene in the *s-cis* conformation (Problem 16.8b, p 553)

4. Structures from Spectroscopic Data (30 points; 5 apiece)

- a) What is the structure of a compound that gives the following IR and mass spectra?
(Problem 14.39, p 503)

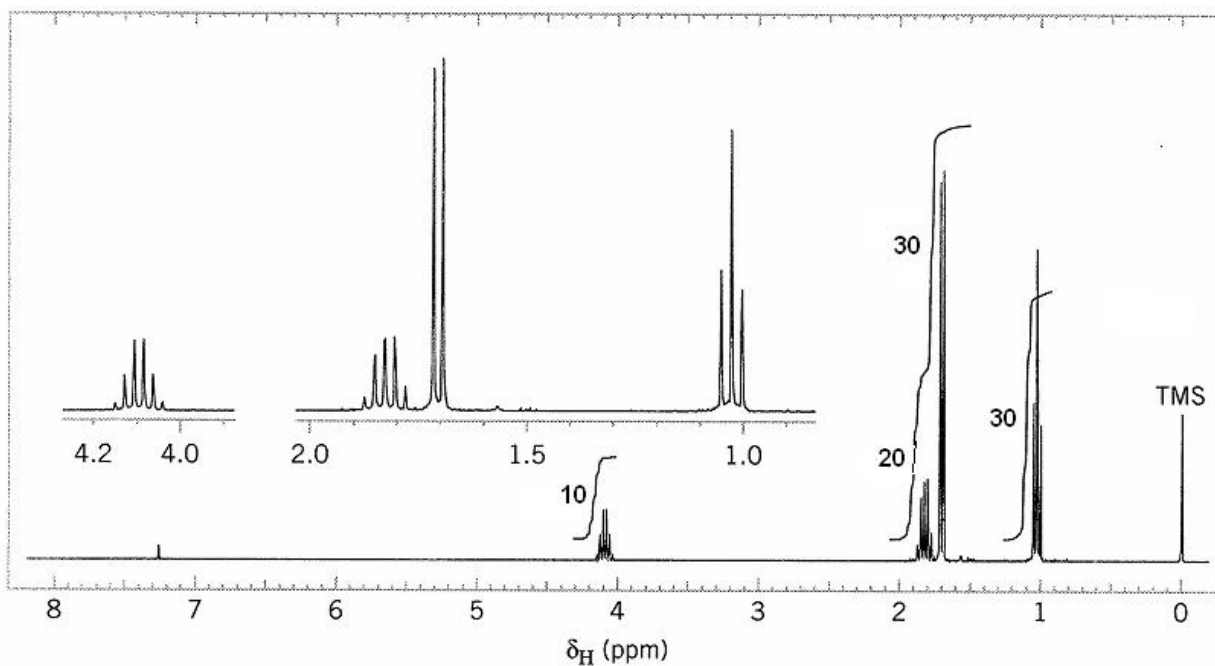


- b) What is the structure of a compound that has a molecular ion at 74, an IR absorption at 3600-3200 cm⁻¹, and sp³ hybridized CH absorption in the IR? There are no other major IR absorptions above 1500 cm⁻¹. (Problem 14.35c, p 502)

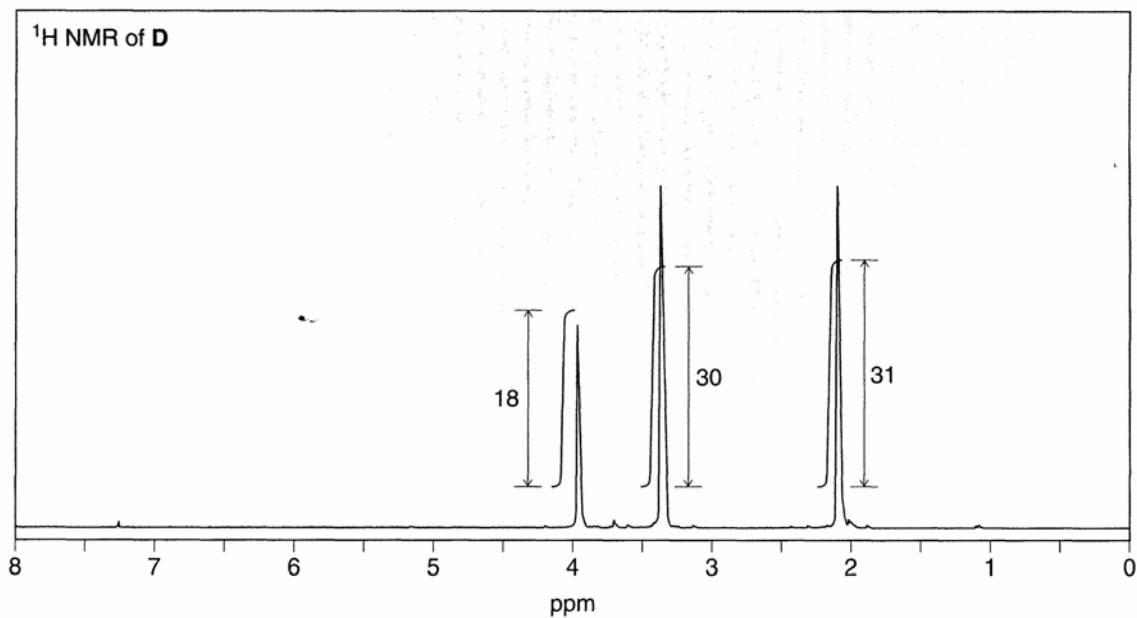
Name: _____

- c) A hydrocarbon has a molecular ion at $m/z = 68$ and IR absorptions at 3310, 3000-2850, and 2120 cm^{-1} . Provide a structure for this compound. (Problem 14.17a, p 499)

- d) A compound gives M and M+2 peaks in a 1:1 intensity ratio in the mass spectrum at $m/z = 136$ and $m/z = 138$. The ^1H NMR spectrum of the compound is below. What is the structure of the compound?



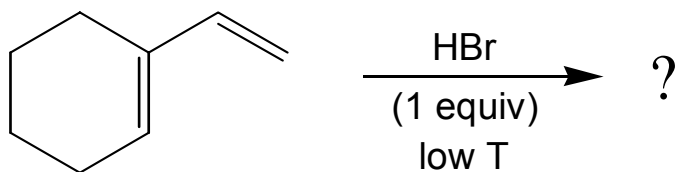
- e) A compound **D** (molecular formula $C_4H_8O_2$) gives a strong IR peak at 1730 cm^{-1} . The 1H NMR spectrum is shown below. What is the structure of **D**? (Problem 15.44, p 539)



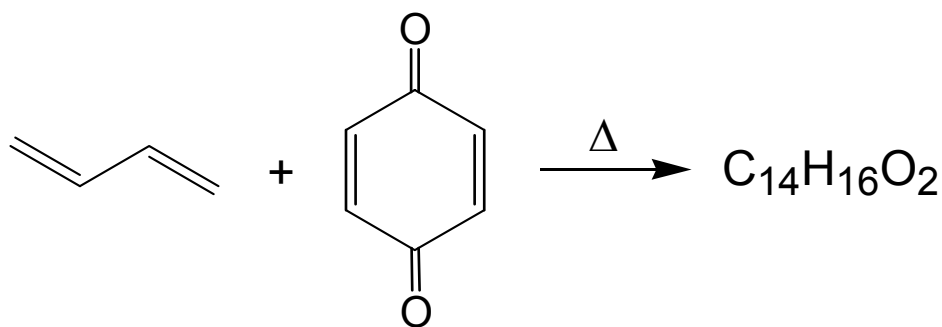
- f) A compound that has the formula $C_5H_{10}O$ has a strong IR absorption at 1720 cm^{-1} and the following 1H NMR data: δ 1.10 (doublet, 6H), δ 2.10 (singlet, 3H), δ 2.50 (septet, 1H). What is the structure of the compound?

5. Provide the missing products or reactants for the following reactions. If more than one product is formed, indicate which is the major and which the minor product. If there is no reaction, so indicate. (12 points; 4 apiece)

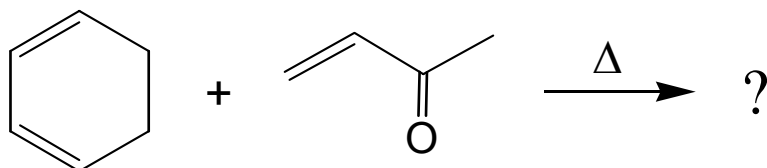
a) Problem 16.38d, p 574



b) Problem 16.50, p 575



c) Problem 16.44f, p 575



Name: _____

6. By using electron pushing, show additional resonance structures for the following anion.
Draw the structure of the resonance hybrid. (Problem 16.5a; 8 points)

