

No. _____

Section A

LAST NAME WST

FIRST NAME _____

**PLEASE REMOVE LAST PAGE OF EXAM BEFORE PRINTING YOUR NAME
ON THE BACK OF PAGE 8.
THERE ARE 9 PAGES TO THIS EXAM. CHECK TO MAKE SURE
YOU HAVE A COMPLETE EXAM.**

CHEMISTRY 331

EXAM V

Fall 2006

December 5, 2006

I. (16 points) _____

II. (13 points) _____

III. (8 points) _____

IV. A, B & C (21 points) _____

D, E & F (21 points) _____

V. (21 points) _____

TOTAL (100 points) _____

Final exam for Chem 331 is scheduled for Wednesday, December 13, from 7:00 to 9:00 p.m.

First 4 exams scores (to be filled in by graders). Best 4 (including score above) will be counted in your final score.

1st

2nd

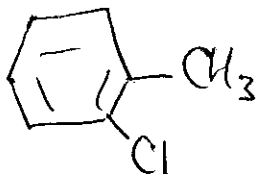
3rd

4th

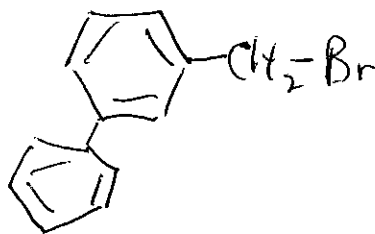
of quizzes
taken out of
6 possible

I. (16 points). Give the correct structure for the following names (2 pts. each)

A. *ortho*-Chlorotoluene



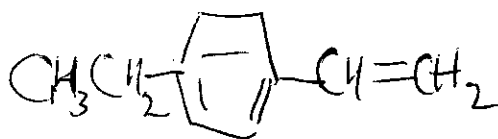
B. *meta*-Phenylbenzyl bromide



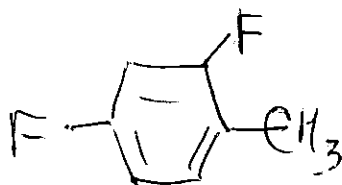
C. *para*-Iodobenzoic acid



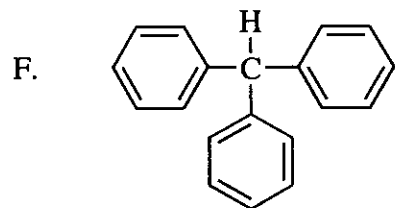
D. *para*-Ethylstyrene



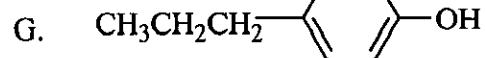
E. 2,4-Difluorotoluene



Give the correct name for the following structures (3 pts. each)

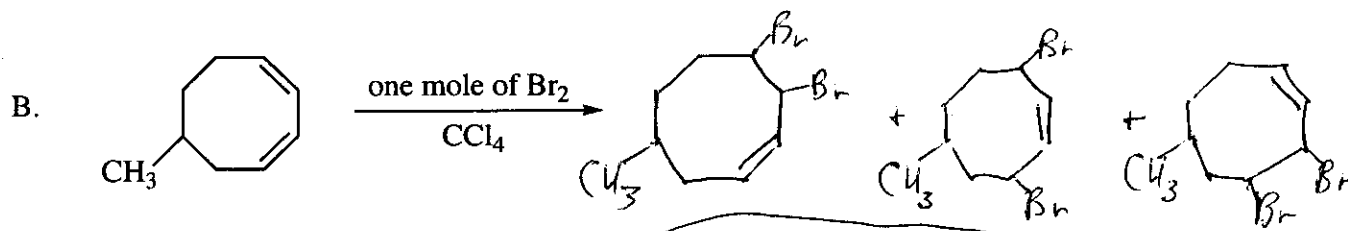
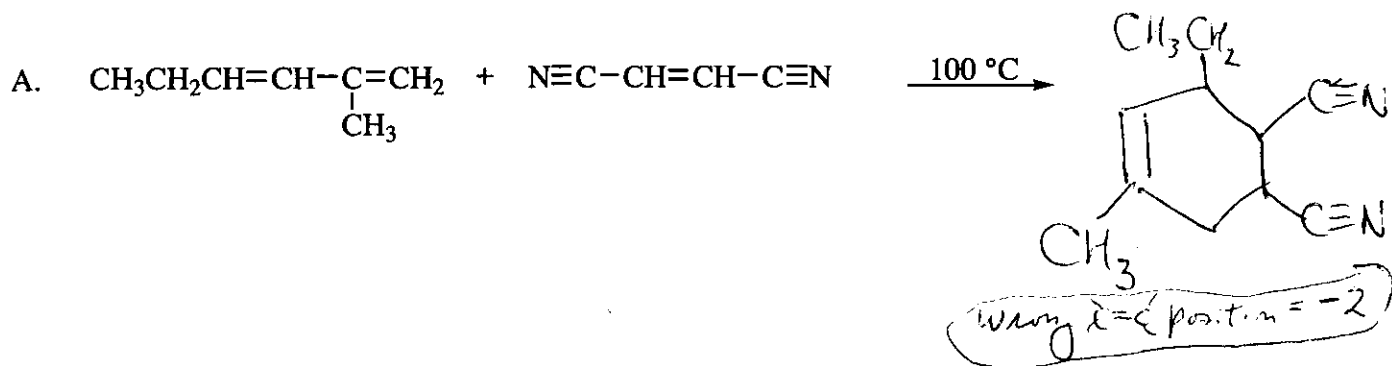


Triphenylmethane



1,4-
para-hydroxypropylbenzene
para-propylphenol

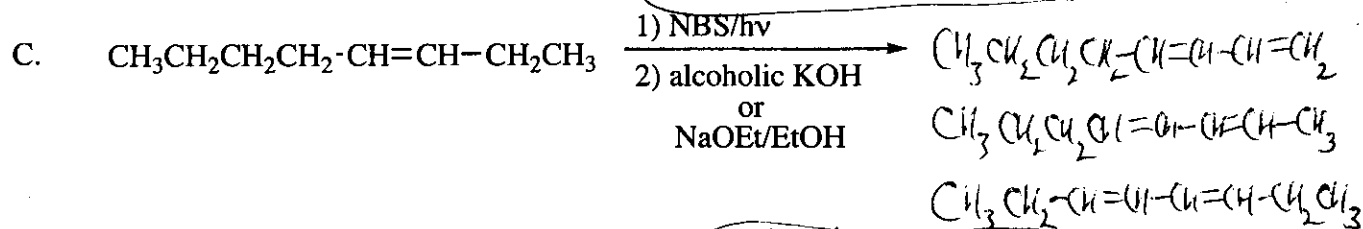
II. (13 pts) Complete the following equations, giving all organic product(s). No stereochemistry required.



3 products = 3 pts

1 or 2 products = 1 pt

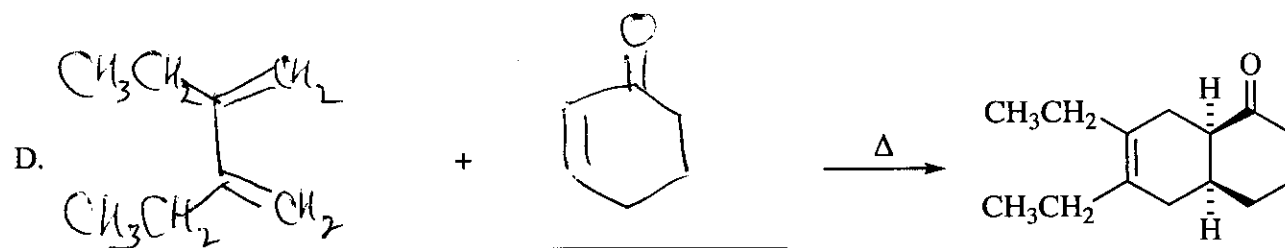
extra products = -1 pt



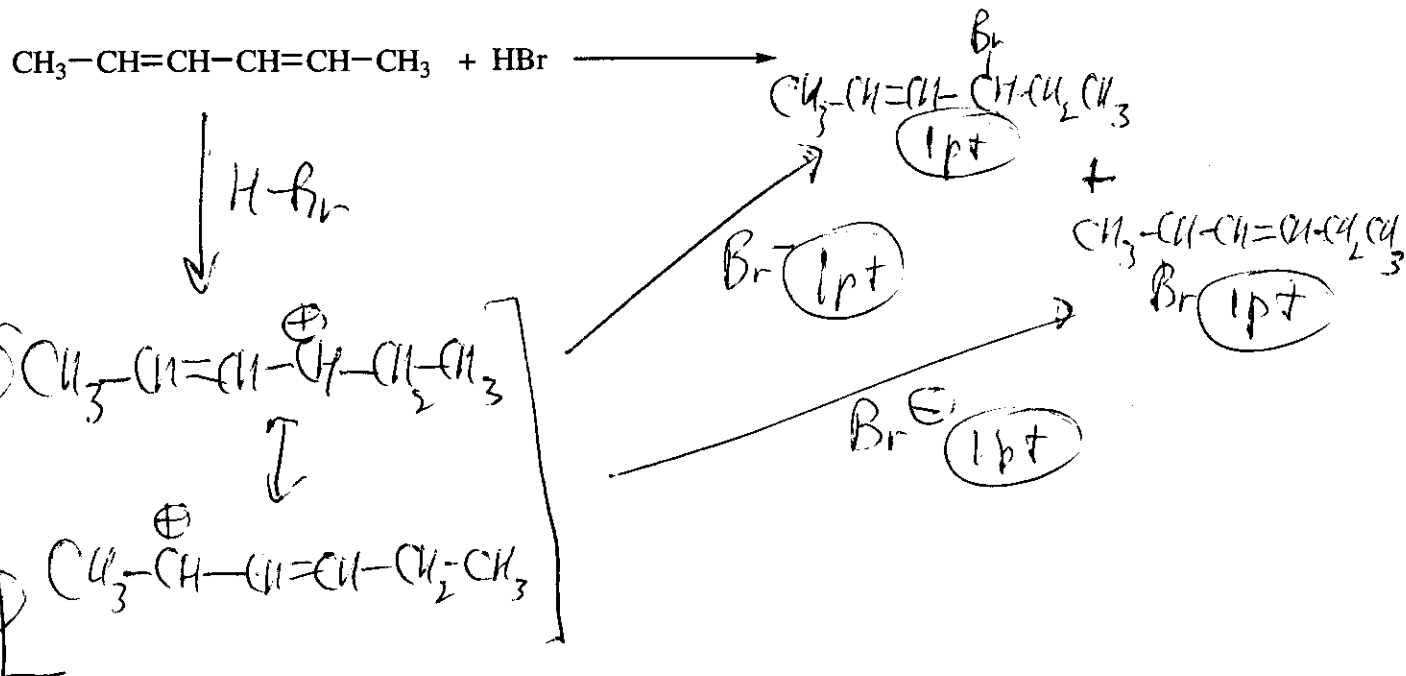
3 products = 3 pts

1 or 2 products = 1 pt

Give the reactants for the following reaction. Stereochemistry must be clear (4 pts).

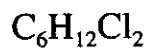


III. (8 pts) Give the product(s) (neglect stereochemistry) and draw a stepwise mechanism for the following reaction (include all important resonance structures).



IV. (42 pts) For each of the following compounds, propose a structure in the box provided that fits the data presented.

A. (7 pts)



^1H NMR:

δ 3.55 (4H, triplet)

δ 1.8 (4H, multiplet)

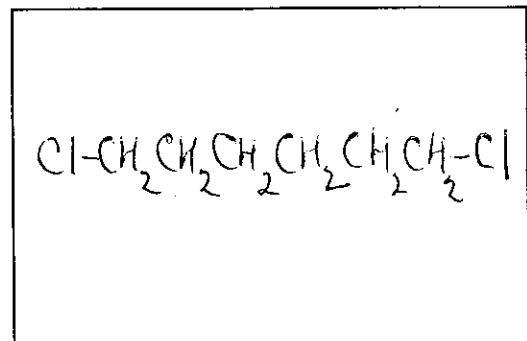
δ 1.5 (4H, multiplet)

Broadband-decoupled ^{13}C NMR:

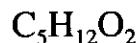
δ 44.88

δ 32.44

δ 26.19



B. (7 pts)



^1H NMR:

δ 4.7 (2H, singlet)

δ 3.6 (4H, quartet)

δ 1.2 (6H, triplet)

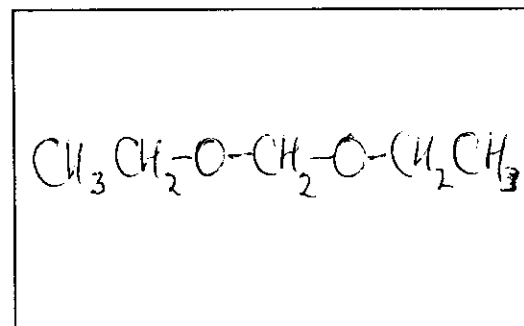
Broadband-decoupled ^{13}C NMR:

δ 94.87

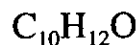
δ 63.11

δ 15.21

IR: 1100 cm^{-1}



C. (7 pts)



^1H NMR:

δ 7.3 (5H, multiplet)

δ 3.7 (2H, singlet)

δ 2.4 (2H, quartet)

δ 1.0 (3H, triplet)

Broadband-decoupled ^{13}C NMR:

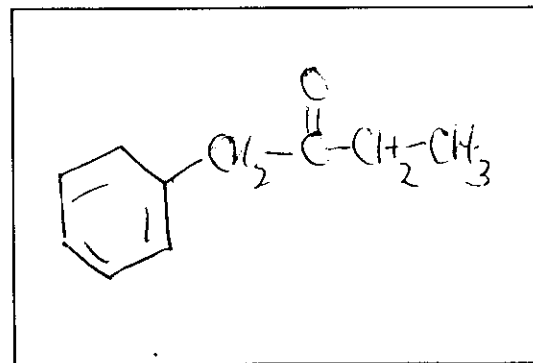
δ 208.79 δ 126.86

δ 134.43 δ 49.77

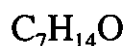
δ 129.31 δ 35.16

δ 128.61 δ 7.75

IR: 1710 cm^{-1}



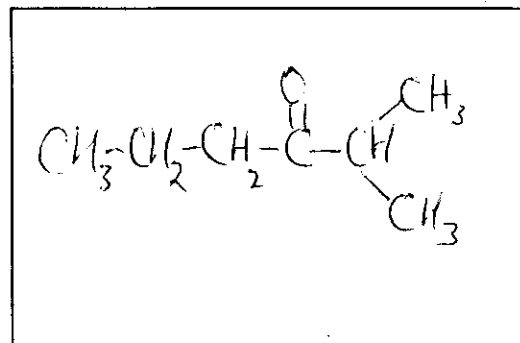
D. (7 pts)

 1H NMR:

- δ 2.6 (1H, septet)
- δ 2.4 (2H, triplet)
- δ 1.6 (2H, sextet)
- δ 1.1 (6H, doublet)
- δ 0.9 (3H, triplet)

Broadband-decoupled ^{13}C NMR:

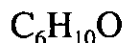
- δ 214.77
- δ 42.26
- δ 40.80
- δ 18.23
- δ 17.24
- δ 13.81

IR: 1710 cm^{-1} 

C=O = +2 pts

 $CH_3-CH- = +2\text{ pts}$
 CH_3

E. (7 pts)



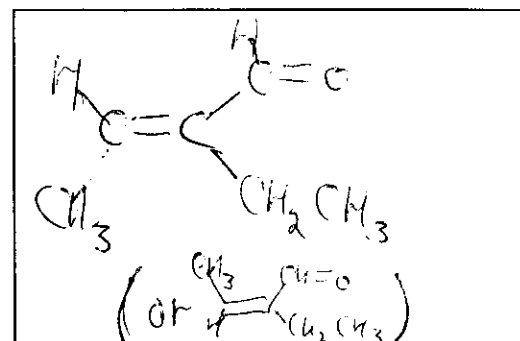
This is one stereoisomer. Either stereoisomer is an acceptable answer.

 1H NMR:

- δ 9.4 (1H, singlet)
- δ 6.5 (1H, quartet)
- δ 2.3 (2H, quartet)
- δ 2.0 (3H, doublet)
- δ 0.95 (3H, triplet)

Broadband-decoupled ^{13}C NMR:

- δ 194.72
- δ 149.10
- δ 146.33
- δ 16.93
- δ 14.47
- δ 12.93

IR: 1700 cm^{-1} 

+1 pt for ketone

+2 pts for aldehyde

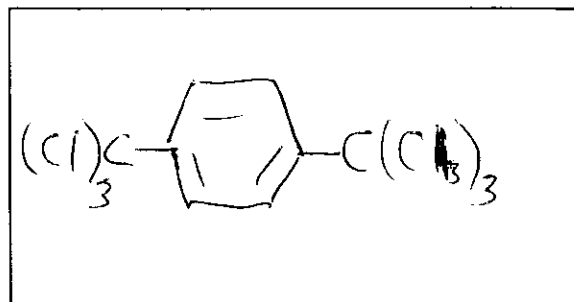
F. (7 pts) The following compound is characterized by a 1H NMR spectrum that consists of only a single peak (a singlet) having the chemical shift indicated. Some additional data are given. Write the correct formula for the compound in the appropriate box.

 1H NMR:

- δ 8.0

Broadband-decoupled ^{13}C NMR:

- δ 145.77
- δ 125.72
- δ 96.33

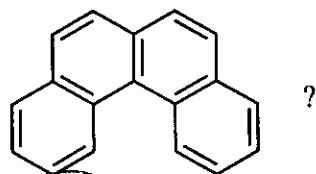


+3 pts for benzene ring

+5 pts for ortho or meta isomers

V. (21 pts) Circle the correct answer (think carefully).

A. How many signals are present in the broadband-decoupled ^{13}C NMR spectrum of



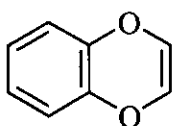
1.) 8

2.) 10

3.) 16

4.) 18

B. How many signals are present in the ^1H NMR spectrum of



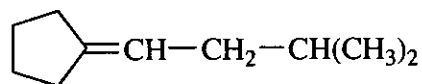
1.) 3

2.) 4

3.) 5

4.) 6

C. How many signals are present in the broadband-decoupled ^{13}C NMR spectrum of



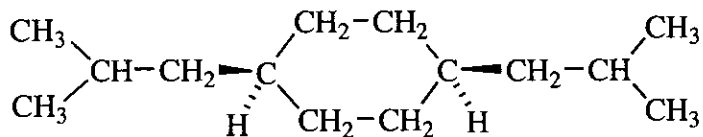
1.) 7

2.) 8

3.) 9

4.) 10

D. The DEPT 90 ^{13}C NMR spectrum of



would show how many signals?

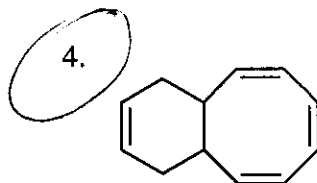
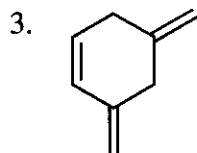
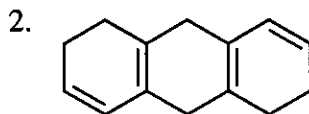
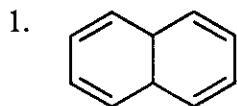
1.) 1

2.) 2

3.) 4

4.) 5

E. Which compound would have the highest λ_{max} in its UV-visible spectrum?



F. The fundamental reaction of vision involves

1. carbon-carbon bond cleavage
2. cis-trans isomerization
3. rotation of a methyl group
4. elimination of water

G. For a normal Diels-Alder reaction, which molecule would be the best dienophile?

