

Seat No. _____

Name _____
(Please print your name and **circle** your last name)

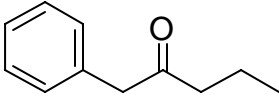
CHEMISTRY 331

EXAM IV

Monday, April 28, 2008

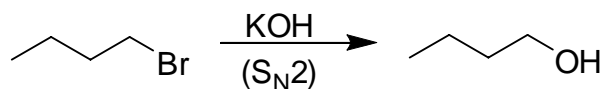
- I. (8 points) _____
- II. (6 points) _____
- III. (9 points) _____
- IV. (9 points) _____
- V. (.5 points) _____
- VI. (9 points) _____
- VII. (10 points) _____
- VIII. (.5 points) _____
- IX. (10 points) _____
- X. (6 points) _____
- XI. (10 points) _____
- XII. (8 points) _____
- XIII. (10 points) _____
- XIV. (4 points) _____

TOTAL (100 points) _____

I. (8 pts.) The mass spectrum of  ($m^+=162$)

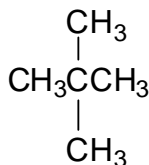
shows peaks for fragment ions at m/z 134, 119 & 91 & 71.
Draw reasonable structures corresponding to each of these 4 fragments.

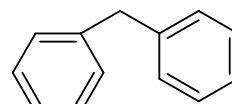
II. (6 pts.) Tell how you would use IR spectroscopy to determine when the following reaction is complete?



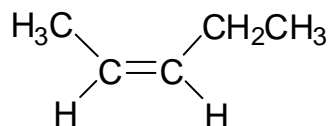
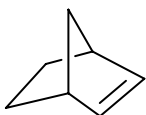
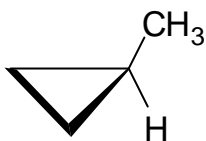
III. (9 pts.) For each of the compounds below tell how many signals you would expect the molecule to display in its broadband-decoupled ^{13}C NMR spectrum.





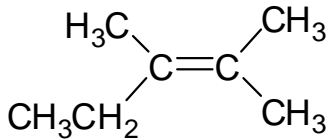
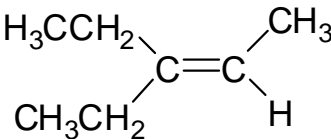
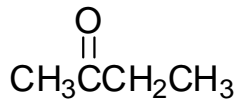
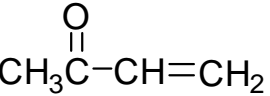


IV. (9 pts.) For each compound below tell how many types of nonequivalent H's there are.



V. (0.5 pts.) What would you call a deer that is blind in both eyes?

VI. (9 pts.) Draw lines connecting the compounds with their associated IR spectral feature(s).

| | | |
|----|---|--|
| A) | $\text{CH}_3\text{C}\equiv\text{CH}$ | 2200 cm^{-1} (w-m), $\sim 2900\text{ cm}^{-1}$ |
| | $\text{CH}_3\text{C}\equiv\text{CCH}_2\text{CH}_3$ | 2200 cm^{-1} (str) 3300 cm^{-1} (str) $\sim 2900\text{ cm}^{-1}$ |
| B) |  | $2870\text{--}2915\text{ cm}^{-1}$ 3015 cm^{-1} |
| |  | $2870\text{--}2915\text{ cm}^{-1}$ |
| C) |  | 1715 cm^{-1} (str) |
| |  | 1690 cm^{-1} (str) |

VII. (10 pts.) The mass spectrum of an unidentified compound has an M^+ of M/Z 113 (and thus contains an odd number of nitrogen atoms), the IR spectrum has characteristic absorptions at 2255 and 1735 cm^{-1} , the ^{13}C NMR spectrum has 5 signals and the ^1H -NMR spectrum is:

$4.3\ \delta$ (q, 2H)

$3.5\ \delta$ (s, 2H)

$1.4\ \delta$ (t, 3H)

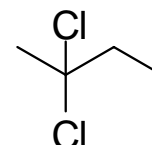
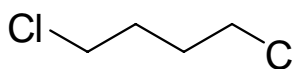
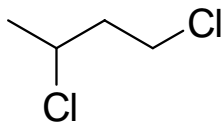
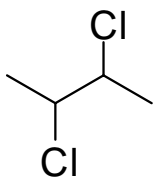
Draw the structure of a compound fitting this spectral data.

VIII. (0.5 pts.) What would you call a deer blind in both eyes and having no legs?

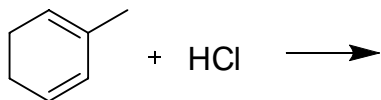
IX. (10 pts.)

A) Circle the structure which best fits the following NMR data.

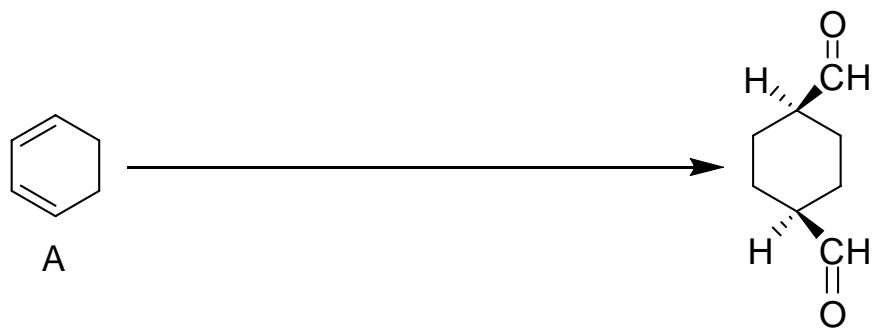
| | | | |
|-------------------|----------------------------|----------------------|----|
| ^1H -NMR | $1.6\ \delta$ (d, 3H) | ^{13}C -NMR | 29 |
| | $2.2\ \delta$ (t of d, 2H) | | 45 |
| | $3.6\ \delta$ (t, 2H) | | 48 |
| | $4.2\ \delta$ (mult, 1H) | | 59 |



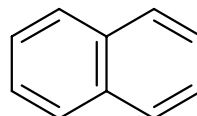
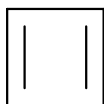
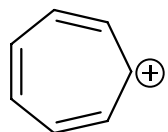
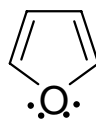
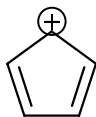
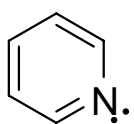
- X. (6 pts.) Draw all the products expected from the addition of 1 equivalent of HCl to 2-methyl-1,3-cyclohexadiene.



- XI. (10 pts.) Show how you would carry out the synthesis of dialdehyde "B" from 1,3-cyclohexadiene "A" and any needed reagents.



- XII. (9 pts.) Circle each of the compounds below which would be expected to display aromatic characteristics.



XIII. (10 pts.) Provide correct structures corresponding to the following names.

A. m-xylene

B. 2,4,5-Trinitrotoluene

C. p-bromophenol

D. pyridine

E. Naphthalene

XIV. (4 pts.) The downfield chemical shifts of aromatic protons (relative to vinylic protons) is due to a _____ which produces an induced _____ which augments (reinforces) the applied field at the outside periphery of the ring.