

Seat No. _____

Name KEY
(Please print your name and circle your last name)

CHEMISTRY 331

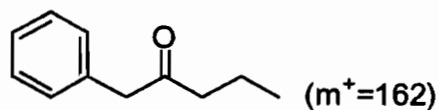
EXAM IV

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~~⁷ points) _____
- XII. (~~8~~¹² points) _____
- XIII. (10 points) _____
- XIV. (4 points) _____

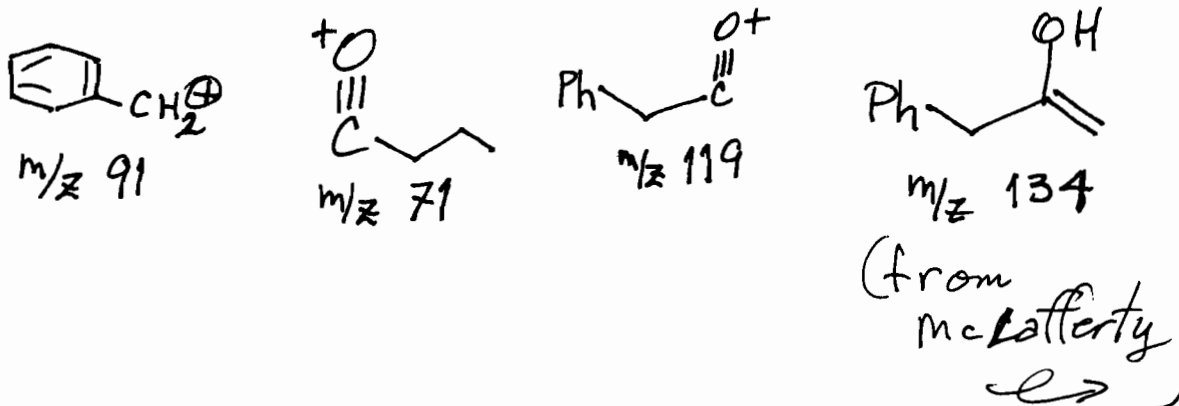
TOTAL (100 points) _____

I. (8 pts.) The mass spectrum of

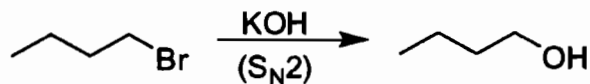


shows peaks for fragment ions at m/z 134, 119 & 91 & 71.

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?

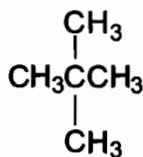


When the broad, strong ROH band $\sim 3500 \text{ cm}^{-1}$ stops growing.

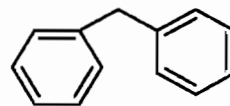
III. (9 pts.) For each of the compounds below tell how many signals you would expect the molecule to display in its broadband-decoupled ^{13}C NMR spectrum.



2

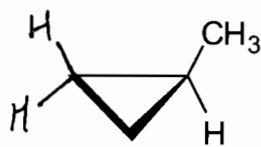


2

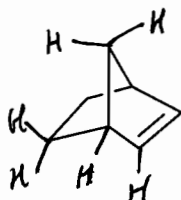


5

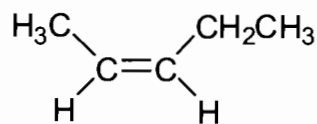
IV. (9 pts.) For each compound below tell how many types of nonequivalent H's there are.



4



6

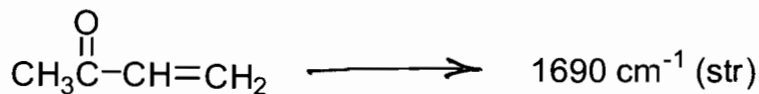
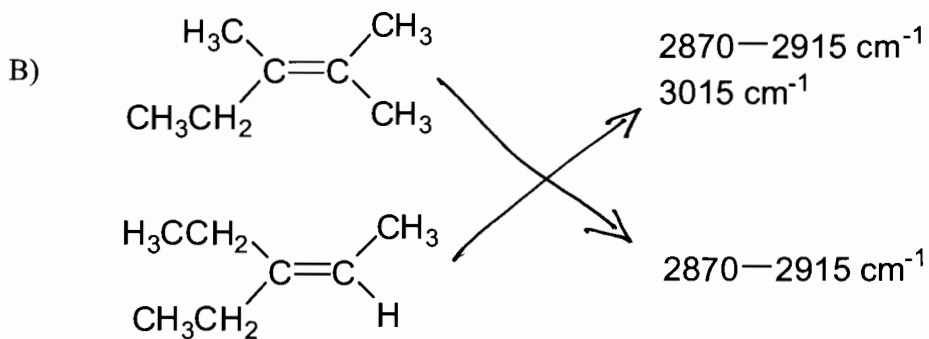
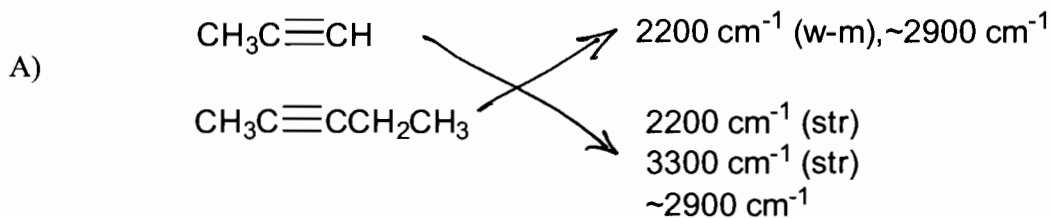


5

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

no eyedeer

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



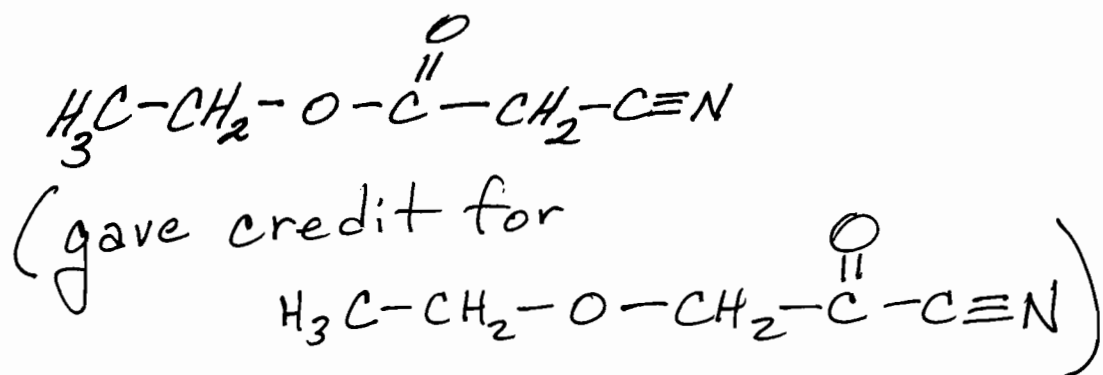
- VII. (10 pts.) The mass spectrum of an unidentified compound has an M^+ of M/Z 113 (and thus contains an odd number of nitrogen atoms), the IR spectrum has characteristic absorptions at 2255 and 1735 cm^{-1} , the ^{13}C NMR spectrum has 5 signals and the ^1H -NMR spectrum is:

4.3 δ (q, 2H)

3.5 δ (s, 2H)

1.4 δ (t, 3H)

Draw the structure of a compound fitting this spectral data.



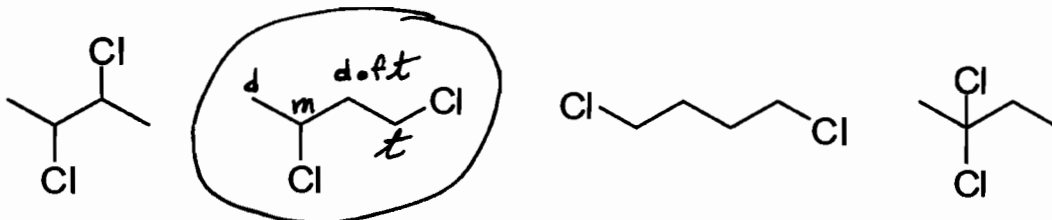
- VIII. (0.5 pts.) What would you call a deer blind in both eyes and having no legs?

still no idea (eye deer)

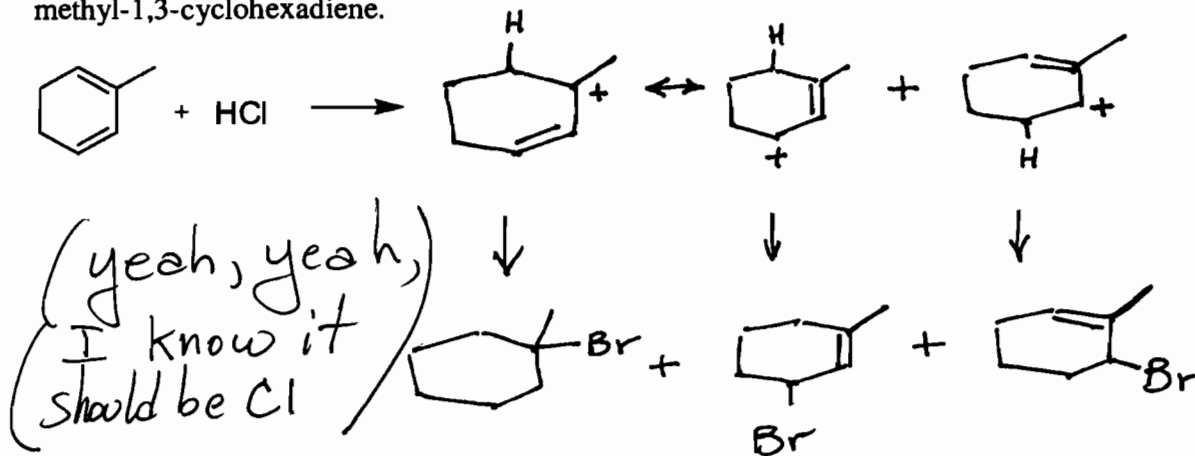
- IX. (10 pts.)

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

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

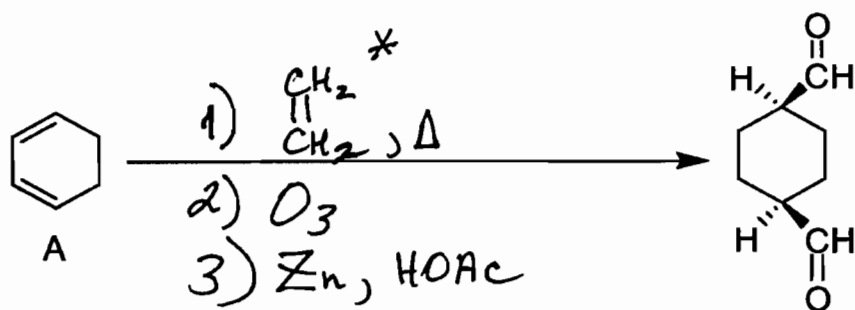


- X. (6 pts.) Draw all the products expected from the addition of 1 equivalent of HCl to 2-methyl-1,3-cyclohexadiene.



- XI. (20 pts.) Show how you would carry out the synthesis of dialdehyde "B" from 1,3-cyclohexadiene "A" and any needed reagents.

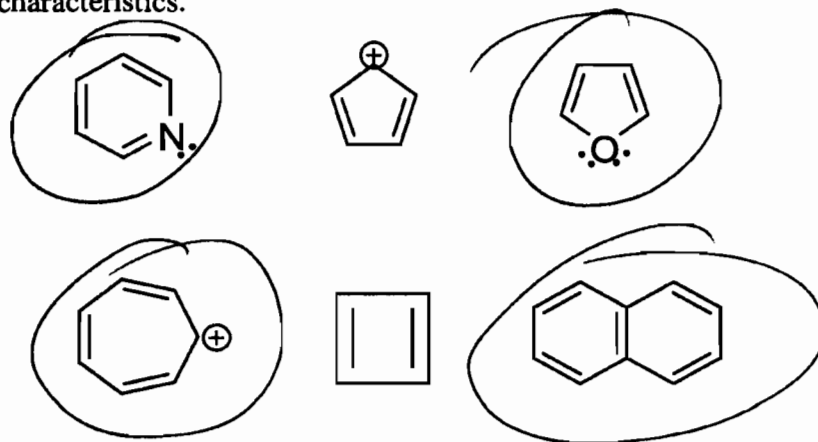
7 pts



* normally unreactive but as I said in class "It will work in 331."

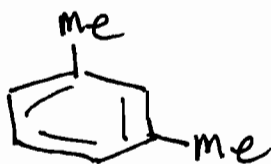
- XII. (9 pts.) Circle each of the compounds below which would be expected to display aromatic characteristics.

12 pts

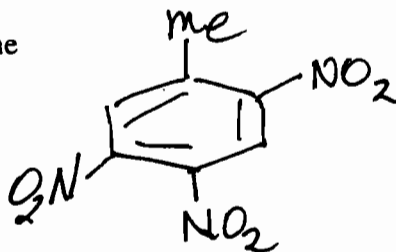


XIII. (10 pts.) Provide correct structures corresponding to the following names.

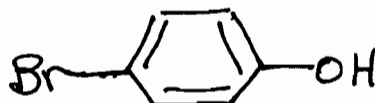
A. m-xylene



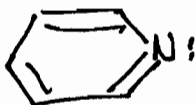
B. 2,4,5-Trinitrotoluene



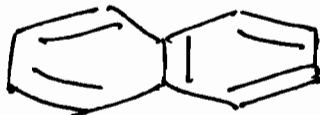
C. p-bromophenol



D. pyridine



E. Naphthalene



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