

**Organic Chemistry 32-335**  
**Exam #2- Spring 2001**

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

Signature: \_\_\_\_\_

Section #: \_\_\_\_\_

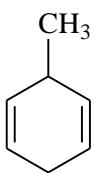
(Monday: 001; Tue. AM: 002; Tue.PM: 003)

ID#: \_\_\_\_\_

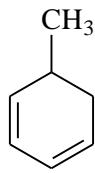
1. Be sure your exam has 6 pages, including this page.
2. Solve easier problems first.
3. Read each problem carefully.  
Write **clearly**; illegible answers will be considered incorrect.
4. Avoid looking or even glancing at other students' exams.
5. Please leave quietly if you leave early.

Part 1. (4 points for each question) Circle only **one** choice !

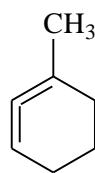
1. Which of the following compounds would give out the *least* amount of heat upon hydrogenation (add 2 mol's of H<sub>2</sub>) ?



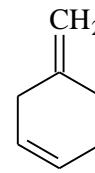
(A)



(B)

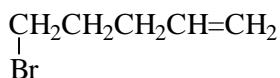


(C)



(D)

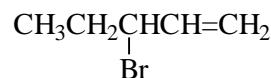
2. Predict the major product for the following reaction:



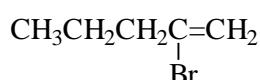
(A)



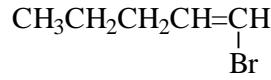
(B)



(C)

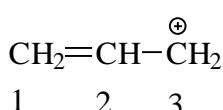


(D)



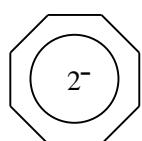
(E)

3. Which of the following is a correct statement for the allyl carbocation ?



- (A) The bond length between C1 and C2 is shorter than C2-C3.
- (B) The carbocation is 1° and is expected to be as stable as ethyl cation CH<sub>3</sub>CH<sub>2</sub><sup>+</sup>.
- (C) It should give us 3 carbon-13 NMR signals.
- (D) Carbon #3 uses sp<sup>3</sup> hybridization.
- (E) None of the above is true.

4. For each compound listed below, specify if they are aromatic (AR), non-aromatic (NAR), or anti-aromatic (AAR):



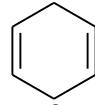
(A)



(B)

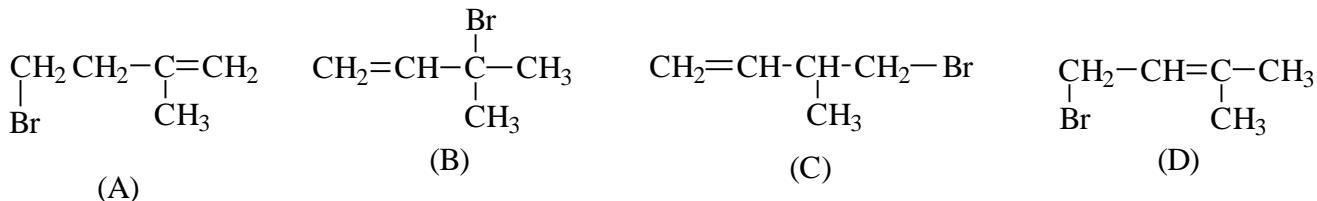
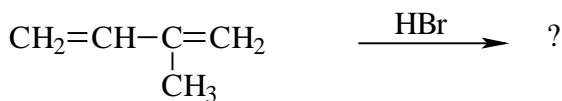


(C)



(D)

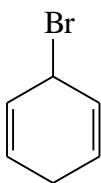
5. What will be the major product for the following reaction at low temperature ?



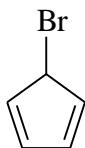
6. Give the structural formula of the reactants that produce the following product in a Diels-Alder reaction.



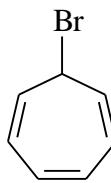
7. Which of the following compound would react most easily with  $\text{Ag}^+\text{NO}_3^-$  to produce silver bromide as a precipitate :



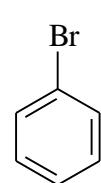
(A)



(B)

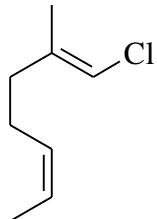


(C)

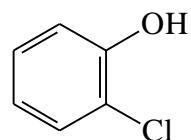
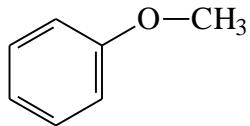


(D)

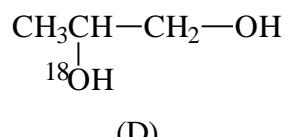
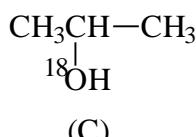
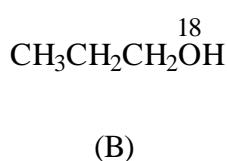
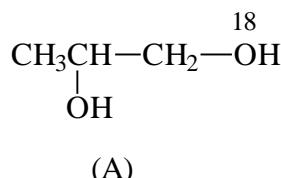
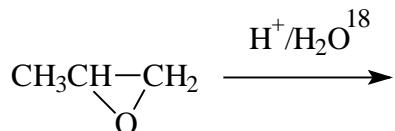
8. Name the following compound with the appropriate stereochemistry:



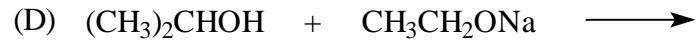
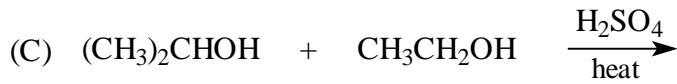
9. Give an appropriate name for each of the following compounds:



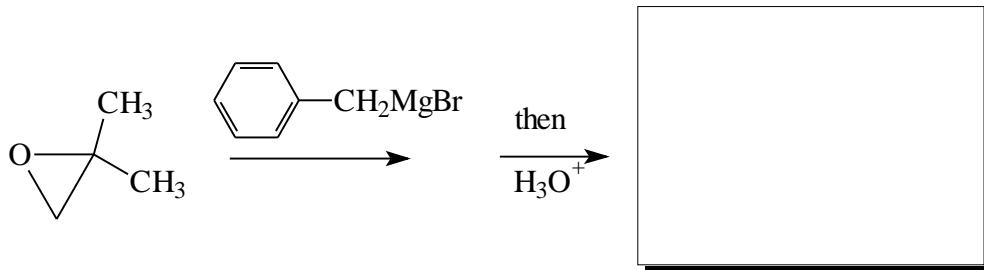
10. The major product of the following reaction is:



11. Which method would provide the best synthesis of ethyl isopropyl ether?



12. Provide the structure of the major organic product for this reaction:



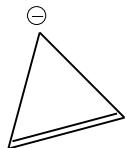
**End of Part 1.**

Part 2. (52 points)

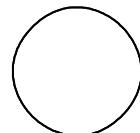
1. (6 point) Draw the structures of a phenyl and a benzyl **group** and label each.

2. (6 point) How would one confirm the presence of a benzene ring in an unknown compound, using IR,  $^1\text{H}$ NMR, and M.S. (provide one characteristic observation expected in each spectrum).

3. (10 point) Treat cyclopropenyl anion using the polygon rule, label new MO's as bonding, non-bonding, or anti-bonding. Does the pi system represent an open or filled shell? Is the molecule expected to be aromatic, non-aromatic, or anti-aromatic?



cyclopropenyl anion

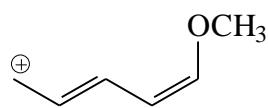


4. (10 point) In the furan molecule shown below, are the two lone pairs of electrons of same or different basicity? Explain which pair is less basic and why (hint: oxygen is  $\text{sp}^2$  hybridized in this molecule)

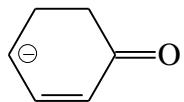


5. (8 points) Draw important resonance contributors for each of the following structures:

(A)



(B)



6. (12 points) Intermolecular dehydration of ethanol is an important industrial method for synthesizing diethylether. Draw a plausible step-by-step mechanism for this process and explain, based on your mechanistic scheme, why an acid is a catalyst for this reaction.

