

**Chem 0320**  
**Dennis P. Curran**  
**Feb. 2, 2010**  
**Exam 1**

*Suggested Answers*

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

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

Answer all questions on this exam. If you need more space than that provided, use the back of any page.

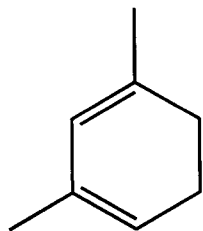
1. \_\_\_\_\_ (20 points) Names and Structures
  2. \_\_\_\_\_ (30 points) Short Answers
  3. \_\_\_\_\_ (20 points) Reactions
  4. \_\_\_\_\_ (20 points) Mechanisms
  5. \_\_\_\_\_ (10 points) Short Synthesis
- TOTAL \_\_\_\_\_ (100 points)

The test has **8** pages (including this cover page) and **5** questions  
The exam ends at 12:15 pm sharp.

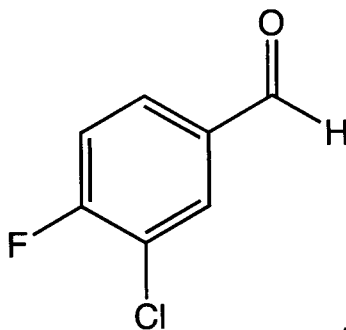
Good Luck !!!

1) Names and Structures (20 points)

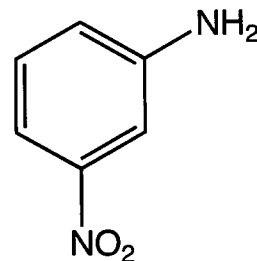
a) Provide IUPAC names for the following compounds (12 points):



1,3-dimethyl-1,3-cyclohexadiene  
(or cyclohexa-1,3-diene)



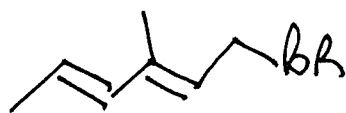
3-chloro-4-fluorobenzaldehyde



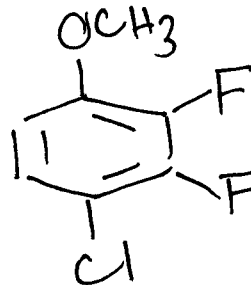
m-nitroaniline  
- or -  
3-nitroaniline

b) Provide clear structures for the following compounds (8 points):

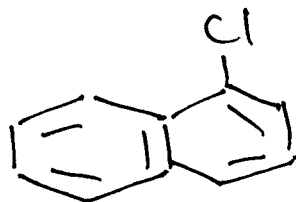
(2E,4E)-1-bromo-3-methylhexa-2,4-diene



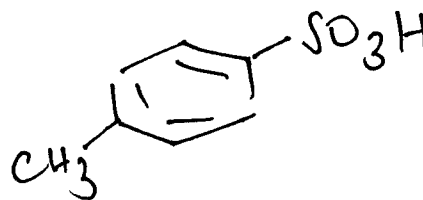
4-chloro-2,3-difluoroanisole



1-chloronaphthalene



p-toluene sulfonic acid

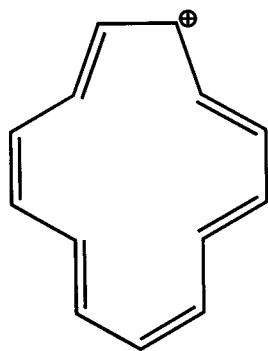


2) Short answer questions. Briefly answer the following questions. (30 points)

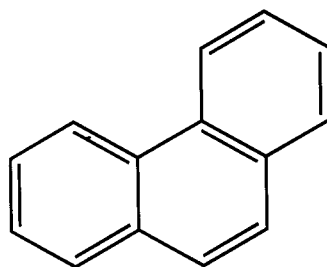
a) List the criteria for aromaticity.

- Cyclic array of  $\pi$ -orbitals
- PLANAR
- $4n+2$   $\pi$  electrons

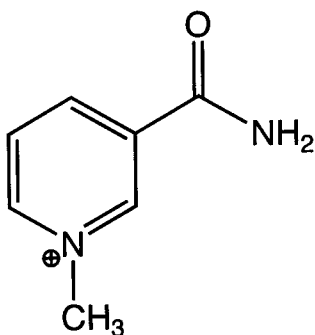
b) Using the criteria in "a", decide whether the following compounds are aromatic or not.



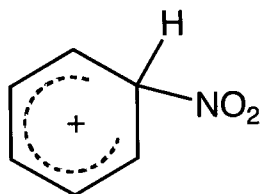
NO



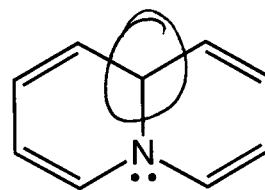
YES



YES

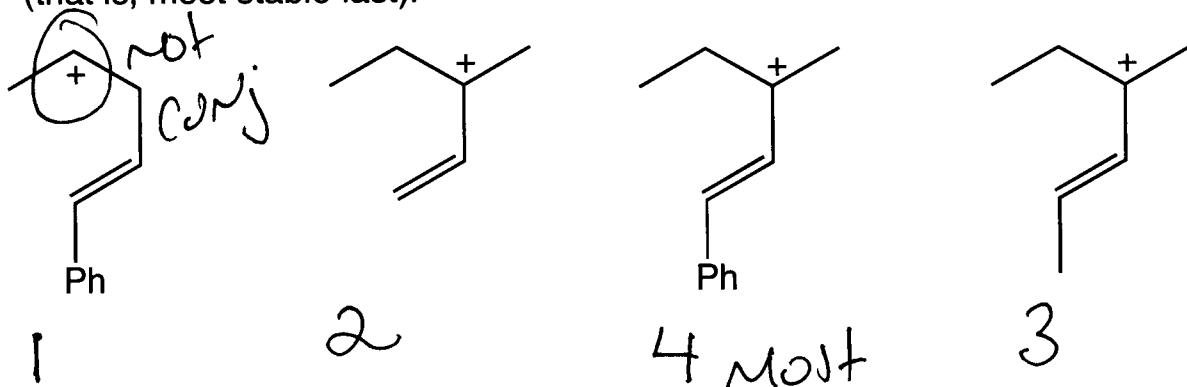


NO

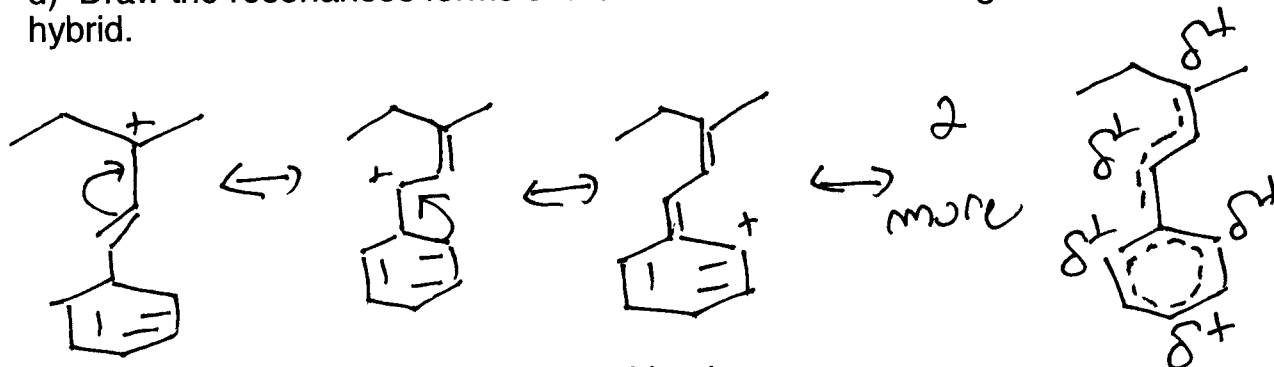


NO

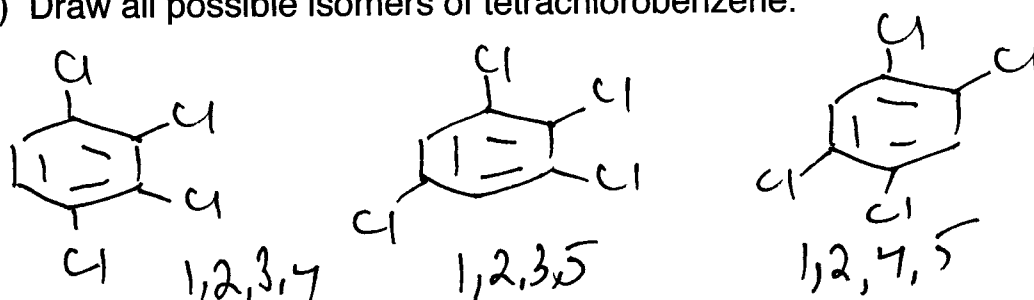
c) Arrange the following cations in order of increasing stability (that is, most stable last).



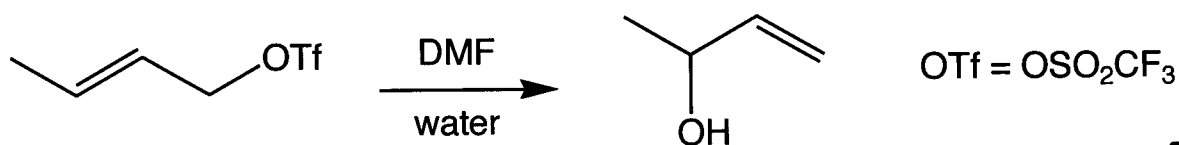
d) Draw the resonance forms of the **third** cation in "c" along with a resonance hybrid.



e) Draw all possible isomers of tetrachlorobenzene.



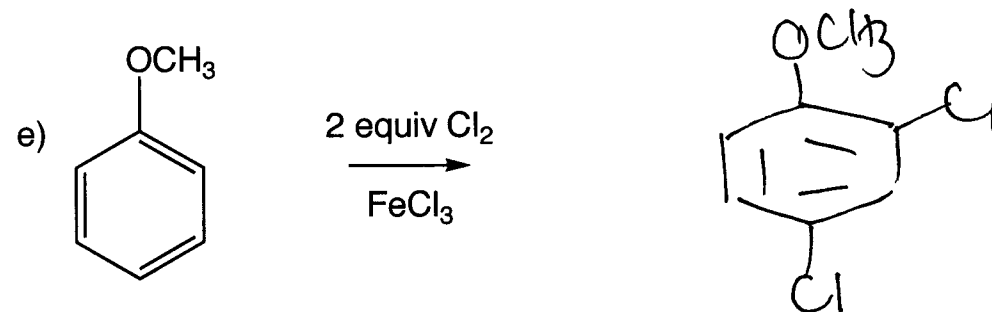
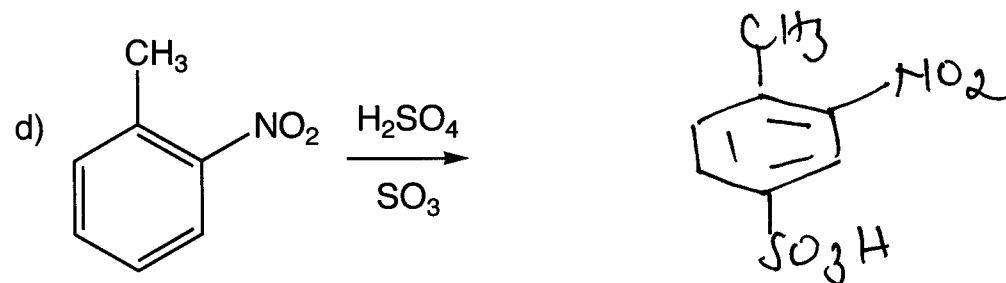
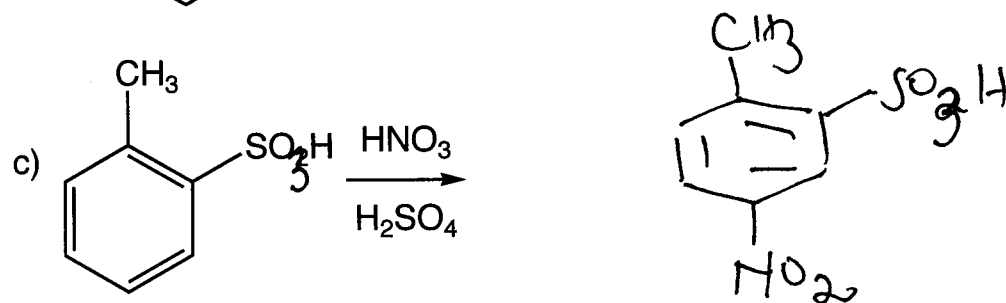
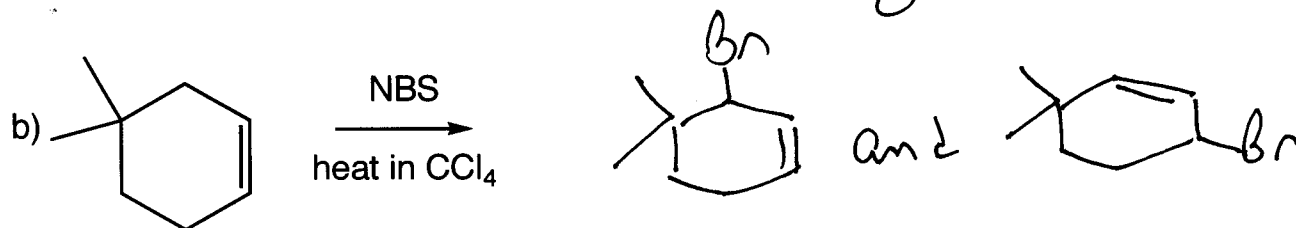
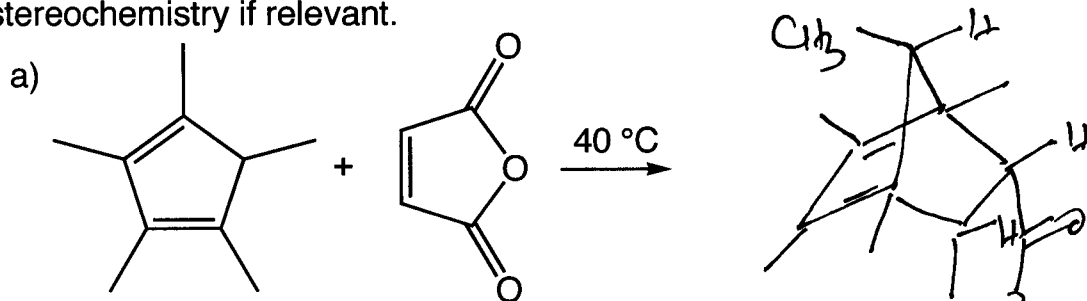
f) Is the following reaction under kinetic or thermodynamic control? Briefly explain how you decided.



kinetic control since a less stable prod is formed  
 (More stable is -4- )

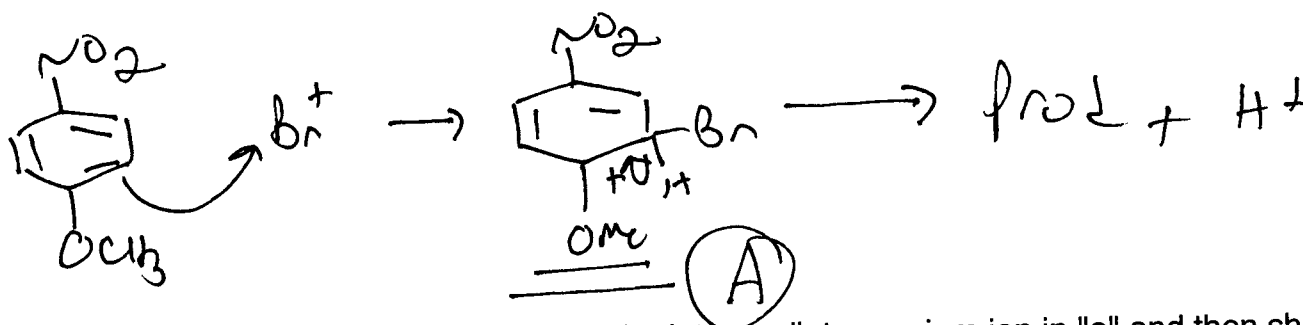
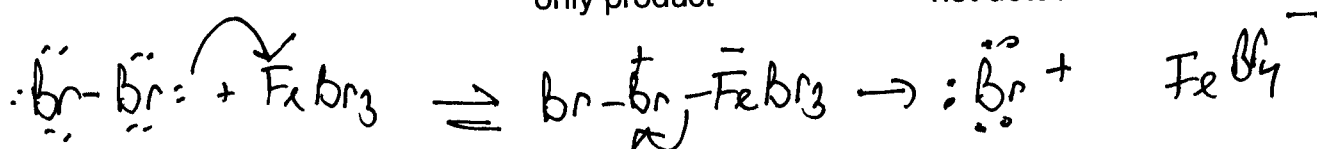
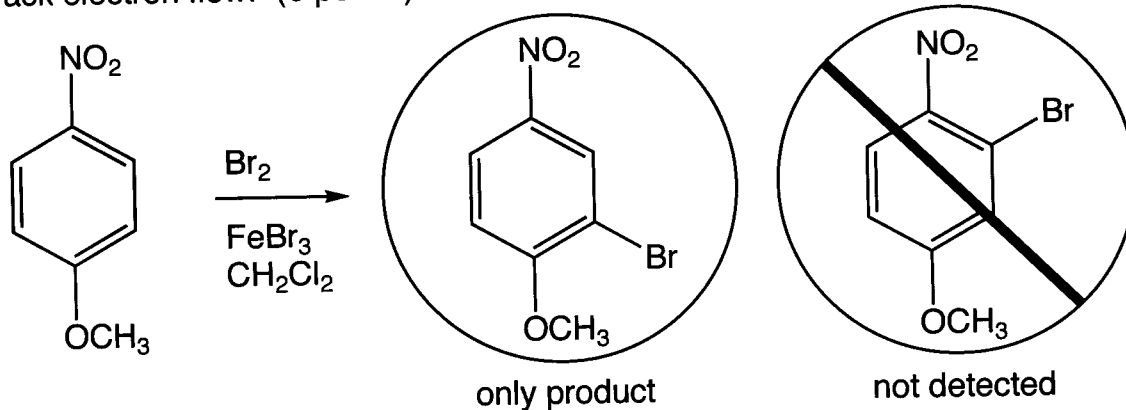
3) Reactions. (20 points)

Show the *major* product or products of the following reactions. Be sure to indicate stereochemistry if relevant.

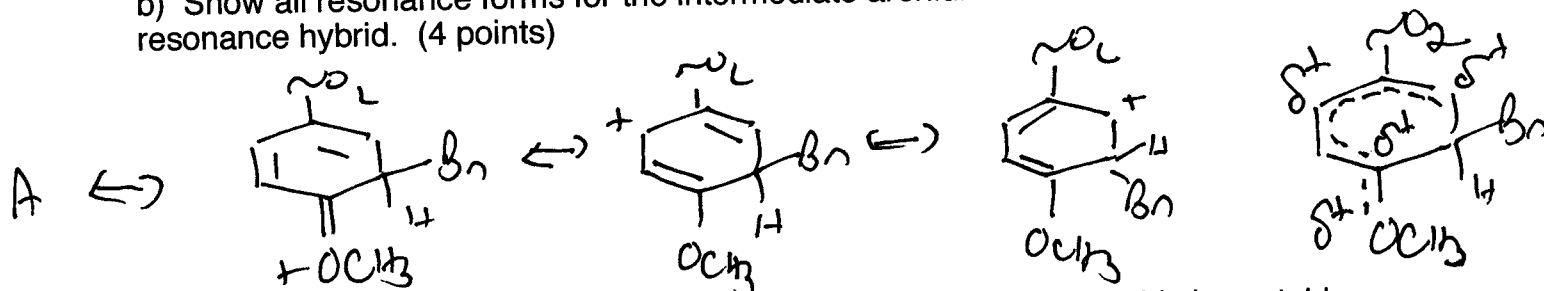


4) Mechanisms. (20 points)

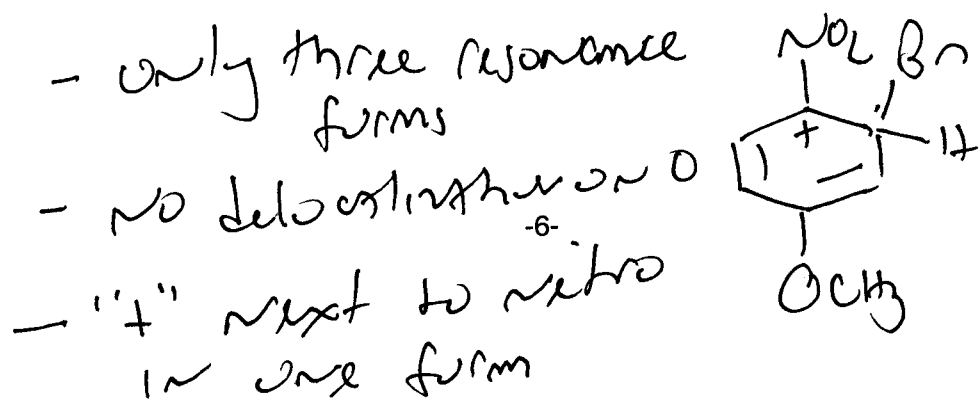
a) Provide a clear, step-by-step mechanism for the following reaction. Use arrows to track electron flow. (6 points)



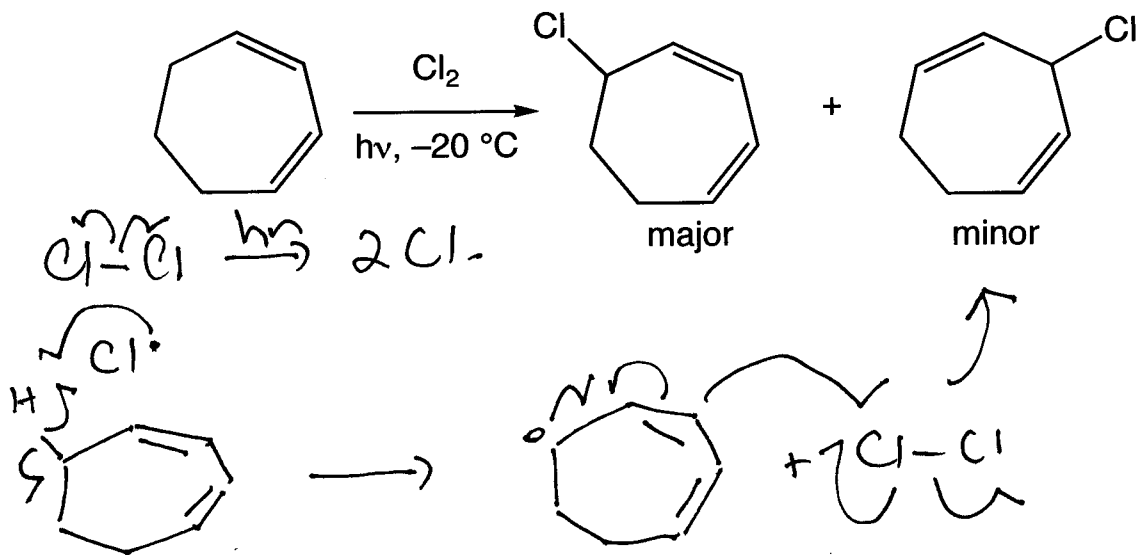
b) Show all resonance forms for the intermediate arenium ion in "a" and then show a resonance hybrid. (4 points)



b) Draw the arenium ion leading to the disfavored product. Why is this less stable than the ion that you drew in part "b"? (2 points)

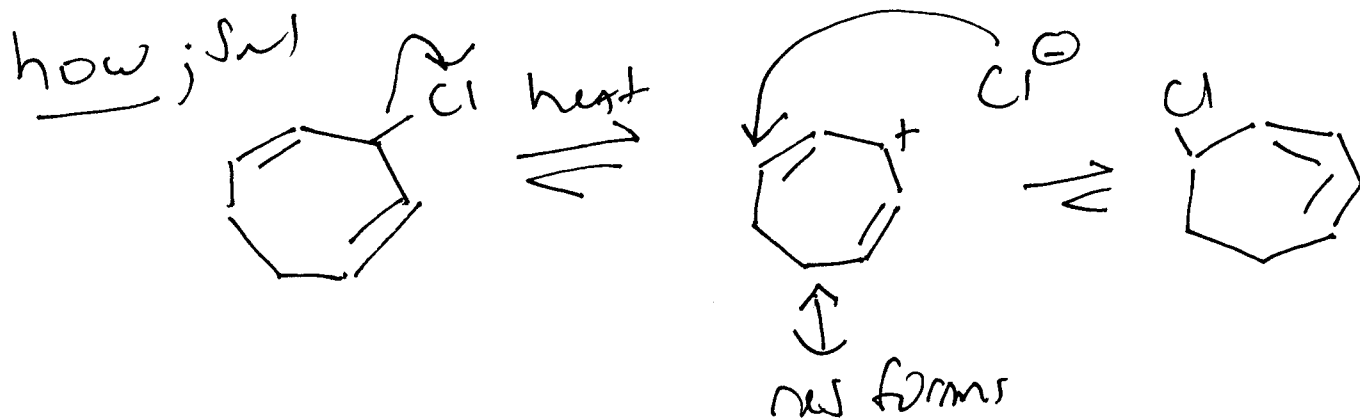


d) Chlorination of 1,3-cycloheptadiene at low temperature gives the following products. Write a clear, step-by-step mechanism for this reaction. (4 points)



Mech to minor shown, also ok to write mech to major

e) Upon warming to room temperature, the minor product in "d" isomerizes to the major product. How does this happen (show steps) and why? (4 points)



why conj diene is more stable than isolated diene

5) Multi-step Syntheses. (10 points)

Provide reaction conditions to accomplish **two of the following three transformations**, More than one step may be needed. You can use any other reagents that you need.

