

First Three Letters of Last Name

TA Name

Exam 3
5.12 Spring 2005

K

E

Y

Name _____

Signature _____

ID# _____

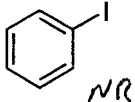
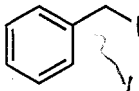

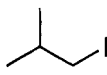
Prerequisite (circle one): 5.112 5.111 3.091

1. Make sure your exam has 10 numbered pages plus a periodic table.
2. Write your initials on each page.
3. Look over entire exam before starting and carefully read all instructions.
4. Show work for partial credit.

Page	Possible Points	Total
1	12	
2	15	
3	11	
4	10	
5	14	
6	10	
7	10	
8	4	
9	14	
Total	100	
10	5	
XC		

1. (12 points)

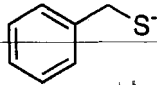
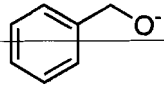
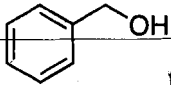
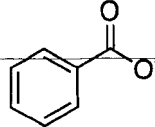
a. Rank in order of S_N2 reactivity (1= most reactive)

 NR	 benzylic bond a little weaker		
4	1	3	2

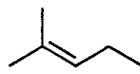
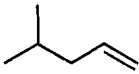
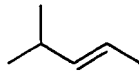
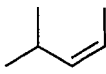
b. Rank in order of leaving group ability (1= best leaving group)

NH_2^-	H_2O	Cl^-	I^-
4	1	3	2



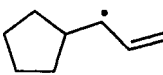

c. Rank in order of nucleophilicity (1= best nucleophile)

 polarizable		 not charged	
1	2	4	3

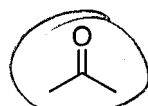
d. Rank in order of alkene stability (1= most stable)

			
1	4	2	3

e. Rank in order of radical stability (1= most stable)

			
4	3	2	1

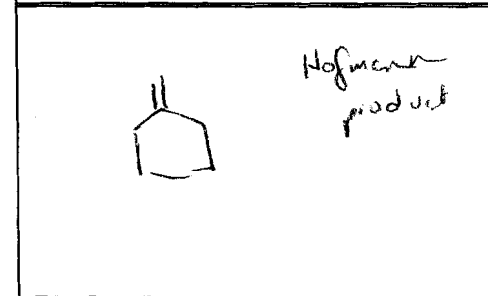
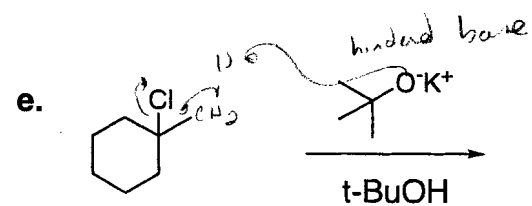
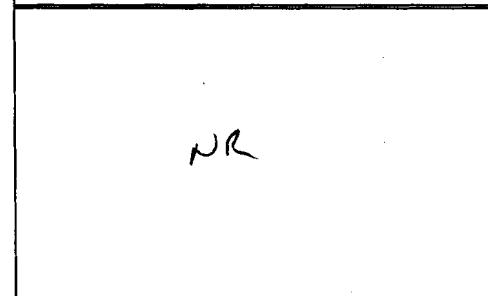
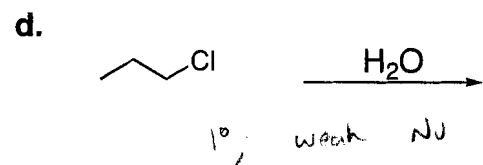
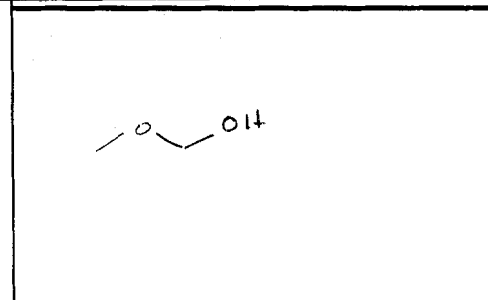
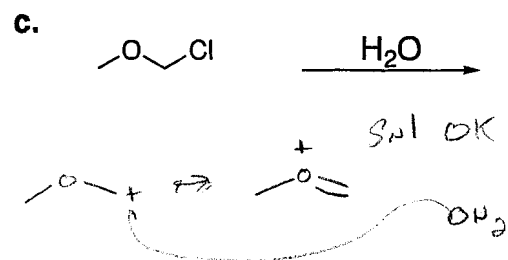
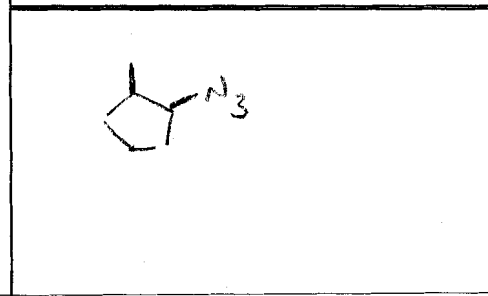
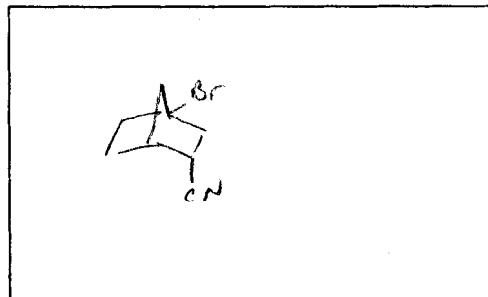
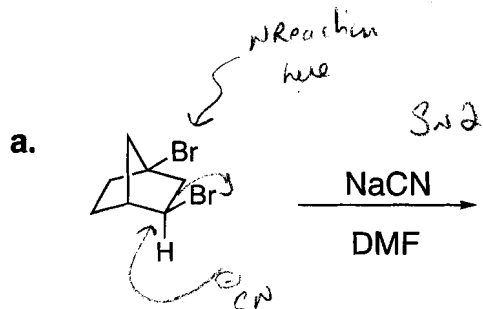
f. Circle the best solvent for an S_N2 reaction.

	CH_3OH
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Initials

Points

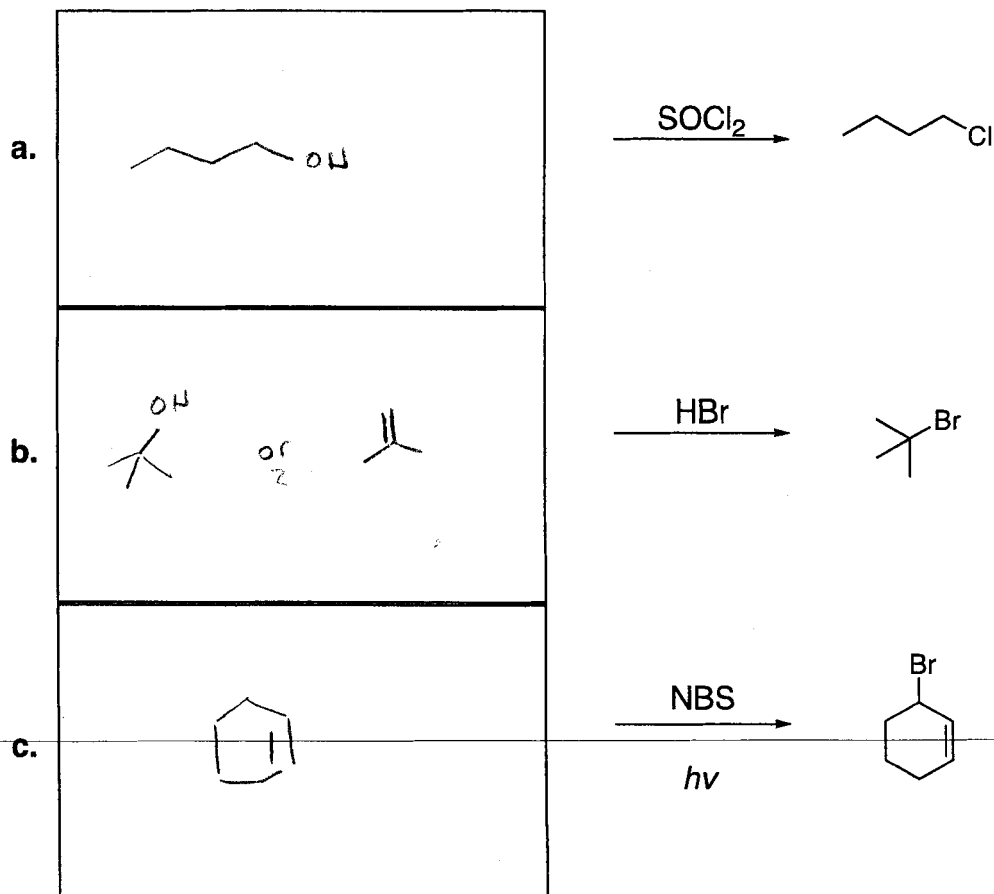
2. (15 points) Draw the structure of the products of the following reactions. Indicate stereochemistry where appropriate. If there is no reaction, write "NR".



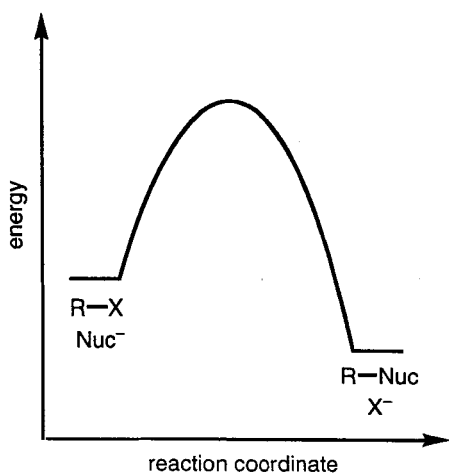
Initials

Points

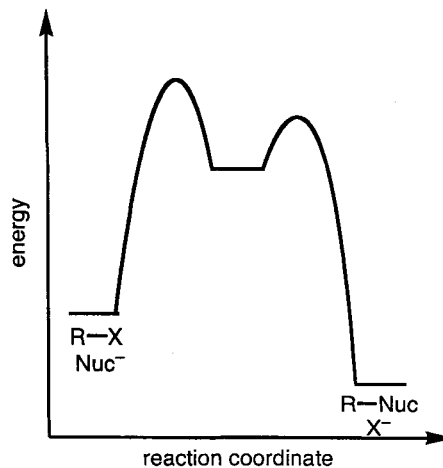
3. (9 points) Draw the structure of the starting materials for the following reactions.



4. (2 points) One of the reaction coordinate energy diagrams corresponds to an S_N1 mechanism, the other corresponds to an S_N2 mechanism. Indicate which reaction coordinate energy diagram goes with which mechanism.



Circle one: S_N1 S_N2

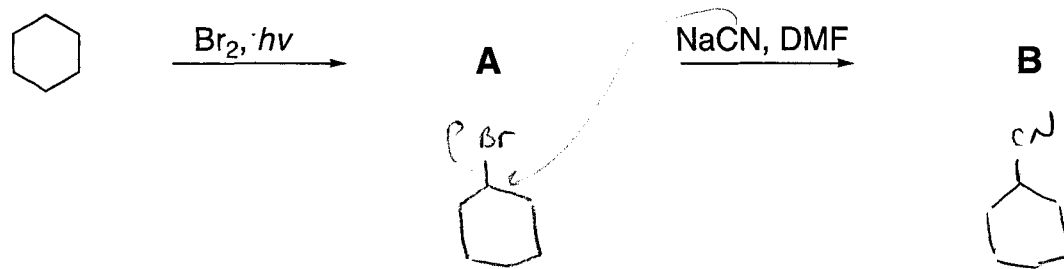


Circle one: S_N1 S_N2

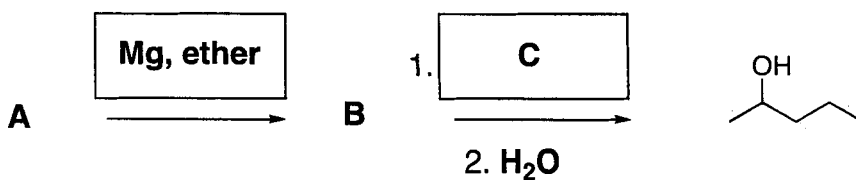
Initials

Points

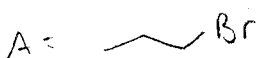
5. (4 points) Draw the structures of **A** and **B**.



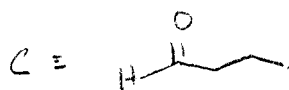
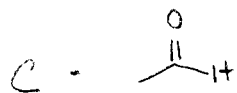
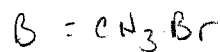
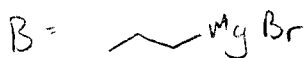
6. (6 points) Draw the structures of the starting materials and reagents (**A**, **B**, **C**) needed to synthesize the given product.



Several answers:



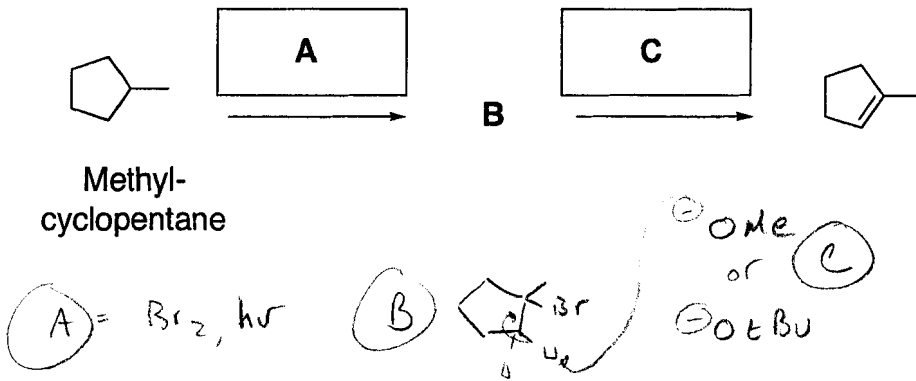
2 possible answers



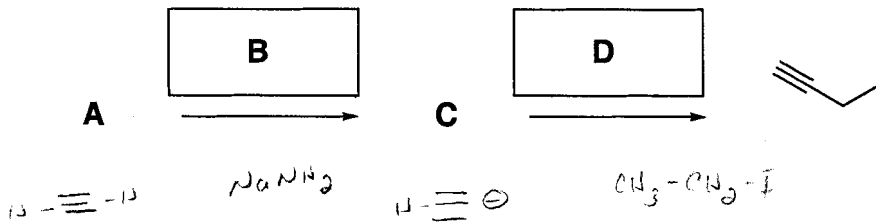
Initials

Points

7. (6 points) Show the synthesis of the following product in two steps from methylcyclopentane by drawing the structures of **A**, **B**, **C**.



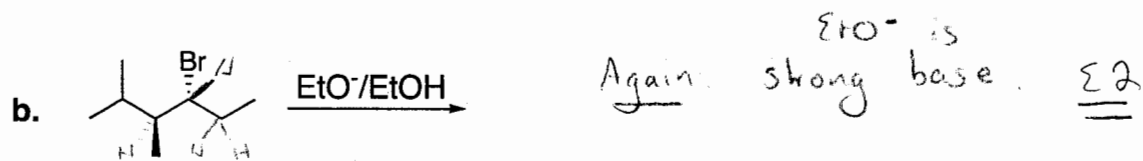
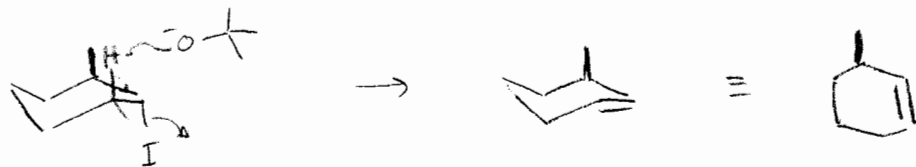
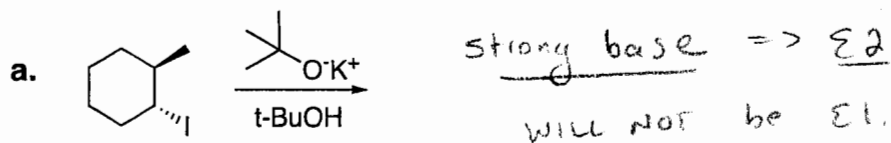
8. (8 points) Show the synthesis of the following product in two steps by drawing the structures of the starting materials and reagents (**A**, **B**, **C**, **D**) for the following reaction.
Hint: **A** is an alkyne.



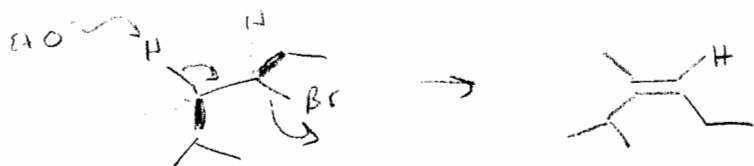
Initials

Points

9. (10 points) Draw the MAJOR elimination product and a detailed mechanism for the following reactions. Specify correct stereochemistry where appropriate.



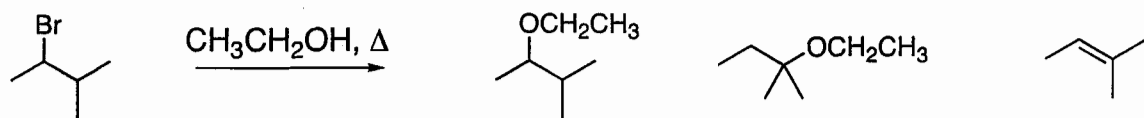
2 possibilities
 both can be APP
 choose H⁺ that gives more stable alkene



Initials

Points

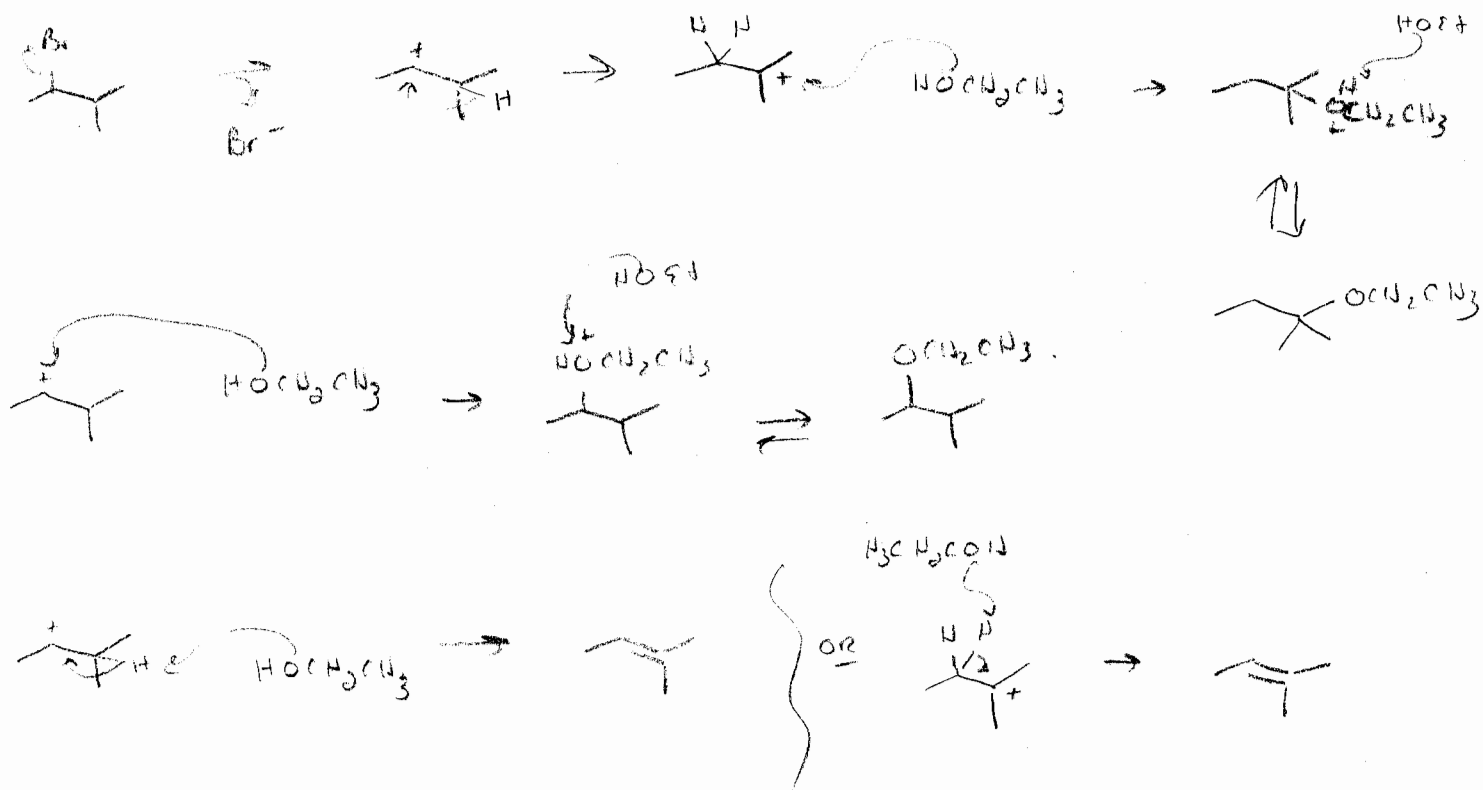
10. (10 points) Draw a detailed mechanism that accounts for each of the following products.



weak base/nucleophile \Rightarrow SN1/E1!

($\text{CH}_3\text{CH}_2\text{O}^-$ is a STRONG base, would change mechanism)

No ethoxide in this mechanism.

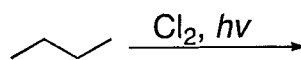
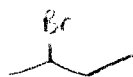
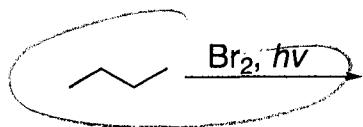


Initials

Points

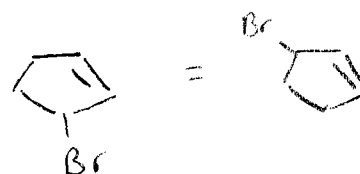
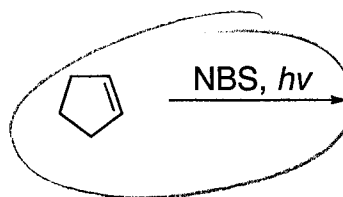
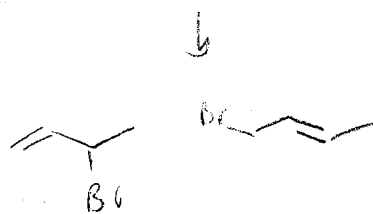
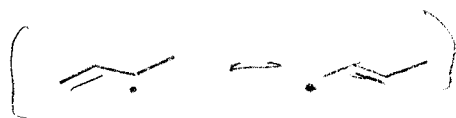
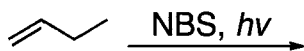
11. (4 points)

a. Circle the reaction that is more regioselective.



many multiply
chlorinated
products

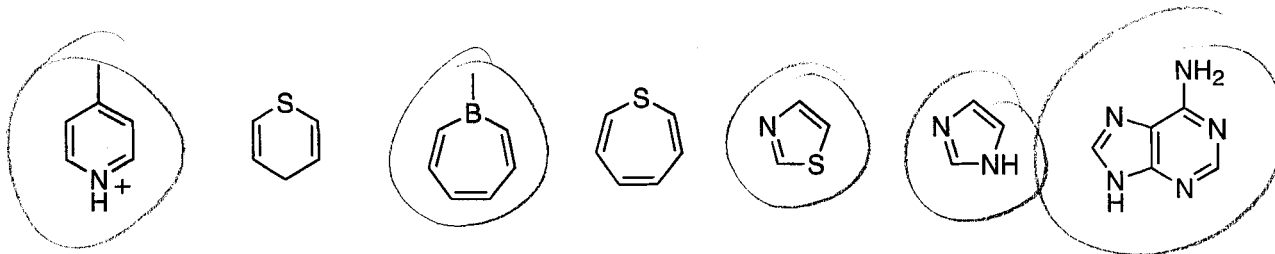
b. Circle the reaction that is more regioselective.



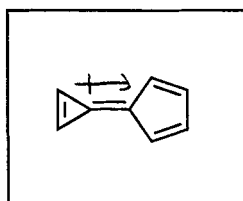
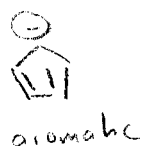
Initials

Points

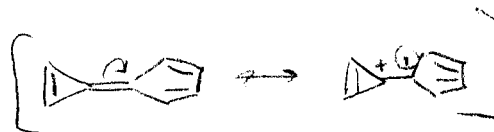
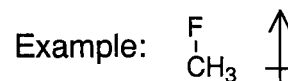
12. (7 points) Circle the heterocycles that are aromatic.



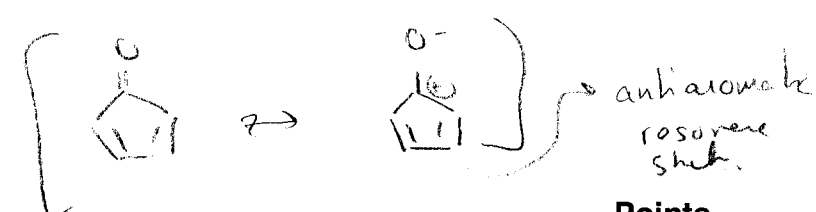
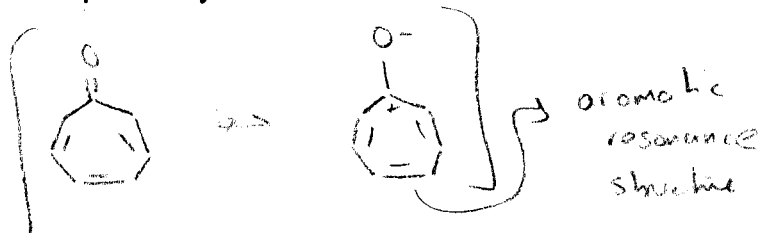
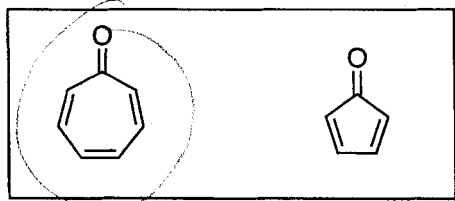
13. (3 points) Draw the dipole moment of calicene, if there is one. Hint: think about aromaticity.



calicene



14. (4 points) Which molecule is more stable? Explain why in 1-2 sentences.

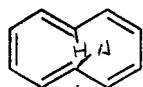


Initials

Points

Extra Credit:(5 points)

The compound shown below is not aromatic. Explain why not. Draw a picture or a model if this will help explain your reasoning.



cyclic ✓
4n+2 ✓ (10)
planar x.

these 2 H's will be too close -
Molecule must bend to avoid steric clash

Initials

Points