# CH310N
# Spring 2010

## Anslyn

## April 20, 2010

## Exam 3

Please **PRINT** the first three letters of your last name in the boxes below.

| | | |
|---|---|---|
| | | |

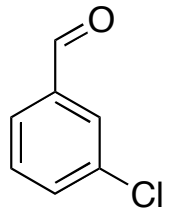
**PRINT Full Name** _____ **UT-EID**_____

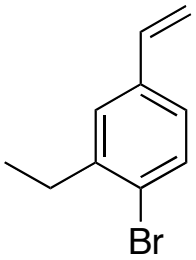
1) _____ ( 10 pts )
2) _____ ( 5 pts )
3) _____ ( 9 pts )
4) _____ ( 4 pts )
5) _____ ( 5 pts )
6) _____ ( 5 pts )
7) _____ ( 16 pts )
8) _____ ( 12 pts )
9) _____ ( 6 pts )
10) _____ ( 10 pts )
11) _____ ( 8 pts )
12) _____ ( 10 pts )
Bonus) _____ ( 2 pts )

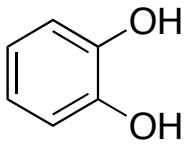
Total Score _____ (100 pts)

1.

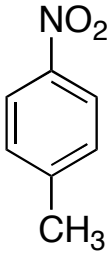
a) Using the common names for the parent structures, give names for the following molecules. (3 points)

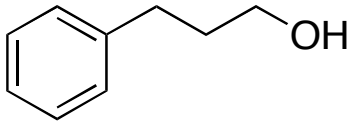



b) Give the IUPAC name for the following molecules. (From homework, problem 21.8, 2 points)




c) Draw the chemical structures for the following common names. (3 points)

*m*-cresol

*p*-ethoxyaniline

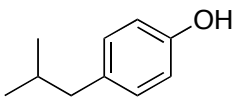
*o*-nitrophenol

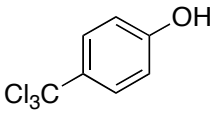
d) Draw the chemical structure for the following IUPAC name. (From homework, problem 21.9, 2 points)

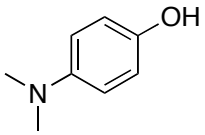
2,4,6-trinitrotoluene

benzyl bromide

2. Several factors affect the acidity of the hydroxylic proton in a phenol. Put the indicated phenol derivatives in order of decreasing acidity (thus 1 signifies the most acidic species). Please explain why you made these assignments. (5 points)



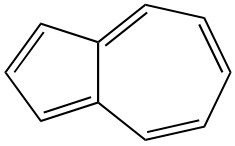




_____ _____ _____

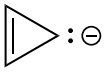
3. Please write the number of π-electrons in each of the following compounds. Then **circle** the compounds which are **aromatic** according to the Hückel criteria. (9 points)

Number of π–electrons = _____

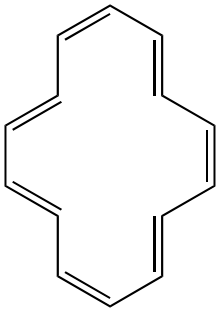


Number of π–electrons = _____

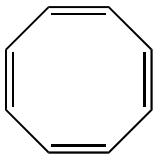
Number of π–electrons = _____



Number of π–electrons = _____

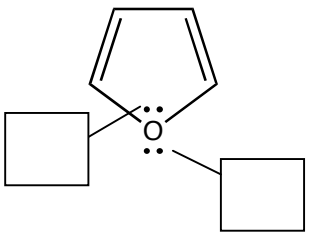


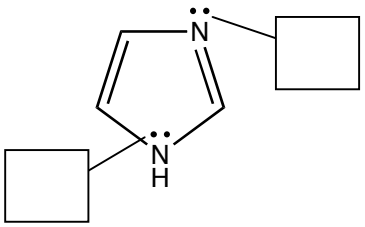
Number of π–electrons = _____



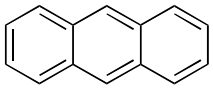
Number of π–electrons = _____

4. For both compounds below, please write the orbital in which each lone pair of electrons resides. (4 points)

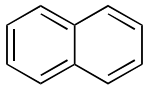


5. Two aromatic species, anthracene and naphthalene, are pictured below. Anthracene absorbs light with a $\lambda_{max}$ value of 380 nm. Where would you expect naphthalene to absorb light, relative to anthracene? Explain your answer. (5 points)

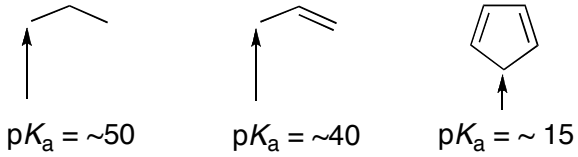


Anthracene



Naphthalene

6. The allylic hydrogens of propene have a p$K_a$ of roughly 40, compared to an unsubstituted hydrocarbon having a p$K_a$ around 50. Cyclopentadiene, however, has a p$K_a$ around 15. (5 points)

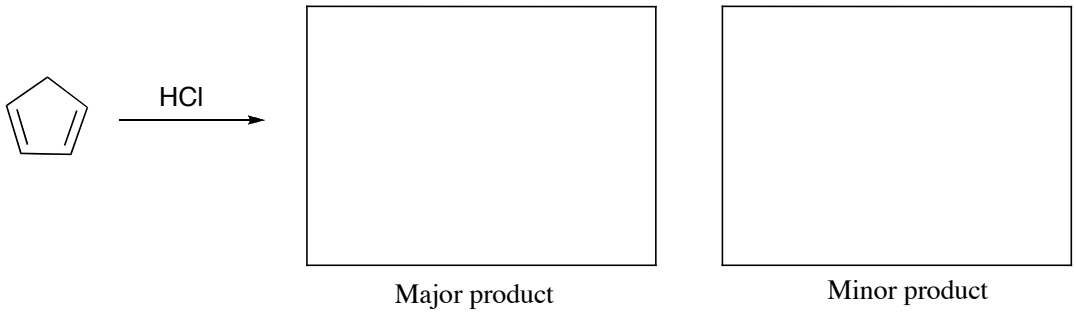



a) Circle the species with the most acidic proton.

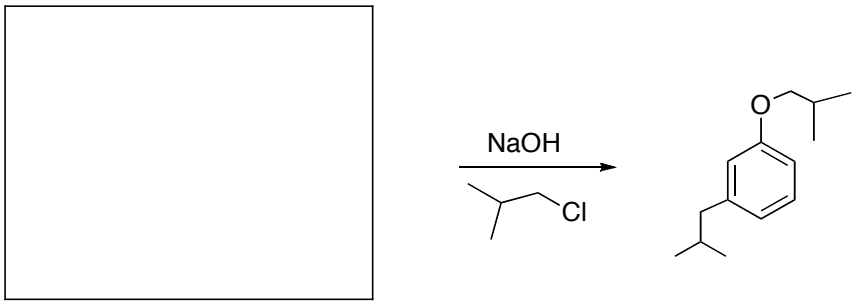
b) What accounts for the dramatic difference in p$K_a$ between propene and cyclopentadiene?

7. Fill in the box with the appropriate reactant, reagent, or product. Some boxes require more than one step. (16 points)

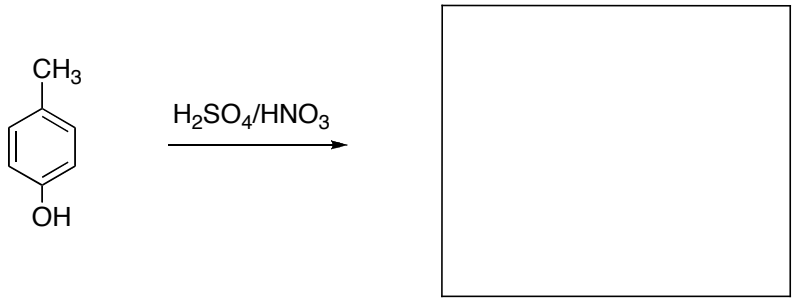
a) From homework, problem 20.11



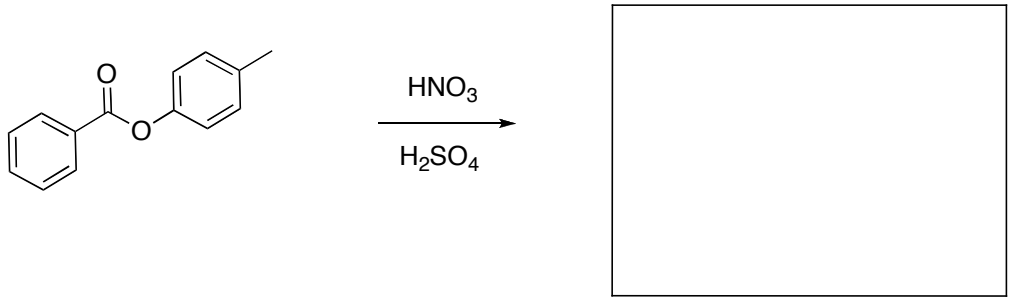

b)



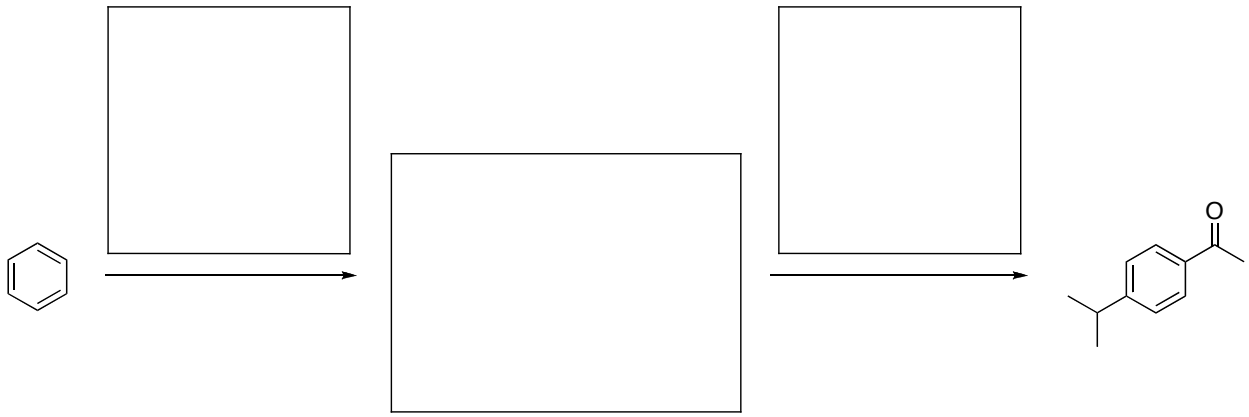

c) From homework, problem 22.15c



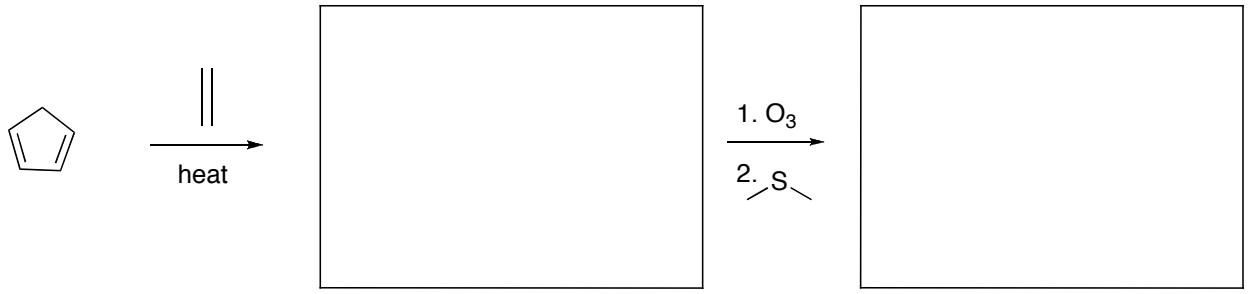

d) From homework, problem 22.21c



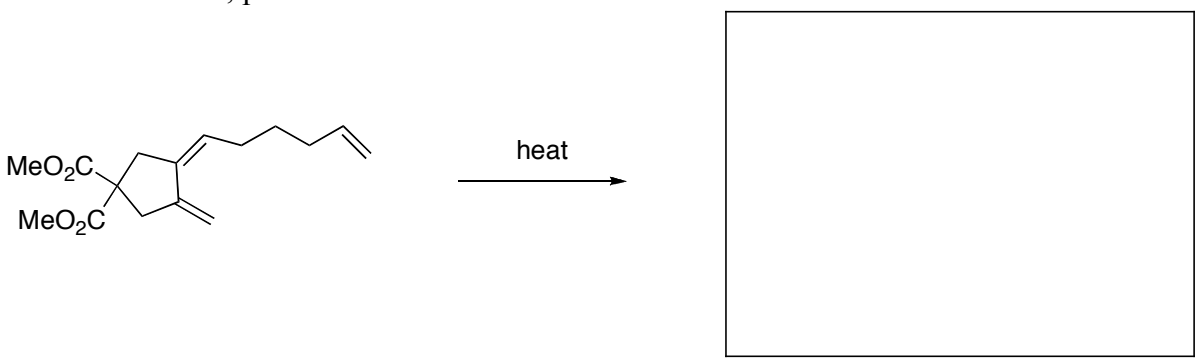
e) From homework, problem 22.41



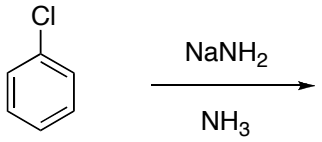

f)



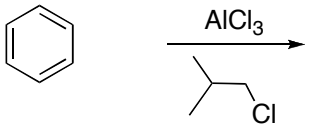

g) From homework, problem 24.47



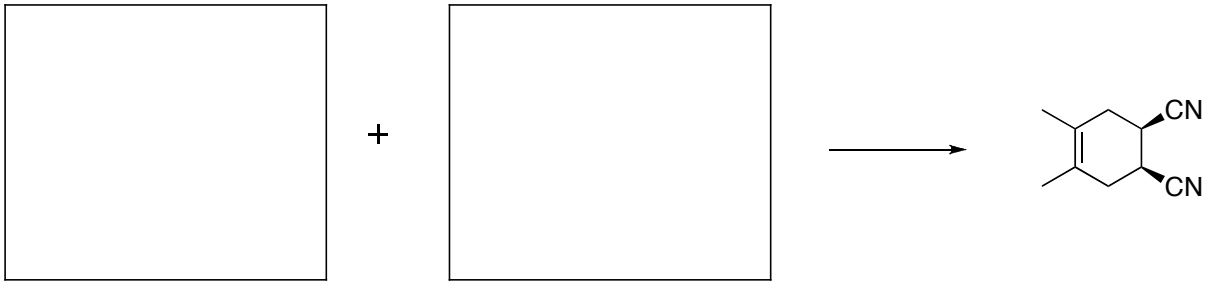
h)



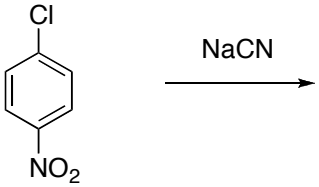

i)



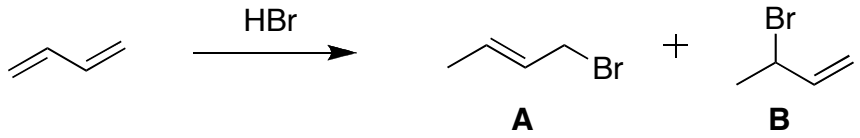

j) From class notes




k)



8. (From class) Addition of HBr to butadiene proceeds to make two products, A and B, as shown below. (12 points)




a) Write mechanisms that account for formation of both of the products, A and B, including all participating lone pairs, applicable formal charges, and required arrow pushing to indicate flow of electrons.

**A-**

**B-**

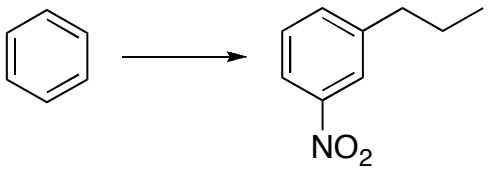
b) Put both reactions on the same reaction coordinate diagram, making sure to show the correct relative energy levels for the peaks and valleys. Structures should be drawn for each valley (also known as a trough).

c) Briefly describe reaction conditions that would favor the formation of A as the major product, and then do the same for B.

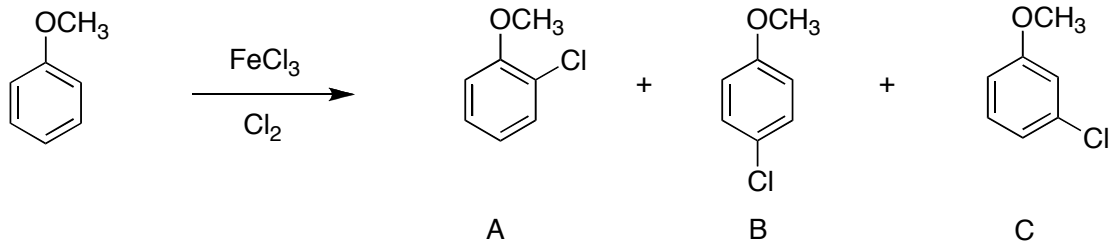
**A-**

**B-**

9. Please show how you would synthesize the following compound from benzene and any reagent containing 4 carbons or less. (From class notes, 6 points)

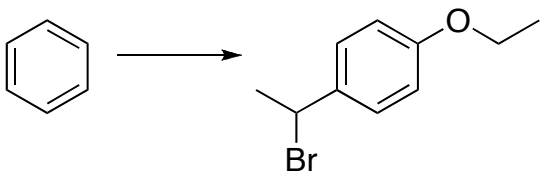


10. Electrophilic chlorination of anisole gives A and B as the predominant products, with C only formed in trace amounts. Please use resonance structures to explain this observed regioselectivity. Then, explain these resonance structures in words. (10 points)

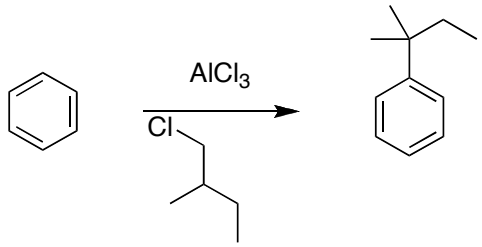



A B C

11. Please show how you would synthesize the following compound from benzene and any reagent containing 4 carbons or less. (8 points)



12. Draw the mechanism for the following reaction, including all participating lone pairs, applicable formal charges, and required arrow pushing to indicate flow of electrons. (10 points)




**BONUS**: What does Dr. Anslyn feel is the best part of his job as professor?