CH 310N
Fall 2006
Anslyn

November 30, 2006
Exam 3

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

PRINT Name_____ **UT-EID**_____

1) _____ (5 pts)

2) _____ (18 pts)

3) _____ (12 pts)

4) _____ (4 pts)

5) _____ (8 pts)

6) _____ (5 pts)

7) _____ (5 pts)

8) _____ (5 pts)

9) _____ (8 pts)

10) _____ (10 pts)

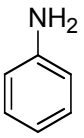
11) _____ (10 pts)

12) _____ (10 pts)

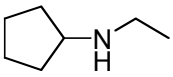
Total score _____ (100pts)

1) Name the structure or draw the structure of the given name. (5 points)

A) Give common name of the following molecule

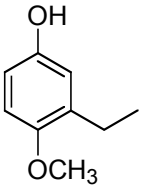


B) Name compound



C)
From homework, problem 21.8

Name the compound



D) From homework, problem 21.9

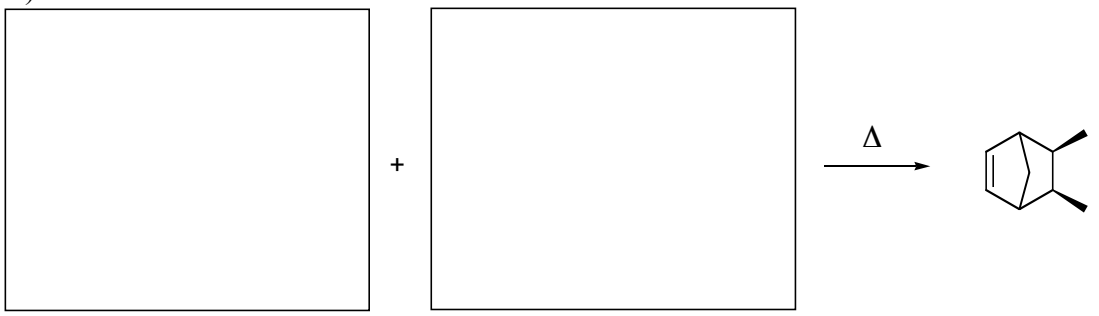
Draw 3,5 – dinitrotoluene

E) From homework, problem 23.26

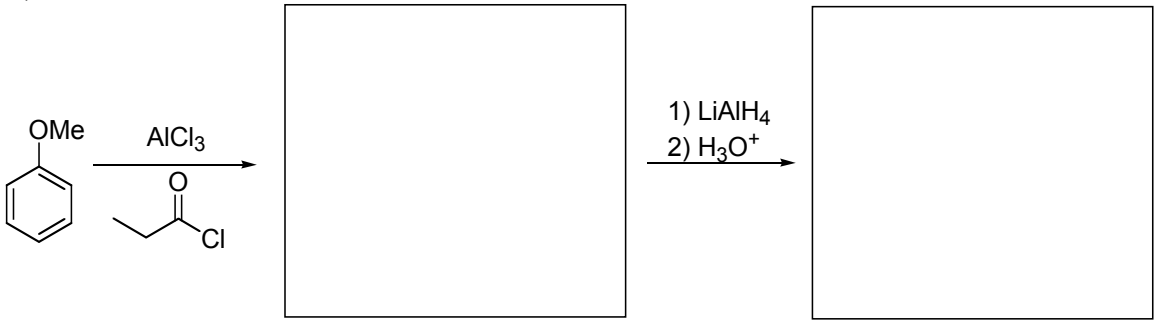
Draw 4-aminobutanoic acid

2) Fill in the box with the correct reagents, reactants or products. Show any necessary stereochemistry. Some reagent boxes (boxes over the arrow) require multiple steps. (18 points)

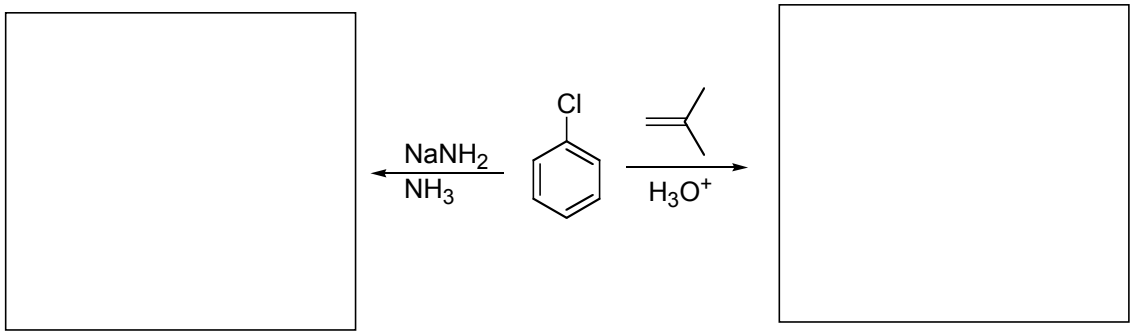
A)



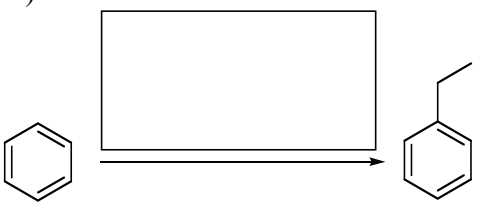
B)



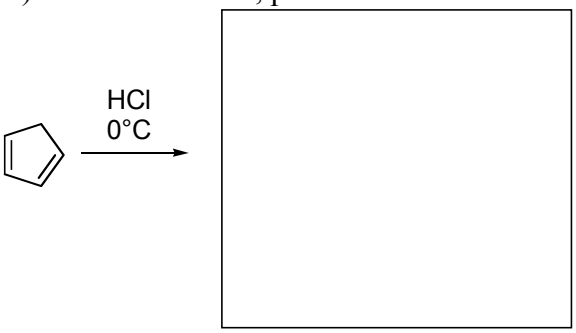
C)



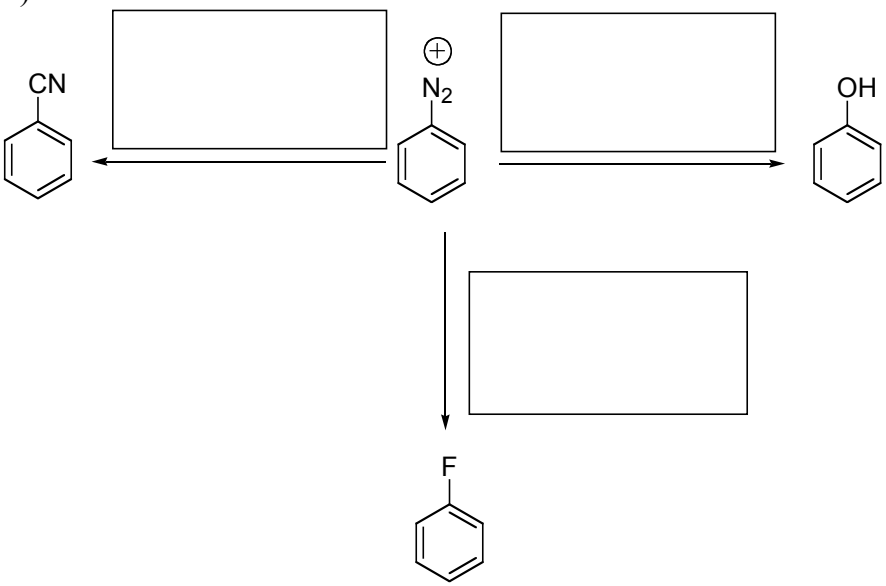
D)



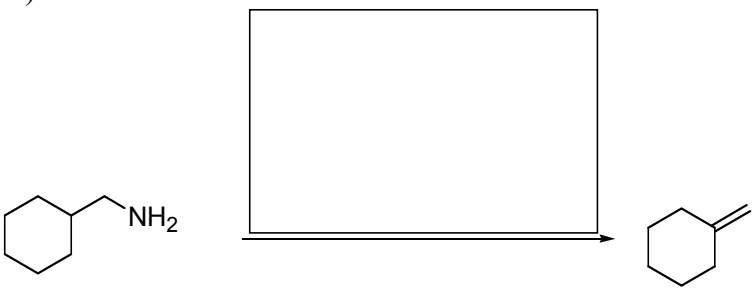
E) From homework, problem 20.11



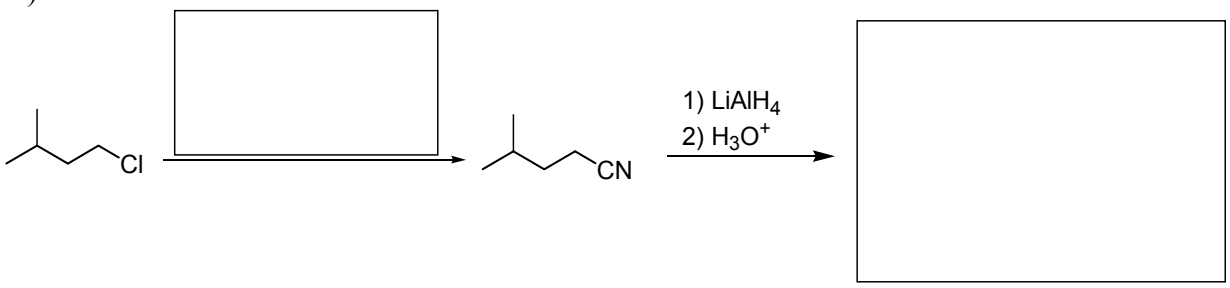
F)



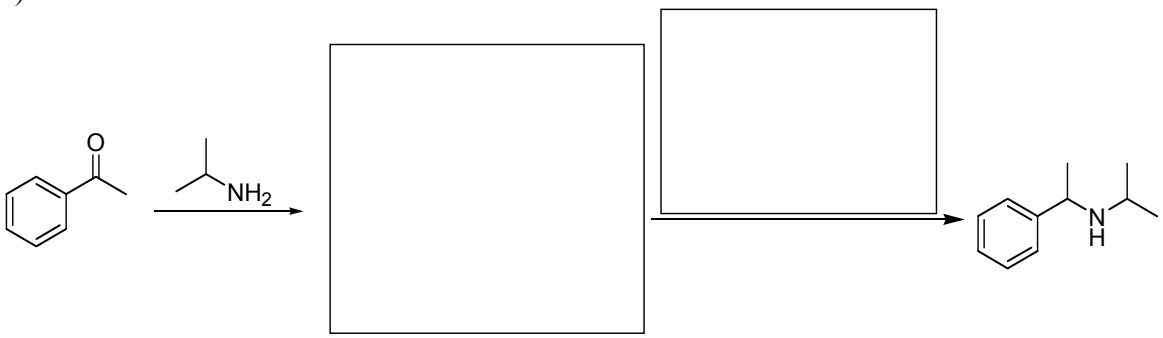
G) From lecture notes



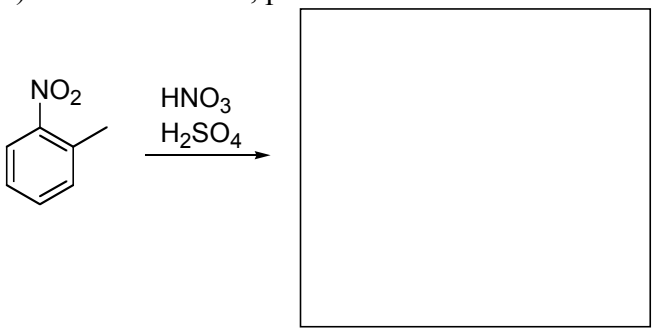
H)



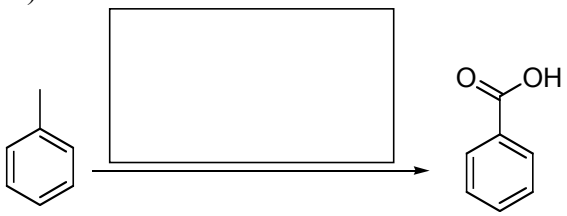
I)



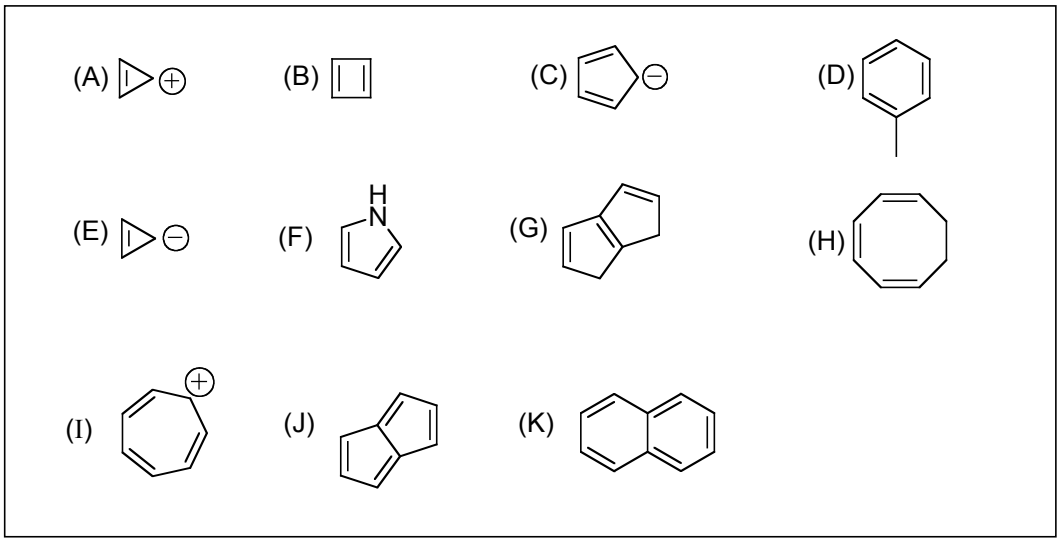
J) From homework, problem 22.15



K)



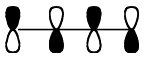
3) There are 11 molecular structures in the box below and **6** of them are aromatic. Give the **letters** of the structures that are aromatic in the following 6 boxes. (12 points)

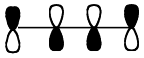


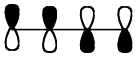
Aromatic molecules (write the letters of aromatic molecules in the boxes)

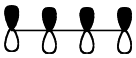
4) (4 points)

a) The 4π molecular orbitals of 1,3-butadiene are shown below. Please fill in the molecular orbital diagram with arrows representing electrons for 1,3-butadiene.

D  ____

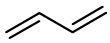
C  ____

B  ____

A  ____

b) Point out which one (A, B, C, or D molecular orbital) is the HOMO and which one is the LUMO molecular orbital below.

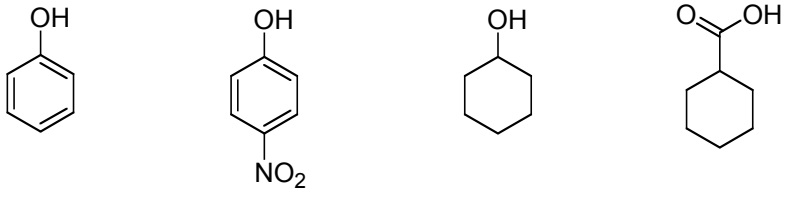
LUMO _____



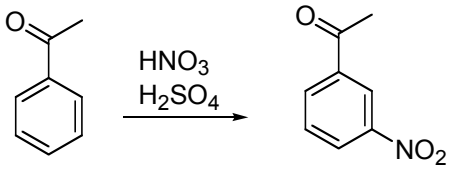
1,3-butadiene

HOMO _____

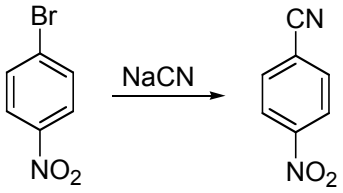
5) Rank the following sets of molecules in order of decreasing acidity? (1 being the most acidic and 4 being the least acidic) (8 points)



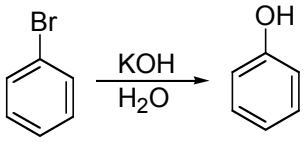
6) Provide a mechanism for the following reaction. Show all arrow pushing through curved arrows and the intermediates produced. (5 points)



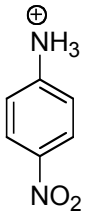
7) Provide a mechanism for the following reaction. Show all arrow pushing through curved arrows and the intermediates produced. (5 points)



8) Provide a mechanism for the following reaction. Show all arrow pushing through curved arrows and the intermediates produced. (5 points)

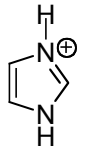


9) Predict the dominate protonation state of the following molecules at pH 3 & pH 9 by drawing the structure of A, B, C, and D in its corresponding boxes at the two different pHs. (8 points)



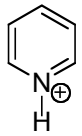
pK_a 1.0

A



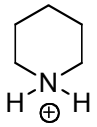
pK_a 6.95

B



pK_a 5.25

C



pK_a 10.75

D

pH =3

A	B	C	D

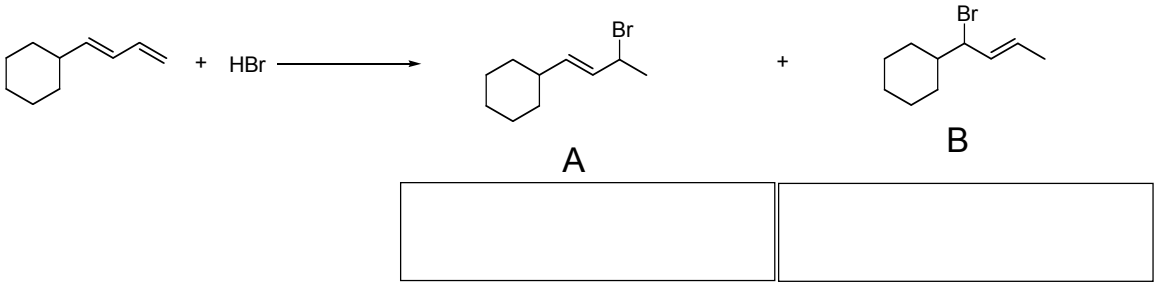
pH =9

A	B	C	D

10) (10 points)

The following reaction gives two possible products, **A** and **B**. At low temperatures, **A** is the major product, and at high temperatures **B** is the major product.

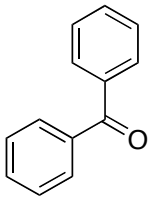
a) Given this information along with your knowledge of structural stability, label in the boxes provided the "kinetic" product and the "thermodynamic" product.



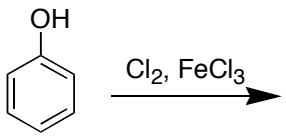
b) Draw **I** (intermediate) in the box provided for the above reaction.
Label the wells (in the boxes) in the reaction coordinate diagram, product **A** or **B**.

c) In three sentences or less, explain why the temperature at which the reaction is run has such a great effect on the outcome of the major product produced.

11) Propose a synthesis of the compound below starting from benzene and CH_3Br?
(**Hint:** You will have to use two benzene molecules) (10 points)



12) (10 points)
Draw the three possible products (*ortho*-, *meta*-, and *para*-) of the following electrophilic aromatic substitution reaction in the boxes provided. Draw a circle around the major product(s).
Draw all of the possible resonance structures for the carbocation intermediates formed during the creation of each of the three products in the boxes provided. There will be empty boxes. Briefly explain why the major product(s) is/are favored. You should use the resonance structures you drew in your **explanation.**



ortho

meta

para

Explanation: