

Chemistry 2522

Spring Semester 2006; Midterm 2 Exam

April 5, Wednesday, 1:00 to 1:50 pm

This exam has 8 problems (100 pts) on 6 pages. Make sure your copy is complete and correct.

Printed Name (**LAST**, First) _____

Your grades will be available Friday, April 7, morning before class.

Good Luck!

Chemistry 2522
Spring 2006; Midterm 2 Exam

This exam has 8 problems on 6 pages. Make sure your copy is complete and correct.

Printed Name (***Last***, First) _____

Scores:

1. _____

2. _____

3. _____

4. _____

5. _____

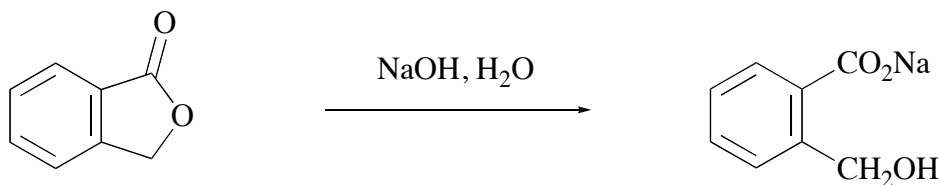
6. _____

7. _____

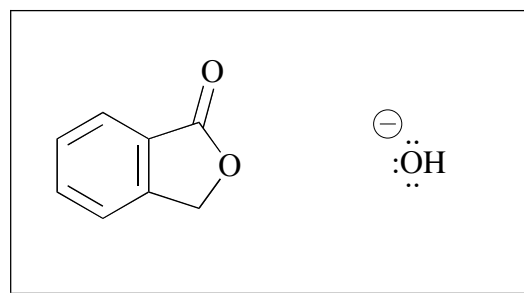
8. _____

Total: _____

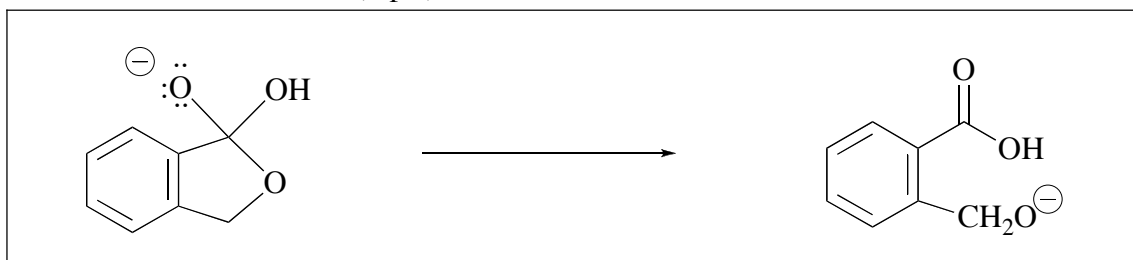
1. (8) Answer questions (a) and (b) on the **mechanism** of the following reaction:



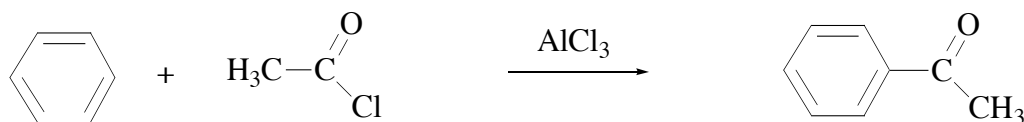
- (a) In the provided box, draw **two curved arrows** explaining the initial step (*nucleophilic addition*) in the mechanism of this reaction (4 pts):



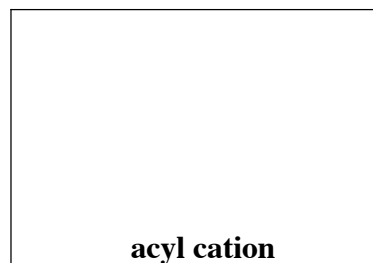
- (b) In the provided box, draw **two curved arrows** explaining the second step (*elimination*) in the mechanism of this reaction (4 pts):



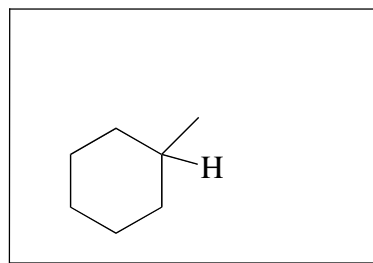
2. (8) Using provided boxes, answer the questions on the **mechanism** of the following reaction:



(a) In the provided box, draw the structure of the *electrophile* (**acyl cation**) in this reaction (4 pts):

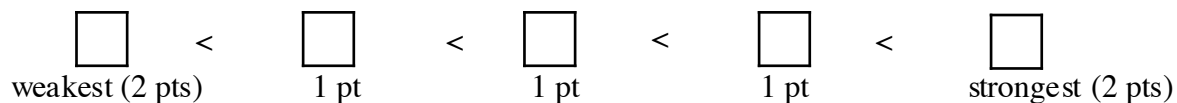


(b) In the provided box, finish drawing of the **carbocationic intermediate** formed by *electrophilic addition* of acyl cation to benzene (4 pts; 1 pt for each of the four missing fragments):



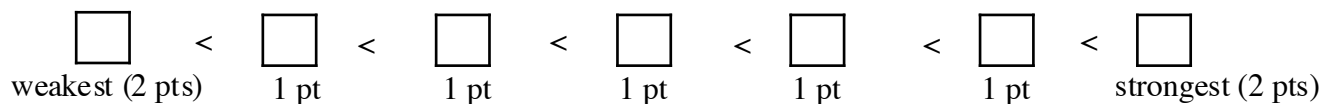
3. (19 pts) (a) (7 pts) Arrange the following compounds in order of increasing acidity (put the number in the appropriate box)

(1) 2,2-difluoropropanoic acid (2) 2-fluoropropanoic acid, (3) propanoic acid, (4) propane, (5) 2-propanol

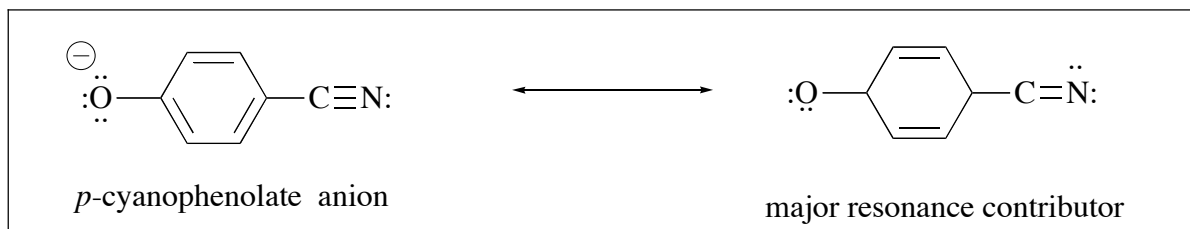


(b) (9 pts) Arrange the following **phenols** in order of increasing acidity:

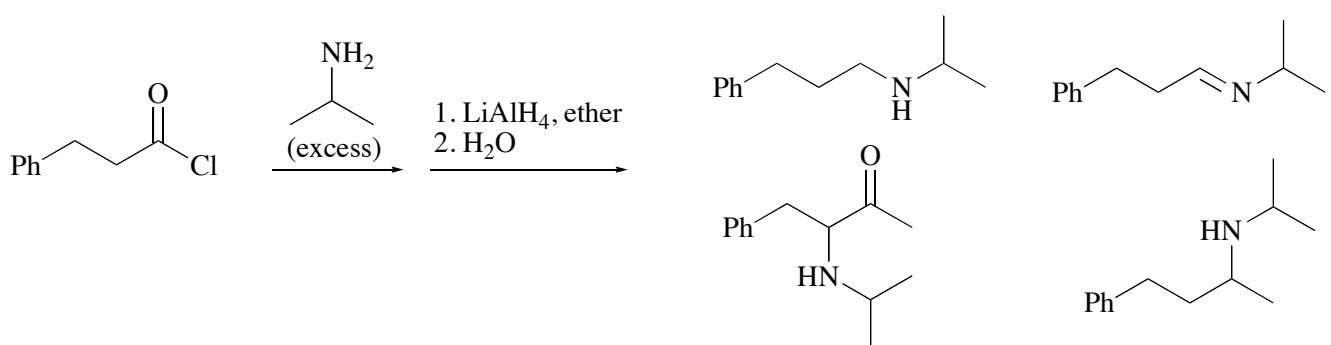
(1) 2,4-dimethylphenol, (2) 2,4,6-trinitrophenol, (3) *o*-nitrophenol, (4) *p*-methylphenol,
(5) 2,4,6-trimethylphenol, (6) phenol, (7) 2,4-dinitrophenol



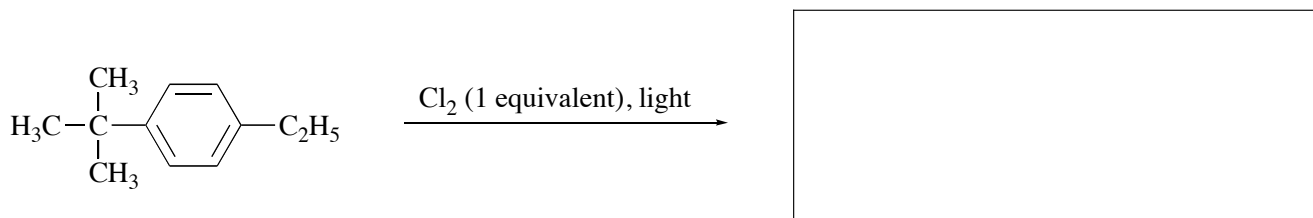
(c) (3 pts) Finish drawing of the important resonance contributor of ***p*-cyanophenolate anion** that explains the **high acidity** of *p*-cyanophenol (1 pt for each of the three missing fragments):



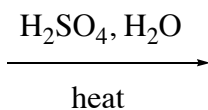
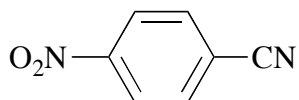
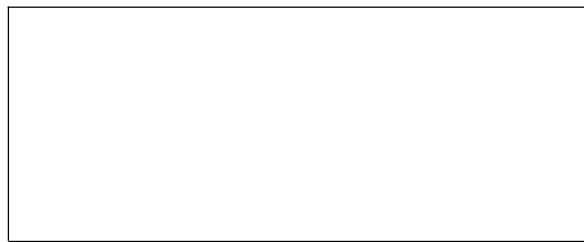
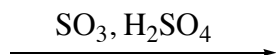
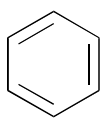
4. (12) Circle the **major organic product** obtained from each of the following of reactions (4 pt each):



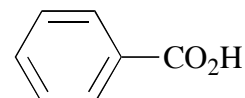
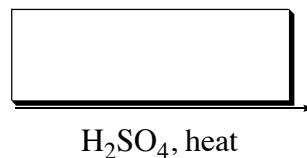
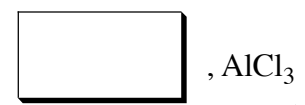
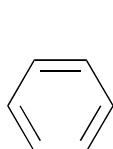
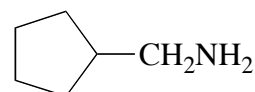
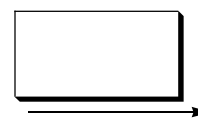
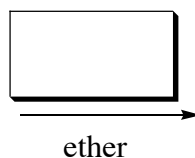
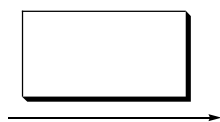
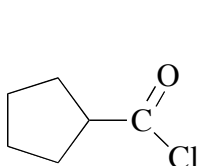
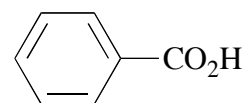
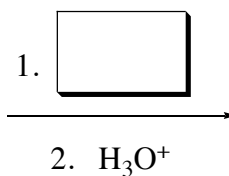
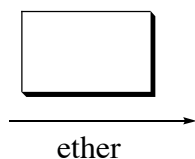
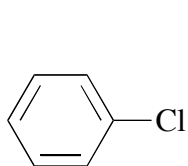
5. (15) Draw the structure of the main product for each the following reactions (5 pts each):



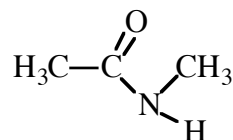
5



6. (14, 2 pts each box) Draw the molecule of a reagent that is required to perform each of the following reactions in the box above the arrow:



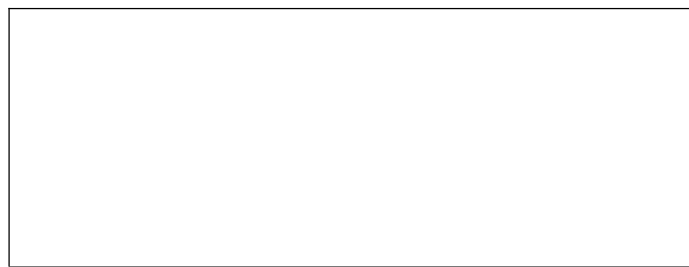
7. (9) Give either the **IUPAC name** or the **correct structure** for each of the following compounds:



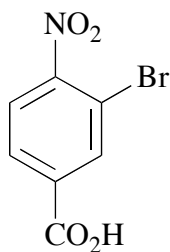
(3 pts)

m-chlorophenol

(3 pts)



Circle the correct the IUPAC name of the following compound (3 pts):



2-bromo-4-carboxynitrobenzene

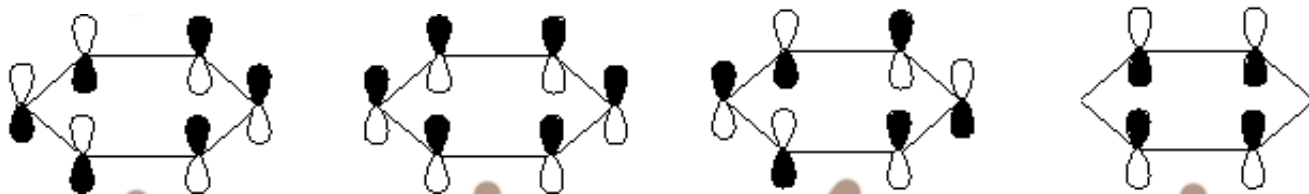
2-bromo-1-nitro-4-benzoic acid

2-nitro-6-carboxybromobenzene

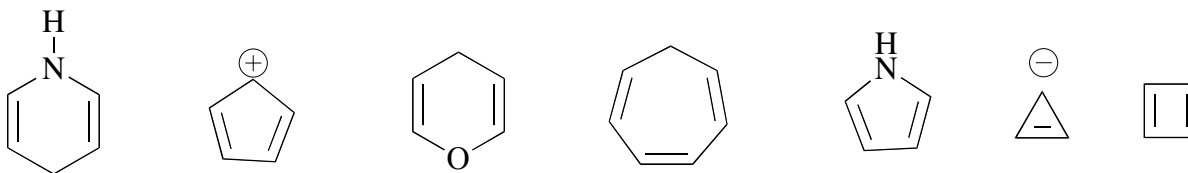
3-bromo-4-nitrobenzoic acid

8. (15, 5 pts each) For each of the following questions (a)-(c) **circle** the item that is the correct answer.

(a) Which of the following represents the **lowest** energy **bonding** π molecular orbital of benzene?



(b) Which one of the following molecules is **aromatic** according to the Hückel criteria?



(c) Which of the following compounds is a conjugated **diene**?

2,4-hexadiene 1,4-cyclohexadiene 1,4-hexadiene 1,2-butadiene cyclopentene ethylene