

Chemistry 2542
Spring 2008; Midterm 1 Exam

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

Printed Name (Last, First) _____

Key

Scores:

Problem 1: 15

Problem 2: 15

Problem 3: 30

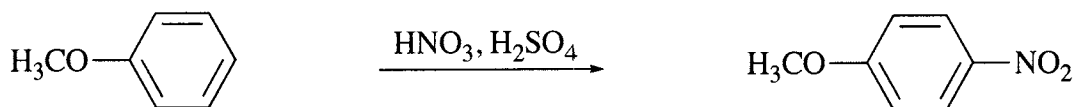
Problem 4: 10

Problem 5: 15

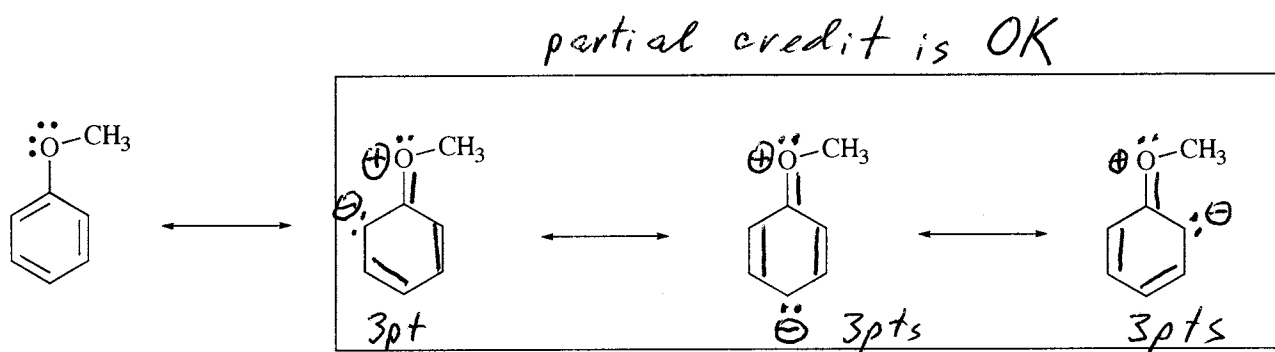
Problem 6: 15

Total: 100

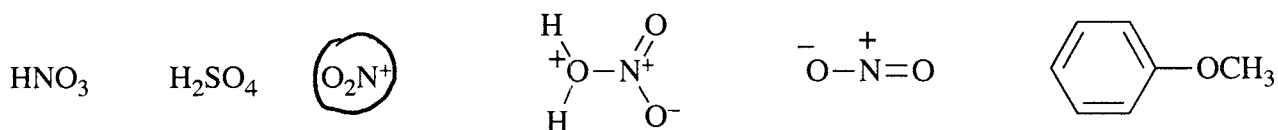
1. (15 pts) Answer the questions on mechanism of the following reaction:



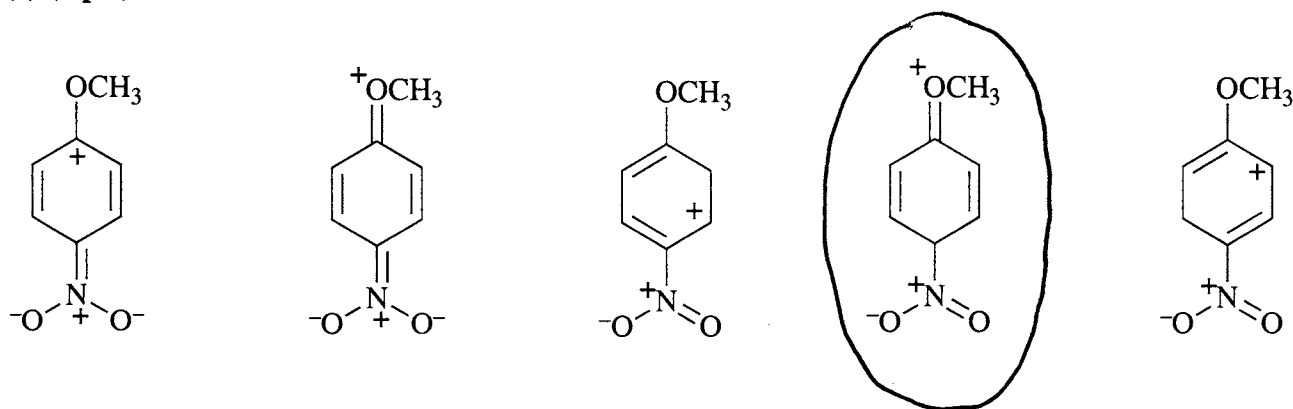
(a) (9 pts) In the provided box, finish drawing of three resonance contributors of the starting compound that explains the activating and directing effects of the methoxy group (3 pts each contributor; don't forget to show nonbonding electron pairs and formal charges):



(b) (3 pts) Circle the structure of the **electrophile** in this reaction

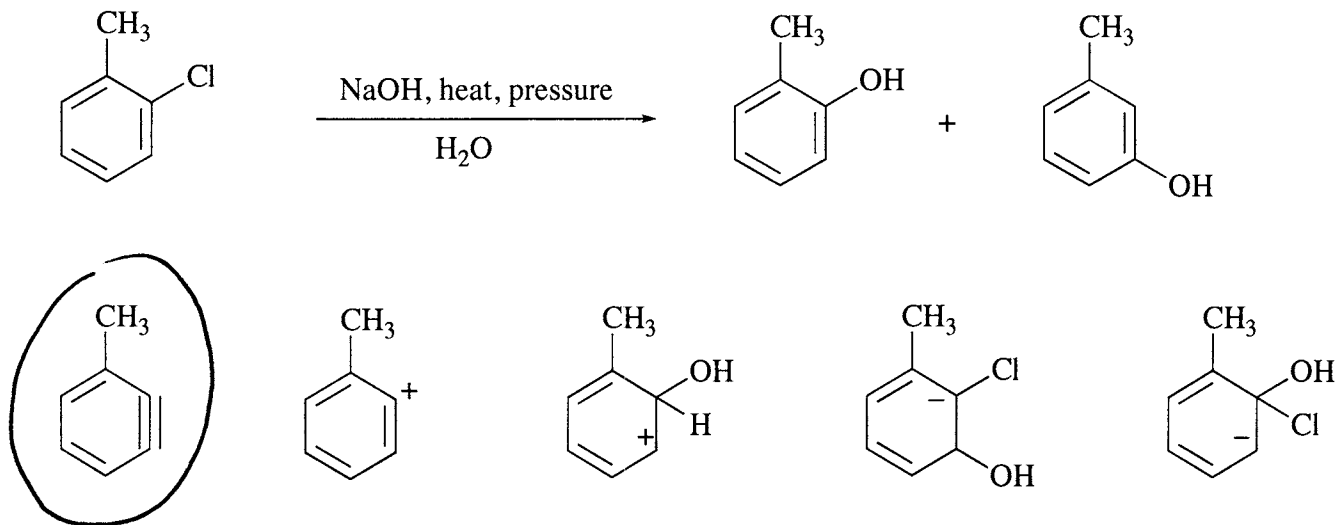


(c) (3 pts) Circle the structure of the **intermediate** in this reaction

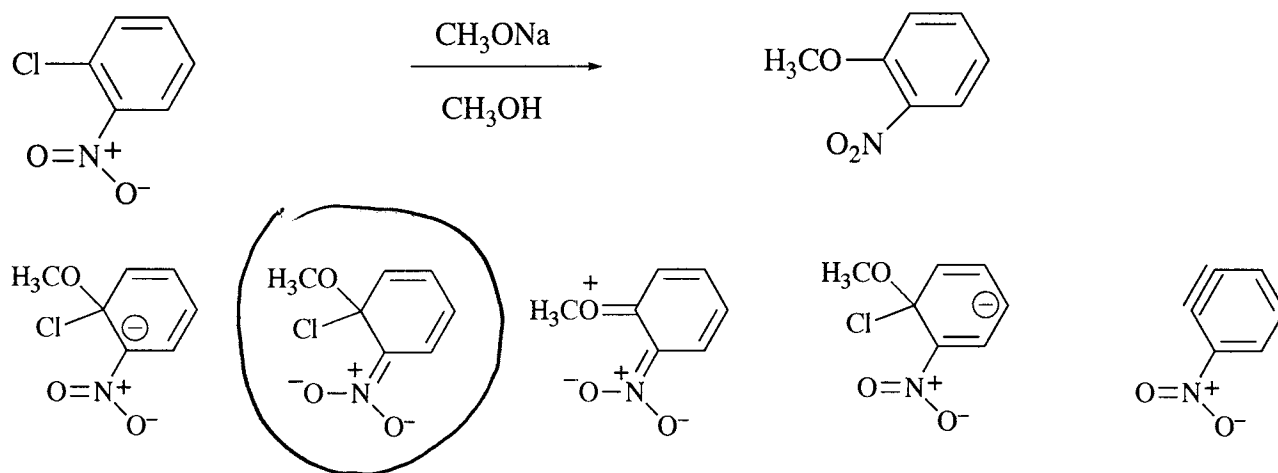


2. (15 pts) Answer the following questions.

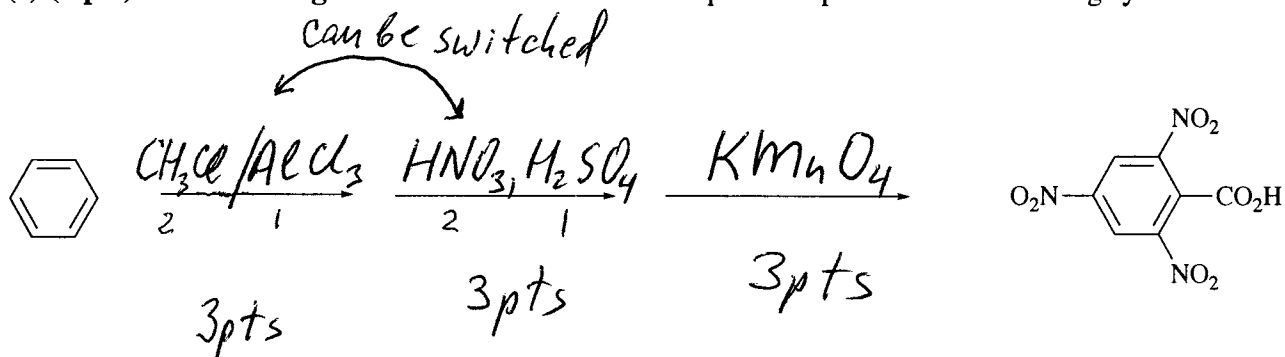
(a) (3 pts) Circle the structure of the **intermediate** in this reaction:



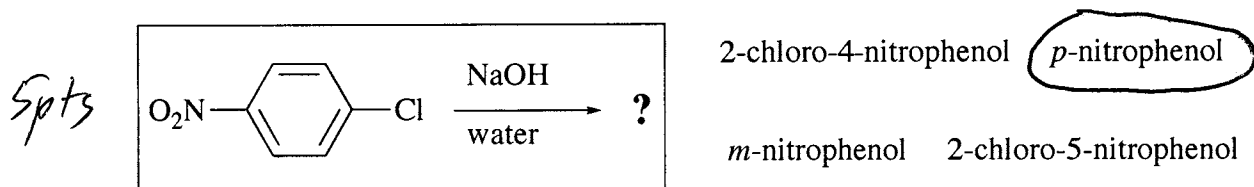
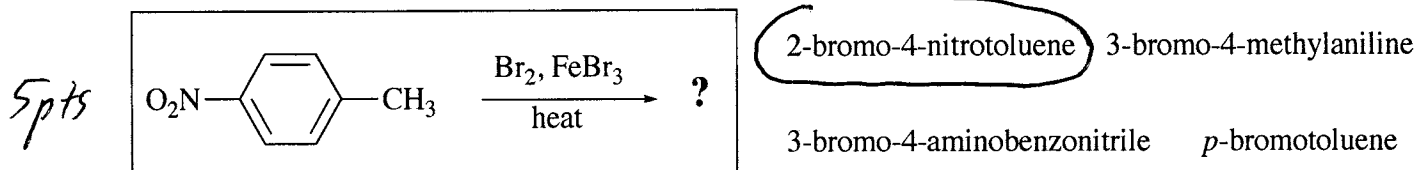
(b) (3 pts) Circle the structure of the *most important resonance contributor* of the intermediate in the following reaction:



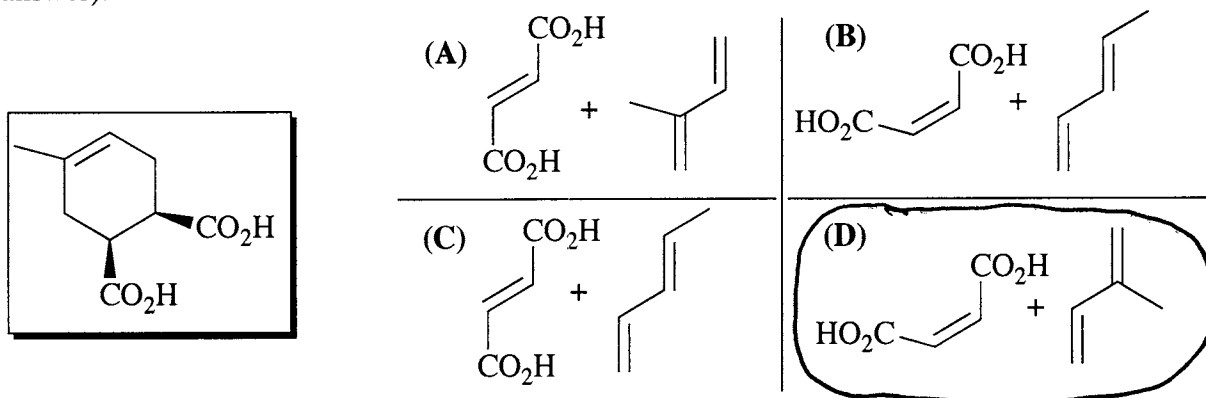
(c) (9 pts) Place the **reagents on the arrow** that are required to perform the following synthesis:



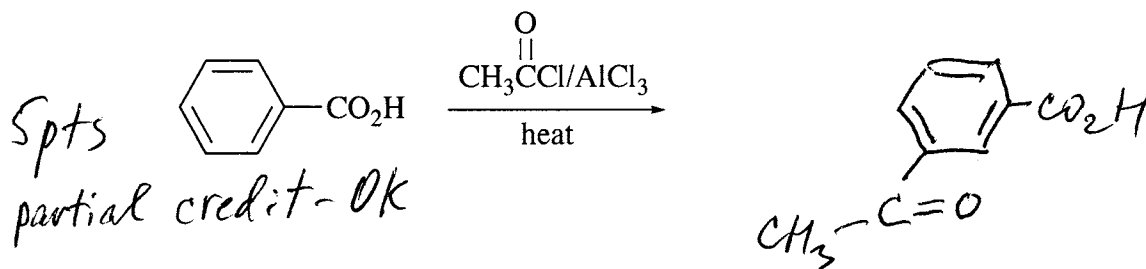
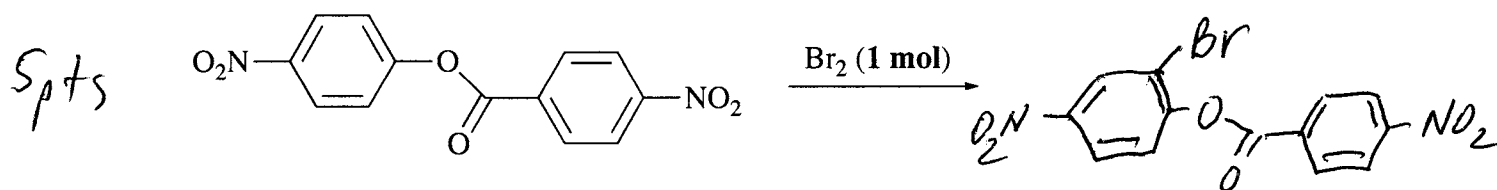
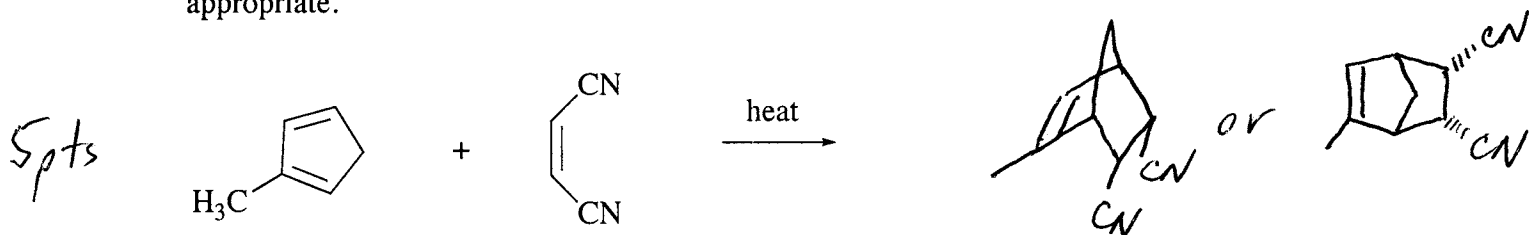
3. (30 pts) (a) (10 pts) Circle the structure of the **major product** in each of the following reactions:



(b) (5 pts) What pair of reactants is required to synthesize the compound in the box (circle the answer):

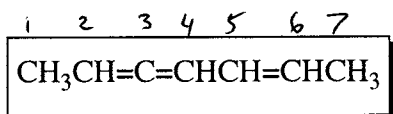


(c) (15 pts) Complete the following equations, showing the **stereochemistry** of the product(s) when appropriate.



4. (10 pts) Answer the following questions on the IUPAC nomenclature:

(a) Circle the correct IUPAC name of the compounds in the boxes (2 pts each):



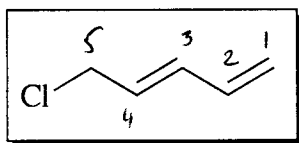
2,3,5-heptatriene

2,4,5-heptatriene

2,5-heptadiene

2,3,5-hexatriene

2,4,5-hexatriene



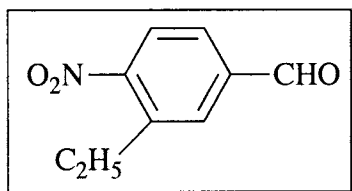
(2Z)-1-chloro-2,4-pentadiene

(2E)-1-chloro-2,4-pentadiene

(3Z)-5-chloro-1,3-pentadiene

(3E)-5-chloro-1,3-pentadiene

(1E,3E)-5-chloro-1,3-pentadiene



3-ethyl-4-nitrophenol

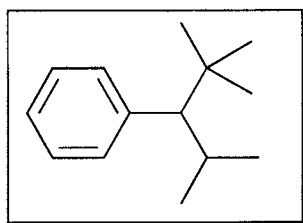
3-ethyl-4-nitroaniline

3-ethyl-4-nitrobenzaldehyde

5-ethyl-4-nitrobenzaldehyde

3-ethyl-4-nitrobenzoic acid

2-ethyl-1-nitro-4-benzaldehyde



tert-butylbenzene

isooctylbenzene

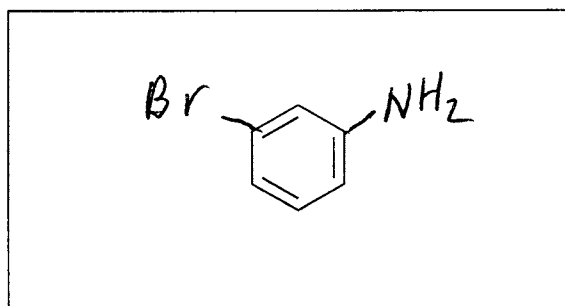
isopropylbenzene

2,2,4-trimethyl-3-phenylpentane

2,4,4-trimethyl-3-phenylpentane

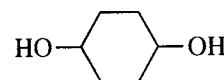
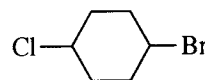
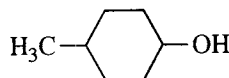
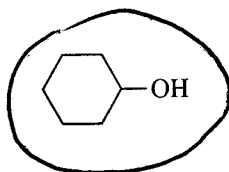
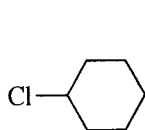
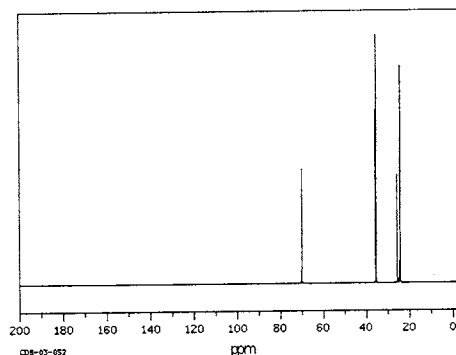
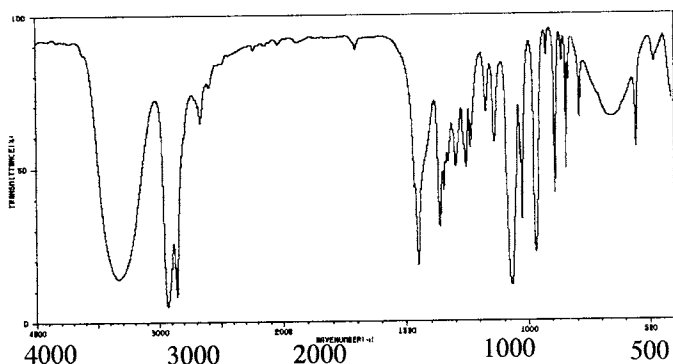
tert-butyl(isopropyl)benzene

(b) Finish drawing of *m*-bromoaniline in the provided box (2 pts):

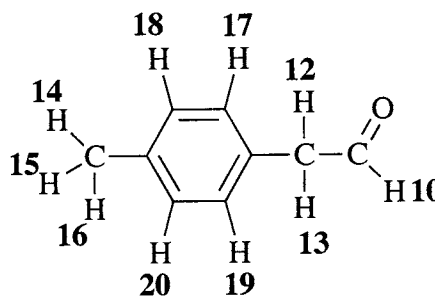


5. (15 pts) Answer the following spectroscopy questions:

(a) (5 pts) Circle the structure of the compound which gives these infrared and ^{13}C NMR spectra:

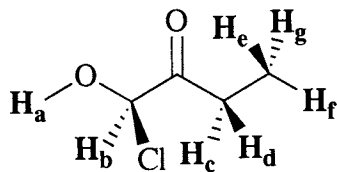


(b) (5 pts) Into how many peaks would you expect the ^1H NMR signals of the indicated protons to be split (put number of peaks in each box; 1 pt each)?



H10	3
H12	2
H17	2
H18	2
H14	1

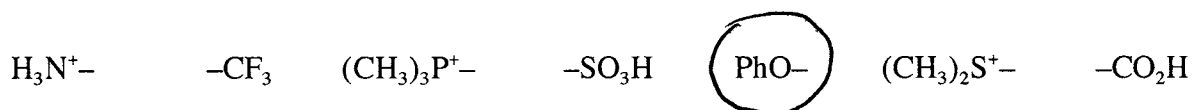
(c) (5 pts) Identify the indicated protons (H_a - H_g) in the following molecule as **unrelated**, **homotopic**, **enantiotopic**, or **diastereotopic** (write one word in each box; 1 pt each)



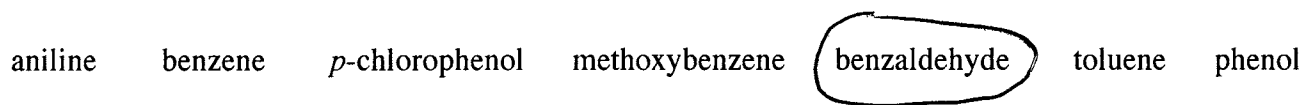
H_a and H_b	unrelated
H_b and H_c	unrelated
H_c and H_d	diastereotopic
H_e and H_g	homotopic
H_g and H_f	homotopic

6. (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 groups will be *o,p*-directing in aromatic electrophilic substitution:



(b) Which one of the following compounds is the **least reactive** in the aromatic electrophilic substitution reaction?



(c) Which one of the following molecules is *not aromatic*?

