

**Chemistry 2542**  
**Summer 2011; Final Exam**

This exam has 7 problems on 9 pages. Make sure your copy is complete and correct.

Printed Name (Last, First) Key

**Scores:**

Problem 1: 25

Problem 2: 25

Problem 3: 25

Problem 4: 35

Problem 5: 35

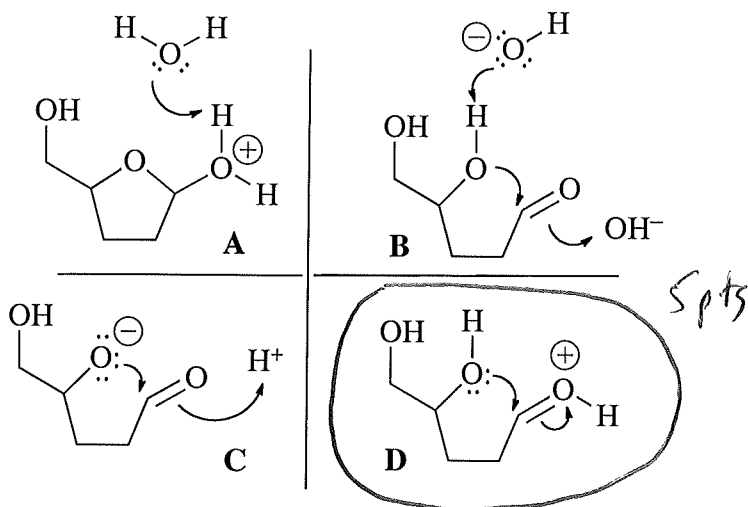
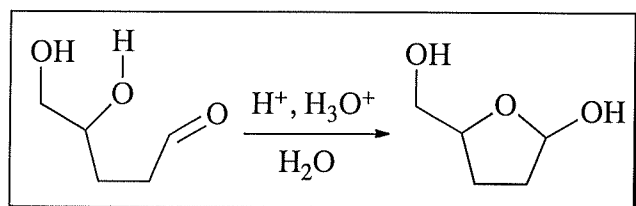
Problem 6: 30

Problem 7: 10

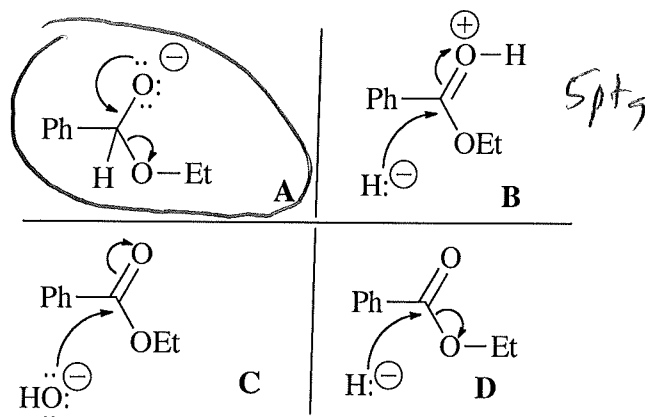
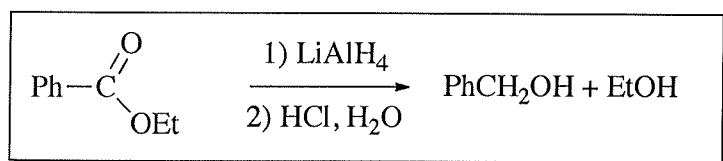
Problem 8: 15

Total: 200

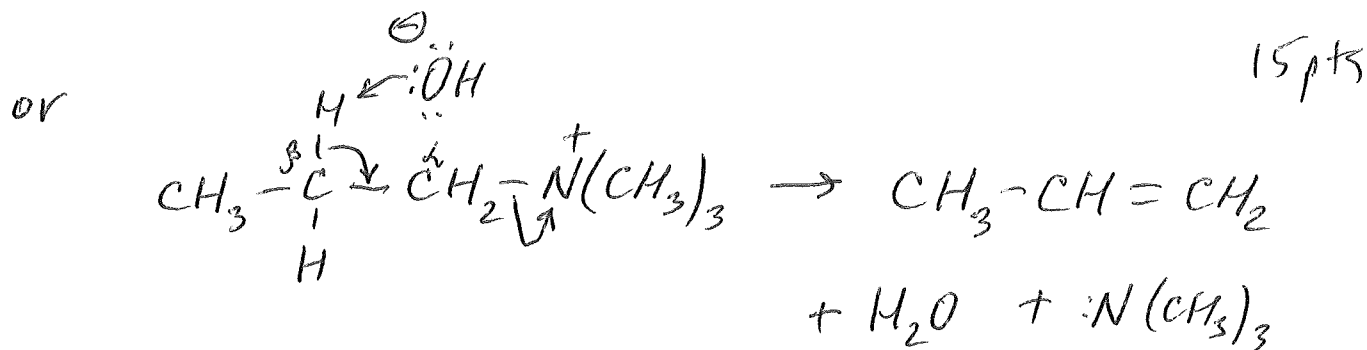
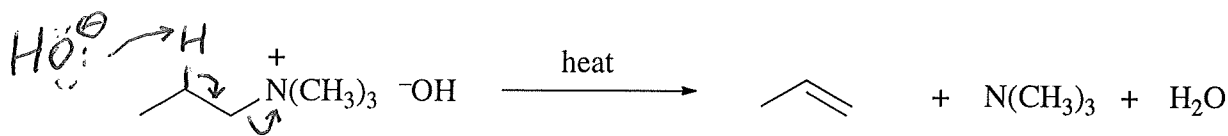
1. 25 pts (a) (5 pts) Which one of the following four schemes (A-D) gives the best representation of the *initial step* of the mechanism of the reaction in the box (circle the correct answer)



(b) (5 pts) Which one of the following four schemes (A-D) represents an important step in the mechanism of the reaction in the box (circle the correct answer)



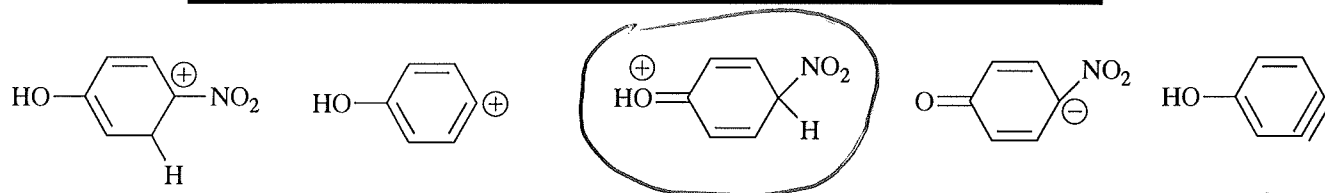
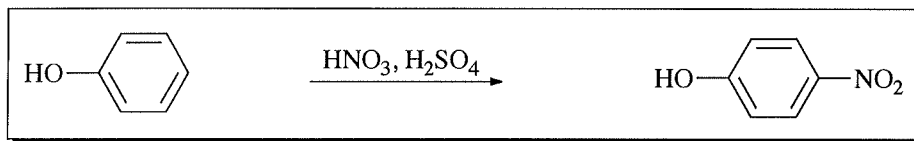
(c) (15 pts) Using **curved arrows** and showing the structure of the **intermediates**, write the **mechanism** that accounts for the product in the following reaction:



15 pts  
25 pts

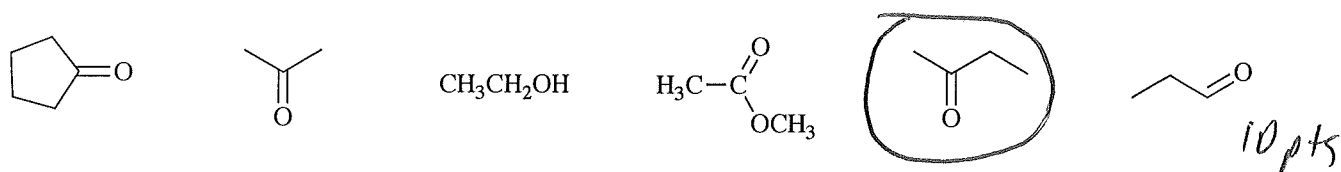
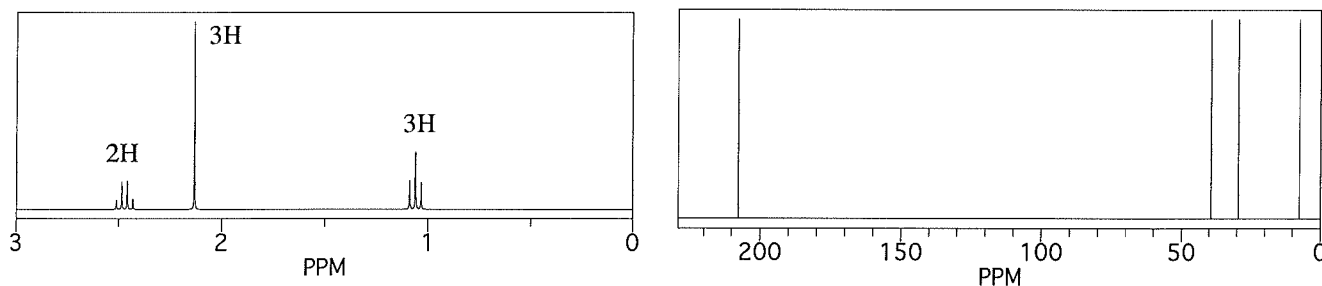
2. (25 pts) Answer the following questions:

(a) (5 pts) Circle the structure of the **intermediate** product for the reaction in the box:



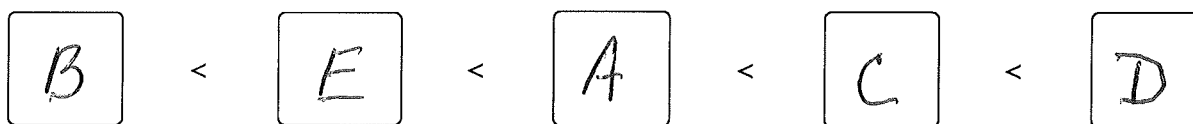
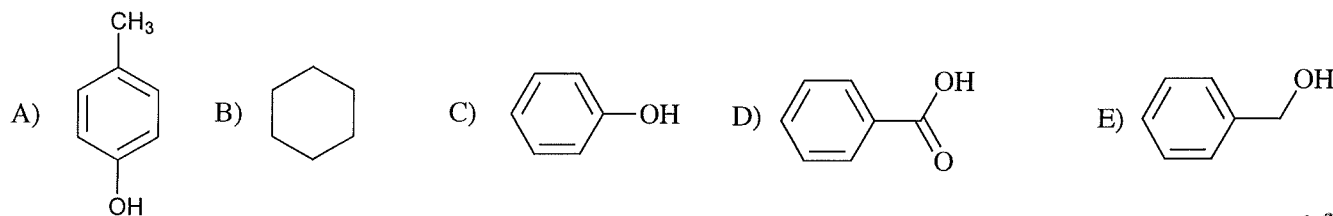
5 pts

(b) (10 pts) Circle the structure of the compound that gives these  $^1\text{H}$  and  $^{13}\text{C}$  NMR spectra:



10 pts

(c) (10 pts) Rank the following substances in order of increasing acidity. Put A, B, C, D, or E into the boxes (2 pts each).



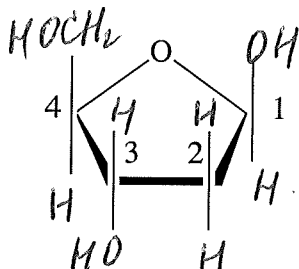
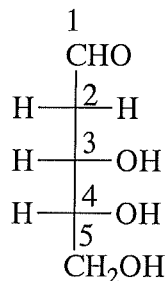
least acidic

most acidic

10 pts

25 pts

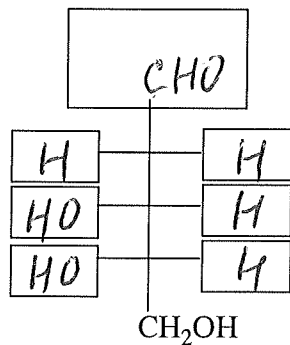
3. (25 pts) (a) Finish drawing of the Haworth projection formula of 2-Deoxy-D-ribose in the form of  $\beta$ -D-furanose ( $\beta$ -2-Deoxy-D-ribofuranose). [make sure to place **all** missing -H and -OH groups at the end of each bond!] (8 pts; 2 pts each carbon atom)



8 pts

 $\beta$ -2-Deoxy-D-ribose $\beta$ -2-Deoxy-D-ribofuranose

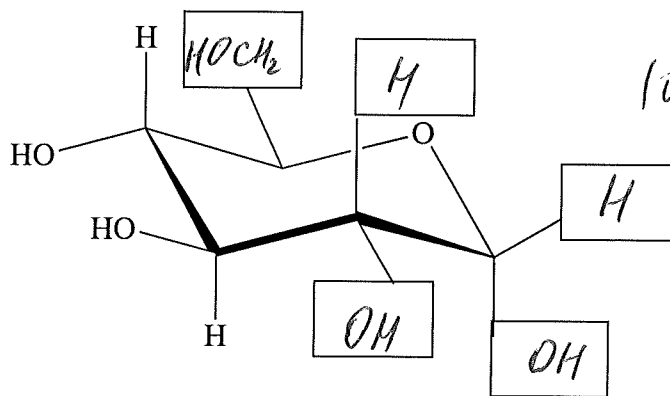
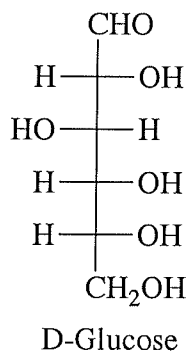
(b) Finish drawing of Fischer projection of 2-Deoxy-L-ribose (7 pts; 1 pt each box):



7 pts

2-Deoxy-L-ribose

(c) Finish drawing of the cyclic structure of D-glucose in the form of  $\alpha$ -D-glucopyranose. [place missing substituents in each box] (10 pts; 2 pts each)

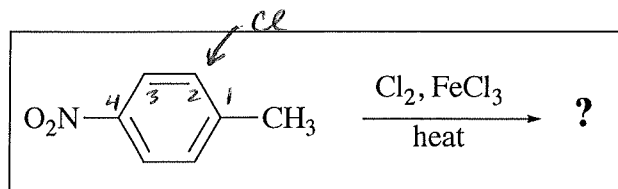


10 pts

 $\alpha$ -D-Glucopyranose

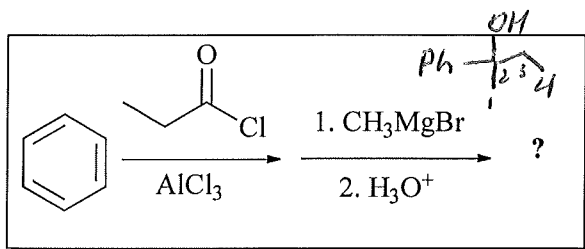
25 pts

4. (35 pts) Circle the name of the **major product** for each the following reactions (5 pts each):



3-chloro-4-methylaniline    2-chloro-4-nitrotoluene

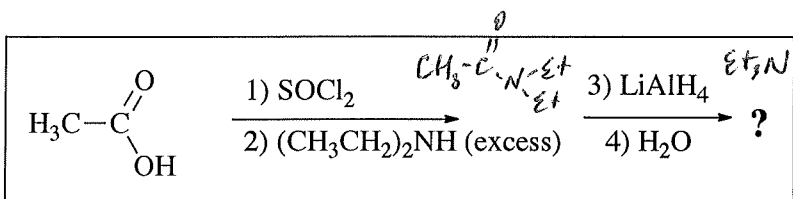
2-chloro-4-nitrophenol    *p*-chlorotoluene



1-phenyl-2-butanol    3-chloro-2-isopropylphenol

2-phenyl-2-butanol    propylbenzene

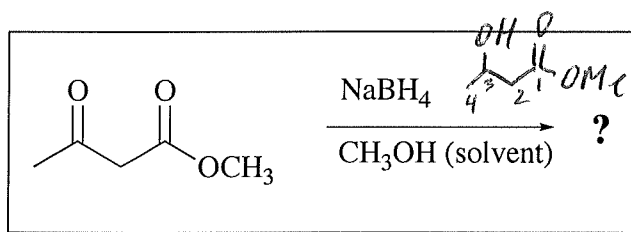
1-phenyl-1-propanone    1-phenyl-1-propanol



*N,N*-diethylacetamide    diethylamine

*N*-ethylpropylamine    triethylamine

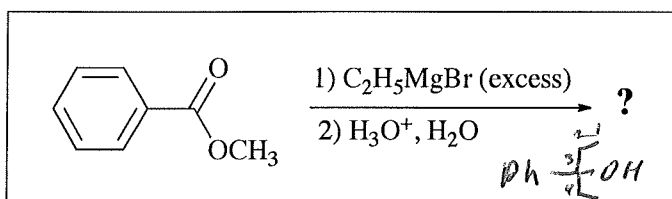
ethylamine



1,3-butandiol    methyl butanoate

1-methoxy-1,3-butandiol    3-methoxybutanoic acid

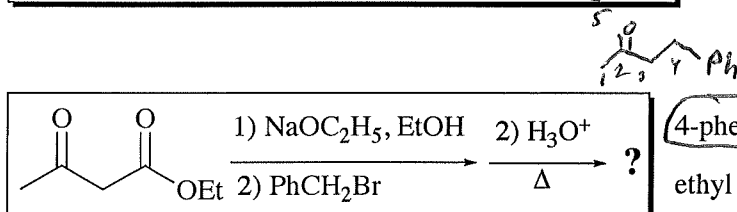
methyl 3-hydroxybutanoate



1,1-diethylbenzyl ether    phenyl ethyl ketone

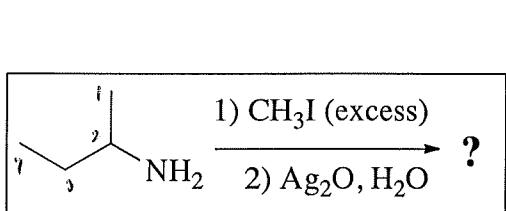
1-ethyl-1-phenylethanol    1-benzyl-1-ethanol

3-phenyl-3-pentanol



4-phenyl-2-butanone    2-phenylacetoacetic acid

ethyl acetoacetate    1-phenyl-2-propanone    acetone

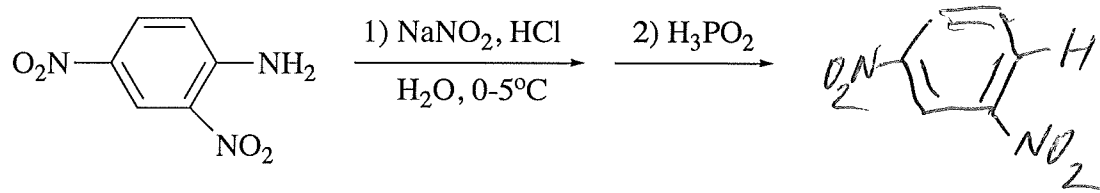
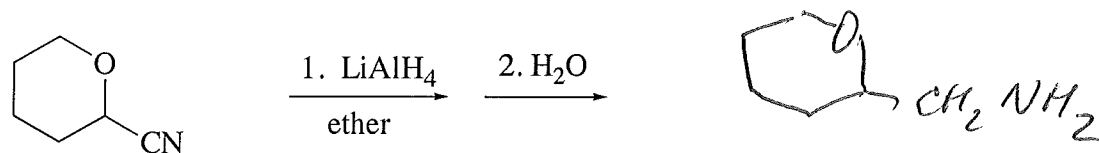
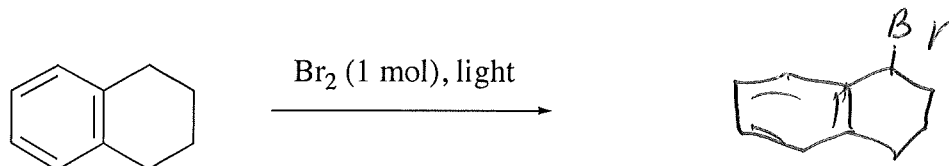
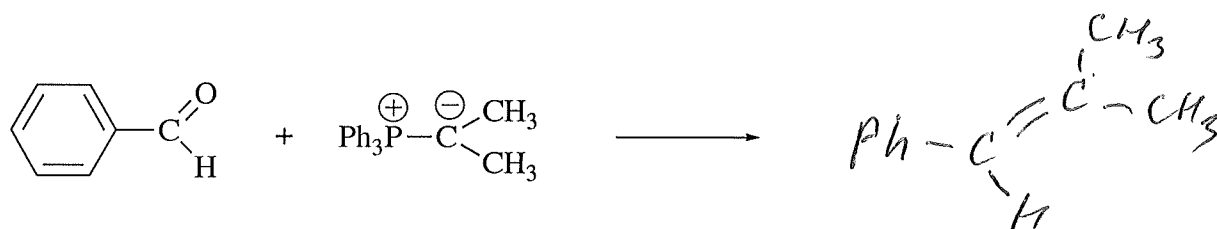
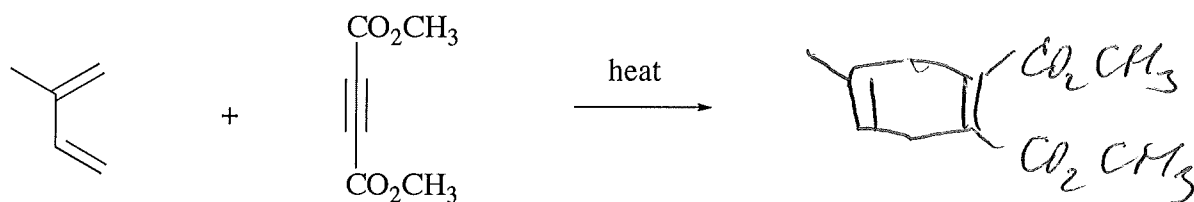
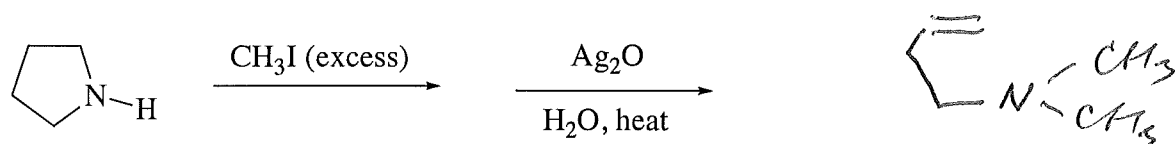
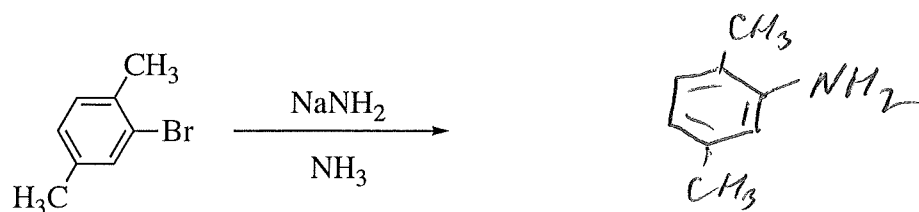


2-butene    2-butanol    2-(*N,N*-dimethyl)butylamine

1-butene    2-butanone    2-(*tert*-butoxy)butane

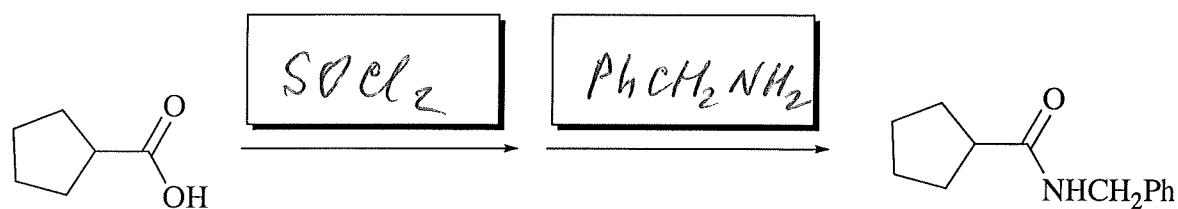
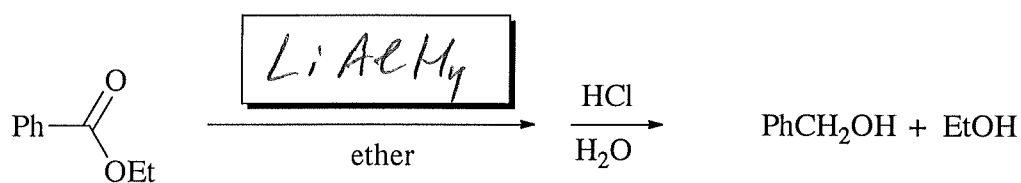
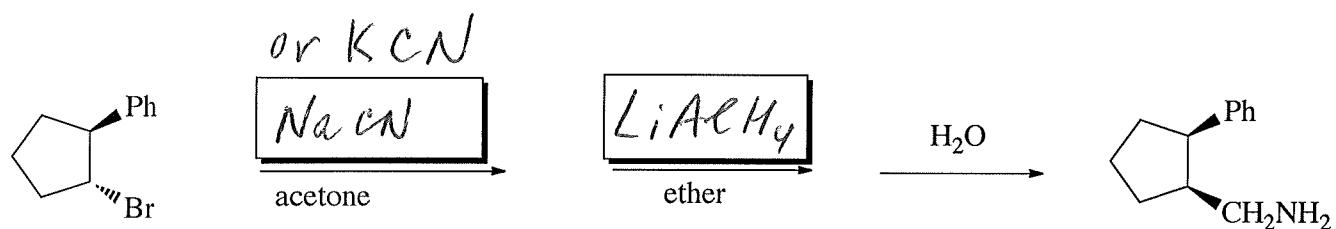
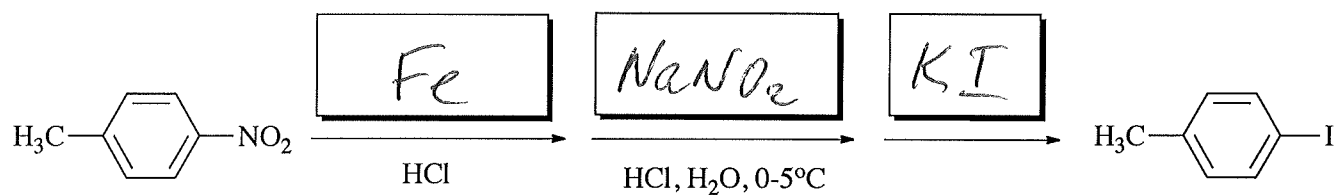
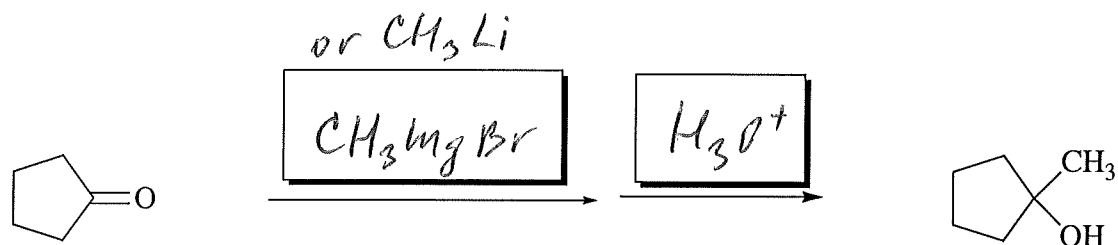
39 pts

5. (35 pts) Draw the structure of the main product for each the following reactions (5 pts each):



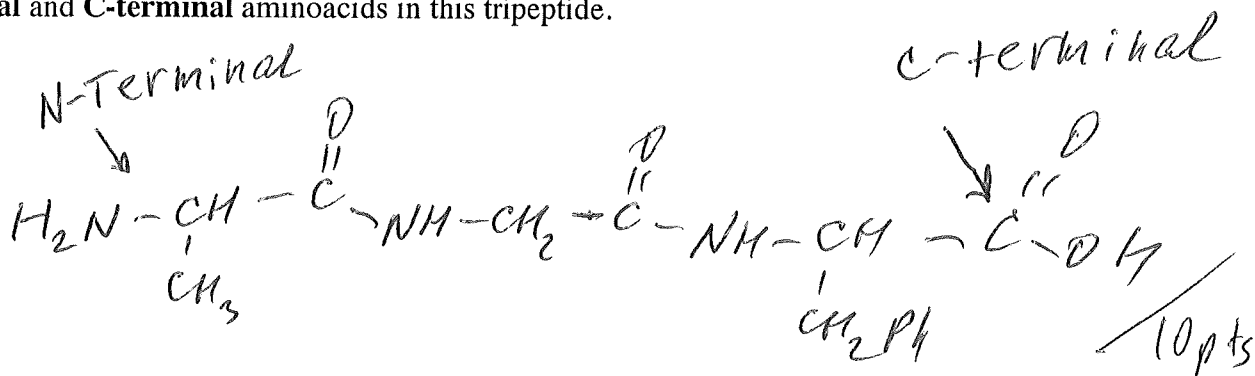
35 pts

6. (30 pts) Place in each box the molecule of a reagent that is required to perform each of the following reactions (3 pts each box):



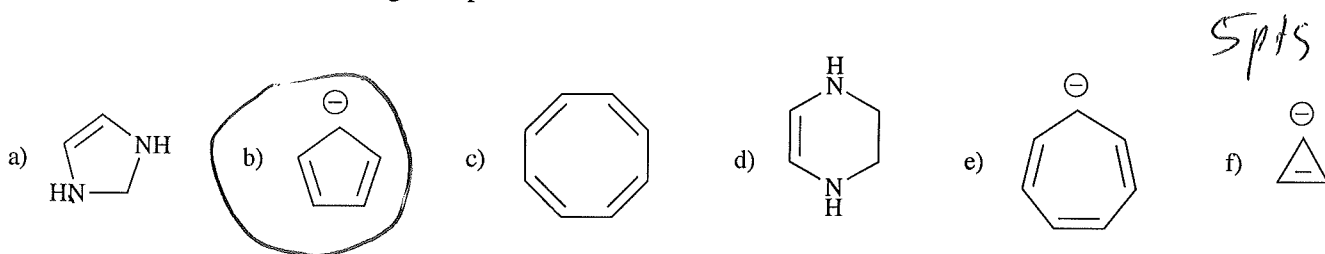
30pts

7. (10 pts) Draw the structure of the **tripeptide** Ala-Gly-Phe which is formed from the aminoacids alanine  $\text{H}_2\text{NCH}(\text{CH}_3)\text{CO}_2\text{H}$ , glycine  $\text{H}_2\text{NCH}_2\text{CO}_2\text{H}$  and phenylalanine  $\text{H}_2\text{NCH}(\text{CH}_2\text{Ph})\text{CO}_2\text{H}$ . Indicate **N-terminal** and **C-terminal** aminoacids in this tripeptide.

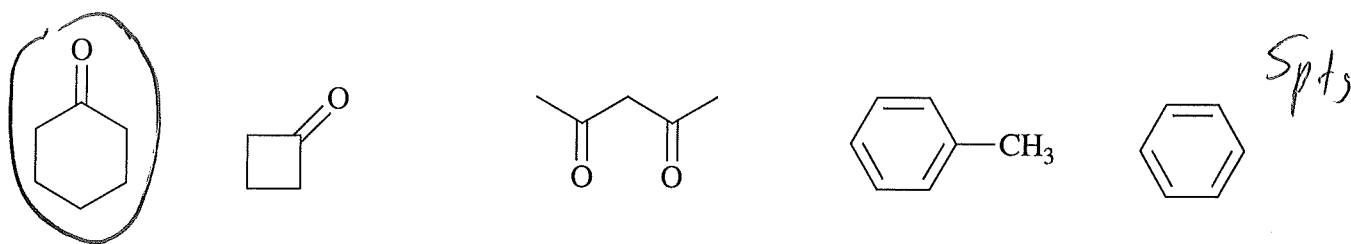


8. (15 pts) For each of the following questions **circle** the item that is the correct answer (5 pts each):

(a) Which one of the following compounds is aromatic?



(b) Which of the following compounds will have the *characteristic IR* peak at about  $1700\text{ cm}^{-1}$  and four signals in the  $^{13}\text{C}$  NMR spectrum?



(e) How many **stereoisomers** (including enantiomers) has a molecule of *aldopentose* in the *furanose* form?  $2^4 = 16$

one two three four five six seven eight nine ten **sixteen** thirty two sixty four

