

Name Key

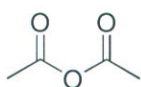
Exam 2
Chemistry 52
July 25, 2013

Do not open or begin this exam until instructed. This exam consists of 8 pages plus the cover page and 1 scrap page. Before starting the exam, check to make sure that you have all of the pages. The exam has a total of 120 points and includes 13 questions. Only legible answers written on the exam will be considered for grading. All pertinent information needed for the exam is given. Notes, textbooks, and electronic communication devices are not permitted. This exam is administered under the Dartmouth College Honor Principle. You have 2 hours to complete the exam.

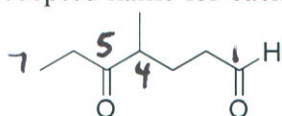
Use your time wisely.

Page Number	Value	Points Awarded
1	16	
2	17	
3	22	
4	12	
5	20	
6	13	
7	10	
8	10	
Total	120	

1. (6 points, 3 each) Provide an IUPAC accepted name for each of the following compounds.



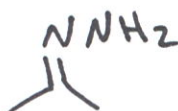
acetic anhydride



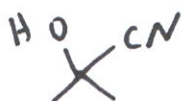
4-methyl-5-oxoheptanal

2. (6 points, 2 each) Provide a representative compound for each of the following functional groups.

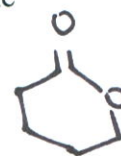
hydrazone



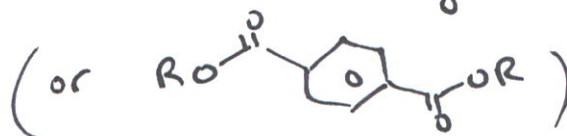
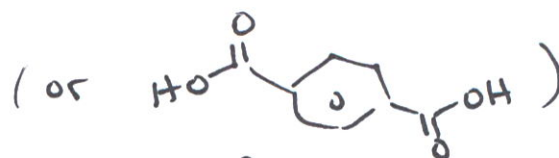
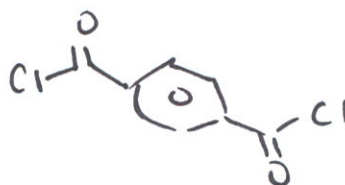
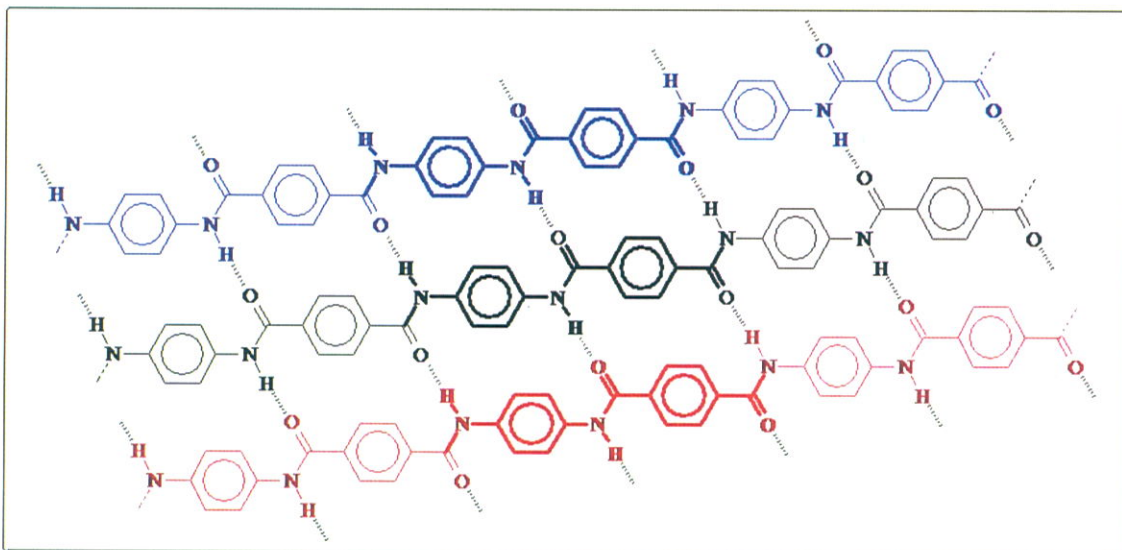
cyanohydrin



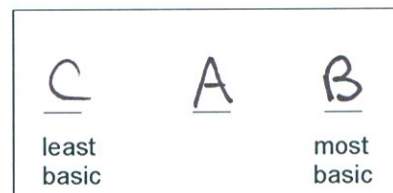
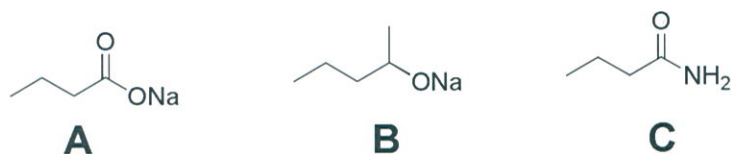
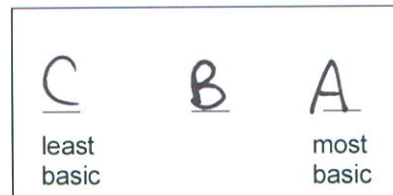
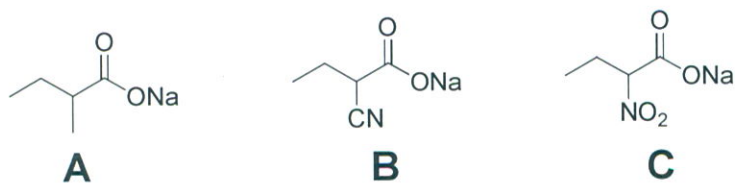
lactone



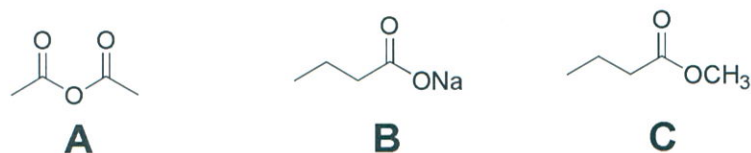
3. (4 points) Aramids are aromatic polyamides. As a class, they can be spun into heat-resistant, strong fibers. Kevlar is an aramid used in body armor fabric. Flame-resistant clothing can also be made from aramids. Below is an image that emphasizes the hydrogen-bonding between the polymer chains of an aramid. What monomers could be used to prepare this polymer?
(Image from <https://sites.google.com/site/aromaticpolyamides/>.)



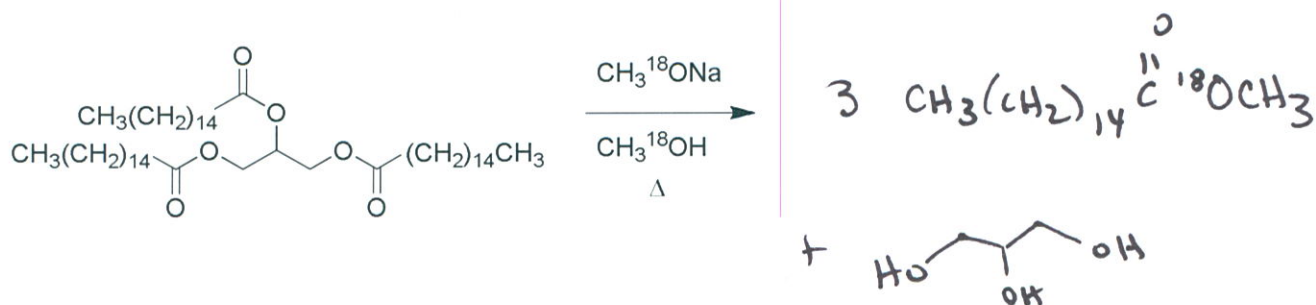
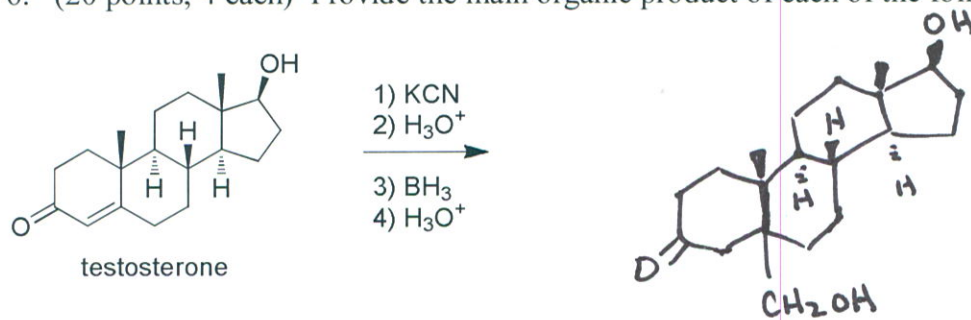
4. (6 points, 3 each) For each set of compounds, rank from least basic to most basic. Place your final answer in the box.

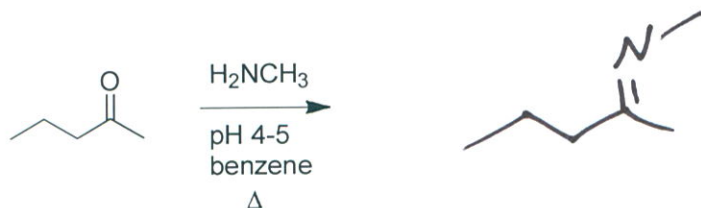
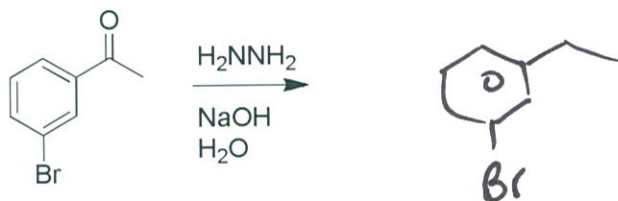
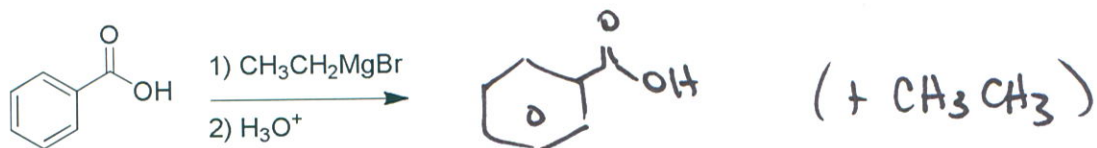


5. (3 points) List the following compound in order of increasing reactivity toward nucleophilic acyl substitution. Place your final answer in the box.

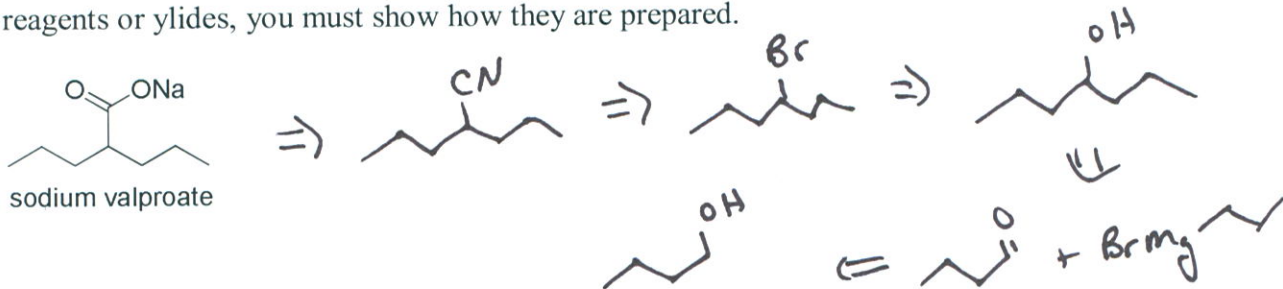


6. (20 points, 4 each) Provide the main organic product of each of the following reactions.

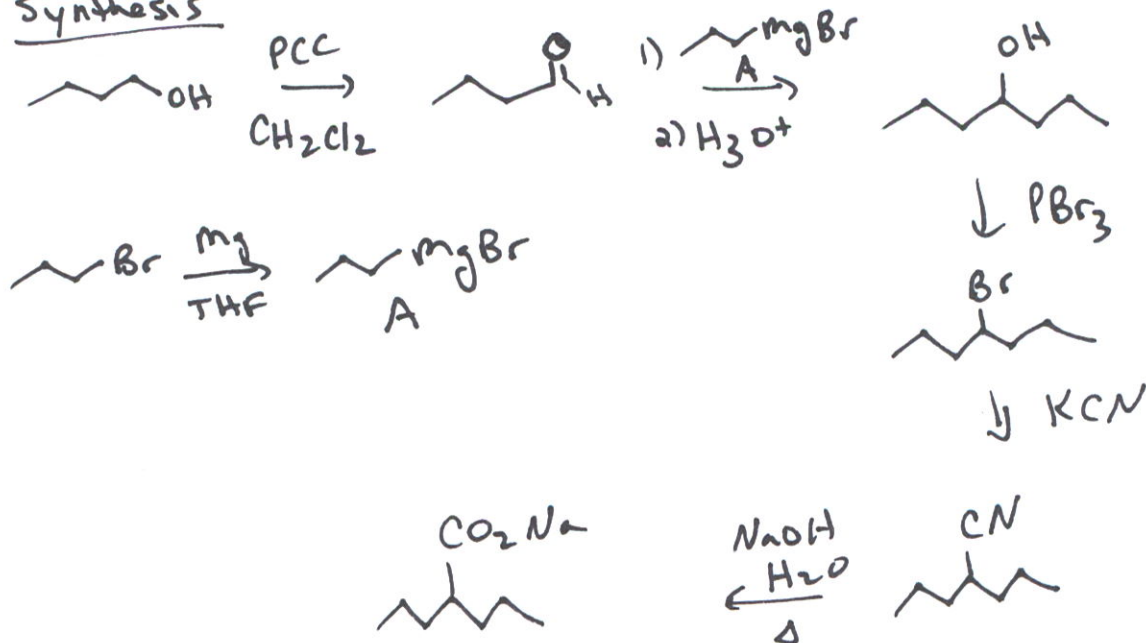




7. (10 points) Sodium valproate is used in the treatment of epilepsy. Propose a synthesis from 1-butanol and any other reagents you need. As always, if you elect to use organometallic reagents or ylides, you must show how they are prepared.

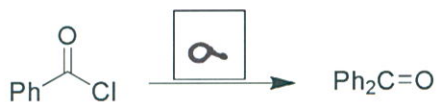
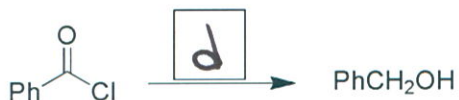
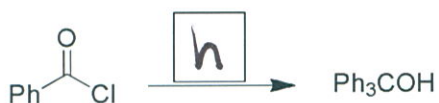


Synthesis

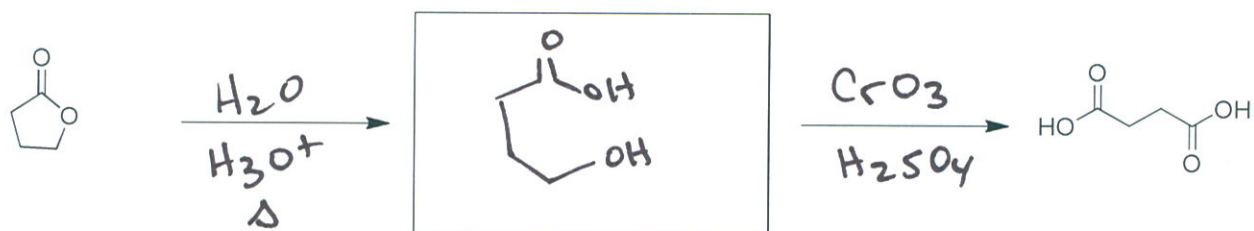
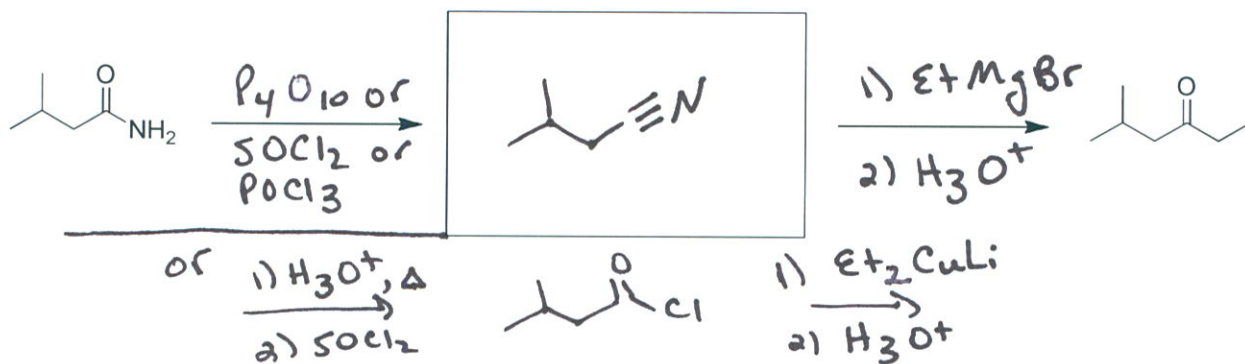
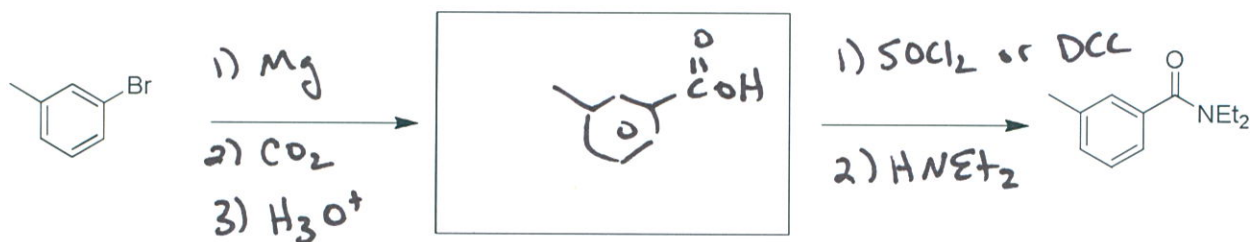
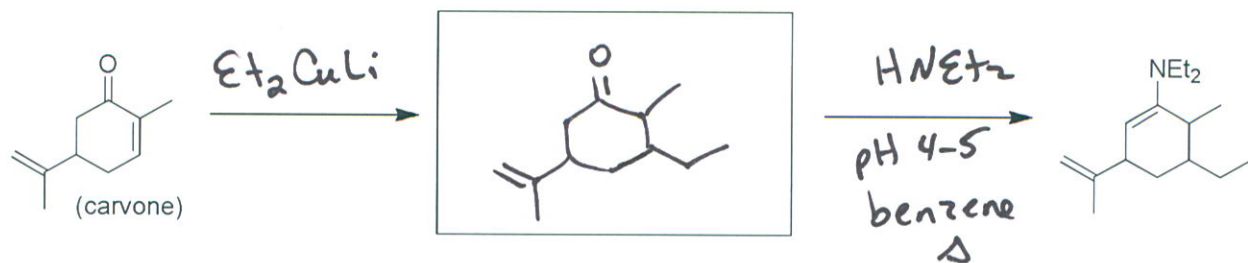


8. (12 point, 2 each) Choose the best reagent(s) from the list provided for carrying out the following transformations. Place the corresponding letter in the box over the reaction arrow.

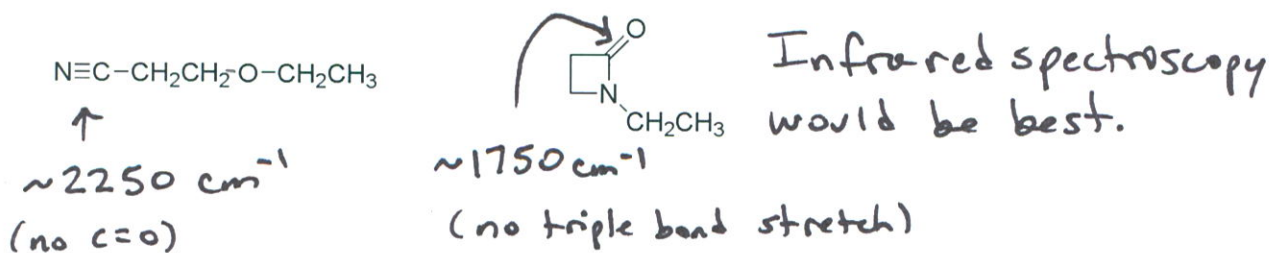
- a. $(\text{Ph})_2\text{CuLi}$, ether
- b. NaBH_4 , ethanol
- c. 1) CH_3MgBr , ether 2) H_3O^+
- d. 1) LiAlH_4 , THF 2) H_3O^+
- e. $(\text{CH}_3)_2\text{CuLi}$, ether
- f. 1) 1 eq. DIBAL, toluene, $-78\text{ }^\circ\text{C}$ 2) H_3O^+
- g. 1) Ph_2CHMgBr , ether 2) H_3O^+
- h. 1) PhMgBr , ether 2) H_3O^+



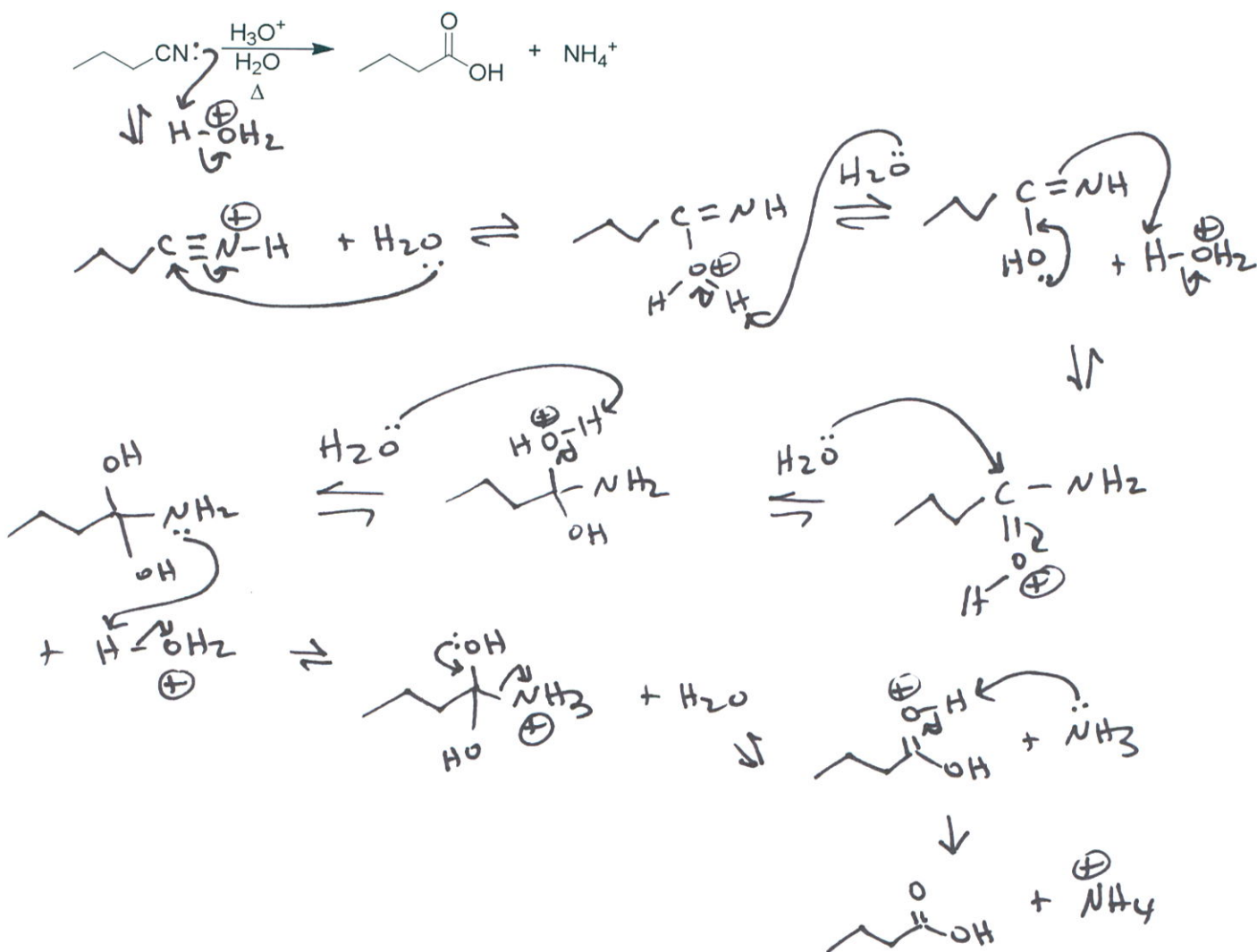
9. (20 points, 5 each) Complete the following short syntheses by providing reagents over arrows and intermediate compounds in the boxes. Excluding workup steps, most can be completed in two steps.



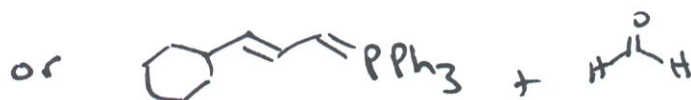
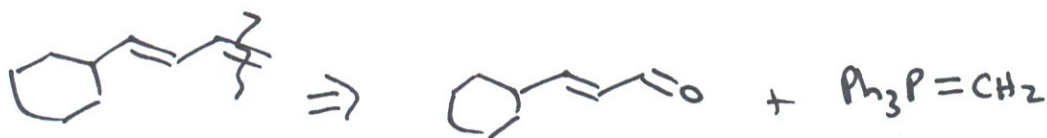
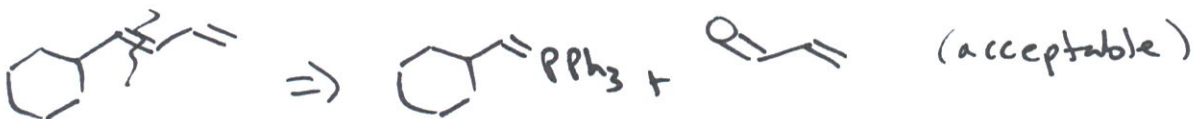
10. (3 points) Which spectroscopic technique would you use to distinguish between the following molecules? Briefly explain what differences you would expect to see.



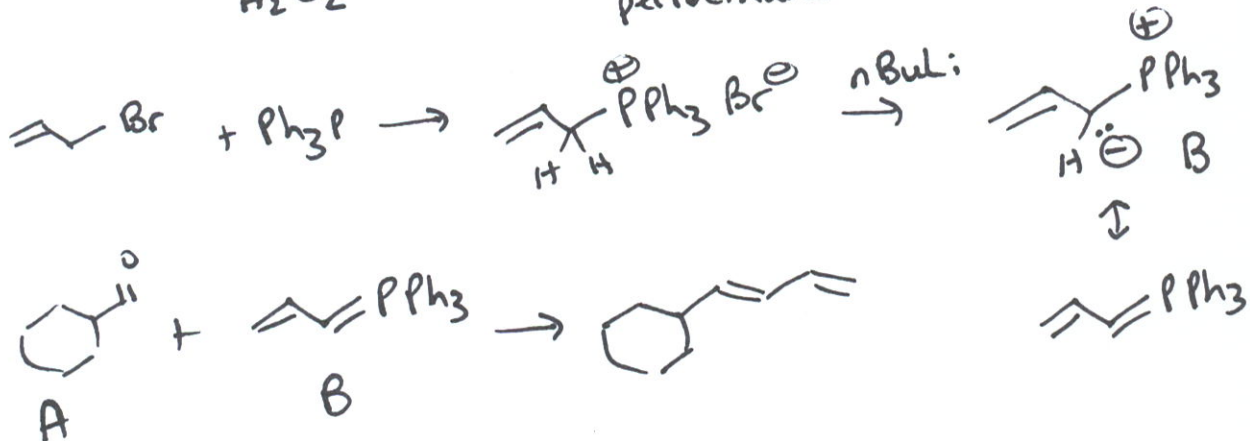
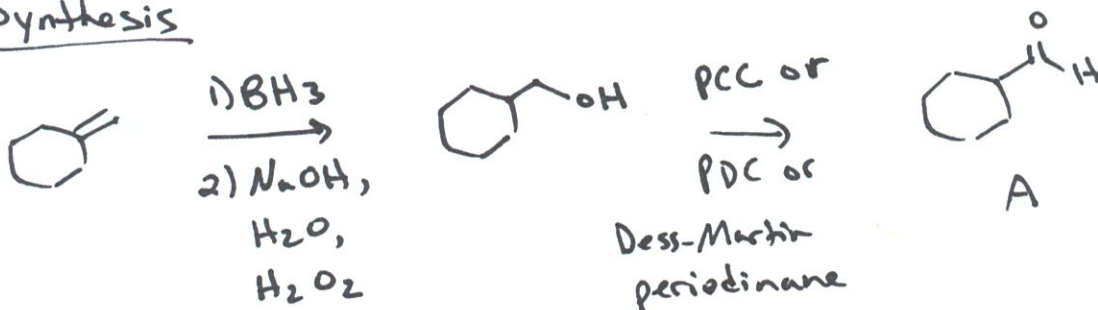
11. (10 points) Provide a complete electron pushing mechanism for the following. Be sure to include any by-products as they are formed and show arrows for every bond change. Do not combine steps!



12. (10 points) Provide the necessary sequence of reagents to achieve the following transformation. You may use any additional reagents you need. As always, if you elect to use organometallic reagents or ylides, you must show how they are prepared. You may find a Wittig reaction to be a useful step in this conversion. Show the intermediate compounds in your synthesis if you wish to receive partial credit.



Synthesis



13. (10 points) Provide a complete electron pushing mechanism for the following reaction using only the reagents provided. Be sure to include any by-products as they are formed and show arrows for every bond change. Do not combine steps!

