Name_____

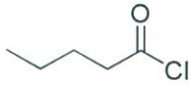
Exam 2
Chemistry 52
July 26, 2012

Do not open or begin this exam until instructed. This exam consists of 7 pages plus the cover page and a periodic table. Before starting the exam, check to make sure that you have all of the pages. The exam has a total of 133 points and includes 9 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.

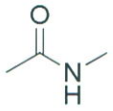
Use your time wisely.

Page Number	Value	Points Awarded
1	18	
2	36	
3	14	
4	25	
5	8	
6	20	
7	12	
Total	133	

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

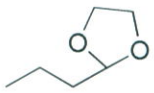


pentanoyl chloride



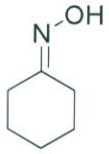
N-methylacetamide
or N-methylethanamide

2. (8 points, 2 each) Match the given structures to the appropriate functional group name by writing the matching letter in the box under the structure.

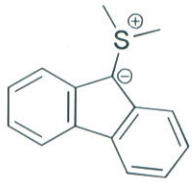


A

I



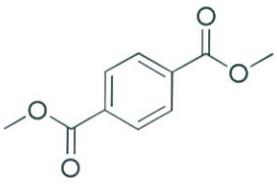
M



O

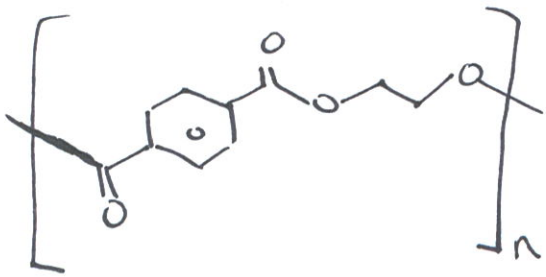
A. Acetal
B. Amide
C. Amine
D. Cyanohydrin
E. Enamine
F. Hemiacetal
G. Hydrazone
H. Imide
I. Imine
J. Lactam
K. Lactone
L. Nitrile
M. Oxime
N. Thioester
O. Ylide

3. (4 points) Dimethyl terephthalate and ethylene glycol polymerize under acid conditions to form the polymer Dacron™, also known as polyethylene terephthalate (PET.) Draw the repeating unit of the polymer.

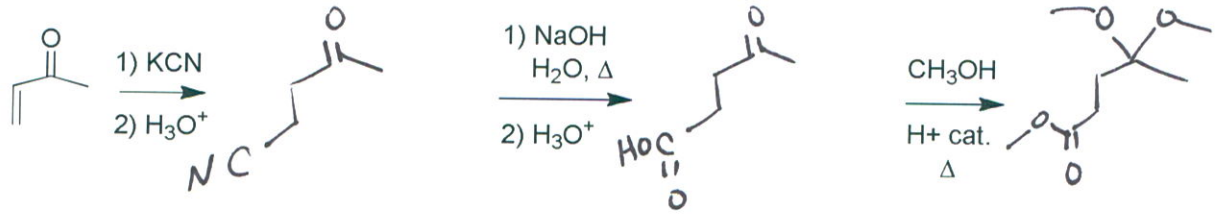


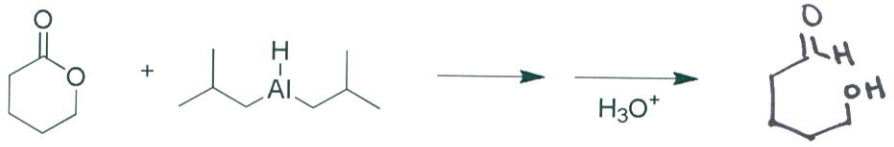
dimethyl terephthalate

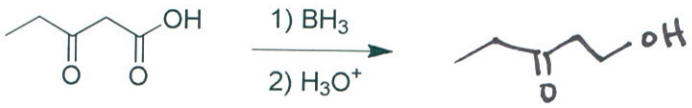
ethylene glycol

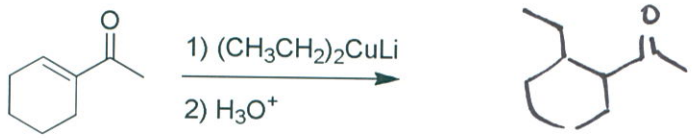


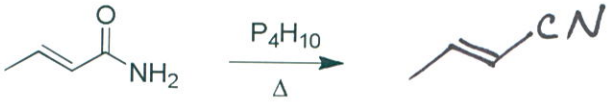
4. (40 points, 4 each) Provide the organic products of the following reactions.

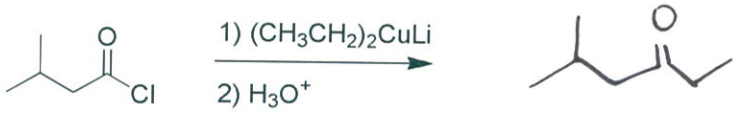


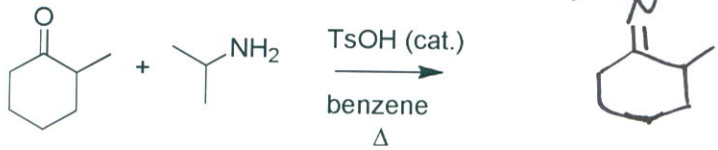


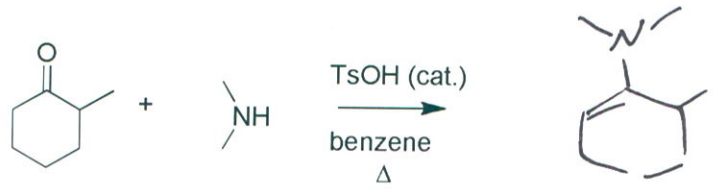




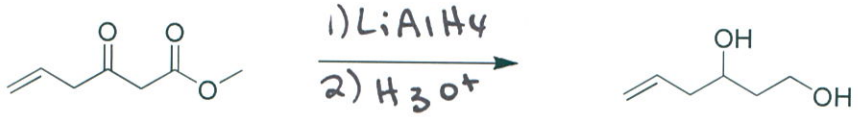


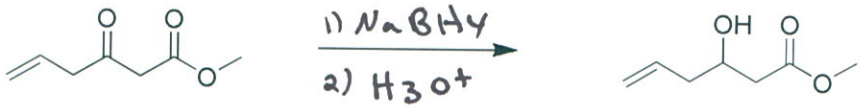


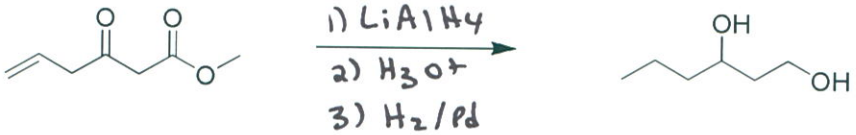


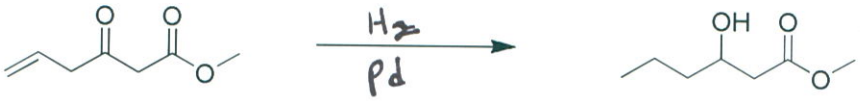


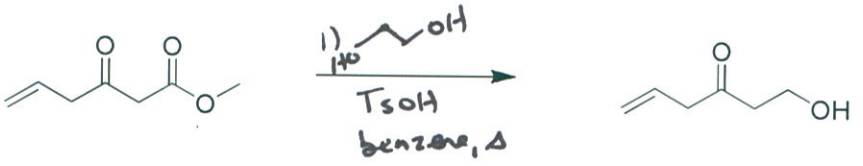
5. (10 points, 2 each) Provide the missing reagent(s) for each reaction. If more than one step is required, clearly separate the steps.



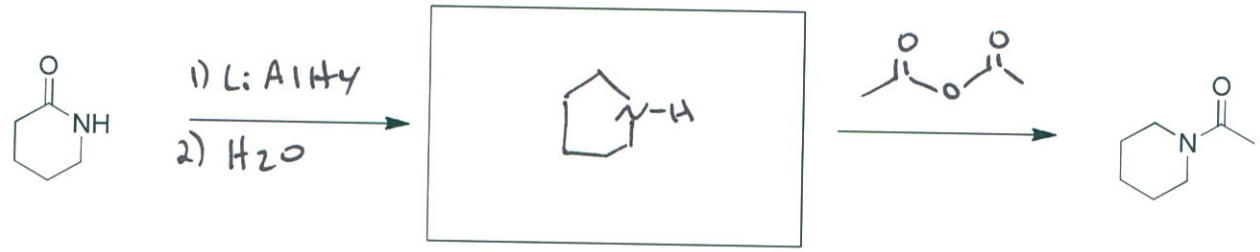


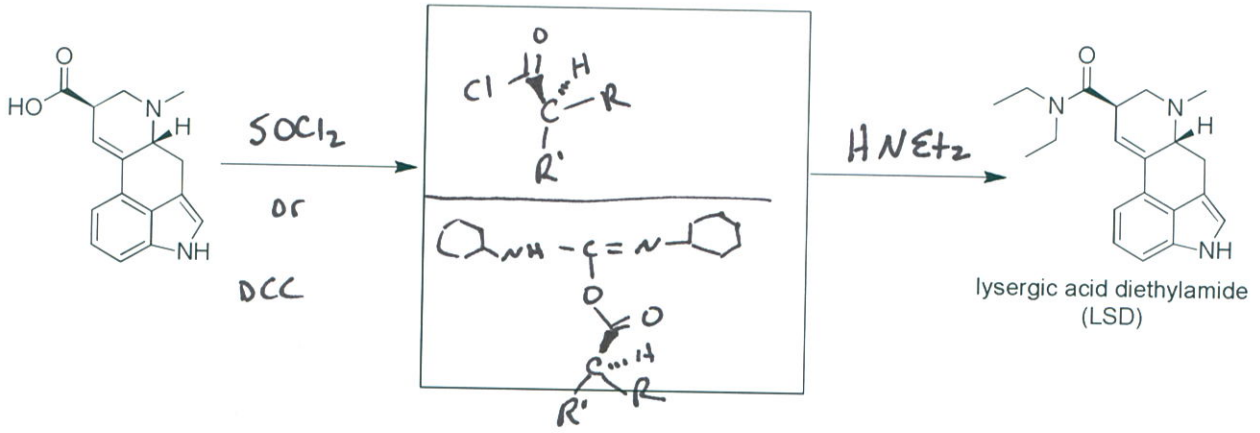


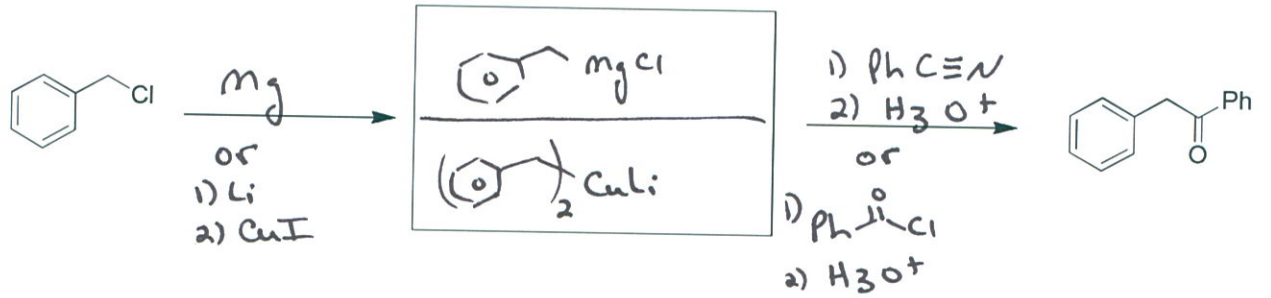


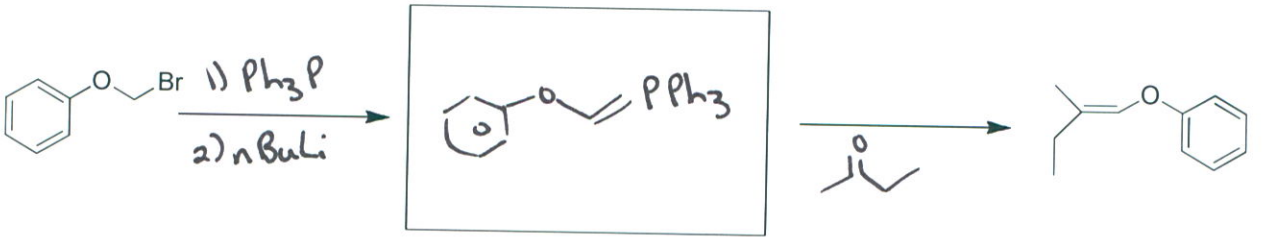


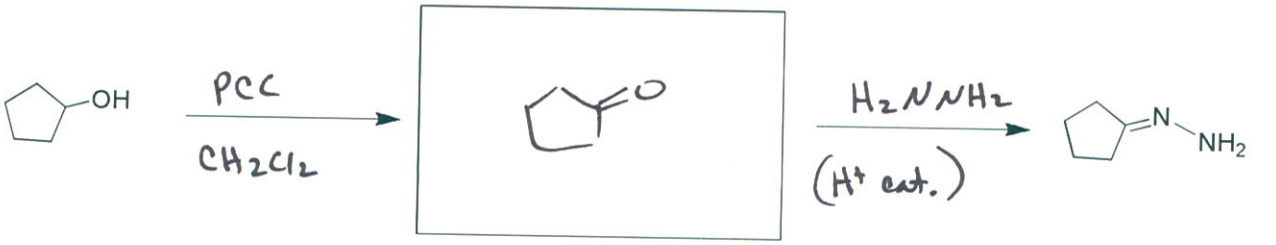
6. (25 points, 5 each) Complete the following 2-3 step syntheses by providing reagents over arrows and intermediate compounds in the boxes.



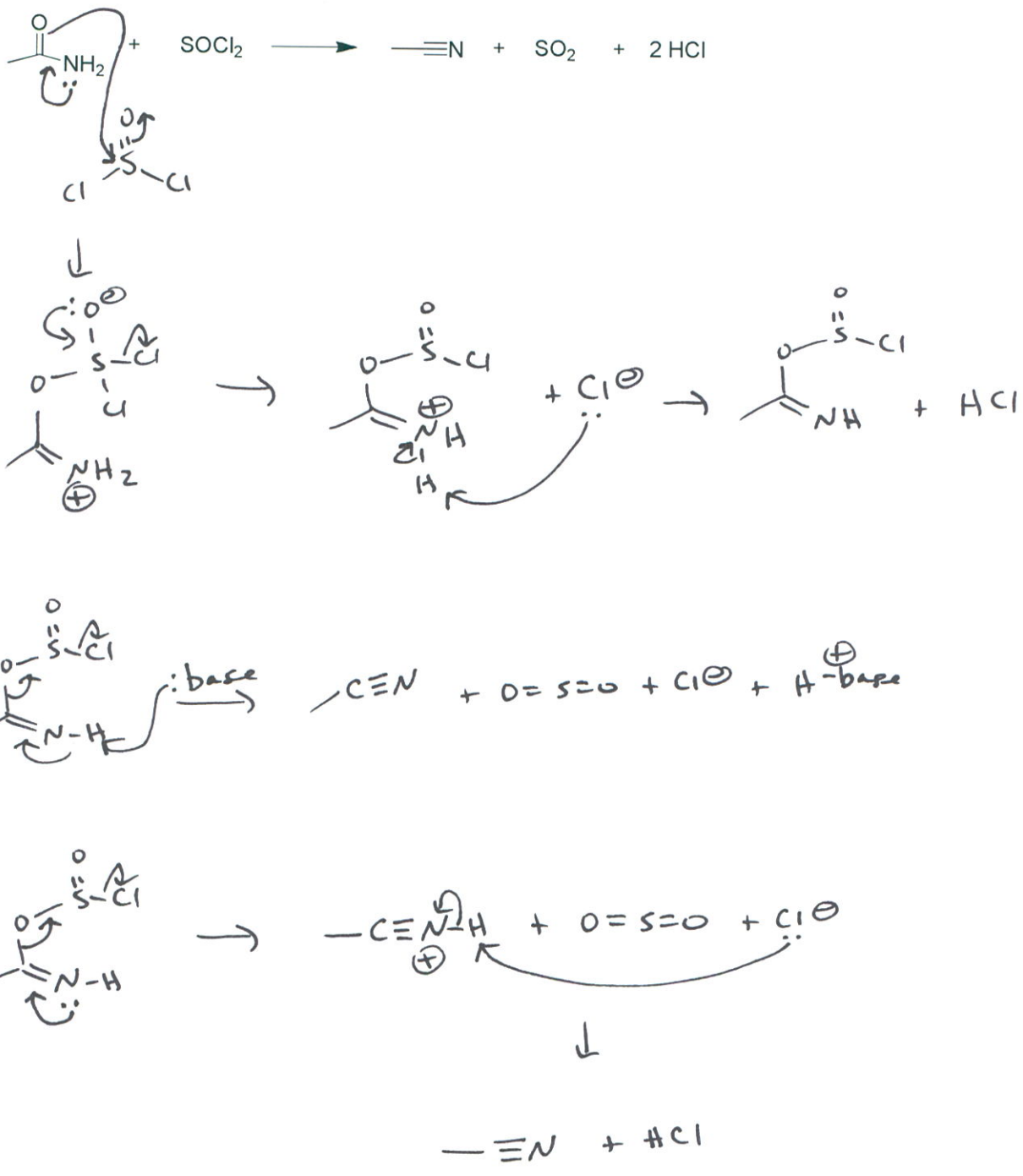




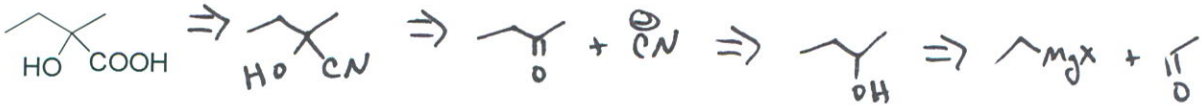




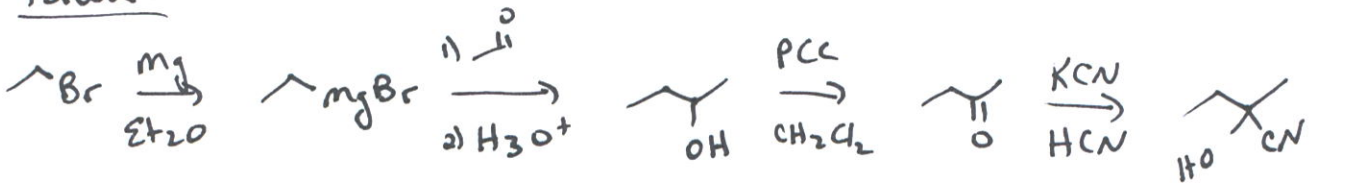
7. (8 points) Amides can be dehydrated by thionyl chloride. Provide a complete electron pushing mechanism for the following reaction using only the reagents listed. Be sure to include any by-products as they are formed and show arrows for every bond change.

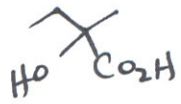


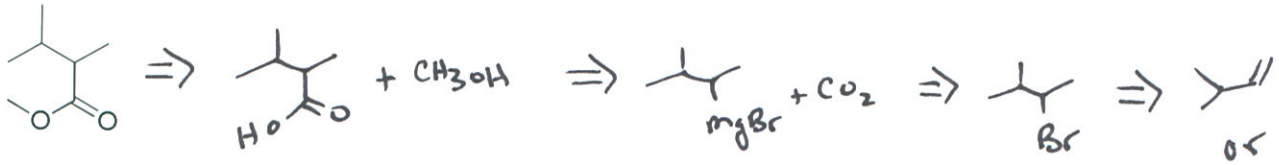
8. (20 points, 10 each) Provide a synthesis for the following target compounds. You may use any organic compounds with three carbons or less and any inorganic reagents you need. You must synthesize any organometallic reagents or ylides that you wish to use. (I consider triphenylphosphine to be an inorganic reagent and therefore acceptable as a starting material.)



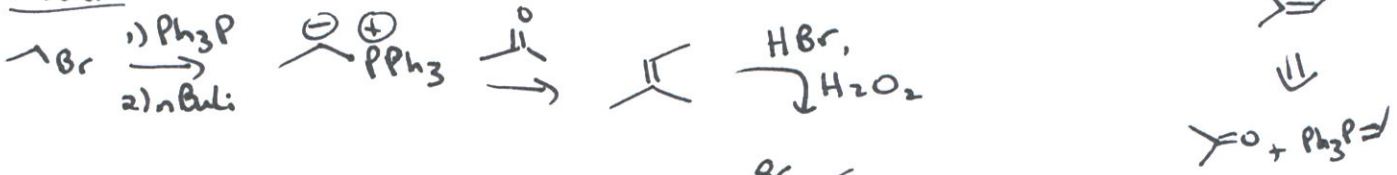
forward

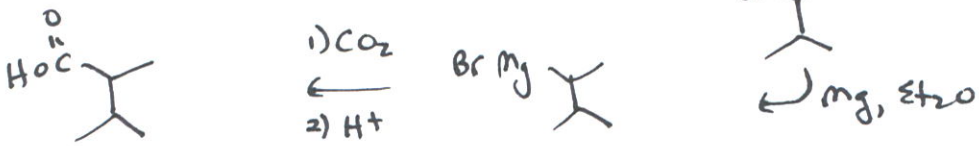


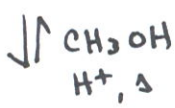


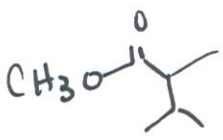


forward









Other perfectly acceptable methods exist.

9. (12 points) Provide a complete electron pushing mechanism for the following reaction using only the reagents listed. Be sure to include any by-products as they are formed and show arrows for <u>every</u> bond change. Do not combine steps!!