**CHEM 330**

**Exam 1**
October 12, 2011

**ANSWERS**

**Your name:** _____

**This document consists of 6 pages**

This a closed-notes, closed-book exam

The use of molecular models is allowed

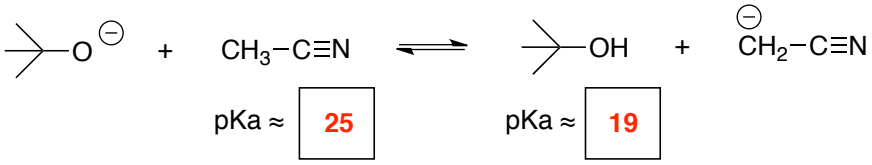
Time: 1.5 h

1. _____ / 10
2. _____ / 15
3. _____ / 15
4. _____ / 20
5. _____ / 20
6. _____ / 20

**TOTAL** _____ /100

This exam counts for 25% of your CHEM 330 final grade

1. (10 pts.) Consider the following acid-base equilibrium:



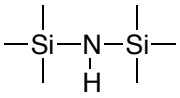

a. write the approximate pKa's of the two conjugate acids in the appropriate boxes;

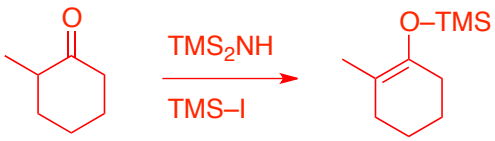
b. estimate the approximate equilibrium constant, $K_{eq}$, for the process: Keq ≈ $10^{-6}$

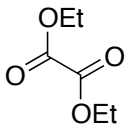
c. specify whether ΔG for the reaction will be positive or negative: __POSITIVE____

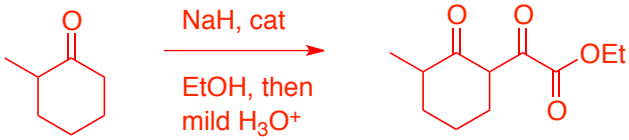
2. (15 pts) Write a chemical equation to illustrate an application of each of the following reagents (**do not** write mechanisms – just the chemical equation).

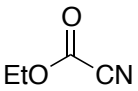
**e.g., with 2-methylcyclohexanone as the substrate**

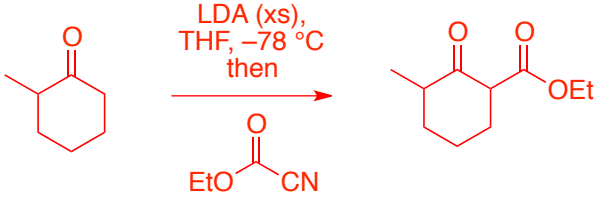
a. 




b. 

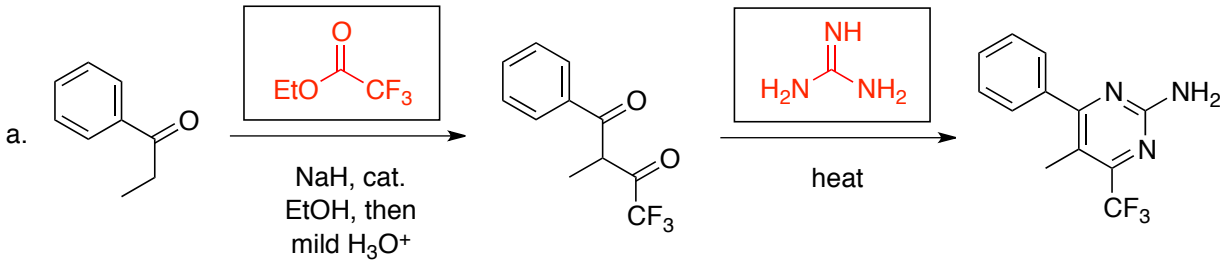



c. 

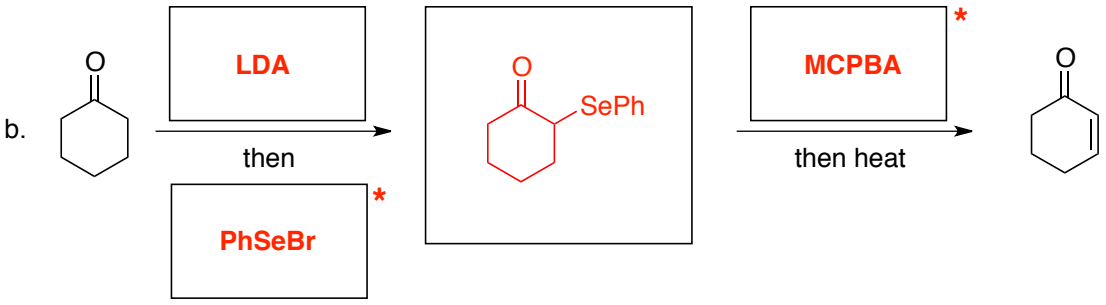


3. (15 pts.) Complete the following reaction schemes by writing the structure of all the missing reagents / products in the appropriate boxes.

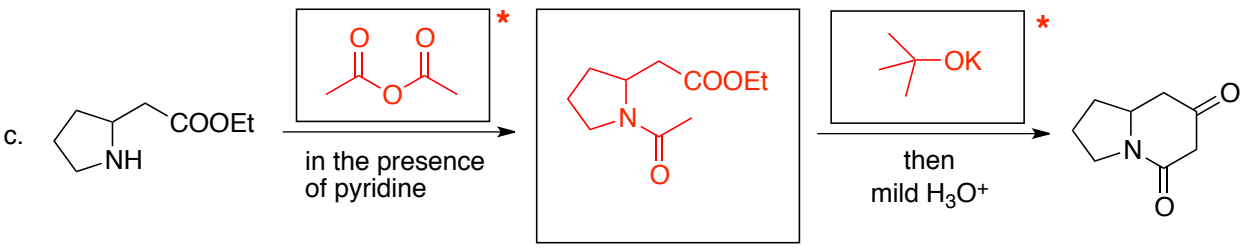
a.




b.



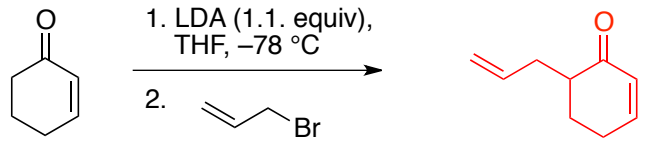

c.



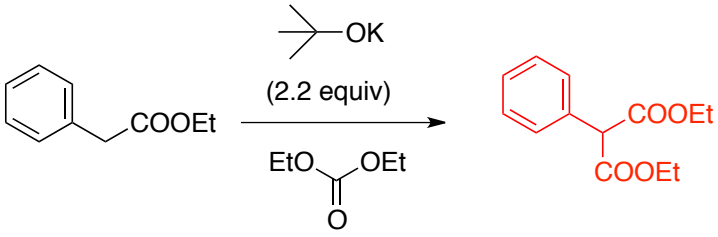

*** Alternative reagents may be acceptable**

4. (20 pts.) Predict the structure of the major product expected from each of the reactions shown below. **Important**: final aqueous workups after each reaction are understood.

a.




b.

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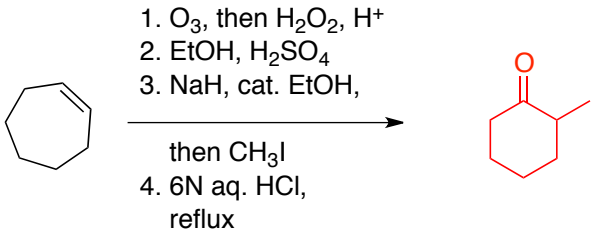
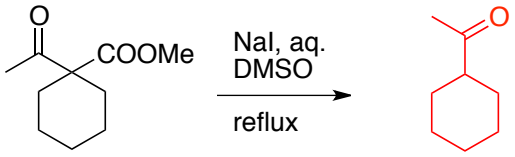
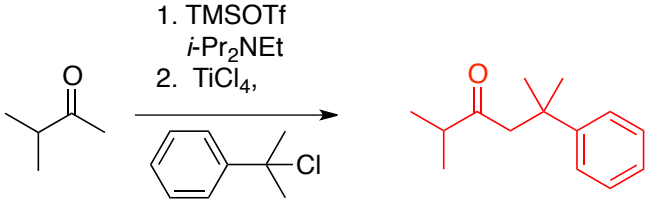



d.

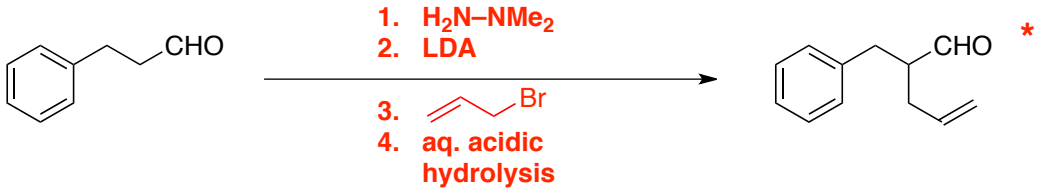



e.

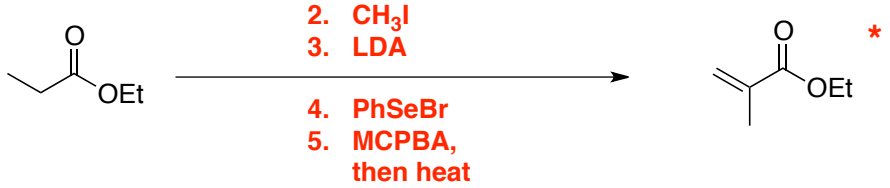


5. (20 pts.) Propose a method to accomplish the transformations shown below. Show all required reagents, in the correct order, as a numbered list above / below the reaction arrow. **Aqueous workups after each step are understood and there is no need to specify them.**

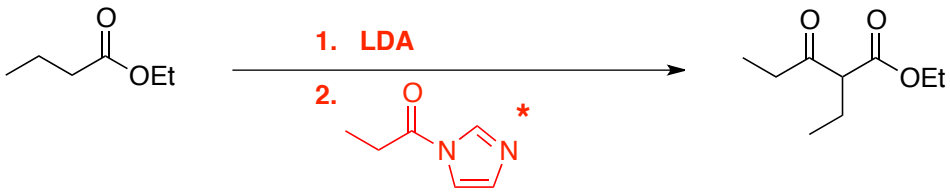
a.



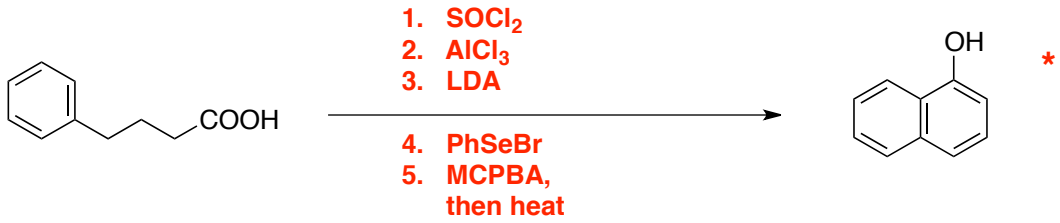

b.




c.



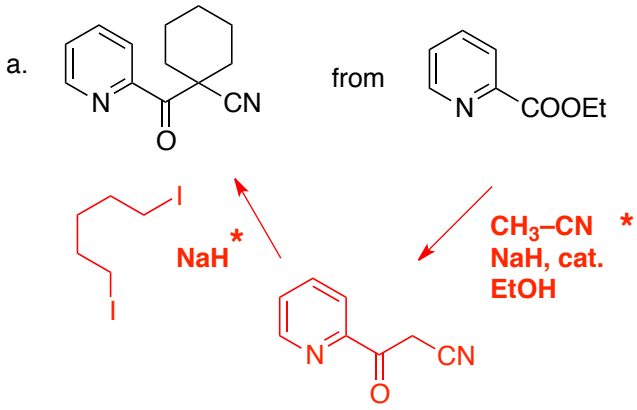

d.



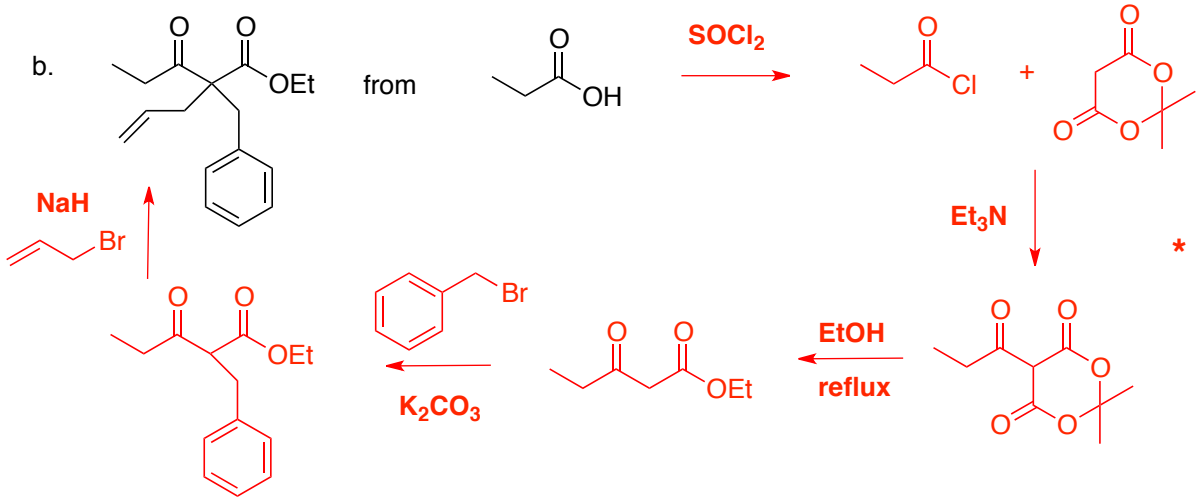

*** Slightly different methods / reagents may be OK**

6. (20 pts.) Propose a method to synthesize the substances shown below from the indicated materials. Assume the availability of all reagents needed to convert the starting compound into the product (e.g, bases, alkyl halides, etc.). Present your answer as a flowchart. **It is not necessary to draw mechanisms**. **Also, aqueous workups after each step are understood.**

a.




b.




*** Alternative reagents / procedures may be OK**