Hour Exam #3
Chemistry 345
Professor Gellman
29 April 2009

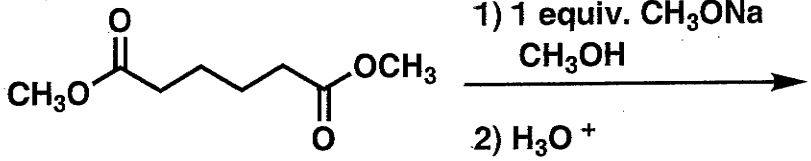
Last Name Answer Key

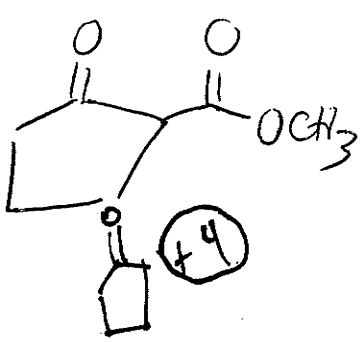
First Name

General Instructions:
(i) Use scratch paper at back of exam to work out answers; final answers must be recorded at the proper place on the exam itself for credit.
(ii) Print your name on each page.

1. (18 points) Show the major product or products expected from each reaction:

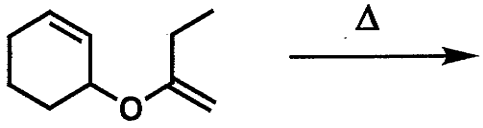
(a)

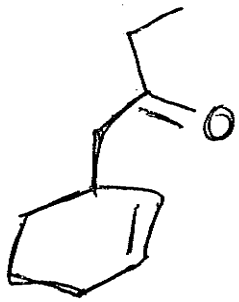




[Hint: The product has strong IR signals at 1750 and 1725 cm^{-1}, but the starting material has only the signal at 1750 cm^{-1}.]

(b)

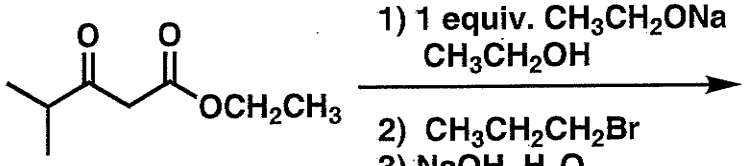


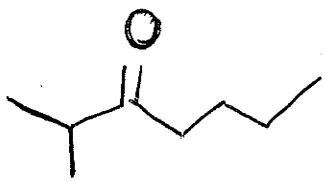


+6

[Hint: The product has a strong IR signal at 1715 cm^{-1}, but the starting material has no strong IR signal between 1700 and 1750 cm^{-1}.]

(c)





+6

-2 for extra incorrect products

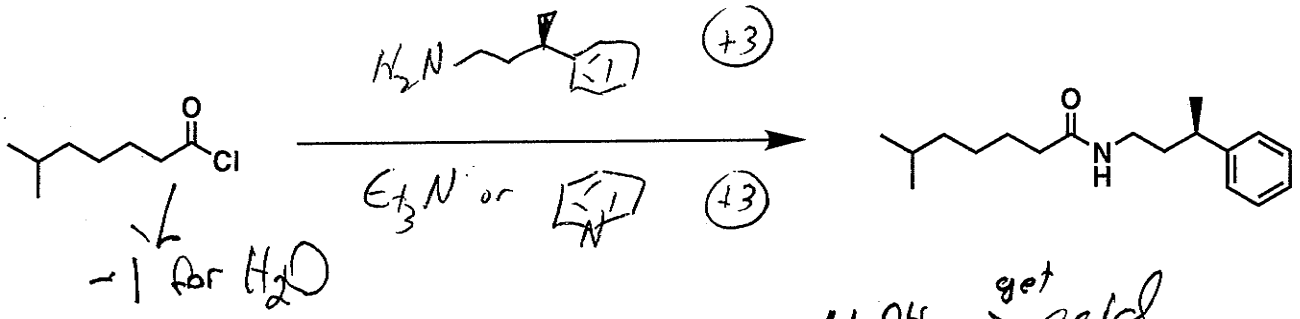
[Hint: The product has a strong IR signal at 1720 cm^{-1}; the starting material has a similar signal, along with a signal at 1745 cm^{-1}, which is lacking in the product.]

Name _____

2. (30 points) Show the reagents and other organic molecules required to convert the starting material to the indicated product. Be sure to differentiate clearly between distinct steps by using "1)", "2)", etc.

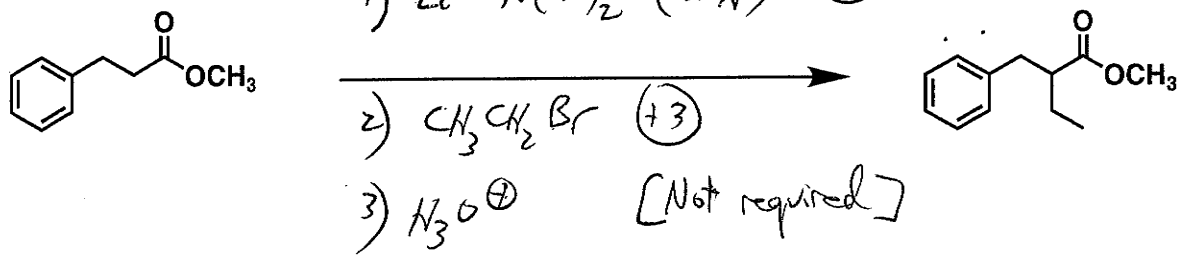
4

(a)

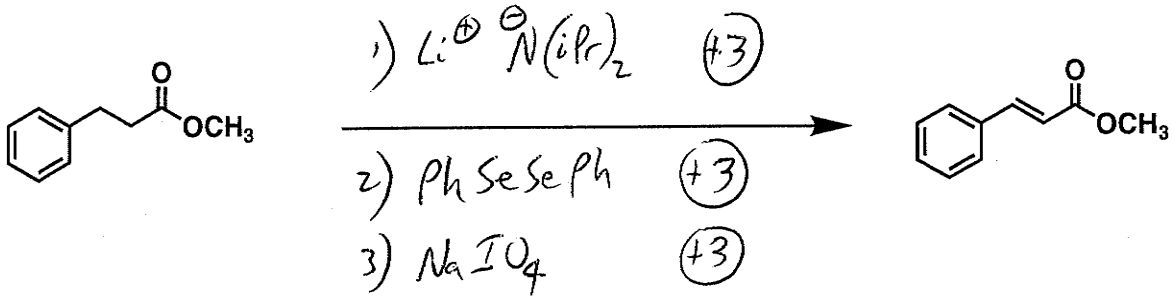


-3 NaOH → get acid
-2 for $NaOCH_3$ too weak
NaH → too reactive

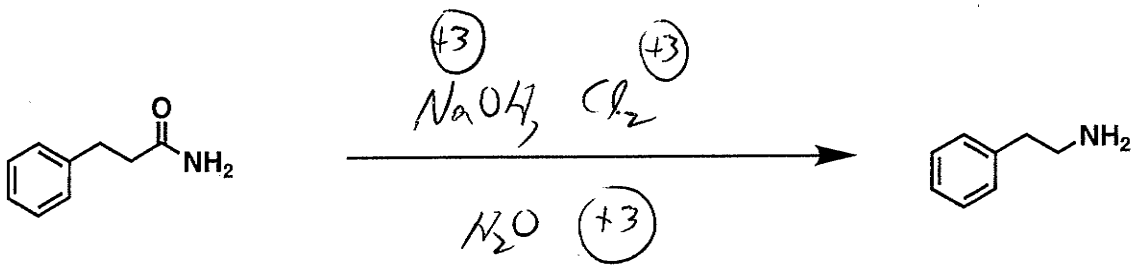
(b)



(c)



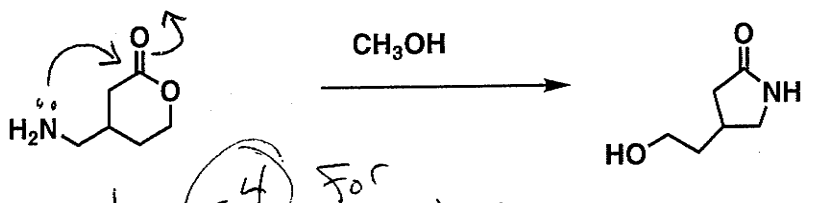
(d)



Name Key

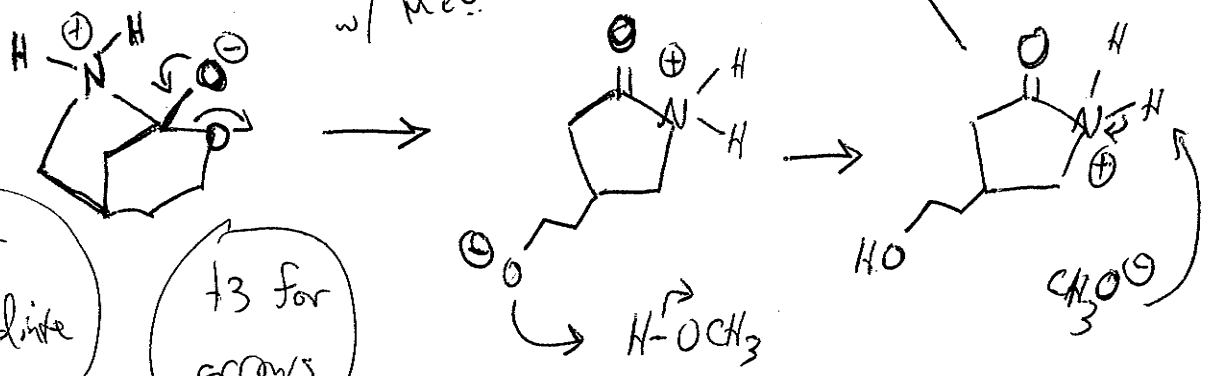
3. (20 points) Draw out a mechanism ("curved arrows") for each reaction shown below. Be sure to show all important resonance structures in intermediates.

(a)



+3 for arrows

-4 For attacking w/ MeOH first



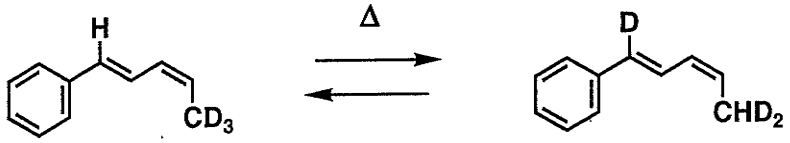
+4 for intermediate

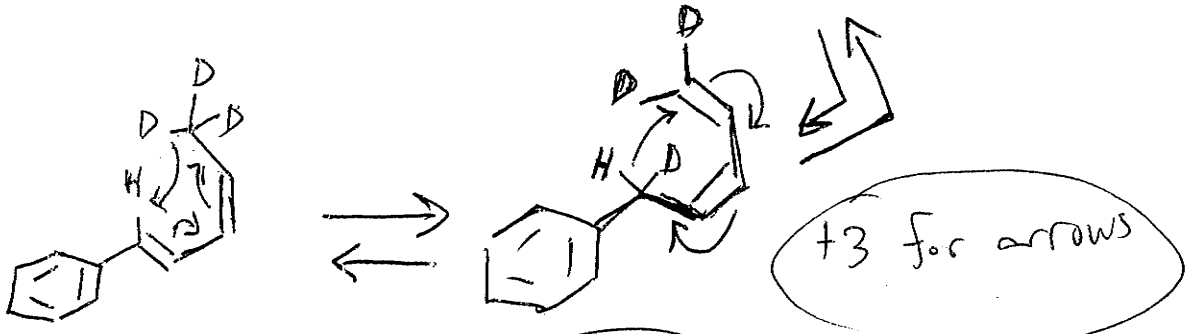
+3 for arrows

[Specifics of proton transfer are not essential.]

-2 for deprotonating free amine as step 1...

(b)





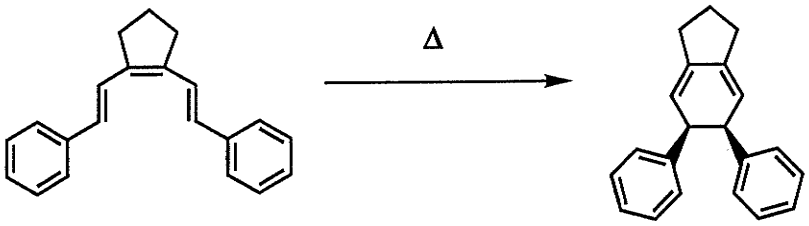
+3 for arrows

+3 for arrows

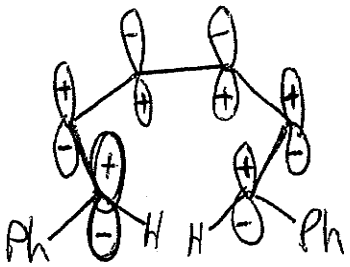
+4 for intermediate

Name _____

4. (12 points) Rationalize the stereochemical preference observed in the reaction below, based on molecular orbital considerations.



Ring closure reaction occurs via ψ_3 M.O. of hexatriene system.



+8

Must be disrotatory

+4

Name _____

5. (20 points) Propose an efficient synthetic route to prepare the indicated target molecule from the indicated starting material and any other organic molecules necessary. Your route should be as short as possible, and each step should be as selective as possible.