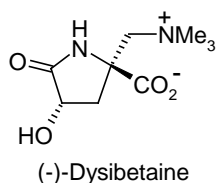


**University of Massachusetts Boston**  
**Department of Chemistry**  
**Chemistry Doctoral Program**  
**Written Qualifying Examinations**  
**June 17, 2008**  
**Organic Chemistry II**

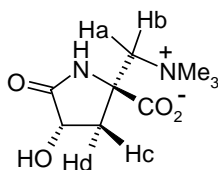
Questions are based on the following article:

Jerry Isaacson, Mandy Loo, and Yoshihisa Kobayashi "Total Synthesis of ( $\pm$ )-Dysibetaine"  
*Organic Letters* **2008**, *10*, 11461-1463.

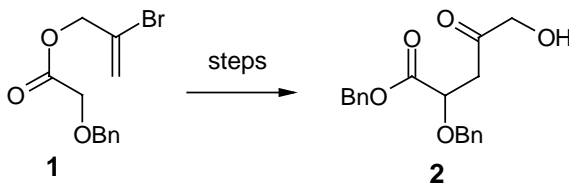
1. (2 points) (a) Give configuration assignments to the chiral centers of (-)-Dysibetaine. (b) Draw the diastereomer structure(s) of (-)-Dysibetaine. (c) Explain the difference between (-)-Dysibetaine and ( $\pm$ )-Dysibetaine.



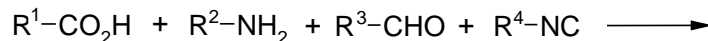
2. (2 points) (a) For protons Ha and Hb of (-)-Dysibetaine, do you expect they have identical  $^1\text{H}$  NMR chemical shift? What kind of coupling (split) patterns do they have? (b) Please answer the same questions for protons Hc and Hd.



3. (3 points) Compound **2** is a key intermediate in the synthesis of ( $\pm$ )-Dysibetaine. Please give the reagents and conditions for the preparation of **2** using **1** as a starting material.



4. (3 points) The Ugi four-center three-component reaction (U4C-3CR) is a key step in the synthesis of ( $\pm$ )-Dysibetaine. Please give the product and a detailed mechanism for a general U4C-4CR.



Green Chemistry question (2 points)

The Scheme shows the steps of U4C-3CR, TBS deprotection, and chromatography separation of the diastereomers of **5** in the total synthesis of ( $\pm$ )-Dysibetaine. From the green chemistry point of view, please comment on the pros and cons of each step.

