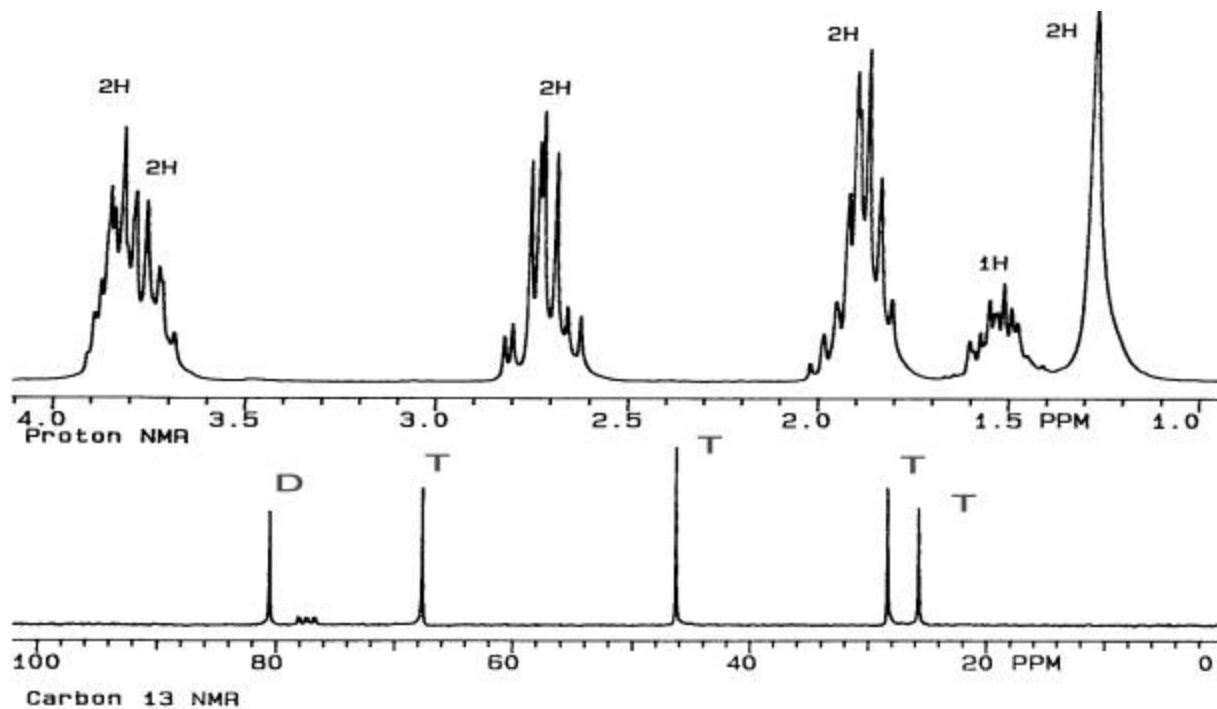
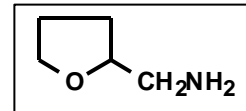


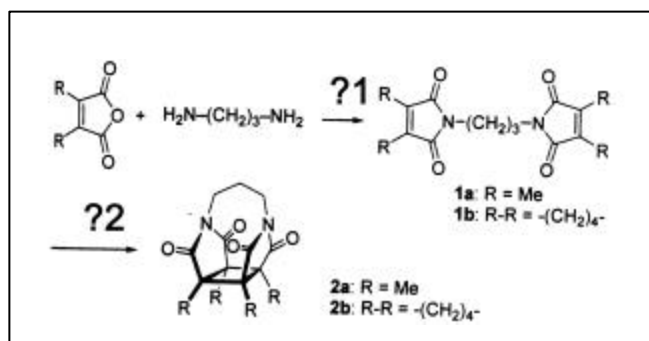
ORGANIC CUMULATIVE EXAM
November 4, 2000

1. (20) The ^1H and ^{13}C spectra shown below have been presented in a problem as belonging to tetrahydrofurfurylamine, the structure of which is shown at the right. Consider each spectrum separately and discuss whether the spectrum is consistent with the structure.



2. You do not have to have read the paper from which this work comes to answer this question. If you would like to it can be found in Laurenti et al. JOC **2000** 65 6418-6422. Consider the structure diagram.

a. (5) What type of reaction conditions would you have to employ to effect the transformation marked with ?1?

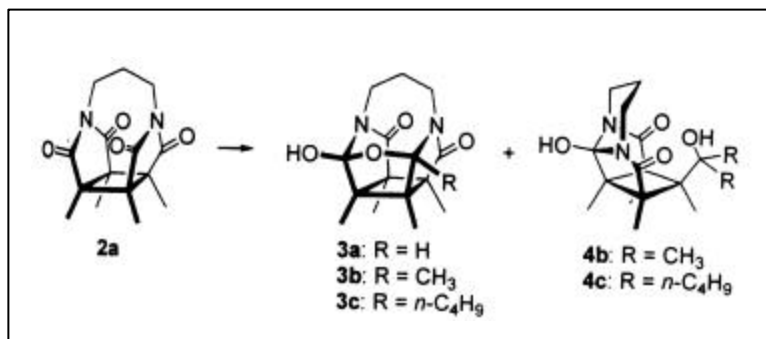


b. (10) Give a mechanism for the transformation one of the amino groups with the anhydride shown.

c. (10) Give the structure of any side products expected in a transformation of this type.

d. (20) How is the transformation marked ?2 carried out? Discuss the theory behind this.

e. Compound **2a** shown above and at the right undergoes some interesting chemistry when reacted with nucleophiles. Compounds **3** and **4** are formed when **2a** is reacted respectively with either, **a** NaBH_4 , **b** CH_3Li , or **c** $n\text{BuLi}$.



(1) [8] Using *N,N*-dimethylformamide (DMF) as a substrate, give the product expected from the reaction of each of these reagents.

(2) [8] Are compounds such as **3** normally stable? Explain.

(3) [10] Why do you think compounds **3a-c** are stable and can be isolated as crystalline solids (which allowed their definitive structure determination by X-ray diffraction).

(4) [15] Give a mechanism for the formation of **4b**, You may abbreviate parts of the molecule.

3. (14) In a recent seminar the some aspects of the chemistry of the ruthenium compound shown below were presented. Give two typical reactions of this compound that illustrate its chemistry and indicate why it is important.

