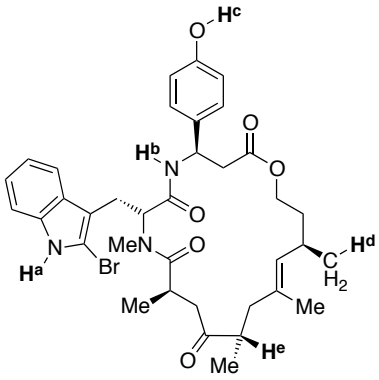
1. (10 points) Number the following protons in (+)-jasplakinolide from 1 to 5 in terms of acidity, where 1 is the most acidic proton and 5 is the least acidic proton.



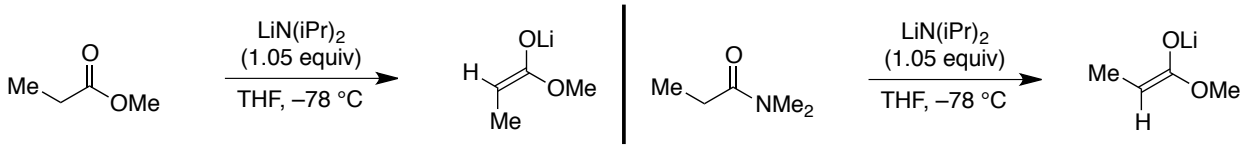
2. (15 points) Using frontier molecular orbital theory, explain the difference in diastereoselectivity for following two [4+2] cycloaddition reactions. Be sure that your answer includes a detailed analysis the transition states that lead to each product.

catalyst	d.r.
Me_3Al	99 : 1
ATPH	18 : 82

ATPH = Al(O-2,3,5-*i*-$Pr_3C_6H_2)_3$

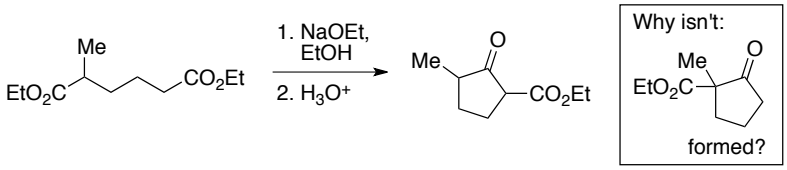
Maruoka, K.; Imoto, H.; Yamamoto, H. *J. Am. Chem. Soc.* **1994**, *116*, 12115.

3. (15 points) Provide the transition state that leads to the enolate isomer for each of the following deprotonations.

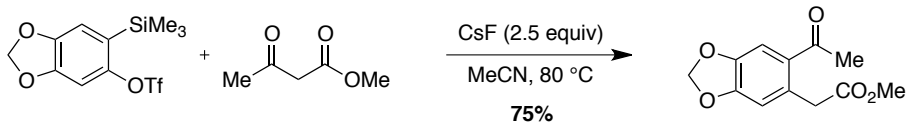


Ireland, R. E.; Wipf, P.; Armstrong, J. D. *J. Org. Chem.* **1991**, *56*, 650.

4. (10 points) Provide a reasonable mechanism for the reaction below that accounts for why the indicated alternative product is not formed.

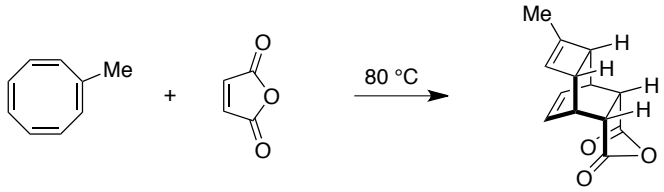


5. (10 points) Provide a reasonable mechanism for the reaction below.

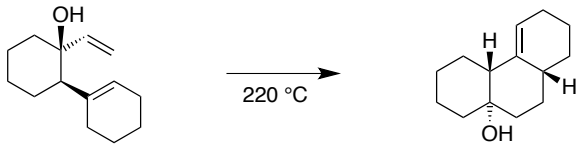


Tambar, U. K.; Stoltz, B. M. *J. Am. Chem. Soc.* **2005**, *127*, 5340.

6. (10 points) Provide a reasonable mechanism for the reaction below.

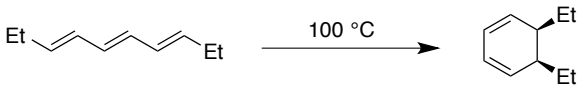


7. (10 points) Provide a reasonable mechanism for the reaction below.



8. (20 points) For the reactions given below provide: a) an electron-pushing mechanism; b) the transition state for the transformation; c) the frontier molecular orbital interaction that forms the new sigma bond or breaks the strained sigma bond.

a)



b)