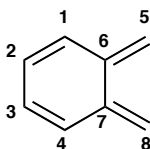
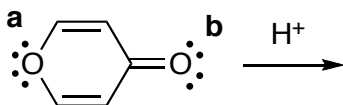


1. Use *both* text and structural illustrations to solve the problems below. (14 points)

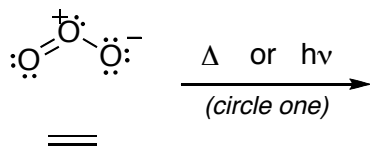
- A. The compound shown has two sets of dienes, a diene at C₁-C₂-C₃-C₄ and a diene at C₅-C₆-C₇-C₈. Therefore, two products are possible in Diels-Alder reactions with this compound. Show the two products that would form using ethylene (CH₂=CH₂) as the dienophile, indicate which is favored (by circling it), and provide a rationale for your decision. Assume that enough heat is used to overcome any activation barriers in the forward direction of reaction.



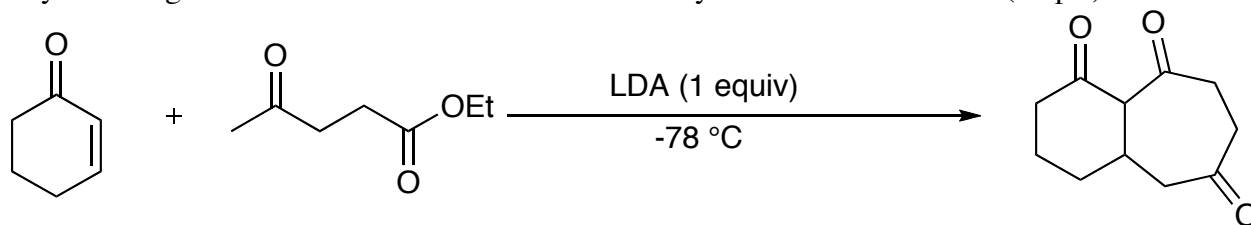
- B. Indicate whether O_a or O_b is more basic in the compound shown and provide a rationale for your decision. *Note: at the very least, draw both conjugate bases.*



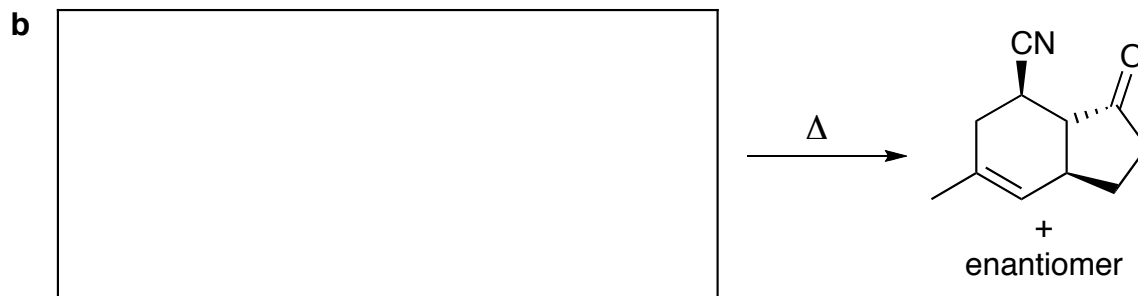
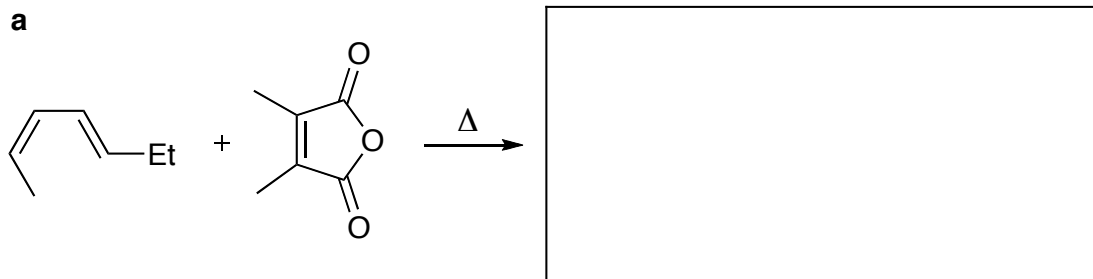
2. Use MO theory to predict whether the cycloaddition reaction of ethylene and ozone is allowed using heat *or* light. Draw the π MOs for both compounds and provide a structure for the product. (10 pts)



3. Provide a mechanism for the reaction shown below. Be sure to show all relevant charges and lone pairs in your structures, and provide the structures of all intermediates. DO NOT add any new reagents to the reaction and DO NOT use any shortcut mechanisms. (10 pts)

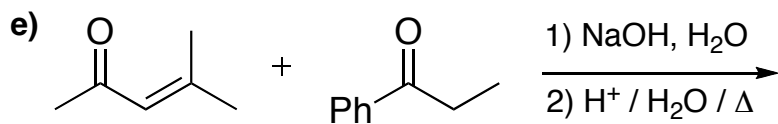
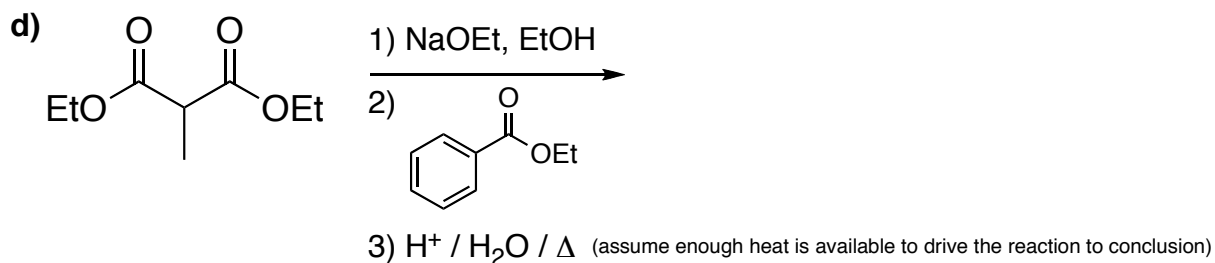
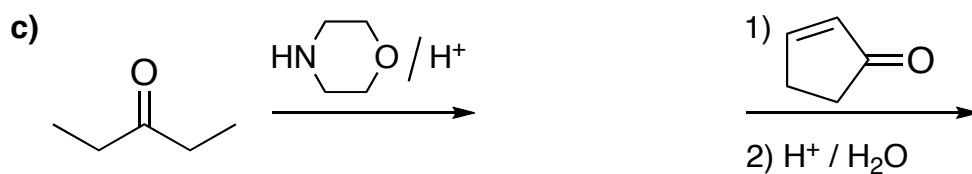
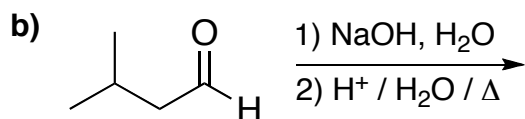
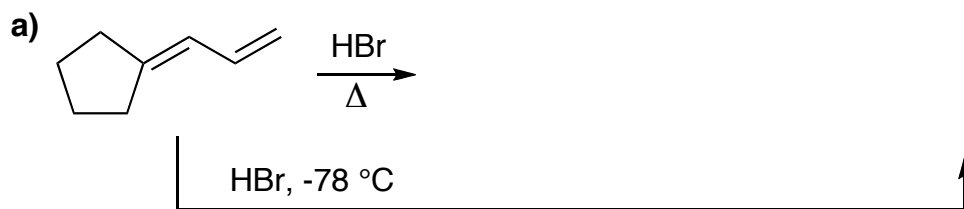


4. Complete the following Diels-Alder reactions by filling in the boxes. (8 points)

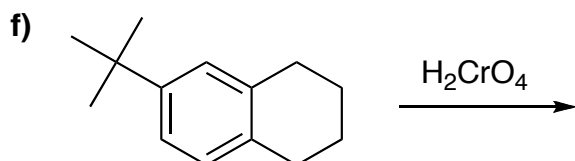


5. Explain how one could use UV-vis spectroscopy to monitor the progress of a typical Diels-Alder reaction. DO NOT use more than the space provided below. (4 points)

6. Provide the major product (circle it) of the following reactions. You may indicate new stereocenters formed in a 50:50 ratio with a "*" rather than drawing all the possible stereoisomers. (30 points)



Robinson Annulation Product



7. Provide syntheses for the following transformations. For full credit, be sure to draw all intermediary products along the way. (24 points)

