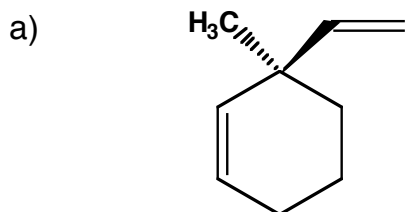
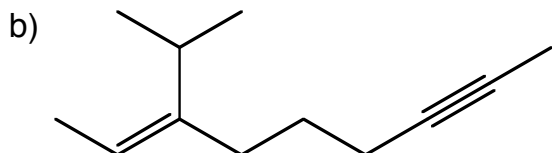


Fall 2004 Exam 3 **Answer Key**  
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1) Provide an unambiguous name (IUPAC or common) for each of the following molecules. (14 points)

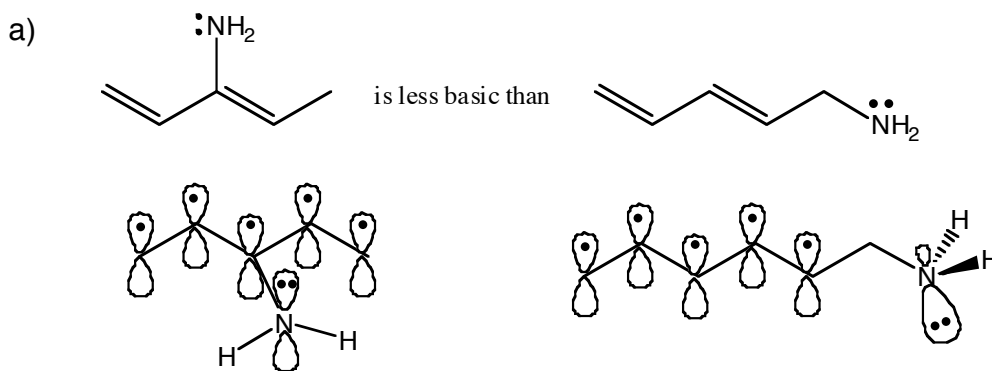


**(R)-3-methyl-3-vinylcyclohexene**



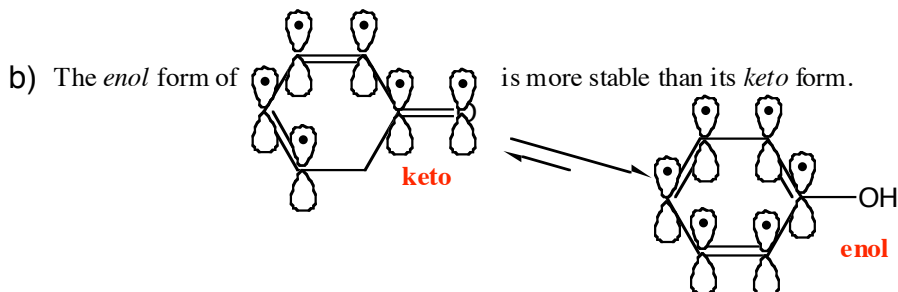
**(Z)-3-isopropyl-2-nonen-7-yne**  
 or  
**(Z)-3-isopropylnon-2-en-7-yne**

2) Explain the following trends *using pictures* and only a few words. (12 points)



Having a lone pair of electrons adjacent to the conjugated pi system allows the lone pair to be part of the pi system. This delocalization of the lone pair of electrons makes them less available to abstract a proton, making this molecule less basic.

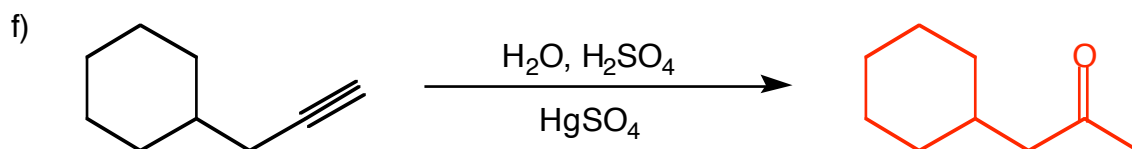
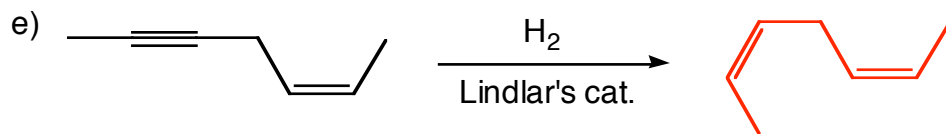
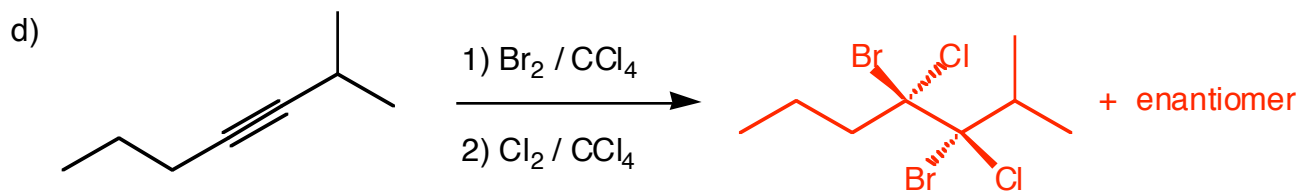
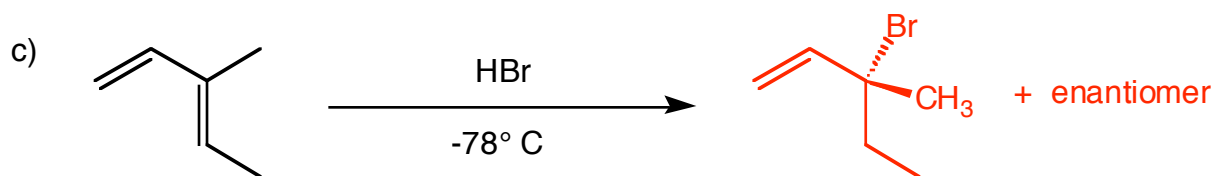
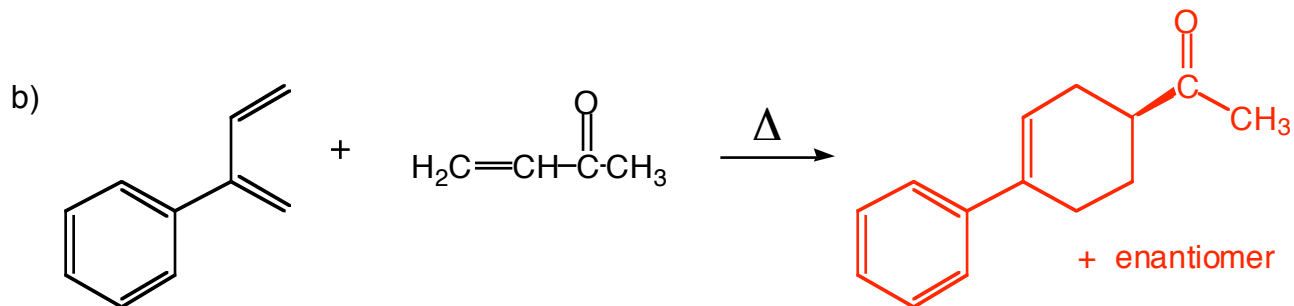
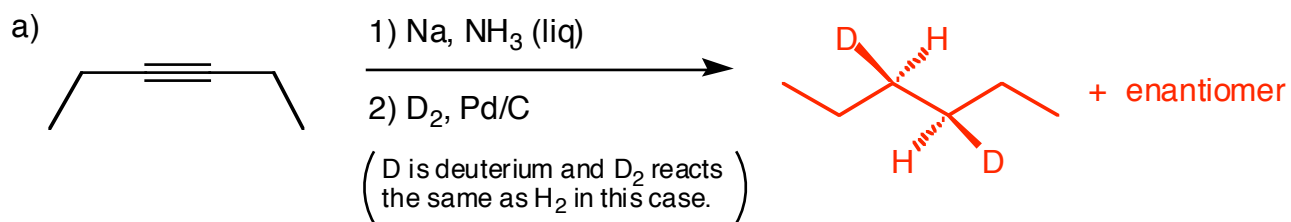
No conjugation; therefore the lone pair of electrons on the nitrogen atom are readily available to abstract a proton from an acid, making the molecule more basic.



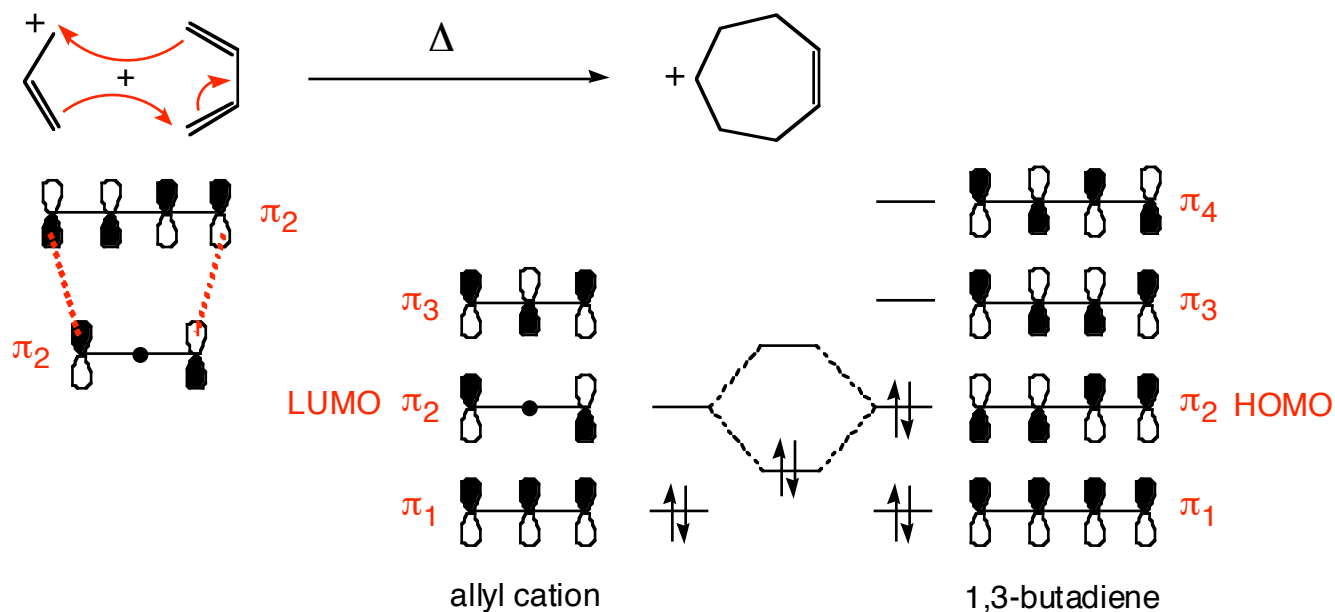
Although the real explanation is a concept known as aromaticity (covered next semester), we can see that in the enol form, the conjugation is arranged in a cyclic manner. This allows the electrons to be even more delocalized, and because there is no carbonyl in the enol form, the conjugated system is not as polarized, allowing the electrons to be evenly delocalized around the pi system.

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3) Predict the *major* organic product of each of the following reactions. If more than one product is equally favored, draw each product. (36 points)

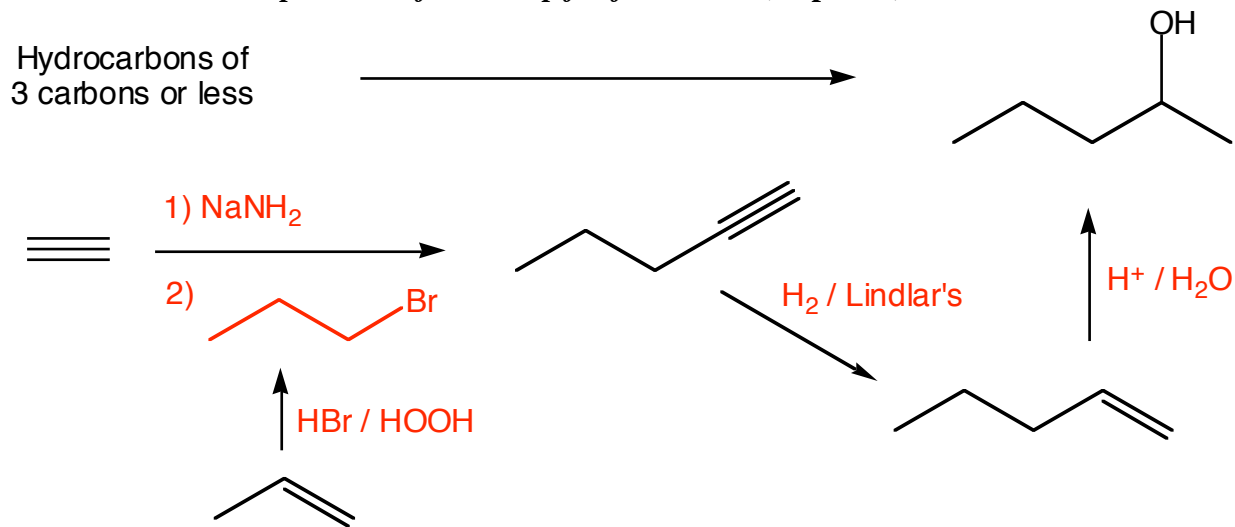


- 4) Provide a mechanism for the following hypothetical pericyclic reaction. Then use MO theory to determine whether it or not it could take place. *Note: you will need ample illustrations to obtain full credit for this problem.* (12 points)

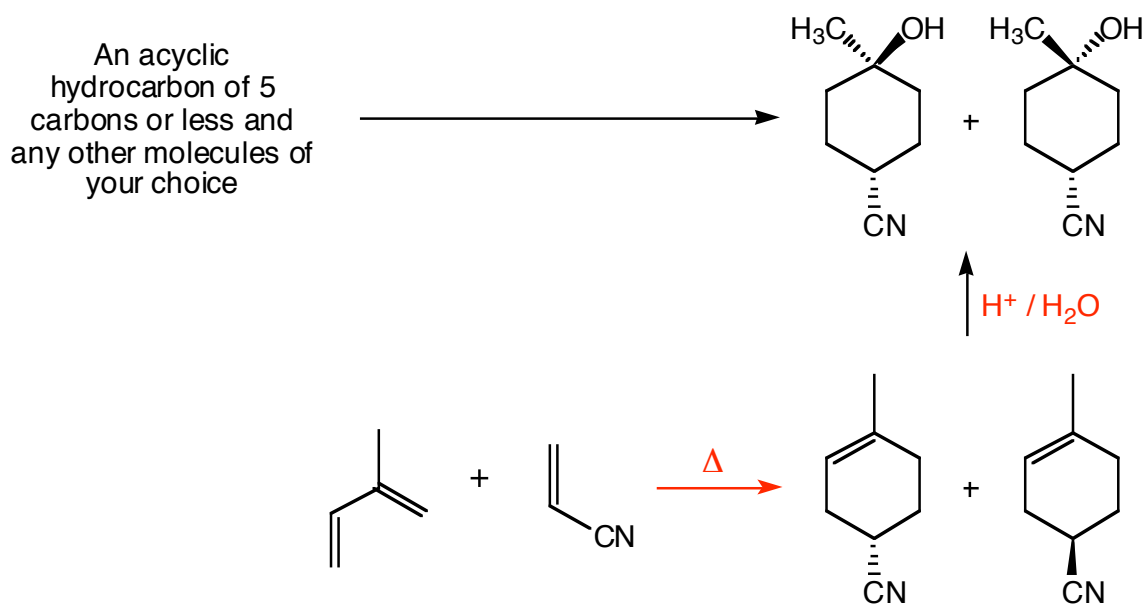


**The energy diagram shows which orbitals (HOMO and LUMO) will interact. Since the signs of the lobes of the orbitals are in phase, this reaction is allowed.**

- 5) Propose a synthesis (sequence of reactions) that will accomplish the following transformation. *Be sure to include the products of each step for full credit.* (10 points)



- 6) Propose a synthesis (sequence of reactions) that will accomplish the following transformation. Be sure to include the products of each step for full credit. (8 points)



- 7) Cantharidin is a naturally occurring compound isolated from the blister beetle and approved in Canada for the treatment of warts. When researchers tried to synthesize cantharidin using the Diels-Alder reaction as the first step, they found that the reaction did not give the desired product. Explain why this Diels-Alder reaction does not give the product shown and draw the compound that is actually formed from this Diels-Alder reaction. (8 points)

