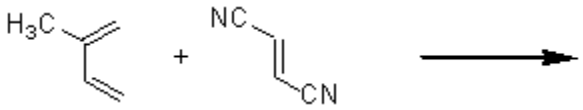
Organic II lecture
Review for exam 2
Conjugation, Aromatic and Aromatic Reactions

Another good review is the practice test in the N.S. testing center.

Practice questions:

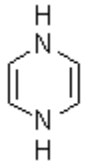
1. **Draw** the highest occupied molecular orbital (HOMO) for 1,3,5-hexatriene. How many **bonding** and **anti-bonding** interactions in this MO?

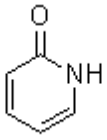
2. Predict the product of the following Diels-Alder reaction. Include relevant stereochemistry. (3 points)

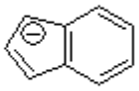


3. Predict whether the following reaction will go, and under which conditions. Hint: Use your knowledge of pericyclic reactions, and conservation of molecular orbital theory.

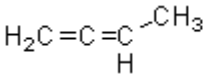
4. Label the following molecules as aromatic, anti-aromatic, or nonaromatic. Assume planarity.

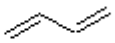


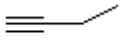




5. Which compound would have the greatest -ΔH value for hydrogenation?

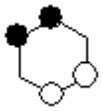






6. Which of the molecules in problem 5 has the smallest energy gap between its HOMO and LUMO molecular orbitals?

7. For the molecular orbital of benzene shown below, answer the following questions.

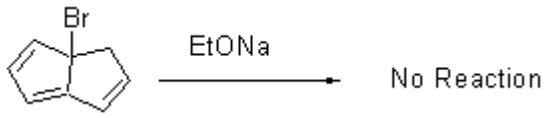


a) How many nodes are present?

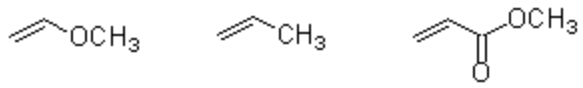
b) How many bonding interactions? Antibonding interactions?

c) Using the polygon rule, draw a molecular orbital energy diagram for benzene and indicate with an X where the depicted molecular orbital would exist in the diagram.

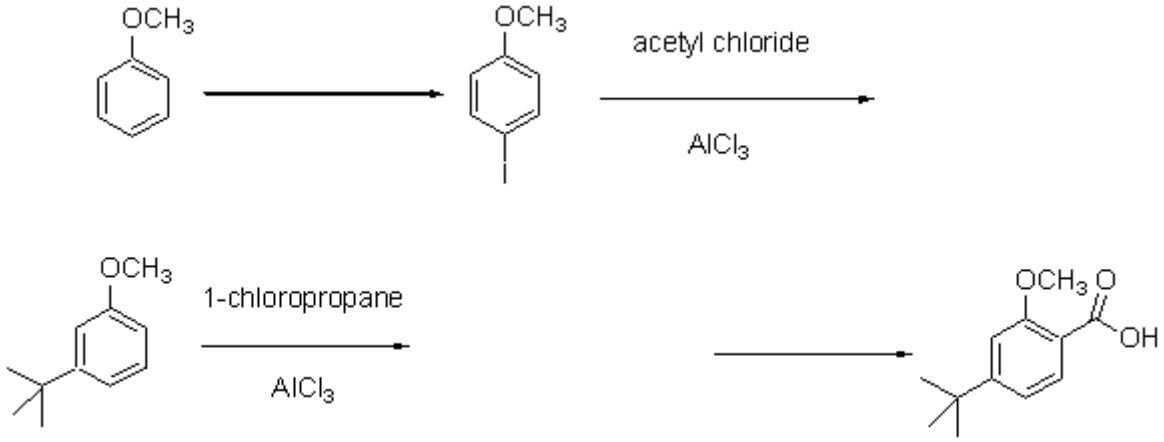
8. The following reaction fails to undergo E2 elimination. Explain.



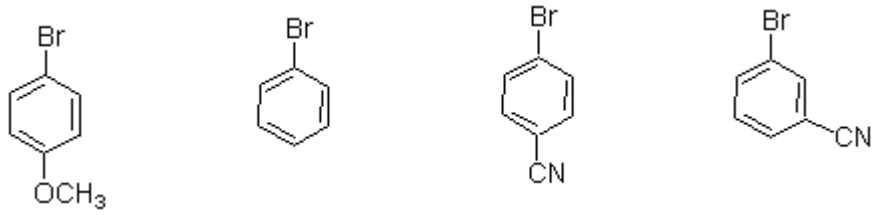
9. Which is the best dienophile in the D-A reaction?



10. Complete the following:



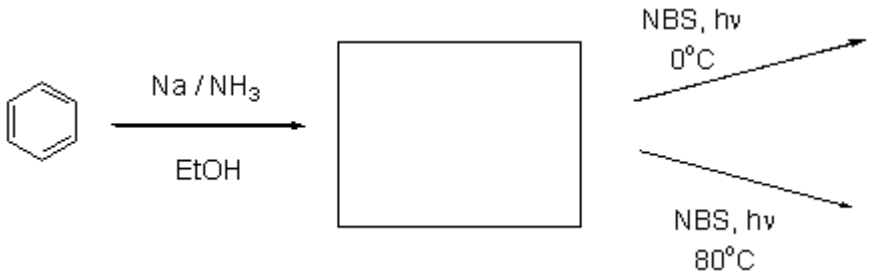
11. Which aromatic ring would undergo nucleophilic aromatic substitution the fastest?



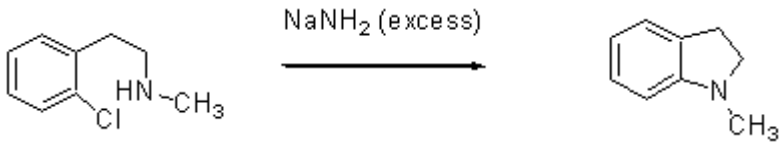
12. Circle the answers that correctly describe the behavior of a halide substituent in EAS. A halide is a (weak / strong) inductive (EWG / EDG) and a (weak / strong) resonance (EWG / EDG).

(EWG = Electron withdrawing group and EDG = Electron donating group).

13. Fill in the missing information. Justify!

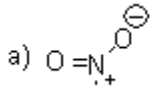
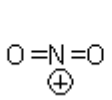


14. Propose a mechanism to account for the following reaction.

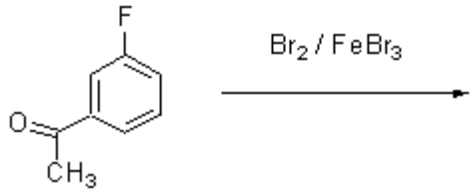


15. Circle correct answers. (EWG / EDG) are most activating in the (ortho / meta / para) position of an aromatic ring for **EAS**. (EWG / EDG) are most activating in the (ortho / meta / para) position for **NAS**.

16. Which of the following is the reactive electrophile in the nitration of aromatic rings?

a)  b)  c) NO_3^- d) NO_3^+

17. Provide the product of the following reaction:



18. Explain why the following synthesis was unsuccessful.