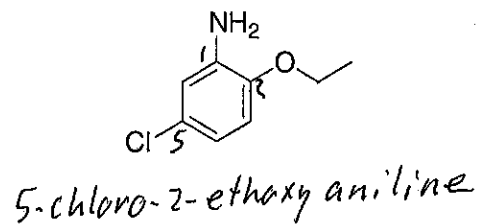
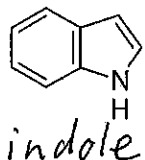
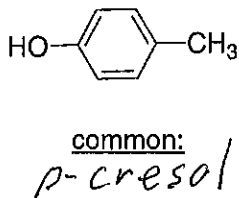
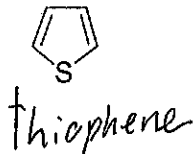


I. Nomenclature

1. Provide correct names for each of the following structures. (8 points)



2. Provide structures for each compound listed below. (6 points)

anthracene:



pyrimidine:

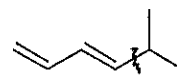
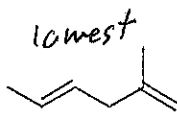
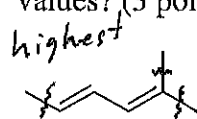


quinoline:



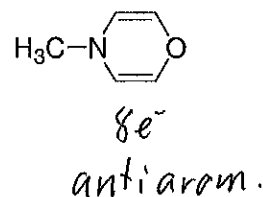
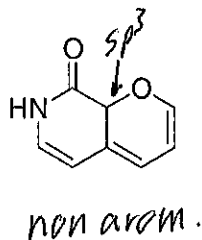
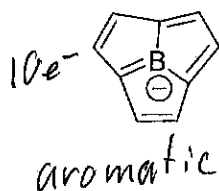
II. Theory

1. Which sequence ranks the following compounds in order of increasing UV_{max} values? (3 points)



a) 1<2<3 **b) 2<3<1** c) 3<1<2 d) 3<2<1 e) 2<1<3 f) 1<3<2

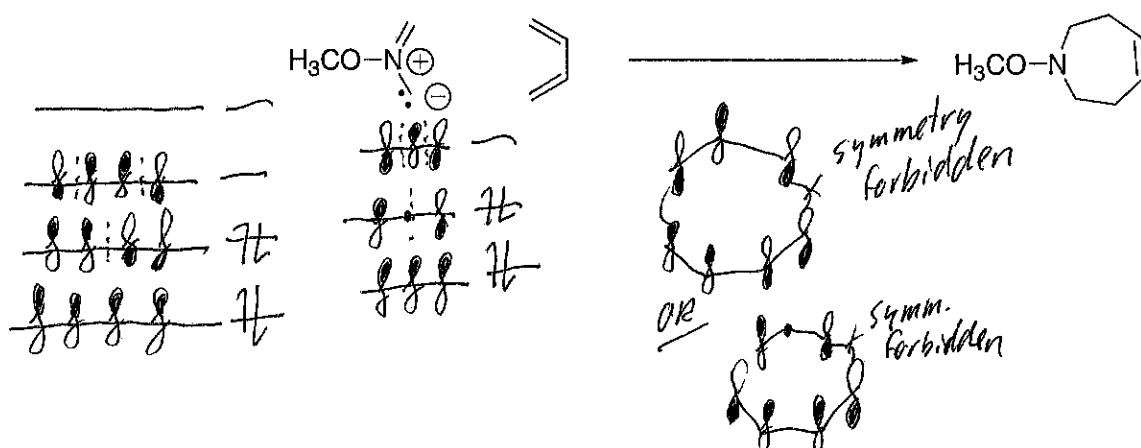
2. Assuming planarity of each ring below, classify the following compounds as aromatic, antiaromatic, or nonaromatic. (6 points)



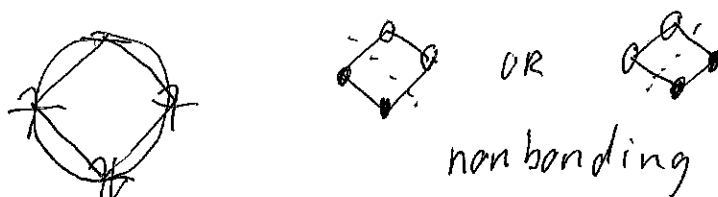
3. Circle all statements that correctly describes the effect ultraviolet radiation has on a molecule? (2 points)

- a) The molecule is ionized as electrons are expelled from pi bonds.
 b) Covalent bonds are broken as electrons are promoted to higher energy states.
 c) Electrons from occupied molecular orbitals are promoted to previously unoccupied molecular orbitals.
 d) As electrons are excited from their ground state, a new highest occupied molecular orbital is generated.

4. Predict whether the following cycloaddition reaction would be symmetry allowed or forbidden under thermal conditions. Justify your answer by showing the correct overlap between molecular orbitals. Hint: it will not matter which you choose as the nucleophile vs electrophile. (6 points)



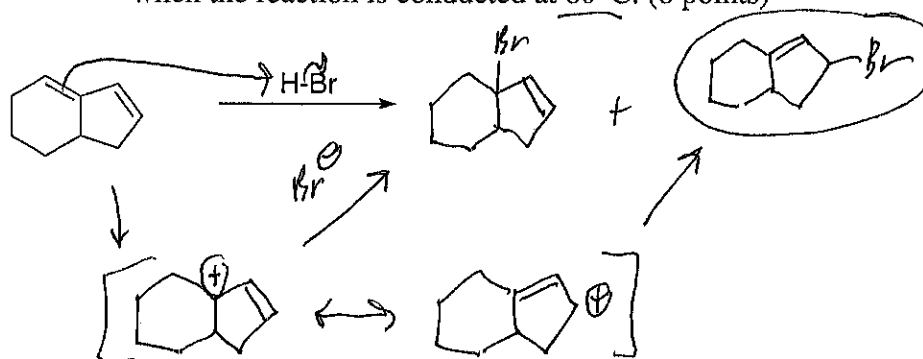
5. Draw one of the highest occupied molecular orbital for cyclobutadiene. **State** the net bonding of this molecular orbital. (3 points)



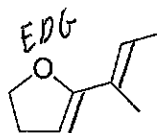
6. What is the bond order for each carbon-carbon bond in benzene? (2 points)

- a) 1 b) 1.5 c) 2 d) 2.5

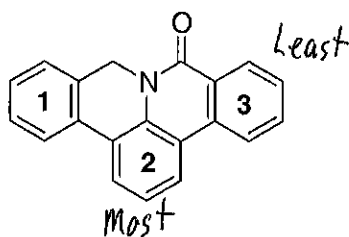
7. Draw the two major products of the following reaction. Circle the major product when the reaction is conducted at 80°C. (8 points)



8. Build your own diene!! Introduce two additional degrees of unsaturation into the structure below to create the most reactive diene in a Diels-Alder reaction. (3 points)

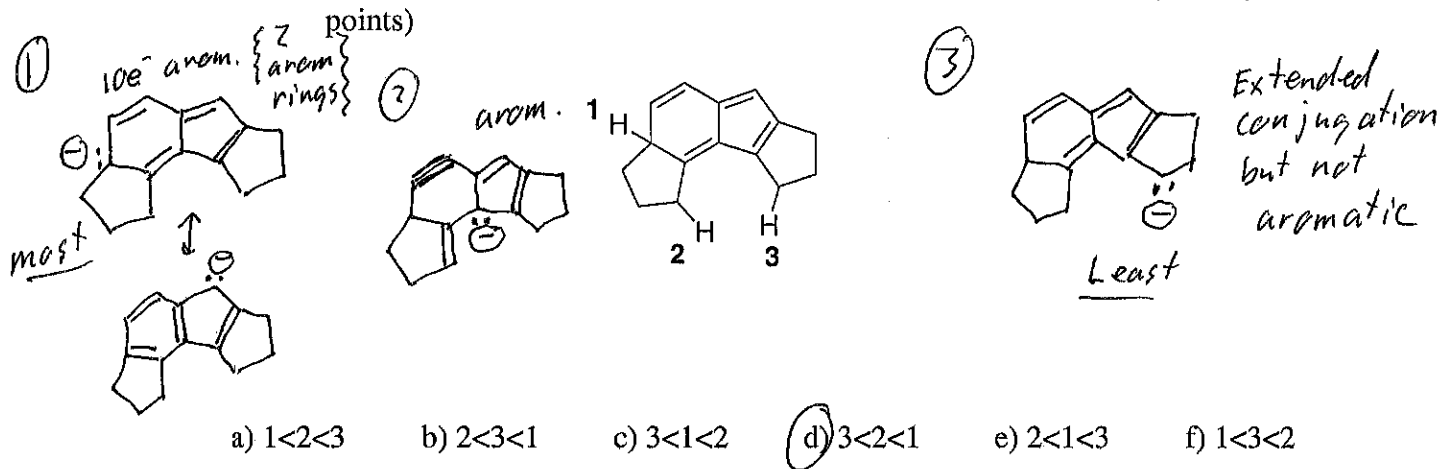


9. Which sequence ranks the following aromatic rings in order of increasing reactivity in an electrophilic aromatic substitution reaction? (3 points)



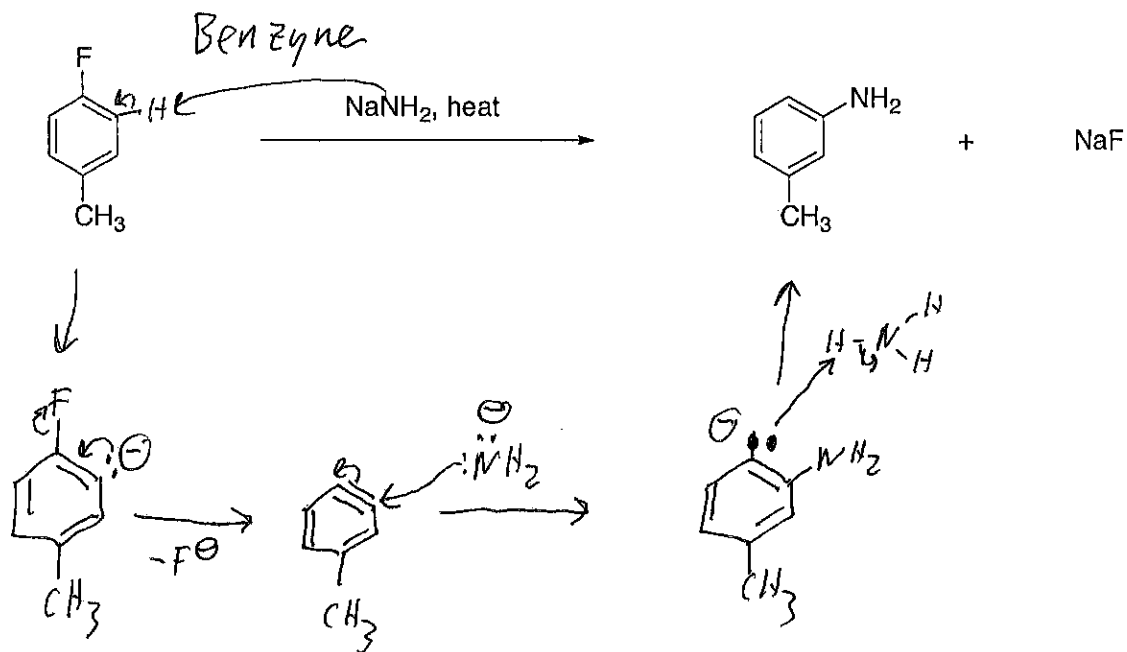
- a) 1<2<3 b) 2<3<1 c) 3<1<2 d) 3<2<1 e) 2<1<3 f) 1<3<2

10. Which sequence ranks the indicated protons in order of increasing acidity? (3 points)



III. Mechanism:

1. Provide a correct electron arrow pushing mechanism for the following reaction. Include all intermediate structures and formal charges. (10 points)

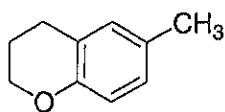
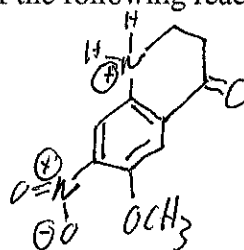
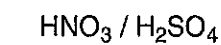
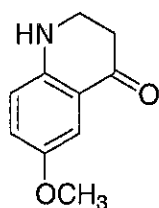


IV. Reactions

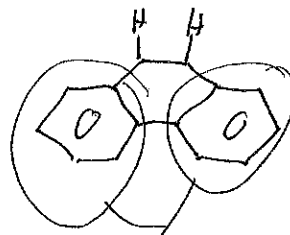
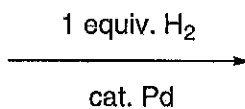
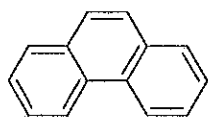
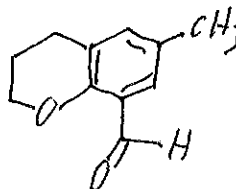
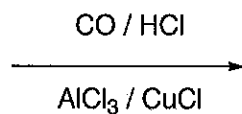
1. Show how the structure below could be made using a Diels-Alder reaction by drawing a correct structure for the starting material. Include any relevant stereochemistry. (4 points)



2. Predict the major product of each of the following reactions. (9 points)

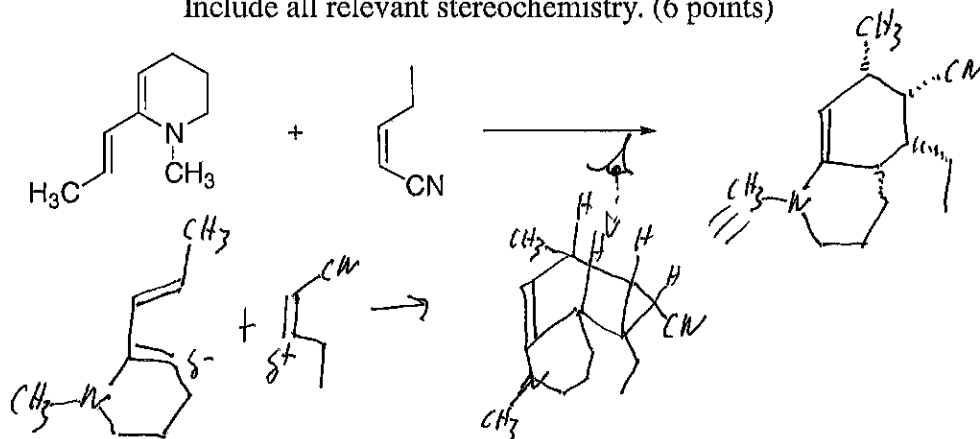


Gatterman-Koch

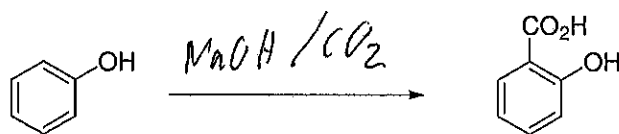
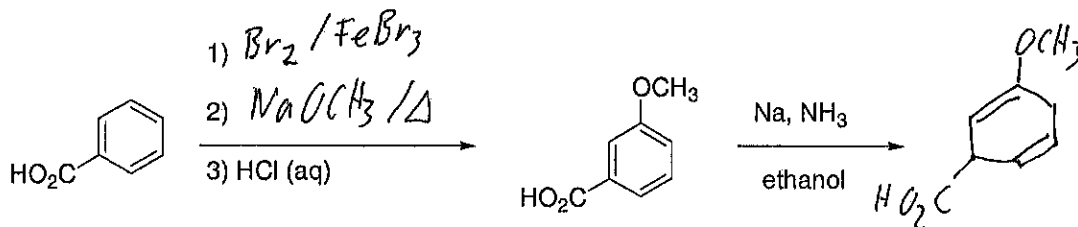
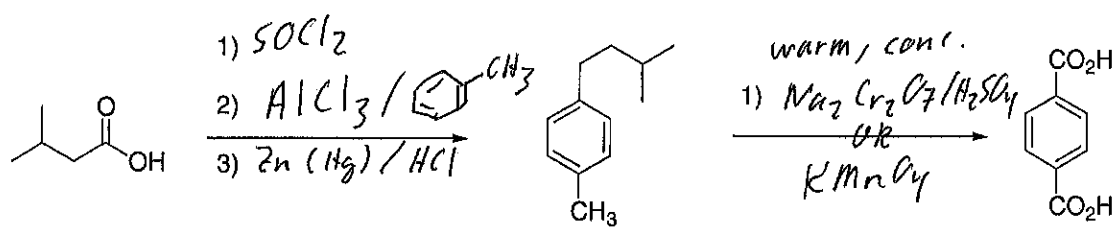


*2 separate
benzene rings*

3. Assuming kinetic control, draw the expected product of the following reaction. Include all relevant stereochemistry. (6 points)

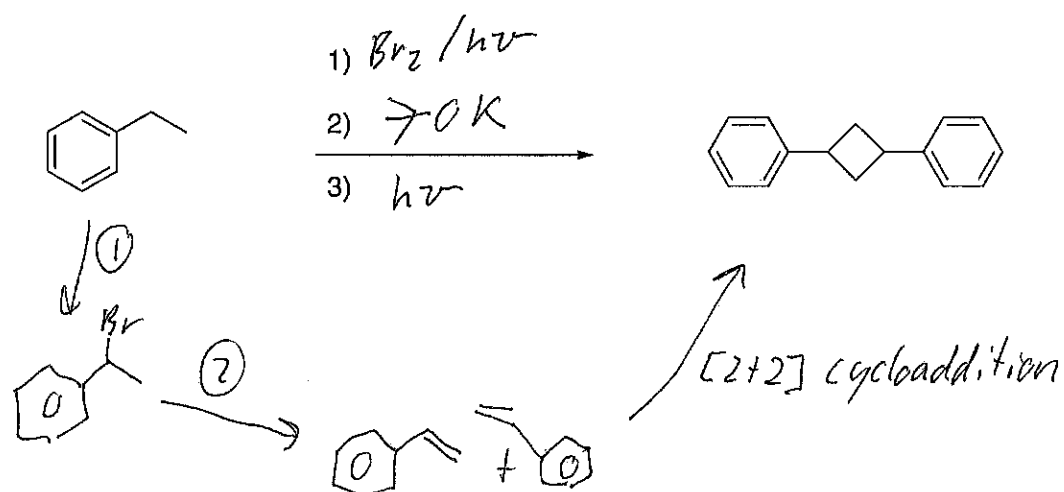


4. Complete the following reactions by filling in the missing reagents or product. (18 points)



V. Extra Credit (5 points)

Complete the following reaction by filling in the missing reagents.



You received _____ points out of 100 points possible. To check your overall performance in lecture see <http://canvas.weber.edu>.