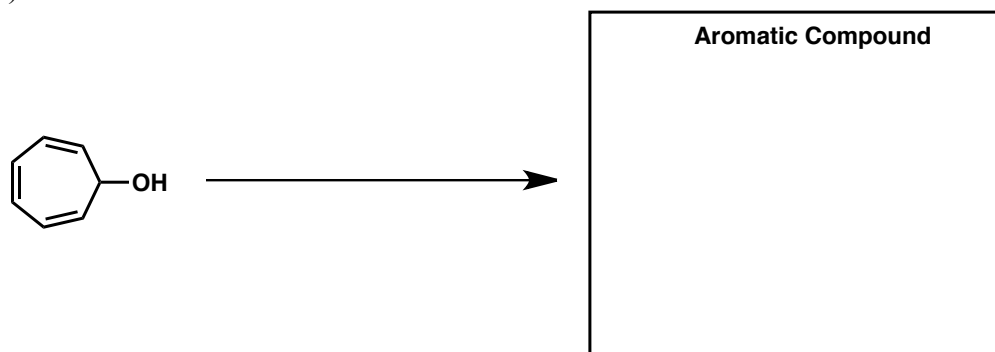


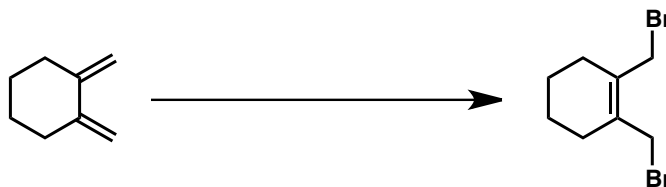
READ!!!! You may use only a model kit, a pencil, and scratch paper to answer the following. Look through the entire exam and do the easier and faster problems first. Read all directions carefully and write your answers in appropriate spaces. Answers on the backs of pages will not be graded. Note that the bonus problem at the end of the test is significantly harder and more time consuming than the regular test questions (35 possible bonus points total).

1. Write reagents over the arrows in the reactions below to perform the following transformations. If multiple steps are required, label them with "1)", "2)", etc. Partial credit is possible if correct intermediates are drawn.

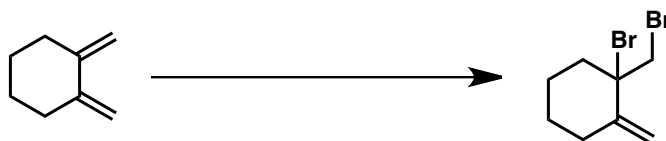
A) (10 points)



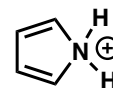
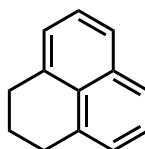
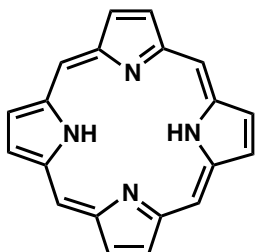
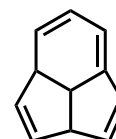
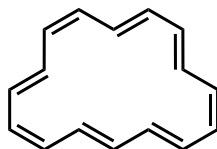
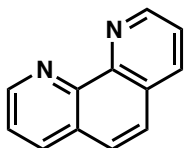
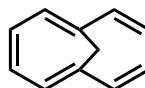
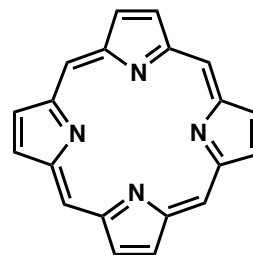
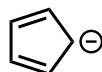
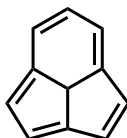
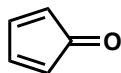
B) (5 points)



C) (5 points)

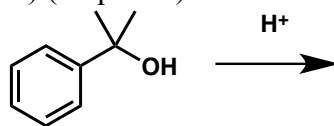


2. Label each of the following structures as "Aromatic", "Antiaromatic", or "Nonaromatic".
(5 points each; 65 points total)

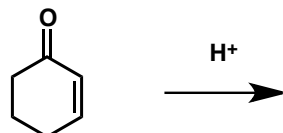


3. Show the reactive charged intermediate that results from each of the following. Draw all of the relevant resonance structures that show how the charged intermediate is stabilized.

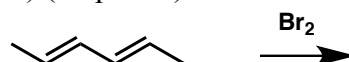
A) (10 points)



B) (10 points)

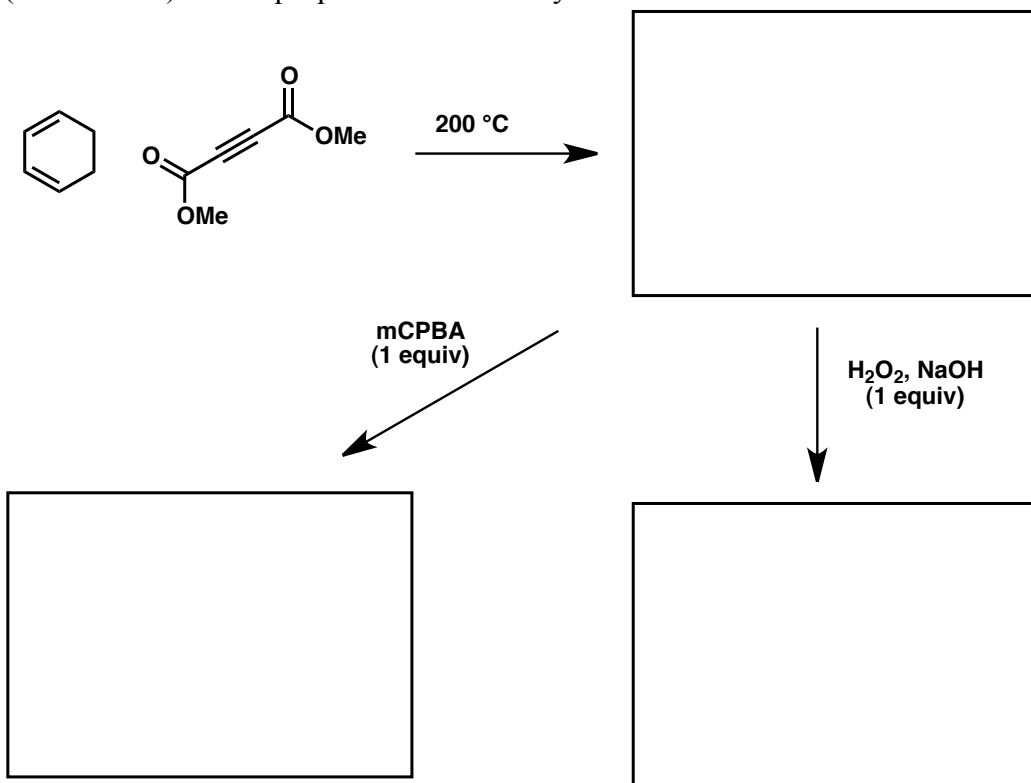


C) (10 points)



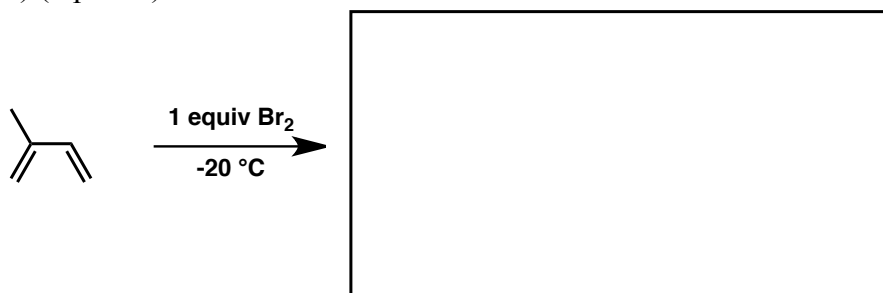
4. Provide the missing structures for the products of the following reactions. (15 points)

<<BONUS (10 POINTS): Show proper stereochemistry.>>

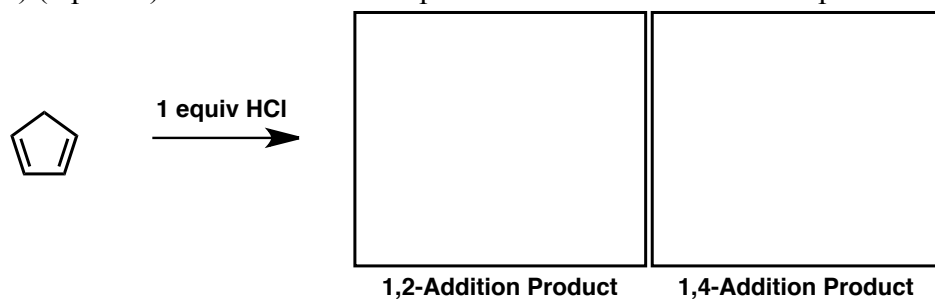


5. Predict the major products when the compounds on the left are treated with the indicated sets of conditions.

A) (5 points)

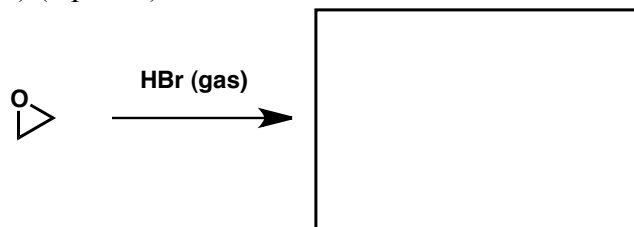


B) (5 points) <<For a BONUS 5 points: Describe the relationship between the two products.>>

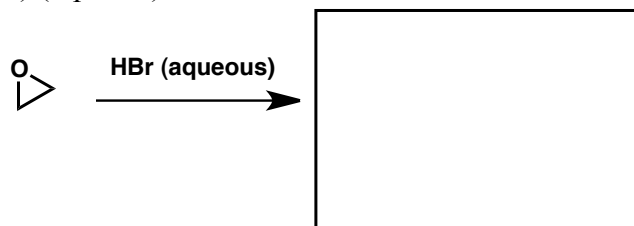


BONUS Answer:

C) (5 points)

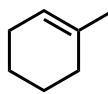
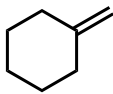


D) (5 points)

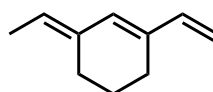
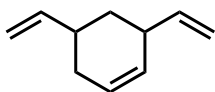


6. For each pair of compounds, predict which would release more energy upon complete hydrogenation. Explain why one compound releases more energy than the other.

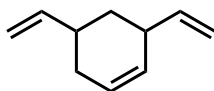
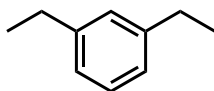
A) (10 points)



B) (10 points)

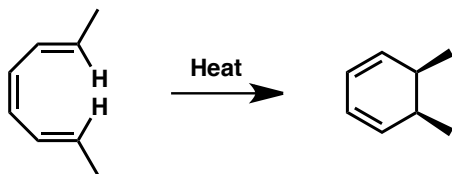


C) (10 points)

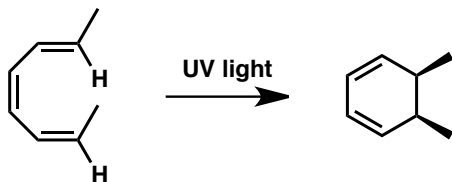


7. Give a THOROUGH explanation for formation of the product in each reaction below that includes why the C-C bond formation is possible and why the illustrated diastereomer is obtained.

A) (15 points)

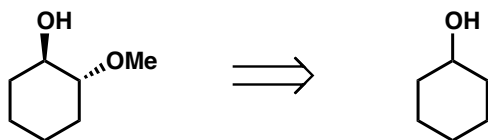


B) (15 points)

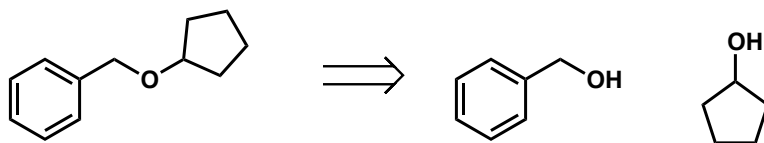


8. Show how to synthesize the compounds on the left from the compounds on the right.

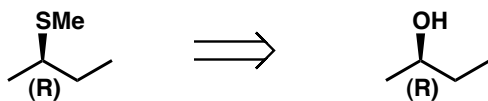
A) (20 points)



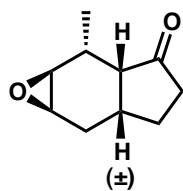
B) (20 points)



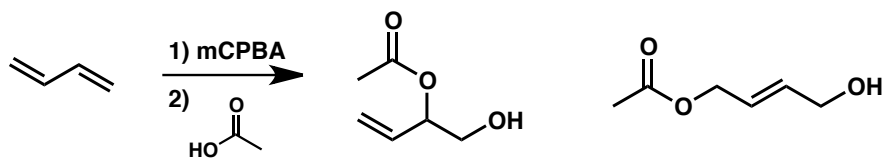
C) (20 points)



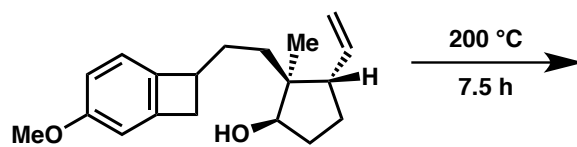
9. Synthesize the following from starting materials or reagents that add five carbons or less to the product. Describe why you think this stereochemistry would result from your proposed synthesis.
(25 points)



10. Draw the mechanism of the following transformation. Push arrows and show EVERY step!
(15 points)



BONUS (20 points). Paul Grieco performed the following reaction while at the University of Pittsburgh. It involves two reactions that were recently discussed in class that occur in sequence under the given conditions. What is the product of the reaction? Draw a mechanism and push arrows to show its formation.



END OF TEST