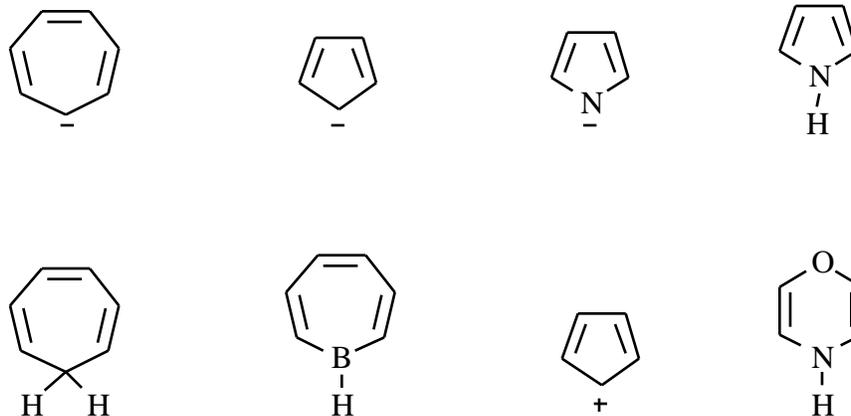
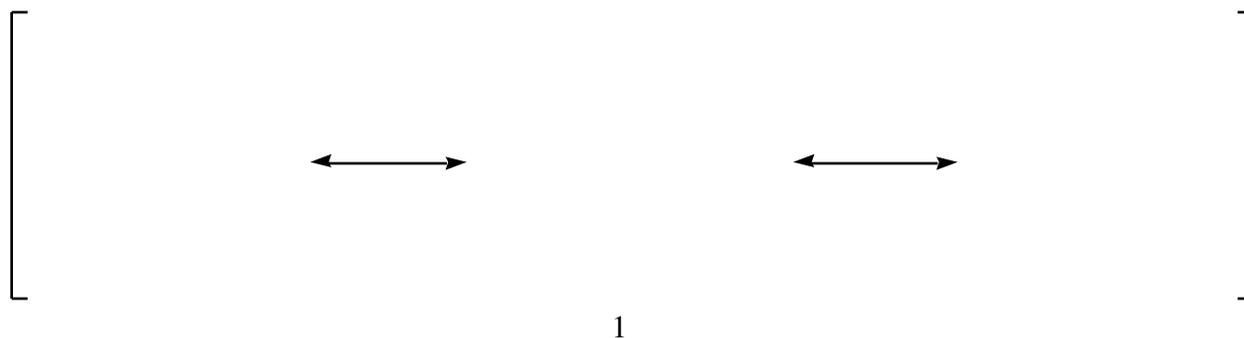
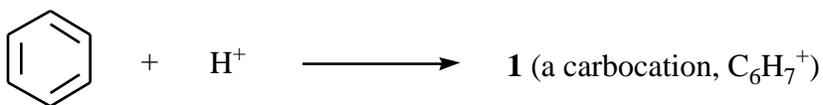


Name: _____

1) (26 pts) a) Circle the aromatic compounds in the following list. Note that in these structures H atoms on carbons are not shown and lone pairs are not shown. This is following the standard convention. The H atoms and lone pairs are implied by the formal charges given on the atoms!



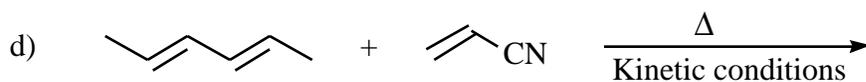
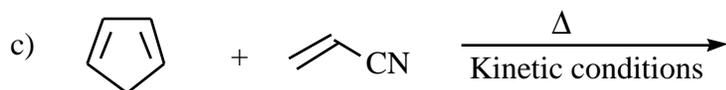
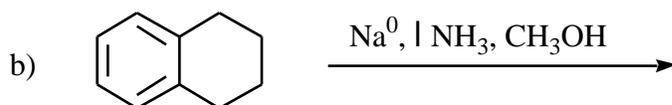
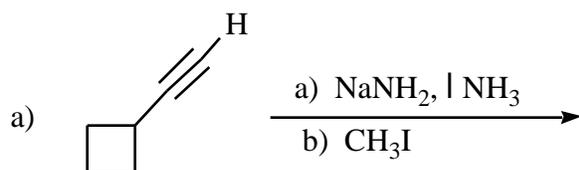
b) Benzene reacts with strong acid to give the carbocation **1**, as indicated in the equation below. Draw the three most important resonance contributors to the structure of cation **1**.



c) Carbocations typically react with nucleophiles such as Br^- to give a new product. Cation **1**, however, does not react with any nucleophiles. What happens to cation **1** and why?

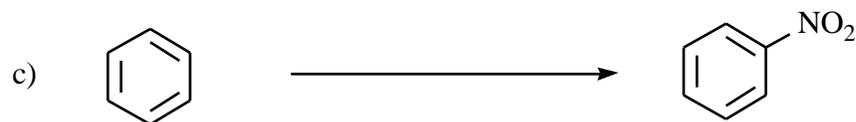
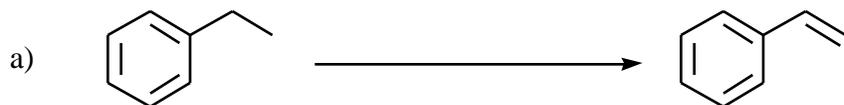
Name: _____

2) (24 pts) Give the single major organic product for each of the following reactions. If a racemate is formed, consider this to be one product, show only one of the enantiomers, and label the structure racemic (rac). If there is the possibility of stereoisomerism, carefully show the stereochemistry of the product using wedges and dashes (for bicyclic structures you may use either wedges and dashes or a perspective drawing).



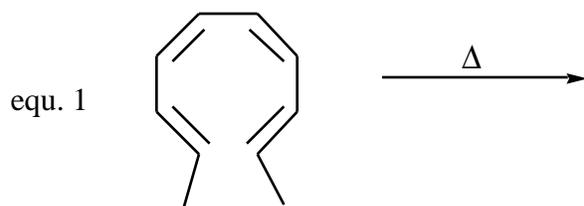
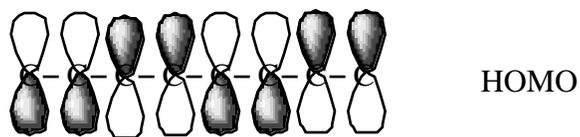
Name: _____

3) (24 pts) Propose reagents for accomplishing each of the following transformations (more than one step may be required). Try to make your syntheses efficient (i.e. the desired target should be the major product in each step, and you should try to use the fewest possible steps).

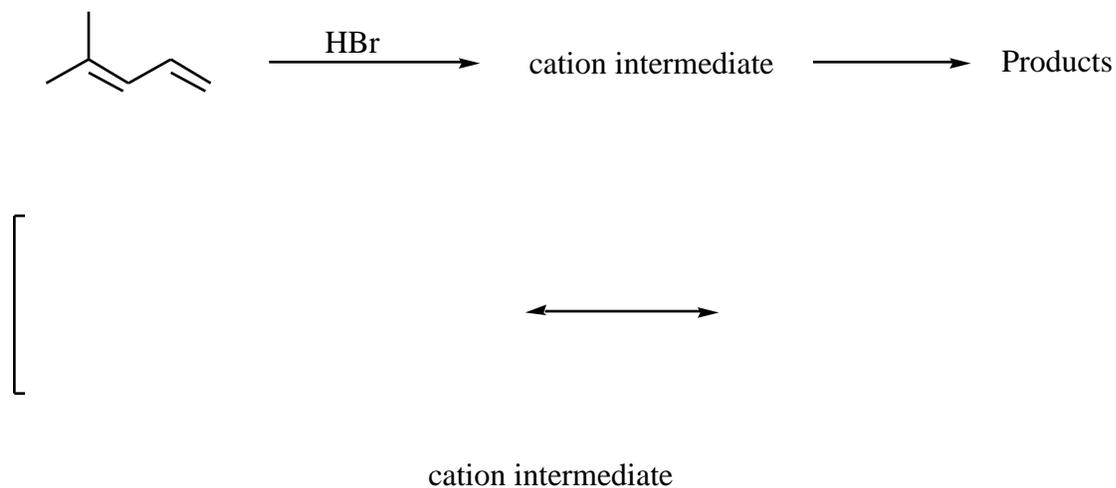


Name: _____

4) (26 pts) a) Given that the highest occupied molecular orbital of octatetraene has the symmetry shown below, predict the major product, showing stereochemistry using wedges and dashes, of the reaction shown in equation 1.



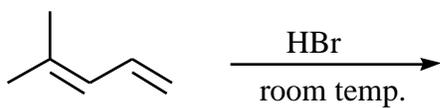
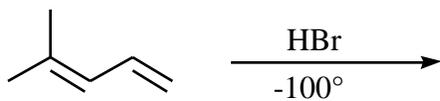
b) Give the two major resonance contributors to the structure of the single major cation intermediate resulting when 4-methyl-1,3-pentadiene reacts with HBr.



Name: _____

4) - continued -

c) Predict the structure of the major final product of this reaction under kinetic conditions (-100°C) and under thermodynamic conditions (room temperature).



d) Briefly explain why you predicted the products you gave for part c.