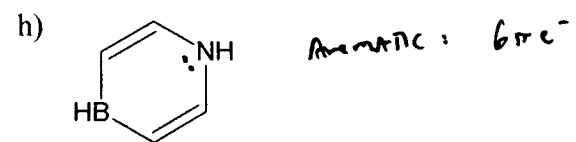
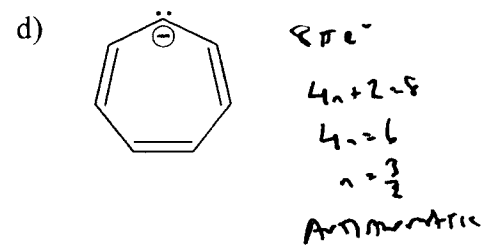
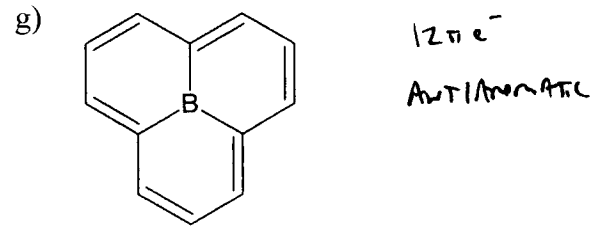
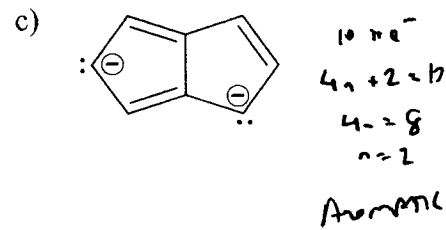
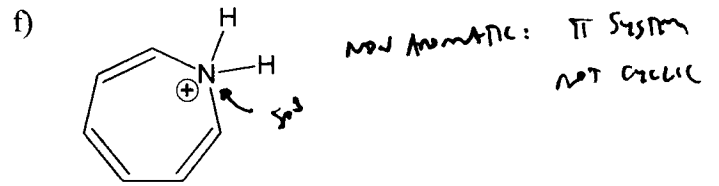
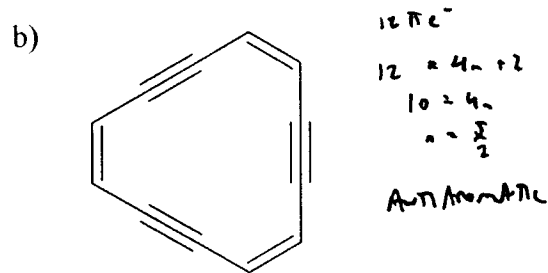
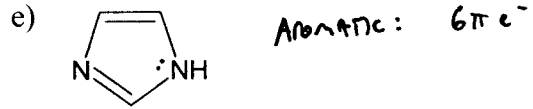
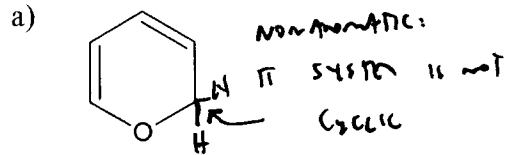


CHT 212
Exam I

1. For each of the following compounds, predict whether the compound should be aromatic, antiaromatic, or nonaromatic. Explain your answers.

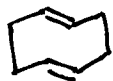


2. Draw the structure of the following compounds.

a) *m*-dinitrobenzene



b) (*E, E*)-1,5-cyclooctadiene

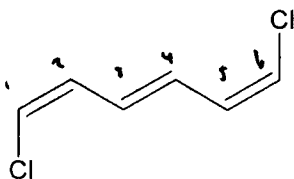


c) 6,6-dimethyl-2-cyclohex-2-ene-1-one



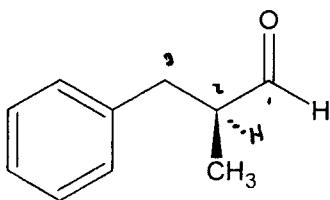
3. Provide unambiguous, systematic names for each compound.

a)



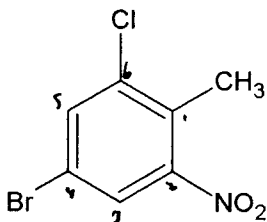
(1*E*,3*E*,5*E*)-1,6-dichloro-1,3,5-hexatriene

b)



(*S*)-2-methyl-3-phenylpropanal

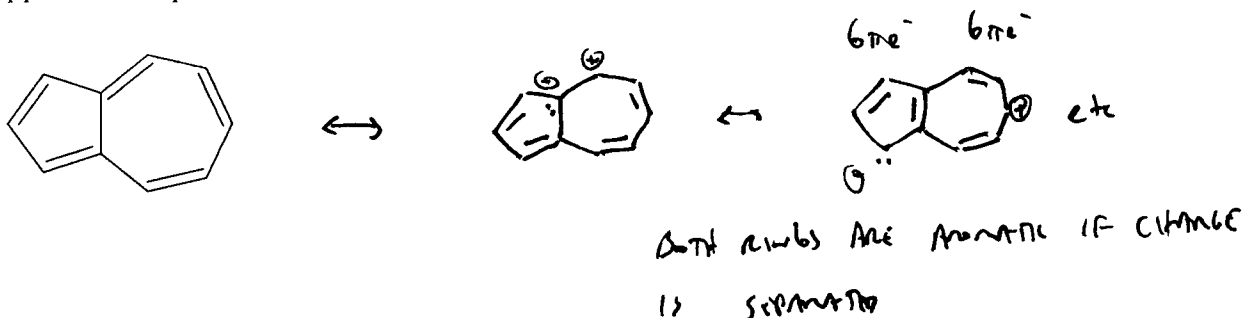
c)



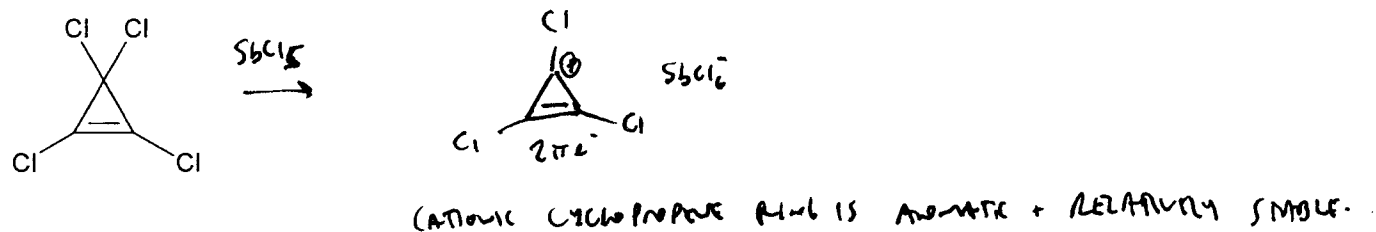
4-bromo-6-chloro-2-nitrotoluene

4. Explain the following phenomena:

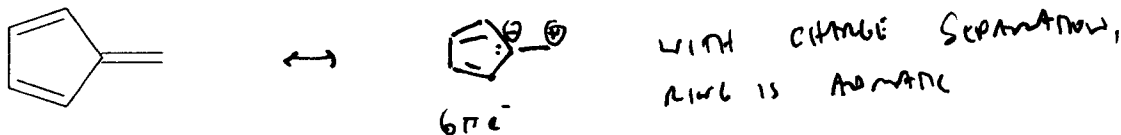
a). The compound bicyclo[5.3.0]decapentaene, shown below, is a stable blue solid with an appreciable dipole moment.



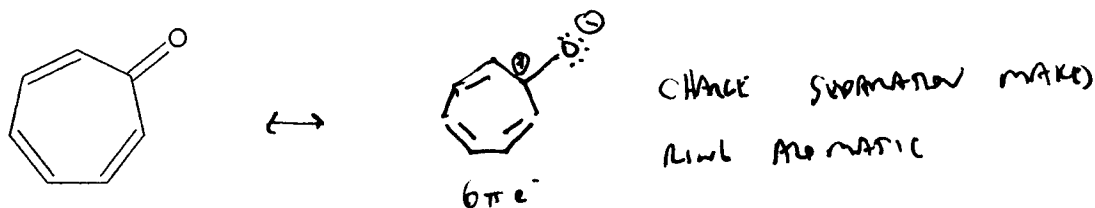
b) The compound 1,2,3,3-tetrachlorocyclopropene, shown below, forms a stable salt of composition $C_3Cl_3^+ SbCl_6^-$ when treated with the Lewis acid $SbCl_5$.



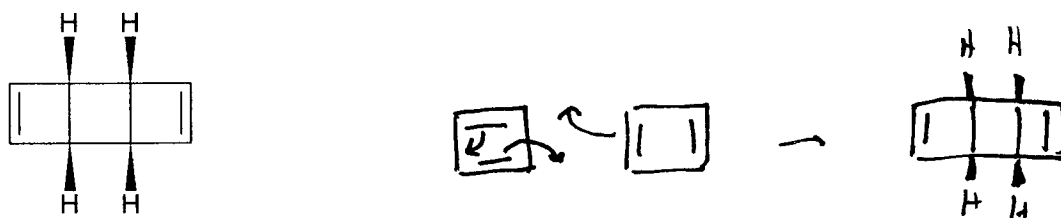
c) The compound fulvene, shown below, is extremely susceptible to nucleophilic attack at the exocyclic CH_2 group.



d) The compound tropone, shown below, has an unusually basic oxygen in the carbonyl group.



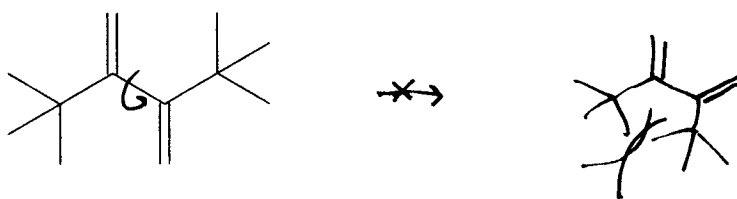
5a) Attempts to prepare cyclobutadiene usually result in the formation of the compound below. Propose a mechanism for the formation of the compound from cyclobutadiene.



THIS IS A DIELS-ALDER REACTION.

6

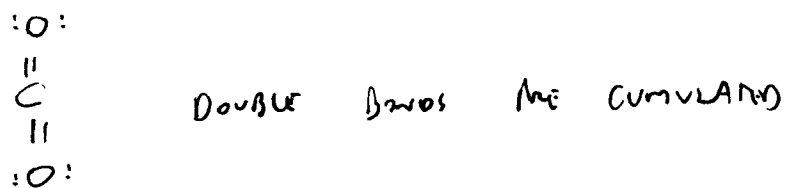
b) The compound shown below is extremely unreactive as a dieneophile in Diels-Alder reactions, despite having two electron donating groups on the diene. Why?



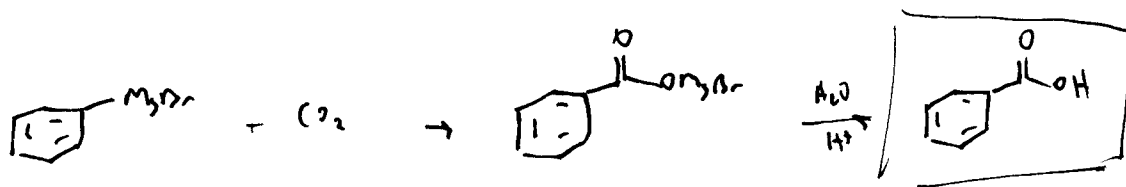
STERIC HINDRANCE OF T-BUTYL GROUPS PREVENTS DIENE FROM ADOPTING S-CIS CONFORMATION.

6

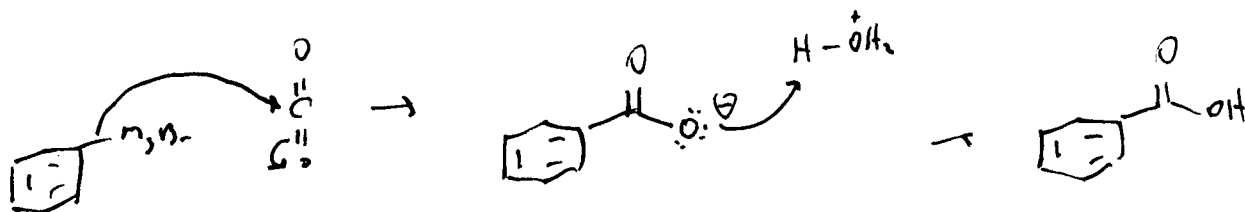
6a) Write a Lewis structure for carbon dioxide. Are the double bonds conjugated, cumulated, or isolated?



b) When phenylmagnesium bromide is treated with carbon dioxide, a reaction occurs that yields a compound of formula $C_7H_6O_2$ after workup with aqueous acid. What is the structure of this compound?

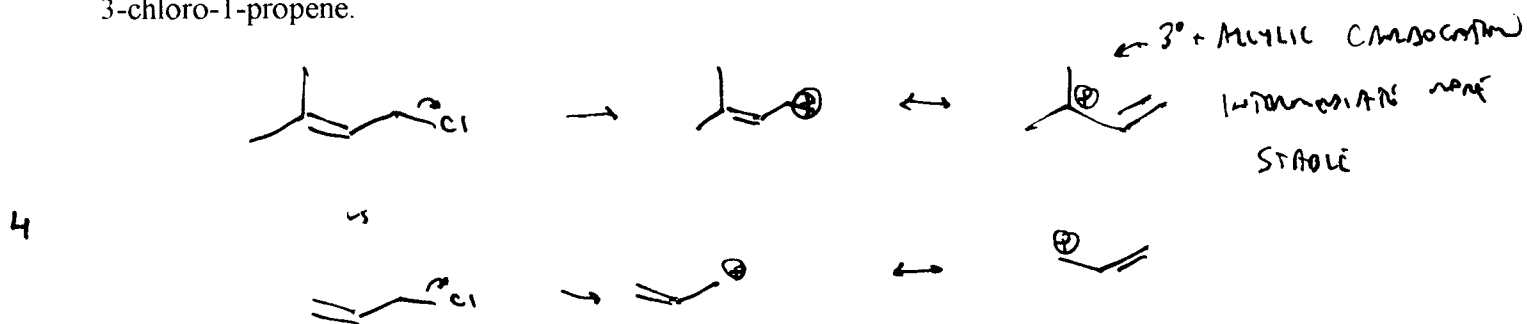


c) Propose a mechanism for this reaction.

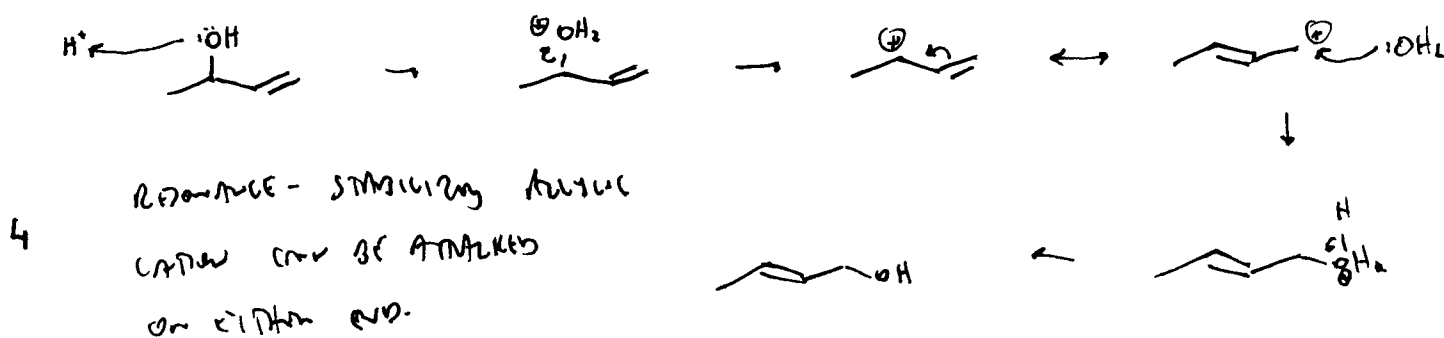


7. Suggest reasonable explanations for the following observations.

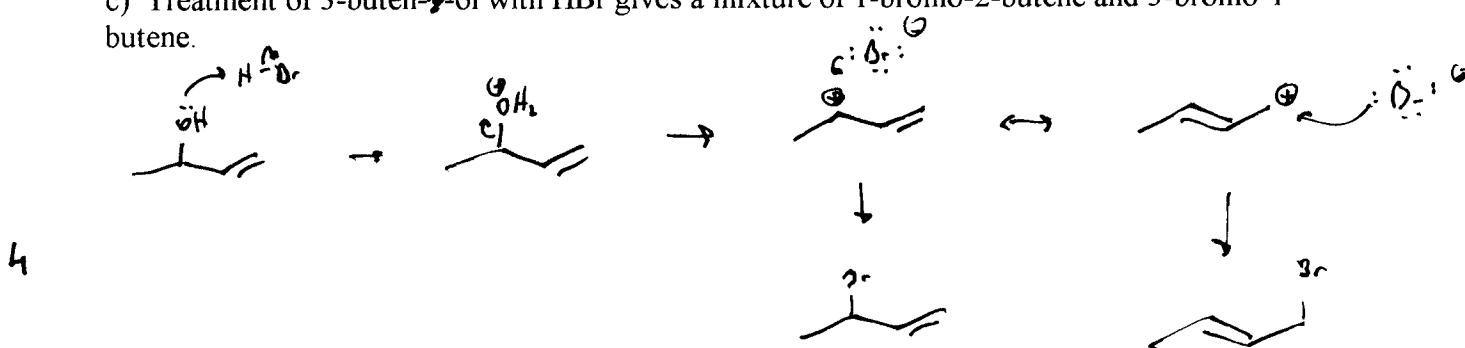
a) The solvolysis of 1-chloro-3-methyl-2-butene in ethanol is over 6000 times faster than that of 3-chloro-1-propene.



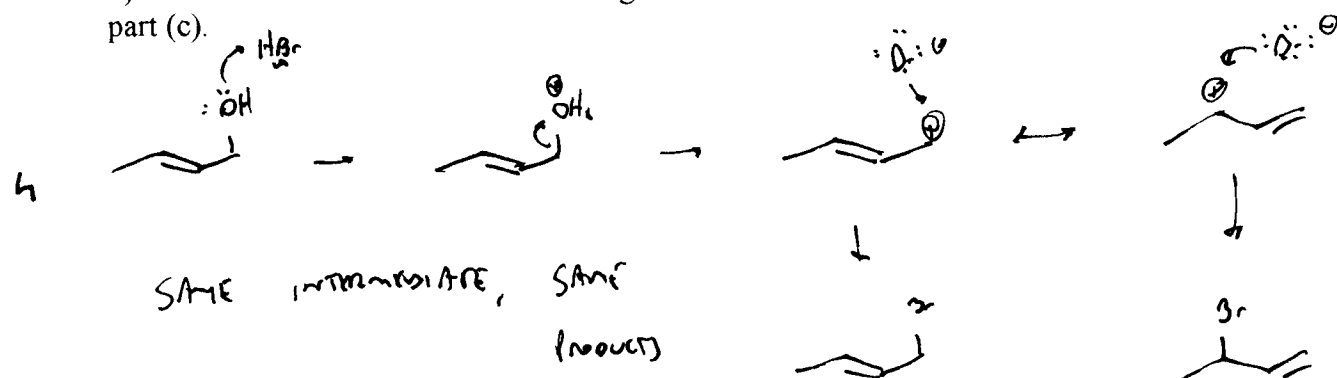
b) After standing for a week, a solution of 3-buten-2-ol in aqueous sulfuric acid contained a mixture of 3-buten-2-ol and 2-buten-1-ol.



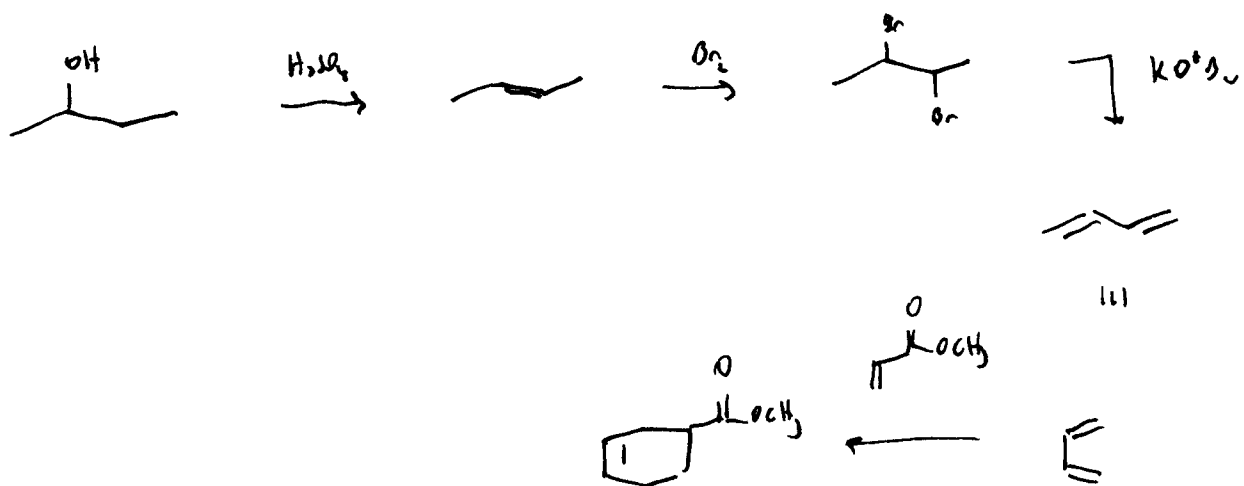
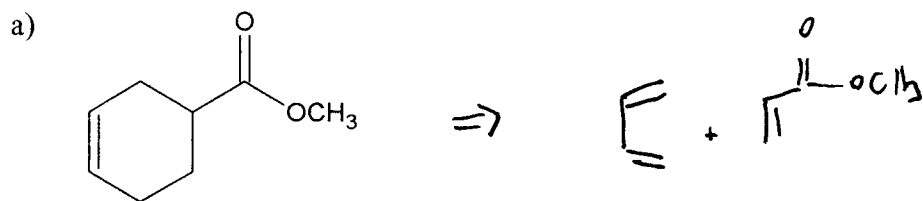
c) Treatment of 3-buten-2-ol with HBr gives a mixture of 1-bromo-2-butene and 3-bromo-1-butene.



d) Treatment of 2-buten-1-ol with HBr gives an identical mixture of the same bromides as in part (c).

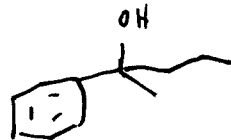
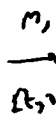
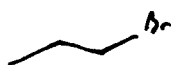
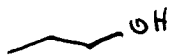
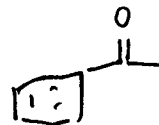
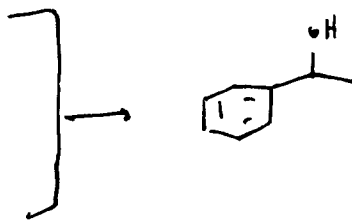
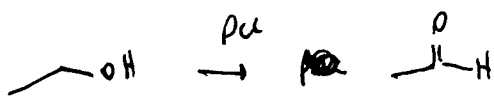
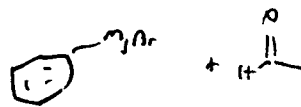
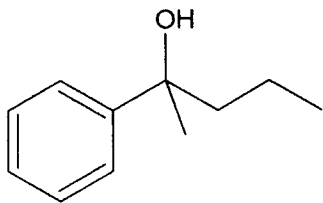


8. Assuming that you have only alcohols or esters containing no more than four carbon atoms, show how you might synthesize the following compounds. If needed, you may use oxirane and bromobenzene, but you must show the synthesis of any other required organic compounds. Assume you have available any solvents and any inorganic reagents that you require.



8

b)



8