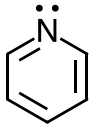
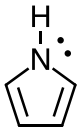
Objective 6. Identify an aromatic compound and apply substitution, elimination, and oxidation-reduction principles to aromatic side chain reactions.

1. a. Cyclopentadiene is not aromatic but the cyclopentadiene anion is aromatic. Apply the aromaticity rules to each compound.

b. Pyridine (it stinks) is aromatic. The N on pyridine is trigonal planar and is sp^2 hybridized. The lone pair on N is not part of the conjugated pi system. This means the lone pair occupies the ____ orbital and the pi bond occupies the _____ orbital. (Choices: sp^2 hybrid orbital or p orbital)

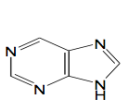


c. The N on pyrrole is sp^2 hybridized. Pyrrole has a lone pair on the N. This lone pair is part of the conjugated pi system. Is pyrrole aromatic?

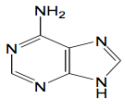


d. The furan ring is aromatic. Is each lone pair on the O part of the conjugated pi system?

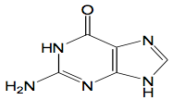
e. DNA bases are aromatic. How many pi electrons does each base have? Are the lone pairs on N part of the conjugated pi system?



Purine

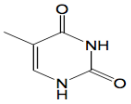


Adenine

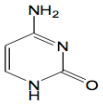


Guanine

Pyrimidine



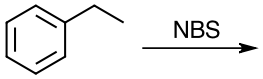
Thymine



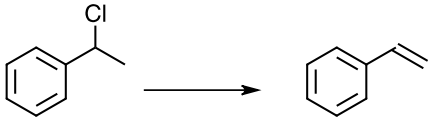
Cytosine

2. Reactions on arene side chain.

a. NBS is a special brominating agent in which Br substitutes for H at the allylic C. Identify the allylic C. Then, draw the structure of the product.



b. Consider the reaction. What reaction type? The Cl behaves like a _____. What reagent would you use? Use curved arrows to show how reactant forms product.

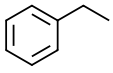


A B

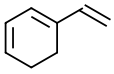
c. Which pi bond in the Structure B is more reactive? Why?

d. What reagent would you use to convert Structure B back to Structure A? Use curved arrows to show how this reaction occurs.

e. Which product forms when Structure B reacts with H_2/Pd? Why?

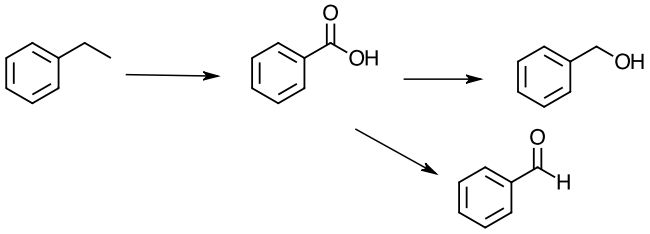


C



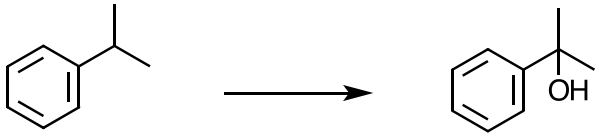
D

f. Classify each reaction as an oxidation or reduction reaction. What reagent would you use in each reaction?



3. Describe a synthesis.

a. How many carbons are in the starting material and target compound? What is the reaction type? At what position is something happening? Does a C-C bond have to form? If so, what method would you use (acetylide, Grignard)?



b. How many carbons are in the starting material and target compound? What is the reaction type? At what position is something happening? Does a C-C bond have to form? If so, what method would you use (acetylide, Grignard)?