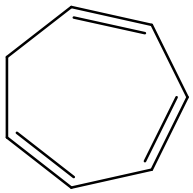
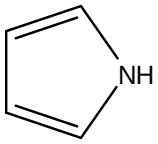
**Chemistry 2500 (Fall 2017): Assignment #10 – Aromaticity**

1. Label the following as aromatic, antiaromatic or nonaromatic. Briefly justify your choice.

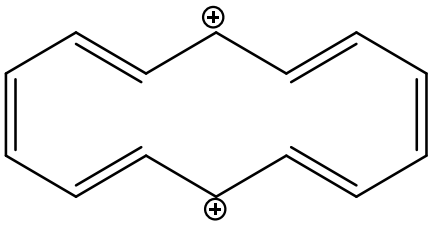
a)



b)

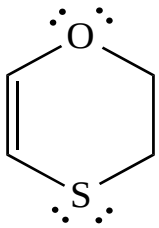



c)

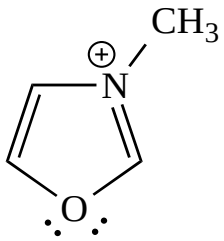


2. Apply the criteria for aromaticity to each of the following molecules and classify them as aromatic, non-aromatic or antiaromatic. Where appropriate, indicate the number of π-electrons that are part of the pertinent π-system. Assume that all of these molecules are planar.

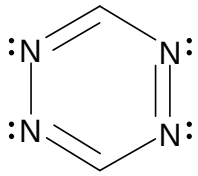
a)



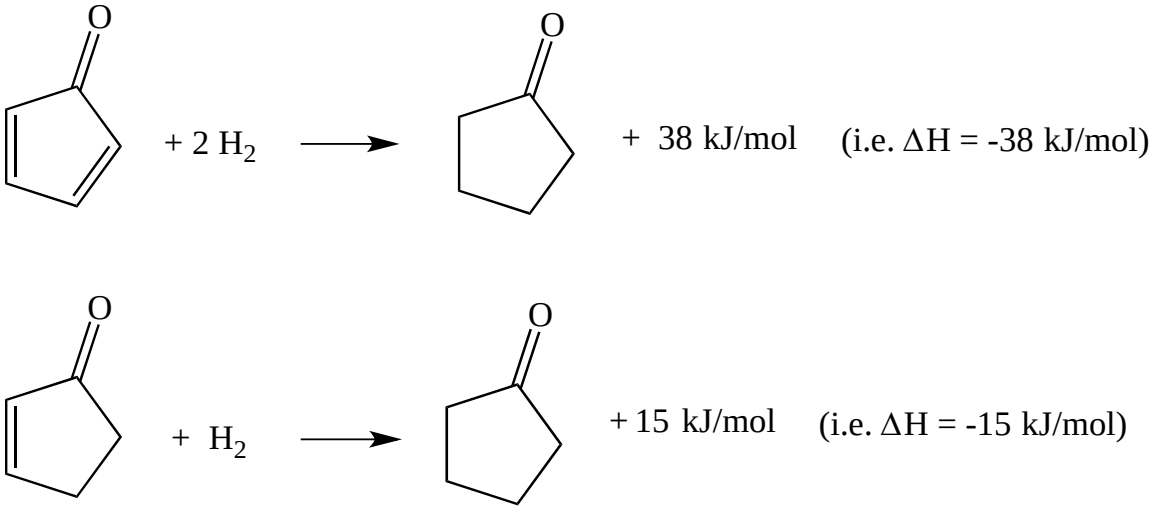
b)




c)




3. a) The following hydrogenation data is for the molecules cyclopentadienone and cyclopentenone.



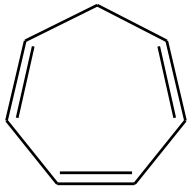

Heats of hydrogenation are often used to calculate resonance energies. Though cyclopentadienone does not fit our criteria for aromaticity, it is nonetheless an interesting case. Using the same process that is applied to determining the resonance energy of benzene, calculate a "resonance energy" for this molecule.

b) Based on your answer to (a), does cyclopentadienone have aromatic, or antiaromatic character? *Briefly* explain.

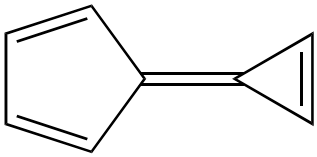
c) For the C=O bond, we often draw a charge-separated resonance structure in which the C–O π electrons are moved (localized) onto the O atom. Draw this resonance structure for cyclopentadienone.

d) How does this resonance structure help explain your answer to part (b)?

4. Removal of a hydride ($H^-$) or proton from cycloheptatriene (depicted below) gives a cation or an anion, respectively. Which process is more likely? Sketch the π MO diagrams for both species as part of your answer.



5. The molecule below has a much greater molecular dipole than you would expect for a hydrocarbon. Draw the dipole on this molecule and explain its origin.



b) One of the molecules below is 30 orders of magnitude more acidic than the other. Which one and why?