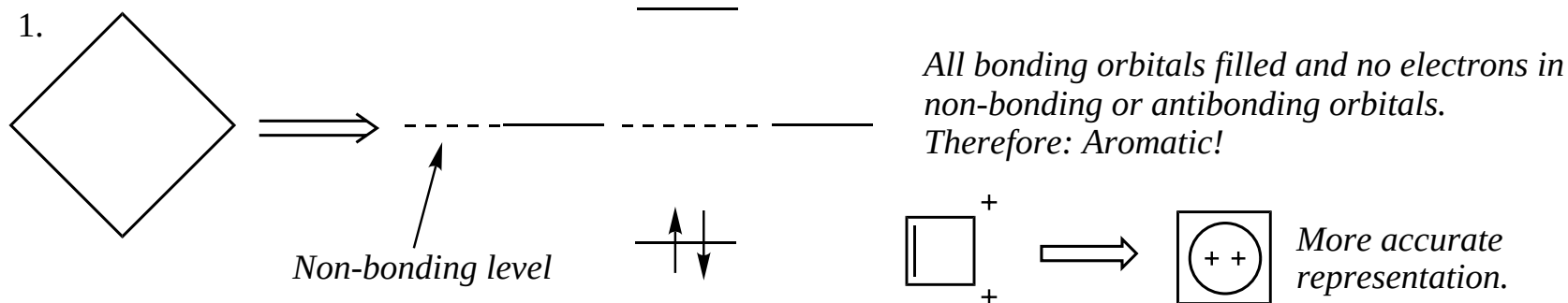
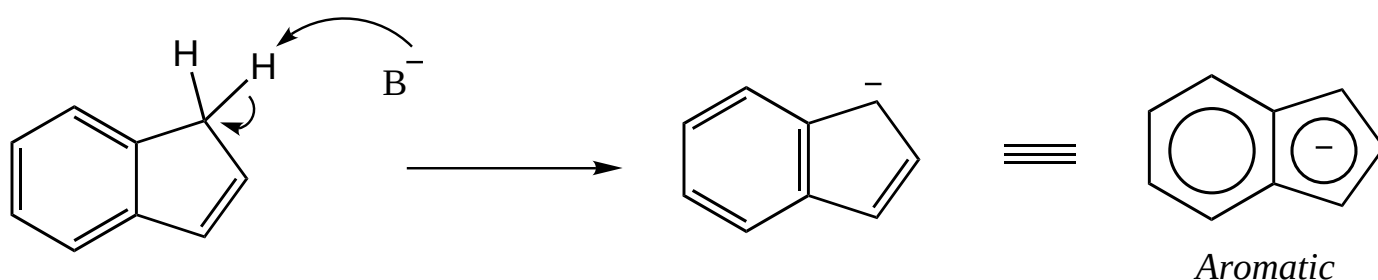


Organic Chemistry c3444y

Problem Set 2 - Answer Key



2. Indicate which is(are) the most acidic proton(s) of indene:

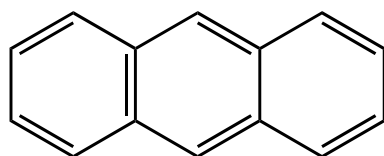


If you were to deprotonate indene at this site would there be any special stability associated with the anion you have left behind? Explain.

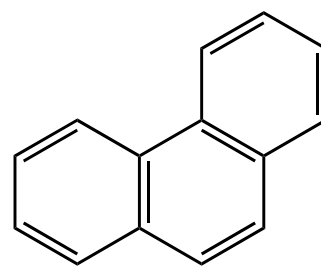
3. Recall our in class analysis of the structure of naphthalene and anthracene. Use resonance theory to explain the greater resonance energy of phenanthrene relative to anthracene. In other words why is phenanthrene "more aromatic" than anthracene?

Resonance Energy

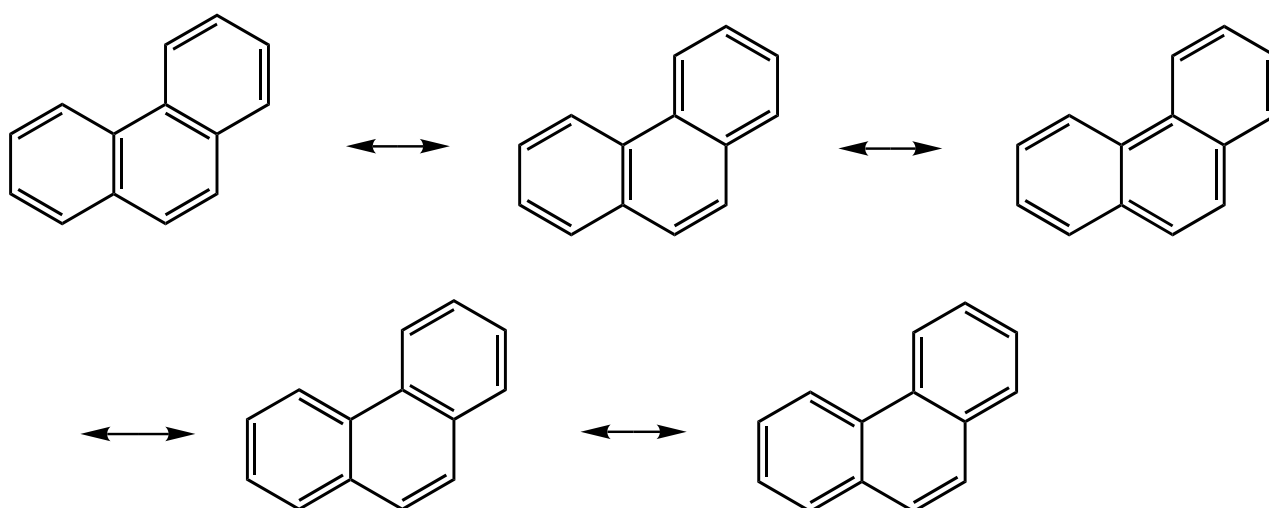
Benzene	= 36 kcal/mol
Naphthalene	= 61 kcal/mol
Anthracene	= 84 kcal/mol
Phenanthrene	= 92 kcal/mol



Anthracene

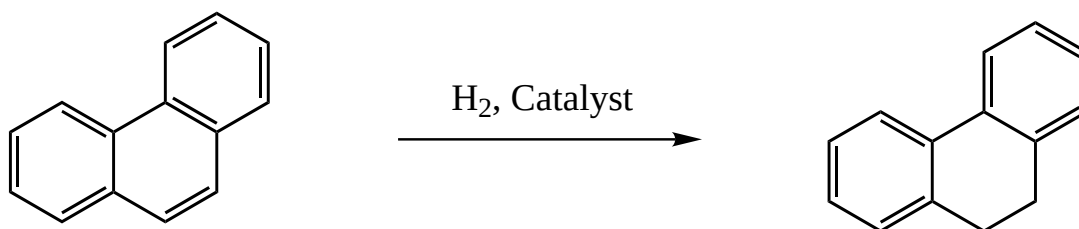


Phenanthrene



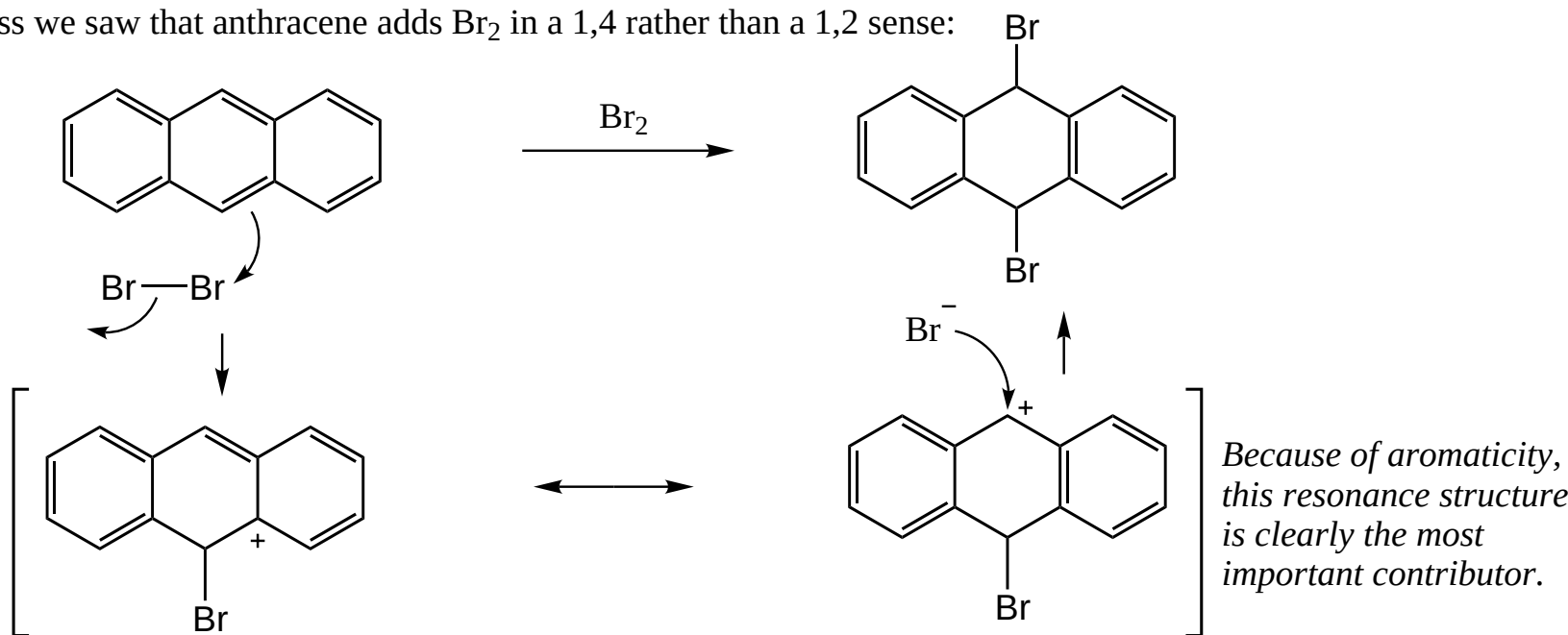
The rings on the ends are aromatic in 4/5 or 80% of the resonance structures. The ring in the middle is aromatic in 2/5 or 40% of the resonance structures. Overall, this is more "aromaticity per ring" than anthracene where we concluded that each ring is aromatic in 50% of its resonance structures.

4. a.

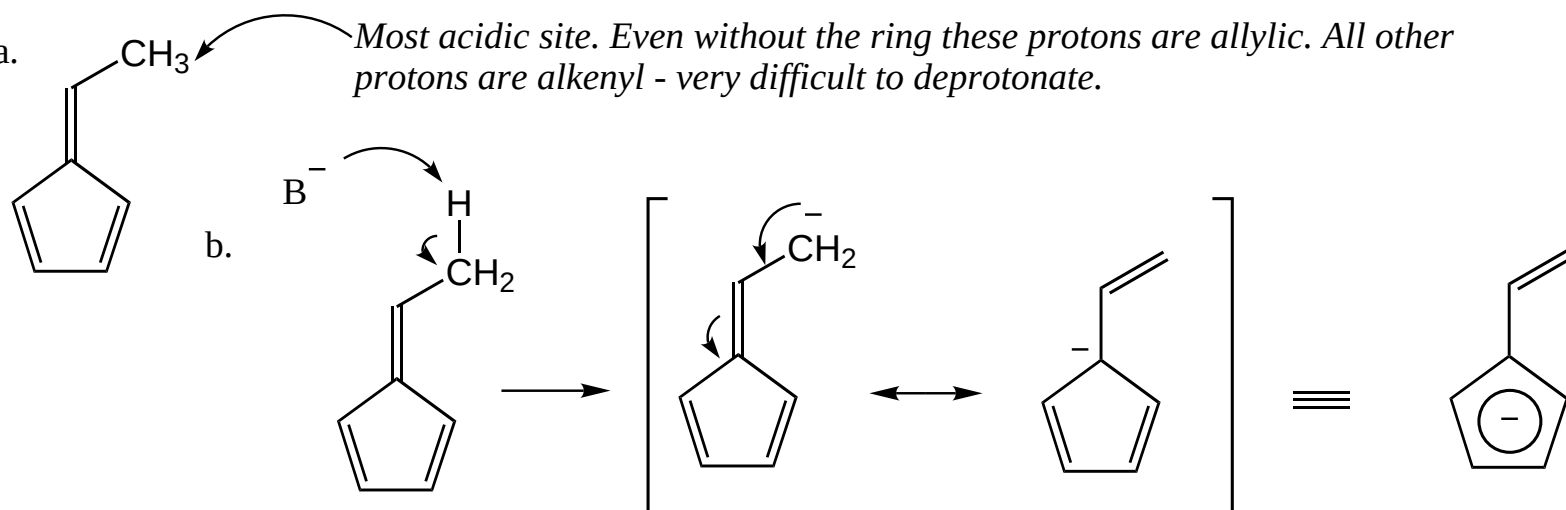


In doing this reduction, we've gone from a phenanthrene to two separate benzene rings, and we've lost $92 - (36 \times 2) = 20$ kcal/mol of resonance energy. Reduction of any other of the double bonds of phenanthrene would lead to a much greater loss of resonance energy. Try it!

b. In class we saw that anthracene adds Br_2 in a 1,4 rather than a 1,2 sense:



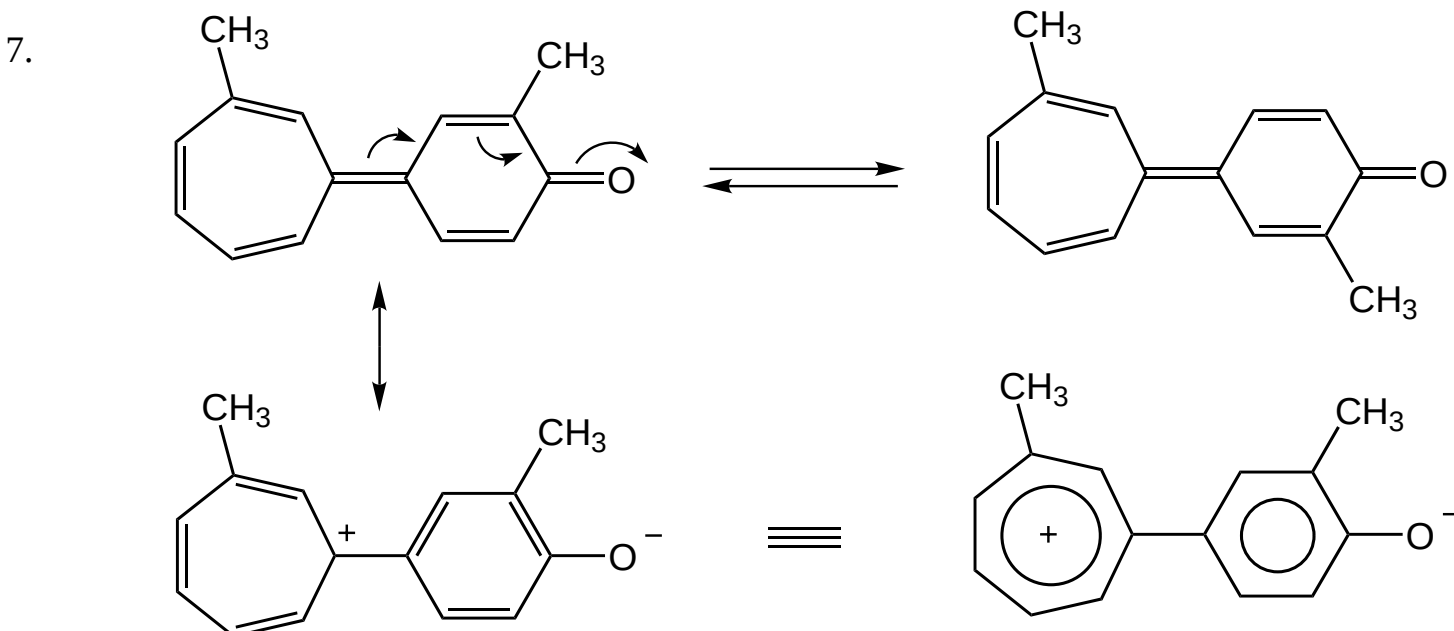
5. a. *Most acidic site. Even without the ring these protons are allylic. All other protons are alkenyl - very difficult to deprotonate.*



Like any allyl anion, we can draw these resonance structures. In this case the resonance structure on the right is aromatic:

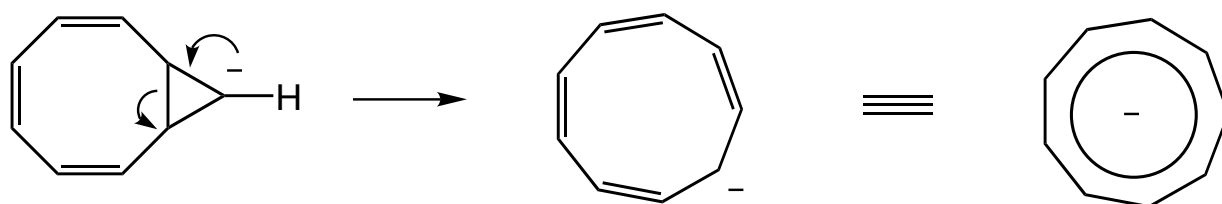
6. For the following pair of reactions, which one should be faster? Why?

ii is faster. In i, an antiaromatic cation is produced. In ii, a stable doubly allylic cation is produced.



Very strong contributor, because both rings are aromatic. Therefore, much single bond character in the middle, and rotation is facile.

8.



10 π electrons - Aromatic!