PRACTICE PROBLEMS – UNIT 15 KEY

15A.1

a) *o*-nitroaniline

b) *p*-bromotoluene

c) 3,4-diethylbenzoic acid

d) *p*-diisopropylbenzene

e) iodobenzene

f) 2,4,6-tribromophenol

g) pentylbenzene

h) 1-phenylheptane

i) *p*-nitroaniline

j) 3-benzyl- 1-phenylnonane

k) 2,2-diphenylnonane

l) *m*-ethylphenol

m) 2-methyl-3,3-diphenyloctane

n) 1,3-diethyl-5-isopropylbenzene

o) *p*-nitrophenol

p) 2,6-dibromotoluene

q) 5-benzyl-1-phenylnonane

r) *o*-nitrobenzoic acid

s) 2,5-dibromo-4-ethylaniline

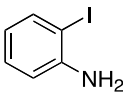
t) *m*-chloro-fluorobenzene

u) 1,2,4,5-tetrachlorobenzene

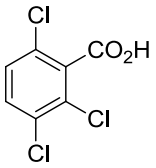
v) 2-bromo-1,3,5-trichlorobenzene

15A.2

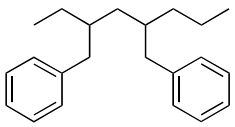
a)



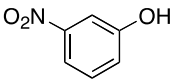
b)



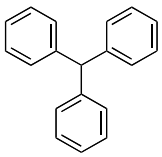
c)



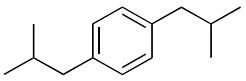
d)



e)



f)



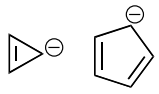
15A.3 When choosing between two equal length chains, preference goes to the more substituted chain. A 2-benzyl would be named as a 1-phenyl-2-methyl.

15B.1 Determine if the following molecules are aromatic, anti-aromatic, or non-aromatic. If non-aromatic state why.

a) aromatic
b) non-aromatic, not fully conjugated
c) non-aromatic, exocyclic pi bond
d) aromatic
e) aromatic
f) aromatic
g) anti-aromatic
h) non-aromatic, not fully conjugated
i) aromatic
j) non-aromatic (has aromatic resonance)
k) aromatic
l) aromatic
m) aromatic
n) aromatic
o) non-aromatic, not cyclic
p) anti-aromatic
q) non-aromatic, not fully conjugated
r) aromatic
s) non-aromatic, not fully conjugated
t) anti-aromatic
u) aromatic
v) aromatic
w) aromatic
x) non-aromatic, non-planar
y) aromatic
z) non-aromatic, exocyclic pi bonds
aa) aromatic
bb) non-aromatic, not fully conjugated
cc) non-aromatic, non-planar
dd) aromatic

15C Use principles of aromaticity to predict properties of molecules.

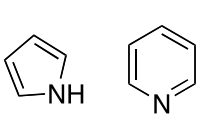
15C.1



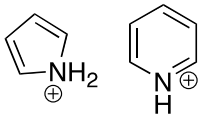
A B

The conjugate base of A is anti-aromatic, the conjugate base of B is aromatic. The compound with the more stable conjugate base (B) is more acidic.

15C.2



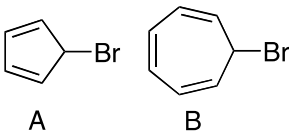
A B



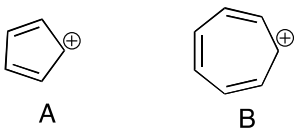
A B

Both A and B are aromatic. The conjugate acid of A is non-aromatic while the conjugate acid of B maintains its aromaticity. Since B does not lose stability upon protonation, B is more basic.

15C.3



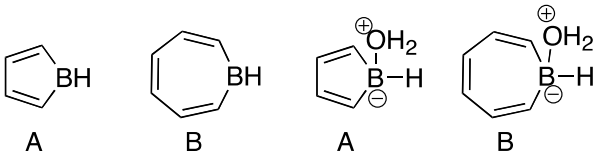
A B



A B

SN1 RDS involves formation of a cation; the more stable the cation, the faster the rate. A's cation is anti-aromatic; B's is aromatic, therefore more stable and results in a faster reaction.

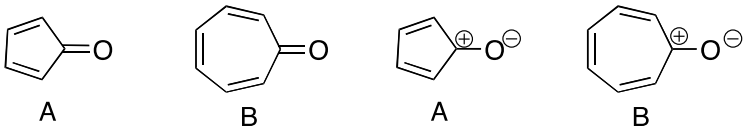
15C.4



A B A B

A is anti aromatic, B is aromatic, therefore A is more reactive. Moreover once reacted with a Lewis base (rxn with water shown) A and B both become non-aromatic – a favorable change for A but not for B.

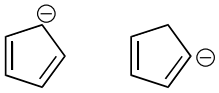
15C.5



A B A B

The resonance structure of B is aromatic, thus a major contributor to the hybrid structure. The ionic resonance structure makes the overall molecule more polar. A's resonance structure is anti-aromatic and thus a minor contributor.

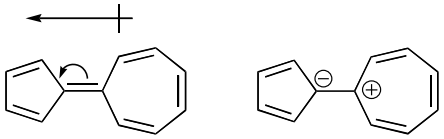
15C.6



A B

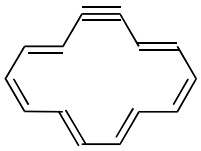
B is a better base – it stays non-aromatic upon reaction. A would lose aromaticity upon reaction which would be unfavorable energetically.

15C.7



The aromatic resonance structure leads to a dipole moment.

15C.8



The compound only has 14 electrons that are part of the pi system. The pi bonds are at right angles in the triple bond, so only one pi bond can overlap with the rest of the ring system.