Spring 2017 (March 22)

1. Use the Woodward-Fieser table to estimate the λ_{max} observed in a UV spectra of the following cross-conjugated systems (6 pts)

Acyclic	217 nm
Heteroannular	214 nm
Homoannular	253 nm

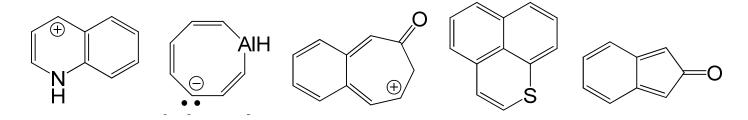
For each additional conjugated double bond	+ 30 nm
For each exocyclic double bond	+ 5 nm
For each substituent	
C-substituent	+ 5 nm
Cl	+ 5 nm
Br	+ 5 nm
O-Alkyl	+ 6 nm
OCOCH₃	+ 0 nm
N(alkyl) ₂	+ 60 nm
S-alkyl	+ 30 nm
Solvent correction	+ 0 nm

2. Name the following compounds (3 \times 6 = 18 pts)

$$O_2$$
N O

$$O_2N$$
 OH Br

3. Classify the following molecules as aromatic, anti-aromatic or non-aromatic (5 pts)



4. Predict the major product(s) expected from the following reaction sequences (3 x 14 = 42 pts)

(a)

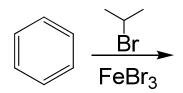
$$\begin{array}{c|c}
& Br_2 \\
\hline
& BBr_3
\end{array}$$

$$\begin{array}{c}
HNO_3 \\
H_2SO_4
\end{array}$$

$$\begin{array}{c}
SO_3 \\
\hline
H_2SO_4
\end{array}$$

$$\frac{\mathsf{HNO}_3}{\mathsf{1/}_2\,\mathsf{I}_2}$$

(d)



Light

(f)

(g)

(h)

$$\begin{array}{c}
\text{OCH}_3\\
\hline
\text{HNO}_3\\
\hline
\text{H}_2\text{SO}_4
\end{array}$$

Fe, HCI

(i)

(j)

(k)
$$\frac{\text{CI}_2}{\text{AICI}_3} \qquad \frac{\text{KMnO}_4}{\text{NaOH, Heat}}$$

SO₃H
$$Br_2 D_2O D_2SO_4$$
OCH₃

$$\begin{array}{c}
\text{HNO}_{3} \\
\hline
\text{H}_{2}\text{SO}_{4}
\end{array}$$

$$\begin{array}{c}
\text{Zn(Hg)} \\
\hline
\text{HCI}
\end{array}$$

(n)

$$\begin{array}{c}
\text{Na}_2\text{Cr}_2\text{O}_7 \\
\hline
\text{H}_2\text{SO}_4
\end{array}$$

(o) NO₂

5. Show how you would synthesize each of the following compounds from the given starting material(s). You must draw keys intermediates to receive full credit (3 \times 6 = 18 pts)

(a)

(b)

(c)

(d)

(e)

(f)

6. Propose a mechanism consistent with the following reactions (you must show all the intermediates to receive full credit) ($3 \times 3 = 9 \text{ pts}$)

(a)

(b)

(c)

$$\bigcirc \stackrel{\text{OH}}{\longrightarrow} \bigcirc \stackrel{\text{OH}}{\longrightarrow}$$