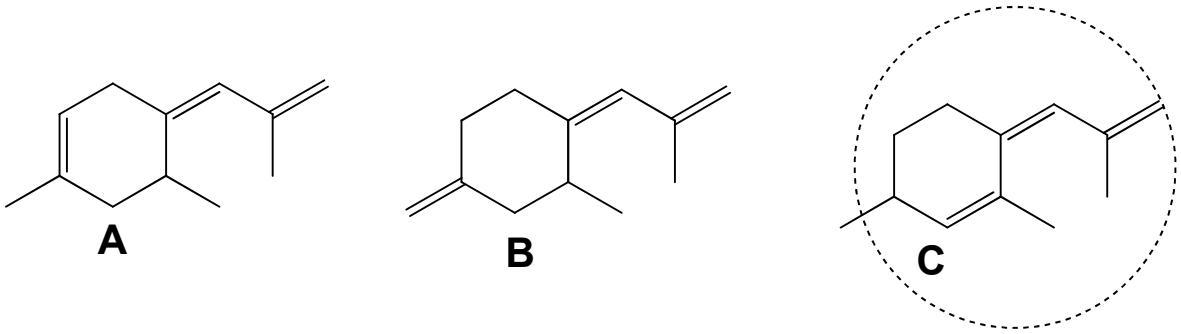
WORKSHEET IV_Keys

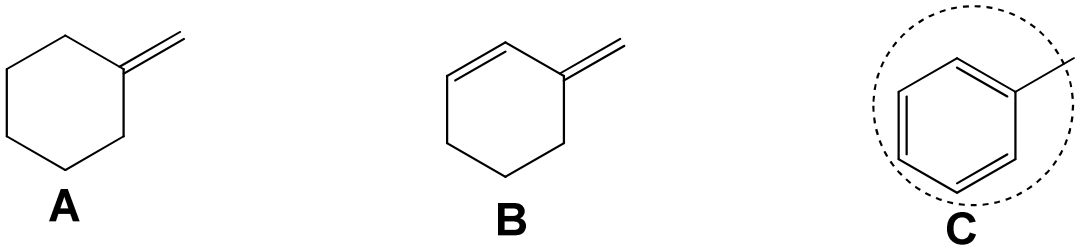
1. In each set of compounds, identify the most stable

(a)



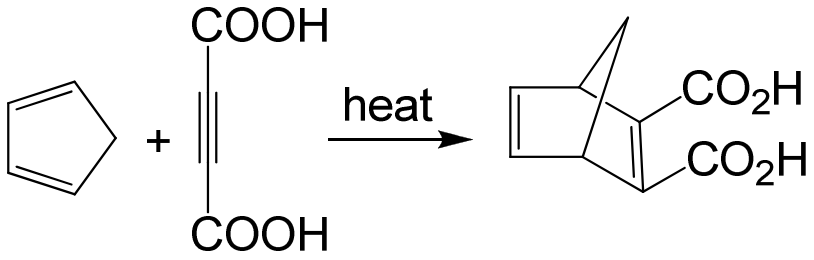
More stable due to more resonance structures

(b)

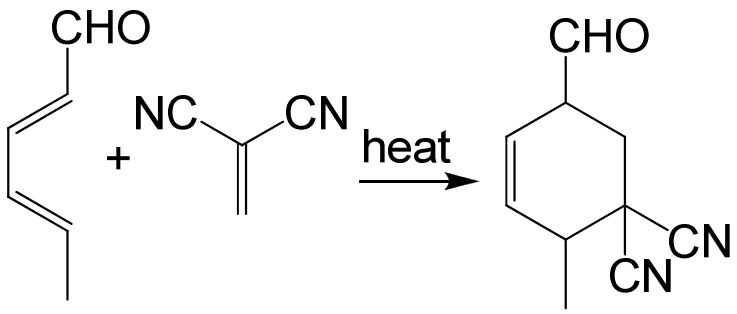


2. What is the product(s) of the following reactions?

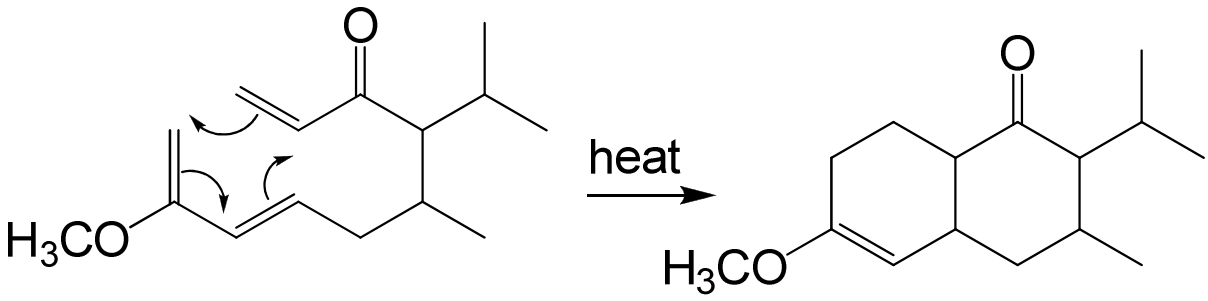
A



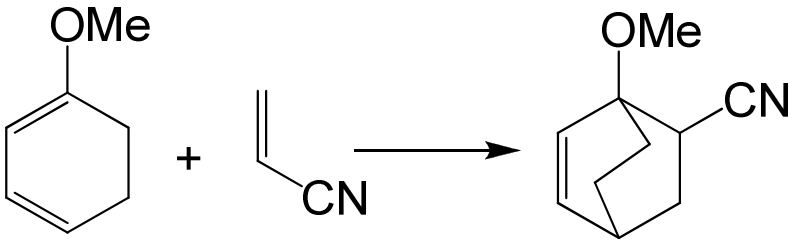
B



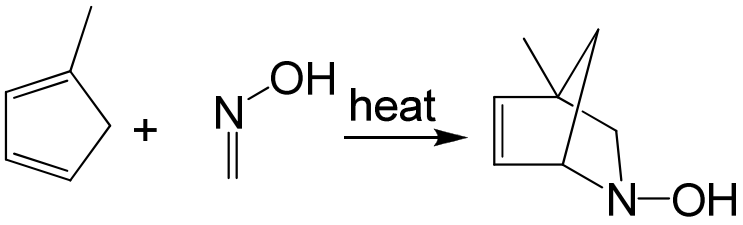
C


O
H3CO
heat
O
H3CO

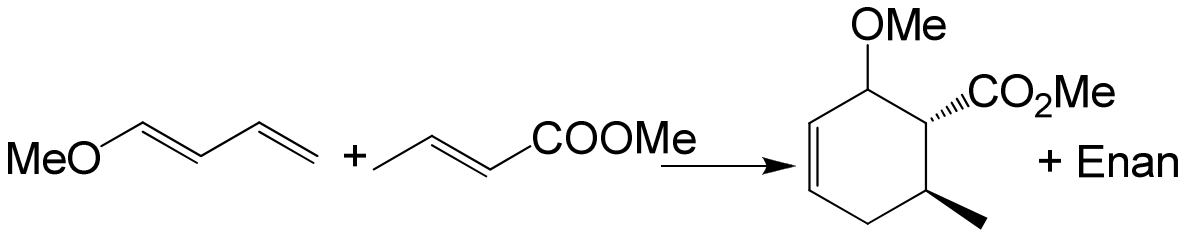
D


OMe
+
CN
OMe
CN

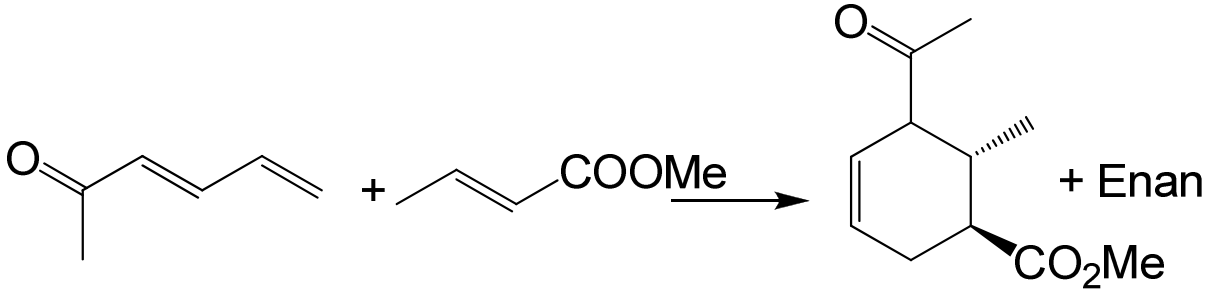
E


+
N
OH
heat
N—OH

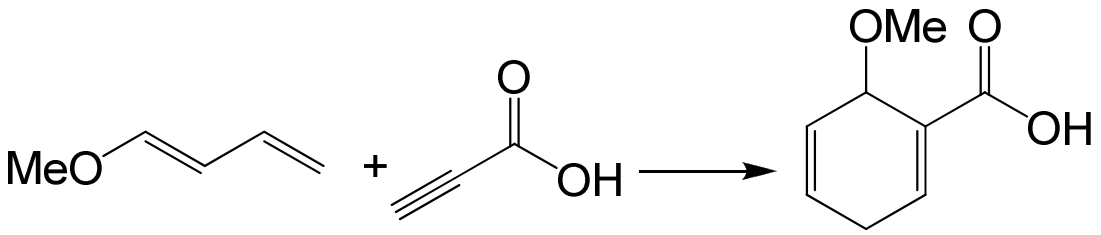
F


MeO
+
COOMe
OMe
CO2Me
+ Enan

G

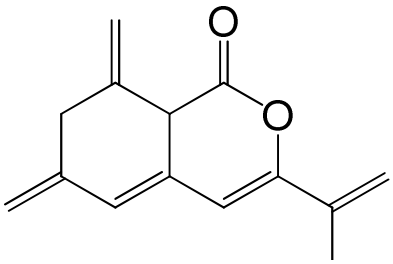

O
+
COOMe
O
+ Enan
CO2Me

H



3. Use the Woodward-Fieser rule and the table from your course material to estimate the λ_{max} for the following cross-conjugated systems

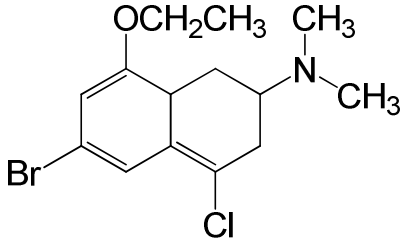
A



Parent value	**= 214**
Extra conjugated C=C	**= 60**
Alkyls	**= 15**
Exocyclic C=C	**= 10**

Total	**= 299**

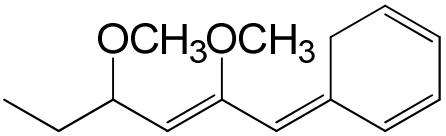
B



Parent value	**= 253**
Extra conjugated C=C	**= 30**
Alkyls	**= 15**
Exocyclic C=C	**= 5**
Cl	**= 5**
Br	**= 5**
OCH_2CH_3	**= 6**

Total	**= 319**

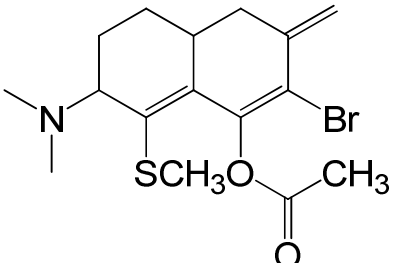
C



Parent value	**= 253**
Extra conjugated C=C	**= 60**
Alkyls	**= 15**
Exocyclic C=C	**= 5**
OCH_3	**= 6**

Total	**= 339**

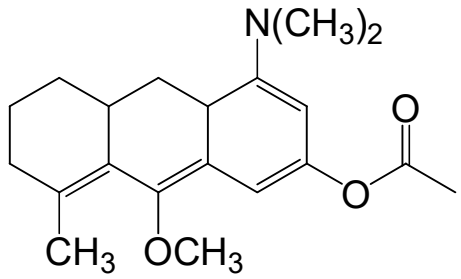
D



Parent value	**= 214**
Extra conjugated C=C	**= 30**
Alkyls	**= 15**
Exocyclic C=C	**= 10**
SCH_3	**= 30**
Br	**= 5**

Total	**= 304**

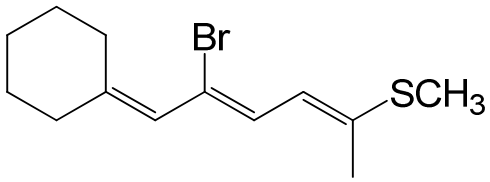
E



Parent value	**= 253**
Extra conjugated C=C	**= 60**
Alkyls	**= 25**
Exocyclic C=C	**= 10**
OCH_3	**= 6**
$N(CH_3)_2$	**= 60**

Total	**= 414**

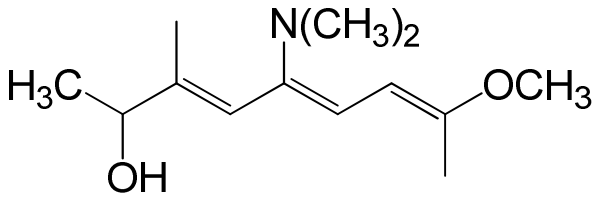
F



Parent value	**= 217**
Extra conjugated C=C	**= 30**
Alkyls	**= 15**
Exocyclic C=C	**= 5**
SCH_3	**= 30**
Br	**= 5**

Total	**= 302**

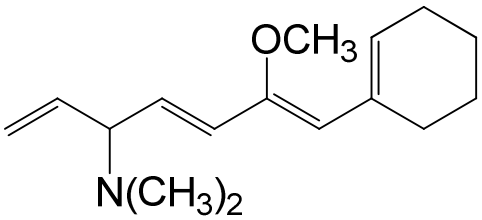
G



Parent value	**= 217**
Extra conjugated C=C	**= 30**
Alkyls	**= 15**
$N(CH_3)_2$	**= 60**
OCH_3	**= 6**

Total	**= 328**

H



Parent value	**= 217**
Extra conjugated C=C	**= 30**
Alkyls	**= 15**
OCH_3	**= 6**

Total	**= 268**

4. Explain why in the IR spectrum the signals are downward, and upward in the UV spectrum.

This is because IR measures transmittance and UV measures absorbance. The two effects are opposites of each other.

5. You are hired by a chemical plan to design a new sunscreen that could protect the skin from UVA and UVB radiations. Explain in detail how you will approach such a task.

UVA is the longest of the two (320-400 nm) while UVB ranges from 290 to 320 nm. The approach will be to design a molecule that will absorb any UV radiation with a wavelength within the UVA and UVB wavelengths (290 – 400 nm).The rule of increments can be used to estimate the λmax of the molecules designed.

6. Use the given data to calculate the missing parameter.

(a) A solution of methyl p-aminobenzoate has an absorbance (A) of 0.43 at and ε = 1.23 x 10^4 $M^{-1}cm^{-1}$. What is the concentration of such a solution? The path length is 2.3 cm.

$A = \varepsilon cl$, meaning $C = A/\varepsilon l = 0.43 / (1.23 \times 10^4 \times 2.3) = 1.52 \times 10^{-5}$ mol/l

(b) 4-Hydroxyxanthone has an absorption coefficient of 3.675 x 10^3 M^{-1} cm^{-1}. What is the concentration of a solution of a solution of 4-hydroxyxanthone having an absorbance (A) of 0.56? The path length is 1.6 cm.

$A = \varepsilon cl$, meaning $C = A/\varepsilon l = 0.56 / (3.675 \times 10^3 \times 1.6) = 9.52 \times 10^{-5}$ mol/l

(c) What is the concentration of β-carotene in solution if a solution has an absorbance (A) of 0.91 and a molar absorptivity coefficient of 2.3 x 10^5 $M^{-1}cm^{-1}$? The path length is 1.3 cm.

$A = \varepsilon cl$, meaning $C = A/\varepsilon l = 0.91 / (2.3 \times 10^5 \times 1.3) = 3.04 \times 10^{-6}$ mol/l

7. Explain why saturated systems although they enable σ to σ* transition are not UV active.

This just because σ to σ* transition requires a radiation which wavelength is outside the UV range. As such, UV radiation is unable to enable such a transition.