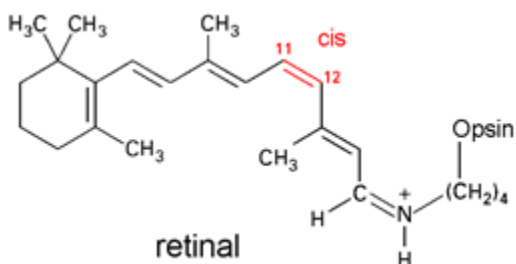


1. Answer the questions about the structure of rhodopsin's chromophore, retinal, shown below.



a) How many molecular orbitals will retinal's conjugate pi system have?

- (1) 6 (2) 8 (3) 10 (4) 12 (5) 15

b) How many nodes would the HOMO of retinal's conjugate pi system have?

- (1) 1 (2) 3 (3) 5 (4) 7 (5) 9

2. I often get the question, why does the HOMO-LUMO gap decrease with increasing conjugation. Presented in this question is one explanation.

a) Draw the HOMO and LUMO for 1,3-butadiene.

<u>MO</u>	<u># nodes</u>	<u>depiction</u>
LUMO		
HOMO		

b) Draw the HOMO and LUMO for 1,3,5-hexatriene.

<u>MO</u>	<u># nodes</u>	<u>depiction</u>
LUMO		

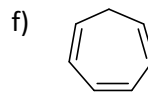
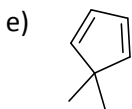
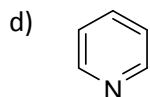
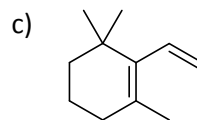
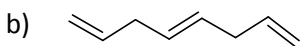
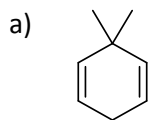
HOMO

c) What is the percent increase in the number of nodes for 1,3-butadiene?

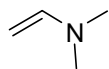
d) What is the percent increase in the number of nodes for 1,3,5-hexatriene?

e) Which molecule experiences a greater percentage or relative change in number of nodes and how does this help explain the smaller HOMO-LUMO gap in 1,3,5-hexatriene versus 1,3-butadiene?

3. Circle all the structures with chromophores that would be expected to have strong UV-visible absorption.



4. The enamine functional group shown below has a UV absorption with a $\lambda_{\max}=230$ nm. You will recall that the λ_{\max} for 1,3-butadiene is 217 nm. How does the enamine functional group mimic the π system of 1,3-butadiene allowing it to absorb UV radiation?



enamine