

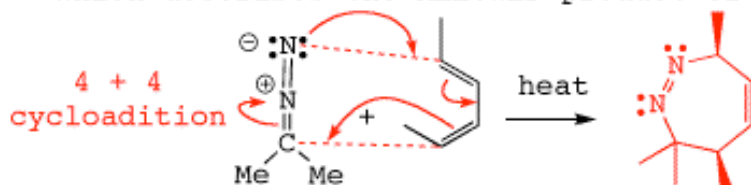
CHM 234, Spring 2018
QUIZ #8 ANSWER KEY

(hit the RETURN Button to return to the Main Quiz Page)

QUESTION 1

MC40a

Which describes the ALLOWED product of this reaction?



- A Hückel transition state, suprafacial/suprafacial reaction
- B Hückel transition state, suprafacial/antarafacial reaction
- C Möbius transition state, suprafacial/suprafacial reaction
- D Möbius transition state, suprafacial/antarafacial reaction**

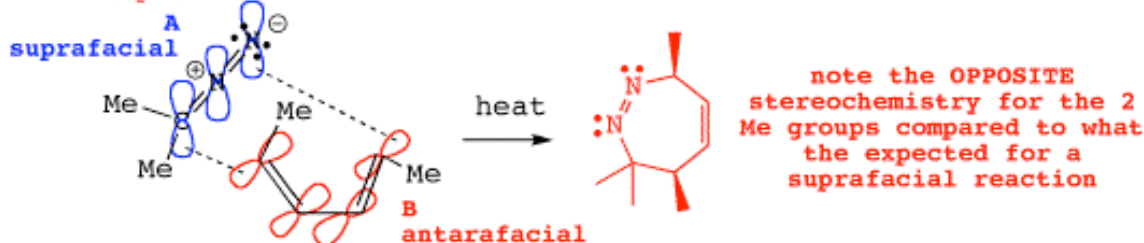
Explaining this using AROMATIC TRANSITION STATE THEORY....

There are 8 electrons in this reaction, therefore the transition state can not be Huckel, since this would be aromatic, the transition state must be Mobius

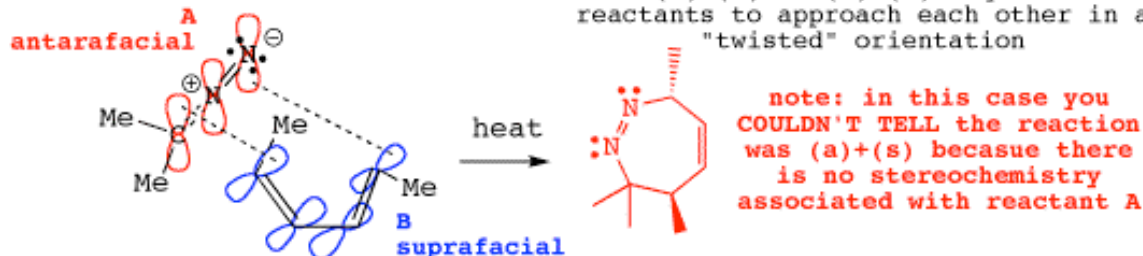
In comparison to the Diels-Alder reaction, which we know has a Huckel transition state and is a suprafacial/suprafacial addition reaction, the allowed reaction must be suprafacial/antarafacial

with seven atoms in the cyclic system there is just enough flexibility to allow a suprafacial/antarafacial reaction, which means both bonds are formed on the same side of one reactant and on the OPPOSITE sides of the other

the reaction can be suprafacial on A and antarafacial on B to give one allowed product



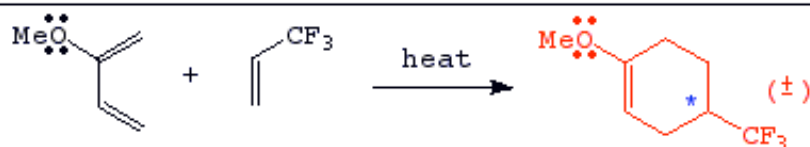
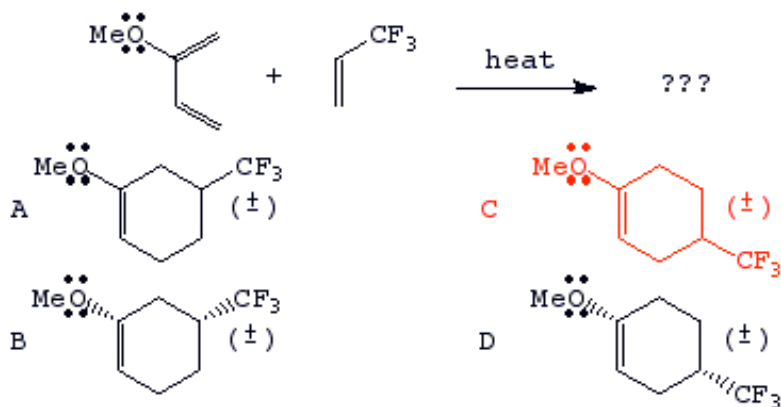
the reaction can ALSO be suprafacial on B and antarafacial on A to give a second (different) allowed product the (s)+(a) or (a)+(s) requires the reactants to approach each other in a "twisted" orientation



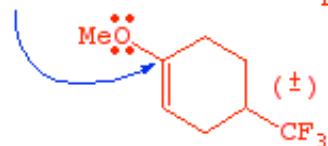
QUESTION 2

MC30u

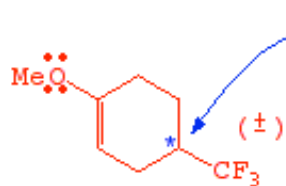
Which *correctly and completely* describes the product of the following Diels-Alder reaction?



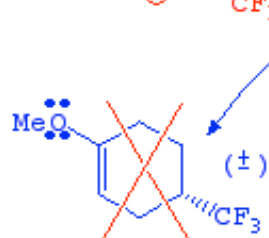
The REGIOCHEMISTRY of the Diels-Alder reaction is such that the 1,2- and 1,4 addition products are always formed (are the Major products), thus A and B can't be correct, only a 1,4-product can be formed in this case. The hybridization at THIS carbon in the product is sp², thus the MeO- donating



group can NOT be wedged or dashed, it has to be "plain" in the plane of the paper. Thus, D is silly and can't be correct. C is correct. Note that there is a chiral/asymmetric center



HERE. No wedged/or dashed bond is shown since there is only one such center, and the (±) symbol means that it must be both wedged and dashed. It wouldn't really be correct to draw



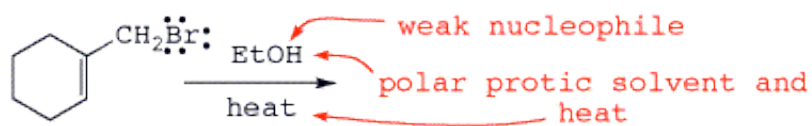
like this, since even though the withdrawing group is shown going "down" as we learned in class, there isn't any "inside" or "outside" group on the diene to compare the W group to (there are only hydrogens on the "ends" of the diene) so it isn't "down" with respect to a substituent on the diene end, and the dashed bond is redundant, particularly because it is also wedged!

QUESTION 3

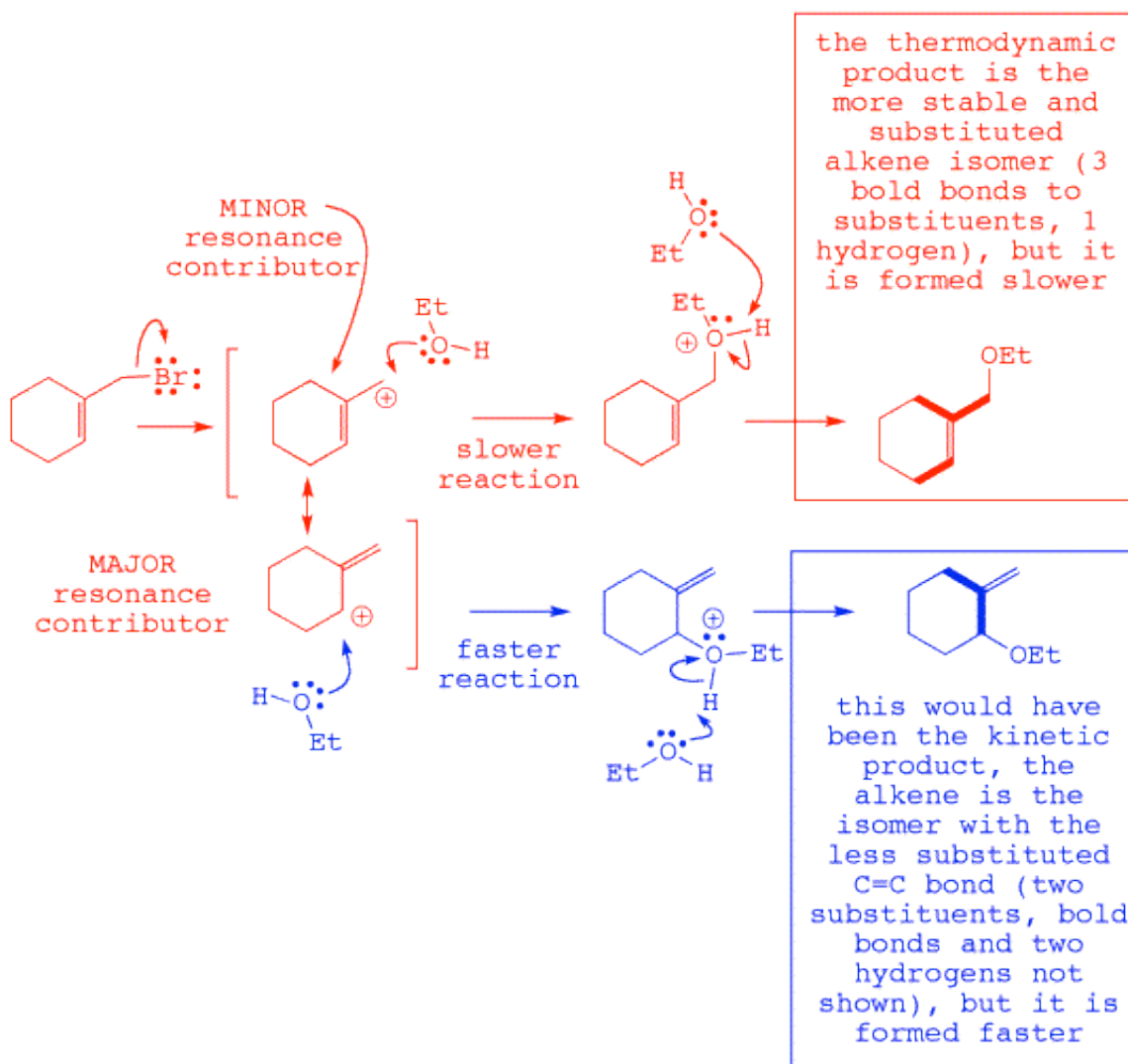
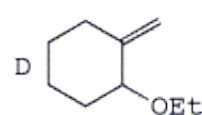
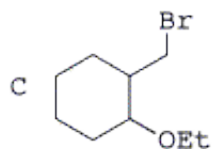
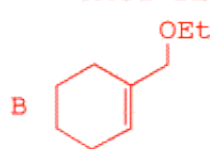
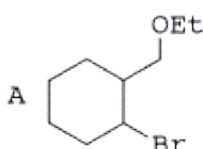
MC30g

Give the product of the following reaction under THERMODYNAMIC control conditions (high temperature)

allylic bromide, good for SN1 and SN2



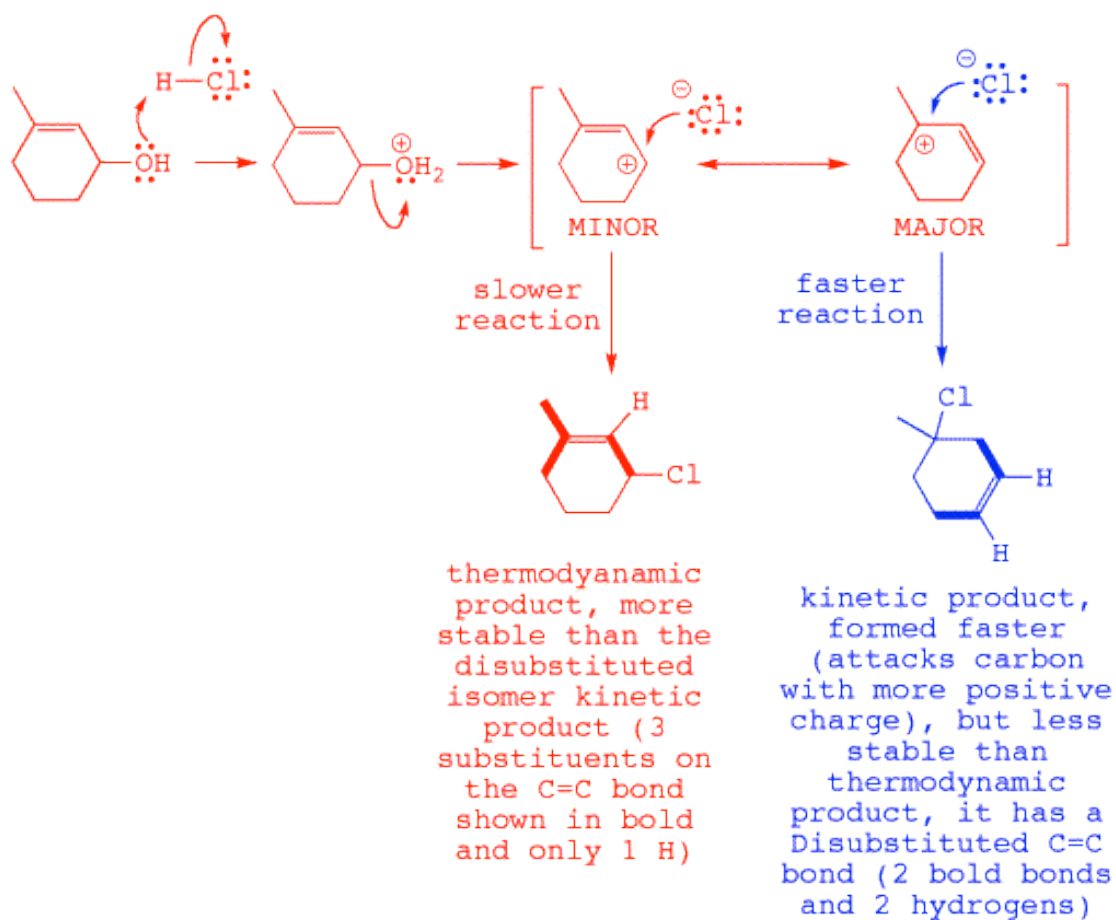
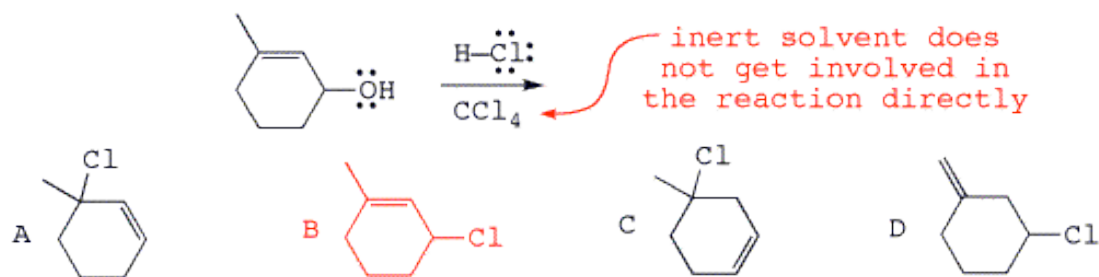
MUST BE SN1!!!



QUESTION 4

MC30h

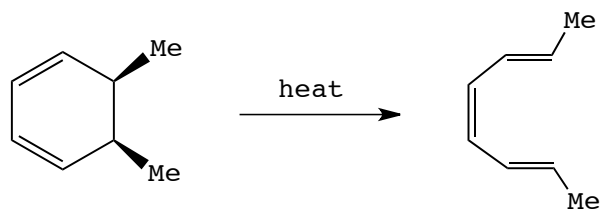
Give the product of the following reaction under THERMODYNAMICALLY controlled conditions (high temperature)



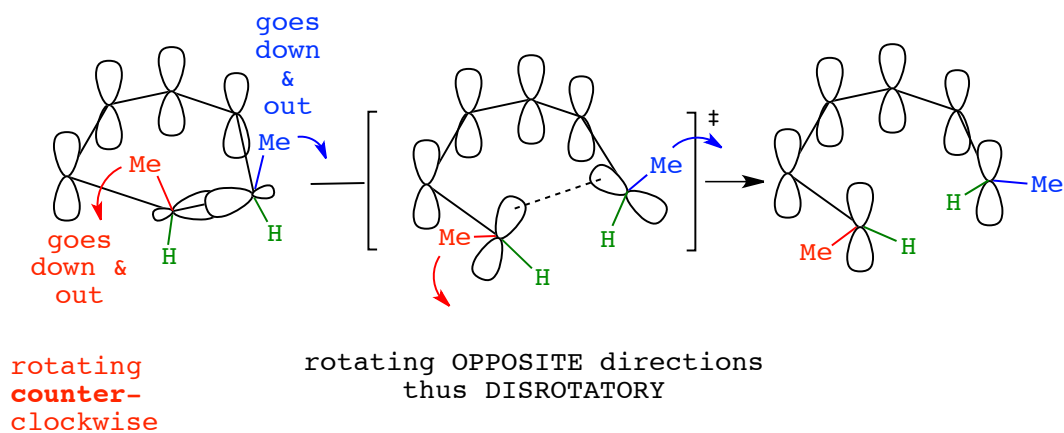
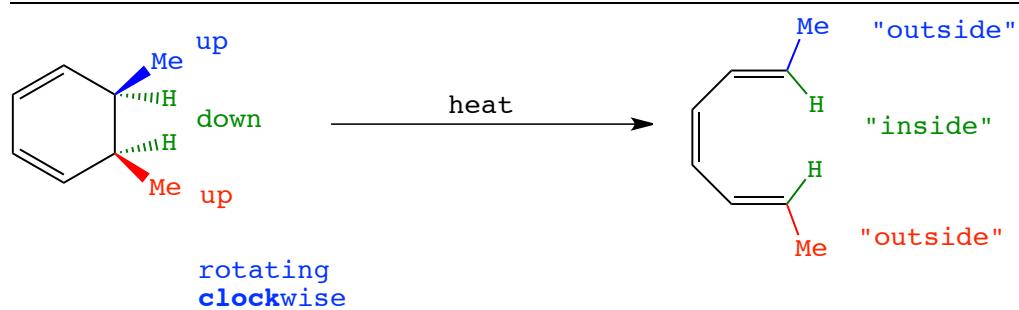
QUESTION 5

MC40d

Which best describes the following reaction?



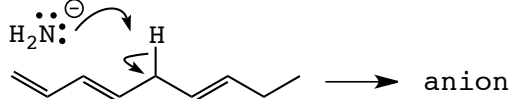
- A Conrotatory
- B Disrotatory
- C Neither Conrotatory or Disrotatory
- D Not Enough Information To Tell



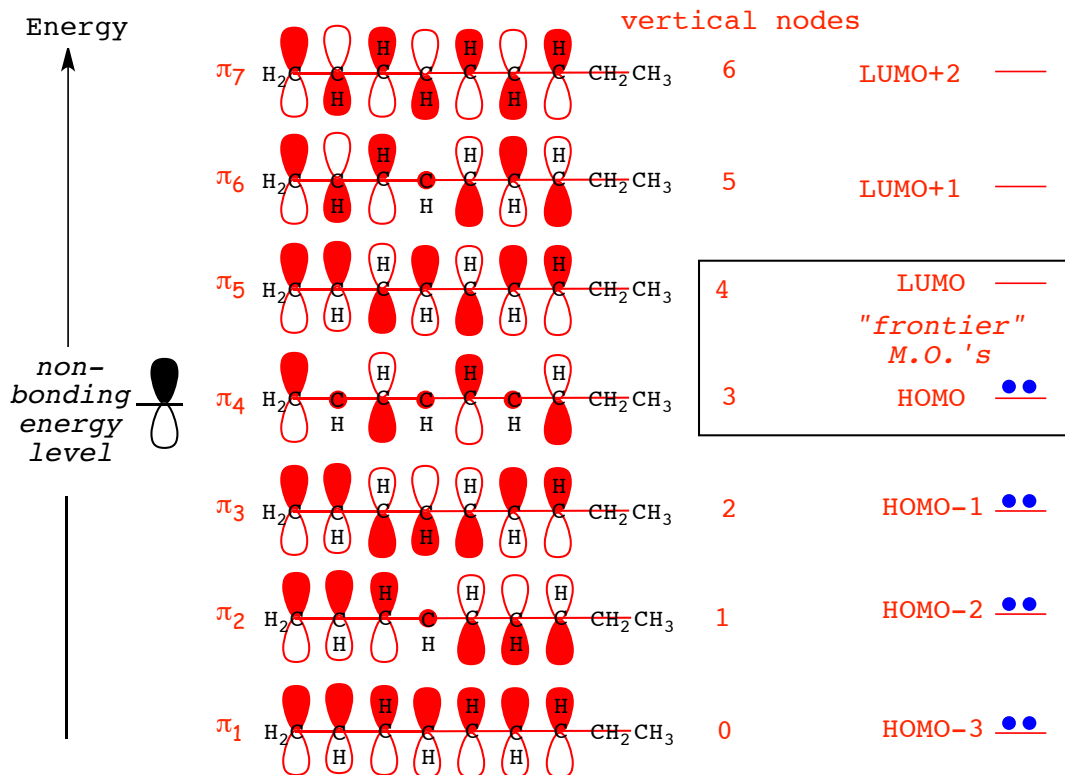
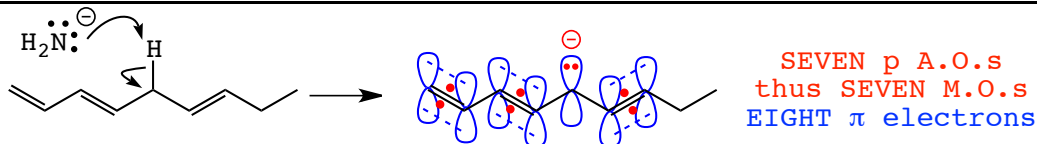
QUESTION 6

MC30w

How many VERTICAL nodes do the Highest Occupied and Lowest Unoccupied π -Molecular Orbitals of the anion formed upon deprotonation of the structure shown?



- A) HOMO = 0 and LUMO = 1 C) HOMO = 2 and LUMO = 3
 B) HOMO = 1 and LUMO = 2 D) HOMO = 3 and LUMO = 4

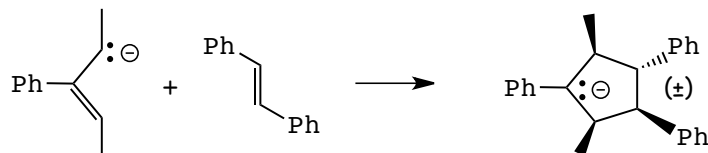


the EXACT positions of the nodes, especially in π_5 and π_6 , are somewhat arbitrary, it is more important to get the NUMBER correct and to distribute them approximately symmetrically. The problem is that we are using "binary" pictures of the p A.O.s (up or down) to represent the shapes of the waveforms, that have real non-binary wave behavior. The nodes at the CENTERS of the π -systems, however, should be exactly in the center

QUESTION 7

MC40o

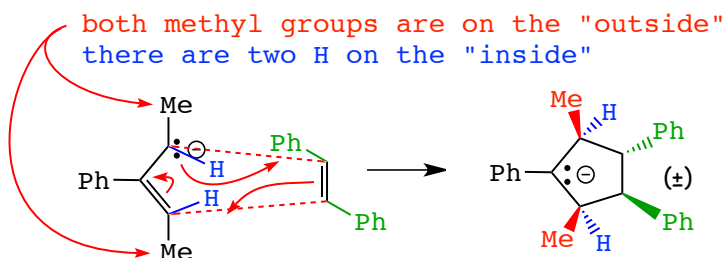
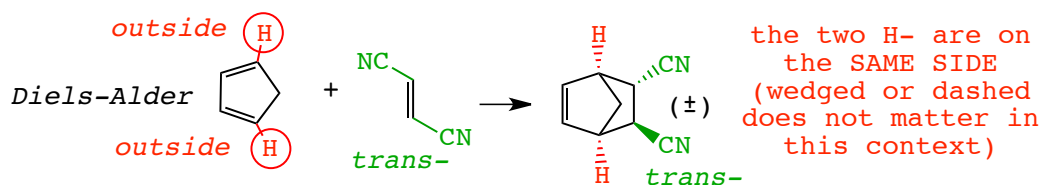
Which best describes the following reaction?



- A suprafacial on the anion and suprafacial on the alkene
 B suprafacial on the anion and antarafacial on the alkene
 C antarafacial on the anion and suprafacial on the alkene
 D antarafacial on the anion and antarafacial on the alkene

suprafacial: both bonds are made on the same side
 antarafacial: the bonds are made on opposite sides

for cycloaddition reactions it is easiest to think of them in relation to the Diels-Alder reaction, the stereochemistry of the Diels-Alder reaction is the way it is because the reaction is suprafacial on the diene and also suprafacial on the dienophile

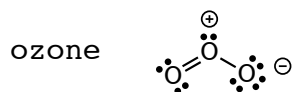


the two Me- groups are on the same side in the product (wedged or dashed is irrelevant, what matters is that they are both the same, this is "Diels-Alder" type stereochemistry, the reaction is suprafacial on the anion)
 the two Ph- groups are trans- in the reactant and also trans- in the product, this is Diels-Alder type stereochemistry, the reaction is suprafacial on the alkene

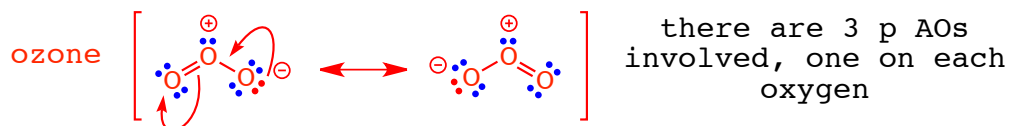
QUESTION 8

MC30aa

Which answer describes the number of VERTICAL nodes for the HOMO and the LUMO of ozone?



- A) HOMO = 0 and LUMO = 1
- B) HOMO = 1 and LUMO = 2
- C) HOMO = 2 and LUMO = 3
- D) HOMO = 3 and LUMO = 4



the electrons in **BLUE** are **NOT INVOLVED** in the conjugated π -system, they do not get involved in resonance and each is in an sp^2 hybridized AO on oxygen

so, there are only 4 electrons in the π -system

