1.) 1,3,5-Hexatriene

a.) HOMO

(1)

b) LUMO

(1)

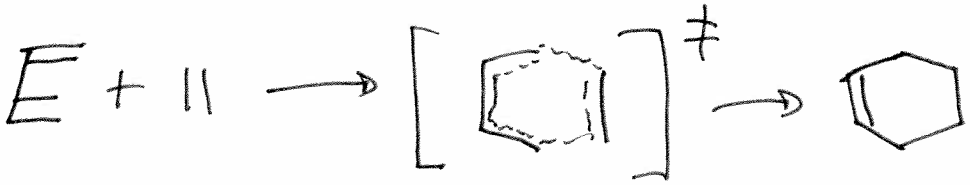
c.) Highest Energy

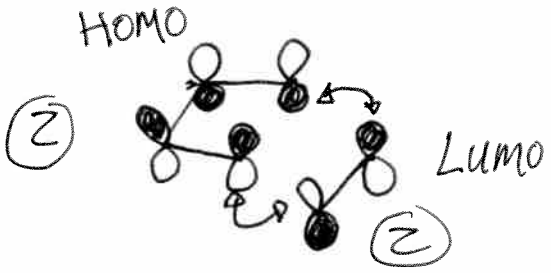
(1)

d.) Lowest Energy

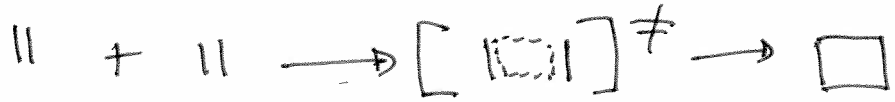
(1)

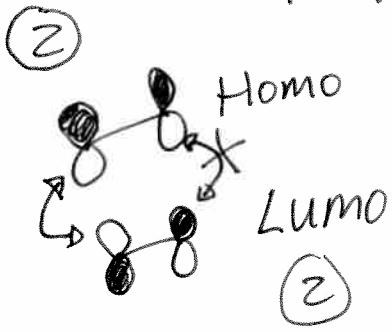
2.





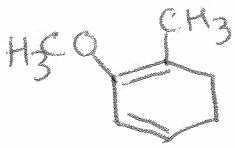
Overlapping orbitals of the same phase
∴ bond formation can occur

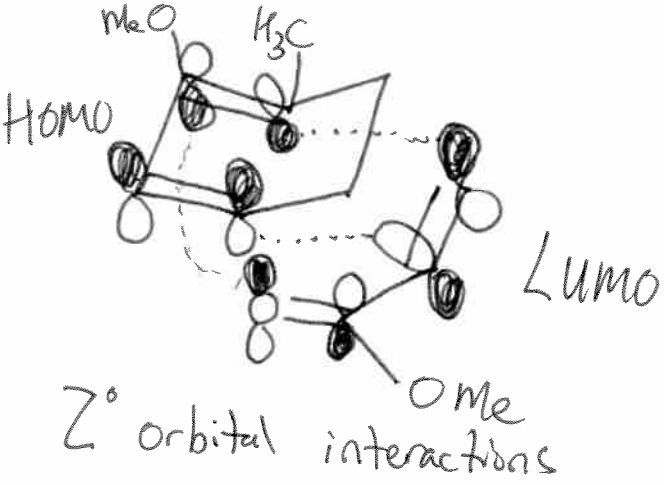


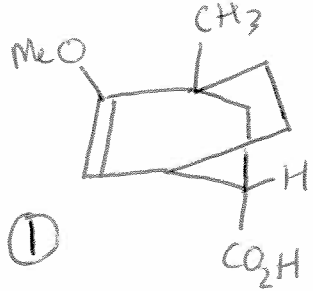


Lone pairs of overlapping orbitals
are not in phase
∴ bond formation cannot occur.

3. a)





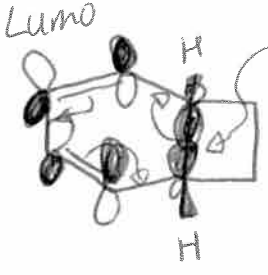


(1)

Endo (1) Product

Regiochemistry (1)

b)



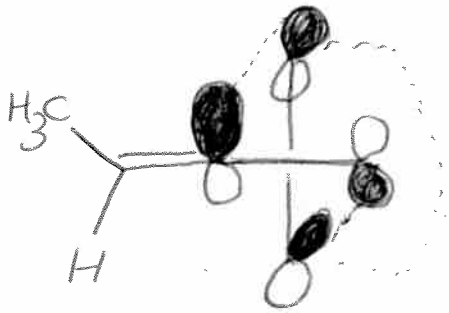
$4n+2$

Disrotatory (1)

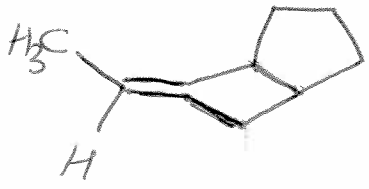
(2)

3 c)

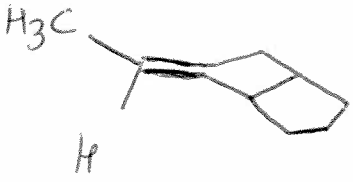
Using Terminal Alkene



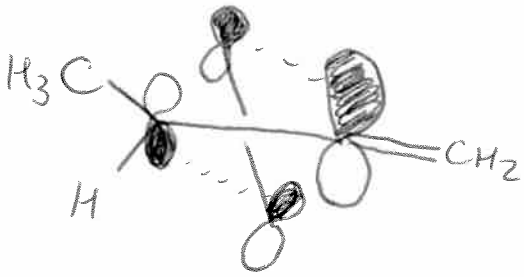
[2+2]



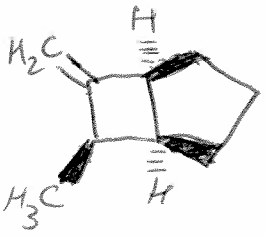
or



Using Internal Alkene

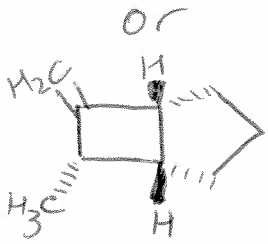


[2+2]

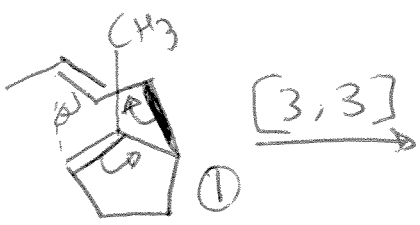


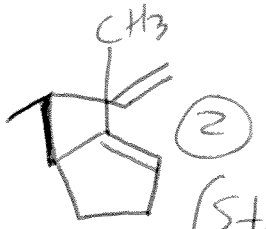
Stereochem ② Product ①

or



3 d)

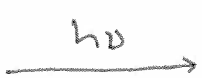




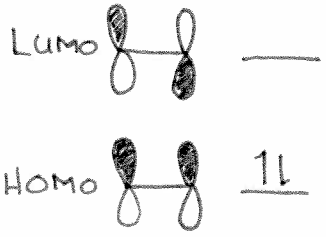
(Stereochem)

Chair like T.S.

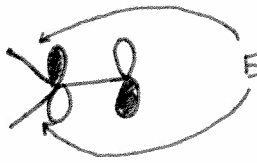
4.)



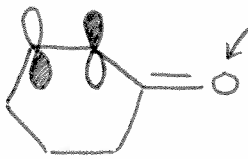

orbitals

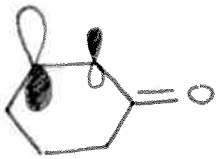


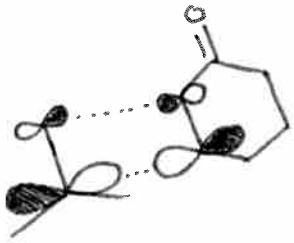
(2)

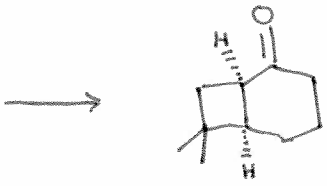

EDGs polarize LUMO* Towards

(2)


EWG polarizes LUMO away

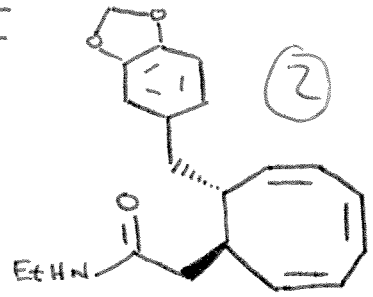


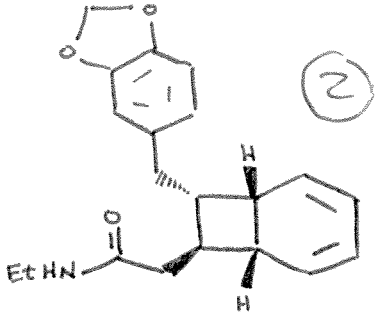




(2)

5.) a.

I  (2)

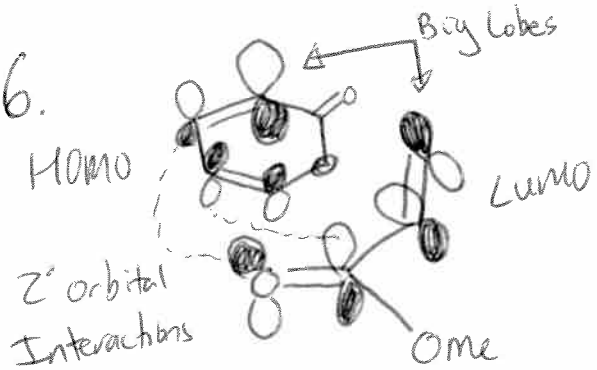
II  (2)

b. See stereochemistry in part a. (3)

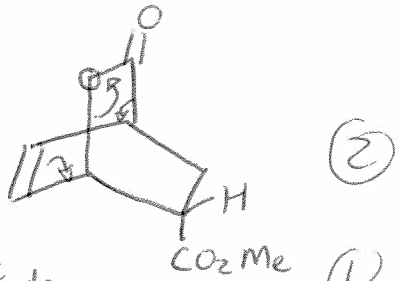
c.
I. Conrotatory Electrocyclization (4n, Thermal)
II. Disrotatory Electrocyclization (4n+2, Thermal)
III. Cycloaddition (Exo)

(3)

6.



[4+2]



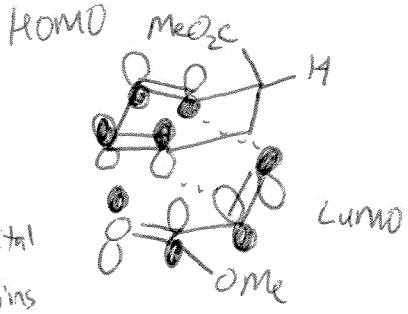
(2)

(1)

Endo Product

$-CO_2$

Retrocyclization
Decarboxylation



[4+2]

Endo Product

≡

(1)

(2)