

1. Draw the following orbital. (5)

a) LUMO of C=CC=O.

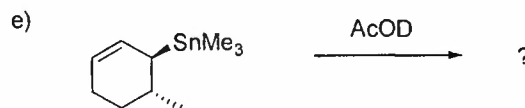
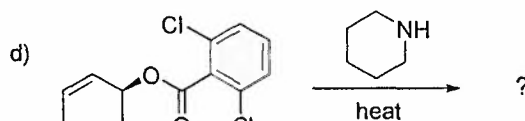
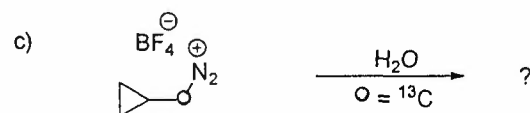
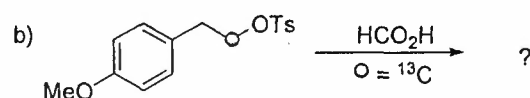
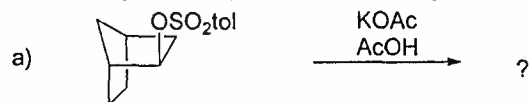
b) HOMO of C=C[N+](C)(C)C.

c)  $\sigma^*$  of C-H bond.

d)  $\sigma$  of C-Li bond.

e) LUMO of C=C[CH2+].

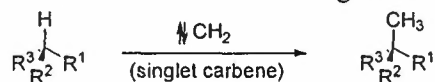
2. Write the product(s) for the following reactions. Indicate the major product if applicable. (5)



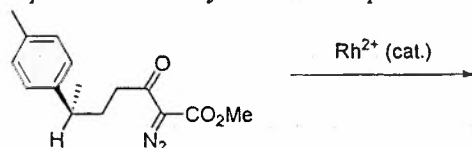
3. A)  $\text{N}(\text{SiH}_3)_3$ , unlike  $\text{N}(\text{CH}_3)_3$  is planar with trigonal nitrogen. Why? (3)

B) "Bridge-head olefins are unstable"-Justify. (2)

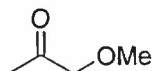
4. A) Explain the mechanism of the following reaction with the help of FMO. (4)



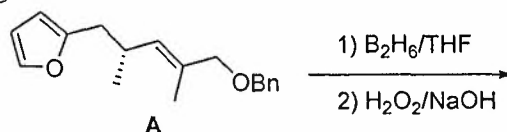
B) With the help of above analysis write the product for the following reaction. (1)



5. A) Write the preferred conformation for the following molecule. Explain its stability in terms of FMO. (2)

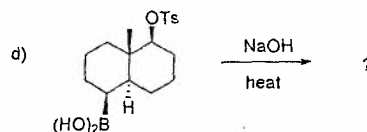
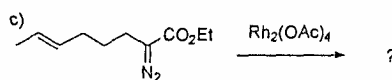
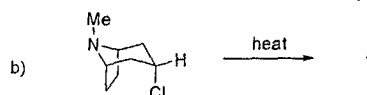
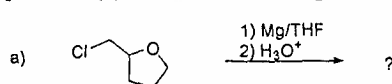


B) Write the most stable conformation of the molecule A. With the help of it write the major product for the following reaction. (3)



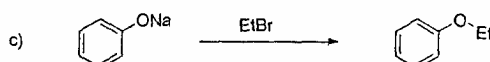
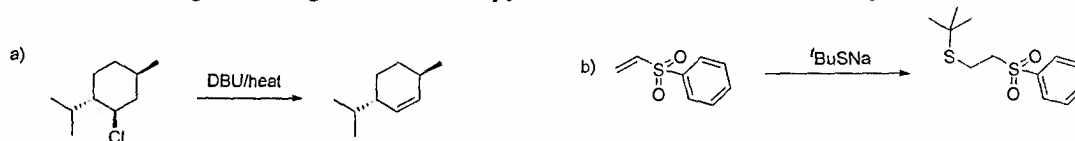
6. Write the product(s) for the following reaction.

(1 x 3 + 2)

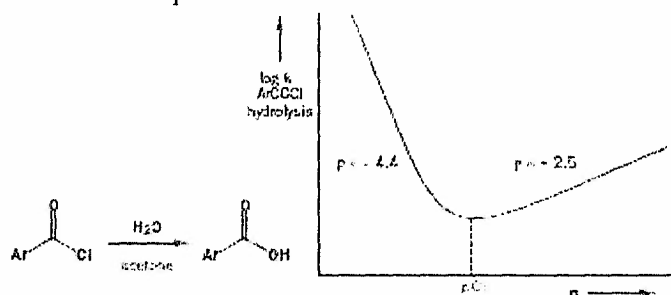


7. a) Entropy of activation provides the information about nature of the mechanism. Explain. (2)

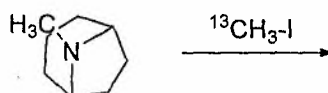
b) Predict the sign and magnitude of entropy of activation for the following reaction (3)



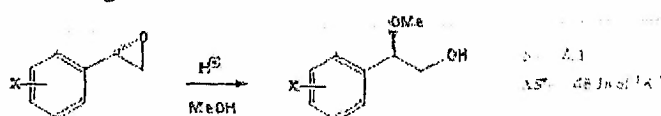
8. For the hydrolysis of the acid chlorides of benzoic acids in aqueous acetone, the following Hammett plot was observed. Explain. (5)



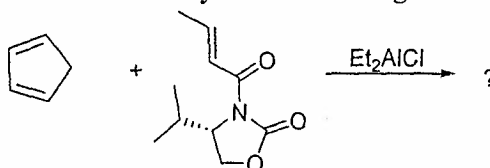
9. Write the major product for the following reaction and Explain in terms of Curtin-Hammett principle. (Hint: Write the structure in the chair conformation.) (5)



10. By looking at the Hammett  $\rho$  value and entropy of activation suggest a mechanism for the following reaction. (5)



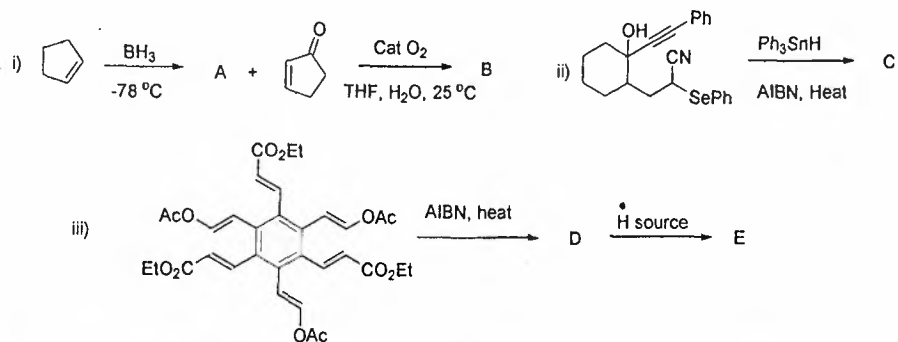
11. Write the mechanism and enantioselectivity of the following Diels Alder reaction. (5)



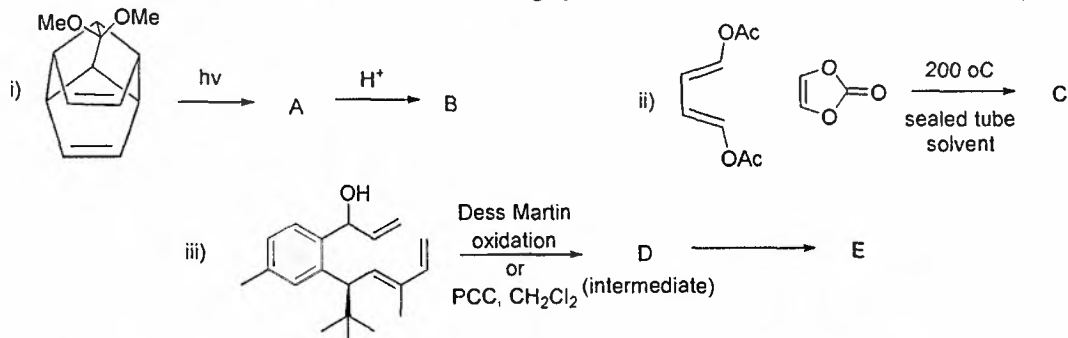
12. Write the products (A-E)

(1x5=5)

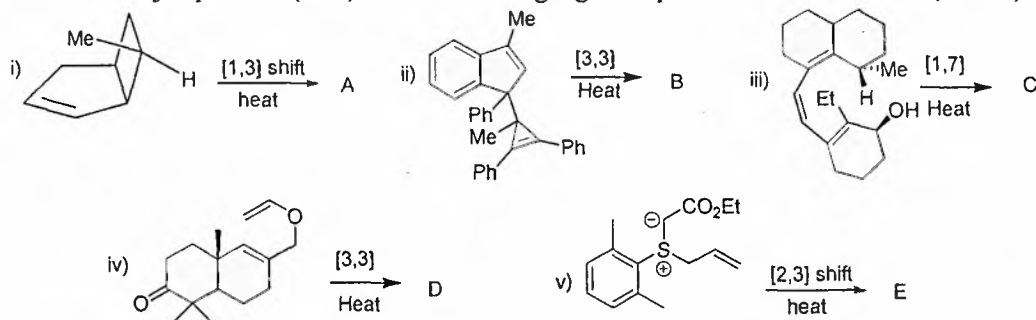
24



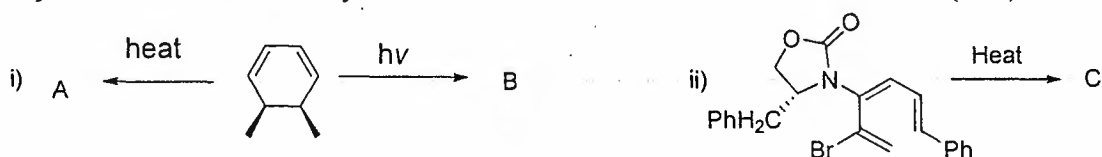
13. Write the major product (A-E) of the following cycloaddition reaction. (1x5=5)



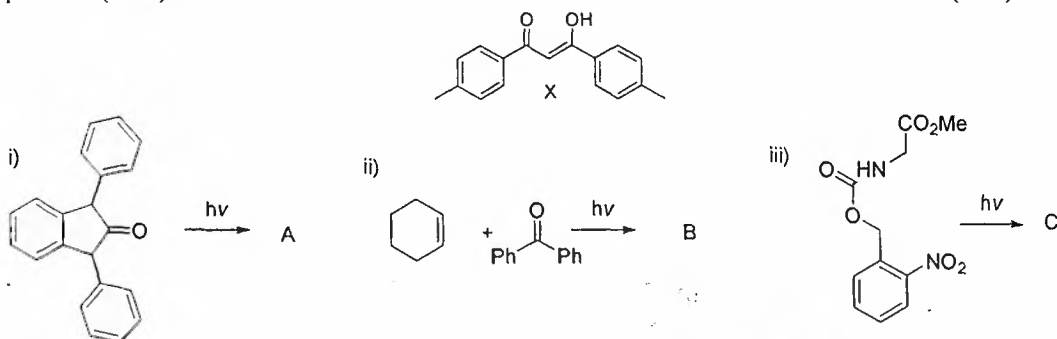
14. Write the major product (A-E) of the following sigmatropic reaction. (1x5=5)



15. Write the electrocyclic ring opening product (A and B). Write the product (C) and explain the stereoselectivity. (2+3)

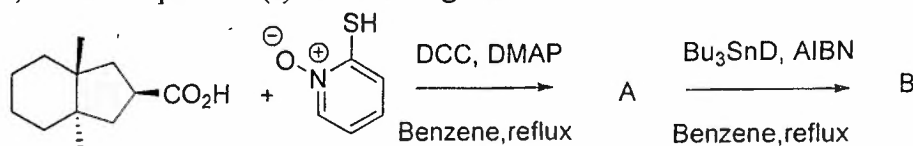


16. The Compound 'X' is an important ingredient of sunscreen lotion. Looking at the structure predict how it protect the skin from sunlight. Also write the photochemical product (A-C). (2+3)

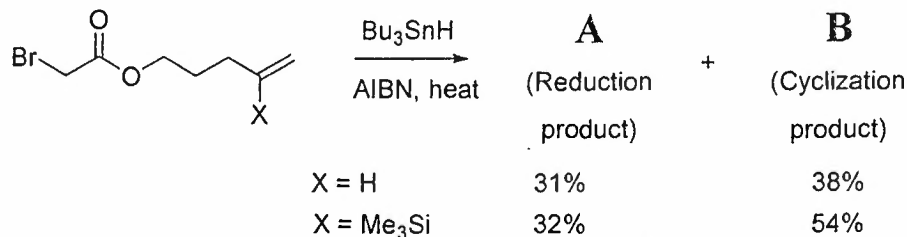


17. i) Write the product (s) of following reaction.

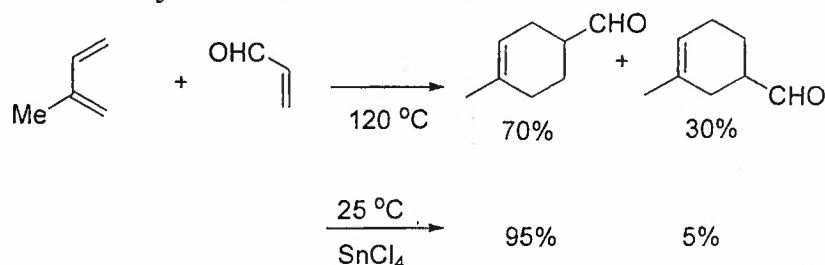
(2+3)



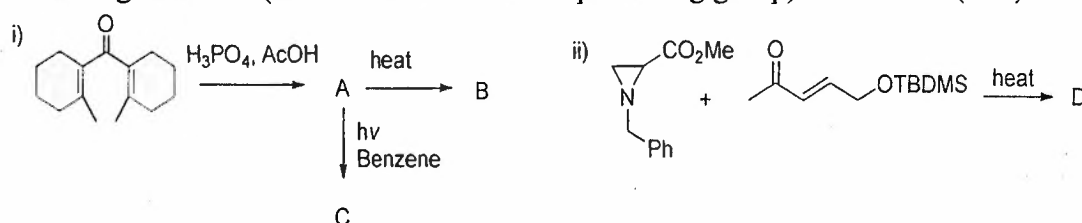
ii) Identify the reduction (A) and cyclization (B) product of the following reaction. Cite reason why the changing the X group we can control the yield of cyclization product.



18. Explain the regioselectivity and role of catalyst in detail. Using FMO explain why endo product is the major in Diels Alder reaction. (3+2)



19. i) Identify the intermediate (A) and products (B-C). ii) Write the major product (D) of the following reaction? (OTBDMS is an alcohol protecting group). (3+2)



20. Write the structures of major products (A-E).

