

2026

CHEMISTRY

(Major)

Paper : CHE0600204

(Organic Chemistry III)

Full Marks : 45

Time : 2 hours

*The figures in the margin indicate full marks
for the questions*

1. Answer all questions : 1×5=5

- (a) While preparing Grignard reagent, small amount of iodine is often used. Why?
- (b) Arrange the following dienes in order of increasing reactivity towards dienophiles in Diels-Alder reaction :



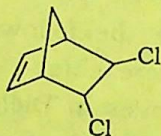
- (c) Between Grignard reagent and organo-lithium compounds, which one is more basic?

(2)

- (d) Write the name of the compound which acts as photosensitizer in photosynthesis.
- (e) What is inverse electron demand Diels-Alder reaction?

2. Answer any five questions : $2 \times 5 = 10$

- (a) Why is photochemistry of organic compounds often referred to as photochemistry of the triplet state?
- (b) What do you mean by optical pumping?
- (c) Write a reaction for the preparation of Frankland reagent.
- (d) How can you prepare unsolvated Grignard reagent?
- (e) The following compound has been prepared by Diels-Alder reaction. Identify the starting materials :



- (f) Give the product of the following reaction and classify the type of pericyclic reaction :

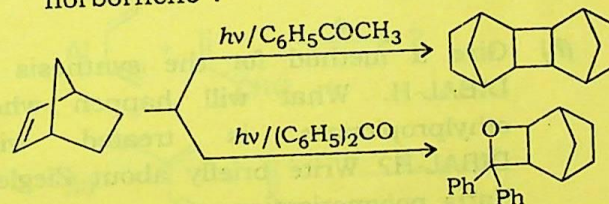


(3)

- (g) Suggest a reason for the greater stability of β - over α -naphthalene sulfonic acid.
- (h) Do both BH_3 and $\text{B}(\text{CH}_3)_3$ exist as a dimer? Give reasons.
- (i) What are degenerate Cope rearrangements?
- (j) Draw the π -MOs of butadiene and identify the HOMO and LUMO in the ground state.

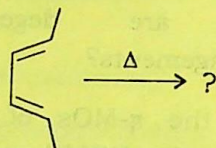
3. Answer any four questions : $5 \times 4 = 20$

- (a) Gas phase irradiation of 2-pentanone produces acetone and ethylene in about 90% yield along with 10% of 1-methylcyclobutanol. Account for the formation of those three photochemical products.
- (b) Norbornene and acetophenone have a triplet excitation energy of 74 kcal/mol and benzophenone has one of 69 kcal/mol. Use those data to explain the course of the following reactions of norbornene :



(4)

- (c) Use FMO theory to explain whether [4+2]-cycloaddition is thermally allowed or not.
- (d) Predict the product in the following reaction :



Explain the stereochemistry of the product. 1+4=5

- (e) Why do both substitution and addition take place at the 9,10-positions of anthracene? Explain with the help of suitable examples.
- (f) Write the steps involved in the Haworth synthesis of naphthalene. Why this method cannot be extended for the synthesis of anthracene? 3+2=5
- (g) What is meant by Schlenk equilibrium? What will happen when ester of formic acid is treated with Grignard reagent? Write the steps involved in the reaction. 2+3=5
- (h) Give a method for the synthesis of DIBAL-H. What will happen when ethylpropionate is treated with DIBAL-H? Write briefly about Ziegler-Natta polymerization. 1+1+3=5

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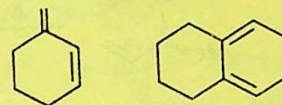
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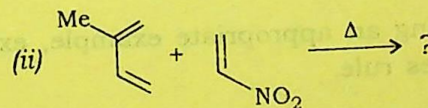
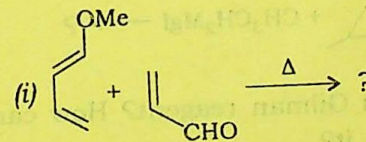
Answer any one question :

10

4. (a) State whether the following dienes is likely to participate in Diels-Alder reaction or not. Explain : 2



- (b) What are Cope rearrangements? Propose a mechanism for the Cope rearrangement. 3
- (c) Describe the structure of MeLi. 2
- (d) Suggest a reaction sequence for the photoreduction of benzophenone in the presence of 2-propanol. 3
5. (a) What is Paterno-Buchi reaction? Discuss the mechanism of the reaction. 1+3=4
- (b) Predict the major product in the following reactions : 1+2=2

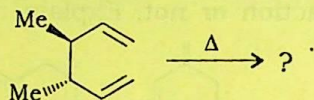


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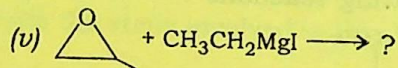
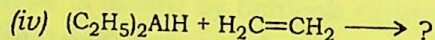
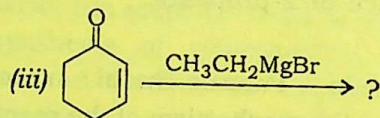
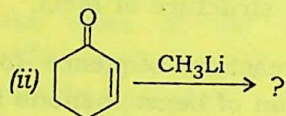
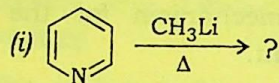
(6)

- (c) Give the product of the following reaction with correct stereochemistry and propose a mechanism to justify its formation :



4

6. (a) Complete the following reactions : $1 \times 5 = 5$



- (b) What is Gilman reagent? How can you prepare it? 1+1=2

- (c) Using an appropriate example, explain Fries rule. 3

(7)

7. (a) How can you convert *p*-bromotoluene to *p*-toluic acid? Write the reactions involved. 2
- (b) What do you mean by conrotatory and disrotatory motions? 2
- (c) What will happen when 2-cyclohexenone is treated with lithium dimethylcuprate? 2
- (d) What is Norrish type I reaction? Write the mechanism. 1+3=4
