

2025

( CBCS )

( 6th Semester )

**CHEMISTRY**

TENTH PAPER

( Organic Chemistry—III )

Full Marks : 75

Time : 3 hours

*The figures in the margin indicate full marks for the questions***( SECTION : A—OBJECTIVE )**

( Marks : 10 )

Tick (✓) the correct answer in the brackets provided :

1×10=10

1. In carbonyl compounds, the absorption of UV-light at 285 nm causes

- (a)  $n \rightarrow \pi^*$  transition ( )
- (b)  $\sigma \rightarrow \sigma^*$  transition ( )
- (c)  $n \rightarrow \sigma^*$  transition ( )
- (d)  $\pi \rightarrow \pi^*$  transition ( )

2. Which of the following regions of the light radiations of the UV-visible range brings about photochemical reactions?

- (a) 2000 Å to 1000 Å ( )
- (b) 1000 Å to 1500 Å ( )
- (c) 2000 Å to 8000 Å ( )
- (d) 12000 Å to 19000 Å ( )

3. The ground-state HOMO of 1,3-butadiene is having
- (a)  $m$ -symmetry ( )
  - (b)  $C_2$ -symmetry ( )
  - (c) three nodes ( )
  - (d) two nodes ( )
4. Electrocyclic reaction involves the formation or breaking of
- (a) one  $\sigma$ -bond ( )
  - (b) two  $\sigma$ -bonds ( )
  - (c) three  $\sigma$ -bonds ( )
  - (d) four  $\sigma$ -bonds ( )
5. Thiols react with ketones in the presence of hydrochloric acid to give
- (a) mercaptals ( )
  - (b) mercaptols ( )
  - (c) mercaptides ( )
  - (d) thiol esters ( )
6. Grignard's reagent reacts with carbon dioxide followed by hydrolysis to produce
- (a) carboxylic acid ( )
  - (b) primary alcohol ( )
  - (c) secondary alcohol ( )
  - (d) tertiary alcohol ( )
7. Cyclohexanone oxygenase enzyme is typically used as
- (a) hydroxylating agent ( )
  - (b) reducing agent ( )
  - (c) oxidizing agent ( )
  - (d) hydrating agent ( )

8. What is the main goal of green chemistry?
- (a) To minimize the use of hazardous chemicals ( )
  - (b) To reduce the amount of waste produce during chemical reaction ( )
  - (c) To increase the efficiency of chemical reaction ( )
  - (d) All of the above ( )
9. Which of the following compounds will give single NMR signal due to equivalent protons?
- (a)  $\text{CH}_3\text{CH}_2\text{OCH}_3$  ( )
  - (b)  $\text{CH}_3\text{COOCH}_3$  ( )
  - (c)  $\text{CH}_3-\text{OCH}_3$  ( )
  - (d)  $\text{CH}_2=\text{CH}-\text{Cl}$  ( )
10. In NMR spectrum, the distance between the centres of the two adjacent peaks in a multiplet is called
- (a) base peak ( )
  - (b) molecular ion peak ( )
  - (c) chemical shift ( )
  - (d) coupling constant ( )

**( SECTION : B—SHORT ANSWERS )**

( Marks : 15 )

Answer the following :

3×5=15

**UNIT—I**

1. Explain singlet and triplet states of an electron.

**OR**

2. Briefly explain intersystem crossing.

## UNIT—II

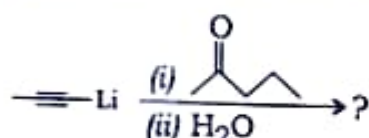
3. Explain conrotatory and disrotatory motions of  $\sigma$ - or  $\pi$ -MO in an electrocyclic reaction by taking suitable examples.

OR

4. Based on FMO method, discuss photo-induced cyclization of 1,4-dimethyl-1,3-butadiene.

## UNIT—III

5. Write the mechanism for the following transformation :



OR

6. Give one difference in chemical reaction between Grignard's reagent and organolithium.

## UNIT—IV

7. What is Baker's yeast and how is it used for selective reduction of beta-keto esters?

OR

8. Discuss green method of aldol condensation in solid phase.

## UNIT—V

9. What is McLafferty rearrangement? Illustrate with suitable example.

OR

10. Explain shielding and deshielding of protons in  $^1\text{H}$ -NMR spectra.

( SECTION : C—DESCRIPTIVE )

( Marks : 50 )


Answer the following :

10×5=50

UNIT—I

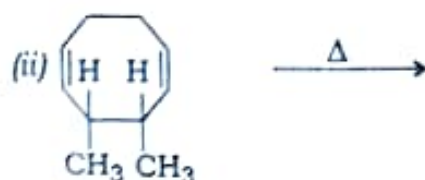
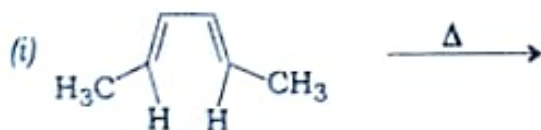
1. (a) Describe different types of electronic excitation of organic compound on irradiation with light. 5
- (b) Explain Norrish type I and Norrish type II product(s) with an examples. 5

OR

2. (a) Explain the photosensitization process with an example. 3
- (b) Give the mechanism of the following transformation : 3
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- (c) Explain Paterno-Buchi reaction taking a suitable example. 4

UNIT—II

3. (a) Explain the reaction of [4+2] cycloaddition using Woodward-Hoffmann rule. 3
- (b) Using FMO method, write the products with stereochemistry for the following electrocyclic reactions : 2×2=4

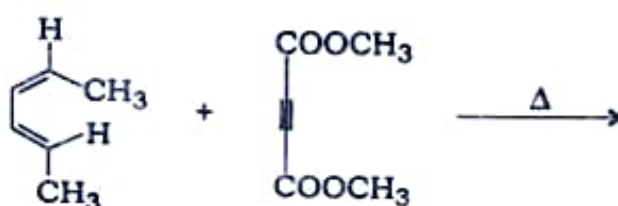


- (c) Discuss frontier orbital theory for an electrocyclic reaction. 3



OR

4. (a) Why is  $[\pi_s^4 + \pi_s^2]$  cycloaddition thermally allowed but not photochemically? 4
- (b) Cyclohexadiene converted to 1,3,5-hexatriene by electrocyclic inter-conversion. Explain the process using Woodward-Hoffmann rule. 4
- (c) Write the product with proper stereochemistry for the following reaction : 2

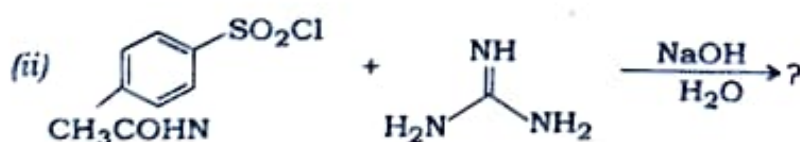
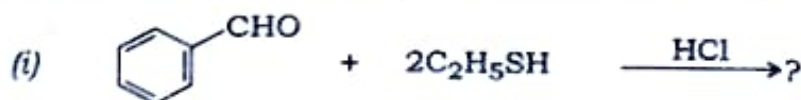


### UNIT—III

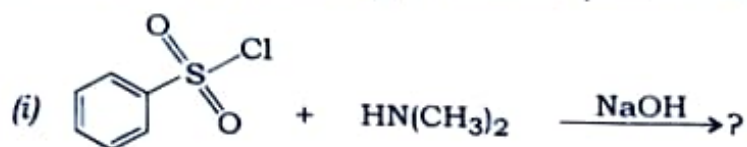
5. (a) How is sulphaguanidine prepared? Write the reaction mechanism. 4
- (b) Write the reaction pathway for the preparation of 2-phenylpropan-2-ol from acetophenone using methylmagnesium bromide. 4
- (c) What is Frankland's reagent? Show one method of its preparation. 2

OR

6. (a) Mention one method of preparation of organolithium compound. 2
- (b) Complete the following reactions with suitable mechanism : 3×2=6



(c) Complete the following reactions (mechanism not required) : 1×2=2



#### UNIT—IV

7. (a) Discuss and illustrate the migratory aptitude in Baeyer-Villiger oxidation process with mechanism. 5
- (b) Write the procedure for the preparation of butyraldehyde by ultrasonic irradiation. 5

**OR**

8. (a) Write a note on biochemical oxidation. 3
- (b) Discuss the microwave-assisted Mannich reaction with an example. 4
- (c) Discuss the preparation of 2-chloro-N-aryl anthranilic acid. 3

#### UNIT—V

9. (a) Sketch the <sup>1</sup>H-NMR signal for acetophenone. 2
- (b) Write the possible fragmentation and related *m/z* values of different fragments of *n*-pentane in mass spectroscopy. 3
- (c) Distinguish between *cis*- and *trans*-stilbene on the basis of <sup>1</sup>H-NMR spectroscopy. 3
- (d) Draw the high resolution <sup>1</sup>H-NMR spectra of toluene. 2

OR

10. (a) When 2-methylbutane is bombarded with high energy electron, it gets fragmented and gives  $m/z$  values at 71, 57 and 43. Determine the fragmented structure. 3
- (b) What is a chemical shift in NMR spectroscopy? Mention the factors that affect chemical shift in NMR spectrum. 3
- (c) Define base peak and molecular ion peak with diagram. 2
- (d) Discuss the fragmentation pattern of *n*-butane. 2

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