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(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. Radiative process from the following is

- (a) fluorescence ()
- (b) intersystem crossing ()
- (c) internal conversion ()
- (d) All of the above ()

2. What will be the quantum yield when one mole of substance reacts by absorbing 6.022×10^{23} photons?

- (a) 0.1 ()
- (b) 1 ()
- (c) 10 ()
- (d) zero ()

3. The Diels-Alder reaction is an example of
- (a) polar elimination reaction ()
 - (b) electrolytic reaction ()
 - (c) cycloaddition reaction ()
 - (d) polar addition reaction ()
4. Electrocyclic reaction involves the formation or breaking of
- (a) one π -bond ()
 - (b) two π -bonds ()
 - (c) three π -bonds ()
 - (d) four π -bonds ()
5. Which of the following compounds does not give a tertiary alcohol upon reaction with methyl magnesium bromide?
- (a) 3-methylpentanal ()
 - (b) Ethyl benzoate ()
 - (c) 4,4-dimethyl cyclohexanone ()
 - (d) 4-heptanone ()
6. What is the reaction between organolithium and water?
- (a) Hydration reaction ()
 - (b) Dehydration reaction ()
 - (c) Decomposition reaction ()
 - (d) Reduction reaction ()
7. What is the main goal of green chemistry?
- (a) To minimize the use of hazardous chemicals ()
 - (b) To reduce the amount of waste produced during chemical reaction ()
 - (c) To increase the efficiency of chemical reaction ()
 - (d) All of the above ()

8. Mannich reaction is an example of
- (a) microwave-assisted reaction ()
- (b) UV-assisted reaction ()
- (c) IR-assisted reaction ()
- (d) All of the above ()
9. What is the multiplicity of the CH₂, hydrogens in CH₃OCH₂CH₂OCH₃?
- (a) A singlet ()
- (b) A triplet ()
- (c) A quartet ()
- (d) A doublet ()
10. In the mass spectrum of the molecule benzyl alcohol (C₆H₅CH₂OH), the base peak would be predicted to correspond to which of the following structures?
- (a) C₆H₅ (*m/z* 77) ()
- (b) C₆H₅CH OH (*m/z* 107) ()
- (c) C₆H₅CH₂O (*m/z* 107) ()
- (d) C₆H₄CH₂OH (*m/z* 107) ()

(SECTION : B—SHORT ANSWER)

(Marks : 15)

Answer the following questions :

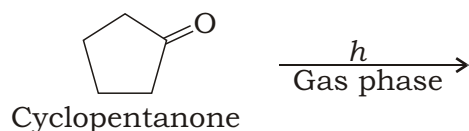
3×5=15

UNIT—I

1. What are the physical processes undergone by excited molecules?

OR

2. Complete the following reaction for Norrish type-I process given by cyclopentanones :



UNIT—II

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

OR

4. What are pericyclic reactions? What are the three classes of pericyclic reaction?

UNIT—III

5. Predict the product and write the mechanism of the interaction of sulphonyl chloride and ammonia.

OR

6. Write the synthetic application of Grignard reagent for ketone.

UNIT—IV

7. Write a short note on the principle of green chemistry.

OR

8. Describe green method of Michael addition reaction taking suitable example.

UNIT—V

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

OR

10. Draw $^1\text{H-NMR}$ spectra for 1,1,2-tribromoethane.

(SECTION : C—DESCRIPTIVE)

(Marks : 50)

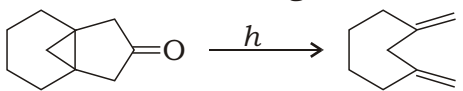
Answer the following questions :

10×5=50

UNIT—I

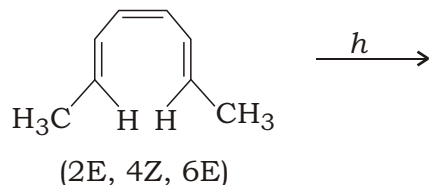
1. (a) Compare and explain Norrish type-I and Norrish type-II cleavages with suitable examples. 2+2=4
- (b) Draw Jablonski diagram with proper labelling and explain the following : 6
- (i) Vibrational relaxation
- (ii) Internal conversion
- (iii) Intersystem crossing
- (iv) Fluorescence
- (v) Phosphorescence

OR

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

UNIT—II

3. (a) Give the product and its stereochemistry for the following reaction : 3

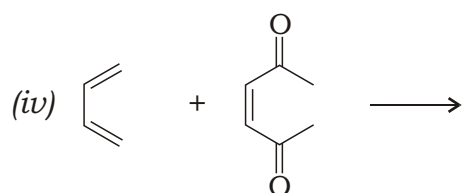
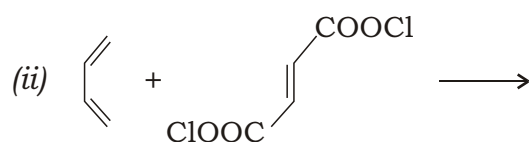
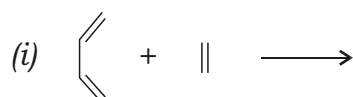


- (b) Explain why $[\frac{2}{s} \quad \frac{2}{s}]$ cycloaddition reaction is thermally forbidden but photochemically allowed. 3

- (c) Discuss the electrocyclic interconversion of cyclohexadiene-hexatriene system using Woodward-Hoffmann rule. 4

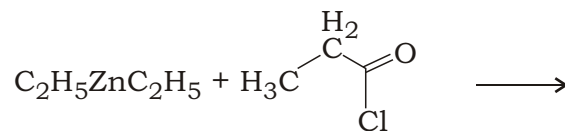
OR

4. (a) Discuss frontier molecular orbital theory for an electrocyclic reaction. 3
 (b) What are dienes and dienophiles? Give examples. 3
 (c) Complete the following cycloaddition reactions : 1×4=4

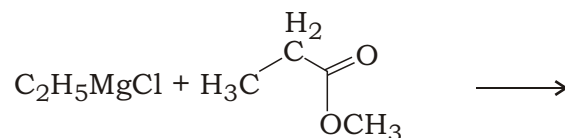


UNIT—III

5. (a) What would be the product for the following reaction? Support your answer with the reaction mechanism : 3



- (b) Predict the product and write the mechanism for the following reaction : 1+2=3

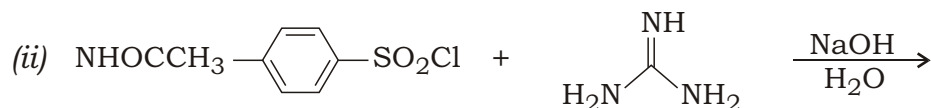
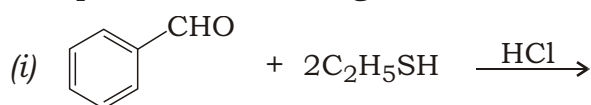


- (c) Write two reactions and mechanism in which organolithium differs from Grignard reagent. 4

OR

6. (a) Mention one method of preparation of organolithium compound. 2
- (b) Starting with acetophenone, how will you prepare 2-phenylpropan-2-ol with CH_3MgBr ? Write down its mechanism. 2

- (c) Complete the following reactions using suitable mechanisms : 3×2=6



UNIT—IV

7. (a) What are the principles of green chemistry? 3
- (b) What is Wittig reaction? Give an example of Wittig reaction in solid phase. 3
- (c) Discuss the microwave-assisted Mannich reaction in water with an example. 4

OR

8. (a) Write a note on biochemical reduction. 3
- (b) Illustrate green reaction of aldol condensation in aqueous phase with mechanism. 3
- (c) Discuss the migratory aptitude in Baeyer-Villiger oxidation process with mechanism. Write one of its reactions in aqueous phase. 3+1=4

UNIT—V

9. (a) Write the possible fragmentation and related m/z value of benzene molecule in mass spectrometry. 3
- (b) Predict the structure of the compound whose peaks in the mass spectrum have m/z values 86, 71, 58, 43(100%). 3
- (c) Explain the principle of NMR spectroscopy. 4

OR

10. (a) Discuss the fragmentation pattern of *n*-butane. 3
- (b) Give a structure consistent with the following data : 3
- Molecular formula— C_8H_9Br
- NMR data :
- (i) Triplet, τ 7.3, d 2.7 (2H)
- (ii) Triplet, τ 6.6, d 3.4 (2H)
- (iii) Singlet, τ 2.78, d 7.22 (5H)
- (c) Sketch the chemical shift for acetaldehyde and 1,1,2-tribromoethane. 4
