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Total No. of Pages : 5

**1(CCEM)0**

**Chemistry**

**(05)**

**Paper—II**

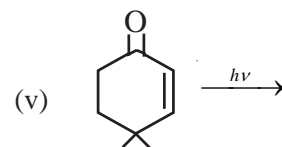
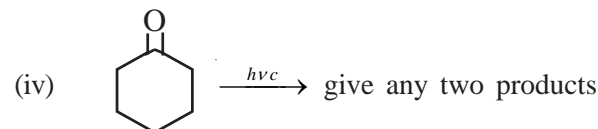
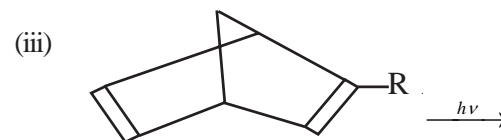
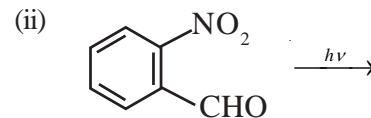
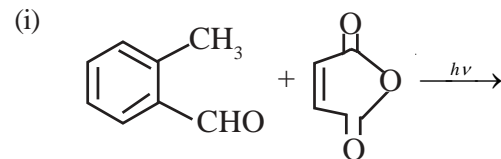
Time : Three Hours]

[Maximum Marks : 300

- Note** :— (i) Answers must be written in English.
- (ii) The number of marks carried by each question are indicated at the end of the question.
- (iii) Part/Parts of the same question must be answered together and should not be interposed between answers to other questions.
- (iv) The answer to each question or part thereof should begin on a fresh page.
- (v) Your answers should be precise and coherent.
- (vi) Attempt any **five** questions.
- (vii) If you encounter any typographical error, please read it as it appears in the text-book.
- I. (a) Define carbenes. Write two methods of generation of carbene.  
How will you trap a carbene ? 12
- (b) Discuss the planar pyramidal structure of carbanions. 12
- (c) Write the mechanism of Reimer-Tiemann reaction. How will you prove that reaction involves dichloro carbene as intermediate ? 12

- (d) Deduce the structural formula of the following Compound having molecular formula  $C_4H_8O_2$   
 IR (Neat film)  $1740\text{ cm}^{-1}$   
 $^1\text{H NMR}$   $\delta$  1.2 (t, 3 H), 2 – 3(q, 2 H), 3.8 (S, 3 H). 12
- (e) Which spectroscopy is based on the principle of change of spin? What is the frequency range in which such spectroscopy is carried out? 12
- II. (a) Write the mechanism of Friedal Craft's reaction. What are the limitations of this reaction? 12
- (b) Explain why reduction of cyclohexanone with less hindered hydride donor like  $\text{NaBH}_4$  or  $\text{Li AlH}_4$  give predominantly the equatorial alcohol. 12
- (c) Give the preparation, important uses and the mechanisms of the reactions brought about by the following :
- N-bromo succinimide
  - Lithium aluminium hydroxide. 12
- (d) What is Wagner-Meerwein rearrangement? What is its mechanism? What is the driving force for it? 12
- (e) What is the principle involved in pinacol-pinacolone rearrangement? Give its mechanism. Discuss the migratory aptitude of different groups. 12
- III. Give the mechanism of any **five** of the following :
- Base catalysed aldol condensation
  - Perkin Reaction
  - Cannizaro's reaction
  - Addition of bromine to cis-but-2-ene and trans-but-2-ene.
  - Reaction mechanism of tert-butylchloride with aqueous sodium.

- (c) Write the products of the following photo reactions :



20

- (d) Discuss the mass spectrum of the following compounds :

- 3-methyl-3 hexanol
- 4-methyl -2- pentanone
- 2,2,4,6,6,-pentamethyl heptane
- $C_{60}$ .

20

- (vi) Claisen rearrangement mechanism.
- (vii) Reformatsky reaction mechanism. (12 each)
- IV. (a) Explain any **three** of the following terms :
- Coupling constant
  - Shielding and deshielding of protons.
  - Molecular ion peaks
  - Spin-Spin splitting. 20
- (b) Give the structure consistent with the following data :
- Molecular formula of compound =  $C_9H_{11}Br$
- multiplet — 2H,  $\tau = 7.85$
- triplet — 2H,  $\tau = 7.25$
- triplet — 2H,  $\tau = 6.62$
- Singlet — 5H,  $\tau = 2.78$ . 20
- (c) What absorption in IR spectrum would be used to distinguish the following ?
- $CH_3COOH$  and  $CH_3COCH_3$
  - $CH_3CH_2NHCH_3$  and  $(CH_3)_3N$

**OR**

What do you understand by ?

- Stretching and bending vibrations
- $n - \pi^*$ ,  $\pi - \pi^*$  and  $\sigma - \pi^*$  transitions. 20

- V. (a) Give an account of phosphonitrilic compounds with their structural aspects. 12
- (b) Give the synthesis and structure of borazine. 12
- (c) What are the selection rules for Rotation, Vibration, Raman spectra of diatomic molecules. Applying these rules, explain

what type of rotation vibration Raman spectrum is obtained for a diatomic molecule. 12

- (d) Taking the example of carbonyl compounds represent and explain the electronic transitions taking place between them. 12
- (e) Define Hooke's Law. Assign IR stretching frequencies ( $V_c=0$ ) for the following molecules.

$BrCH_2COOH$ ,  $Cl_2CHCOOH$ ,  $ClCH_2COOH$ ,  $F_3CCOOH$ ,  
 $BrCH_2CH_2CH_2COOH$

1725, 1776, 1751, 1730, 1736  $cm^{-1}$

**OR**

Identify the compound by given data :

Mol. wt. = 116

UV – 283  $m\mu$ ,  $\xi$  max : 22

IR – 3000 – 2500 (h), 1715 (s), 1342 (w)  $cm^{-1}$ .

$^1H$  NMR –  $\delta$  2.12 (s, 3H); 2.6 (t, 2H); 2.25(t, 2H);  
11.1 (s, 1H). 12

VI. Attempt any **three** parts.

- (a) Discuss briefly the following :
- Free-radical polymerization.
  - Co polymerization
  - Ionic polymerization
  - Show that the average molecular weight determined by sedimentation and diffusion is weight average molecular weight. 20
- (b) Discuss the photochemistry of  $[Ru(hipy)_3]^{2+}$  and also give the example of Taubercrautz and Mayer complex. 20