

Roll No.

76053

**M.Sc. 3rd Semester Chemistry
Examination-December, 2015**

ORGANIC SPECIAL-I

Paper : CH-501 P-XI

Time : 3 hours **Max. Marks : 80**

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard will be entertained after the examination.

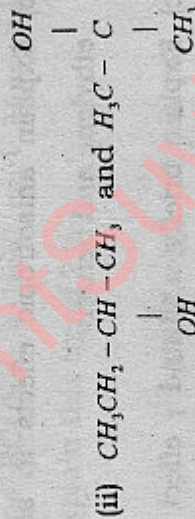
Note : Attempt **five** questions in all, selecting **one** question from each Unit. Q. No. 1 is **compulsory**. All questions carry equal marks.

1. (a) How many vibrational absorptions are expected to be observed in the IR spectrum of carbon dioxide? 2

76053-900-(P-8)(Q-9)(15) (1) [Turn Over

9. (a) How would you distinguish the following pairs by mass spectrometry? 6

(i) $\text{CH}_3\text{COOC}_2\text{H}_5$ and $\text{C}_2\text{H}_5\text{COOCH}_3$



(b) Write short note on the negative ion mass spectrometry. 4

(c) Suggest structure of a compound with molecular formula $\text{C}_{10}\text{H}_{12}\text{O}$, whose mass spectrum shows peaks at m/z 15, 43, 57, 91, 105 and 148. 6

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UNIT - I

(b) Why the peaks in UV spectrum are broad? 2

(c) How is decalin and trans-decalin can be distinguished using PMR spectroscopy? 2

(d) Discuss effect of ring size in carbonyl stretching frequencies. 2

(e) What is the significance of metastable peaks in mass spectrometry? 2

(f) Why a polar solvent usually shift $\Pi \rightarrow \Pi^*$ transition to longer wavelength and $n \rightarrow \Pi^*$ transition to shorter wavelength? 2

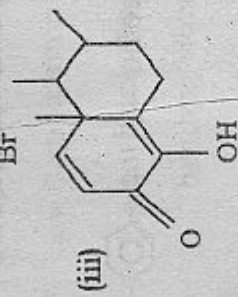
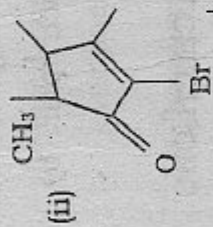
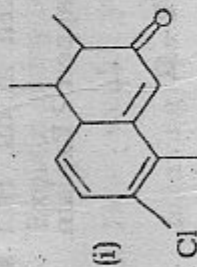
(g) Where do outer protons in porphyrin generally resonate and why? 2

(h) What are the disadvantages of EI over CI in mass spectrometry? 2

76053-900-(P-8)(Q-9)(15) (2)

2. (a) How do you determine strength of hydrogen bonding on the basis of UV spectroscopic technique? 4

(b) Calculate λ -max values for the following compounds according to existing empirical rules. 12



76053-900-(P-8)(Q-9)(15) (3)

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3. (a) Write short notes on : 6

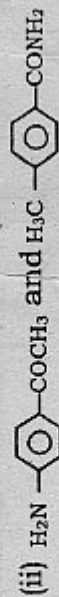
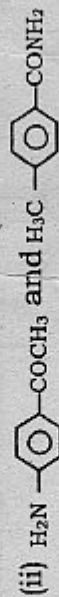
- (i) Auxochrome
- (ii) Hypochromic and hypochromic shift
- (iii) Chromophore

(b) How many bonds are expected to appear in UV spectrum of aniline. If the spectrum is taken in dil. HCl solution then what will happen ? Explain. 10

UNIT - II

4. (a) How would you distinguish between the compounds in each pair by infrared spectroscopy : 6

(i) CH_3COCH_3 and $\text{CH}_3\text{CH}_2\text{CHO}$

(ii)  and 

(iii) Cis and trans stibene

76053-900-(P-8)(Q-9)(15) (4)

(b) How do inductive and mesomeric effects influence the absorption due to carbonyl group ? 6

(c) How can intermolecular and intramolecular hydrogen bonding be distinguished by IR spectroscopy ? 4

5. (a) What do you mean by Fermi resonance ? Explain giving one example. 3

(b) How would you distinguish between following pairs on the basis of IR spectroscopy : 8

(i) Fundamental vibrations and overtones

(ii) Fermi resonance and overtones

(iii) Combination bands and overtones

(iv) In-plane bending and out of plane bending vibrations.

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(c) Some of $C = O$ stretching frequencies are as follows :

$RCOU \approx 1800 \text{ cm}^{-1}$, $RCOOR' \approx 1735 \text{ cm}^{-1}$
and $RCONH_2 \approx 1690 \text{ cm}^{-1}$. How do you explain this trend ? 5

UNIT - III

6. (a) Explain :

(i) Fourier transform technique

(ii) Spin-spin decoupling

(iii) Nuclear overhauser effect

(b) Define chemical shift and discuss various factors affecting it. 7

7. (a) How will you distinguish on the basis of PMR spectroscopy ? 6

(i) Cis and trans-stilbenes

76053-900-(P-8)(Q-9)(15) (6)

(ii) Inter and Intra-molecular hydrogen bonding

(b) Explain anisotropic effects in acetylene, ethylene and benzene. 5

(c) Explain briefly α , β and γ effect in CMR spectroscopy. 5

UNIT - IV

8. (a) What are plane curves and curves with cotton effect ? 5

(b) Explain :

(i) McLafferty rearrangement

(ii) Metastable ions

(c) Mass spectrum of methyl butyrate showed peaks at m/z 102, 71, 59, 43 and 31. Explain their formation. 5

76053-900-(P-8)(Q-9)(15) (7)

[Turn Over