

Seat No.	29339
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B.Sc. (Part-III) (Semester-V) (CBCS) Examination, October - 2023

CHEMISTRY

Organic Chemistry (Paper-X)

Sub. Code : 79683

Day and Date : Wednesday, 25- 10 - 2023

Total Marks : 40

Time : 10.30 a.m. to 12.30 p.m.

- Instructions :
- 1) All questions are compulsory.
 - 2) Figures to the right indicate full marks.
 - 3) Spectroscopic chart is allowed.

Q1) Select most correct alternative among those given below and rewrite the sentences. [8]

- a) In the electromagnetic spectrum, which region has the longest wavelength?
 - i) Ultraviolet
 - ii) Infrared
 - iii) Visible
 - iv) X-ray
- b) Which type of Spectroscopy is particularly useful for studying molecular vibrations?
 - i) UV-Vis Spectroscopy
 - ii) X-ray Spectroscopy
 - iii) IR Spectroscopy
 - iv) NMR Spectroscopy
- c) In UV-Visible spectroscopy, which type of electronic transition is responsible for the absorption of visible light?
 - i) $n \rightarrow \sigma^*$
 - ii) $n \rightarrow \pi^*$
 - iii) $\sigma \rightarrow \sigma^*$
 - iv) $\pi \rightarrow \pi^*$
- d) The shift of absorption band to shorter wavelength is called as _____.
 - i) bathochromic shift
 - ii) hypochromic shift
 - iii) hyperchromic shift
 - iv) hypsochromic shift
- e) Which nucleus is commonly used in NMR spectroscopy?
 - i) Hydrogen (^1H)
 - ii) Carbon (^{12}C)
 - iii) Oxygen (^{16}O)
 - iv) Nitrogen (^{14}N)
- f) In a proton NMR spectrum, how many signals would you expect for a compound with the molecular formula C_4H_{10} ?
 - i) 3
 - ii) 2
 - iii) 4
 - iv) 5

P.T.O.

- g) In mass spectrometry, ions are separated based on their _____
- | | |
|-------------------------|------------------|
| i) Charge-to-mass ratio | ii) Charge alone |
| iii) Mass alone | iv) Size |
- h) Molecular weight is determined by using _____
- | | |
|----------------------|-----------------------|
| i) NMR Spectroscopy | ii) IR Spectroscopy |
| iii) UV Spectroscopy | iv) Mass Spectroscopy |

[20]

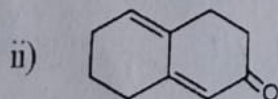
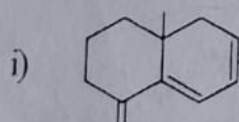
Q2) Attempt any two of the following:

- a) Explain the fundamental modes of vibrations in IR Spectroscopy.
- b) i) Explain the terms:
- 1) Bathochromic shift
 - 2) Hypsochromic shift
- ii) Explain the phenomenon of spin-spin coupling, with examples.
- c) i) State and explain Beer Lambert Law and name the terms involved in its expression.
- ii) Draw a neat labeled diagram of Mass Spectrometer and explain its working.

Q3) Attempt any four of the following:

[12]

- a) Calculate the λ_{max} value of following compounds by using Woodward fieser rule



- b) Write a note on McLafferty rearrangement.
- c) Deduce the structure of the compound using following spectral data
 MF: $\text{C}_2\text{H}_6\text{O}$
 IR : 3300 cm^{-1}
 PMR : δ 1.2 (triplet, 3H); δ 3.7 (quartet, 2H); δ 5.2 (singlet, 1H)
- d) Applications of Mass Spectroscopy.
- e) Write a note on Chemical Shift.

CHEMICAL SHIFTS OF PROTONS δ in ppm			
Proton	δ ppm	Proton	δ ppm
$\text{H}_3\text{C}-\text{R}$	0.9	$-\text{C}-\text{CH}_2-\text{C}-$	1.4
$\text{H}_3\text{C}-\text{C}=\text{C}$	1.7	$-\text{C}-\text{CH}_2-\underset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{OR}$	2.2
$\text{H}_3\text{C}-\underset{\text{R}}{\underset{\mid}{\text{C}}}=\text{O}$	2-2.7	$-\text{C}-\text{CH}_2-\text{C}=\text{C}$	2.3
$\text{H}_3\text{C}-\text{S}-$	2.1	$-\text{C}-\text{CH}_2-\text{S}-$	2.5
$\text{H}_3\text{C}-\text{Ar}$	2.3	$-\text{C}-\text{CH}_2-\underset{\mid}{\text{N}}-$	2.5
$\text{H}_3\text{C}-\underset{\mid}{\text{N}}-\text{R}$	2.3	$-\text{C}-\text{CH}_2-\text{Ar}$	2.7
$\text{H}_3\text{C}-\underset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{Ar}$	2.6	$-\text{C}-\text{CH}_2-\text{OR}$	3.4
$\text{H}_3\text{C}-\underset{\mid}{\text{N}}-\text{Ar}$	3.0	$-\text{C}-\text{CH}_2-\text{I}$	3.2
$\text{H}_3\text{C}-\text{O}-\text{R}$	3.3	$-\text{C}-\text{CH}_2-\text{Br}$	3.5
$\text{H}_3\text{C}-\text{O}-\underset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{R}$	3.7	$-\text{C}-\text{CH}_2-\text{Cl}$	3.6
$\text{H}_3\text{C}-\text{O}-\text{Ar}$	3.8	$-\text{C}-\text{CH}_2-\text{OH}$	3.6
$\text{Ar}-\text{H}$	7.3	$-\text{C}-\text{CH}-\text{C}-$	1.5
$\text{R}-\underset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{H}$	9.0-10.0	$-\text{C}-\text{CH}-\underset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{R}$	2.5
$\text{R}-\underset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{OH}$	10.5-12	$-\text{C}-\text{CH}-\underset{\mid}{\text{N}}-$	2.8
$\text{R}-\text{OH}$	0.5-4.5	$-\text{C}-\text{CH}-\text{Ar}$	3.0