

PARUL UNIVERSITY
FACULTY OF APPLIED SCIENCE
M.Sc. Winter 2018-19 Examination

Semester: 3
Subject Code: 11205204
Subject Name: Spectroscopy of Organic Compounds

Date: 30/10/2018
Time: 10:30am to 1:00pm
Total Marks: 60

Instructions:

- All questions are compulsory.
- Figures to the right indicate full marks.
- Make suitable assumptions wherever necessary.
- Start new question on new page.

Q.1. A) Essay type/brief note (4x2) (Each of 04 marks) (08)

(a) In mass spectrometry, a compound shows m/z values at 43,57,87,101 and 116. Which of the following molecule exhibit the following values among the two given below and show the fragmentation in both.

- Propyl Chloride
 - S- butyl isopropyl ether
- (b) Explain Nuclear overhauser effect in ^{13}C NMR?

Q.1. B) Answer the following questions (Any two from the three) (04)

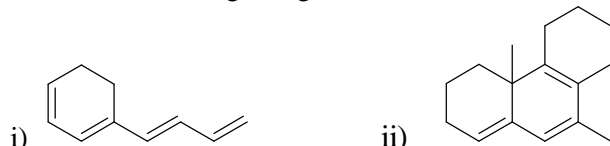
- (a) Short note/ Brief note (2x2)/ Schematically label the figures (2x2) (Each of 02 marks) (04)
- Show diagrammatically the deshielding of protons in alkenes and explain?
 - What is the principle of ^{13}C NMR Spectroscopy? Explain with suitable flipping diagram.
- (b) State the main differences between ^{13}C NMR and ^1H NMR Spectroscopy? (04)
- (c) Why stretching frequency is low for _____ and high for _____ in IR Spectroscopy? (04)

**Q.2. A) Answer the following questions. (04)**

- (a) Short note/ Brief note (2x2)/ Fill in the blanks. (Each of 02 marks) (04)
- The natural abundance of ^{13}C is _____% and spin quantum (I) = _____
 - $n \rightarrow \pi^*$ is a _____ transition.
- (b) Why TMS is chosen as a reference compound in NMR spectroscopy? (04)

Q.2. B) Answer the following questions (Any two) (03)

- (a) Short note/ Multiple choice questions. (Each of 01 marks) (03)
- Olefins and ketones are-
 - Chromophores
 - Auxochromes
 - NMR active
 - Selection rule for NMR Spectroscopy is-
 - $I = \frac{1}{2}$
 - $I = 0$
 - $I \neq 0$
 - Selection rule for UV-Visible spectroscopy is-
 - $\Delta S = 0, \Delta L = \pm 1$
 - $\Delta S = \pm 1, \Delta L = 0$
 - $\Delta S = 1, \Delta L = 1$
- (b) Solve the following using woodward fieser rule- (03)



- The base value for homoannular is 253 nm and base value for hetroannular is 215 nm
- (c) How many NMR signals will be observed in the following compounds- (03)
- p-chlorobenzene
 - $\text{CH}_3\text{COCH}_2\text{CH}_3$
 - HCOOCH_3

Q.3. A) Essay type/ Brief note (4x2) (Each of 04 marks) (08)

- (a) The hydrogen bonding lowers the stretching frequency in IR spectroscopy explain why?
- (b) Explain chemical shift term and explain the scale?

Q.3. B) Answer the following questions (Any two)

- (a) Short note/ Brief note (2x2)/ Schematically label the figures (2x2) (Each of 02 marks) **(04)**
1. Why mass is spectrometry method and not spectroscopy?
 2. Explain the term coupling constant (J)?
- (b) Show the increasing order of stretching frequency in β - lactones, γ -lactones and δ - lactones and explain why? **(04)**
- (c) A short note on effect of conjugation in UV-Visible spectroscopy? **(04)**

Q.4. A) Answer the following questions.

- (a) Short note/ Brief note (2x2)/ Fill in the blanks. (Each of 02 marks) **(04)**
1. Base value for homoannular is _____ nm.
 2. Mass _____ works on the principle of _____ .
- (b) Why substituted benzene shows m/z at 91 and 65 with intense peaks whereas benzene shows m/z at 77 and 52? **(04)**

Q.4. B) Answer the following questions (Any two)

- (a) Short note/ Multiple choice questions. (Each of 01 marks) **(03)**
1. Which scientist were awarded noble prize for NMR?
 - a) Block and Purcell
 - b) Ingold and agust
 - c) Einstein and curie
 2. In IR spectroscopy, selection rule change in dipole moment is-
 - a) not mandatory
 - b) equals to zero
 - c) mandatory
 3. The range of C=O stretching is –
 - a) $3650-3200\text{cm}^{-1}$
 - b) $1250-1050\text{cm}^{-1}$
 - c) $1780-1650\text{cm}^{-1}$
- (b) Show the fragmentation in phenol with m/z values of 93 and 65? **(03)**
- (c) Write down the selection rule for UV-Visible spectroscopy? **(03)**