MANAV RACHNA
vidyanatariksha

MANAV RACHNA UNIVERSITY
(FORMERLY MANAV RACHNA COLLEGE OF ENGINEERING
NAAC ACCREDITED 'A' GRADE INSTITUTION)
Declared as State Private University under section 2f of the UGC act, 1956

DEPARTMENT OF CHEMISTRY

"T3 Examination, May-2018"

Semester: II **Date of Exam**: 24/05/2018
Subject: **Analytical Techniques & Spectroscopy – II** **Subject Code**: CHH-511
Branch: Chemistry **Session**: I
Course Type: Core **Course Nature:** Hard
Time: 3 Hours **Program:** M. Sc
Max. Marks:100 **Signature: HOD/Associate HOD:**

PART- A

Attempt any two questions

1. a) What do you understand by the term "Splitting of Signals"? Explain with examples. 5 Marks

   b) Describe briefly the difference in the positions of absorption as noted in the case of acetylene and benzene. 5 Marks

2. a) A compound with a molecular formula $C_6H_{12}O_2$ shows following 4 signals in NMR Spectrum: 6 marks

   i) Singlet at 1.1 δ (6H)
   ii) Singlet at 2.1 δ (3H)
   iii) Singlet at 2.6 δ (2H)
   iv) Singlet at 3.9 δ (1H)

   Propose a structure consistent with the given data along with explanation.

   b) How will you distinguish Chlorobenzene from 1,2-dichloroethane by ^{1}H NMR spectroscopy? 4 Marks

3. a) Briefly describe C-13 NMR Spectroscopy. What are the extra advantages of it over Proton NMR Spectroscopy? 5 Marks

   b) What is Nuclear Overhauser Effect and What are its consequences on the quantitative spectra in C-13 NMR Spectroscopy? 5 Marks

PART- B

Attempt any two questions

4. a) Why ESR Spectroscopy is widely used in the study of chemical, photochemical and electrochemical reactions, which proceed via free radical mechanism? Discuss the Quantum Theory of Electron Spin Resonance Spectroscopy. 10 Marks

   b) Discuss the instrumentation of ESR Spectrometer. Explain the functioning of its each component. 10 Marks

5. a) What are the basic functions of Mass Spectrometer? Discuss in brief the major components of Mass Spectrometer and explain how these perform various functions ? 10 Marks

   b) Write Short notes on the following: 10 Marks
      i) Metastable ion peak
      ii) Mc Lafferty Rearrangement

6. a) Discuss the main features of Double Focussing and Time of Flight Mass Spectrometers. 10 Marks

   b) What are the various ionization techniques? Describe Chemical Ionization Technique in great detail. 10 Marks

PART- C

Attempt any two questions

7a) Illustrate the basic principle of X-Ray Photoelectron Spectroscopy (XPS) with the help of Energy Level Diagram? How it is used for the surface analysis of various compounds? 10 Marks

b) What are the major differences between UV Photoelectron Spectroscopy and X-Ray Photoelectron Spectroscopy? What are the essential components of XPES or ESCA- discuss the function of each unit. 10 Marks

8 a) How Auger Electron Spectroscopy (AES) is different from Photoelectron Spectroscopy (PES)? Explain the importance of AES for analysis of solid compounds. 10 Marks

b) Discuss the photoelectron spectra of Hydrogen, Nitrogen and Water. 10Marks

9 a) Explain the relevance of Koopman's Theorem in Photoelectron Spectroscopy. Explain all the peaks observed in the Photoelectron Spectrum of Carbon Mono-oxide . 10 Marks

b) What important information is derived from Photoelectron Spectroscopy? How ESCA is useful in the qualitative analysis of various compounds? 10Marks