

UKA TARSADIA UNIVERSITY
M. Pharm. (Pharmaceutical Analysis) (1st Semester)
040060103: Advanced Spectroscopic Techniques

Duration: 3 hours

Maximum marks: 70

Instructions:

1. Attempt all questions
2. Write each section in a separate answer book.
3. Make suitable assumptions wherever necessary.
4. Figures to the right indicate full marks allocated to that question.
5. Draw diagrams/figures wherever necessary.

SECTION-1

Q.1] (a) Answer the following: [7 x 1 = 7]

- 1) What is Chemi luminescence?
- 2) Name the detectors used in Photo acoustic spectroscopy.
- 3) Give full form of SERS.
- 4) What do you mean by lasing medium?
- 5) What is 2D NMR?
- 6) What is a virtual state?
- 7) Enlist the components of a Raman spectrometer.

(b) Attempt any four: [4 x 2 = 8]

- 1) Which unique features make LASER a highly useful source in analytical instrumentation?
- 2) What is stoke's and antistoke's shift?
- 3) What is resonance Raman spectroscopy?
- 4) What do you mean by three and four level laser systems?
- 5) Give benefits of 2D NMR.
- 6) Define enantiotopic protons and diastereotopic protons.

Q.2]

(a) Describe the principle of COSY with suitable example. [5]

OR

(a) Define chemical equivalence and magnetic equivalence. Differentiate between first order and non-first order NMR spectra. [5]

(b) Describe the pulse sequence followed in HETCOR. [5]

OR

(b) Describe the instrumentation and applications of Chemi luminescence. [5]

Q.3] Attempt any two **[2 x 5 = 10]**

- 1) Explain principle of photo acoustic spectroscopy and state its applications.
- 2) Enumerate the types of lasers used in analytical chemistry. Explain the working of Semi conductor diode laser with suitable diagram.
- 3) Describe homotopic and nonhomotopic groups with suitable examples.

SECTION-2

Q.4] (a) Answer the following: **[7 x 1 = 7]**

- 1) Name the radiation source in ESR spectroscopy.
- 2) What is the value of natural abundance of ^{13}C ?
- 3) Name the reference compound used in ESR spectroscopy.
- 4) What do you mean by activation method?
- 5) What is hyperfine splitting?
- 6) Predict the CMR number of signals for Methyl acetate.
- 7) Name the sources of neutrons employed in neutron activation method.

(b) Attempt any four: **[4 x 2 = 8]**

- 1) Explain the principle of ESR spectroscopy.
- 2) What do you mean by slow and fast neutrons?
- 3) What is deuterium substitution?
- 4) Peak intensity of quaternary carbon is less as compared to non-substituted alkane in CMR. Explain.
- 5) The resonances of ^{13}C nuclei are weaker and more difficult to observe than proton resonances. Give reason.
- 6) Differentiate between alpha and beta decay.

Q.5]

(a) Write note on ENDOR and ELDOR techniques. **[5]**

OR

(a) What is INADEQUATE? Explain significance of INADEQUATE in ^{13}C NMR with suitable example. **[5]**

(b) Write note on neutron activation methods. **[5]**

OR

(b) Describe the factors affecting chemical shift in ^{13}C -NMR. **[5]**

Q.6] Attempt any two **[2 x 5 = 10]**

- 1) Describe instrumentation and applications of ESR spectroscopy.
- 2) Write note on Positron Emission Tomography.
- 3) Describe proton decoupled and off resonance technique used in CMR.