

2012
M.Sc. (Applied Chemistry/Pharmaceutical)
Third Semester
Paper – 304: Spectroscopic Instrumentation Techniques

Time allowed: 3 Hours

Max. Marks: 60

NOTE: Attempt five questions in all, including Question No. IX (Unit-V) which is compulsory and selecting one question each from Unit I -IV.

x-x-x

UNIT – I

- I. a) Describe in detail different radiation sources used in UV and visible absorption spectroscopy.
b) Explain Lambert Beer's Law. Derive it. (7,5)
- II. a) How Nephelometry differs from turbidity?
b) Discuss in detail fundamentals of instrumentation for fluorescence. (6,6)

UNIT – II

- III. a) Discuss the following in IR spectroscopy:-
i) Combination bands
ii) Overtones
iii) Fermi resonance
b) Why water is not used as a solvent in IR spectroscopy? (9,3)
- IV. a) Calculate the theoretical number of vibrational degrees of freedom in
i) CO₂
ii) N₂O
iii) C₆H₆
iv) SO₂
b) Derive the expression for vibrational frequency.
c) What will be the force constant for the bond in HCl if the fundamental vibration frequency is $4.332 \times 10^{13} \text{S}^{-1}$. (3x4)

P.T.O.

(2)

UNIT – III

- V. a) What is chemical shift? Discuss the various factors affecting chemical shift.
b) Explain spin-spin coupling and spin-spin interactions in detail. (2x6)
- VI. a) Explain NMR spectrum of Ethyl alcohol ($\text{CH}_3\text{-CH}_2\text{-OH}$)
b) Explain equivalent and non-equivalent protons in NMR spectroscopy giving examples.
c) Discuss quantum description of NMR in detail. (3,4,5)

UNIT – IV

- VII. Write complete notes on the following:-
a) Time of flight analyzer
b) Spark source spectrometry (2x6)
- VIII. a) Explain C-13 NMR spectroscopy briefly.
b) Write in detail about double focusing analyzers. (2x6)

UNIT - V

- IX. Attempt the following:-
a) Briefly note on quadrupole analyzer.
b) Why TMS is used as reference standard in NMR spectroscopy?
c) What is effect of hydrogen bonding of solvent on vibrational frequency?
d) Short note on Derivative spectroscopy. (4x3)

X-X-X