Exam. Code: 0433
Sub. Code: 3456

2021

M.Sc. (Applied Chemistry/Pharmaceutical)

3rd Semester

Paper-304: Spectroscopic Instrumentation Technique

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.*

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UNIT – I

I. (a) Discuss in detail various radiation sources used in UV and visible absorption spectroscopy.

(b) Derive and explain Lambert Beer's Law. (8+4)

II. (a) Describe in detail fundamentals of instrumentation for phosphorescence.

(b) Differentiate between Nephelometry and Turbidity. (7+5)

UNIT – II

III. (a) Calculate the number of fundamental vibrations in case of Linear and Non-Linear molecules.

(b) Discuss the following concepts of infrared spectroscopy: -

(i) Overtone

(ii) Combination bands

(iii) Fermi resonance (6+6)

IV. (a) Explain the concept of hydrogen bonding on the frequency of absorption of different compounds.

(b) What are expected bands to occur in IR spectrum of Toluene?

(c) Calculate the vibrational absorption frequency of the carbonyl $(\rangle C=0)$ group, if force constant for double bond is 1×10^{6} dynes cm^{-1}. (6+3+3)

UNIT – III

V. Discuss the following terms: -

(a) Spin-Spin Interactions

(b) Chemical shift and factors affecting it

(c) Spin-Spin coupling (4+5+3)

P.T.O.

VI. (a) Explain quantum description of NMR in detail.

(b) Why TMS is used as reference standard in NMR?

(c) How many kinds of hydrogen are there in the following compounds?

(a) $CH_3-CHCl-CH_3$ (b) $CHBr_2-CH_2Br$

(c) $CH_3-CH_2-CH_2-Cl$ (6+3+3)

UNIT-IV

VII. (a) Discuss in detail about Dempster's mass spectrometer.

(b) Write a note on Time of Flight analyzer. (7+5)

VIII. (a) Discuss in brief about C-13 NMR spectroscopy.

(b) Write a note on Quandrapole analyzer. (6+6)

UNIT-V

IX. Attempt the following: -

(a) What is effect of concentration on Fluorescence?

(b) Brief about Derivative Spectroscopy.

(c) Spark source spectrometry

(d) Equivalent and Non-equivalent protons (4×3)

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