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DD-458

M. Sc. (Second Semester)
EXAMINATION, May-June, 2020

CHEMISTRY

Paper Fourth (CH—10)

(Theory and Application of Spectroscopy—II)

Time : Three Hours

Maximum Marks : 80

Note : Attempt all the *four* questions. *One* questions from each Unit is compulsory. All question carry equal marks.

Unit—I

1. (a) Discuss the methods of determinants of ligand to metal ratio in a complex by spectrophotometric method. 7

   (b) Write a note on Franck-Condon principle. 7

   (c) Define the terms bathochromic shift and hypsochromic shift. What structural feature may produce a bathochromic or a hypsochromic shift in an organic compound ? 6

Or

2. (a) Solution of iodine in hexane is violet in colour while in benzene, it is brown. Explain. 6

(b) Discuss the rotational fine structure of electronic vibration transitions. 7

(c) Describe the applications of electronic spectroscopy. 7

Unit—II

3. (a) Describe the factors influencing vibrational frequencies in the IR spectra. 7

(b) How would you distinguish between the compounds in each pair by infrared spectral studies ? 6

(i) Acetone and acetaldehyde

(ii) Cyclohexanol and phenol

(iii) O-xylene and ethyl benzene

(c) Discuss Anharmonic oscillators in vibrational spectroscopy. 7

Or

4. (a) Describe instrumentation and principle of Fourier transform IR spectroscopy. 7

(b) What do you mean by coupled vibrations ? Discuss, how they originate. 6

(c) Explain the importance of IR spectroscopy in fingerprint region. 7

Unit—III

5. (a) Describe the principle of Gas Chromatography Mass Spectrophotometer (GCMS). 7

(b) How would you distinguish among ethylamine, diethylamine and triethylamine on the basis of their mass spectra studies ? 6

(c) Write a note on McLafferty rearrangement. 7

Or

6. (a) What do you mean by molecular ion peak and mass spectra fragmentation of organic compounds ? Discuss the factors affecting fragmentation. 7

(b) How will you account for the appearance of prominent peaks at *m/z* 31, 42 and 70 in the mass spectrum of *n*-pentanol ? 6

(c) What is nitrogen rule as applied in mass spectrometry ? Explain with suitable examples, its significance in mass spectral analysis. 7

Unit—IV

7. (a) Define chemical shift. Discuss the various factors which affect the chemical shift. 7

(b) Write a note on Fourier transform NMR spectrophotometer. 6

(c) How will you distinguish between inter and intra-molecular hydrogen bonding on the basis of NMR spectroscopy ? 7

Or

8. (a) Explain, why the aromatic protons are more deshielded than the ethylenic protons although both the types of protons are attached to sp^2 hybridised carbons. 7

(b) Explain spin-spin splitting and coupling constant with suitable examples. 6

(c) Discuss the theory and instrumentation of NMR spectroscopy. 7