LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **CHEMISTRY**

THIRD SEMESTER – NOVEMBER 2017

CH 3810 - MOLECULAR SPECTROSCOPY

Date: 07-11-2017 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

Part-A

Answer ALL questions. **(10 × 2= 20)**

1. What is the significance of Fourier transform spectroscopy?
2. Mention the names of any two photon detectors.
3. State mutual exclusion principle.
4. Mention the significance of finger print region in IR spectroscopy.
5. State the principle of photoelectron spectroscopy.
6. What is the significance of asymmetry parameter?
7. What is zero field splitting?
8. Sketch the EPR of methyl radical.
9. Define quadrupole coupling constant.
10. Mention the importance of Doppler shift in Mossbauer spectroscopy.

Part-B

Answer any EIGHT questions. **(8 × 5= 40)**

11. Briefly discuss the factors affecting the intensity of spectral lines.
12. Outline the causes for the broadening of the spectral lines.
13. Discuss the isotopic effect in the rotational spectra.
14. The first 3 stokes lines in the rotational Raman spectrum of $^{16}O_2$ are separated by 14.4 cm^{-1}, 25.8 cm^{-1} and 37.4 cm^{-1} from the exciting radiation. Using the rigid rotor model, obtain the value of r_o.
15. Draw Morse curve and explain the vibrational energy of a diatomic molecule.
16. Explain the various electronic transitions possible for the organic compounds.
17. How is coupling constant calculated? Account for the positive and negative coupling constants.
18. Discuss the factors that affect chemical shift.
19. Calculate the Lande splitting factor for chlorine atom.
20. Why is it that EPR spectra are presented in first derivative mode?
21. Explain geminal and vicinal coupling with examples.
22. Discuss the quadrupole transitions possible in axially symmetric fields.

Part-C

Answer any FOUR questions. **(4 × 10= 40)**

23. Using rotational spectra, explain the stark effect of a linear and symmetric top molecule.
24. Explain the origin of P, Q, R branches of the rotation-vibration spectra.
25. Draw Jablonski energy level diagram and explain the various absorption and emission processes.
26. Discuss the principle of COSY and HETCOR with relevant examples.
27. Explain the EPR of naphthalene biradical and mention the causes of anisotropy in hyperfine splitting.
28. Explain i) isomer shift ii) quadrupole splitting with suitable examples.

$$$$$$$$