D 6818

(Pages : 2)

Name.....................................

Reg. No...............................

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, DECEMBER 2016

(CUCSS)

Chemistry

CH 3C 09 – MOLECULAR SPECTROSCOPY

(2015 Admissions)

Time : Three Hours

Maximum : 36 Weightage

Part A

Answer all questions.

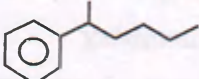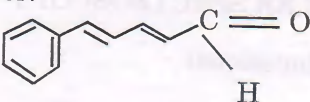*Each question carries a weightage of 1.*

1. Calculate the bandwidth of radiation with a lifetime of 100 micro-seconds.

2. Which of the following molecules are microwave active? CH_2Cl_2, $CHCl_3$, CH_4, C_2H_2.

3. Define normal mode of vibration.

4. Stokes' lines are more intense than anti-stokes' lines in vibrational Raman spectrum. Why?

5. A proton absorbs 900 Hz downfield with respect to TMS in a 300 MHz NMR instrument. Calculate the chemical shift δ (delta).

6. State and explain Karplus relationship.

7. What is cotton effect?

8. Explain the term 'Scalar coupling' in NMR.

9. What do you mean by first order NMR spectrum?

10. Explain the term 'polarization transfer' in NMR.

11. Distinguish between base peak and molecular ion peak in mass spectrum.

12. Explain 'rule of thirteen' in mass spectrometry.

(12 × 1 = 12 weightage)

Part B

Answer any eight questions.

Each question carries a weightage of 2.

13. How would you determine dipole moment of a molecule from microwave spectroscopy? Explain.

14. Discuss microwave spectra of symmetric top molecules.

15. Write Morse equation. Represent graphically. Show that real molecules obey simple harmonic oscillator approximation for low amplitude vibrations.

16. What is NOE? Explain its significance.

Turn over

17. Suggest an experiment to determine spin-spin relaxation time. Discuss.

18. Calculate the magnetic field required to bring protons into resonance in a 400 MHz NMR spectrometer gyro-magnetic ratio $(r_N) = 26.7 \times 10^7$ radians $T^{-1} S^{-1}$.

19. What is Kramer's theorem? Discuss its applications.

20. You are given the molecule . Predict the major fragmentation pathway. Justify your answer.

21. Predict λ_{max} for . Justify your answer.

22. Predict IR bands with intensity for following compounds : (a) Diethyl acetylene ; (b) Sodium propionate.

23. Predict proton decoupled ^{13}C NMR and DEPT spectrum of Br.

24. What is FAB^{-MS}? Discuss.

(8 × 2 = 16 weightage)

Part C

Answer any two questions.
Each question carries a weightage of 4.

25. Define Bandwidth. What are the factors influencing bandwidth. Discuss.

26. Briefly discuss theory of FT NMR.

27. Discuss briefly theory and applications of Mössbauer spectroscopy.

28. Write a brief account of the theory of Optical Rotatory Dispersion.

(2 × 4 = 8 weightage)