D 52429 (Pages : 2) Name.....

Reg. No.....

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, DECEMBER 2018

(CUCSS–PG)

Chemistry

CH 3C 09—MOLECULAR SPECTROSCOPY

(2015 Syllabus Year)

Time : Three Hours Maximum : 36 Weightage

Part A

Answer **all** *questions.*
Each question carries a weightage of 1.

1. An organic molecular absorbs radiation of wavelength 540 nm. What is the energy in $Jmol^{-1}$?
2. Which of the following molecules are microwave active ?

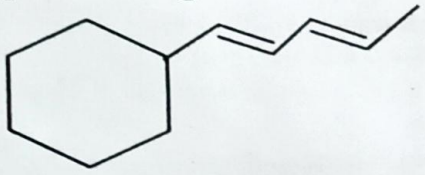
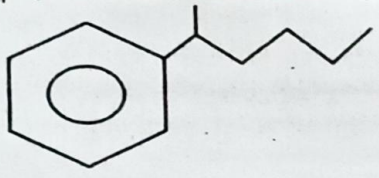
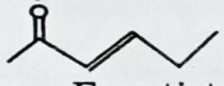
   CH_2cl_2, $CHcl_3$, CH_4, C_2H_2.
3. What is an harmonicity constant (x_e) ?
4. Stoke's lines are more intense than antistokes lines in the vibrational Raman spectrum. Why ?
5. Define gyromagnetic ratio.
6. State and explain Karplus relationship.
7. State axial haloketone rule. Explain.
8. Explain term 'scalar coupling in NMR'.
9. Name one nuclear shift reagent. Explain its function.
10. What do you mean by polarization transfer in NMR ?
11. Explain the term TOF in mass spectrometry.
12. What is rule of thirteen ?

(12 × 1 = 12 weightage)

Turn over

Part B

Answer **eight** *questions.*
Each question carries a weightage of 2.

13. How would you determine C = O and C = S bond length in cos. Explain.
14. Discuss microwave spectra of symmetric top molecules.
15. What is predissociation spectrum ? Discuss.
16. What is NOE ? Explain its significance.
17. Predict λ_{max} for  Justify your answer.
18. Calculate the magnetic field required to bring ^{13}C nuclei into resonance in a 300 MH_z NMR spectrometer. Gyromagnetic ratio $(\gamma_N) = 6.7 \times 10^7$ radians $T^{-1}\ S^{-1}$.
19. How would you determine G∥ (Parallel) and G⊥r (Perpendicular) ? Discuss.
20. You are given the molecule  Predict the major fragmentation pathway. Justify your answer.
21. Predict IR bands with intensity for following compounds. (a) diphenylacetylene ; (b) Sodium propionate.
22. You are given the compound  . List all spin systems, chemically equivalent protons, magnetically equivalent protons, Enantiotopic protons and diastereotopic protons. Justify your answer.
23. Sketch the proton decoupled ^{13}C NMR and DEPT spectrum of  Br.
24. What is FAB ? Discuss.

(8 × 2 = 16 weightage)

Part C

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

25. Define bandwidth. What are the factors influencing bandwidth ? Discuss.
26. Briefly discuss theory and applications of 2-dimensional NMR spectroscopy.
27. Discuss briefly theory and applications Mössbaver spectroscopy.
28. Discuss briefly :
    (a) McLafferty rearrangement ; (b) Spin Echo experiment.

(2 × 4 = 8 weightage)