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(Pages : 2)

Name.....

Reg. No.....

THIRD SEMESTER M.A./M.Sc./M.Com. DEGREE (REGULAR) EXAMINATION NOVEMBER 2020

(CBCSS)

Chemistry

CHE 3C 09—MOLECULAR SPECTROSCOPY

(2019 Admissions)

Time : Three Hours

Maximum : 30 Weightage

Section A

Answer at least **six** *questions.*
Each question carries 1 *weightage.*
All questions can be attended.
Overall Ceiling 6.

1. The lifetime of a pulse of radiation is 100 microseconds. Calculate the band width in Hz.
2. Distinguish between prolate and oblate type of molecules with examples.
3. Explain the term 'Resonance Raman'.
4. What is predissociation spectrum ?
5. What are the drawbacks of ^{13}C in NMR ?
6. State and explain Kramer's theorem.
7. What is Octant rule ? Explain.
8. Distinguish : Enantiotopic, diastereotopic and homotopic protons in NMR.
9. Explain Spin decoupling.
10. What is time of flight mass spectrometry ?

(6 × 1 = 6 weightage)

Section B

Answer at least **four** *questions.*
Each question carries 3 *weightage.*
All questions can be attended.
Overall Ceiling 12.

11. How would you determine C=O and C=S bondlengths in COS by microwave spectroscopy ? Discuss.
12. Find the lowest energy electronic transition in *nm* for Octatetraene. The length of the π(pi), bond system is 9.3 Å. Use particle in a box model.

Turn over

13. How would you determine spin-lattice relaxation time T_1 in NMRL ?

14. How many lines do you expect in the EPR spectrum of ND_3 radical. What is the relative int
Discuss.

15. How would you distinguish the following pairs by IR Spectroscopy ?

    (a) Ph CH_2NH_2 and Ph CO NH_2.

    (b) MeO – C_6H_4 – COMe and Me – C_6H_4 COOMe.

16. Draw NMR spectrum of 4-vinyl pyridine and assign the peaks.

17. Briefly discuss correlation spectroscopy.

18. Write a brief account of the various ionization techniques in MS.

(4 × 3 = 12 weig

Section C

Answer at least **two** *questions.*
Each question carries 6 *weightage.*
All questions can be attended.
Overall Ceiling 12.

19. Discuss theory, applications and instrumentation in Raman spectroscopy.

20. Briefly discuss FT NMR.

21. Discuss the applications of ORD in structural elucidation.

22. The spectral data of a compound is given below :

IR : 1620 cm^{-1}(m), 1695 cm^{-1}(s).

NMR : 1.9 δ(3H,singlet), 2.1 δ(6H,singlet).

UV : λ_{max} – 238 nm (ε = 11700).

MS : $\frac{m}{z}$ 55(100), 83(90), 43(78), 98(49)
29(46), 39(43), 27(42), 53(13)
41(13),28(8).

Deduce the structure of the compound and assign the peaks.

(2 × 6 = 12 weig