(Pages : 2)

Name..

D 11613

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

THIRD SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, NOVEMBER 2021

(CBCSS)

Chemistry

CHE 3C 09—MOLECULAR SPECTROSCOPY

(2019 Admission onwards)
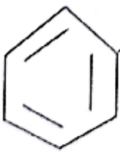
Maximum : 30 Weightage

Time : Three Hours

General Instructions

1. *In cases where choices are provided, students can attend* **all** *questions in each section.*

2. *The minimum number of questions to be attended from the Section / Part shall remain the same.*

3. *The instruction if any, to attend a minimum number of questions from each sub section / sub part / sub division may be ignored.*

4. *There will be an overall ceiling for each Section / Part that is equivalent to the maximum weightage of the Section / Part.*

Section A

Answer any **eight** *questions.*
Each question carries a weightage of 1.

1. Which of the following molecules are microwave active ? Justify your answer CH_2Cl_2. $CHCl_3$. CCl_4, BCl_3 ?

2. Define normal mode of vibration.

3. A set of protons absorb at a frequency 900 Hz higher w.r.t. TMS in 100 MHz NMR instrument. Calculate the chemical shift δ(delta).

4. Define of factor. Explain its significance.

5. Predict λ-max for

$$\text{CH} = \text{CH} - \text{CHO}$$

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

7. δ(delta) values of ^{13}C are appreciably higher compound to proton. Why ?

Turn over

8. State and explain nitrogen rule.

9. What is Karplus relationship?

10. How many lines do you expect in the EPR spectrum of benzene negative ion ? Justify your a

$(8 \times 1 = 8$ we

Section B

Answer any six questions.
Each question carries a weightage of 2.

11. How would you find dipole moment of a molecule from microwave spectroscopy ? Expla

12. Write Morse equation-represent graphically. Show that it approximates to simple harmonic for low amplitude vibrations.

13. How you determine spin-spin relaxation time T_2 using pulsed NMR ? Discuss.

14. Briefly discuss zero field splitting.

15. How would you establish conformation and configuration of 3-methyl cyclohexanone by

16. Discuss the various mechanisms of spin-sprin coupling.

17. What is NOE ? Discuss.

18. With the help of suitable examples discuss McLafferty rearrangement.

$(6 \times 2 = 12$ w

Section C

Answer any two questions.
Each question carries a weightage of 5.

19. What are the drawbacks of conventional NMR spectrum ? How are they overcome in ? Discuss.

20. Discuss theory and applications of Mössbauer spectroscopy.

21. The spectral data of a compound is given IR 1620 cm$^-$ (m), 1695 cm^{-1} (s)

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

UV : λ_{max} 238 nm ($\epsilon = 11700$)

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

Deduce the structure and assign the peaks.

22. Discuss the applications of ORD in structural investigation.

$(2 \times 5 = 1$