20P310 (Pages: 2) Name……..

Reg. No…….…….

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2021

(CBCSS-PG)

(Regular/Supplementary/Improvement)

CC19P CHE3 C09 - MOLECULAR SPECTROSCOPY

(Chemistry)

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

Section A

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

1. Explain the significance of the term 'gyromagnetic ratio'.
2. Which of the following will be NMR active? Justify your answer ^{1}H, ^{13}C, ^{16}O and ^{12}C
3. What is meant by Stark effect?
4. State mutual exclusion principle
5. What is transition moment integral?
6. Write selection rule for pure rotational Raman spectrum.
7. In general IR absorption peaks of O-H group of phenols and alcohols are broad, why?
8. Give one application of 'The Rule of 13' in mass spectrum.
9. Expand the terms in INADEQUATE.
10. Sketch vibrational modes of water molecule.

(8 × 1 = 8 Weightage)

Section B

Answer any ***six*** questions. Each question carries 2 weightage.

11. Explain g anisotropy
12. What is meant by zero fields splitting?
13. Explain the factors affecting the intensity of spectral lines
14. What is Fortrat Parabola? Explain it for the case of $B' - B'' < 0$
15. Give the energy level expression for symmetric top molecules and draw the energy level diagram of J = 2 level of a prolate molecule.
16. The rotational spectrum of CO shows a series of equidistant lines separated by 3.84325 cm^{-1}. Calculate bond length.
17. Explain McConnell equation
18. Give a brief outline of COSY method in NMR.

(6 × 2 =12 Weightage)

Section C

Answer any ***two*** questions. Each question carries 5 weightage.

19. Discuss the rotational-vibrational Raman spectrum of diatomic molecules
20. Discuss the influence of rotation on the vibration spectra of polyatomic molecules
21. Discuss Relaxation Methods in NMR Spectroscopy.
24. Explain the following in NMR spectroscopy.
    (a) Spin – Spin coupling.
    (b) Origin of chemical shift.

(2 × 5 =10 Weightage)

****