MSc DEGREE (CSS) EXAMINATION , NOVEMBER 2022

Second Semester

CORE - CH500204 - MOLECULAR SPECTROSCOPY

M Sc ANALYTICAL CHEMISTRY,M Sc APPLIED CHEMISTRY ,M Sc CHEMISTRY,M Sc PHARMACEUTICAL CHEMISTRY,M Sc POLYMER CHEMISTRY

2019 Admission Onwards

F3A94460

Time: 3 Hours   Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. Explain the term natural line width.

2. State and explain Born-Oppenheimer approximation.

3. Give some important applications of microwave spectroscopy.

4. Differentiate overtones and hot bands.

5. Explain Frequency doubling.

6. What is meant by shielding and deshielding of a nucleus?

7. Disuss briefly on the lattice relaxation techniques.

8. What are the factors which effects chemical shift?

9. What are the factors effecting the coupling in NMR?

10. Write a short note on NQR spectroscopy.

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. The first line in the rotational spectrum of carbon monoxide has a frequency of $3.8424\,cm^{-1}$. Calculate the rotational constant and hence C-O bond length in carbon monoxide.

12. Explain the rotational spectra of a Non-rigid rotator.

13. Write a note on the classical theory of Raman spectroscopy.

14. Explain the localized electronic transitions occuring in a functional group and in a bond?

15. Explain the instrumentation of FT NMR technique.

16. Explain the spin-spin relaxation in multiple pulse FT NMR.

17. Explain magic angle spinning in solid state NMR. What are the main applications of solid state NMR?

18. Explain the principle of Mossbauer spectroscopy.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. (a) Explain the vibrational spectra of polyatomic molecules taking water and carbon dioxide as examples.
    (b) Briefly describe combination & difference bands and fermi resonance.

20. (a) Explain with diagram the Frank Condon principle. (b) How heat of dissociation is calculated using the spectrum?

21. Explain the pulse sequences in FT NMR with pulse width and the relaxation methods.

22. Explain the principle and applications of EPR spectroscopy.

(2×5=10 weightage)