



QP CODE: 22000492



22000492

Reg No : .....

Name : .....

**MSc DEGREE (CSS) EXAMINATION , JANUARY 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

C8DBCC16

Time: 3 Hours

Weightage: 30

**Part A (Short Answer Questions)**

*Answer any **eight** questions.*

*Weight 1 each.*

1. What is meant by signal to noise ratio?
2. Explain the significance of Born Oppenheimer approximation.
3. Give a short note on rotational spectra of linear polyatomic molecules.
4. What is meant by Fermi resonance? Explain with example.
5. What is meant by population inversion and frequency doubling?
6. Why TMS is used as reference standard in H-NMR?
7. What is meant by signal to noise ratio in FT NMR spectroscopy?
8. What is meant by spin flipping in NMR?
9. What is meant by magic angle spinning in NMR spectroscopy?
10. Differentiate between fine structure and hyperfine structure in EPR.

(8×1=8 weightage)

**Part B (Short Essay/Problems)**

*Answer any **six** questions.*

*Weight 2 each.*

11. Derive an expression for calculating  $J_{\max}$  in microwave spectra.
12. Explain the principle involved in the preparation of food in microwave oven. What are the applications of microwave spectroscopy?
13. Determine the force constant for CO vibrator provided  $\omega_e = 2170 \text{ cm}^{-1}$ .





14. Explain Birge-spooner method for determining dissociation energy.
15. A particular NMR instrument operates at 30.256 MHz what magnetic field are required to bring a proton nucleus and C-13 nucleus to resonate at this frequency? Magnetic moment of proton nucleus =  $2.7927 \mu\text{N}$  and a C-13 =  $0.7022 \mu\text{N}$ .
16. Explain relaxation methods in NMR spectroscopy.
17. Discuss the various factors influencing the coupling constant in NMR.
18. Discuss briefly on hyperfine and quadrapole splitting in Mossbauer spectroscopy.

(6×2=12 weightage)

### **Part C (Essay Type Questions)**

*Answer any **two** questions.*

*Weight 5 each.*

19. (a) Explain the classical theory of Raman spectrum. (b) Discuss Resonance Raman scattering and resonance fluorescence.
20. Explain the various transitions involved in the electronic spectra of polyatomic molecules giving emphasise to the transitions occurring in a functional group and in a bond.
21. What is FID in FTNMR? Explain how data acquisition and storage is done in FT NMR?
22. Briefly explain the theory and important applications of NQR spectroscopy.

(2×5=10 weightage)

