QP CODE: 24044864

24044864

Reg No : .....

Name : .....

M.Sc DEGREE (CSS) EXAMINATION, OCTOBER 2024

Third Semester

CORE - CH500303 - SPECTROSCOPIC METHODS IN CHEMISTRY

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

2019 ADMISSION ONWARDS

7D85ECFD

Time: 3 Hours Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. How will you distinguish between cis and trans 1,3,5 hexatriene?
2. How will you distinguish between the inter molecular and intra molecular hydrogen bonding?
3. Which of the following bonds would be expected to have the lowest frequency stretch? Explain.
   a) C-I b) C- Br c) C-Cl d) C- F
4. Why the acid proton shows high chemical shift value?
5. Write the theory of spin-spin splitting.
6. Comment on Pascal's triangle in NMR spectra.
7. What is NOE? Illustrate NOE using cross polarisation method.
8. Explain the twchnique DEPT in NMR.
9. Explain the strong peaks at m/e 91 and m/e 65 in Toluene.
10. Analyse the Fries rearrangement using spectral methods.

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. Explain the Cotton effect curves. What are its uses? Illustrate with asuitable example.
12. Write a note on field effect on IR spectrum of organic compounds.

14. Discuss about deuterium coupling in NMR spectroscopy.

15. Deduce the structure of the molecules from the proton NMR data
    (a) $C_5H_{10}O_2$. 1HNMR data, δ 4.1(q, J=7Hz), 2.2(q, J=7Hz), 1.1(t, J=7Hz), 1.25(t, J=7Hz)
    (b) $C_5H_{10}O_2$. 1HNMR data, δ 3.6(s), 2.2(t, J=7Hz), 1.6(m), 0.9(t, J=7Hz)

16. Write a note on chemical ionization. What are its advantages?

17. Ethyl butanoate in its mass spectrum shows two characteristic peaks due to odd electron ions at m/z = 88 and 60 and an abundant ion at m/z = 71. Explain the fragmentation.

18. Determine the structure of mass 74. In the IR Spectrum, it absorbs at 3560(b), 2960 - 2850 (w), 1145 cm^{-1} (s). In the are NMR spectrum, two signals observed at 6.5 τ (singlet, 3.4 Squares) and 8.95 τ (singlet, 31.0 Squares).

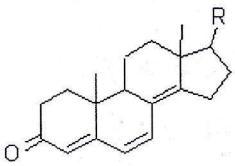
(6×2=12 weightage)

Part C (Essay Type Questions)

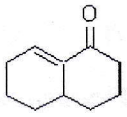
*Answer any **two** questions.*

*Weight **5** each.*

19. *(a) Give in detail about Chiro optical properties. (b) Find out the sign of cotton effect for the following molecules.*



(a)



(b)

20. Explain 2D NMR.

21. a) Explain Mc Lafferty rearrangement and discuss its application.
    b) Write on Nitrogen rule in Mass spectrometry
    c) Ethyl butanoate in its mass spectrum show two characteristic peaks due to odd electron ions at m/z = 88 and 60 and an abundant ion at m/z = 71. Explain the fragmentation.

22. A compound 'A' with molecular formula C_5H_{10} on ozonolysis gives 'B', C_4H_8O, as one of the products. The IR spectrum of B showed a band at 1720 cm^{-1} and the NMR spectrum showed three signals at δ values 0.9 (3H, t), 3.4 (2H, q) and 2.2 (3H, s). What are A and B? Explain.

(2×5=10 weightage)