QP CODE: 21000546

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Reg No : .....

Name : .....

M Sc DEGREE (CSS) EXAMINATION, MARCH 2021

Third Semester

Faculty of Science

CORE - CH500303 - SPECTROSCOPIC METHODS IN CHEMISTRY

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

2019 Admission Onwards

6F18F775

Time: 3 Hours Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. Briefly explain about ORD and CD.
2. Explain briefly about the fingerprint region in IR spectroscopy.
3. Arrange the following in the increasing order of their carbonyl stretching frequencies: cyclohexanone, cyclopentanone, cyclobutanone, cyclopropenone.
4. Explain the term Chemical shift. What is its unit?
5. What is anisotropic effect in NMR?
6. What do you meant by virtual coupling.
7. What are Lanthanide shift reagents? Give example. Write their mechanism.
8. What is the importance of off diagonal peaks in COSY experiment? Illustrate with an example.
9. Explain Nitrogen Rule.
10. A hydrocarbon with molecular mass C7H12 (M+ at m/e 96) shows large peaks at m/e 54 and due to M-15. What structure can be assigned to the compound?

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. The π-π* transition of ethylene occurs at 170 nm, while butadiene absorbs at 217 nm. Explain.
12. Write a note on field effect on IR spectrum of organic compounds.
13. Explain AB, ABC and AMX type splitting in NMR.
14. Write a note on dueterioration in NMR spectroscopy?
15. Explain DEPT with Suitable example.
16. 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)
17. Deduce the feasible structures for the compound whose mass spectra have ions at the following M/Z values. Base peak first.Discuss the fragmentation pattern.
    $C1_0H_{20}O$ m/z 57, 81, 67, 56, 82, 83, 41, 123, 99
18. State whether the following pairs of compounds could be distinguished by the examination of their IR spectra. Give reasons.
    (a) $PhCH_2NH_2$ and $PhCONH_2$
    (b) NH_2-C_6H_4-CO_2Me and Me-C_6H_4-$CONH_2$

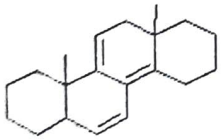
(6×2=12 weightage)

Part C (Essay Type Questions)

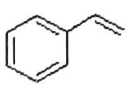
*Answer any **two** questions.*

*Weight **5** each.*

19. (a) Systematically write down the procedure to calculate λ_{max} of compounds usnig Woodward-Fieser Rules.
    (b) Find out the λ_{max} value of the following compounds



(a)



(b)

20. Write a note on the mechanism of coupling with special reference to Dirac model.

21. Discuss the various ionasiation methods used in mass spectrometry.

22. Predict the structure of the compound (MF: $C_{11}H_{20}O_4$) which gave the following spectral data.

UV – No λ_{max} above 200 nm

IR: 1740 cm^{-1}.

^{1}HNMR: δ 4.2 (4H, q), 3.3 (1H, t), 1.9 (2H, q), 1.33 (4H, m), 1.27 (6H, t) and 0.9 (3H, t) ppm.

^{13}C NMR: δ 14.10, 13.81, 22.4, 28.5, 29.5, 52.0, 61.1 and 169.3 ppm.

Mass: m/z 216 (M^+), 171, 160 (100%), 133 and 115.

(2×5=10 weightage)