MOTHER TERASA WOMEN'S UNIVERSITY, KODAIKANAL

UG DEGREE EXAMINATIONS - NOVEMBER 2020

B. SC. CHEMISTRY –V - SEMESTER

UCHT55 - SPECTROSCOPY

Time: 3 Hours **Total Marks:75**

Part –A (10 X1=10 MARKS)

I. Answer ALL the following objective questions (Choose the correct answer)

1. Which of the following is an application of molecular of spectroscopy?
   a) Functional group investigation b) Compound formation
   c) Study of energetically excited reaction products d) Ionization

2. During the motion, if the centre of gravity of molecule changes, the molecule process ----
   a) Electronic energy b) Rotational energy
   c) Translational energy d) Vibrational energy

3. Which of the following molecules will not show infrared spectrum?
   a) H_2 b) HCl c) CH_4 d) H_2O

4. Which of the following is the wave number of near infrared spectrometer?
   a) 4000 - 200 cm^{-1} b) 200 - 10 cm^{-1} c) 12500 - 4000 cm^{-1} d) 50 - 1000 cm^{-1}

5. Which is the correct order of λmax for n ---> σ^* transition?
   a) R- OH > R- NH_2 > R - SH b) R-NH_2 > R-OH > R- SH
   c) R- OH > R- SH > R- NH_2 d) R -SH > R- OH > R-NH_2

6. Which of the following does not absorb light in UV / visible spectrum?
   a) Chloral hydrate b) Aspirin c) Paracetamol d) Phenobarbitone

7. The chemical shift value of TMS signal is ---------- ppm.
   a) 1 b) 0 c) 3.4 d) 5.6

8. How many proton NMR signals in CH_3CB_{r2} CH_3 ?
   a) One b) Two c) Three d) Four

9. In which state of matter Mass spectroscopy being performed?
   a) Solid b) Liquid c) Gaseous d) Plasma

10. What are the main criteria on which mass spectrometer used for?
    a) Composition in sample b) relative mass of atoms
    c) Concentrations of elements in the sample d) Properties of sample

Part –B (5 X 4=20 MARKS)

II. Answer ALL the questions for the following. Write note more than 200 words each.

11. a) Write a note on Born- Oppenheimer approximation.

(OR)

b) Explain the terms: i) Absorption spectra ii) Emission spectra.

12. a) Compare IR and Raman Spectroscopy.

(OR)

b) State and Explain Stoke's and Anti- Stoke's lines.

13. a) Write notes on: i) Chromophore ii) Auxochrome

(OR)

b) What are the different types of electronic transitions that takes place on absorption of light.

14. a) Enumerate the various applications of NMR spectroscopy.

(OR)

b) What is chemical shift? Explain the factors influencing chemical shift.

15. a) What is mass spectroscopy? What is the principle of mass spectroscopy?

(OR)

b) Write note on Nitrogen rule and Metastable peak.

Part –C (3 X 15=45 MARKS)

III. Answer any THREE questions:

16. a) Write note on Microwave spectroscopy and examine the rotational spectra of diatomic molecules.

b) Outline electronic, vibrational and rotational energy levels in spectroscopy.

17. a) Explain the Functional group and Finger print region in IR spectroscopy.

b) Discuss the principle and instrumentation of IR spectroscopy.

18. a) Write an elaborate note on Franck London principle.

b) Explain the factors influencing λmax in UV spectroscopy.

19. a) What are different kinds of protons indicated in an NMR spectrum?

b) What is meant by shielding and unshielding protons?

c) Describe the principle of Nuclear magnetic spectroscopy.

20. a) Write the different fragments with their m/e values obtained in spectrum of ethanol and toluene.

b) Outline the Base peak and Isotopic peak in Mass spectroscopy.

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