

IV B.Tech I Semester Regular Examinations, November 2005
SPECTROSCOPIC ANALYSIS OF BIOMOLECULES
(Bio-Technology)

Time: 3 hours**Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Describe the range of electromagnetic radiations useful for ultraviolet and infrared spectroscopy.
(b) What is the range of frequencies for visible light? Express it in wavelengths and also in terms of wave numbers. [8+8]
2. (a) Write a short note on finger print region.
(b) Describe the scanning of an IR spectrum of an organic compound. [8+8]
3. Discuss the IR spectra for the Lipids. [16]
4. (a) Detail the chemistry of electronic spectroscopy. Give the various types of transitions involved in this technique with one example in each case.
(b) Explain the effect of polar solvents on [8+8]
i. $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$ transitions.
5. (a) Write a note on symmetry restrictions in electronic transitions.
(b) Explain Job's and Mole ratio curves. [8+8]
6. (a) What is coupling constant and give the importance?
(b) Write the applications of coupling constants. [6+10]
7. How can you interpret the NMR signals for Lipids? [16]
8. Explain the instrumentation of ESR. [16]

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1. (a) Explain the different properties of electromagnetic radiation.
(b) Describe the use of electromagnetic radiation for different spectral studies. [8+8]
2. (a) Explain the solid sampling technique in IR spectrometer.
(b) Discuss the inductive and mesomeric effects influencing the carbonyl absorption frequency. Give examples. [6+10]
3. Discuss the stretching and bending frequencies of different functional groups. [16]
4. Describe briefly how an ultraviolet spectrum can be scanned for a pure organic compound. Why are absorption bands formed instead of sharp lines in the spectra? [16]
5. Explain the study of metal chelates and their stability constants by using U.V. visible spectrophotometer. [16]
6. Draw a schematic diagram of an NMR Instrument and discuss the components of it. [16]
7. (a) What arrangement of protons would give two triplets of equal area?
(b) Explain the patterns and intensities of the isopropyl group in isopropyl chlorid. [8+8]
8. (a) Write a brief note in spin trapping and spin labels.
(b) Discuss about time scale of ESR. [10+6]

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1. (a) Define the following terms: wave length, Frequency, wave number and Velocity.
(b) The wavelength of Sodium D-line is 589 nm. Calculate [8+8]
 - i. the frequency in cycles /sec
 - ii. the wave number in cm^{-1} .
2. (a) Write the principle involved in IR Spectroscopy.
(b) Explain the different functional groups identification by IR spectra. [8+8]
3. Discuss the IR spectra for the Lipids. [16]
4. (a) Discuss the vacuum ultraviolet region and Quartz ultraviolet region.
(b) Write the importance of U.V. visible spectrophotometer in biotech industry. [8+8]
5. (a) Explain about Fluorescence and Phosphorescence.
(b) Ultraviolet light of wavelength 180nm is incident on a tungsten surface. If the wavelength of the photoelectric threshold of tungsten is 230 nm, determine the energy of the photo-electrons ejected from the surface. [8+8]
6. (a) Write about Chemical shift.
(b) Explain shielding and deshielding of protons. [6+10]
7. How can you interpret the NMR signals for Lipids? [16]
8. (a) Discuss the hydrogen atom & methyl radical hyperfine structures in ESR spectra.
(b) Calculate the frequency required for the resonance absorption by H in the magnetic field of 14.092G. [8+8]

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1. (a) Write electromagnetic spectrum with their wavelengths and explain the use of each light.
(b) The wavelength range of visible light is 3800 \AA to 7600 \AA . Calculate the corresponding frequency range? [8+8]
2. Define the IR spectroscopy and describe the various molecular vibrations in the technique. What is the major requirement of IR absorption. [16]
3. (a) Explain the role of IR in the study of metallo proteins
(b) X- compound obtained by metabolide from an antibiotic formation. Its molecular weight is around at 136. Its IR spectrum showed the presence of a bonded carbonyl function and a bonded -OH group heating with alkali yielded toluene and CO_2 . Deduce the structure of the compound. [8+8]
4. Describe briefly how an ultraviolet spectrum can be scanned for a pure organic compound. Why are absorption bands formed instead of sharp lines in the spectra? [16]
5. Discuss the study of different amino acids and proteins by using U.V. visible spectrophotometer. [16]
6. (a) Write a brief note on geminal and vicinal couplings.
(b) How can you distinguish cis and trans compounds by coupling constant values? [10+6]
7. (a) Predict the appearance of the high resolution NMR spectrum of 2- hydroxypropionic acid.
(b) Explain the coupling constants and their applications. [8+8]
8. (a) Discuss in detail about hyperfine splitting in ESR.
(b) Write a brief notes on determination of g-value. [10+6]
