



RAJARATA UNIVERSITY OF SRI LANKA

FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree in Applied Sciences

Second Year – Semester II Examination – February / March 2019

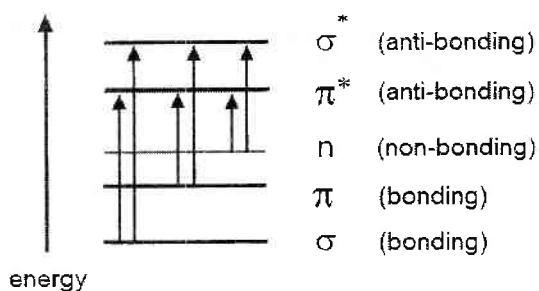
CHE 2106 - SPECTROSCOPIC METHODS IN ORGANIC CHEMISTRY

Answer ALL Questions

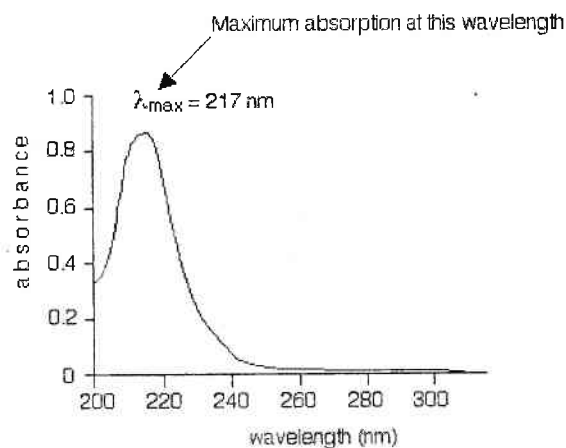
Time: One (01) hour.

1.

- a). When light passes through a compound, some wavelengths are absorbed because their energy is used to promote electrons into a higher energy orbital. The diagram shows the electron transitions which are possible.



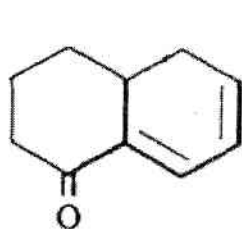
- i. Which transition needs the highest energy?
- ii. Which transition absorbs light of the highest frequency? Explain your answer.
- iii. Which transition absorbs light of the highest wavelength? Explain your answer.
- iv. The UV-visible spectrum of buta-1,3-diene, $\text{CH}_2=\text{CH}-\text{CH}=\text{CH}_2$, is given below. Explain the electronic transition responsible for the peak.



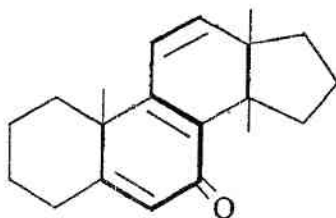
(15 marks)

- (c). Calculate the UV λ_{max} of the following structures using Woodward-Fischer rule. (Basic value for acyclic conjugated enone: 215 nm, heteroannular conjugated system: 214 nm, homoannular conjugated system 253 nm, homodiene component: 39 nm, extended conjugation: 30 nm, Alkyl substitution: 5 nm, Exocyclic double bond: 5 nm, α -substitution: 10 nm, β -substitution: 12 nm, γ -substitution: 18 nm)

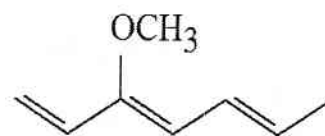
(15 marks)



(i)

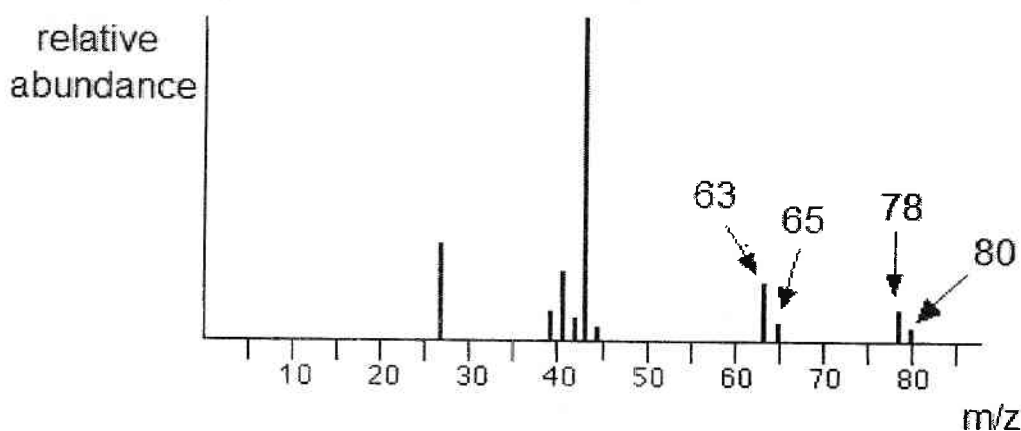


(ii)

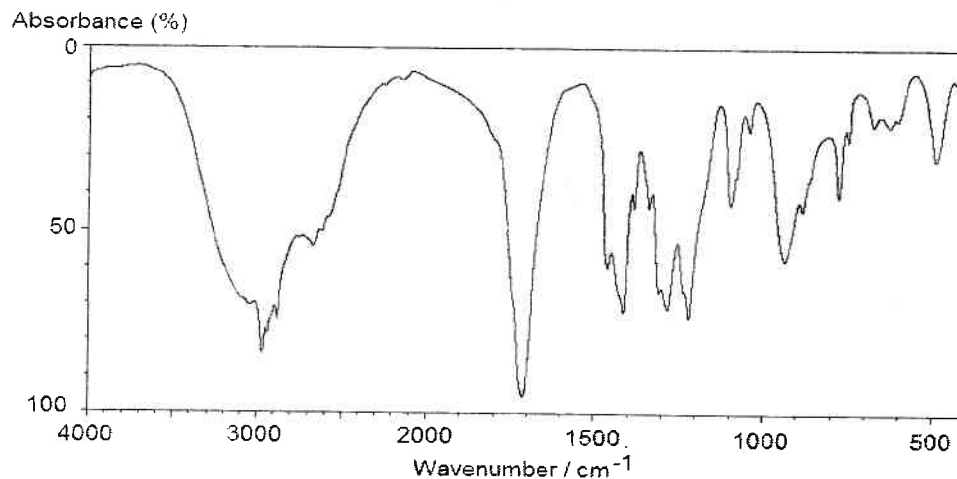


(iii)

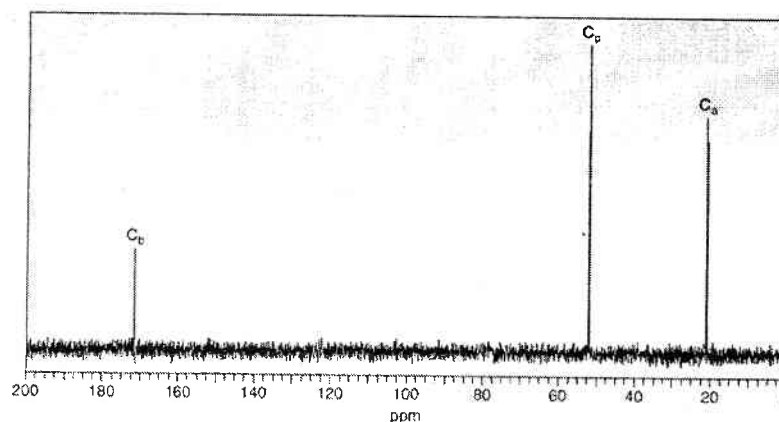
2. a). Write a brief account on basic principles of Mass spectrometry. (10 marks)
- b). Draw a sketch of Ion-trap mass analyzer and explain the function (10 marks)
- c). Simplified mass spectrum of 2-chloropropane is given below. Discuss the fragmentation and identify major peaks including peaks at 63, 65, 78 and 80 m/z. (10 marks)



3. a). Explain, how infra-red spectroscopy could be used to differentiate 1-Hexyne from 3-Hexyne. Draw possible IR spectra for both compounds and explain all possible stretching / bending of the molecules. (10 marks)
- b). IR spectra of Butanoic acid is given below. Identify all important peaks and explain their stretching / bending of the molecules. Ignore fingerprint region. (10 marks)



- c). Sketch ¹H NMR spectra for the following compounds taking into account of the number of signals, and their relative positions.
- Methyl acetate
 - 1-bromo-1-chloroethane
 - Bromocyclopropane.
- (15 marks)
- d). ¹³C NMR of a compound of molecular formula C₃H₃O₂ is given below. Explain the spectrum and suggest a likely structure/s for the compound. (05 marks)



- End -