

Eastern University Sri Lanka

External Degree

Second Year Second Semester Examination in Science

2004/2005 (January/ March 2011)

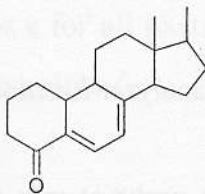
EXTCH 203 Spectroscopic Methods

(Proper & Repeat)

Answer all questions

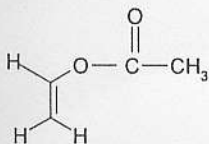
Time: One Hour

1. (a) Draw a fully labelled energy level diagram to show the various electronic transitions caused by UV-Visible absorption of organic compounds
(10 marks)
- (b) Give reasons and indicate which of the above mentioned electronic transition(s) are observed in the UV- Visible spectrum
(10 marks)
- (c) By means of appropriate diagram explain what is meant by the term "Bathochromic shift"
(15 marks)
- (d) Calculate the λ_{\max} value of the following compound using Woodward and Fisher's rule



(15 marks)

- (e) IR spectrum of vinyl acetate shows absorption bands at ν / cm^{-1} 3000, 1760, 1650, 1200, 960 and 870. Match these frequencies with the respective group vibrations of the molecule

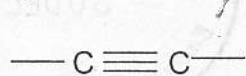


Vinyl acetate

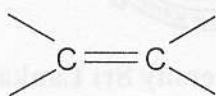
(30 marks)

cont..

(f) Explain the following observation



$$V \text{ str.} = 2150\text{cm}^{-1}$$



$$V \text{ str.} = 1650\text{cm}^{-1}$$



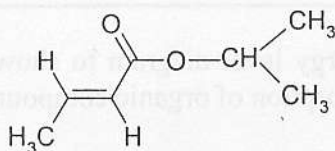
$$V \text{ str.} = 1200\text{cm}^{-1}$$

(20 marks)

2. (a) Explain why Non-equivalent protons in a molecule have different chemical shift values in the ^1H - NMR spectra.

(10marks)

(b) Trans isopropyl crotonate has the following structure



i) Give the number of signals that could be observed in the ^1H -NMR spectrum of the compound

(10 marks)

ii) Using splitting tree diagram explain the splitting pattern of the various protons in the above structure. Give approximate coupling constants of that protons.

(10 marks)

iii) Sketch the ^1H -NMR spectrum of this compound with approximate chemical shift values

(25 marks)

(c) i) How does the mass spectrum analyzer function in the separation of ions?

(10 marks)

ii) EI-MS of n-hexanal shows peaks at m/z 100, 99, 29, 57 and 44. Give possible mechanism for their formation in the mass spectrum. Give reason indicate the molecular ion peak and base peak in the mass spectrum.

(25 marks)

iii) m/z 91 is an intense peak for the compounds undergo benzylic cleavage. Explain this.

(10 marks)

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