RAJARATA UNIVERSITY OF SRI LANKA

FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree in Applied Sciences

Second Year – Semester II Examination – October / November 2017

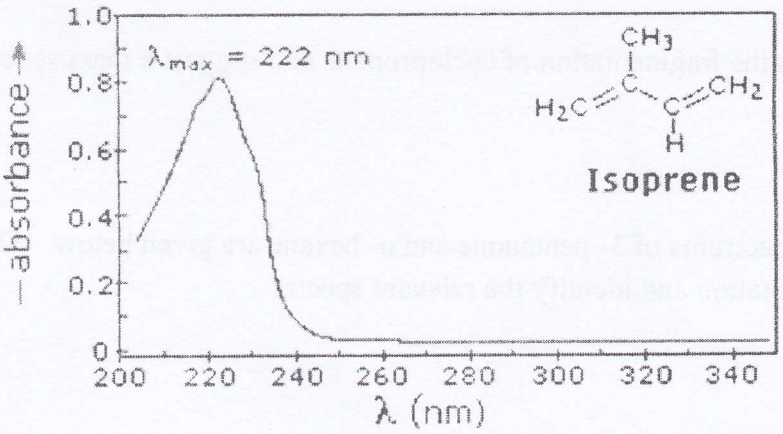
CHE 2106 SPECTROSCOPIC METHODS IN ORGANIC CHEMISTRY

Answer ALL Questions **Time: One (01) hour.**

1. (a). Briefly describe the UV-Visible Spectroscopy and structural features of molecules that can be determined by this technique.

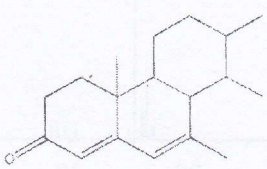
(10 marks)

(b). Draw the molecular orbital diagram of isoprene with necessary details and explain the UV spectrum given below.

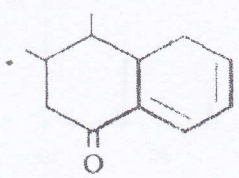


(10 mark)

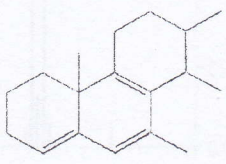
(c). Calculate the UV λ_{max} of the following structures using Woodward-Fischer rule. (Basic value for acyclic conjugated enone : 215 nm, heteroannular conjugated system: 214 nm, homoannular conjugated system 253 nm, homodiene component : 39 nm, extended conjugation: 30 nm, Alkyl substitution: 5 nm, Exocyclic double bond: 5 nm, α-substitution: 10 nm, β-substitution: 12 nm, γ-substitution: 18 nm) . (15 marks)



(i)



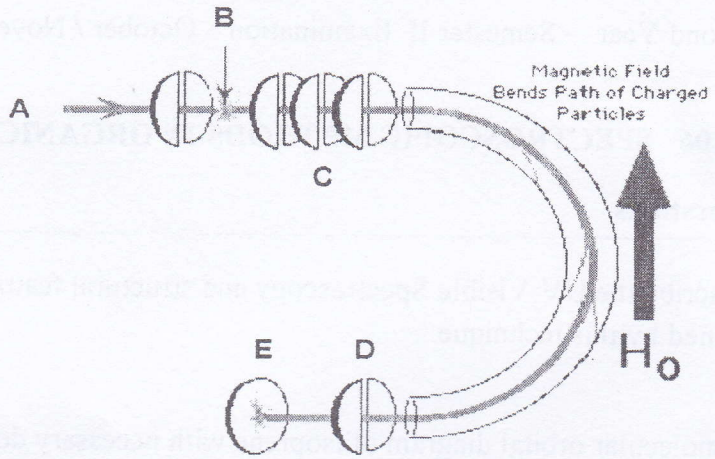
(ii)



(iii)

2. (a). Briefly describe the advantages of the Mass spectrometry over other spectroscopic methods
(05 marks)

(b). Sketch diagram of a mass spectrometer is given below. Name the sections A, B, C, D and E.
(05 marks)

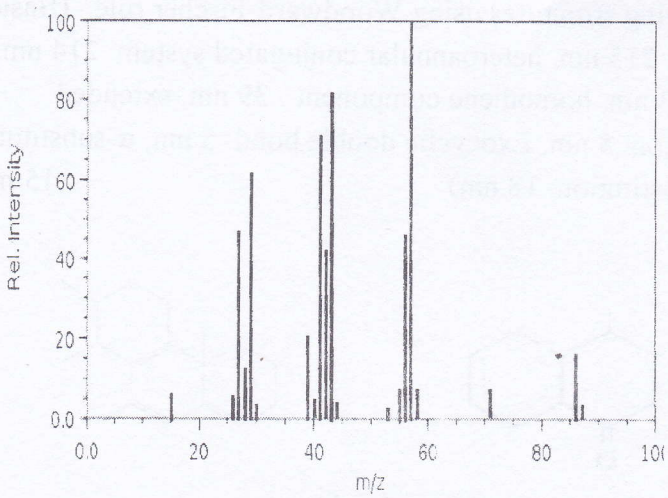


(c). Discuss the fragmentation of cyclopropane and suggest a mass spectrum for the molecule.
(10 marks)

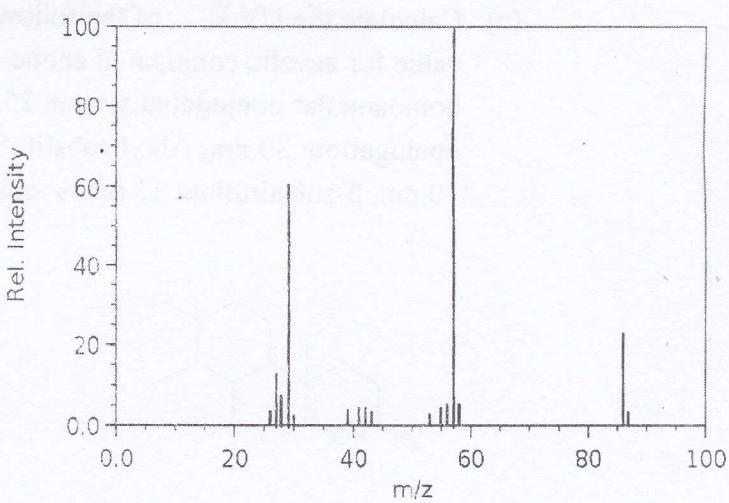
(d). Mass spectrums of 3- pentanone and n- hexane are given below. Discuss the fragmentation and identify the relevant spectra.

(15 marks)

A



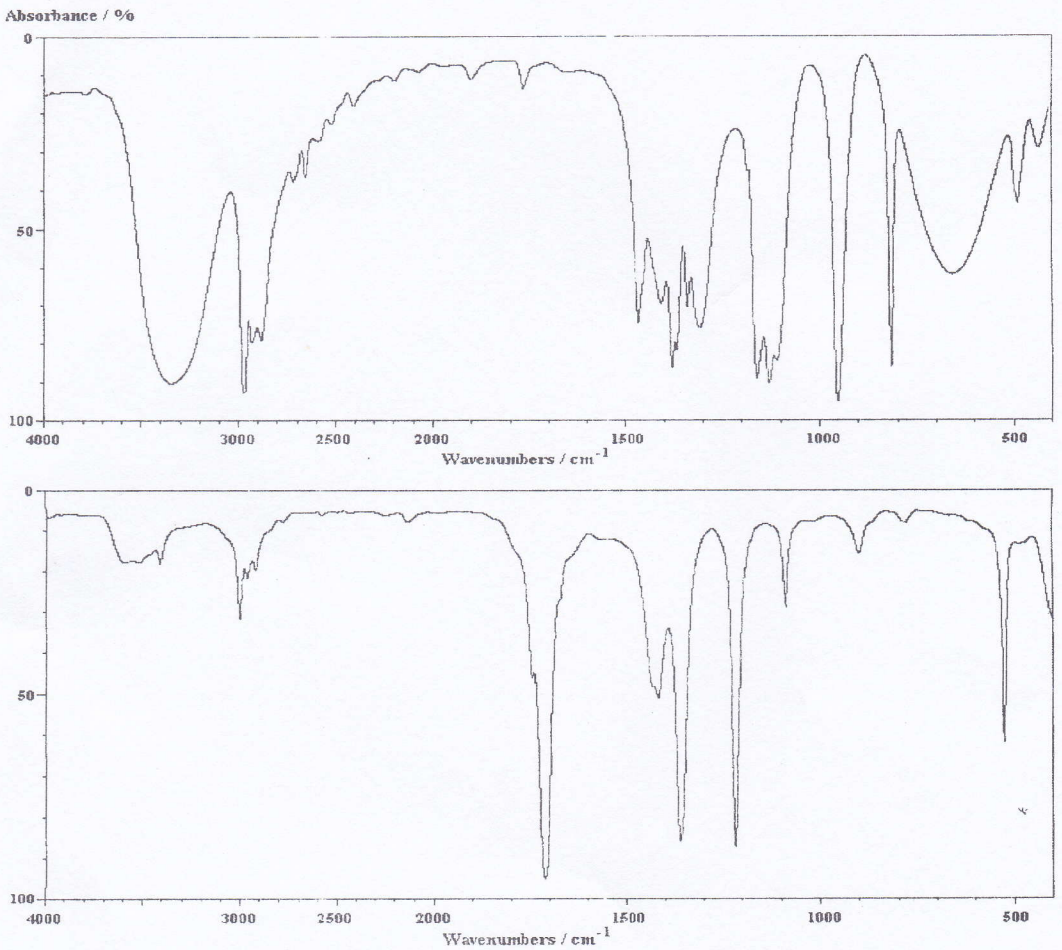
B



3. (a). Asymmetrical stretching / bending and internal rotation change the dipole moment of a molecule, thus IR active. How much movement occurs in the vibration of a C-C bond in IR? (05 marks)

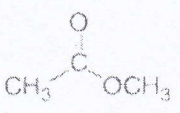
(b). IR spectra of C_3H_6O and C_3H_8O are given below. Draw possible structures of the compounds using IR spectrums.

(10 marks)



(c). Write down the number of signals, their relative positions and sketch the ^{H}NMR of following compounds. (15 marks)

CH_3-O-CH_3
dimethyl ether



methyl acetate

$CH_3-CH_2-CH_2-OH$
1- propanol

=======//========