KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER
SUPPLEMENTARY EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF SCIENCE

COURSE CODE: SCH 431

COURSE TITLE: NATURAL PRODUCTS CHEMISTRY

DATE: 21/1/2022 **TIME:** 2-4PM

INSTRUCTIONS TO CANDIDATES:

TIME: 2 Hours

Answer **question ONE** and **any TWO** of the remaining

1(a) Describe the molecular ion peak in mass spectrometry **[2mks]**

(b) Explain the principle behind UV absorption in UV spectroscopy **[4mks]**

(c) Compare bend and stretch vibrations IR spectroscopy **[4mks]**

(d) With a specific example, explain the concept of chemical shielding in NMR spectroscopy **[4mks]**

(e) Describe charge transfer transitions in UV spectroscopy **[4mks]**

(f)Describe the matrix assisted laser desorption ionization (MALDI) **[4mks]**

(g) Describe the concept of ring currents in NMR spectroscopy **[4mks]**

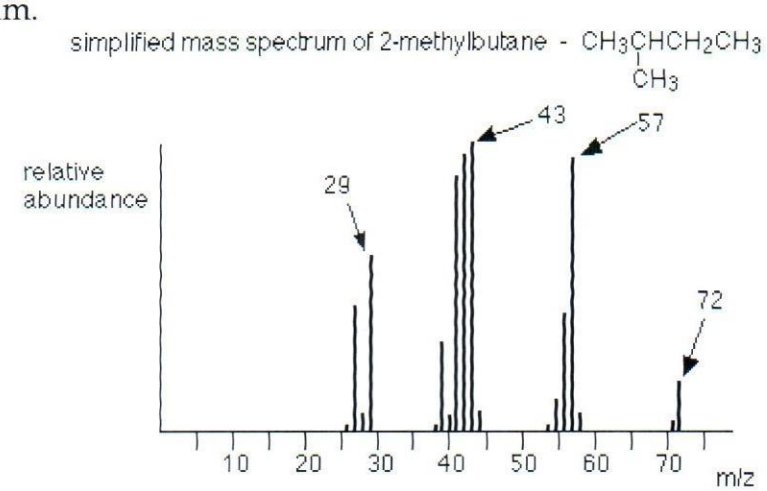
(h) **[4mks]**

QUESTION TWO (20 Marks)

2(a)Explain the field ionization techniques in mass spectrometry **[6mks]**

(b) Illustrate retro Diels-Alder fragmentation in mass spectrometry **[2mks]**

(c) Below is a mass spectrum of an organic compound whose structure is indicated on the spectrum.



(c) Give structures of fragment ions associated with M/Z values, 29, 43, 57, 72 **[6mks]**

(d) Explain the nitrogen rule in mass spectrometry **[6mks]**

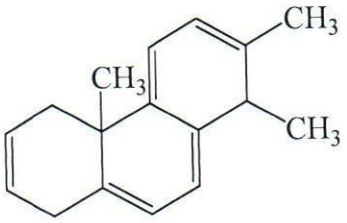
QUESTION THREE (20 Marks)

3(a) Explain the principles behind the following spectroscopic techniques **[4mks]**
(i) UV spectroscopy
(ii) IR spectroscopy

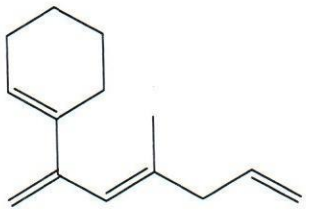
(b) Explain a "forbidden" transition in UV spectroscopy **[2mks]**

(c) Explain the working principle of a UV detector **[4mks]**

(d) Using woodward-Fieser rules for dienes, determine the maximum absorption wavelength (λ_{max}) of the following compounds **[8mks]**



(i)


(ii)

(f) State any two solvents suitable in UV spectroscopy **[2mks]**

QUESTION FOUR (20 Marks)

4(a) Discuss the effect of solvent polarity in IR spectroscopy **[6mks]**
(b) List any two solvents suitable in IR spectroscopy **[2mks]**

(c) The IR spectrum of hexanoic acid is shown below. Identify the functional groups associated with given peaks in the compound **[12mks]**

1(a) Describe the molecular ion peak in mass spectrometry **[2mks]**

(b) Explain the principle behind UV absorption in UV spectroscopy **[4mks]**

(c) Compare bend and stretch vibrations IR spectroscopy **[4mks]**

(d) With a specific example, explain the concept of chemical shielding in NMR spectroscopy **[4mks]**

(e) Describe charge transfer transitions in UV spectroscopy **[4mks]**

(f)Describe the matrix assisted laser desorption ionization (MALDI) **[4mks]**

(g) Describe the concept of ring currents in NMR spectroscopy **[4mks]**

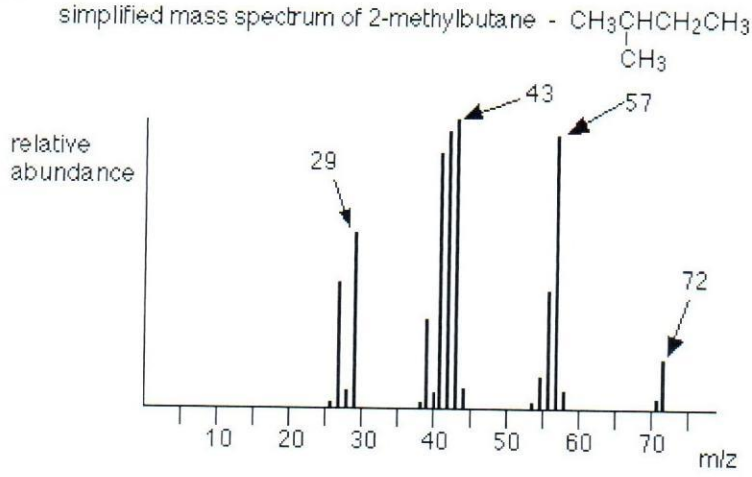
(h) **[4mks]**

QUESTION TWO (20 Marks)

2(a)Explain the field ionization techniques in mass spectrometry **[6mks]**

(b) Illustrate retro Diels-Alder fragmentation in mass spectrometry **[2mks]**

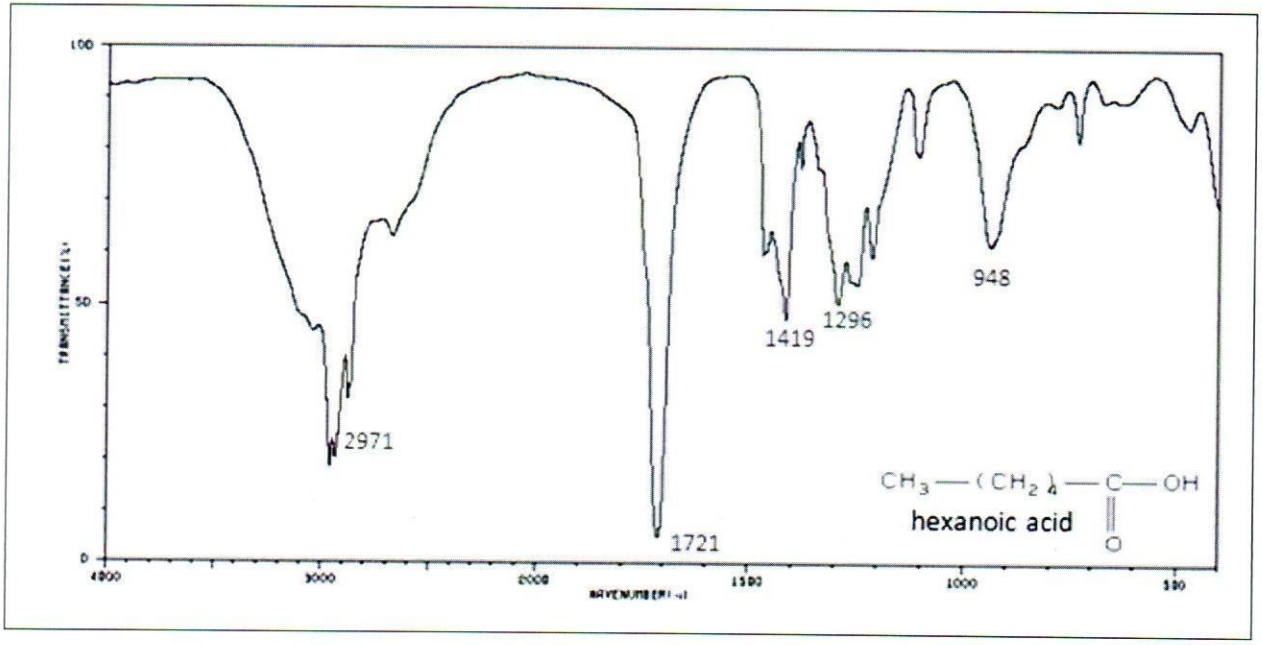
(c) Below is a mass spectrum of an organic compound whose structure is indicated on the spectrum.



(c) Give structures of fragment ions associated with M/Z values, 29, 43, 57, 72 **[6mks]**

(d) Explain the nitrogen rule in mass spectrometry **[6mks]**

QUESTION THREE (20 Marks)



QUESTION FIVE (20 Marks)

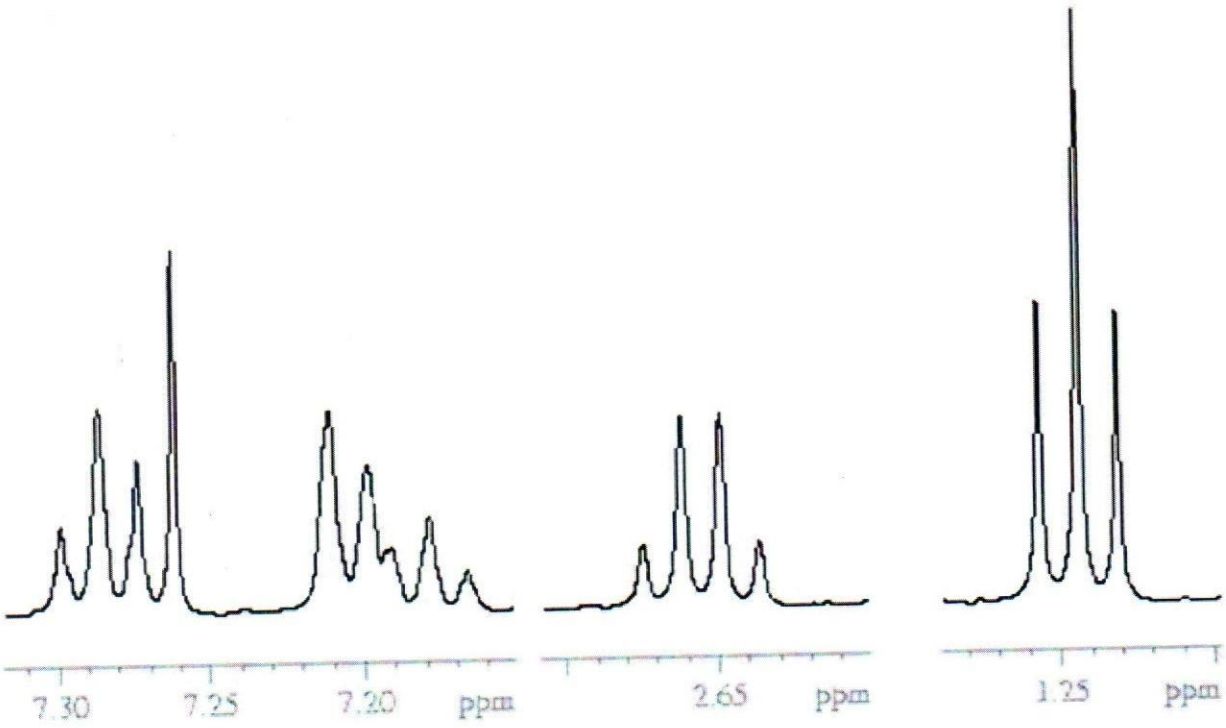
5(a) Explain the difference between one and two dimension NMR spectroscopy **[4mks]**

(b) Explain the causes of the following types of spin coupling in NMR spectroscopy **[6mks]**

(i) Meta coupling
(ii) vicinal coupling
(iii) Germinal coupling

(c) The ^1H NMR spectrum of an organic compound is shown below.

1H NMR Spectrum of Ethylbenzene



(i) Identify the correct peaks and multiplicities for all the chemically different protons of the compound **[10mks]**