



UNIVERSITY OF EMBU

2017/2018 ACADEMIC YEAR

SECOND SEMESTER EXAMINATIONS

FIRST YEAR EXAMINATION FOR THE DEGREE OF MASTER OF SCIENCE

SCH 510: ADVANCED ORGANIC SPECTROSCOPY

DATE: APRIL 4, 2018

TIME: 2:00-5:00PM

INSTRUCTIONS:

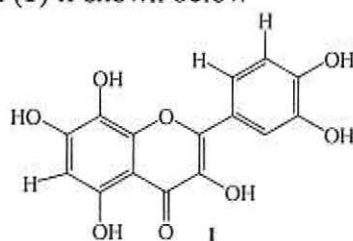
Answer Question ONE and ANY Other TWO Questions

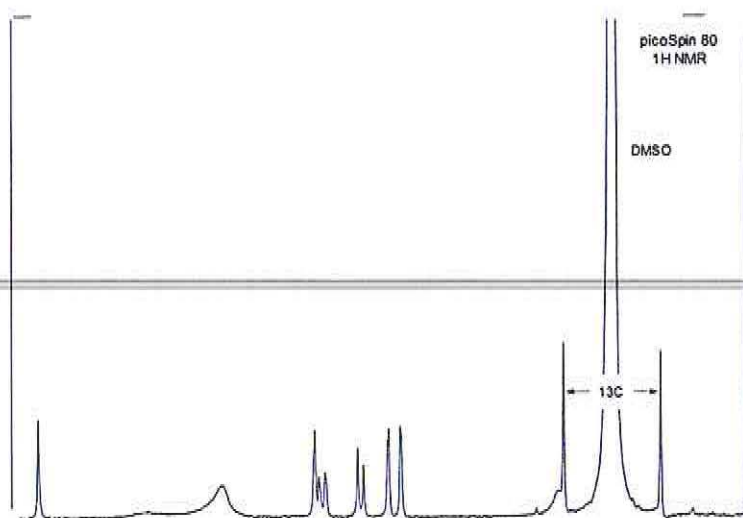
QUESTION ONE (30 MARKS)

- Describe the principle behind spin-spin coupling in NMR spectroscopy (6 marks)
- Explain the "Nitrogen" rule in mass spectrometry and illustrate its application in spectroscopy (8 marks)
- Compare the IR spectroscopy behavior of a conjugated carbonyl and a non-conjugated one (6 marks)
- Explain a possible cause of bathchromic and hypsochromic shifts in UV spectroscopy (6 marks)
- Explain the effect of hydrogen bonding in the resonance of a proton in ^1H NMR spectroscopy (4 marks)

QUESTION TWO (20MARKS)

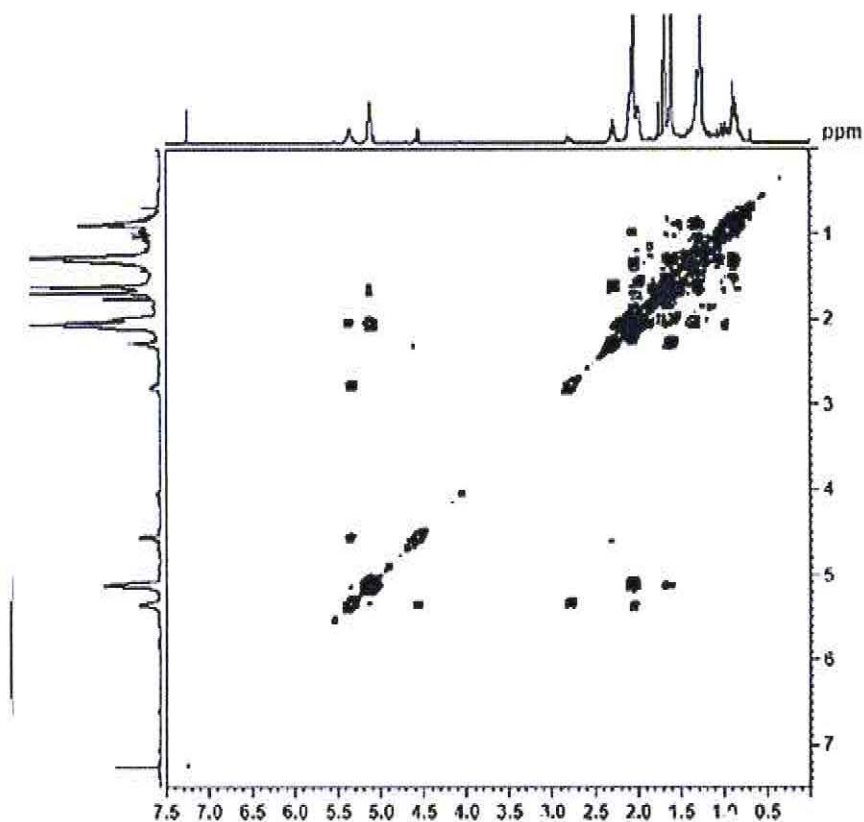
^1H NMR spectrum of quercetin (1) if shown below





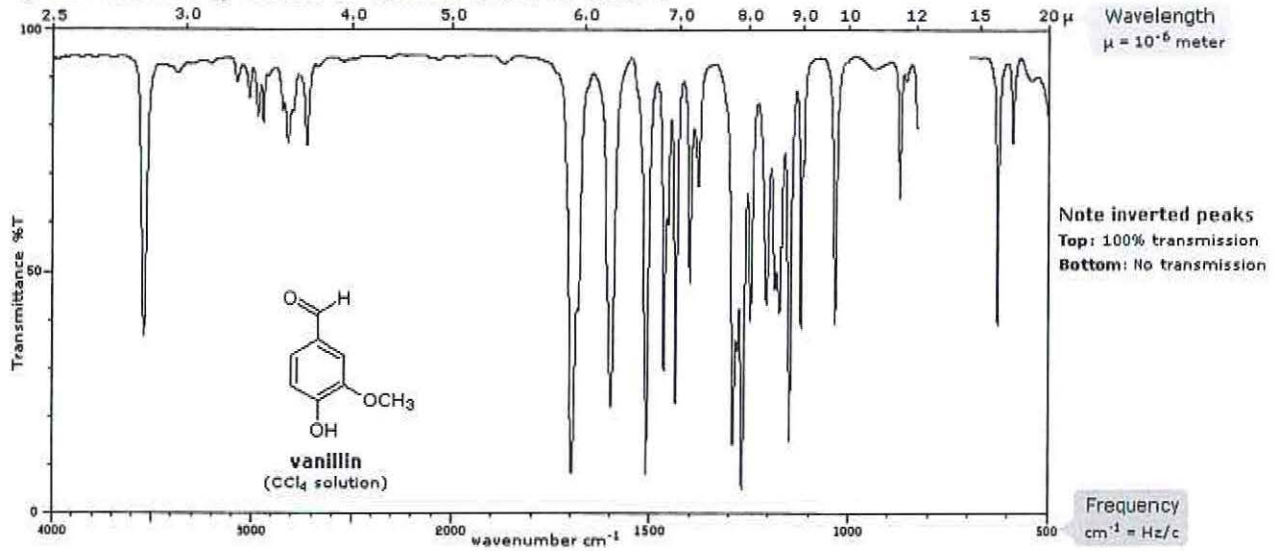
(a) Assign all the protons of the molecule correct pick and explain their multiplicities where applicable (10 marks)

(b) A COSY spectrum of an organic compound is shown below. Give δ values of five sets of proton that show coupling. (10 marks)



QUESTION THREE (20 MARKS)

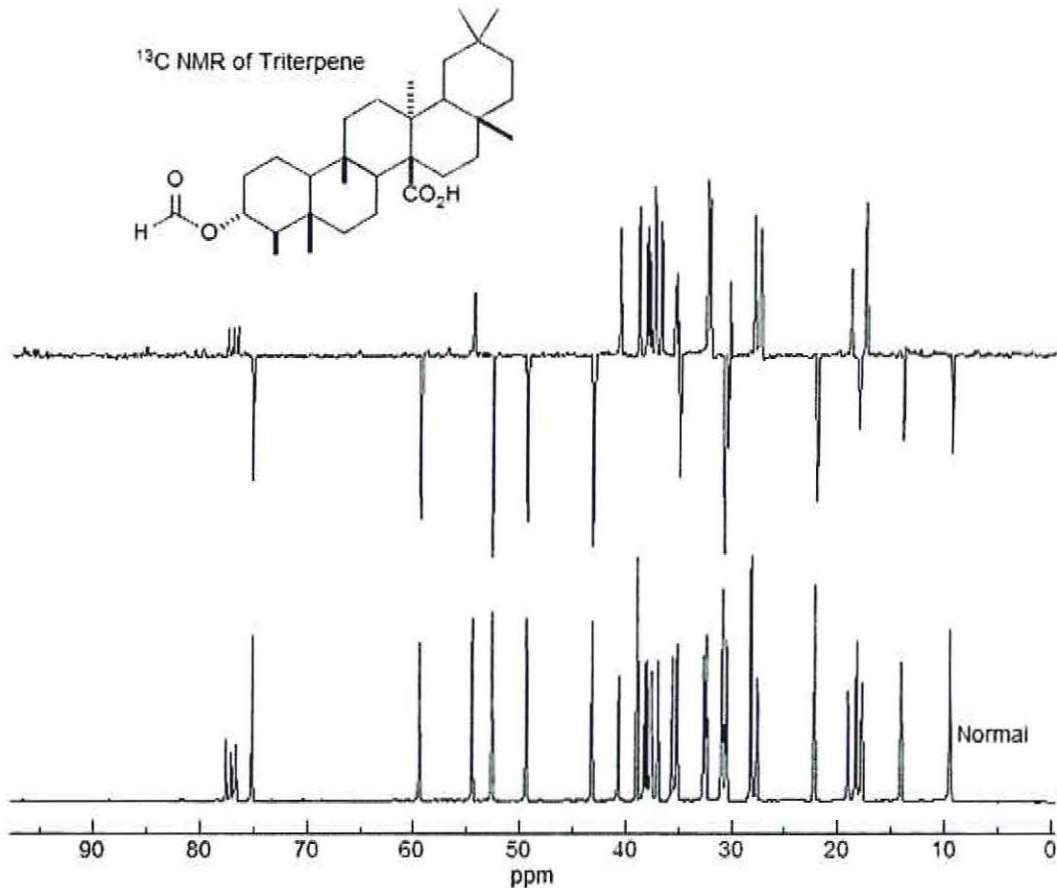
a) The infrared spectrum of vanillin is shown below.



Using correlation tables provided identify peak frequencies corresponding to various functional groups in the molecule (10 marks)

QUESTION FOUR (20 MARKS)

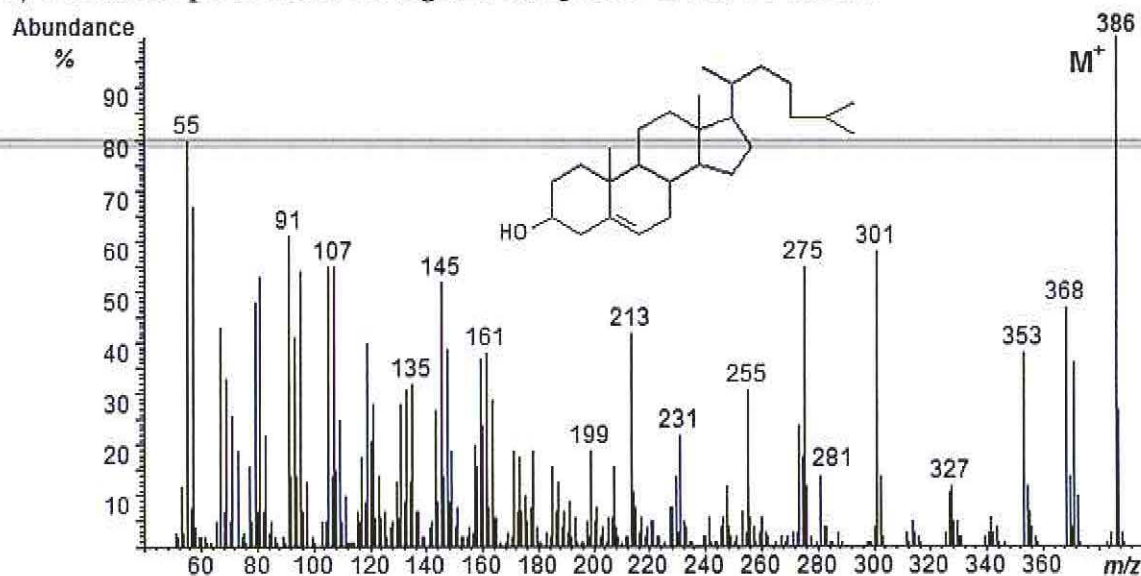
a) ^{13}C and DEPT spectra of an organic compound is shown below



Identify all quaternary, CH, CH₂ and CH₃ group

(10 marks)

b) The mass spectrum of an organic compound is shown below.

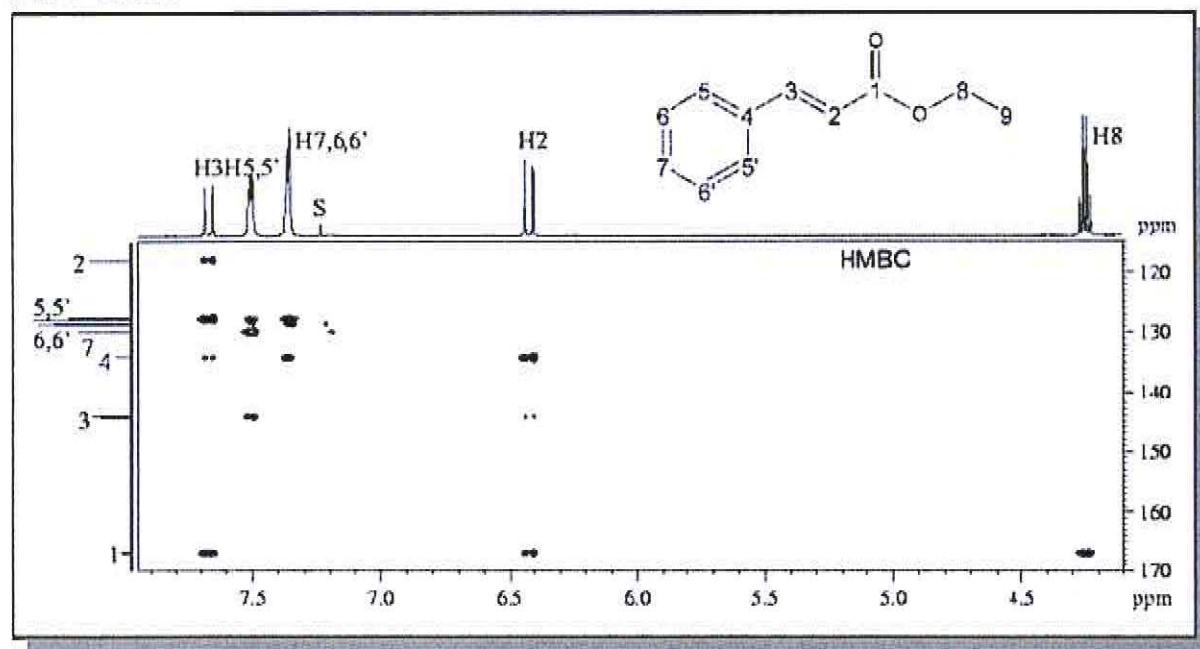


Identify any five fragment ions with an assign them corresponding M/Z values

(10 marks)

QUESTION FIVE (20 MARKS)

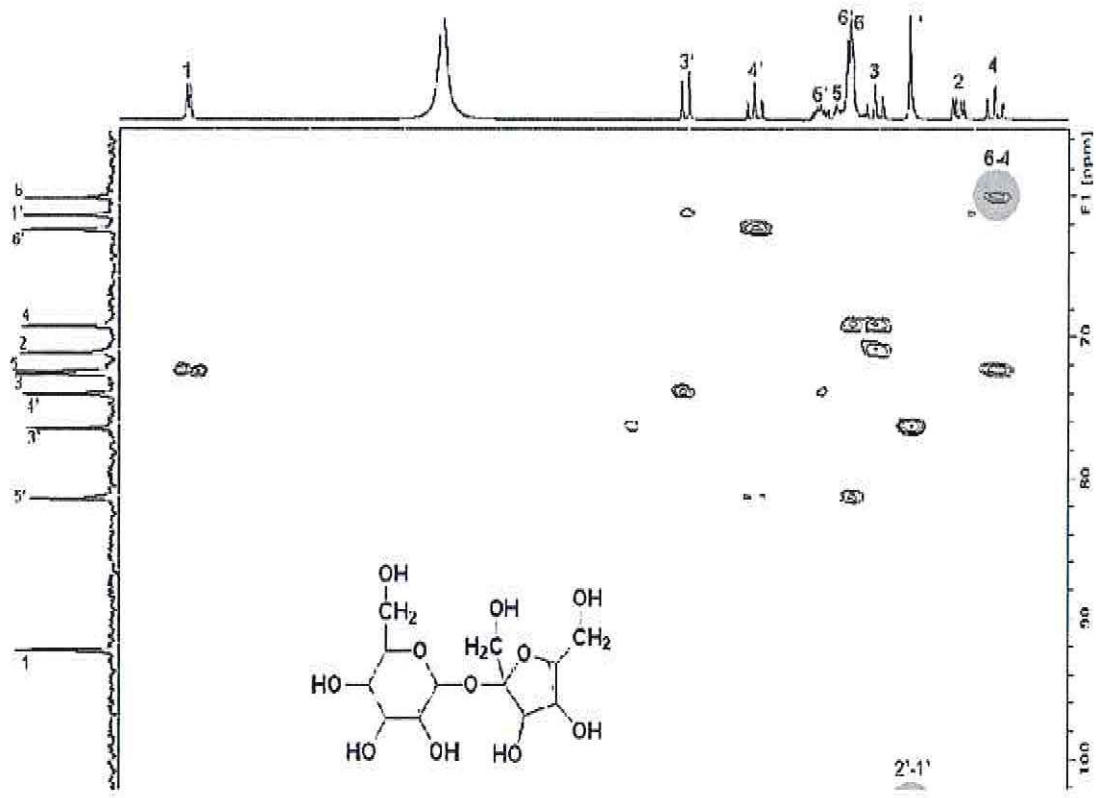
a) Heteronuclear Bond Multiple Bond Correlation (HMBC) spectrum of an organic compound is shown below.



Use curly arrows to indicate the different C/H correlations in the compound

(10 marks)

b) Heteronuclear single quantum correlation spectrum of an organic compound is shown below



Using the numbers indicated on the pick, write down the various C/H HSQC correlations

(10 marks)

--END--

10

