



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2010/2011

INSTITUTIONAL BASED PROGRAMME (IBP) DECEMBER SESSION

EXAMINATION FOR THE DEGREE OF MASTER OF SCIENCE

SCH 555: ANALYTICAL SPECTROSCOPY II

DATE: Thursday 28th April 2011

TIME: 9.00a.m – 12.00p.m

INSTRUCTIONS:

Answer all questions.

1. (a) Explain the following terms: **(6 marks)**
 - (i) Spin-spin relaxation
 - (ii) Magic angle
 - (iii) Magnetic anisotropy
- (b) Why is it necessary to spin a sample and maintain it at a constant temperature during NMR analysis. Explain two other methods used to do the same thing. **(5 marks)**
- (c) Explain chemical shift and its application. How can chemical shift be differentiated from spin- spin coupling? **(5 marks)**
- (d) Explain double resonance NMR and its application. **(5 marks)**
2. (a) What is the purpose of shift reagents in NMR? **(4 marks)**
- (b) A chemist isolated a number of pure organic compounds from a certain plant. She wanted a technique that she could use to identify the isolated compounds. Which technique would you recommend and why? Briefly explain how the technique works. **(5 marks)**
- (c) Why was the carbon 13 NMR not useful for a long time until recently? **(3 marks)**

- (d) Give high resolution NMR spectra that would be expected for the following compounds: (i) acetone (ii) ethyl benzene. **(3 marks)**
3. (a) Differentiate between diamagnetic, ferromagnetic and paramagnetic compounds. **(3 marks)**
- (b) What is magnetic susceptibility and its application? **(4 marks)**
- (c) Why is it sometimes necessary to use two methods of ionization during analysis using mass spectrometry analysis? **(3 marks)**
- (d) Briefly explain how fast atom bombardment works. What type of samples require this type of ionization? **(4 marks)**
4. (a) Why is it necessary to maintain low pressure during mass analysis using mass spectrometer? **(3 marks)**
- (b) Explain how time of flight mass analyzer works. How does it differ from quadrupole mass analyzer? **(5 marks)**
- (c) What is tandem mass spectrometry? What are the advantages of tandem mass spectrometry? **(5 marks)**
- (d) What resolution is required to separate the following masses using mass spectrometer? N_2^+ , and CO^+ (masses of 28.0061 and 27.9949) **(3 marks)**
- =====