KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN ANALYTICAL CHEMISTRY

SCH 417: SPECROSCOPIC METHODS OF ANALYSIS

DATE: Tuesday, 29th November, 2011 TIME: 2.00 p.m. – 4.00 p.m.

INSTRUCTIONS: Answer **ALL** questions.

1 (a) Explain three interference s in flame atomic absorption and flame photometry, and ways these interferences can be minimized (6 marks).

(b) Why is flame atomic absorption able to analyze over sixty metals and metalloids while flame photometry can only analyze a few elements from group one and two in the periodic table (4 marks)

(c) Compare and contrast flame and graphite atomizers (6 marks).

(d) Differentiate between the following:
(i) phosphorescence and fluorescence
(ii) intersystem crossing and internal conversions
(iii) X-ray and atomic fluorescence (6 marks)

2 (a) Explain three factors that affect the intensity of fluorescence of a fluoropore (6 marks).

(b) You are given a small sample of urine to determine all the elements present. Which analytical instrument would choose and why ? How would you go about to determine all the element present and their concentration (6 marks).

(c) Briefly explain how attenuated total reflectance IR works. What type of samples require this technique? (5 marks).

(d) Write short note on the following:

(i) Chemical shift in NMR

(ii) Double beam instruments (6 marks)

3 (a) Draw a schematic diagram showing the basic components of any optical spectroscopy instrument and explain the role of each instrument (6 Marks).

(b) Explain how chemical ionization in mass spectrometry works. When is it necessary to use this technique. (5 marks).

(c) When a nucleus is in the excited state, it can relax in two ways without emitting radiation. Explain the two ways (4 marks).

(d) At what frequency would you expect a proton to absorb in NMR if the applied magnetic field is kept constant1.45 T? Note Plancks constant $= 6.632 \times 10^{-34} JT^{-1}$. Bohr magneton $= 5.05 \times 10^{-27} JT^{-1}$ proton magnetogyric ratio = 5.505 ? (5 marks).

(e) An interference filter is to be constructed foe isolation of CS_2 absorption band at 4.54 μm. If it is based on first order interference, what should be the thickness of the dielectric layer if refractive index is 1.34? (5 marks).