NATIONAL OPEN UNIVERSITY OF NIGERIA
14/16 AHMADU BELLO WAY, VICTORIA ISLAND, LAGOS
SCHOOL OF SCIENCE AND TECHNOLOGY
MARCH/APRIL 2014 EXAMINATION

COURSE CODE: CHM 306
COURSE TITLE: INSTRUMENTAL METHODS OF ANALYSIS
TIME ALLOWED: 2HOURS
INSTRUCTION: ANSWER ANY FOUR QUESTIONS

Question One

a) Distinguish between the following:
   i. Electronic spectroscopy and Vibrational spectroscopy. (6 marks)
   ii. Absorption spectroscopy and Emission spectroscopy . (4marks)
b) State Beer's and Lambert's law. (7½ marks)

Question Two

a) i. What is colorimetry . (2½ marks)
   ii. List the components of a colorimeter. (6 marks)
b) Explain briefly how the concentration of a coloured solution can be estimated using a colorimeter.(9 marks)

Question Three

a) i. What are spectrophotometers . (2½ marks)
   ii. Sketch a simple schematic diagram of a typical spectrophotometer.(5 marks)
   Iii. Explain briefly the function of any one of the components of a spectrophotometer shown/listed in the schematic diagram in (3aii) above.(2 marks)
b) Differentiate between Flame Emission spectroscopy and Flame Atomic Absorption spectroscopy. (8 marks)

Question Four

(a) i. Explain briefly what happens when a molecule absorbs Infrared radiation of a specific frequency. (3 marks)
   ii. List the types of stretching vibration. (2 marks)
(b) i. What are Group frequencies. (3½ marks)
   ii. Which range of the infrared radiation does the energy required for the following vibrations fall into
   a. Bending vibration (3 marks)
   b. Stretching vibration (3 marks)
   iii. What information can be obtained from group frequencies. (3 marks)

Question Five

a) i. What is X- ray spectroscopy. (2 marks)
   ii. Differentiate between light rays and X- rays. (4 marks)
b) i. Explain briefly X- ray diffraction. (7½ marks)
   ii. Explain why atoms are able to produce diffraction patterns. (4 marks)

Question Six

a) i. Describe briefly the basic principle of Nuclear Magnetic Resonance (NMR) spectroscopy.
(7½ marks)

ii. What factor accounts for the difference in the pattern of NMR spectrum of hydrogens in different organic molecules. (5 marks)

b) Explain briefly Polarography. (5 marks)