NATIONAL OPEN UNIVERSITY OF NIGERIA
14/16 AHMADU BELLO WAY, VICTORIA ISLAND, LAGOS

SCHOOL OF SCIENCE AND TECHNOLOGY
OCTOBER 2013 EXAMINATION

Course Code: CHM 306 **Time Allowed: 2 Hours**

Course Title: INSTRUMENTAL METHODS OF ANALYSIS

INSTRUCTION: Answer any four Questions

1(a) (i) What is Spectroscopy? (2½ marks)
(ii)Distinguish between absorption spectroscopy and emission spectroscopy. (5 marks)
(b) (iii)Specify the wavelength range that represents each of the following:
- Visible region (2½ marks)
- Infrared region (2½ marks)

(ii)Write short notes on the following types of optical method of analysis:
- Colorimetry (2½ marks)
- Spectrophotometry (2½ marks)

2(a) State the region of the electromagnetic spectrum associated with the following spectroscopic techniques. (7½ marks)
i Electronic spectroscopy
ii Vibrational Spectroscopy
iii Rotational Spectroscopy
(b) iList the basic components of a colorimeter. (5 marks)
iiDescribe briefly the mode of operation of the colorimeter. (5 marks)

3(a) i.What do you understand by the following terms:
Absorbance
Transmittance. (4 marks)
ii.Show and state the relationship between absorbance and transmittance. (3 marks)
(b) iWhat is a spectrophotometer? (3 marks)
iiState the function of the following components of a spectrophotometer:
Cuvette,
Monochromator, Detectors. (7½ marks)

4(a) i.Name the types of stretching and bending vibration. (6 marks)
ii.The energies that cause bending and stretching vibration are found in what region of
the electromagnetic spectrum. (2 marks)
iii.What is the finger print region? (3 marks)
(b) i. What are group frequencies? (3½ marks)
ii. The bands at 2500-3000 cm^{-1} are characteristics of which functional group. (3 marks)

5(a) i. Write short notes on the followings: (a) flame emission spectroscopy (b) flame atomic

absorption spectroscopy (6 marks)

ii. Which of the flame spectroscopic technique is used to analyze the followings?

- Alkali metals
- Trace metals 5 marks)

(b) Describe briefly the working principle of flame emission spectroscopy. (6½ marks)

6(a) i.What are X-RAYS? (3 marks)

ii. Differentiate between x-rays and light rays. (4 marks)

iii.State one source of x-rays. (2 marks)

iv. State one application of x-rays. (2 marks)

(b) i. What do you understand by the term “chemical shift”. (3 ½marks)

ii. Give three examples of elements detectable by NMR spectroscopy. (3 marks)