

**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**UNIVERSITY VILLAGE, PLOT 91 CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESS WAY, JABI - ABUJA.**

**FACULTY OF SCIENCES**

**DEPARTMENT OF PURE AND APPLIED SCIENCES**

**NOVEMBER 2018, SECOND SEMESTER EXAMINATION**

**COURSE CODE: CHM 306**

**COURSE TITLE: INSTRUMENTAL METHODS OF ANALYSIS**

**COURSE UNIT: 2**

**TIME: 2 HOURS**

**INSTRUCTION: Question one is compulsory. Answer question one and any other three questions.**

**QUESTION ONE**

1ai. What happens when radiation and matter interact? (6marks)

1aii. State the laws of the absorption of light radiation by solutions and show mathematically these laws.

(9 marks)

aiii)Calculate the concentration of a sample solution whose absorbance and molar absorptivity at 270nm is 1.92 and 19400 respectively.

(21/2 marks)

bi) What are spectrophotometers. (1 mark)

 bii) Sketch a simple schematic diagram of a typical spectrophotometer. (21/2 marks**)**

biii) Explain briefly the function of any one of the components of spectrophotometer sketched.

(1 marks)

1ci) What factor accounts for the difference, in the pattern of NMR spectrum of hydrogens in different organic molecules.

 (3 marks)

**QUESTION TWO**

2a. Enumerate on the types of molecular vibrations experienced by an organic molecule when it absorbs infrared radiation.

 (12 marks)

2b. Distinguish between Infrared spectrometer and Fourier Transformer Infrared spectrometer.

 (3 marks)

**QUESTION THREE**

3ai. Write short notes on the followings:

i. Flame Emission Spectroscopy (FES). (3 marks)

 ii. Flame Atomic Absorption Spectroscopy (FAAS). (3 marks)

 3aii. Which of the flame spectroscopic technique is used to analyze the followings?

i. Alkali metals (1 mark)

ii. Trace metals (1 mark)

3b.Expatiate on the working principle of Flame Atomic Absorption Spectroscopy. (7marks)

**QUESTION FOUR**

4a. Write short note on the following:

1. Electronic spectroscopy **(**21/2 marks)
2. Vibrational spectroscopy (21/2 marks)
3. Rotational spectroscopy (2marks)

4b. State one use of each of the following

1. Infrared spectroscopy
2. X- ray diffraction method
3. Flame Emission and Flame Atomic Absorption Spectroscopy
4. Nuclear Magnetic Resonance Spectroscopy

 (4 marks)

4ci. What are optical methods of analysis? (1 marks)

4cii.State and explain briefly any two types of optical methods of analysis. (3 marks)

**QUESTION FIVE**

5a. Describe briefly the basic principle of Nuclear Magnetic Resonance (NMR) spectroscopy.

 (7 marks)

5b. Distinguish between the following terms used in Flame Atomic Absorption Spectroscopy

1. Interference
2. Sensitivity
3. Detection Limit

(41/2 marks)

5c. Based on the nature of the radiation that is been absorbed or emitted, mention types of spectroscopy. (21/2 marks)

5d. Highlight the major application of conductimetry (1 mark)