



NATIONAL OPEN UNIVERSITY OF NIGERIA
UNIVERSITY VILLAGE, PLOT 91 CADASTRAL ZONE, NNAMDI AZIKIWE
EXPRESSWAY, JABI - ABUJA.
FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY
2025_2 EXAMINATIONS

COURSE CODE: CHM 306
COURSE TITLE: Instrumental Methods of Analysis
COURSE UNIT: 2
TIME: 2 Hours
INSTRUCTION: Answer question one and any other two questions.

1. a. Describe the following:
 - I. Atomic emission 2 ½ marks
 - II. Molecular absorption 4 ½ marks
 - b. A molecule has 6 atoms. Find the fundamental mode of vibration if its atomic molecule is linear. 2marks
 - c. Compare and contrast flame atomic absorption and flame emission spectroscopy. 7marks
 - d. Briefly describe how Nuclear Magnetic Resonance spectroscopy can be applied. 2 ½marks
 - e. What are the merits of applying Fourier Transform Spectroscopy? 5marks
 - f. In what way is conductimetry applied? 2marks
 - g. Define Polarography. 1 ½ marks
 - h. State Bragg's equation and highlight its components. 3marks
- 2a. Discuss on:
- i. Rotational spectroscopy 3marks
 - ii. Electronic spectroscopy 3marks
 - iii. Vibrational spectroscopy 3marks
- b. Mention the types of optical method of analysis. 5marks
- c. List the valuable components of a spectrophotometer. 6marks
- 3a. Briefly explain the different types of x-ray detector. 8marks
- b. State the condition that could minimize the diffraction of x-ray wave. 2marks
- c. State with reasons and examples, which of lithium or sodium atom will produce stronger diffraction pattern. 7marks
- d. List the three common source of x-ray for analytical processes. 3marks
- 4a. With regards to fluorimetric analysis, explain in detail the terms:
- I. Quenching 6marks
 - II. Sensitivity 7marks
- b. Define FTIR. 4marks
- c. Compare spectrophotometric and fluorimetric methods in terms of sensitivity. 3marks
5. a. What is a beam splitter? 5marks
- b. What is the relationship between Absorbance and Transmittance. 6marks
- c. If the group frequencies of absorption band or signal occurs within $1700\text{cm}^{-1} - 1740\text{cm}^{-1}$ in IR spectrum. List the possible vibrations, the respective molecule type and group frequencies within that range. 9marks