



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
APRIL/MAY, 2019 FIRST SEMESTER EXAMINATION

COURSE CODE: CHM 306
COURSE TITLE: INSTRUMENTAL METHODS OF ANALYSIS
COURSE UNIT: 2
TIME: 2 HOURS
INSTRUCTION: Answer question one and any other three questions.

QUESTION ONE

1a) In a tabular form, compare and contrast between flame emission and flame absorption spectroscopy. 5 marks

1bi) What is Fluorimeter? 1 mark

(1bii) How does the following affect fluorimetric analysis?

- i. Quenching 2½ marks
- ii. Sensitivity 2½ marks

1biii) List any two (2) applications of Fluorimetry. 2 marks

1ci) State four (4) advantages of coulometric titration over conventional titrations. 4 marks

1cii) Assuming that a 2000 cm³ solution containing 0.7113 mg of cyclohexene/cm³ is to be titrated against bromine. If the coulometer is operated at a constant current of 5.820 mA, calculate the time required for complete titration. (Molar mass of cyclohexene = 82.146 g/mol; 1F = 96485C). 5 marks

1ciii) Identify the three (3) ways where coulometric titration can be applied in. 3 marks

QUESTION TWO

2ai) What is infrared spectroscopy? 1½ marks

2aii) How would you determine the functional groups present in an organic molecule using infrared spectroscopy? 8 marks

2b) Distinguish between Infrared spectrometer and Fourier Transformer Infrared spectrometer. 5½ marks

QUESTION THREE

3a) Distinguish between absorption and emission spectroscopy.

2 marks

3b) Enumerate the different types of spectroscopy based on the nature of the radiation that is being absorbed or emitted.

2¹/₂ marks

3c) Write on the NMR spectroscopy under the following headings:

- | | | |
|------|-----------------------|-------------------------------------|
| i. | Basic principle | 5 ¹ / ₂ marks |
| ii. | Operational procedure | 3 marks |
| iii. | Applications | 2 marks |

QUESTION FOUR

4a) Describe the electromagnetic radiation making reference to wavelength, frequency and the different region of the electromagnetic radiation 8 marks

4bi) Explain the basic concept of conductimetry. 5 marks

1bii) Highlight the major application of conductimetry 2 marks

QUESTION FIVE

5ai) Define x-ray spectroscopy. 1 mark

5aii) Enumerate three (3) common sources of X- rays 3 marks

5bi) Draw and label a block diagram of an X-ray emission spectrometer. 3marks

5bii) Give a brief account on how X-ray emission spectrometer operates. 4 marks

(5ci) List any two applications of X-ray spectroscopy. 2 marks

5cii) Enumerate any two (2) types of x-ray detectors. 2 marks