

**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? 1mark

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

1. Quenching 2½ marks
2. 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? 11/2 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. 51/2 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:

1. Basic principle 51/2 marks
2. Operational procedure 3marks
3. 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