

**NATIONAL UNIVERSITY OF LESOTHO  
FACULTY OF HEALTH SCIENCES  
DEPARTMENT OF NUTRITION  
FIRST SEMESTER EXAMINATIONS  
NUT 3315- FOOD CHEMISTRY AND ANALYSIS II**

**JANUARY 2024      MARKS:100      TIME: 3 HOURS**

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**INSTRUCTIONS: ANSWER ALL QUESTIONS IN THIS QUESTION PAPER.**

**THE MARKS FOR EACH QUESTION ARE SHOWN IN THE BRACKETS.**

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### Questions One

- a. Critically differentiate between the following;
- Classical and instrumental analysis. (6)
  - Infrared and Ultra-Violet/Visible spectrophotometry. (10)
- b. By use of the diagram, differentiate between absorption and emission as used in spectroscopy. (6)

**Total [12]**

### Questions Two

Lesotho has just past the regulation enforcing micronutrients fortification on flours. In the confirmatory analysis of iron from the 50 kg bag wheat flour using UV-VIS spectrophotometry, the complex  $\text{FeSCN}^{2+}$  had the wavelength of its maximum absorption at 580 nm with a molar absorptivity of  $7.00 \times 10^3 \text{ Lcm}^{-1}\text{mol}^{-1}$ . Calculate

- The absorbance of a  $3.75 \times 10^{-5} \text{ M}$  solution of the complex at 580 nm in a 1.00-cm cell. (12)
- The absorbance of a solution in which the concentration of the complex is twice that in (a). (10)
- Mention any two ways in which errors could be minimized. (2)

**Total [24]**

### Questions Three

- a. Complete the following table.

Organic Compound	Functional Group
Alkenes	(2)
Alcohol	(2)
Phenol	(2)
Amino acid	(4)
Fatty acid	(3)
Amides	(3)
Ethers	(2)
Esters	(2)
Aldehydes	(2)

Ketones	(2)
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b. Complete the table. [21]

Analytical Techniques	Qualitative / Quantitative (1)	Brief Principle Description (3)
1. Colorimetry		
2. IR Spectrophotometry		
3. UV-VIS Spectrophotometry		
4. Atomic Absorption Spectrophotometry (AAS)		
5. Atomic Emission Spectrophotometry (AES)		
6. Gas Chromatography (GC)		
7. High Performance Liquid Chromatography (HPLC)		

**Total [45]**

#### Questions Four

IR spectrum for the solid food sample with toxic organic compound that caused people to be sick and hospitalised showed the presence of carbonyl group (C=O). There is also a very distinct broad peak at around  $3000\text{ cm}^{-1}$

a. Describe how the sample would be prepared for the analysis. (6)

b. Choose the toxic compound from the following;

(2)

- i. Amine
- ii. Alcohol
- iii. Carboxylic acid
- iv. Ester

**Total [8]**

*...End...*