NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES

DEPARTMENT OF APPLIED CHEMISTRY

ANALYTICAL CHEMISTRY III

SCH 4206

First Semester Examination Paper

December 2015

This examination paper consists of 3 pages

Time Allowed:	**3 hours**
Total Marks:	**100**
Examiner's Name:	**Dr A. Maringa**

INSTRUCTIONS

1. Answer any five (5) questions.
2. Each question carries 20 marks.
3. Use of calculators is permissible.

MARK ALLOCATION

QUESTION	MARKS
1.	**20**
2.	**20**
3.	**20**
4.	**20**
5.	**20**
6.	**20**
TOTAL POSSIBLE MARKS	**100**

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1. (a). Describe some of the errors that might arise during the sample preparation stage.

[5 marks]

   (b). What types of contamination and changes in composition can occur during crushing and grinding?   [5 marks]

   (c). How are organic compounds decomposed for the determination of:
       i. Halogens   [5 marks]
       ii. Nitrogen   [5 marks]

2. (a). Describe the following extraction techniques, including the advantages and limitations:
       i.   Liquid-Liquid Extraction (LLE)   [5 marks]
       ii. Soxhlet Extraction   [5 marks]
       iii. Solid Phase Extraction (SPE)   [5 marks]

   (b). In supercritical fluid extraction (SFE), a fluid is used above its critical pressure and temperature. What are the other properties of a fluid in a supercritical state and how can this be used in analytical sample preparation.   [5 marks]

3. (a). What is the distribution constant and state its importance?   [4 marks]

   (b). The distribution constant for X between *n*-hexane and water is 8.9. Calculate the concentration of X remaining in the aqueous phase after 50.0 mL of 0.200 M X is treated by extraction with the following quantities of *n*-hexane:
       i.   One 40.0mL portion.   [4 marks]
       ii. Two 20.0mL portions.   [4 marks]
       iii. Four 10.0mL portions.   [4 marks]
       iv. Eight 5.00mL portions.   [4 marks]

4. (a). Discuss the advantages and disadvantages of automatic analysis.   [10 marks]

   (b). Compare and contrast discrete and continuous automatic systems.   [10 marks]

5. (a). Describe the factors that affect the choice of an analytical method.   [10 marks]

   (b). What are the sources of interference in an analytical procedure? Describe any two techniques which are used to manage interferences.   [10 marks]

6. Suppose that your laboratory has been approached to assess the contamination levels of a river by determining the levels of Cu(II), Sn(II), Pb(II) and Cd(II). Explain how you would carry out this assessment taking into consideration steps such as sampling and sample preparation, elimination of interferences (separation), and also the sensitivity of the chosen analytical method.   [20 marks]

End of question Paper!!!

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