**NATIONAL OPEN UNIVERSITY OF NIGERIA**
**14-16 AHMADU BELLO WAY, VICTORIA ISLAND LAGOS**
**SEPTEMBER/OCTOBER 2015 EXAMINATION**
**SCHOOL OF SCIENCE AND TECHNOLOGY**
**COURSE CODE: CHM413**
**COURSE TITLE: ANALYTICAL CHEMISTRY II**
**INSTRUCTION: Answer Question *one* and any other *three* questions**

**Duration: 2 hours**

**Question 1**

The concentration of copper metal in ten different floodwater samples is as follows;
87.4, 23.3, 17.3, 40.7, 45.3, 69, 58.6, 40.5, 33.5, 89.5
Calculate;

i) Mean **(3 marks)**
ii) Median **(3 marks)**
iii) Standard deviation **(6 marks)**
iv) The 95% confidence limits for the true pH **(5 ½ marks)**

**Question 2**

a) Differentiate between thin layer chromatography and column chromatography**. (9 ½ marks)**
b) Discuss the following:
i) Solid state membrane and
ii) Liquid membrane electrode. **(8 marks)**

**Questions 3**

a) What factors affect the conductance of electrolyte solutions? **(7 ½ marks)**

b) Briefly explain the following terms:
i) visual output of the chromatograph ii) mobile phase iii) chromatography iv) bonded phase

**(2 ½ marks each; =10marks)**

**Question 4**

**a)** State theKohlrausch law of independent migration of ions **(3 ½ marks)**
b) Briefly explain the two application of Kohlrausch law of independent migration of ions (5 marks)

c) A solution is $10^{-3}$M in $Cr_2O_7^{-2}$ and $10^{-2}$M in$Cr^{3+}$. If the pH is 2.0, what is the potential of the half reaction?

**(9 mark)**

**Question 5**

a) List any five (5) type of voltammetry you have studied **( 2 ½ marks)**

b) Outline and explain the three type of electrodes used in a voltammetric cell**( 6 marks)**

c) Discuss Size-exclusion chromatography under the following headings**; ( 9 marks)**

i) Principles ii) types iii) application iv) advantages

**Question 6**

a) What is meant by gel electrophoresis? **( 1 ½ marks)**

b) Classify detectors used in High Performance Liquid Chromatography (HPLC).**(4 marks)**

c) (i) Define the term heat capasity of a calorimeter and describe how to determine the heat capacity of a substance experimentally. **(3 marks)**

(ii) Describe the relationship between heat transferred and change in temperature.**( 2 marks)**

d) Write short notes on the following: **( 7 marks)**

i) Electrochemical deposition ii) Ion exchange technique