FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA
SCHOOL OF PHYSICAL SCIENCES
DEPARTMENT OF GEOLOGY

FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BTech (GEOLOGY), 2015/2016 SESSION

COURSE: GEL 513 (APPLIED GEOCHEMISTRY) UNIT: 3

DATE: 11th April, 2016. Time Allowed: 2½ Hours

Instructions: Answer question 1 and any 3 other questions.

Q1. (a) Write explanatory notes on the terms anomaly, threshold and background.
(b) Using the data in Table 1 below, plot a frequency distribution curve and use it to identify the threshold, background and anomalous values.
(c) Explain two other methods of defining the threshold concentration in geochemical prospecting.

Table 1 Frequency distribution of the $\log_{10}$ of an element in soil

Log Concentration	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0
Frequency	5	12	25	35	50	38	8	3	5	12	8	5	1

Q2. (a) List and explain five factors that affect the mobility of elements in low temperature geochemical environments.
(b) Give a classification of secondary dispersion patterns based on their geometry and relationship with the ore body.
(c) Explain the importance of provenance in soil geochemical prospecting.

Q3. (a) Explain why anomalous stream sediments may not necessarily be accompanied by anomalies in the water with which they are in contact.
(b) With the aid of a well labelled diagram, explain how drainage geochemical survey is carried out.
(c) Briefly explain how you can distinguish between direct chemical precipitation and mechanical erosion and deposition in streams.

Q4. (a) Explain in detail the term trace element.
(b) Outline the factors controlling the partition coefficient (D) of trace elements during magma crystallization.
(c) Explain the following observations made from chemical analyses of a suite of rocks.
(i) High concentration of Ni and Cr (ii) Declining concentrations of Ni, Co and Cr (iii) Declining Sr concentration.

Q5. (a) i) Explain the factors that influence the magnitude of stable isotope separation.
ii) List three methods through which stable isotope separation factors can be obtained.
(b) Write an equation for determining the ratio (δ) of ^{18}O (‰) in a carbonate sample.
(c) i) What are the applications of stable isotope geochemistry?
ii) In the deuterium method for dating groundwater, why is it important to use standards obtained before the 1960s?

Q6. Enumerate and explain various applications of geochemistry in solving human problems.