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

COURSE: **GEL 314 (DETERMINATIVE MINERALOGY)**   UNIT: 3

DATE: 14th April, 2016   TIME ALLOWED: 2½ Hours

<u>Instructions:</u> Answer any two questions from section A and question 1 and any other one from section B.

<u>SECTION A</u>
<u>Instructions:</u> Answer any two questions from this section.

1a. Briefly write on the following properties of minerals with examples.
 i. Colour and streak
 ii. Tenacity and hardness
 iii. Fluorescence and phosphorescence
 iv. Polymorphism and isostructural properties
 v. Cleavage and parting
 b. Differentiate between physical and chemical properties of minerals and give example of each.

2a. List and discuss at least five mineral separation techniques known to you.
 b. Give a concise account of sample liberation or Communition.
 c. Mineral processing involves the production of three main products. Name them and give an example of each.

3. List and discuss five applications of determinative mineralogy

<u>SECTION B</u>
<u>Instructions:</u> Answer Question 1 and any other one question.

1a. Table 1 below was obtained during calibration of an atomic absorption spectrometer for measurement of arsenic concentration in stream sediments in exploration programme.
i. Plot the data and work out the equation of the line.
ii. An unknown sample gave an absorbance of (A) of 0.85. What is the concentration of arsenic in the sample?
iii. If another sample gave an absorbance of 1.28. How would you bring it back within the calibration range? What is the concentration of arsenic in the sample?
b. Outline two disadvantages of atomic absorption spectrometry as an analytical tool.
Table 1: Calibration data for an AAS spectrometer.

Concentration	0.00	2.00	6.00	10.00	14.00	18.00
Absorbance	0.03	0.17	0.42	0.70	0.96	1.26

2a. Using a block diagram only, outline the major components of an energy dispersive X-ray fluorescence spectrometer.
b. Explain how to prepare a rock sample for major oxides analysis using X-ray fluorescence technology.

a. State Bragg's law and explain all the terms in the equation.
b. Figure 1 below is a powder X-ray diffraction pattern for a clay sample. The first order CuKα primary X-rays had a wavelength of 1.5405. Calculate the inter-planar spacings of peaks 3, 5, 6, 9, 10, 12 and 18 and state the unit of measurement.
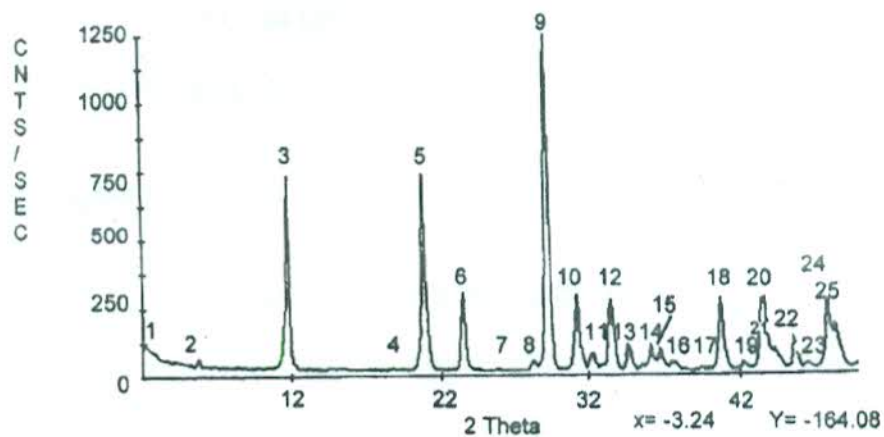

Figure 1 Powder X-ray diffraction pattern of a clay sample.