FEDERAL UNIVERSITY OF TECHNOLOGY, OWERRI
(SCHOOL OF AGRIC. AND AGRIC. TECHNOLOGY)
DEAPRTMENT OF SOIL SCIENCE AND TECHNOLOGY

2007/2008 SESSION HARMATTAN SEMESTER EXAMINATION
COURSE CODE: SST 505 – SOIL CHEMISTRY
TIME ALLOWED: 3 HOURS

INSTRUCTION: ANSWER 3 QUESTIONS ONLY FROM SECTION A AND 2 QUESTIONS FROM SECTION B.

SECTION A

1) What is meant by the term "**Nutrient fixation'?**

a) Discuss this term with special reference to, Nitrogen, Phosphorus and Potassium.

b) Discuss the terms "Expansible: and Non-expansible" illite and with the help of diagrams illustrate what happens to the latter, if it is enriched with potassium fertilizer and state why it behaves that way.

2) A soil was leached (washed) with physiological acid fertilizer like $(NH4)_2$ S04, but instead of getting ammonium sulphate as would be expected in the leachate, $CaS0_4$, K2 $S0_4$ were found.

a) Write an equation showing what could have happened.
b) Discuss the importance of this phenomenon in soil studies.
c) Fully discuss the interrelationships between the fertilizer elements applied (e.g. 180kg K/ha) to two soils with different mineralogical compositions of 1:1 and 2:1 lattice clay minerals and their cation exchange capacity of 10 (mol $-^1$/ 100g soil and 20 cmol-1/100g soil respectively, with special reference to the availability of these elements to the plants and soil management.

3 In identifying deficiencies symptoms in plants, we differentiate between deficiencies caused by "Immobile nutrients" and those caused by "Mobile nutrients".

With specific examples, name the mobile and the immobile nutrients and explain why the difference between them.

b) What are the advantages and disadvantages to a farmer of the fact that nitrates are not generally absorbed or fixed in soils?

4a) Define the term COLLOIDAL MATERIAL and state the properties of colloidal materials that make them useful soil components in tropical agriculture.

b) Attempt a classification of colloidal materials in soil, giving suitable examples of each class.

5a) Name three clay minerals (phyllosilicates) you know. There is a major difference between the 2-layered (1:1) and 3-layered (2:1) clay minerals, what is it?

b) What is the origin of negative charges in the soil and how are the permanent and variable charges connected with the type of soil colloid and the soil p^H?

c) A farmer at Ihiagwa adjacent to ~~University~~ of Federal University experimental farm, after clearing a piece of land for groundnut cultivation, collected soil samples from the area cleared and subjected these to chemical analyses. It was found that the soil has these characteristics:

i. CEC =4 me/ 100g soil
ii TEB (S-Value) = 2.5me/100g soil
iii Exchangeable Al- 1.5 me/100g and
iv Exchangeable Mg = 1.3 me/100g soil