FEDERAL UNIVERSITY OF TECHNOLOGY OWERRI
SCHOOL OF AGRICULTURE AND AGRICULTURAL TECHNOLOGY
DEPARTMENT OF SOIL SCIENCE TECHNOLOGY
2006/2007 HARMATTAN SEMESTER EXAMINATION
SOIL CHEMISTRY AND FERTILITY SST 301
TIME ALLOWED: 3 HOURS

INSTRUCTION. Attempt 5 questions, at least one from each section.
SECTION A.

1 (a). (i) Define cation exchange capacity (CEC) and how does it differ from exchangeable cations. (ii) List the sources and factors that affect cations involved in exchange reaction. (b) NH_4OAc extract of 25g surface (0 -15cm) soil with bulk density of 1.32g/cc contains Ca (0.05g), Mg (0.003g), K (0.018g), Na (0.012g), Al (0.005g) and H (0.001g). Calculate (i) %BS and (ii) K concentration in kg/ha soil (K = 39, Na = 23, Mg = 24, Ca = 40, Al = 27 and H = 1).

2.a. What is clay mineral and how can the structure affect its behavior in soil?
(b) What is the total charge and amount of charges required to attain neutrality in a 2:1 clay mineral of the following constitution.

(c) Explain the process of ion entry into the root

3. (a) Discuss the chemistry of phosphorus in soil.
(b) In order to determine the P concentration of a leaf sample, 1.2g of dry ashed sample was dissolved in acid and the solution made up to 250 ml. The analytical method requires that the analyst should take an aliquot of this solution containing 0.3 and 1.5mg. What volume of aliquot would the analyst use (% P in leaf dry matter is about 0.3).

4 a (i) Distinguish fertilizer ratio from fertilizer formula? (ii) Explain the term 20:10:10. (b).A farmer was advised to apply 3000kg N, 80 kg P_2O_5 and 125 kg K_2O ha-1 to a maize harm in Ihiagwa with NPK 20:10:10. If also at the farmers disposal are urea (46% N), and MOP (60kg). Calculate the quantity of each of three fertilizers to be applied to a 6 hectare farm. Express your answer in tons.
(c) If $(NH_4)_2SO_4$ costs N22, 200 per ton, acid phosphate N12, 600 per ton and muriate of potash N10,820 per ton. What is the value of N, P and K in the different fertilizers. Atomic weights of N (14), H (1), 0 (16), P (31), K (39.1), Cl (35.5) and S (32).

SECTION B

5. Soil organic matter has been defined as the organic fraction of soil exclusive of undecayed plant and animal residues. Discuss? (b) What are the benefits of soil organic matter?

6 (a) What are the sources of soil acidity?
(b) Differentiate Alkaline from saline soils. Explain the ways in which saline soils can be managed.