

SST 301: SOIL CHEMISTRY AND FERTILITY : CREDIT UNIT: 2 UNITS
 TIME: 2 1/2 HOURS

Instruction: Answer 5 questions in all and not less than 2 questions from each section

SECTION A

(1) (a) Define soil according to ^{soil is a natural body covering the earth crust in a thin layer and which is synthesized in a profile from various materials and broken and weathered minerals and decaying organic matter}
 (i) An agronomist (ii) A pedologist (iii) An engineer ^{soil is a mixture of mineral material (sand, clay, gravel) used as base for construction.}

(2) List the three (3) types of rocks → (1) Igneous rock (2) Metamorphic rocks (3) sedimentary rock

(c) Explain any two (2) types listed above.
 Igneous rock: They are formed from molten magmas.
 Metamorphic rock: They are formed as a result of heat, pressure and compression of rocks.

(2) (a) Define the term mineral → Minerals are well defined chemical substances that are crystalline in form.

(i) List and explain the two types of minerals.
 Primary minerals are minerals which have not been chemically altered since their deposition and crystallization of molten magma or lava.
 Secondary minerals are formed from the decomposition of the primary minerals.

(ii) Give three examples of each type listed above
 Primary minerals e.g. → Albite, Anorthite, Biotite
 Secondary mineral e.g. include Chlorite, Calcite, Vermiculite

(3) (a) Explain the origin of clay minerals
 (b) Explain the formation of clay minerals

(4) Write short note on the following groups of clay minerals
 (i) Kaolin group
 (ii) Hydrous group (iii) montmorillonite group (iv) chlorite group

SECTION B

5(a) Write short note on the following
 (i) strongly acidic soil (ii) volatilization loss of nutrients
 (iii) fertilizer grade (iv) vermicomposting (v) nutrient loss through erosion

(b) List and explain the factors that affect leaching of nutrients in the soil.

6(a) Explain the factors that can encourage increase in soil acidity in tropical soils
 (b) Define organic manure and enumerate its importance to the soil.

(7) As a Soil scientist, you are to carry out a research work on soyabean production in the field. Your recommendation rates are 30 kg N/ha, 40kg P₂O₅/ha and 50 kg K₂O/ha. The fertilizer to be used are urea (45 %N), single super phosphate (18 % P₂O₅) and muriate of potash (60 % K₂O). If your plot size is 4m x 20m, what are the quantities of each fertilizer material required.

Climate:
 Soil structure
 Soil texture
 Soil acidity

Kaolinite group of primary part of clay soil is a type of soil

Mr. Mr.

20161966171

FEDERAL UNIVERSITY OF TECHNOLOGY OWERRI
School of Agriculture and Agricultural Technology
Department of Soil Science and Technology
Harmattan Semester Examinations 2018/2019

SST 301: SOIL CHEMISTRY AND FERTILITY: CREDIT UNITS: 2 UNITS

Time: 2 ½ HOURS

Instruction: Answer 4 questions in all. At least 2 questions from each section

SECTION A

1(a) Define isomorphous substitution 3 marks
(b) With aid of a diagram, show isomorphous substitution in 1: 1 clay mineral and 2: 1 clay Mineral 12 marks

2 (a) Write short notes on the following clay mineral groups.
(i) Kaoline group (ii) Hydrous mica group (iii) montmorillonite group (v) Chlorite group 7 marks
(b) with the aid of a diagram, explain soil composition.

3 (a) Define the following terms
(i) Plant nutrients 2 marks
(ii) Nutrient mineralization 2 marks
(iii) Nutrient immobilization 2 marks
(iv) Nutrient dynamics or chemistry 2 marks
(b) Discuss the chemistry of potassium 7 marks

SECTION B

4 Loss of plant nutrients in the soil can be caused by so many factors. List and explain 15 marks

(a) Write short notes on the following
(i) Soil acidity 2marks
(ii) Leaching of plant nutrient 2 marks
(iii) Thermophylic composting 2 marks
(iv) Split application method of fertilization 2 marks
(v) Animal bedding litter 2 marks
(vi) Fertilizer requirement 3 marks

b Differentiate between fertilizer carrier and fertilizer grade

6 How would you prepare 18kg of 4-10-8 fertilizer mixture using sulphate of ammonia (21% of N), SSP (18% OF P₂O₅) and 60 % K₂O 15 marks