UNIVERSITY OF KABIANGA

UNIVERSITY EXAMINATIONS

2017/2018 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER EXAMINATION

FOR THE DEGREES OF BACHELOR OF SCIENCE

IN

AGRICULTURAL EXTENSION EDUCATION, AGRICULTURE AND HORTICULTURE

SSC 311: SOIL CHEMISTRY TIME 3 HOURS

INSTRUTIONS TO CANDIDATES: ANSWER ALL QUESTIONS IN SECTION A AND ANY OTHER THREE IN SECTION B

SECTION A (ANSWER ALL)

1) With relevant examples, describe the two mechanisms by which soil develops their charges. **(8 Marks)**

2) a) Define soil colloid. **(2 Marks)**
   b) Briefly discuss soil colloidal properties under the following: **(6 marks)**

   i) availability of nutrients,
   ii) swelling an shrinkage, and
   iii) dispersion and flocculation

3) Highlight under what circumstances a soil might be expected to take on a net positive charge. **(8 Marks)**

4) a) Differentiate betweenpositive and negative adsorption **(4 marks)**

   b) Write short notes on factors that affect anion repulsion in soils **(4 marks)**

5) Both the crystalline structure and the micro-size of clay minerals contribute to the magnitude of the ion-exchange properties. Highlight three causes of the cation exchange properties. **(8 marks)**

SECTION B

6) a) Define cation exchange capacity (CEC). **(5 Marks)**

b) Discuss three factors that affect CEC in soil. **(15 Marks)**

7) a) Highlight the characteristics of the following salt-affected soils:- **(8 marks)**

i. Saline soils
ii. Sodic soils

b) Describe how saline soils and sodic soils are reclaimed so that they can be used again for agricultural crop production **(12marks)**

8) a) With examples, describe briefly why certain clay minerals expand in water while others do not. **(8 Marks)**

b) Soil A is found to have a cation exchange capacity of 40 cmol kg^{-1}. Soil B has a CEC of 15 cmol kg^{-1}.Textural analysis shows that both soils contain approx. 75% sand and silt. Explain your inferences about themake-up of the colloidal fractions of the two soils. **(12 Marks)**

9) a) Discuss under what circumstances a soil might be expected to take on a net positive charge. **(8 Marks)**

b) List four common soil colloidal constituents and discuss their respective impact upon soil chemistry. **(12 Marks)**

10) Explain the origins and relative magnitudes of the negative charges of the soil inorganic fraction. **(20 Marks)**