(*Knowledge for Development*)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS 2022/2023 ACADEMIC YEAR

THIRD YEAR 1ST SEMESTER MAIN EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE AGRICULTURE AND BIOTECHNOLOGY

COURSE CODE: ASS 311
COURSE TITLE: SOIL CHEMISTRY

DATE: 13TH DECEMBER 2022 **TIME:** 9 – 11 AM

INSTRUCTIONS TO CANDIDATES

Answer Question ONE and any other TWO Questions.

TIME: 2 Hours

This paper consists of 2 printed pages. Please Turn Over

QUESTION ONE = 30 MARKS (Compulsory)

a) Using equations, differentiate between Hydrolysis and Oxidation reactions of chemical weathering. (5 Marks)

b) Using equations, describe the role of Iron in enhancing soil acidity. (4 Marks)

c) A farmer presents you with an analysis from a saturated paste extract. The following were measured: Na^+ = 412 mg L^{-1} , Ca^{2+} = 28 mg L^{-1} , Mg^{2+} = 10.5 mg L^{-1} , EC = 197 mS m^{-1} (Molar masses are Na^+ =23, Ca^{2+}=40.1 and Mg^{2+}=24.3 g mol^{-1}). Calculate the sodium adsorption ratio for this soil. (5 Marks)

d) Explain the concept of isomorphous substitution, showing how it gives rise to charge development in silicate clay minerals. (6 Marks)

e) Describe the structures and properties of Eldoret Kaolinite and Chemelil Montmorillonite minerals. (10 Marks)

QUESTION TWO = 20 MARKS

a) Using equations, describe how lime corrects soil acidity. (5 Marks)

b) The Langmuir and Freundlich models are widely used to describe and construct nutrient sorption isotherms. Write down the equations representing each model and explain the variables given in each model. (5 Marks)

c) Describe the chemical groupings of Humus. (10 Marks)

QUESTION THREE = 20 MARKS

Discuss the Laboratory methods used to determine the CEC in soils. (20 Marks)

QUESTION FOUR = 20 MARKS

Describe how the SOM content is affected by factors of soil formation. (20 Marks)

QUESTION FIVE = 20 MARKS

Describe the classification of Tetrahedral structures in soil chemistry. (20 Marks)