



(Knowledge for Development)

KIBABII UNIVERSITY
UNIVERSITY EXAMINATIONS
2023/2024 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: 4TH DECEMBER 2023 **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



KIBU observes ZERO tolerance to examination cheating

QUESTION ONE = 30 MARKS (Compulsory)

- a) Using equations, differentiate between Hydrolysis and Hydration reactions of chemical weathering. (5 Marks)
- b) Using equations, describe the role of Manganese in enhancing soil acidity. (4 Marks)
- c) A farmer presents you with an analysis from a saturated paste extract. The following were measured: $\text{Na}^+ = 410 \text{ mg L}^{-1}$, $\text{Ca}^{2+} = 30 \text{ mg L}^{-1}$, $\text{Mg}^{2+} = 15.5 \text{ mg L}^{-1}$, $\text{EC} = 207 \text{ mS m}^{-1}$ (Molar masses are $\text{Na}^+ = 23$, $\text{Ca}^{2+} = 40.1$ and $\text{Mg}^{2+} = 24.3 \text{ g mol}^{-1}$). Calculate the sodium adsorption ratio for this soil. (5 Marks)
- d) Describe how Tetrahedral and Octahedral sheets combine. (6 Marks)
- e) Using appropriate illustrations, describe the structures of Illite and Kaolinite minerals. (10 Marks)

QUESTION TWO = 20 MARKS

- a) Using equations, discuss the causes of soil acidity. (10 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. (4 Marks)
- c) Discuss the reactions of humus in soils. (6 Marks)

QUESTION THREE = 20 MARKS

Discuss the ways in which electrical charges develop on soil colloids. (20 Marks)

QUESTION FOUR = 20 MARKS

Describe Saline, Sodic and Saline-Sodic soils. (20 Marks)

QUESTION FIVE = 20 MARKS

Describe the decomposition of soil organic matter. (20 Marks)