



**MASENO UNIVERSITY**  
**UNIVERSITY EXAMINATIONS 2013/2014**

**SECOND YEAR SECOND SEMESTER EXAMINATIONS FOR THE  
DEGREE OF BACHELOR OF SCIENCE IN SOIL SCIENCE &  
PLANT NUTRITION WITH INFORMATION TECHNOLOGY  
(MAIN CAMPUS)**

**ASS 204: SOIL CHEMISTRY**

Date: 10<sup>th</sup> April, 2014

Time 2.45 – 5.00 p.m.

---

**INSTRUCTIONS:**

- Answer ALL questions in Section A and any TWO questions in Section B.



ASS 204: SOIL CHEMISTRY

INSTRUCTIONS: ANSWER ALL QUESTIONS IN SECTION A AND ANY TWO IN SECTION B

TIME: 2 HOURS

SECTION A

- Q1 a) Using appropriate illustrations, describe the structures of illite and kaolinite. (10 marks)
- b) Explain why kaolinite has a lower exchange capacity than montmorillonite. (4 marks)
- Q2 a) Define the term calcium carbonate equivalent. (2 marks)
- b) Calculate the calcium carbonate equivalents of pure forms of calcium hydroxide and calcium oxide and hence determine which of the two materials is a more effective liming material. (Ca = 40, C = 12, O = 16, H = 1) (5 marks)
- Q3a) Define the term cation exchange capacity (CEC). (2 marks)
- b) Explain the factors that affect the CEC of a soil. (4 marks)
- c) The table below shows some chemical properties that were found in the A horizon of a soil.

Exchangeable cations	Cmol/kg soil
Calcium	1.50
Potassium	0.72
hydrogen	0.75
Sodium	0.03
Magnesium	0.45
Aluminium	1.90

Using the above information, calculate the following:

- i) Cation exchange capacity (1 marks)
- ii) % Base saturation (1 marks)

- iii) % Exchangeable acidity (1 marks)
- d) State two management practices that can be used to increase the CEC of a soil. (2 marks)
- Q4 a). Outline causes of acidity in soils. (5 marks)
- b) State any three causes of acid soil infertility. (3 marks)

**SECTION B: ANSWER ANY TWO QUESTIONS**

- 5 a) Define the term colloid and name the four types of soil colloids. (6 marks)
- b) Describe the ways in which electrical charges develop on soil colloids (9 marks)
- 6 a) Describe a laboratory method of determining the soil pH using a pH meter. (6 marks)
- b) Describe saline, sodic and saline-sodic soils using the following chemical properties: pH, electrical conductivity and exchangeable sodium percentage. (9 marks)
- 7 a) Define the term phosphorus fixation and explain how it differs with nitrogen fixation. (4 marks)
- b) Explain any three factors that affect phosphorus fixation in soils. (3 marks)
- b) Using appropriate equations/illustrations, explain how phosphorus and potassium are fixed in soils. (8 marks)
-