AFRICA UNIVERSITY
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COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES

NACP 111 INTRODUCTION TO SOIL SCIENCE

SUPPLEMENTARY EXAMINATION

JANUARY 2020

LECTURER: MRS. S. MBIZI

DURATION: 3 HRS

INSTRUCTIONS

1. Do not write your name on the answer sheet.
2. Use answer sheets provided.
3. Begin your answer for each question on a new page.

Read questions carefully before you answer

This paper is comprised of two parts. Attempt all questions from both sections as per instructions. Marks allocated for each section or parts thereof are indicated in brackets. Section A is worth 60 marks and section B is worth 40 marks.

SECTION A

Answer all questions in this section

1. Define a Catena and explain how differences in soil properties arise in a Catena. [6]
2. With the aid of a well labelled diagram, describe the development of a soil profile showing all the relevant horizons. [8]
3. Define the following terms:
   (a) Percentage Base Saturation (% BS)
   (b) Soil pH
   (c) Isormophous Substitution (IS).
   (d) Cation Exchange Capacity (CEC).
   (e) Exchangeable Sodium Percentage (ESP). [10]
4. (a) Identify the two sources of negative charges in clays. [2]
   (b) List any six factors that cause acidity in soils. [6]
5. State four factors that affect the bulk density (Db) of soils. [4]
6. Define the following terms:
   (a) Leaching
   (b) Eluviation
   (c) Illuviation
   (d) Salinisation
   (e) Podzolization [10]
7. State the 5 soil forming factors. [5]

8. With the aid of an equation, describe the process that leads to the formation of gleyed soils. [5]

9. (a) State the composition of soil in terms of volume basis. [2]

(b) Identify any two factors that cause poor soil aeration. [2]

SECTION B

Answer any two questions from this section

10. Describe the processes involved in soil formation. [20]

11. (a) Identify the processes that cause N gain and N loss in soils. [10]

(b) Explain any three methods of reclamation of Saline and Sodic soils. [8]

(c) Explain the term Calcium Mgnesium ratio. [2]

12. (a) The following table shows the chemical data deduced from soils X, Y and Z.

SOIL	**X**	**Y**	**Z**
Exhcangeable Ca (mmoles $_c kg^{-1}$)	62	650	10
Exchangeable Mg (mmoles$_c kg^{-1}$)	38	300	6
Exchangeable K (mmoles$_c kg^{-1}$)	3	25	4
Exchangeable Na (mmoles$_c kg^{-1}$)	1	3	1
Exchangeable H (mmoles$_c kg^{-1}$)	8	5	2
Exchangeable Al (mmole$_c kg^{-1}$)	40	0	4

Use the information from the table to calculate the:

(i) CEC Values for each of the soils. [3]

(ii) ESP values for each of the soils. [3]

(iii) How can the information in the table be used to understand and manage the soils. [4]

(iv) Explain the importance of Cation Exchange Capacity in soil fertility.

(b) Explain how organic matter can influence the soil characteristics:

(i) soil microorganisms [3]

(ii) soil structure [3]

END OF EXAM PAPER