



“Investing in Africa’s future”

COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES

NACP 111 INTRODUCTION TO SOIL SCIENCE

SUPPLEMENTARY EXAMINATION

JANUARY 2022

LECTURER: MRS. S. MBIZI

DURATION: 5 HOURS

INSTRUCTIONS

1. Read and understand all questions before you answer.
2. Answer any one question from any of the options 1, 2 and 3.
3. All working for numerical answers must be shown.
4. The intended number of marks is given in brackets at the end of each question or part of the question.
5. Begin your answer for each question on a new page.

1. (a) According to the Jenny's model of soil formation, soil is a product of five soil forming factors. Discuss. (25)
- (b) Discuss in what way Technology has contributed to both soil improvement and degradation. (25)
- C (i) Describe the structure of a typical soil profile including the zones of Eluviation and Illuviation in your Horizon profile. (15)
- (ii) Discuss the factors that affect Bulk Density in soils. (10)
- (d) Using examples, discuss the importance of soil physical, chemical and Biological properties in any Agricultural system. (25)

End of Question 1

2. You have completed soil analyses on three different soils that a farmer has brought into your laboratory. The three soils A, B and C have the following exchange cations in their top soils (0-15cm depth) expressed in $\text{mmoles}_c \text{ kg}^{-1}$.

ANALYSIS	SOIL A	SOIL B	SOIL C
Exchangeable Ca	45	10	20
Exchangeable Mg	58	4	15
Exchangeable K	3	2	1
Exchangeable Na	2	0	6
Exchangeable H	1	5	1
CEC	112	27	45
pH	7.2	5.4	7.8

Draw up a table for these three soils showing their:

- (i) Total Exchangeable Bases (TEB)
 - (ii) % Base Saturation (%BS)
 - (iii) % Hydrogen Saturation (%HS)
 - (iv) Exchangeable Sodium percentage (ESP)
 - (v) Ca/Mg ratios (15)
 - (vi) Which of the soil is likely to be clay? Justify your answer. (3)
 - (vii) Using the answers from 2a(i) to v above, which soil would you recommend the farmer to crop and why? (4)
 - (viii) Comparing the Ca /Mg ratios of the three soils, which soil is likely to give problems when cropped? Explain why. (3)
- (b) Discuss the four main groups of Aluminosilicate clays. (25)

- C (i) Describe the two main building blocks of Aluminosilicate clays. (10)
- (ii) Describe the formation of negative charges on clays. (15)
- (d) (i) Discuss the effect of pH on nutrient availability. (10)
- (ii) Describe the factors that cause and increase acidity in soils. (15)

End of Question 2

3. (a) Describe the factors that cause N loss and gain in soils. (25)
- (b) Explain the differences between Saline and sodic soils. How can each be managed? What three factors make a sodic soil unsuitable for plant growth? (25)
- c (i) Differentiate between a primary and secondary mineral and give an example of each. (6)
- (ii) Differentiate between Organic matter and Humus. (7)
- (iii) Explain how leaching, Organic matter and gleying influence soil formation. (12)
- (d) Write short notes on the following:
- (i) Saprolite (4)
- (ii) A Catena (5)
- (iii) Colluvium (4)
- (iv) Alluvium (4)
- (v) Isomorphous Substitution (IS) (4)
- (vii) Sodium Adsorption Ratio (SAR) (4)

End of Examination Paper