



"Investing in Africa's Future"

COLLEGE OF HEALTH, AGRICULTURE & NATURAL SCIENCES

NACP11 INTRODUCTION TO SOIL SCIENCE

END OF SEMESTER EXAMINATIONS

NOVEMBER 2019

LECTURER: MBIZI

DURATION: 3 HOURS

INSTRUCTIONS

- 1. Attempt all questions from both sections as per instructions.***
- 2. Do not write your name on the answer sheets.***
- 3. Use Answer sheets provided***
- 4. Begin your answer for each question on a new page.***
- 5. Marks allocated for each question or parts thereof are indicated in brackets.***
- 6. Credit is given for neat presentation of answers.***

SECTION A (60 MARKS)

Answer all questions in this section

1. a) List any four factors which affect soil porosity. (4)

b) Given a soil sample with a bulk density of 1.3kgm^{-3} and a particle density of 2.63kgm^{-3} .

Calculate the pore space of the soil? (3)

2. Stoke's Law formular is given as :

$$V = \frac{2 (D_p - D_l) g r^2}{9 \eta}$$

Explain the meaning of each of the letters in the formular. (6)

3. a) State any four chemical weathering processes of rocks (4)

b) State the five soil forming factors. (5)

4. List any six factors that affect soil pH. (6)

5. a) Describe the structure of a typical soil profile including the zones of Eluviation and Illuviation in your horizon labeling. (8)

b) Define a Catena. (2)

6. Define the following terms.

a) Percentage base saturation (% BS). (2)

b) Cation Exchange Capacity (CEC). (2)

c) Soil PH (2)

d) Texture (2)

1. Describe the two building blocks of Aluminosilicate clays. (6)

2. a) Name three examples of hydrous oxides of Iron and Aluminium. (3)

b) List the Cations that a soil can adsorb in their preferential order (3)

c) What is the major implication of Isomorphous substitution in a clay lattice. (2)

SECTION B (40 MARKS)

ANSWER ANY TWO QUESTIONS FROM THIS SECTION

9(a) Describe any five processes involved in soil formation. (10)

(b) Explain the factors that cause nitrogen loss in soils. (10)

10. Discuss the four groups of Alumminosilicate clays. (20)

11. A soil has the following complement of exchangeable cations, the amounts being expressed in $\text{mmoles}_c/\text{kg}$.

Exchangeable H^+ 12

Exchangeable Ca^{2+} 60

Exchangeable Al^{3+} 48

Exchangeable Mg^{2+} 40

Exchangeable Na^+ 2

Exchangeable K^+ 7

(a) Calculate the following parameters for the above soil.

(i) Cation Exchange Capacity (CEC).

(ii) %Base Saturation (% BS).

(iii) Percentage Acid saturation (% AS).

(iv) Total Exchangeable Bases (TEB).

(V)Total Exchangeable Acids (TEA). (10)

(B)What are typical characteristics of soils with a high CEC value. (3)

© Explain how a permanent charge is formed in clay lattice. (2)

(d) Calculate the % clay in a soil from the following data

Mass of beaker = 125g

Mass of beaker + sand = 150g

Mass of beaker + silt = 140g

Total mass of soil = 50g (3)

(e)Explain the importance of soil colour. (2)

THE END