"Investing in Africa's future"

COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES

AFRICA UNIVERSITY
A United Methodist-Related Institution

NACP 101: INTRODUCTION TO SOIL SCIENCE

END OF FIRST SEMESTER FINAL EXAMINATIONS

NOVEMBER/ DECEMBER 2022

LECTURER: MRS. S. MBIZI

DURATION: 3 HOURS

INSTRUCTIONS

1. Read and understand all questions before you answer.
2. Answer all questions from section A and any two from section B.
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) Explain how parent material and climate affect soil formation. [6]

2. Four soil cores are obtained from the upper 40cm of sandy loam soil under maize. The soil has been continuously ploughed for the past ten years. Each core had a volume of 150cm^3. The cores were over dried at 105^{0}C and then weighed and the data entered in the table below.

Core No.	Soil Depth (cm)	Oven Dry Soil Mass (g)	Bulky Density Mgm^3	% Porosity
1	0 – 10	215	----------	----------
2	10 – 20	235	----------	----------
3	20 – 30	255	----------	----------
4	30 – 40	230	----------	----------

a) Complete the missing sections in the table showing any formulae used. You need to reproduce this table or show your work on your answer sheet. Assume particle density is 2,6 Mgm^{-3}. [8]
b) Comment on the meaning of the % porosities obtained above. [4]
3. State any four chemical weathering processes of rocks. [4]
4. Explain how organic matter can influence the following soil characteristics.
   a) Soil microorganisms. [3]
   b) Soil structure. [3]
5. Briefly discuss the factors that are likely to cause poor soil aeration. [6]
6. a) What is the major implication of Isormophous substitution in a clay lattice? [2]
   b. Discuss five factors that are likely to acidify soils. [5]
   c. Briefly explain how soil temperature may be detrimental to plant growth. [3]

7. With the aid of a well labeled diagram, describe the development of soil profile showing all the relevant horizons. [8]

8. List the factors that affect the free energy of water. [4]

9. Define the following terms:

   i) Availability of water capacity (AWC). [2]

   ii) Exchangeable Sodium Percentage (ESP). [2]

SECTION B

10. Discuss the four groups of Alumino silicate clays. [20]

11. Define the following terms:

i) Saprolite [3]

ii) Isormophous substitution [4]

iii) Anion Exchange Capacity [3]

iv) Cation Exchange Capacity [3]

v) Soil pH [3]

b) List the five soil forming factors [4]

12. a) What is bulky density (Db). [4]

b) Outline the factors that affect Bulky Density. [16]

END OF EXAMINATION PAPER