



“Investing in Africa’s future”

COLLEGE OF HEALTH, AGRICULTURE & NATURAL SCIENCES

NACP 209: SOIL FERTILITY AND PLANT NUTRITION

END OF SECOND SEMESTER FINAL EXAMINATIONS

APRIL 2023

LECTURER: MRS. S. MBIZI

DURATION: 3 HOURS

INSTRUCTIONS

1. Read and understand all questions before you answer.
2. **Do not** write your name on the answer sheets.
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.

SECTION A (60 MARKS)

ANSWER ALL QUESTIONS FROM THIS SECTION

1. One of the limitations of maize, horticulture and Citrus production in smallholder farming areas is the depletion and lack of Micronutrients including Mo, Zn and Bo. Describe the significance of these Nutrients in crop production. (9)
2. Given that the neutralising value of CaCO_3 is 100. Use the molecular masses given below to calculate the neutralising values of Ca(OH)_2 and CaO .
 $C = 12g, O = 16g, Ca = 40g \text{ and } H = 1g.$ (6)
3. Suggest six strategies that a resource poor farmer can use to reduce N losses from the soil. (6)
4. (a) Give the Primary and Secondary orthophosphate ionic forms in which Phosphorous is taken up from the soil and the pH values in which they occur in the soil for plant uptake. (4)

(b)(i) Calculate the % of N in Ammonium Sulphate $(\text{NH}_4)_2\text{SO}_4$ and Urea $(\text{NH}_2)_2\text{CO}$ fertilizers, given the following atomic masses:
 $N = 14g, S = 32g, O = 16g, H = 1g \text{ and } C = 12g$ (4)

(ii) How many kilograms of Ammonium Sulphate would be needed to provide 100kg of N? (3)
5. State the benefits of using the Biological Nitrogen Fixation (BNF) over the use of synthetic fertilizers. (5)
6. State the benefits of applying lime in the soil. (6)
7. (a) Nitrate ions (NO_3^-) are the most abundant in the soil compared to ammonium ions NH_4^+ . Explain why NH_4^+ (Ammonium ions) are preferred for uptake compared to NO_3^- ions (3)

(b) Define pH buffering and explain the importance of soil pH buffering. (5)
8. List any six causes of soil acidity and three that can cause alkalinity in the soil. (9)

SECTION B

ANSWER ANY **TWO** QUESTIONS FROM THIS SECTION

9. (a) Discuss the effect of soil reaction on nutrient availability. (10)
- b) Discuss the sources of H^+ ions which are the initial source of soil solution acidity. (10)
10. (a) Describe in detail the N loss and gain pathways in soils. (16)
- (b) Discuss the management of Nitrogen Depression Period (NDP) in crop production. (4)
11. While Phosphorous is a major nutrient required by plants in large amounts it is often unavailable in the soil. Discuss the validity of this statement, clearly stating the reasons for the less availability of P in the soil including effects of P losses in the soil. (20)

END OF EXAMINATION PAPER