



“Investing in Africa’s future”

COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES

NACP 209: SOIL FERTILITY AND PLANT NUTRITION

END OF SECOND SEMESTER FINAL EXAMINATIONS

APRIL 2022

LECTURER: S. MBIZI

DURATION: 3 HOURS

INSTRUCTIONS

1. DO NOT WRITE YOUR NAME ON THE ANSWER SHEETS.
2. BEGIN YOUR ANSWER FOR EACH QUESTION ON A NEW PAGE
3. CREDIT IS GIVEN FOR NEAT PRESENTATION
4. THIS PAPER IS COMPRISED OF TWO PARTS

ANSWER ALL QUESTIONS IN SECTION A AND ANY TWO QUESTIONS IN SECTION B

SECTION A (60 MARKS)

Answer all Questions.

1. (a) What is Nitrogen Depression Period (NDP)? Explain how you would assist the farmer to manage it. (4)
2. Suggest four strategies that a poor resource farmer can use to reduce N losses from the soil. (6)
3. (a) Give the two primary and secondary orthophosphate ionic forms in which Phosphorus 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 and C = 12g. (4)
ii. How many Kgs of Ammonium Sulphate would be needed to provide 100 kgs of N. (3)
4. State the benefits of using the Biological Nitrogen Fertilizer (BNF) over the use of Synthetic Fertilizers. (6)
5. (a) When Aluminium is hydrolysed, it is more acidifying than the Hydrogen ion. Give the three balanced equations used to illustrate this. (6)
(b) List any six factors that can cause soil acidity and three that can cause soil alkalinity. (9)
6. State the benefits of applying lime in the soil. (6)
7. (a) Define the following terms
i. Mineralization
ii. Immobilization
iii. Nitrification (3)
(b) Nitrate (NO_3^-) ions are the most abundant in the soil compared to Ammonium ions NH_4^+ . Explain why Ammonium ions are preferred for uptake compared to NO_3^- . (3)
c) Define pH buffering and explain the importance of soil pH buffering. (6)

SECTION B (40 MARKS)

Answer any two questions from this section.

8. (a) Describe the three stages involved in the production of NO_3^- ions from Organic matter. Include the soil Organisms responsible for each of the breakdown stages. (10)

(b) Describe the Nitrogen loss and gain pathways from the soil. (10)

9. (a) State the important physical, chemical and Biological properties that organic matter gives to soil. (12)

(b) Explain the principal cause of alkalinity in sodic soils and explain in detail how soil alkalinity and sodicity may affect crop growth. (8)

10. Write short notes on the following N loss and gain pathways.

i. Volatilization (6)

ii Denitrification (5)

iii. Lightning (5)

iv. Leaching (4)

End of Examination Paper