GWANDA STATE UNIVERSITY

FACULTY OF NATURAL RESOURCES MANAGEMENT & AGRICULTURE

DEPARTMENT OF HORTICULTURE & CROP PRODUCTION

BACHELOR OF SCIENCE (HONOURS) DEGREE IN CROP SCIENCE

PRINCIPLES OF SOIL SCIENCE (NHC 1102)

EXAMINATION PAPER

NOVEMBER/DECEMBER 2025

This examination paper consists of 3 pages, inclusive of cover page

Time Allowed: **3 hours**

Total Marks: **100**

Examiner's Name: **Mr Musabayana**

INSTRUCTIONS

1. Answer **ALL** questions in Section A
2. Answer ONLY **THREE** questions in Section B

MARK ALLOCATION

QUESTION	MARKS
SECTION A	**40**
SECTION B	**60**
TOTAL ATTAINABLE MARKS	**100**

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SECTION A: ALL QUESTIONS IN SECTION A

Question 1.

A farmer has taken **TWO** soil samples using a core measuring 10cm in diameter and 6 cm in height from two different fields and labelled them A and B respectively. He sent the samples to a laboratory for analysis and the following data was recorded as follows:

Mass of oven dry soil sample A = 490g and B = 900g respectively.
Soil texture of sample; A 90% sand, 6% silt and 4% clay and soil sample B; 10% sand, 30% silt and 60% clay.

i) Determine the type of soil samples A and B using the texture triangle. (2)

ii) Calculate the bulk density of soil samples A and B in Mg m^{-3}. Determine the type of each soil using yours answers. (7)

iii) Explain the difference in bulk density between soil samples A and B (2)

iv) Do you agree or not that compacted clay soils exhibit higher bulk densities? Give a reason for your answer. (1)

v) Given that the particle density for soil samples A and B is equal to 2650kg Mg m^{-3}. Calculate the percentage (%) pore space for the two soil samples. (4)

vi) Do you agree or not that compacted clay soils exhibit higher bulk densities? Give a reason for your answer. (1)

vii) Given that the particle density for soil samples A and B is equal to 2650kg Mg m^{-3}. Calculate the % pore space for the two soil samples. (4)

Question 2

Illustrating your answer, name and describe types of aluminosilicate clays. (20)

SECTION B: ANSWER THREE QUESTIONS IN SECTION B

Question 3.

a) Explain why a platy soil structure is not favourable for crop growth. (2)

b) Spheroidal structure is divided into crumb and granules. Explain why crumb structure is favourable for crop growth. (5)

c) Give a comparison between leaching and eluviation in processes in soils. (6)

d) Citing examples, describe the negative and positive sources of alluminosilicate clays. (7)

Question 4.

Elaborate on factors that are involved in soil formation. (20)

Question 5

Citing examples, describe factors that affect soil pH. (20)

Question 6

(a) Explain the effect of organic matter on soil properties. (8)

(b) Giving examples, classify soil organisms according to:

(i) Size. (3)

(ii) Modes of nutrition. (3)

(iii) Oxygen requirements. (3)

(iv) Evolutionary development. (2)

(c) Distinguish between mineralization and immobilization. (1)

Question 7

Citing named examples, describe the importance of the following on soil physical and soil chemical properties:

a. Soil texture. (10)

b. Soil structure. (10)

END OF EXAMINATION