

GWANDA STATE UNIVERSITY



FACULTY OF NATURAL RESOURCES MANAGEMENT AND AGRICULTURE

DEPARTMENT OF HORTICULTURE AND CROP PRODUCTION

PROGRAMME: BSc HONOURS HORTICULTURE & CROP  
PRODUCTION/ANIMAL HEALTH & PRODUCTION

NHC1102: PRINCIPLES OF SOIL SCIENCE

FINAL EXAMINATION

MAIN PAPER

SEPTEMBER 2023

This examination paper consists of 3 pages.

Time Allowed:	Three (3) Hours
Total Marks:	100
Special Requirements:	Scientific calculator, ruler (supplied by student)
Examiner's Name:	Mr Madzaramba T.H

**Instructions**

1. Answer **ALL** questions in Section A
2. Answer any **THREE (3)** questions in Section B

**Mark allocation**

Question	Marks
Section A	40
Section B	60
Total attainable marks	100

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**SECTION A:** Answer **ALL** questions.

**Question 1**

- a) Outline the functions of the soil as a natural body. [8]
- b) Explain the significance of soil pH in soil chemistry and plant growth. [12]
- c) Compute the bulk density of an undisturbed soil sample that was collected from a citrus plantation, a few days after a rainfall event, when the soil moisture was near field capacity. The inside dimension of core sampler was 40mm in diameter and 100mm deep. The weight of the wet soil and cylinder was 3.80kg and the dry weight of the soil was 3.62kg. In addition, the weight of core sampling cylinder was 2.45kg. [10]
- d) Explore the relationship between soil quality and food security. [10]

**SECTION B:** Answer any **THREE** questions.

**Question 2**

- a) Compare and contrast the structure of kaolinite and hydrous mica aluminosilicate clays. [8]
- b) Discuss the management strategies for saline and sodic soils [12]

**Question 3**

- a) Calculate the cation exchange capacity (CEC) of a soil with 25%  $H^+$  and 60%  $Ca^{2+}$  on the exchange complex, given a CEC of 30 cmolc/kg. [5]
- b) Discuss the influence of parent rocks on soil formation [15]

**Question 4**

- a) You are considering the purchase of some farmland in a region with variable soil textures. The soils on one farm are mostly sandy loams and loamy sands, while those on a second farm are mostly clay loams and clays. Explain in detail the potential benefits and likely challenges of each farm. [10]
- b) Describe the concept of the Soil Taxonomy system and how soil nomenclature aids in categorizing and communicating soil information [10]

**Question 5**

- a) Outline the procedure of determining soil colour using the Munsell Book. [10]
- b) Explain four (4) factors that influence soil development and profile formation in sub-humid regions. [10]

**Question 6**

- a) Elaborate on how deforestation impacts soil structure and functions. [10]
- b) A  $500\text{cm}^3$  oven dry core has a bulk density of  $1.1\text{ g/cm}^3$ . The soil core is placed in a pan of water and becomes water saturated. The oven dry soil and water at saturation weigh 825g. Calculate the total soil porosity. [10]

**END OF QUESTION PAPER!!!**