

UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER

**PROGRAMMES: BACHELOR OF SCIENCE YEAR TWO IN  
AGRICULTURAL AND BIOSYSTEMS ENGINEERING,  
AGRICULTURAL EDUCATION, AGRONOMY, ANIMAL  
SCIENCE, ANIMAL SCIENCE DAIRY OPTION AND  
HORTICULTURE.**

**COURSE CODE: CP 201**

**TITLE OF PAPER: INTRODUCTORY SOIL SCIENCE**

**TIME ALLOWED: TWO (2) HOURS**

**INSTRUCTIONS: ANSWER ANY FOUR (4) QUESTIONS**

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GRANTED BY THE CHIEF INVIGILATOR**

**QUESTION 1**

(a) Define the following terms:(Each question carries **2 marks**).

- (i) Soil morphology
- (ii) Soil texture
- (iii) Illuviation
- (iv) Buffering Capacity
- (v) Isomorphous substitution

(b) Discuss the processes of soil formation and indicate how they contribute to the formation of soils.

[15]  
[25]

**QUESTION 2**

(a) Distinguish between physical and biogeochemical weathering of rocks and minerals to form soil.

[5]

(b) Discuss the physical and biogeochemical weathering processes of rocks and minerals to form soil.

[20]  
[25]

**QUESTION 3**

(a) Outline the types of acidity found in acid soils and comment on the relative importance of each on soil behaviour.

[5]

(b) Discuss the effects of soil acidity on plant growth.

[14]

(c) What strategies would you recommend to increase crop yields in very acid soils?

[6]  
[25]

**QUESTION 4**

(a) Define the term soil structure and explain the importance of soil structure in crop production

[10]

(b) Discuss the management strategies that can be recommended to improve or maintain good soil structure in arable agriculture.

[15]  
[25]

**QUESTION 5**

A chemical analysis of a well-drained mineral soil gave the following contents of elements:

Exchangeable Ca -	1568 kg/ha
Exchangeable Mg -	300ppm
Exchangeable K -	195ppm
Exchangeable Na -	257.6 kg/ha
Exchangeable H -	3mg/100g
Exchangeable Al -	450ppm

Milliequivalent weights of the elements in mg :

Ca – 20, Mg – 12, K – 39, Na – 23, H – 1, Al – 9.

Assuming that these cations occupy all the negative charges of this soil:

- (a) Calculate the cation exchange capacity of this soil and express it in cmolc/kg. [15]
  - (b) What is its percent base saturation? [5]
  - (c) Evaluate this soil in terms of its suitability for optimum growth of plants. [5]
- [25]**

**QUESTION 6**

- (a) Define the term organic matter. [3]
  - (b) Discuss the effects of organic matter on important soil properties when soils are used for crop production. [15]
  - (c) Comment on the contribution of organic matter to the quality of the environment. [7]
- [25]**