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**UNIVERSITY OF SWAZILAND**

**FINAL EXAMINATION PAPER**

**PROGRAMME: BACHELOR OF SCIENCE IN AGRICULTURAL EDUCATION  
YEAR THREE AND BACHELOR OF SCIENCE IN  
AGRONOMY YEAR THREE**

**COURSE CODE: CP 302**

**TITLE OF PAPER: CROP NUTRITION**

**TIME ALLOWED: TWO AND A HALF (2.5) HOURS**

**INSTRUCTIONS: ANSWER FOUR QUESTIONS WITH AT LEAST  
ONE QUESTION FROM EACH SECTION**

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CHIEF INVIGILATOR**

**SECTION 1: SOIL CHEMISTRY****QUESTION 1**

- (a) Organic and inorganic colloids are known to possess negative charges in soil systems. Describe in detail the various ways in which these two types of colloids obtain negative charges. [6]
- (b) Discuss the significance of clay minerals when soils are used for crop production [19]

**QUESTION 2**

- (a) Outline the types of acidity found in soils and comment on the significance of each in crop production. [4]
- (b) Discuss in detail the acid-infertility factors of soils and comment on the strategies you would recommend to increase plant growth in such soils. [15]
- (c) An acid soil, in the highveld of Swaziland, was found to contain 1.25 m.e. exchangeable Al per 100g of soil (1.25 m.e. Al/100 g). Calculate the amount of lime, in tonnes per hectare, required to remove the acid infertility factors to a depth of 20 cm. The soil had a bulk density of  $1.2 \text{ Mg/m}^3$  and the lime had a neutralizing value of 90%. [6]

**QUESTION 3**

- (a) What is the importance of minerals in crop nutrition? [5]
- (b) Discuss the interactions of aluminium oxides and hydroxides with anions in soils and comment on the implications of such interactions in crop nutrition. [20]

**SECTION 2: CROP NUTRITION****QUESTION 4**

- (a) Discuss the transformations of phosphorus in soils and comment on the implications of these reactions on phosphorus nutrition of plants. [7]
- (b) Discuss the factors which influence the availability of phosphorus to plants in soils and identify strategies you would recommend to improve phosphorus availability to plants.

**[18]****QUESTION 5**

- (a) Discuss in detail the methods of fertilizer application you would recommend to farmers in your country for the fertilization of cereal crops. [12]
- (b) Fertilizer recommendation for the production of maize in the middleveld of Swaziland was given as follows:

N	-	50 kg ha <sup>-1</sup>
P	-	30 kg ha <sup>-1</sup>
K	-	40 kg ha <sup>-1</sup>

- (i) Calculate the amount of the compound fertilizer 2:3:2 (37) that must be applied to supply the entire N requirement. [7]
- (ii) How much P and K would this quantity of fertilizer obtained in (i) above supply? [3]
- (iii) What is the major disadvantage of using a compound fertilizer in this recommendation? [3]

**QUESTION 6**

- (a) Briefly outline the basis for the movement of mineral nutrients to the surface of plant roots. [12]
- (b) Discuss the components of nutrient movement to the vicinity of plant roots in soils and comment on the relative importance of each component for: (i) mobile and (ii) immobile nutrients. [13]