



1st SEM. 2010/2011 (M)

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UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER

**PROGRAMMES: BACHELOR OF SCIENCE IN AGRICULTURAL
EDUCATION AND AGRONOMY YEAR III**

COURSE CODE: CP 302

TITLE OF PAPER: CROP NUTRITION

TIME ALLOWED: TWO AND A HALF (2.5) HOURS

**INSTRUCTIONS: ANSWER FOUR (4) QUESTIONS WITH AT LEAST ONE
QUESTION FROM EACH SECTION**

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THE CHIEF INVIGILATOR**

SECTION 1: SOIL CHEMISTRY

QUESTION 1

- (a) Discuss in detail the acid-infertility of soils [15]
- (b) What management strategies would you recommend to increase crop yields in acid soils? [4]
- (c) An acid soil was found to contain 4 m.e exchangeable Al per 100g of soil. Calculate the amount of CaCO_3 in tonnes per hectare required to neutralise the exchangeable Al to a depth of 15 cm. The soil had a bulk density of 1.2 Mg/m^3 and CaCO_3 had a neutralizing value of 90%. [6]

QUESTION 2

- (a) Describe the ways in which organic and inorganic colloids obtain negative charges [9]
- (b) Discuss the significance of clay minerals when soils are used for crop production [16]

QUESTION 3

- (a) What is the importance of feldspar minerals in soil science? [5]
- (b) Discuss the factors which influence the persistence of feldspar minerals in the environment. [20]

SECTION 2: SOIL FERTILITY

QUESTION 4

(a) Describe the transformations of phosphorous in soils and highlight the implications of such transformations on phosphorus nutrition of plants [5]

(b) The availability of phosphorus to plants in soil is influenced by a number of factors. Discuss this statement and suggest strategies you would recommend to increase phosphorus availability to plants in soils. [15]

(c) An analysis of a soil revealed that it had a phosphorus content of 10 mg kg^{-1} soil and the P sufficiency level for most crop plants is 20 mg kg^{-1} soil. The efficiency of conversion of fertilizer P to soil P is 20%. Calculate the amount of triple super phosphate (22% P) that is required to increase the soil P test to the sufficiency level. [5]

QUESTION 5

(a) Discuss in detail the various ways in which nitrogen may be added to soils. [15]

(b) Outline the management strategies you would recommend to enhance the efficiency of nitrogen uptake and utilisation by plants in soils [10]

QUESTION 6

(a) Discuss three methods of fertilizer application you would recommend to farmers in your home area for the fertilization of cereal crops and highlight the merits and demerits of each method [14]

(b) A fertilizer recommendation for maize in the Middleveld of Swaziland was given as follows:

N - 70 kg ha⁻¹

P - 40 kg ha⁻¹

K - 50 kg ha⁻¹

(i) Calculate the amount of the compound fertilizer 2:3:2 (37) that must be added to supply all the N requirement [4]

(ii) How much P and K would the quantity of fertilizer obtained in (i) above supply to the maize plants? [4]

(iii) What is the disadvantage of using a compound fertilizer in such recommendations? [3]