

1ST SEM. 2016/2017 (M)



PAGE 1 OF 4

89

UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER

**PROGRAMMES: BACHELOR OF SCIENCE YEAR 3 IN AGRICULTURAL
EDUCATION, AGRONOMY AND HORTICULTURE**

COURSE CODE: CP 302

TITLE OF PAPER: CROP NUTRITION

TIME ALLOWED: TWO (2) HOURS

**INSTRUCTIONS: ANSWER FOUR (4) QUESTIONS WITH TWO QUESTIONS
FROM EACH SECTION.**

**DO NOT OPEN THIS PAPER UNTIL PERMISSION HAS BEEN GRANTED BY
THE CHIEF INVIGILATOR.**

SECTION 1: SOIL CHEMISTRY

QUESTION 1

- (a) Discuss the acid-infertility of soils [15]
- (b) The analysis of an acid soil was found to contain 2.5 milliequivalents exchangeable Al^{3+} per 100g of soil. Calculate the amount of dolomitic limestone required to neutralize all the exchangeable Al^{3+} in this soil given the following information; bulk density of the soil = 1.25 Mg/m^3 ; depth of ploughing = 20cm and the neutralizing value of dolomitic limestone is 1.09. Express your answer in tonnes per hectare. [10]
[25]

QUESTION 2

- (a) Describe in detail the ways in which organic and inorganic colloids acquire negative charges and comment on the importance of these charges in soils. [9]
- (b) Discuss the properties of clay minerals which are important in soils that are under crop production and comment on the effect these clay minerals have on the quality of the environment [16]
[25]

QUESTION 3

Sesquioxides and their hydroxides are among the most abundant mineral colloids in tropical and sub-tropical soils. Discuss the interactions of these mineral colloids with anions in soils and comment on the effect of these interactions on crop nutrition [25]

91

SECTION 2: SOIL FERTILITY

QUESTION 4

(a) The availability of phosphorus to plants in soil is influenced by a number of factors. Discuss this statement and suggest practical strategies that can be recommended to increase phosphorus availability to plants in soil. [15]

(b) An analysis of a soil from the middleveld of Swaziland showed that it had a phosphorus content of 8mg/kg of soil and the phosphorus sufficiency level for most crop plants is 20mg/kg of soil. Calculate the amount of triple super phosphate fertiliser (22%P) that is required to increase the soil phosphorus content to the sufficiency level taking into account the fact that the efficiency of conversion of fertiliser P to soil P is 20%. [10]
[25]

QUESTION 5

(a) Outline the transformations of nitrogen in soil and comment on the implications of these reactions on nitrogen availability for plant uptake. [10]

(b) Discuss possible interventions that may be recommended to enhance the efficiency of nitrogen uptake and utilization by plants in different soil types. [15]
[25]

92

QUESTION 6

(a) One of the most important aspects of fertiliser usage is to know when fertilizers should be applied and the method of application. Discuss three methods of fertiliser application that can be recommended to farmers in rural Swaziland for maize production. Highlight the merits and demerits of each method recommended. [15]

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

N	-	40 kg/ha
P	-	30 kg/ha
K	-	35 kg/ha

(i) Calculate the amount of the compound fertiliser with a ratio 2:3:2 (37) that must be used to supply the entire N required. [4]

(ii) How much P and K will this quantity of compound fertiliser in (i) above supply to the maize plants? [3]

(iii) Comment on the practice of using compound fertilizers in such fertiliser calculations. [3]
[25]