UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER

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

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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SECTION 1: SOIL CHEMISTRY

QUESTION 1

(a) Outline the importance of feldspar minerals in soil science. **(5 marks)**

(b) Discuss the factors which influence the stability of feldspar mineral in soils and comment on the implications of these reactions on the mineral nutrition of plants. **(20 marks)**

[25 MARKS]

QUESTION 2

(a) Describe the types of acidity in soils and indicate their significance in soil science. **(4 marks)**

(b) Discuss the acid-infertility factors of soils and suggest practical strategies to increase crop yields in such soils. **(15 marks)**

(c) An acid soil was found to contain 2.25 m.e. exchangeable Al per 100 g. Calculate the amount of lime in tonnes per hectare required to neutralize the exchangeable Al to a depth of 15 cm. The soil had a bulk density of 1.2 Mg/m3 and the lime had a neutralizing value of 95%. **(6 marks)**

[25 MARKS]

QUESTION 3

(a) Highlight the charge characteristics of tropical and sub-tropical soils and comment on the challenges these soils present when used for crop production. **(8 marks)**

(b) Discuss the ways in which the cation exchange capacity of these soils can be improved for better nutrient retention. **(17 marks)**

[25 MARKS]

SECTION 2: CROP NUTRITION

QUESTION 4

(a) Outline the basis for the movement of mineral nutrients to the surface of plant roots. **(7 marks)**

(b) Discuss the three components of nutrient movement to the root surface and comment on the relative importance of each component for (i) mobile and (ii) immobile nutrients, giving examples in each case. **(18 marks)**

[25 MARKS]

QUESTION 5

(a) Discuss the ways in which nitrogen may be added to soils and indicate the relative importance of each method in the nitrogen nutrition of plants. **(12 marks)**

(b) Discuss the management strategies you would recommend to improve the efficiency of nitrogen uptake and utilization by plants. **(13 marks)**

[25 MARKS]

QUESTION 6

(a) Discuss three methods of fertilizer application that you can recommend to farmers in your country for the fertilization of the staple food crop and give merits and demerits of each method. **(15 marks)**

(b) A crop requires a total of 300 kg N/ha. Urea is broadcast and then incorporated in the middle of October just before planting. Ten percent is volatilized prior to incorporation, 10% of the remainder is denitrified and, subsequently there is a 10% leaching loss of that remaining after denitrification. If the efficiency of uptake of N by the crop is 65%, calculate the amount of urea (45% N) that must be applied to satisfy crop needs. **(10 marks)**

[25 MARKS]