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UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER

PROGRAMME: BACHELOR OF SCIENCE IN AGRICULTURE YEAR 5 (CROP PRODUCTION AND HORTICULTURE OPTIONS) AND BACHELOR OF SCIENCE IN AGRICULTURAL EDUCATION YEAR 5.

COURSE CODE: CP 502

TITLE OF PAPER: SOIL CHEMISTRY AND FERTILITY

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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SECTION 1: SOIL CHEMISTRY

QUESTION 1

- (a) Outline the origin of charge in organic and inorganic colloids in soils [5]
- (b) Discuss the significance of clay minerals when soils are used for crop production and as a medium for the disposal of Municipal waste [20]
- (25 MARKS)**

QUESTION 2

- (a) Discuss the interactions of anions with aluminium oxides and hydroxides in acid soils [20]
- (b) What are the implications of these interactions in the mineral nutrition of plants [5]
- (25 MARKS)**

QUESTION 3

Discuss the stability of feldspar minerals in soils and highlight the significance of these minerals in soil science and in the mineral nutrition of plants [25 MARKS]

SECTION 2: SOIL FERTILITY**QUESTION 4**

(a) Discuss three methods of fertilizer application, which you would recommend to farmers in your area and highlight their advantages and disadvantages [14]

(b) A fertilizer recommendation for maize in the highveld of Swaziland showed that the following elements must be applied as follows:

$$\text{N} = 70 \text{ kg ha}^{-1}$$

$$\text{P} = 30 \text{ kg ha}^{-1}$$

$$\text{K} = 35 \text{ kg ha}^{-1}$$

(i) Calculate the amount of the compound fertilizer 2:3:2 (38) that must be added to supply the entire N required. [5]

(ii) How much P and K would this quantity of 2:3:2 (38) fertilizer obtained in (i) above supply to the maize plants? [4]

(iii) What is the disadvantage of using compound fertilizer in the present case? [2]
(25 MARKS)

QUESTION 5

(a) Discuss the various ways in which nitrogen may be added to soils [13]

(b) What management strategies would you recommend to improve the efficiency of uptake and utilization of nitrogen in soils? [12]
(25 MARKS)

QUESTION 6

(a) Identify the pools of potassium in soils and comment on the relative importance of each pool in the potassium nutrition of plants [10]

(b) Discuss the factors which influence the availability of potassium to plants in soils [15]
(25 MARKS)