UNIVERSITY OF FORT HARE

AGS 321

DEGREE EXAMINATIONS

NOVEMBER 2018

Time: 3 hours
Marks: 100

Subject: AGS 321 - Plant Nutrition and Soil Fertility

INTERNAL EXAMINERS

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INSTRUCTIONS

ANSWER ALL QUESTIONS
Question 1: (25 Marks)

(a) J.B. Van Helmont is one of the early scientists who contributed significantly to the discipline of Plant Nutrition. What was: (a) his profession (b) the kind of contribution he made? - Describe briefly and in general terms the experiment he carried out. (5 marks)

(b) Name the main forms of each of the following plant nutrients
(i) Nitrogen (2 mark)
(ii) Phosphorus (2 mark)
(iii) Potassium (1 mark)

(c) Describe the main functions of each of the following plant nutrients
(i) Nitrogen (4 marks)
(ii) Phosphorus (5 marks)
(iii) Potassium (6 marks)

Question 2: (25 Marks)

(a) What determines whether a given element is essential or not? (4 marks)
(b) Explain the following terms with respect to soil nutrient levels: deficiency range, sufficiency range, hidden hunger, luxury consumption, and toxicity range. (6 marks)
(c) Biological nitrogen fixation is one source of nitrogen in the soil-plant system. What happens in this process? (7.5 marks)
(c) What is denitrification? Which portion of the landscape is this most likely to occur? (7.5 marks)

Question 3 (25 Marks)

(a) A field in Fort Beaufort was found to contain up to 3% K, yet plants growing on the soil responded to potassium fertilization. However, the same plant species growing on a soil containing less K responded much less to K fertilization. Explain these observations, including in your discussion reasons why various soils differ in their ability to provide K to plants. (10 Marks)

(b) Use appropriate terms and chemical equations and explain the fate of P that is applied as single super phosphate fertilizer in acid soils. (7 marks)

(c) Explain why adding larger amounts of fertilizer may not necessarily generate greater profit. (8 marks)

Question 4 (25 marks)

(a) Acid soils normally have low soil fertility. Discuss this statement and indicate ways of addressing acidity problems for improved soil fertility management. (10 marks)

(b) What general soil conditions are most likely to result in a micronutrient deficiency? (5 marks)

(c) Write short explanatory notes on the following:
   i. Induced nutrient deficiency (5 marks)
   ii. Leibig’s law of minimum (5 marks)

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