

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

Prof P N S Mkeni
Dr T A Weldeslassie

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. Liebig's law of minimum (5 marks)

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