



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND  
TECHNOLOGY**

**SCHOOL OF AGRICULTURAL AND FOOD SCIENCES**

**FIRST YEAR SECOND SEMESTER UNIVERSITY EXAMINATION FOR THE  
DEGREE OF BACHELOR OF SCIENCE IN HORTICULTURE  
2016/2017 ACADEMIC YEAR**

**REGULAR**

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**COURSE CODE: AHT 3214:**

**COURSE TITLE: PLANT NUTRITION AND FERTILIZERS**

**EXAM VENUE:**

**STREAMS: BSc. Horticulture**

**DATE:**

**EXAM SESSION:**

**TIME: 2 HOURS**

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**Instructions:**

- 1. Answer ALL questions in section A and ANY other 2 Questions in section B.**
- 2. Candidates are advised not to write on question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

**Section A: 30 marks (ANSWER ALL QUESTIONS)**

**Question 1**

- a) Differentiate between fertilizer ration and fertilizer grade (2 marks)
- b) State the two major forms in which phosphorous is absorbed by plants (2 marks)
- c) State the four major classes of nitrogenous fertilizers (4 marks)
- d) Explain the sources of non mineral elements required by plants (3 marks)
- e) Explain any three differences between active and passive transport in plants (3 marks)
- f) Describe any three precautions to be considered during visual identification of nutrients stress symptoms in plants (3 marks)
- g) Explain how CEC and AEC influence nutrients concentration in soil solution (5 marks)
- h) Explain the differences in deficiency symptoms of the following nutrients and provide a possible physiological explanation (4 marks)
  - i. nitrogen and sulphur (chlorosis of lower leaves in nitrogen and upper leaves in sulphur)
  - ii. Magnesium and Iron ( Interveinal chlorosis of lower leaves in Mg and upper leaves in Fe).
- i) Explain any two mechanisms by which soil nutrients are replenished 4 marks

**SECTION B: 40 MARKS (ANSWER ANY TWO QUESTIONS)**

**QUESTION 1**

- (a) Using Fick's law, describe the relationship between diffusion gradient and nutrients diffusion in soils highlight in details the role of effective diffusion coefficient  
10 marks

Discuss the physiological classification of essential mineral elements based on their roles in plants  
5 marks

Discuss the mechanisms by which protein pumps operate during active transport in plants  
5 marks

**QUESTION 2**

a) Using a well labeled diagram, discuss nitrogen cycle (15 marks)

b) Show the relationship between plant growth and health and amount of nutrients availability with the soil solution 5 marks

#### **QUESTION 4**

**Show how the deficiency of a given mineral element can be investigated (20 marks)**

#### **QUESTION 5**

A soil analysis carried out at JOOUST farm showed that a soil sample contains 15 ppm (part per million) of N, 10 ppm of P and 10 ppm of K. The area was been planted with jackfruit trees at the distance of 9.0 m x 9.0 m and each tree requires 0.7 kg N, 0.5 kg P and 0.6 kg K . Assuming one hectare contains 3 millions kg of soil. Calculate the amount of urea 46-0-0, CIRP 0-36-0 and muriate of potash 0-0-60 to be applied to a hectare of jackfruit trees. (The nutrients in fertilizer are expressed in N, P and K and 1 hectare = 10,000 m<sup>2</sup>) 20 marks