



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

**SCHOOL OF AGRICULTURAL AND FOOD SCIENCES**

**FOURTH YEAR SECOND SEMESTER UNIVERSITY  
EXAMINATION FOR**

**THE DEGREE OF BACHELOR OF SCIENCE IN SOIL SCIENCE**

**2017/2018 ACADEMIC YEAR**

**REGULAR**

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**COURSE CODE: ALS 3421**

**COURSE TITLE: SOILS AND PLANT NUTRIENT BIOAVAILABILITY**

**EXAM VENUE:**

**STREAM: BSc. (Soil Science)**

**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 from this Section.**

1. Define the following terms:
  - a. Rhizosphere (2 Marks)
  - b. Isomorphous substitution (2 Marks)
  - c. Volatilization (2 Marks)
2. Differentiate between the following
  - a. Immobilization and mineralization (3 Marks)
  - b. Active acidity and exchangeable acidity (3 Marks)
3. State four advantages of  $\text{NO}_3^-$  over  $\text{NH}_4^+$  as the form of nitrogen absorbed by plants (4 marks)
4. State the soil conditions that result in denitrification (5 marks)
5. Explain the following mechanisms of nutrient uptake by plants
  - a. Root interception (3 Marks)
  - b. Mass flow (3 Marks)
  - c. Diffusion (3 Marks)

**SECTION B [40 MARKS]**

**Answer ANY TWO questions from this Section.**

- 6 a) Discuss strategy I and strategy II mechanism used by plants to acquire iron from the soil (10 marks)
- b) Explain the important effects of soil organic matter stating factors affecting its availability (10 marks)
7. (a) Using a diagram explain the N- cycle explaining the various transformation processes (15 marks)
- (b) State any five sources of plant nutrients in the soil. (5 marks)
8. a) Explain the factors affecting K availability in the soil. (12 marks)
- b). Discuss the following forms of potassium. (8 marks)
  - i) Mineral K
  - ii) Captured K
  - iii) Exchangeable K
  - iv) Solution K
- 9 a) Discuss aluminium toxicity in acidic soils (10 marks)
- b) Explain the factors affecting P- fixation (10 marks)