



# **MACHAKOS UNIVERSITY**

**University examination for 2024/2025 academic year**

**SCHOOL OF AGRICULTURE, ENVIRONMENT & HEALTH SCIENCES**

**DEPARTMENT OF AGRICULTURAL SCIENCES**

**SECOND YEAR FIRST SEMESTER EXAMINATION**

**BACHELOR OF AGRICULTURAL EDUCATION AND EXTENSION**

**SOL 201: SOIL FERTILITY AND PLANT NUTRITION**

**DATE:16/1/2025**

**TIME: 2:00-4:00 P.M**

**INSTRUTION: Answer question ONE and any other two.**

**QUESTION ONE (30 MARKS)**

- a) Explain four characteristics of an ideal soil. (4 marks)
- b) Discuss any four factors that you would consider when choosing a fertiliser. (4 marks)
- c) Calculate the amounts of N, P and K in a fertilizer 50 kg bag with an analysis of 13-27-12 (5 marks)
- d) Describe Foliar Applications of fertilizers on the farm (3 marks)
- e) Explain three processes by which nutrient ions are absorbed by plant roots. (3 marks)
- f) Using relevant example, explain the chemical composition of liming materials. (2 marks)
- g) Explain any three benefits of liming agricultural farms (3 marks)
- h) You have been tasked to carry out a diagnosis of the soil-plant system in order to advise Machakos farmers on management of a seemingly failing maize crop. Explain three approaches for this exercise. (6 marks)

### **QUESTION TWO (20 MARKS)**

- a) Nitrogen is an essential macronutrient in plant nutrition. Explain:  
i) two deficiency symptoms of N (4 marks)  
ii) three toxicity symptoms of N (6 marks)
- b) Explain the relationships between pH and ion toxicity (10 marks)

### **QUESTION THREE (20 MARKS)**

- a) Explain the forms of phosphorus availability (4 marks)
- b) Explain three functions of phosphorous in plants. (6 marks)
- c) For optimum yields of new hybrid maize, you need to apply 75 kg of phosphorus per hectare. How may kilograms of single super phosphate (SSP:0:24:0) should you apply to obtain optimum maize yields? (10 marks)

### **QUESTION FOUR (20 MARKS)**

- a) Discuss the three benefits of potassium in plant growth (6 marks)
- b) Explain two deficiency symptoms of potassium (4 marks)
- c) With relevant examples, discuss nutrient mobility in plants (10 marks)

### **QUESTION FIVE (20 MARKS)**

- a) Explain how liming agents neutralize acidity in soils (6 marks)
- b) Explain the management of phosphorus fixation in soils. (5 marks)
- c) Explain the importance of the fertilizer salt index in fertilizer management. (9 marks)