CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN AGRICULTURAL ECONOMICS AND BACHELOR OF SCIENCE IN AGRICULTURAL EDUCATION AND EXTENSION

SOIL 320: SOIL FERTILITY AND PLANT NUTRITION

STREAMS: BSc. (AGED & AGED) Y3S2 **TIME: 2 HOURS**

DAY/DATE: TUESDAY 09/04/2024 **2.30 P.M. – 4.30 P.M.**

INSTRUCTION

- **Answer ALL question in section A (20 marks) and any two in section B (40 marks)**

SECTION A

Question one

a) Explain the effects of copper toxicity to plant. (4 marks)

b) Define base saturation and determine the percentage base saturation of a soil with the following analysis. For a soil with 0.6 meq of K, 2.1 meq Ca, 0.7 meq of Mg and CEC of 4.0 meq/100g. (3 marks)

Question two

a) Explain how size and surface area affect Soil Colloids. (4 marks)

b) Explain the characteristics of plasma membrane and tonoplast cells in plants. (3 marks)

Question three

a) In which forms may iron exist in soils? (3 marks)

b) Explain any THREE (3) benefits of liming acidic soils. (3 marks)

Question four

a) How does soil pH affect Zinc availability to plants? (4 marks)

b) Calculate the amounts of N, P and K in a fertilizer bag with an analysis 18:40:14? (6 marks)

SECTION B

Question five

a) Why was the best management practice concept introduced in agricultural production? (6 marks)

b) Explain the anion exchange process in soils. (6 marks)

c) A soil sample requires 2.8 me of $Ca(OH)_2$ per 100g of the soil to change the pH from 4.8 to 6.6. Given that the average soil density = 1600 Kgm^{-3}, hectare furrow slice = 12cm and molecular weights of Ca = 40, O=16, H=1and C= 12, estimate the amount of Ca(OH)2 require for one hectare of land. (8 marks)

Question six

a) In soil testing, a good soil sample and an accurate soil analysis interpretation are not the only considerations for good yield and maximum profit in crop production. What other factors may override the fertilizer effects by limiting crop yield potential on the farm. (6 marks)

b) What are the benefits of proper K nutrition in agricultural productivity? (5 marks)

c) The fertilizer salt index was developed to classify fertilizers according their potential to cause salt injury to plants. Discuss. (9 marks)

Question seven

a) Explain the two pathways that account for most of the movement of nutrients in the soil. (6 marks)

b) For optimum yields of a new hybrid maize variety, you need to apply 72kg of phosphorus per hectare. How many kilograms of double super phosphate (DSP: 0:25:0) should you apply to obtain optimum maize yields? (8 marks)

Conversion table

Convert column 1 to 2, multiply by	Element	Oxide	Convert column 2 to 1, multiply by
2.29	P	P_2O_5	0.437
1.20	K	K_2O	0.830

c) What factors determine availability of magnesium in soils? (6 marks)

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