

GWANDA STATE UNIVERSITY



FACULTY OF LIFE SCIENCES

DEPARTMENT OF CROP SCIENCES

BACHELOR OF SCIENCE HONOURS DEGREE IN CROP SCIENCE

LCS 2103 SOIL FERTILITY AND PLANT NUTRITION

FIRST SEMESTER EXAMINATION

JUNE 2020

This examination paper consists of 3 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements: None

Examiner's Name: Mathema. N

INSTRUCTIONS

1. Answer **all** questions in Section A
2. Answer **only two** questions in Section B

MARK ALLOCATION

QUESTION	MARKS
SECTION A	60
SECTION B	40
TOTAL ATTAINABLE MARKS	100

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SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION

1. a) Define plant nutrition (2)
b) Describe 1 (one) physiological function of each of the 3 (three) primary macro-nutrients of plants. (6)
c) Outline the physiological functions of the micronutrient **IRON** in a selected crop which is grown in Zimbabwe under the following headings:
 - i) Redox reactions (3)
 - ii) Iron and sulphur proteins (3)
 - iii) Chlorophyll manufacture (3)
 - iv) protein synthesis (3)

2. a) Draw and label a cross section of the soil profile clearly showing the soil horizons. (10)
b) Describe the characteristics of each of the horizons found on the soil profile in relation to their ability to support plant life. (10)

3. A farmer in Insiza district of Matabeleland South clears his land where no crop has been grown before. He then spreads 5 (five) tonnes of fresh Pine tree saw dust on the land and tills the land burying the saw dust using a tractor drawn plough and goes on to plant maize SC 403 variety at a plant population of 49 000 plants per hectare a few days later applying the recommended basal fertilizer at 700kg/hectare.
 - a) Using your knowledge of **Carbon to nitrogen ratio**, what effect does the application of fresh saw dust have on availability of nitrogen to the maize plants during the first year of cropping? (14)
 - b) Outline the influence of Organic matter on soil properties under the following:
 - i) Soil colour. (1)
 - ii) Physical properties. (2)
 - iii) Chemical properties. (3)

SECTION B: ANSWER ANY TWO QUESTIONS IN THIS SECTION

4. a) Describe the roles of Potassium in plants under the following headings;
 - i. Osmotic and turgor related functions (5)
 - ii. Protein synthesis (2)
 - iii. Enzyme activation (3)
 - iv. Cation/Anion balance (1)
b) Outline any 5 deficiency symptoms of Potassium in maize plants (5)
c) Briefly explain the types of fertilizers you would apply to the soil pre and post emergence to prevent Potassium deficiency in tomato plants. (4)

5. Justify the importance of the following microorganisms in the production of named crops.
 - i) Nitrogen fixing bacteria. (10)
 - ii) Mycorrhizae or Fungus roots (10)

6. a) Define soil pH. (2)
b) Describe 4 factors affecting soil pH. (12)
c) Outline the effects of soil pH on crop production. (6)
7. a) Assuming you are assigned to train farmers in Mashologwane village east of Gwanda State University campus about green manuring. Recommend four crops which the farmers may grow as green manure crops and describe the whole process of green manuring. (9)
b) Discuss the importance of lime in the availability of plant nutrients in a crop of your choice. (4)
c) Clay soils require larger amounts of lime than sandy soils, to produce the same pH change. Explain (3)
d) Explain any 2 (two) influences of bio-fertilizers on physical properties of soils. (4)

END OF EXAMINATION PAPER