

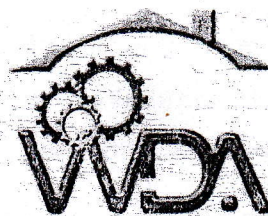
CPR – Soil Analysis and Fertilization

T117

Friday, 30/11/2018

08:30 – 11:30 AM

WORKFORCE DEVELOPMENT AUTHORITY



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**ADVANCED LEVEL NATIONAL EXAMINATIONS, 2018,
TECHNICAL AND PROFESSIONAL STUDIES**

EXAM TITLE: SOIL ANALYSIS AND FERTILIZATION

OPTION: CROP PRODUCTION (CPR)

DURATION: 3 hours

INSTRUCTIONS

The paper is composed of **two (2) main Sections** as follows:

Section I: Attempt **any SIX (6)** out of TEN questions. **30 marks**

Section II: Attempt **any SEVEN (7)** out of TEN questions. **70 marks**

Note:

Every candidate is required to carefully comply with the above instructions. Penalty measures will be applied on their strict consideration.

Section I. Choose and answer any six (6) questions

30 marks

- ✓ 01. The soil has been formed after intervention of different factors which have been reacted on the parent materials (hard rock). Explain how climate and biological activities play a role in the soil formation process. (5 marks)
- ✓ 02. Fertilization is the most important action for soil replenishment where this one involves the use of inorganic and organic fertilizers
- a) What are the three sources of organic fertilizers?
- b) The following agricultural practices are mainly done for increasing crop production. Which one of them, the application of Urea is recommended?
1^o) Land preparation, 2^o) sowing or transplanting, 3^o) Weeding (5marks)
- ✓ 03. Knowing the pH of the soil will quickly allow you to determine if the soil is suitable for plant growth and what nutrients will be most limiting;
- a) What is the instrument which is used for soil pH measurement?
- b) What happens to the crops if the soil pH is below 4.5? (5 marks)
- ✓ 04. Organic and inorganic fertilizers are used by the majority of the farmers for fertilization purpose in order to get more income from agriculture activities. (5 marks)
- a) What is the difference between organic and inorganic fertilizers?
- b) In terms of their composition, inorganic fertilizers are divided into straight and compound fertilizers, explain the difference between the two terms. (5 marks)
- ✓ 05. For soil Nitrogen analysis, the micro kjeldahl procedure is followed. What are the most apparatus used in that process? (5 marks)
- ✓ 06. Soil acidity and soil alkalinity are the two major problems which are affecting the productivity of the plants if no strategic measures are taken;
- a) Within the following soil nutrient elements, choose those which are present in high proportion in alkaline soil: Al, Fe, Mn, Ca, N, P, K, Mg, S
1 2 3 4 5 6 7 8 9 (5 marks)
- b) What are the strategic measures for collecting acidic soils? (5 marks)
- ✓ 07. Crop rotation, improved fallow and traditional fallow are the major agricultural techniques for soil fertility replenishment if they are managed properly
- a) What is the difference between traditional fallow and improved fallow in soil fertility replenishment?

b) What are the main families of the plants to be rotated with?

(5 marks)

08. Soil analysis held in the Laboratory of University of Rwanda, have shown the results about the volume of the soil of 300 cm³ and pores spaces was 165 cm³ (only volume of soil pores) and the weighting of the soil is 358g

a) Calculate the BD (Bulk Density) of that soil.

b) Determine the percentage of the pore space of the soil.

(5 marks)

X 09. Determination of soil organic matter content is mainly done after obtaining the results of soil organic carbon;

a) How can you determine the amount of organic matter content after obtaining the results of soil organic carbon?

b) What is the importance of organic matter in the soil?

(5 marks)

✓ 10. While applying inorganic fertilizers in the soil, they are subjected to different losses which are associated with their own application

a) What are different losses associated with application of inorganic fertilizers?

b) What is the soil type subjected to the high losses after inorganic fertilizers application?

(5 marks)

35.48

Section II. Choose and Answer any seven (7) questions

70 marks

✓ 11. In agriculture, to know the pH of the soil you need to consider its chemical and nutritional status. Give a detailed account of detrimental effects due to the unsuitable soil pH (either low or high pH) on the plant growth.

(10 marks)

12. MUKANDORI is a small farmer in the Eastern province. She has incorporated 3200 kg of crop residues that contain 60% of Carbon with C: N of 20:1 in her field. Note that the principle is that 75% of Carbon is used by micro-organisms for energy production and 25% is used to construct new tissues.

a) Calculate the available Nitrogen realized

b) How can the C: N ratio guide in the selection of organic residues to be used as compost?

(10 marks)

✓ 13. Among the several ways or methods used to determine the soil texture, the feel method is the simple one. How is this method carried out?

(10 marks)

- ✓14. In the season B 2019, NGARAMBE predicts to grow a beans crop in his field of 120m x 70m. Calculate the amount of urea (46%), single super phosphate (16%) and Muriate of Potash (60%) that will satisfy the crop needs, knowing that the nutrient recommendations to this crop are 120 kg of N/ha, 50 kg of P_2O_5 /ha and 35 kg of K_2O /ha. (10 marks)
- ✓15. Write a short note about the factors to be considered during the selection of the raw material to be used in the preparation of organic fertilizer. (10 marks)
16. You are selected to train the vegetable growers of Southern Province of Rwanda because more exported vegetables come from that area. There is a problem of soil fertility and they want you to teach them how to collect soil sample for soil laboratory analysis to amend their soil where it is possible and improve soil fertility. So, explain them the required procedure for soil sampling in order to help to resolve similar problem for next time. (10 marks)
- ✓17. Agro-technician is requested to train the farmers on farm yard manure preparation to help them to increase potato yield in Northern part of Rwanda. Discuss briefly on the methodology to be followed for successful farm yard manure preparation. (10 marks)
- ✓18. A cooperative of maize growers in Eastern Province is requested to control Arm worm after first weeding and apply chemical fertilizers. Discuss on personal safety and protective measures to consider during chemical application. (10 marks)
19. Fill in the missing information under the following subheadings: type and amount of fertilizers, time of fertilizers and application methods for Cassava, Wheat, Rice, Soybeans treated with rhizobium and Tea. (10 marks)

Crop	Fertilizers	Kg/are	Application time	Application methods
Cassava				
Wheat	NPK + Urea			
Rice	DAP + Urea			
Soybeans treated with rhizobium		1kg		
Tea				

- 20. Outline the procedure of determining Nitrogen available in the soil. (10 marks)