



UNIVERSITY OF RUHUNA
FACULTY OF AGRICULTURE

First Examination in BSc Agricultural Resource Management and Technology/
BSc Agribusiness Management/ BSc Green Technology (Part II)
September 2020

SS1201 Introductory Soil Science (Compulsory)

Theory

INSTRUCTIONS

Answer four (04) questions ONLY.

Each question carries 100 marks.

Only non-programmable calculators are permitted.

Mobile phones are NOT permitted.

TIME: two (2) hours and 30 minutes

INDEX NUMBER

1. a)
 - i. Name two (2) most abundance elements in the earth's crust. (6 marks)
 - ii. List four (4) characteristic features of minerals. (12 marks)
 - iii. Name the building block of the silicate minerals and sketch its atomic structure. (8 marks)
 - iv. "Color is not a precise physical property to identify minerals". Do you agree with the preceding statement? Justify your answer. (12 marks)

- b)
 - i. What do you understand by the term "rock"? (8 marks)
 - ii. Name the types of metamorphism. (6 marks)
 - iii. Differentiate intrusive igneous rocks from extrusive igneous rocks. (16 marks)

- c)
 - i. What do you understand by the weathering of rocks and minerals? (4 marks)
 - ii. Name the types of weathering. (6 marks)
 - iii. Explain briefly how freezing and thawing of water influence the weathering process. (12 marks)
 - iv. What do you understand by the term "parent material"? (10 marks)

2. a) i. What are the criteria/parameters used in the determination of soil color? (5 marks)
- ii. Identify each parameter you mentioned above for the soil color given as 10YR 6/4. (10 marks)
- iii. If you observe the surface and the subsurface regions of a typical soil profile, which would be darker in color? (5 marks)
- iv. Briefly explain the basic theory/reason behind the color difference you mentioned in the "question iii" above. (10 marks)
- b) i. What is meant by the term "specific surface area" of a soil? (10 marks)
- ii. Briefly explain the importance of specific surface area. (10 marks)
- iii. Define the term "texture" of soil? (10 marks)
- iv. Explain briefly the relation of the particle size and the texture of a soil to the soil specific surface area. (15 marks)
- v. Explain briefly the Stoke's Law. (5 marks)
- vi. Name three methods that can be used to identify the texture of a soil. (5 marks)
- vii. State the advantages and disadvantages of the methods mentioned for the "question vi" above. (15 marks)
3. a) i. Define "soil colloids". (05 marks)
- ii. Identify five (5) basic features of soil colloids? (10 marks)
- iii. Differentiate organic colloids and inorganic colloids. (10 marks)
- iv. Name the three general types of inorganic soil colloids with examples. (10 marks)
- b) i. What are the two basic building blocks of silicate clay minerals? (10 marks)
- ii. What are the different types of clay minerals? (10 marks)
- iii. List three chemical properties of the soil which are important for agriculture. (10 marks)

- c) i. What is isomorphic substitution? (10 marks)
- ii. Using an example, explain how permanent negative charges are generated in a clay mineral. (10 marks)
- iii. What are the mechanisms responsible for the generation of pH-dependent charges (both positive and negative) in soils? (15 marks)
4. a) i. Write the equivalent USDA soil order for the following great soil groups. (10 marks)

Great soil groups	Orders of USDA classification
1. Reddish brown earths	
2. Alluvial soils	
3. Bog and Half bog soils	
4. Regosols	

- ii. A researcher explained a soil in the wet zone of Sri Lanka as a "clay-enriched soil in extreme weathering conditions". Name the possible soil order according to the USDA classification? (10 marks)
- iii. Name the equivalent great soil group of the above soil according to the conventional classification used in Sri Lanka? (10 marks)
- iv. Explain the typical profile development and the physico-chemical properties of the great soil group you mentioned for the question "b) iii." above. (20 marks)
- b) i. What are the two (2) main sources of the organic matter entering the soil? (5 marks)
- ii. List four (4) factors which could negatively influence the population and diversity of the soil organisms? (12 marks)
- iii. List three (3) important functions of the earthworms. (6 marks)
- iv. Briefly explain the economic importance of the activities performed by the soil organisms. (12 marks)
- v. Briefly explain why most of the soil biological activities occur in the first few centimeters of the soil. (15 marks)

5. a) i. Define a "soil profile". (5 marks)
- What do you mean by 'AC soils'? (10 marks)
- Briefly explain the subordinate distinctions giving examples. (15 marks)
- Explain the 'Latosolization process' in soil formation. (20 marks)
- b) i. Name five (5) diagnostic subsurface horizons. (5 marks)
- What is the importance of having a soil classification system? (10 marks)
- Write five (5) soil orders of the USDA classification which are not found in Sri Lanka. (10 marks)
- Explain the properties of the soil order "Histosols". (25 marks)