

NATIONAL UNIVERSITY OF LESOTHO
FACULTY OF AGRICULTURE
DEPARTMENT OF SOIL SCIENCE AND RESOURCE CONSERVATION
SSR 315: SOIL GENESIS, MORPHOLOGY AND CLASSIFICATION

DECEMBER 2014

100 MARKS

3 HOURS

INSTRUCTION

ANSWER QUESTIONS ONE AND TWO WHICH ARE COMPULSORY AND ANY OTHER THREE

Question 1

The following Horizons are in a single pedon. However, they are not presented in their proper sequence in terms of depth. It is your job to: Part A – Assign the correct name to each horizon and in Part B: Name the properties of each horizon.

Part A – Assign the correct name to each horizon (6 marks).

- Horizon 1 2.5 YR 5/4 material that makes a medium ribbon with some but not a lot of sand felt in the fingers. Structure is angular, solid units about 1 cm in each dimension. These can't be seen in the open face but are apparent in a hand-held sample. It requires noticeable effort to crush the material. 2.5 Y 5/2 mottles occupy one percent of the horizon face. It is 4 cm to the horizon below.
- Horizon 2 10 YR 2/2 material that makes a poor ribbon with no sand felt in the fingers. No structure is apparent but the mass sticks together to form clods. It requires noticeable effort to crush the material. It is 1 cm to the horizon below.
- Horizon 3 5 Y 6/2 material that makes no ribbon and is very sandy. Sand size is fine. 22 percent by volume is gravel. The material can be made into a ball that falls apart when pressed or bounced in hand. Structure is barely visible and consists of solid units 2 cm across and 10 cm vertically, with flat tops. 5 YR 4/4 mottles occupy 4 percent of the horizon face. The lower boundary of this horizon is not exposed.
- Horizon 4 10 YR 3/3 material makes a poor ribbon, but it's almost medium. Some sand (not a lot) can be felt in the fingers. Structure consists of solid, somewhat rounded units about 3 mm in each dimension. These readily apparent in the open face. The material crushes easily in the hand. It is 3 cm to the horizon below.
- Horizon 5 10 RY material that makes a medium ribbon with some sand (not a lot) felt in the fingers. Structure is solid somewhat rounded units, 4 cm in each dimension. These pedis are not easily apparent in the pedon face but are apparent in the hand-held sample. The material requires noticeable effort to crush. It is 6 cm to the horizon below.
- Horizon 6 2.5YR 6/2 material that makes a poor ribbon with some sand (not a lot) felt in the fingers. Structure is solid angular units about 2 cm in each dimension. The material requires noticeable effort to crush. 2.5 YR 4/4 mottles occupy 7 percent of the horizon face. It is < 1 cm to the horizon below. Structure is difficult to see, even in a hand held sample.

Part B – Complete the following table(14 marks)

The numbers of horizons are the ones I have assigned to the horizons and correspond to the horizons numbered 1 through 6 in Part A.

Horizon		Textural	Consistence	Mottle Abundance	Structure
1					
2					
3					
4					
5					
6					

NB: Some horizons may be transitional.

Questions 2

- a) Label the five master horizons in the figure shown below using the appropriate capital letter designation and give an example of one type of soil structure you might expect to find in each horizon. For horizons 2, 3 and 4 indicate whether the horizon is illuvial or eluvial. (13 marks)

		Horizon	Eluvial/Illuvial	Structure Type
1	Organic litter			
2	Organic-matter-enriched, mineral soil			
3	Leached mineral soil			
4	Clay-enriched, low-organic mineral soil			
	Relatively unaltered geologic mineral material (consolidated)			

- b) For the following three soil profiles, rank the soils from youngest (# 1) to oldest (# 3). On what basis did you decide your ranking? Why do soils change this way over time?(7 marks)

	Profile A		Profile B		Profile C
A		A		A	
E		E			
		BE			
B		Bt1			
		Bt2			
		BC			
C		C			

Question 3

- a) Write short notes on the sequence of soil formation **(6 marks)**
- b) The evolution of a true soil occurs as a result of a combined action of soil forming factors and processes. How does rainfall and temperature influence soil formation? **(8 marks)**
- c) Define three properties of soil horizons **(6 marks)**

Question 4

- a) Soil Taxonomy is a multi-categoric and hierarchical system of classification. What does it mean by multi-categoric and hierarchical? **(4 marks)**
- b) Write short notes on the following soil orders **(6 marks)**
 - Entisols
 - Inceptisols
 - Mollisols
- c) Differentiate between the following pairs of terms **(8 marks)**
 - Pedon and Poly-pedon
 - Series and mapping unit
- d) What are diagnostic soil properties? **(2 marks)**

Question 5

- a) Write short notes on the major pathways of precipitation on the land surface **(8 marks)**
- b) In general how are soils in each of the following landscape positions? **(12 marks)**
 - Summit
 - Backslope
 - Footslope
 - Toeslope

Question 6

- a) What are parent materials? **(2 marks)**
- b) State reasons for which the knowledge of parent material is important to the soil scientist **(8 marks)**
- c) Differentiate between two general kinds of parent materials **(4 marks)**
- d) Write short notes on the following water transported parent materials **(6 marks)**
 - Alluvium
 - Lacustrine
 - Marine deposits