WOMEN'S UNIVERSITY IN AFRICA

Addressing gender disparity and fostering equity in University Education

FACULTY OF AGRICULTURAL SCIENCES

BSc HONOURS IN AGRICULTURE DEGREE

PRINCIPLES OF SOIL SCIENCE

AH 113

JANUARY 2021 MAIN PAPER

Time: 2.00Hrs **Date:**

Instructions

Answer any **three** questions

Question one

Discuss the soil forming factors. (25)

Question two

(a) Explain the following soil forming processes;

(i) Podzolisation (5)
(ii) Leaching (5)
(iii) Gleying (5)

(b) Draw and describe a typical soil profile (10)

Question three

(a) Define the following terms
(i) Soil (2)
(ii) Soil structure (2)
(iii) Soil mineralogy (2)

(b) Explain, the following terms;
(i) Isomorphous substitution (6)
(ii) Soil consistence (7)
(iii) Hydropedology (6)

Question four

Two soil samples were taken, one from the upper slope and the other from the bottom valley of a soil catena using a core measuring 60 cm in diameter and 9 cm high and labeled them A and B and sent them to a laboratory for analysis and the following data was recorded:

- Mass of oven dry soil sample A (upper slope) = 590 g and B (bottom valley) = 800g respectively.
- Soil texture of sample A = 65% sand, 20% silt and 15% clay and soil sample B = 35% sand, 40% silt and 25% clay.

a) Determine the type of soil sample A and B using the texture triangle provided (2)
b) Calculate the bulk density in Mg m^{-3} of soil samples A and B. (9)

c) Determine the type of the soil between soil samples A and B that exhibit a higher and a lower Bulk density? Give reasons for your answers. (3)

d) Calculate;
(i) Particle density for both soil samples A and B (3)
(ii) The % pore space of soil samples A and B. (2)

(iii) Void ratio of samples A and B (4)

e) Determine the type of soil sample that is most likely to exhibit higher water holding capacity between soil sample A and B using your answers in b). Give a reason for your answer? (2)

Question five

a) Define the term soil erosion (2)

b) Copy and complete the table below that shows typical data for various Zimbabwean soils. **Show all the workings**.

Soil Series	HARARE 5 E.2	CHISUMBANJE 3B.2	HARARE 6G.2
Soil type	Red clay	Black clay	Brown Sandy loam
Exch.Ca ($mmoles_c\ kg^{-1}$)	59	470	8
Exch. Mg ($mmoles_c\ kg^{-1}$)	38	250	5
Exch. K ($mmoles_c\ kg^{-1}$)	2	25	3
Exch. Na ($mmoles_c\ kg^{-1}$)	1	2	0
Exch. H ($mmoles_c\ kg^{-1}$)	8	6	3
Exch. Al ($mmoles_c\ kg^{-1}$)	60	0	1
CEC ($mmoles_c\ kg^{-1}$)	-	-	-
TEB ($mmoles_c\ kg^{-1}$)	-	-	-
% acid saturation	-	-	-
ESP value	-	-	-
Exch. Sodium ($mmoles_c\ kg^{-1}$)	-	-	-
%BS	-	-	-
TEA ($mmoles_c\ kg^{-1}$)	-	-	-

(23)

END