NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF NATURAL RESOURCES AND SPATIAL SCIENCES

DEPARTMENT OF AGRICULTURE AND NATURAL RESOURCES SCIENCES

QUALIFICATION: BACHELOR OF AGRICULTURE	
QUALIFICATION CODE: 07BAGR	**LEVEL:** 5
COURSE CODE: SSA520S	**COURSE NAME:** SOIL SCIENCE
SESSION: NOVEMBER 2019	**PAPER:** THEORY
DURATION: 3 HOURS	**MARKS:** 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER(S)	**Mr Brian J. Mhango**
MODERATOR:	**Dr Fidelis Mwazi**

INSTRUCTIONS

1. Marks for each question are indicated
2. Answer each question on a separate answer sheet
3. Provide your name and student number on the answer booklet(s)

THIS QUESTION PAPER CONSISTS OF 4 PAGES (Excluding this front page)

PERMISSIBLE MATERIALS

1. All written work MUST be done in blue or black ink
2. No books, notes and other additional aids are allowed
3. You are allowed to use a scientific calculator in this examination

SECTION A: ANSWER ALL THE QUESTIONS IN THIS SECTION **[60 MARKS]**

QUESTION 1

Define the following soil science terms or abbreviations:

a) Sand (2)
b) Textural triangle (2)
c) Bulk density (2)
d) Soil horizon (2)
e) NPK (2)
f) Molybdenum (2)
g) SAR (2)
h) Epipedon (2)
i) pH dependent charge (2)
j) USLE or RUSLE (2)

[20]

QUESTION 2

Choose the most correct answer for the following questions:

2.1 Ability of rainfall to cause soil erosion is (2)

A. Runoff
B. Erosivity
C. Erodibility
D. Transportation

2.2 Water erosion follows the following sequence (2)

A. Sheet, Splash, Rill and Gully
B. Splash, Rill, Sheet and Gully
C. Splash, Sheet, Rill and Gully
D. Rill, Splash, Gully and Sheet

2.3 The study of relationship between soil properties and plant production is known as (2)

A. Soil science
B. Agronomy
C. CEC
D. Soil Ph

2.4 For a detailed soil survey at a scale of 1:20 000, which of the following mapping units cannot be

mapped? (2)

A. 10,000 m^2
B. 16,000 m^2
C. 20,000 m^2
D. All above (A, B and C)

2.5 According to the UNESCO-FAO soil classification system, the dominant soil types in Namibia are: (2)

A. Luvisols
B. Histosols
C. Aeronosols
D. Desert soils

[10]

QUESTION 3

a) What are the main compositions of the soil? (10)

b) Sketch a diagram showing soil compositions you identified in (a) above, with their relative percent composition. (5)

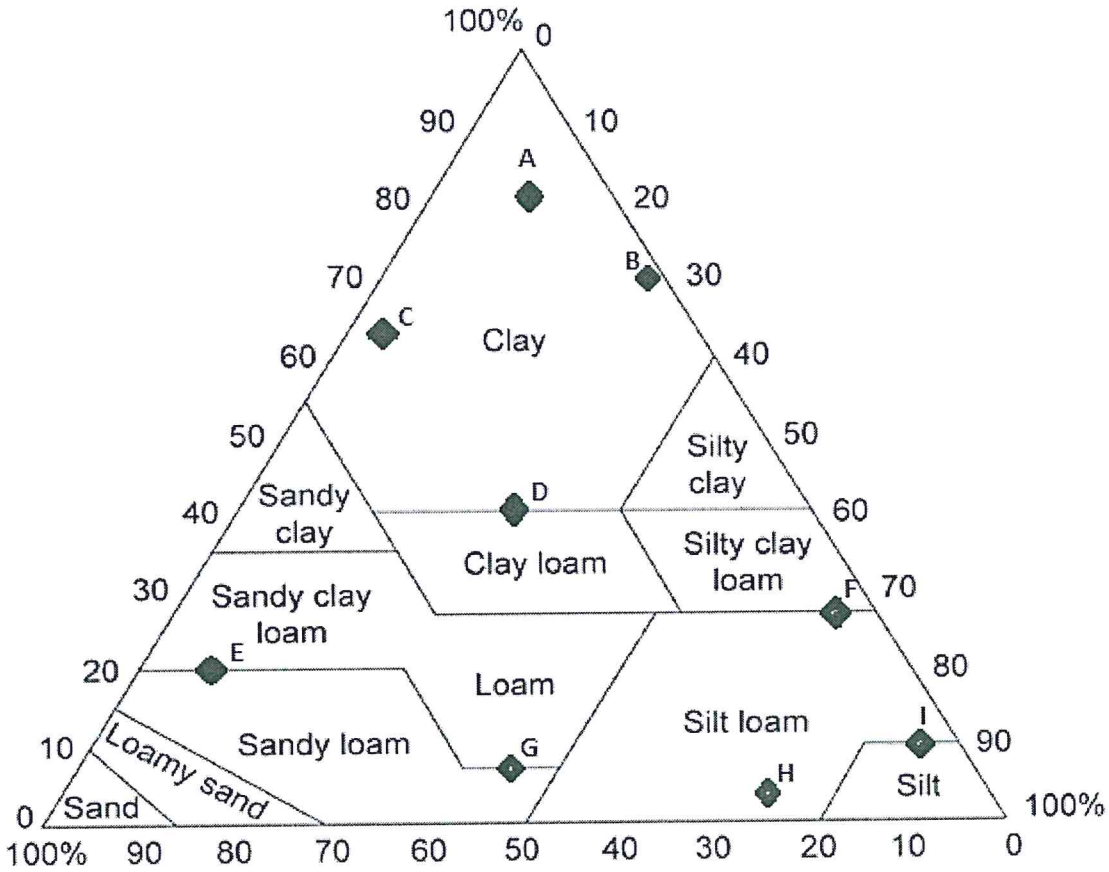
[15]

QUESTION 4

Study both the soil particle analysis table and the soil textural triangle below.

Table: Soil Particle Size Analysis

Soil Sample	% Sand	%Silt	Texture
A	50		Sandy loam
B		50	Silty clay loam
C	35	15	
D	25	60	
E	60		



The Soil Textural Triangle

Based on the information provide by the table and the textural triangle:

a) Complete the table by filling-in the appropriate data in empty cells (6)

b) Provide the % clay for the nine soil textures (A-I) shown in the textural triangle (9)

[15]

SECTION B: ANSWER ONLY ONE QUESTION IN THIS SECTION **[40 MARKS]**

QUESTION 5

5.1 Identify plant nutrients that are not dependent upon the photosynthesis process and their sources. (8)

5.2 Discuss how you would diagnose deficiencies of NPK including magneiusm in soils using visual Symptoms of plant lower leaves and their possible indications. Provide a flow diagram to illustrate your answer. (32)

[40]

QUESTION 6

6.1 The table below shows the Unified Soil Classification System (**USCS**), a soil classification system used in engineering and geology to describe the texture and grain size of a soil.

First and/or Second Letters		**Second Letter**	
Letter	***Definition***	***Letter***	***Definition***
G	Gravel	P	Poorly graded (uniform particle sizes)
S	Sand	W	Well-graded (diversified particles sizes)
M	Silt	H	High plasticity
C	Clay	L	Low plasticity
O	Organic		

Provide symbols for the following descriptions based on this classification system:

a) Well-graded gravel with silt

b) Poorly graded sand with silt

c) Well-graded organic clay

d) Oragnic clay with silt

e) Well-graded sand with silt

(10)

6.2 Question 6a-6c:

a) What is the difference between the first approximation of the soil erodibiltity factor (K) and the actual or final erodibility factor (K) on the soil erodibility nomograph. (5)

b) What are the sources of data used in the universl soil loss equation (USLE)? (10)

c) Discuss erosion and transport processes from upslope to downslope in a landscape . (15)

[40]