NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES
SCHOOL OF AGRICULTURE AND NATURAL RESOURCES SCIENCES
DEPARTMENT OF AGRICULTURAL SCIENCES AND AGRIBUSINESS

QUALIFICATIONS: BACHELOR OF SCIENCE IN AGRICULTURE BACHELOR OF SCIENCE IN HORTICULTURE	
QUALIFICATIONS CODE: 07BAGA **07BHOR**	**LEVEL: 7**
COURSE CODE: SSA520S	**COURSE NAME:** SOIL SCIENCE
DATE: NOVEMBER 2024	**PAPER:** 1
DURATION: 3 HOURS	**MARKS:** 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER:	DR. VENAUNE HEPUTE
MODERATOR:	DR. TENDAI NZUMA

INSTRUCTIONS

1. Answer all the questions.
2. Write neatly and clearly.
3. Mark all answers clearly with their respective question numbers.
4. All written work MUST be done in blue or black ink.
5. No books, notes and other additional aids are allowed.

PERMISSIBLE MATERIALS

1. Calculator
2. Examination paper
3. Examination script

THIS QUESTION PAPER CONSISTS OF 5 PAGES
(Excluding This Front Page)

SECTION A: MULTIPLE CHOICE AND TRUE / FALSE [10 MARKS]

QUESTION 1: MULTIPLE CHOICE QUESTIONS

Evaluate the statements in each numbered section and select the most appropriate answer or phrase from the given possibilities. Fill in the appropriate letter next to the number of the correct statement/phrase on your ANSWER SHEET. *[10 marks]*

1.

1.1. Soil formation is the result of interaction between the below soil forming factors, namely.

- **a.** Parent material, Climate, Tractors, Time and Organisms
- **b.** Parent material, Climate, Topography, Wind and Organisms
- **c.** Parent material, Climate, Topography, Time and Organisms
- **d.** People, Climate, Topography, Wind and Organisms

1.2. The following are two examples of soil physical properties.

- **a.** Soil pH and Cation Exchange Capacity
- **b.** Plants and humans
- **c.** Soil Texture and Cation Exchange Capacity
- **d.** Soil texture and soil structure

1.3. The following are two examples of soil chemical properties.

- **a.** Plants and humans
- **b.** Soil pH and Cation Exchange Capacity
- **c.** Soil texture and soil structure
- **d.** Soil texture and Cation Exchange Capacity

1.4. The following are two examples of soil biological properties.

- **a.** Soil pH and Cation Exchange Capacity
- **b.** Plants and microorganisms
- **c.** Soil texture and soil structure
- **d.** Soil texture and Cation Exchange Capacity

1.5. Restoration of eroded agricultural land is achieved through several agronomic and biological techniques such as:

- **a.** Cover crops
- **b.** Monocropping
- **c.** Maximum tillage
- **d.** None of the above

1.6. Soil sample that is 60% clay, 25% silt, and 15% sand have which soil texture?;

- **a.** Silty clay
- **b.** Sandy clay
- **c.** Clay
- **d.** Silt

1.7. The structure nutrients include;

a) Nitrogen, Phosphorus and Potassium
b) Carbon, Hydrogen and Oxygen
c) Magnesium, Nitrogen and Sulphur
d) Nitrogen, Oxygen, Calcium

1.8. The key nutrient necessary for plant leaves and vegetative development

a) Nitrogen
b) Phosphorous
c) Potassium
d) Iron

1.9. USLE stand for;

a) Revised Universal Soil Loss Equation
b) Universal Soil Loss Equation
c) Run-off Universal Soil Loss Equation
d) Ready Universal Soil Loss Erosion

1.10. Soil organic matter occupy how many percent (%) of total soil volume composition fraction.

a) 25%
b) 5%
c) 25%
d) 30%

QUESTION 2: TRUE/FALSE QUESTIONS [10 MARKS]

Evaluate the statements and select whether the statement is true or false. Write the word 'True' or 'False' next to the corresponding number on your ANSWER SHEET. *[10marks]*

2.

2.1 Solum is known as the upper regolith

2.2 In general, the greater the biodiversity of soil microbes, the better is likely to be for soil organic matter decomposition and nutrients recycling into the soil.

2.3 Pedogenesis is the soil formation processes

2.4 Soil pH determines crop selection and influences the decomposition of organic matter and nutrients availability in the soil.

2.5 Wind erosion is the loss of topsoil caused by water run-off.

2.6 Ideal healthy soil composition comprised of 45% minerals, 50% air, 25% water and 15% organic matter.

2.7 *Class VIII* (8) soil capability classification has slight limitation and requires less conservation, sustainable practices.

2.8 *Class II* (2) soils have moderate limitations that reduce the choice of plants or require only moderate conservation or sustainable practices.

2.9 Arenosols is the most common popular soil order group in Namibia covering over 53% of Namibian land space.

2.10 Clay soil has larger soil particle size of bigger than 2 mm.

SECTION B: SHORT/LONG ANSWER QUESTIONS [35 MARKS]

Please answer ALL the questions in this section.

QUESTION 3: SOIL NUTRIENTS [20 MARKS]

3.

3.1. List and explicitly discuss each of the secondary macronutrients, their responsible functions on crops growth and development. *[9 marks]*

3.2. Briefly describe the deficiency symptoms of Nitrogen (N), Phosphorus (P) and Potassium (K) on maize plant using leaf deficiency analysis method. *[6 marks]*

3.3. List (5) micronutrients and discuss the importance of micronutrients on crops growth and development. *[5 marks]*

QUESTION 4: SOIL TEXTURE TRIANGLE CLASSIFICATION SYSTEM. [15 MARKS]

4. Study the Soil Texture Triangle attached, labelled as Attachment A and answer the following questions.

4.1. Provide the name of the missing soil texture marked with letter A, B, C, D and E on the Soil Texture Triangle. Write only the correct answer next to the letter on YOUR ANSWER SHEET; *[5 marks]*

4.2. A soil sample was collected from Rietfontein field B. The soil-water mixture in the jar has settled after 48 hours and the following soil layer height measurements were recorded; 9.9cm clay, 3cm silt, 3cm sand. Using Soil Texture Triangle, classify the soil texture of this soil sample, illustrate all calculation steps in YOUR ANSWER SHEET and shows the line on the Soil Texture Triangle (Attachment A). *[10 marks]*

QUESTION 5: SOIL PROPERTIES AND SOIL WATER. [30 MARKS]

5.

5.1. Name and briefly discuss three (3) main soil properties groups and the sub-factor components of each of the main three 3 groups in relation to crop performance. *[15 marks]*

5.2. Briefly discuss the following soil water terminologies in relation to soil water availability for plant uptake;

5.2.1.	Permanent wilting point	*[2 Marks]*
5.2.2.	Field capacity	*[2 Marks]*
5.2.3.	Saturation	*[2 Marks]*
5.2.4.	Available water content	*[2 Marks]*
5.2.5.	Adhesion	*[2 Marks]*
5.2.6.	Importance of Soil Organic Matter on soil properties	*[5 Marks]*

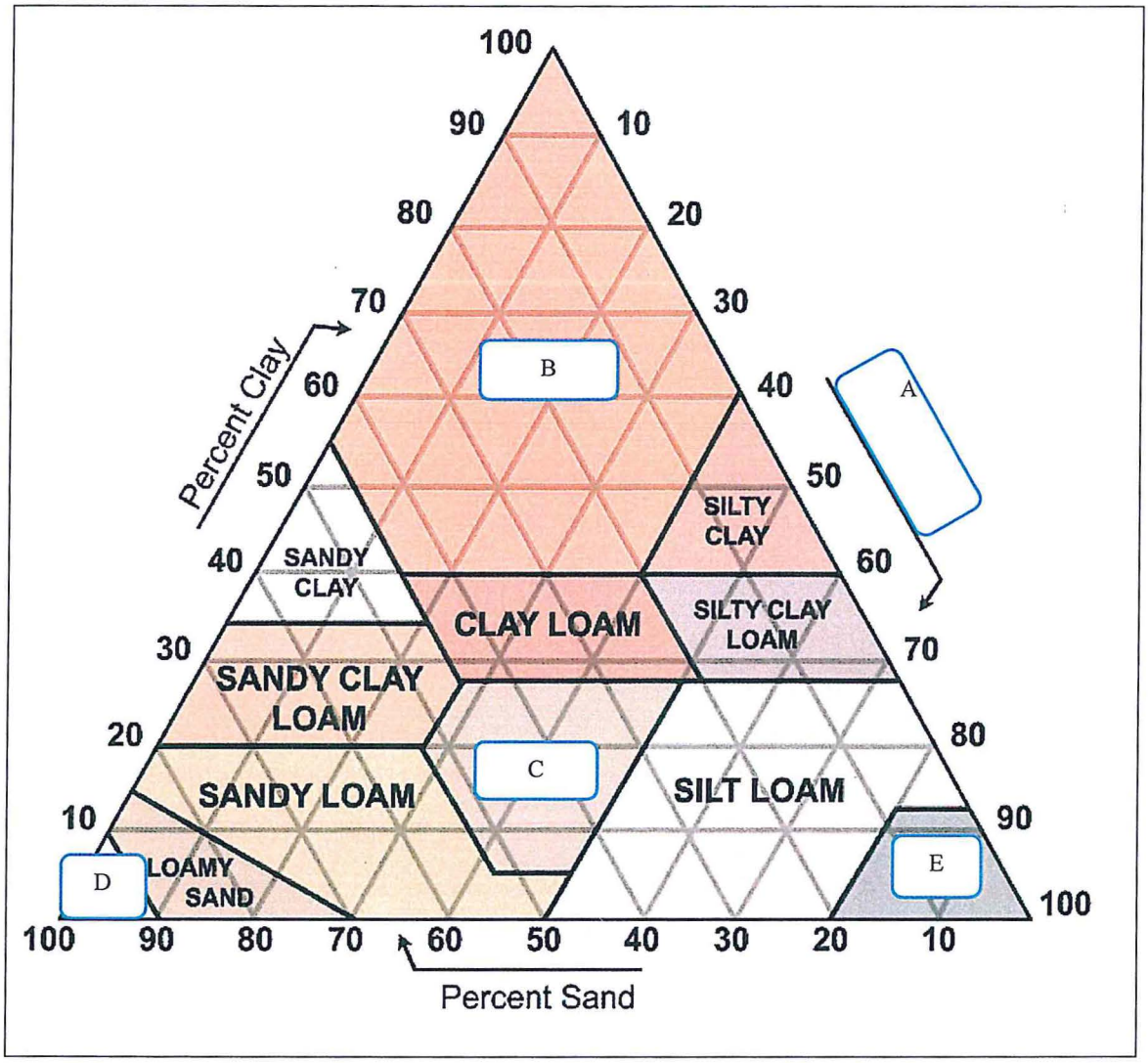
QUESTION 6: SOIL FORMATION AND FUNCTIONS [15 MARKS]

6. Explicitly discuss the following ;

6.1.	Soil functions and ecosystem services	*[5]*
6.2.	Soil mineralogy and any 3 different soil mineral rocks	*[5]*
6.3.	Soil weathering processes	*[5]*

END OF QUESTION PAPER

Attachment A



Insert this Soil Texture Triangle in YOUR ANSWER SHEET.