higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

SOIL SCIENCE
NQF LEVEL 2

(1011002)

20 November 2024 (Y-paper)
13:00–16:00

This question paper consists of 10 pages.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)
SOIL SCIENCE
NQF LEVEL 2
TIME: 3 HOURS
MARKS: 150

INSTRUCTIONS AND INFORMATION

1. Answer all the questions.
2. Read all the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Start each section on a new page.
5. Use only a black or blue pen.
6. Write neatly and legibly.

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SECTION A

QUESTION 1

Choose an item from COLUMN B that matches a description in COLUMN A. Write only the letter (A–L) next to the question number (1.1–1.10) in the ANSWER BOOK.

COLUMN A		COLUMN B	
1.1	Decrease in size	A	melting
1.2	Blocks strong winds to reduce rapid evaporation	B	cation
1.3	Neutral particles of atoms	C	chemical bonding
1.4	Soil with 50% clay and 50% sand	D	contract
1.5	Prevents leaching of cations	E	dynamic
1.6	Positive ion	F	neutrons
1.7	Neutralises acids formed in plants during protein synthesis	G	valence electrons
1.8	A strong force that holds atoms together	H	temperature changes
1.9	Constantly changing	I	loamy soil
1.10	Ice changing into water	J	wind breaks
		K	cation adsorption
		L	Ca

(10 × 1) **[10]**

QUESTION 2

Give ONE term for each of the following descriptions by writing it next to the question number (2.1–2.10) in the ANSWER BOOK.

2.1 The process of separating a mixture of solid and liquid.

2.2 A natural process of breaking down and decaying of organic matter.

2.3 Soil that consists mainly of large pore spaces.

2.4 A crucial substance for the growth of crops which can easily be lost by plant leaves but buffers plant temperature.

2.5 A bond that forms diatomic molecules.

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2.6 Cooler slopes which cannot deliver early crops.

2.7 Lack of nutrients in the soil for plants.

2.8 Anything that occupy space and has mass.

2.9 Simple molecules that bond together to form long protein chains.

2.10 Boiling point of water.

(10 × 1) **[10]**

QUESTION 3

Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (3.1–3.10) in the ANSWER BOOK.

3.1 Measuring dew point is the most accurate way to determine …

A condensation.
B relative humidity.
C air temperature.
D back diffusion.

3.2 Concentration of nutrient elements does not fluctuate in leaves during this time.

A Beginning of January to end of February
B Beginning of January to end of January
C Beginning of January to end of March
D End of February to beginning of January

3.3 Molecular structures of compounds drawn with small line between its elements' symbols.

A Lewis' structure
B Afbou structure
C Couper's structure
D Bonding structure

3.4 A molecule that carries all genetic information.

A Carbohydrates
B Protein
C Amino acids
D DNA

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3.5 Separating a mixture by collecting steam and cooling it with running water

A Rusting
B Distillation
C Filtration
D Evaporation

3.6 Soil with chemical changes, that needs a lot of moisture and little oxygen.

A Yellow soil
B Mottled soil
C Red soil
D Light soil

3.7 One of the diatomic molecules.

A H_2O
B NaCl
C N_2
D Ca^{2+}

3.8 No farmer buys fertilizers that provide hydrogen and oxygen to soil because plants obtain hydrogen and oxygen from the soil in the form of …

A LAN.
B NO_3.
C soil solution.
D water.

3.9 Which particles determine the mass of an atom?

A Particles in the nucleus
B Particles on orbits
C Positively charged particles
D Neutral particles of an atom

3.10 Is a 'pump'-related action of carrying molecules across the cell membrane.

A Cell membrane
B Osmosis
C Diffusion
D Active molecular pump

(10 × 1) **[10]**

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QUESTION 4

Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (4.1–4.5) in the ANSWER BOOK.

4.1 Osmosis is movement of water molecules from a higher to lower concentration.

4.2 Atom is a smallest particle into which an element can be broken down.

4.3 Carbon dioxide is formed by covalent bonding between a carbon atom and two oxygen atoms.

4.4 Soil analysis is done by chemists in the laboratory to determine nutrient status of the soil.

4.5 Microclimate is not the climatic conditions of a large area.

(5 × 1) **[5]**

TOTAL SECTION A: 35

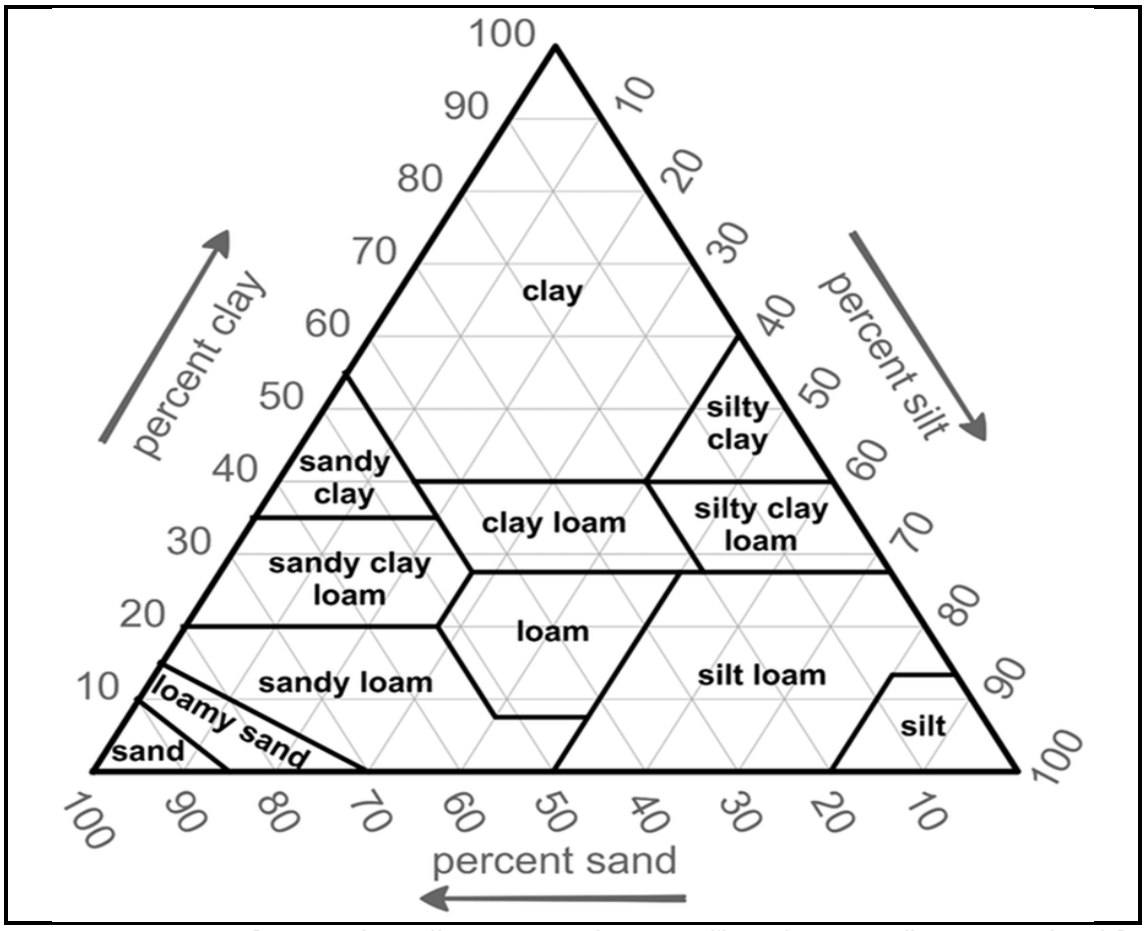
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SECTION B

QUESTION 5

5.1 A level 2 soil science class wants to determine soil texture of the field on the campus to see if it will be suitable for growing sweet potatoes. Sweet potatoes do well in sandy soils, but not in clay soils. Students took a soil sample to the laboratory for texture analysis. The following results were received: sand = 80%, silt = 12%, clay = 8%.

Use the diagram below to answer the questions that follow:



[Source: *https://www.researchgate.net/figure/USDA-Soil-Texture-Triangle*]

FIGURE 1

5.1.1 Use the texture triangle and the results above to determine the texture of the soil tested in the laboratory. (3)

5.1.2 Is the soil suitable for growing sweet potatoes? (1)

5.1.3 Explain your answer to QUESTION 5.1.2 above. (2)

5.1.4 What is the texture class of the sample below? Use the same texture triangle to determine it.

25% silt, 55% sand and 20% clay. (3)

5.1.5 Name TWO field methods used to determine soil texture. (2)

5.2 Answer the following question based on capillarity.

5.2.1 Define the term *capillarity*. (2)

5.2.2 Differentiate between capillarity in clay soil and capillarity in sandy soil. (4)

5.3 Mention characteristics of each of the following soil horizons:

5.3.1 A-horizon

5.3.2 O-horizon

(2 × 2) (4)

5.4 Explain different ways clay and humus colloids can assist in the formation of aggregates. (2 × 2) (4)

5.5 Define *soil pH*. (2)

5.6 List THREE agents of chemical weathering. (3)

[30]

QUESTION 6

6.1 State TWO functions of each of the following elements in plants:

6.1.1 Phosphorus

6.1.2 Calcium

6.1.3 Magnesium

(3 × 2) (6)

6.2 How do macro-nutrients and micro-nutrients differ? (4)

6.3 Explain briefly how suction in plants is created. (3)

6.4 Give FIVE functions of water in the uptake of plant nutrients. (5 × 2) (10)

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6.5 Define the following terms:

6.5.1 Osmosis

6.5.2 Toxicity

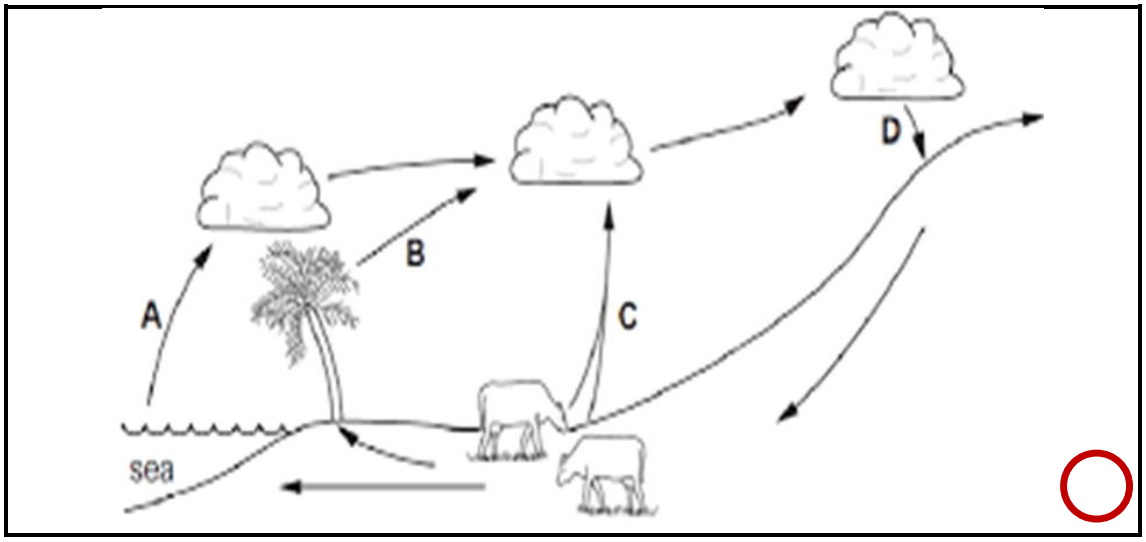
(2 × 2) (4)

6.6 Explain the statement 'essential elements must be present in the soil'. (3)

[30]

QUESTION 7

7.1 Study the diagram below and answer the questions that follow:



[Source: internet www.atomic structues]

FIGURE 2

7.1.1 Give the name of the cycle represented by FIGURE 2 above. (2)

7.1.2 Label A, B, C and D. (4)

7.1.3 Explain the processes represented by letters B and C. (4)

7.2 Define each of the following:

7.2.1 Atomic mass number

7.2.2 Negligible

7.2.3 Relative humidity

7.2.4 Valence electrons

7.2.5 Wet bulb thermometer

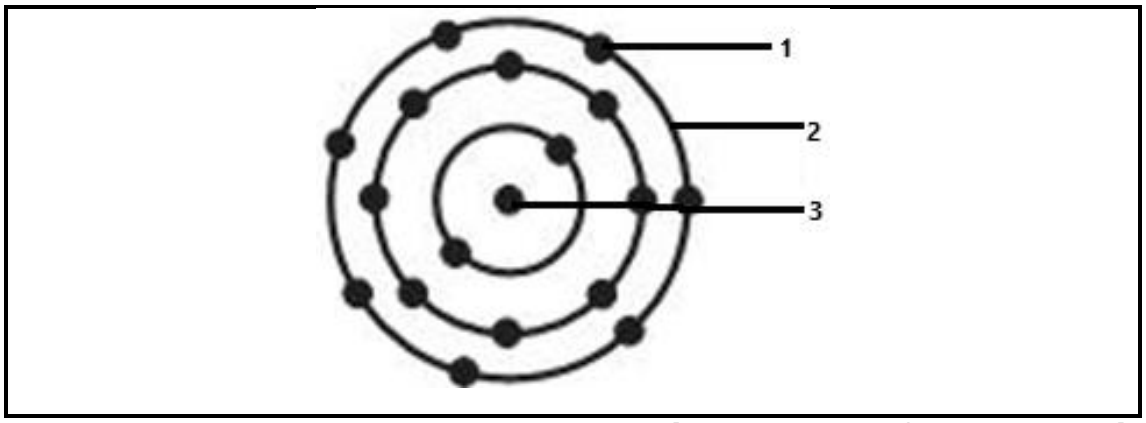
(5 × 2) (10)

7.3 Differentiate between *windbreaks* and *mulching*. (4)

7.4 Name any THREE places on the farm where it is necessary for farmers to measure relative humidity. (3)

7.5 Present a labelled structural formula of water. (4)

7.6 Study the diagram below and answer all the questions that follow:



[Source: *www.atomic structures.co.za*]

FIGURE 3

7.6.1 Give the name of the atom indicated by FIGURE 3 above. (2)

7.6.2 Label 1–3. (3)

7.6.3 What is the atomic number of this atom? (2)

7.6.4 Indicate the Lewis structure of this atom. (4)

7.6.5 Name TWO particles that are found in number 3. (2)

7.7 Give the symbol and the atomic number of each of the following elements:

7.2.1 Aluminium

7.2.2 Hydrogen

7.2.3 Calcium

7.2.4 Nitrogen

7.2.5 Potassium

(5 × 2) (10)

7.8 What is the name of the radical OH? (1)

[55]

TOTAL SECTION B: 115
GRAND TOTAL: 150

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