higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

SOIL SCIENCE
NQF LEVEL 3

(1011003)

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09:00–12:00

This question paper consists of 9 pages.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)
SOIL SCIENCE
NQF LEVEL 3
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. Use only a black or blue pen.
5. Write neatly and legibly.

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SECTION A

QUESTION 1

Various options are given as possible answers to the following questions. Choose the correct answer and write only the letter (A–D) next to the question number (1.1–1.10) in the ANSWER BOOK.

1.1 Sodic soils are high in … salts.

A potassium
B sodium
C calcium
D magnesium

1.2 Which ONE of the following water types is available to plants?

A Capillary water
B Hygroscopic water
C Gravitational
D Field capacity

1.3 In which soil type is water movement the slowest?

A Silt
B Sand
C Loam
D Clay

1.4 The potential ability of rain to cause erosion is called … .

A erodibility
B erosivity
C velocity
D infiltration

1.5 … contains most of the organic matter in soils and as it is eroded, nitrogen, phosphorus and other nutrients are lost.

A Topsoil
B Subsoil
C Parent rock
D Substrata

1.6 … have lots of different living organisms that interact with each other.

A An ecosystem
B Products
C Samples
D A base

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1.7 A recommended amount of nitrogen to be applied to the soil is largely based on the … .

A crop requirement of nitrogen
B type of nitrogen to be applied
C availability of different nitrogen fertilisers
D soil pH

1.8 Energy enters the system through … and is incorporated into plant tissue.

A photosynthesis
B production
C nutrients
D organisms

1.9 The amount of water vapour in the atmosphere is known as … .

A turbidity
B hygroscopic water
C humidity
D cohesion water

1.10 One of the following forms of water erosion is easily observable.

A Gully erosion
B Sheet erosion
C Rill erosion
D Splash erosion

(10 × 1) **[10]**

QUESTION 2

Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (2.1–2.5) in the ANSWER BOOK.

2.1 The spreading of any organic matter on the soil includes grass clippings or any organic debris.

2.2 Green manure are plants sown specifically to improve fertility.

2.3 Suitable cover crops are legumes and grasses which provides good cover.

2.4 Nitrogen fertilisers are used to neutralise soil acidity.

2.5 Water molecules close to the soil particles are easily absorbed and use by plants.

(5 × 1) **[5]**

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QUESTION 3

Choose a term from COLUMN B that matches a description in COLUMN A. Write only the letter (A–L) next to the question number (3.1–3.10) in the ANSWER BOOK.

COLUMN A		COLUMN B	
3.1	Nutrients required by plants in small quantities	A	overall chlorosis
3.2	The crops planted to reduce nutrient leaching	B	straight fertiliser
3.3	Instrument used to measure soil Ph	C	micro-nutrients
3.4	A soil with pH greater than 7.0	D	soil analysis
3.5	A fertiliser that contain only one of the N, P, or K	E	pH meter
3.6	Method used to determine nutrient content of a soil	F	alkaline soil
3.7	General yellowing of the leaves	G	catch crop
3.8	Yellowing of the margins of the leaf	H	necrosis
3.9	Equipment that looks like corkscrews, commonly used for taking soil samples	I	anion
3.10	A term used to describe the signs of death in any living tissue	J	marginal chlorosis
		K	auger
		L	minimum tillage

(10 × 1) **[10]**

QUESTION 4

Complete the following sentence or sentences/paragraph or paragraphs by writing only the missing word or words next to the question number (4.1–4.5) in the ANSWER BOOK.

4.1 The product of decomposed plant remains is called … .

4.2 The conversion of nitrogen gas to ionic nitrogen is known as ... .

4.3 … is a crop grown between the rows of another crop.

4.4 Adding fertiliser on an established crop without incorporating it is called … .

4.5 … is water loss of a plant through evaporation from the soil and from the leaves.

(5 × 2) **[10]**

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QUESTION 5

5.1 Define the term *mixed fertiliser.* (2)

5.2 A fertiliser mixture is designated 3:2:1(25)

5.2.1 Name the THREE soil nutrients in this mixture. (3)

5.2.2 What does the number in the bracket indicate? (1)

5.3 State TWO functions of nitrogen in plants. (2)

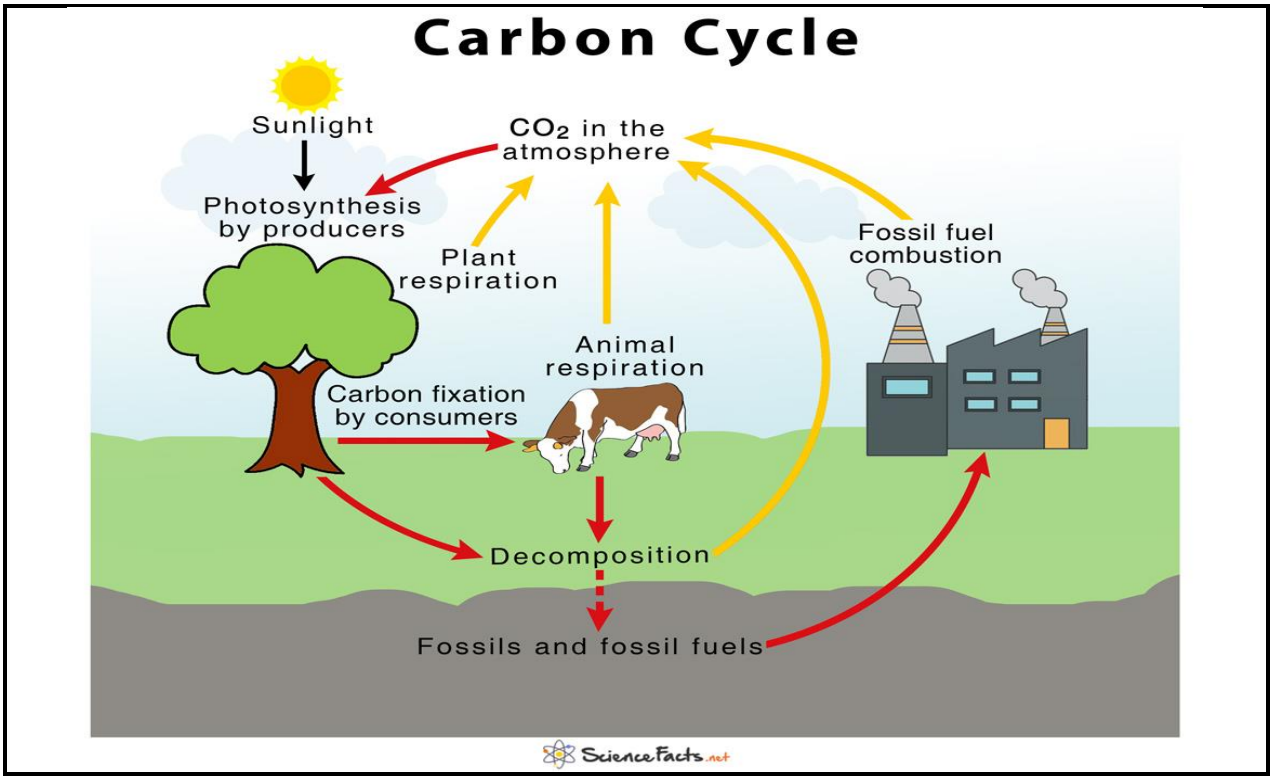
5.4 Name TWO methods of fertiliser application. (2)
[10]

TOTAL SECTION A: 45

SECTION B

QUESTION 6: ORGANIC FERTILISERS

Study the picture below and answer the questions.



6.1 Explain the term carbon cycle in your own words. (2)

6.2 Give the FOUR steps of the carbon cycle. (4)

6.3 State the TWO benefits of the carbon cycle. (4)

6.4 The amount of nutrients contained in manure differs from farm to farm depending on various factors.

List TWO factors that determine the nutrient content and the availability of plant nutrients in animal manure. (4)

6.5 State any TWO requirements for microbes to be effective in the decomposition of organic fertilisers. (4)
[18]



QUESTION 7: SOIL EROSION AND ITS PREVENTION

7.1 Explain the following terms:

7.1.1 Zero tillage

7.1.2 Minimum tillage

7.1.3 Erosivity



(3 × 2) (6)

7.2 Name the TWO primary agents of soil erosion. (2)

7.3 Eroded soil deposits can have serious damage resulting in increased capital costs.

Give any TWO examples of damage that may be caused by sediments. (2)

7.4 Give TWO physical factors that affect the erodibility of the soil. (2)

7.5 Briefly explain how erosion affects the following:

7.5.1 Rooting depth



7.5.2 Soil fertility

(2 × 2) (4)

7.6 Name FOUR ways of controlling erosion on cultivated land. (4)
[20]

QUESTION 8: PLANT NUTRIENTS AND LIMITING FACTORS, SOIL AND PLANT ANALYSIS

Study the picture below and answer the questions.



8.1 Name TWO main categories in which plant nutrients are divided. (2)

8.2 Discuss THREE conditions that affect the limiting factors in a field at a certain time and place. (3 × 2) (6)

8.3 State Liebig's law of the minimum. (2)

8.4 Give FIVE different properties of soil that can be tested during soil analysis. (5)

8.5 Give FIVE functions of lime in acid soil. (5)
[20]

TOTAL SECTION B: 58

SECTION C

QUESTION 9: SOIL WATER AND EVAPOTRANSPIRATION, IRRIGATION

9.1 Give any FIVE reasons why farmers should avoid over-irrigation. (5)

9.2 Availability of water in South Africa is low. The little water is shared between households, farming and industries. Therefore water conservation is very important.

9.2.1 State any THREE main ways how farmers can improve water use efficiency. (3)

9.2.2 Runoff is the loss of water which flows down a slope across the surface of the soil.

Give FOUR ways on how runoff can be captured. (4)

9.3 Give any THREE disadvantages of water stress on the crops. (3)

9.4 Differentiate between *drip* and *sprinkler* irrigation. (4)

9.5 Calculate the total available moisture (TAM) for a maize crop with a rooting depth of 700 mm. The soil has an available moisture capacity (AMC) of 120 mm/m. Show your calculations. (5)

[24]

QUESTION 10: SOIL EROSION AND ITS PREVENTION

10.1 Explain the term *crop residues*. (2)

10.2 List FIVE benefits of mulching in farming. (5 × 2) (10)

10.3 Explain the following ways on the control of soil erosion on rangeland.

10.3.1 Restriction on animal numbers

10.3.2 Burning of veld without permit

10.3.3 Removal of alien invader plants

(3 × 2) (6)

10.4 Some municipalities and some rural communities make efforts to construct gabions to stabilise gullies.

State THREE ways in which these structures can stabilise gullies. (3)

10.5 What is the effect of surface crusting on the plant roots? (2)

[23]

TOTAL SECTION C: 47
GRAND TOTAL: 150

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