higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

SOIL SCIENCE
NQF LEVEL 3

8 December 2020

This marking guideline consists of 7 pages.

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SECTION A

QUESTION 1

1.1 D
1.2 A
1.3 C
1.4 B
1.5 A
1.6 C
1.7 B
1.8 D
1.9 A
1.10 B
1.11 C
1.12 A
1.13 D
1.14 B
1.15 C

(15 × 1) **[15]**

QUESTION 2

2.1 True
2.2 True
2.3 False
2.4 True
2.5 False

(5 × 1) **[5]**

QUESTION 3

3.1 D
3.2 F
3.3 L
3.4 J
3.5 H
3.6 C
3.7 I
3.8 G
3.9 E
3.10 B

(10 × 1) **[10]**

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QUESTION 4

4.1 Small
4.2 Evapotranspiration
4.3 Turgor pressure
4.4 Yellowing
4.5 Hydrogen

(5 × 2) **[10]**

QUESTION 5

5.1 Non-essential nutrients
5.2 Dolomitic lime
5.3 Soil pH or soil reaction
5.4 Broadcasting
5.5 Phosphorus
5.6 Sediment
5.7 Compost
5.8 Living mulch
5.9 Leaching
5.10 Hydroponics

(10 × 1) **[10]**

TOTAL SECTION A: 50

SECTION B

QUESTION 6

6.1 Soil erosion is the process by which wind and water remove the top layer of the soil. (2)

6.2 6.2.1 Water
6.2.2 Wind
6.2.3 Wind

(3 × 1) (3)

6.3 6.3.1
- Silting dams
- Covering roads with soft sand
- Blocking streams
- Clogging estuaries

(Any 2 × 1) (2)

6.3.2
- May interfere with irrigation systems.✓ Buried irrigation pipes are uncovered.✓
- May clog block pipes✓ and nozzles through deposited silt.✓
- Fertile soil is carried away✓ and is deposited where it is not required.✓
- Dongas disturb farming operations.✓ Movement of machinery is limited.✓
- The value of the land is decreased.✓ The surface is uneven.✓
- The land is cut into smaller units by gullies.✓ These units are difficult and costly to work on.✓ (Any 3 × 2) (6)

6.3.3
- Re-establishment of vegetation
- Place wood logs across gullies to trap loose and moving soil particles.
- Divert water from gullies into rivulets or streams leading to dams.
- Block gully heads. (Any 2 × 1) (2)

6.4
- Soil erodibility
- Surface roughness
- Climatic conditions
- Length of the field
- Vegetation cover (4)

6.5 6.5.1 Rotational grazing – provides chance for grass in rested camps to regrow while other camps are not allowed to be overgrazed.✓✓ This provides soil cover.✓

6.5.2 Restriction on animal numbers – involves keeping right number of animals in the camp to avoid overgrazing.✓✓ This will keep soil covered.✓

(2 × 3) (6)
[25]

QUESTION 7

7.1 7.1.1 Soil sample is a small amount of soil taken from different sites on a piece of land or a field. (2)

7.1.2 3 composite samples✓
- Gentle slope
- Steep slope
- Flat slope (3 + 1) (4)

7.1.3 Field edges should be avoided during soil sampling because of the dust from roads, spoil from ditches or the effects of border trees. (2)

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7.1.4 Soil sampling and analysis are done to determine the nutrient status of the soil.✓ It also leads to the profitable use of lime and nutrients inputs in crop production.✓ (2)

7.2 7.2.1 NH_4^+ (ammonium ion) and NO_3^- (nitrate ion) (2)

7.2.2
- For vegetative growth
- To make proteins, enzymes
- Part of DNA molecule
- Constituent of chlorophyll
- Plants become juicier and more nutritious (Any 4 × 1) (4)

7.3 7.3.1 3 = Nitrogen
2 = Phosphorus
1 = Potassium (3)

7.3.2 N: 3/6 × 40 = 20%✓✓
P: 2/6 × 40 = 13,33%✓✓
K: 1/6 × 40 = 6,67%✓✓ (6)
[25]

QUESTION 8

8.1 Loam soil.✓ – Water molecules are tightly adsorbed to soil particles (colloids) at a force stronger than that required by roots to absorb it.✓✓ (1 + 2) (3)

8.2 50% of TAM: 130 mm/2 = 65 mm✓✓

Days it takes to lose 65 mm: 65 mm/10 = 6,5 days (or rounded to 7 days)✓✓ (4)

8.3 The litmus papers are dipped into the mixture of soil and water,✓ especially in the soil suspension.✓ When they change their colour to red,✓ the soil is acidic; to yellow, the soil is neutral;✓ and to blue-green, the soil is alkaline.✓ (5)

8.4
- Uneven distribution of nutrients
- High nutrient loss through leaching
- May cause salinity in soil
- Have no effect on improving soil structure
- They are not food for microbes
- May acidify the soil (Any 5 × 1) (5)

8.5 8.5.1
- Composition of the feed ration
- Amount of bedding and water added or lost
- Method of manure collection and storage
- Method and timing of land application
- Characteristics of the soil
- Crop characteristics
- The climate
- Age of animal
- Type of animal (Any 5 × 1) (5)

8.5.2
- Half of the nitrogen could get lost.
- Most of nutrients are lost through drainage.
- Drying out of manure.
- Manure may get lost through run-off.
- Leaching of nutrients could occur. (Any 3 × 1) (3)

[25]

QUESTION 9

9.1 9.1.1
- Most efficient irrigation system: Drip irrigation
- Least efficient irrigation system: Flood irrigation (2)

9.1.2
- Less water is needed,✓ because water drips directly to plant root.✓
- Water is applied directly to the root zone,✓ in drops. ✓
- 95% efficient,✓since less water is lost through evaporation or run-off.✓
- Less water is lost through evaporation✓ before it reaches the crops✓
- Less water is lost through run-off,✓ because water is provided in drops.✓ (Any 2 × 2) (4)

9.1.3
- Leaching of nutrients
- Lack of oxygen in the soil
- Root rot and root disease occur.
- Toxic salt levels occur.
- Waste of water
- Waste of fuel and labour
- Unnecessary wear and tear caused to equipment and machinery
- Erosion caused by run-off (Any 3 × 1) (3)

9.2
- Poor aeration
- Roots die
- Reduced yield
- Poor plant growth
- Yellowing of plants
- Poor nutritional status
- Accumulation of salt (Any 4 × 1) (4)

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9.3 9.3.1 Green manure is the type of cover crop grown mainly to protect the soil from erosion, improve structure and add nutrients and organic matter to the soil.

OR

- Crops that are planted for a short period, cut or killed with herbicide and ploughed back into the soil
- Compost is the combination of animal and plant remains, which are decomposed and treated to provide fertiliser for soils. (4)

9.3.2
- Constant supply of fresh organic matter
- Adequate moisture
- Moderate temperature
- Suitable pH
- Adequate nitrogen supply
- Good aeration (Any 4 × 1) (4)

9.3.3
- Reduce impact of raindrops.
- Reduce run-off.
- Reduce soil erosion.
- Increase infiltration.
- Sediments are deposited.
- Organic matter increases.
- Improve the nutrient content of the soil.
- Loosen the soil. (Any 4 × 1) (4)

[25]

TOTAL SECTION B: 100
GRAND TOTAL: 150

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