



**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.**

**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]**

**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)

	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 <sub>4</sub> <sup>+</sup> (ammonium ion) and NO <sub>3</sub> <sup>-</sup> (nitrate ion)	(2)
	7.2.2	<ul style="list-style-type: none"> <li>• For vegetative growth</li> <li>• To make proteins, enzymes</li> <li>• Part of DNA molecule</li> <li>• Constituent of chlorophyll</li> <li>• Plants become juicier and more nutritious</li> </ul>	(Any 4 × 1) (4)
7.3	7.3.1	3 = Nitrogen 2 = Phosphorus 1 = Potassium	(3)
	7.3.2	N: $3/6 \times 40 = 20\%$ ✓✓ P: $2/6 \times 40 = 13,33\%$ ✓✓ K: $1/6 \times 40 = 6,67\%$ ✓✓	(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	<ul style="list-style-type: none"> <li>• Uneven distribution of nutrients</li> <li>• High nutrient loss through leaching</li> <li>• May cause salinity in soil</li> <li>• Have no effect on improving soil structure</li> <li>• They are not food for microbes</li> <li>• May acidify the soil</li> </ul>	(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)

- 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**