higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

SOIL SCIENCE
NQF LEVEL 3

XX February 2020

This marking guideline consists of 7 pages.

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SECTION A

QUESTION 1

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

(15 × 1) **[15]**

QUESTION 2

2.1 False
2.2 True
2.3 True
2.4 False
2.5 False

(5 × 1) **[5]**

QUESTION 3

3.1 D
3.2 A
3.3 G
3.4 I
3.5 C

(5 × 2) **[10]**

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QUESTION 4

4.1 wind
4.2 Leaching
4.3 low
4.4 flowering
4.5 Crusting
4.6 Accelerated
4.7 Humidity
4.8 phosphate
4.9 Catch crops
4.10 Evaporation

(10 × 1) **[10]**

QUESTION 5

5.1 Wilting
5.2 Dolomite limestone
5.3 Buffer
5.4 Sodic
5.5 Compost
5.6 Nitrification
5.7 Fertigation
5.8 Living mulch
5.9 Mineralisation
5.10 Straight or single grade

(10 × 1) **[10]**

TOTAL SECTION A: 50

SECTION B

QUESTION 6

6.1
- Overall (whole leaf)
- Interveinal (leaf tissue between the veins)
- Marginal (margin of the leaf) (3)

6.2 6.1.1 Nutrients in liquid fertilisers are immediately available to be absorbed by the roots or leaves.

6.1.2 Fertilisers made from animal and plant remains releasing nutrients after being decomposed by micro-organisms

(2 × 2) (4)

6.3
- Seasonality
- Type of crop
- Growth stage of the crop (3)

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6.4 6.4.1 Actual nutrients used by plants✓ usually forming less than 50% of the mass of each bag✓ (2)

6.4.2 Active ingredients = mass of bag × concentration of active ingredient✓

$$= 50 \times \frac{30}{100}\checkmark$$

$$= 15 \text{ kg}\checkmark\checkmark \quad (4)$$

6.4.3 N = Active ingredients % × Nitrogen ratio × (Mass of bag ÷ Mass of active ingredients)

$$= \frac{30}{100} \times 2 \times \frac{50}{9}\checkmark$$

$$= 3{,}34 \text{ kg}\checkmark\checkmark$$

P = Active ingredients % × phosphorus ratio × (mass of bag ÷ mass of active ingredients)

$$= \frac{30}{100} \times 3 \times \frac{50}{9}\checkmark$$

$$= 5{,}0 \text{ kg}\checkmark\checkmark$$

K = Active ingredients % × potassium ratio × (mass of bag ÷ mass of active ingredients)

$$= \frac{30}{100} \times 4 \times \frac{50}{9}\checkmark$$

$$= 6{,}67 \text{ kg}\checkmark\checkmark$$

OR

$$N = \frac{6{,}67}{100} \times 50\checkmark$$

$$= 3{,}34 \text{ kg}\checkmark\checkmark$$

$$P = \frac{10}{100} \times 50\checkmark$$

$$= 5{,}0 \text{ kg}\checkmark\checkmark$$

$$K = \frac{13{,}33}{100} \times 50\checkmark$$

$$= 6{,}66 \text{ kg}\checkmark\checkmark \quad (9)$$

[25]

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QUESTION 7

7.1 7.1.1 Type of cover crop planted to be ploughed into the soil before flowering or seeding (2)

7.1.2
- Mustard
- Rye
- Rape
- Turnip
- Ryegrass
- White clover
- Vetch
- Velvet beans (Any 3 × 1) (3)

7.1.3
- Dead mulch is any form of vegetative cover left on the soil surface
- Living mulch is a cover crop planted (intercropped) between an annual or perennial cash crop (2 + 2) (4)

7.1.4
- Improves aeration
- Lowers C:N ratio, reducing chance of nitrogen depression
- Period
- Readily available nutrients
- Improves soil structure
- Improves drainage
- Improves water-holding capacity
- Added organic matter and micro-organisms (Any 5 × 1) (5)

7.2 7.2.1
- Calcitic limestone
- Dolomitic limestone (2)

7.2.2 Reflects large decrease in yield✓ as soil acid saturation increases✓ (2)

7.2.3 Decrease✓ in soil acid saturation has little or no effect on yield.✓ (2)

7.2.4 ±98% (2)

7.2.5 Liming to reduce acid saturation to values below permissible acid saturation (point B)✓ would have no beneficial effect on yield✓ and would be a waste of money.✓ (3)

[25]

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QUESTION 8

8.1 8.1.1 Adhesion✓ and cohesion✓ (2)

8.1.2
- Adhesion water – inner part of film which is held very tightly and makes this type of water unavailable to plants
- Cohesion water – outer part of the film which is not tightly held and is available to plants
- Gravitational water – far away from particle surface and quickly lost to gravity thus not available to plants (3 × 2) (6)

8.1.3
- Plant cells need to be turgid to ensure that the plant can stay upright.
- Water is required for the chemical conversion of sunlight energy into carbohydrates for plant food.
- Water loss from plant leaves cools the plant in hot weather.
- Plant nutrients need to be dissolved in water to be absorbed.
- Nutrients are translocated from the roots to different parts.
- Water is required for chemical reactions. (5)

8.2 8.2.1
- Sprinkler irrigation – about 75 to 80% efficient
- Trickle or drip irrigation – 95% efficient (2 × 1) (2)

8.2.2
- Sprinkler irrigation – it is about 75 to 80% efficient
- Trickle or drip irrigation – it is 95% efficient (2 × 2) (4)

8.3 Drip or trickle irrigation is the best (1)

8.4
- Leaching of nutrients from well-drained soils
- Lack of oxygen caused by water saturation
- Root rot and root disease
- Undesirable micro-organism activity which can occur in wet soil
- Toxic salt levels occur
- Erosion caused by runoff (Any 5 × 1) (5)

[25]

QUESTION 9

9.1 Water (1)

9.2 9.2.1 Removal of something attached

9.2.2 Moving something from one place to another

9.2.3 Laying down of something in particular place

(3 × 2) (6)

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9.3
- Rill occurs in small streams or channels on a slope or it occurs when the concentration of surface water increases, and water begins to cause tiny channels.
- Gully or dongas are larger and more permanent. They become bigger when heavy rain occurs. (2 + 2) (4)

9.4 9.4.1 (a)
- Conservation tillage encourages crop residue on the soil surface as mulch and not burying or burning it.
- Conventional tillage means using machines like a ploughs or discs to turn over and loosen the soil after harvesting. (2 + 2)

(b)
- Crop rotation is the growing of multiple crops in a planned sequence on the same field.
- Monocropping involves the repeated planting of one type of crop on the same field. (2 + 2)

(4 × 2) (8)

9.4.2
- Prevents surface crusting
- Improves infiltration
- Improves soil structure
- Increases water-holding capacity
- Prevents soil-borne diseases from splashing to plants
- Improves drainage
- Improves aeration
- Increases organic matter content (Any 3 × 1) (3)

9.4.3 Conservation tillage. It reduces compaction from traffic or rainfall.✓ It also reduces fuel✓ and labour requirements.✓ (3)

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TOTAL SECTION B: 100
GRAND TOTAL: 150

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