



education

Department:
Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATION - 2007

AGRICULTURAL SCIENCE P1

STANDARD GRADE

MAY/JUNE 2008

MEMORANDUM

MARKS: 150

This memorandum consists of 9 pages.

SECTION A**QUESTION 1**

1.1

1.1.1 B. ✓✓

1.1.2 C. ✓✓

1.1.3 D. ✓✓

1.1.4 B. ✓✓

1.1.5 A. ✓✓

(5 x 2) (10)

1.2

1.2.1 Permanent wilting. ✓✓

1.2.2 Structure. ✓✓

1.2.3 Nitrate ions / NO₃⁻. ✓✓

1.2.4 Colloids / Clay. ✓✓

1.2.5 Soil form. ✓✓

(5 x 2) (10)

1.3

1.3.1 D ✓✓

1.3.2 F ✓✓

1.3.3 L ✓✓

1.3.4 H ✓✓

1.3.5 K ✓✓

(5 x 2) (10)

TOTAL SECTION A 30

SECTION B**QUESTION 2: Soil Science**

2.1 Soil Profile

- | | | |
|-------|--------------|------------|
| 2.1.1 | Solum✓ | (1) |
| 2.1.2 | Top Soil✓ | (1) |
| 2.1.3 | Substrata✓ | (1) |
| 2.1.4 | O -horizon✓ | (1) |
| 2.1.5 | A -horizon✓ | (1) |
| 2.1.6 | B - horizon✓ | (1) |
| 2.1.7 | C -horizon✓ | (1) |
| 2.1.8 | R -horizon✓ | (1) |
| | | [8] |

2.2 Interpretation of soil colours.

2.2.1 Grey

- Indicates that iron has been chemically changed / hydrated iron. ✓ (1)
 - This could have happened when iron was in excess water in the absence of oxygen / poor aeration. ✓ (1)
 - Also indicates badly waterlogged / saturated conditions in soil. ✓ (1)
 - Drainage is necessary✓ (1)
- (Any 2)

2.2.2 Red

- Indicates that iron compounds in soil forming minerals underwent chemical changes / the iron is oxidised. ✓ (1)
 - This usually happens when these minerals get exposed to low moisture condition. ✓ (1)
 - With enough air / good aeration. ✓ (1)
 - The colour also indicates good air: moisture ratio in the soil. ✓ (1)
 - These soils show that the sub-soil is well drained. ✓ (1)
- (Any 2)

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- 2.2.3 Yellow
- Indicates that iron in soil underwent chemical changes / Iron is reduced / Iron is hydrated. ✓ (1)
 - Also shows degree of water saturation in soil / it is waterlogged. ✓ (1)
 - Occurs mostly because of exposure during the wet season of the year. ✓ (1)
 - Shortage of oxygen. ✓ (1)
 - Needs to be drained. ✓ (1)
- (Any 2) **[6]**
- 2.3 FIVE influences of particle size on soil characteristics.
- Chemical reactivity. ✓ (1)
 - Drainage. ✓ (1)
 - Tillability. ✓ (1)
 - Erosion potential / erodability. ✓ (1)
 - Water retention / water holding capacity. ✓ (1)
 - Soil Fertility. ✓ (1)
 - Water infiltration / seepage. ✓ (1)
 - Soil aeration. ✓ (1)
 - Capillarity. ✓ (1)
- (Any 5)
- 2.4 THREE measures that can be taken to reduce run-off.
- During rainy seasons sloping soil should be covered with plants. ✓ (1)
 - Construction of contours. ✓ (1)
 - Adding organic matter into the soil. ✓ (1)
 - Redesigning of irrigation systems. ✓ (1)
 - Light cultivation. ✓ (1)
- (Any 3)
- 2.5 Soil water types.
- 2.5.1 Capillary or cohesion water. ✓ (1)
- 2.5.2 Free or seepage water. ✓ (1)
- 2.6 THREE factors that influence water retaining capacity of soil.
- Texture. ✓ (1)
 - Structure. ✓ (1)
 - Organic matter content. ✓ (1)
- 2.7 Brief explanation of the prismatic soil structure.
- Characterised by vertically oriented aggregates. ✓ (1)
 - Aggregates can be as long as 15 cm or more. ✓ (1)
 - Usually occurs in the sub-soil of arid or semi-arid regions. ✓ (1)
 - When its top is rounded it is referred to as columnar structure. ✓ (1)
- (Any 3)

[30]

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QUESTION 3: Soil Science

- 3.1 FIVE factors influencing the decomposition of organic matter.
- High temperature. ✓ (1)
 - Good soil aeration. ✓ (1)
 - Sufficient moisture. ✓ (1)
 - Microbial activities. ✓ (1)
 - Favourable pH / Soil reaction. ✓ (1)
- 3.2 Soil Temperature
- 3.2.1
- Water has a high heat capacity. ✓ (1)
 - Requires more heat to undergo temperature change. ✓ (1)
- 3.2.2
- Light coloured soil reflects more heat than dark coloured soil. ✓ (1)
 - Dark coloured soil absorbs more incidental radiation. ✓ (1)
- 3.2.3
- Vegetation intercepts radiation energy during the day. ✓ (1)
 - Low conductivity of organic matter decreases radiation at night. ✓ (1)
 - Direct heat radiation is decreased during night. ✓ (1)
- (Any 2)
- 3.2.4
- Sun's rays are reflected back up from the land surface. ✓ (1)
 - With clouds these are reflected back down to the earth again. ✓ (1)
- [8]**
- 3.3 THREE ways of describing inorganic colloids.
- Shape / Form ✓ (1)
 - Specific surface ✓ (1)
 - Negative electric charges and adsorbed cations ✓ (1)
- 3.4 FOUR effects of salinity in the soil.
- High salt concentration decreases the accessibility of soil water to the plants. ✓ (1)
 - White salt precipitates will form on the higher parts of the soil. ✓ (1)
 - High salt concentration in the soil is toxic to plants. ✓ (1)
 - Soil surface tends to be powdery. ✓ (1)

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- 3.5 FIVE criteria for describing soil series.
- Soil texture. ✓ (1)
 - The base status / pH / reaction of the soil. ✓ (1)
 - The degree of leaching. ✓ (1)
 - Lime content. ✓ (1)
 - Soil colour. ✓ (1)
 - Organic matter content. ✓ (1)
 - Nature of subsoil material. ✓ (1)
- (Any 5)
- 3.6 FIVE physical influences of organic matter on the soil.
- Darkens the soil. ✓ (1)
 - Organic matter promotes the formation of crumb structure of soil. ✓ (1)
 - Improved structure results in better water infiltration, drainage. ✓ (1)
 - Low plasticity of organic matter makes clay soil looser and better aerated. ✓ (1)
 - Organic matter is spongy and this reduces stickiness in clay soil. ✓ (1)
 - Clay soil does not become compacted when wet or form large cracks when dry. ✓ (1)
 - Improves water retention of sandy soil. ✓ (1)
 - Dark soils are warmer. ✓ (1)
- (Any 5)

[30]**QUESTION 4: Plant Reproduction**

- 4.1 FIVE asexual reproduction methods and ONE example of a plant that can be propagated through each method.
- Rhizomes✓ – ferns, lilies, reed types, irises✓ (2)
 - Bulbs✓ – onions, daffodils✓ (2)
 - Cuttings✓ - prickly pears, carnations✓ (2)
 - Runners✓ – strawberries, sweet potatoes✓ (2)
 - Tubers✓ – potatoes / sweet potatoes✓ (2)
 - Grafting✓ – grapes, peach, apples✓ (2)
 - Budding✓ – grapes, apples✓ (2)
 - Suckers✓ – bananas✓ (2)
 - Cloning or tissue culture✓ – (any plant) ✓ (2)
- (Any 5)
- 4.2 FIVE factors causing abscission in plant.
- Mineral deficiencies / soil factors.✓ (1)
 - Unfavourable climatic conditions / wind /low temperature/frost. ✓ (1)
 - Insect pests / biological factors.✓ (1)
 - Too many fruits on one tree.✓ (1)
 - Too much soil moisture. ✓ (1)
 - Too little soil moisture. ✓ (1)
 - Spraying of trees. ✓ (1)
- (Any 5)

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4.3

- 4.3.1 Labels A to F
- A = Stigma ✓ (1)
 - B = Anther ✓ (1)
 - C = Filament crown / filament ✓ (1)
 - D = Septum ✓ (1)
 - E = Receptacle ✓ (1)
 - F = Pedicel / flower stalk ✓ (1)

- 4.3.2 Functions of parts labelled E and F
- E : Receptacle - Carries the various corollas/crowns of floral leaves. ✓ (1)
 - F : Pedicel - Attaches the flower to the plant. ✓ (1)
- [6]**

4.4 Brief difference between self- and cross-pollination.

| Self pollination | Cross pollination |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • Transfer of ripe pollen grains from the anther ✓ • To the stigma of the same flower. ✓ | <ul style="list-style-type: none"> • Transfer of ripe pollen grains from anther of one flower ✓ • To the receptive stigma of anther flower. ✓ |
| | (2) |
| | (2) |

- 4.5 How double fertilisation occurs in plants.
- Double nuclear fusion takes place ✓ (1)
 - One male gamete fertilises the female gamete ✓ (1)
 - to form a zygote ✓ (1)
 - The other male gamete fuses with the two polar nuclei ✓ (1)
 - to form a triploid cell called the endosperm. ✓ (1)
- (Any 3)

QUESTION 5: Plant Nutrition

5.1

- 5.1.1
- Sufficient sunlight. ✓ (1)
- 5.1.2 Conclusion of this incidence of a yellow colour.
- The chlorophyll disappears in the absence of sunlight. ✓ (1)
 - Without chlorophyll leaves develop chlorosis. ✓ (1)
 - Light phase / Photosynthesis is negatively effected. ✓ (1)
- (Any 1)
- 5.1.3
- Photosynthesis. ✓ (1)

$$5.2 \quad N = \frac{2}{6} \times \frac{20}{1} \checkmark \quad (1)$$

$$= \frac{40}{6} \checkmark \quad (1)$$

$$= \underline{6.7\% \text{ of N}} \rightarrow \quad (1)$$

$$K = \frac{3}{6} \times \frac{20}{1} \checkmark \quad (1)$$

$$= \frac{60}{6} \checkmark \quad (1)$$

$$= \underline{10\% \text{ of K}} \checkmark \quad (1)$$

5.3 Distinction between passive and active ion absorption (6)

| Passive absorption | Active absorption |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • No energy is required. ✓ • Diffusion takes place. ✓ • No carrier molecules. ✓ • Ions have a diameter smaller than the diameter of the protein canals. ✓ | <ul style="list-style-type: none"> • ATP is required. ✓ • No diffusion. ✓ • Carrier molecules carry ions. ✓ • Ions have a diameter greater than the diameter of the protein canals. ✓ |

(6)

5.4

5.4.1 'Black heart' in root crops
• Boron (B) ✓ (1)

5.4.2 Boiling water disease in wheat crops
• Copper (Cu) ✓ (1)

5.4.3 Green inverted V-pattern on leaf bases
• Magnesium (Mg) ✓ (1)

5.4.4 'Saucer leaf' in climbing plants
• Molybdenum ✓ (1)

[4]

5.5 Steps to reclaim brackish soil.

- Find and remove the source of the problem. ✓ (1)
- Improve drainage of the soil. ✓ (1)
- Add gypsum to the soil. ✓ (1)
- Apply heavy irrigation (over irrigation). ✓ (1)
- Plant crops that are resistant to brackish soil. ✓ (1)

(Any 4)

Please turn over

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- 5.6 FOUR factors influencing composition of farm manure.
- Type of animal. ✓ (1)
 - Type and amount of bedding used. ✓ (1)
 - The age of the animals. ✓ (1)
 - Type of ration/feed. ✓ (1)
 - Storage and handling of manure. ✓ (1)
 - Age of the manure. ✓ (1)
- (Any 4)
- 5.7 THREE methods through which plants can be manipulated to increase photosynthesis.
- Trellising system. ✓ (1)
 - Pruning. ✓ (1)
 - Plant density. ✓ (1)
 - Greenhouse. ✓ (1)
 - Breeding or genetic manipulation. ✓ (1)
- (Any 3)
- [30]**
- | | |
|------------------------|------------|
| TOTAL SECTION A | 30 |
| TOTAL SECTION B | 120 |
| GRAND TOTAL | 150 |