



education

Department:
Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

AGRICULTURAL SCIENCES P1

MEMORANDUM

NOVEMBER 2008

MARKS: 150

This memorandum consists of 10 pages.

SECTION A**QUESTION 1.1**

| | | | | |
|--------|------------|------------|------------|------------|
| 1.1.1 | A | X/J | C | D |
| 1.1.2 | A | B | X/J | D |
| 1.1.3 | X/J | B | C | D |
| 1.1.4 | X/J | B | C | D |
| 1.1.5 | A | B | X/J | D |
| 1.1.6 | A | B | C | X/J |
| 1.1.7 | A | B | X/J | D |
| 1.1.8 | A | X/J | C | D |
| 1.1.9 | A | X/J | C | D |
| 1.1.10 | X/J | B | C | D |

(10 x 2) (20)

QUESTION 1.2

| | |
|-------|--------------|
| 1.2.1 | A/E/J |
| 1.2.2 | F/J |
| 1.2.3 | G/J |
| 1.2.4 | I/J |
| 1.2.5 | M/J |

(5 x 2) (10)

Please note:

Question 1.1.1

The most correct answer is B.

Responses **A/J** and **C/J** could be accepted due to the phrasing of the question.

Question 1.4.1

In the cases where acid was underlined the following response will be accepted:**Brack / alkaline/**

Question 1.4.3

In the cases where along was underlined the following response will be accepted:**Below/Rhizomes/runners/stolons/****QUESTION 1.3**1.3.1 temporary wilting/wilting **J**1.3.2 adsorption/cation adsorption**J**1.3.3 budding**J**1.3.4 mechanical/physical/hoeing**J**1.3.5 precision farming/
agricultural technology**J**

(5 x 2) (10)

QUESTION 1.41.4.1 **Hydrogen/Aluminium/Ammonium /H⁺
/Al³⁺ /NH₄⁺ /**1.4.2 **hetero-trophic/parasitic/
saprophytic /**1.4.3 **Rhizomes/runners/stolons /**1.4.4 **vectors /**1.4.5 **Hydroponics/aquaculture /**

(5 x 1) (5)

SECTION B**QUESTION 2****2.1 SALINE SOILS**

- 2.1.1
- the upward motion/movement of water with dissolved salts from the soil water table ✓
 - through the micro-pores ✓
 - carrying the salt upwards/salt accumulates on surface ✓
- (any 2) (2)

- 2.1.2
- occurs naturally from minerals in the rock ✓
 - solutes in irrigation water ✓
 - warm climate and low rainfall conditions ✓
 - in very hot conditions evaporation rates are very high ✓
- (any 3) (3)

- 2.1.3
- Bare patches occur in cultivated fields/kills plants/toxic to plants/lower productivity of plants ✓
 - Soil surface becomes powdery/leads to poor soil structure/soil becomes erodable ✓
 - High salt concentration causes plasmolysis/no osmosis/wilting/exosmosis ✓
- (any 2) (2)

- 2.1.4
- When soil is irrigated with brackish water – provision to remove excess salts ✓
 - Heavier irrigation with longer intervals provided drainage is adequate ✓
 - Irrigation of soils originating from sedimentary rocks must be done judiciously ✓
 - Dams, irrigation canals and water furrows must be cemented out ✓
 - Good quality irrigation water needed ✓
 - Keep the drainage system in good working order/condition ✓
 - Plant brack resistant crops ✓
- (any 4) (4)

- 2.1.5 Calcium sulphate/Gypsum/plaster of Paris/ Ca SO_4 ✓ (1)

- 2.1.6
- $$\boxed{} \text{Na}^+ + \text{Ca SO}_4 \rightarrow \boxed{\phantom{Ca^{2+}}} \text{Ca}^{2+} + \text{Na}_2 \text{SO}_4$$
- ✓ (2)
[14]

(b) Crop aspects

- Crop tastes superior ✓
 - Vegetables sweeter ✓
 - Vegetables have a longer shelf life/better quality ✓
 - Higher yields ✓
 - Nutrients are better utilised ✓
- (any 1) (2)
[4]

2.5 SOIL EROSION AND ENTERPRISES

- Crop (agronomic) enterprises/grain ✓
 - Horticultural enterprises/fruit/vegetable/ornamental production ✓
 - Timber enterprises/forestation ✓
- [3]
[35]

QUESTION 3**3.1 SOIL SURVEYANCE**

- 3.1.1
- Iron compounds underwent chemical changes /oxidation of iron compounds ✓
 - Haematite/minerals in mother/parent rock ✓
 - Aerobic conditions/enough oxygen/well aerated ✓
 - Well drained and warm/good air:moisture conditions ✓
- (any 3) (3)
- 3.1.2
- Contains iron minerals in soil/haematite/augite ✓
 - Aerobic conditions ✓
 - Soil well drained/Good air to water ratio ✓
 - Suited for deep rooted crops/good growth conditions ✓
- (4)
- 3.1.3
- Clay moves downwards/washed/eluviated from A/topsoil to B horizon/sub soil ✓
 - illuviated into the B horizon/sub soil /from the A horizon/topsoil to the B horizon/sub soil ✓
 - leaching of clay particles with soil water movements ✓ (any 2) (2)
- 3.1.4
- Application of organic material/compost/farm manure/green manure/guano ✓
 - Soil under permanent grass cover/crops with good fibrous root system ✓
 - Ploughing of soil at correct water content ✓
 - Application of lime ✓
 - Crop rotation/ley cropping ✓
- (any 2) (2)

- 3.1.5 (a) Applied at the time of sowing because fertilizers cannot leach easily due to high clay content ✓ (1)
- (b)
- Spray- or micro-irrigation – good sideward movement of water in soil (per application) ✓
 - there can be longer intervals between irrigations ✓
 - more irrigation (addition of water) at one time/less leaching (any 2) (2)
- [14]

3.2 PLUM ORCHARD

- 3.2.1 Cross pollination/Cultivar B is used to supply pollen for cross-pollination with Cultivar A/to repel pest/assist in the increase of fruit production/good fruit setting ✓ (1)
- 3.2.2 Cultivar B is placed in such a way that these trees are evenly spread in the orchard/close to most of the trees/better pollination by pollinating agents ✓ (1)
- 3.2.3
- Insects/bees for cross pollination/good fruit setting ✓
 - The production of honey/wax as a secondary product ✓ (2)
- 3.2.4
- Work space for movement of traffic or orchard workers and workspace not needed in the row ✓
 - More effective light penetration on the sides of trees and not needed in the row ✓
 - Enough root volumes (to the sides) for the trees because roots can reach soil volumes to their sides ✓
 - Reduce the competition effect between trees from next row and in the rows the competition effect is managed (pruning etc.) ✓ (any 2) (2)
- 3.2.5 photosynthesis/vegetative growth ✓✓ (2)
- 3.2.6
- Pruning ✓
 - Trellising ✓
 - Leaf management ✓
 - Row direction ✓
 - Green house/tunnels/hot house ✓ (any 2) (2)
- [10]

3.3 GRAPH ON AGRICULTURAL CHEMICALS

- 3.3.1
- Fungicide – chemical substance used to kill fungi or fungal growth ✓
 - Herbicide – chemical substance used to kill weeds/plants/herbs ✓ (2)

- 3.3.2
- Herbicide/Herbicide expenditure ✓ **and** any 1 of the following:
 - More modern agricultural methods like minimum tillage require more herbicide use ✓
 - more weeds had become resistant to herbicides and require higher doses ✓
 - larger areas might have come into production and require more chemicals/less mechanical control of weeds ✓
 - herbicides have become more expensive ✓
- (2)
[4]

3.4 SOIL SURVEYING

- 3.4.1 **Aim:** To determine the exact agricultural value of your soil and use it accordingly/determine the suitability of the soil for agricultural practices/purposes ✓
- (1)

- 3.4.2 **Included in design:** Steps of surveying process (any order)
- Aerial photographs of a region are taken and studied ✓
 - A preliminary indication of the layout, topography, drainage patterns, etc. is made ✓
 - Survey area is visited and various details are indicated on the aerial photograph ✓
 - A more intensive soil survey is now done, using soil profiles and test holes and identifying the soil profile ✓
 - The morphological properties of the soil are now indicated (depth, colour, texture, structure, mottling, etc.) ✓
 - Interpretation of the final data on a soil map is done and a new strategy for implementation is worked out ✓
- (6)
[7]
[35]

QUESTION 4

4.1 SOIL BACTERIA

- 4.1.1 Rhizobium species/Nodular/Nodule bacteria ✓ (1)
- 4.1.2 Legumes, lucerne, clover, peas, cowpeas, different type of beans, acacias, peanuts/groundnuts, lupin ✓+✓ (any 2) (2)
- 4.1.3
- Mutualism ✓
 - both organisms benefit from this relationship ✓
- (2)

- 4.1.4
- Bacteria make use of nitrogen gas from soil air to synthesise body proteins ✓
 - The bacteria in the nodules convert nitrogen gas (N₂) to ammonia (NH₃) ✓
 - The ammonia (NH₃) dissolves in soil water to form ammonium ions (NH₄⁺) ✓
 - The plant roots can absorb NH₄⁺ ✓
 - Bacteria get carbohydrates from the plant roots ✓
 - Proteins in dead bacteria are converted to ammonium compounds and nitrates ✓
- (4)
[9]

4.2 EARTHWORMS

- 4.2.1
- Location B: highest average = 13,75 or 14 (total / 4) ✓
 - Location A: lowest average = 1,5 or 2 (total / 4) ✓
- (2)
- 4.2.2
- Location A – lowest number of organisms: Area was tilled often which kills organisms/many chemicals used in this area which kill organisms/not much organic material is added to the soil which serves as nutrition for organisms ✓
and
 - Location B – highest number of organisms: back of classroom with little traffic (undisturbed soil)/lots of organic matter added to the soil when grass is cut/no contamination with hazardous chemicals ✓
- (2)
- 4.2.3
- Use less chemicals in garden/add more organic material to soil/only till soil when absolutely necessary ✓
- (1)
[5]

4.3 FERTILISATION PROGRAMME

- 4.3.1
- (a) Urea ✓
very soluble / low unit value ✓
- (2)
- (b) Rock phosphate ✓
improves the release of phosphates/limits phosphate deposition ✓
- (2)
- (c) dolomitic lime ✓
treats acid soil and contains magnesium ✓
- (2)
- 4.3.2
- 400 mm scenario = 85 kg/ha ✓
 - 550 mm scenario = 120 kg/ha ✓
- and**
- higher rainfall has a higher yield potential and therefore needs more nitrogen ✓
 - higher rainfall leads to more leaching which requires more nitrogen application ✓
- vise versa**
- (4)

- 4.3.3
- nitrogen levels in the soil fluctuate too much/leaching ✓
 - decomposition of organic protein ✓
- (any 1) (1)

4.3.4 **N in 3:2:5 (35) is:**

| | | |
|-----------------------------|-----------------------------|-------------|
| $3+2+5 = 10✓$ | $3+2+5 = 10✓$ | |
| $3/10✓ \times 35 ✓$ | or $35/10✓$ | |
| $= 10,5\% \text{ or kg N}✓$ | $= 3 \times 3,5 ✓$ | |
| | $= 10,5\% \text{ or kg N}✓$ | (any 3) (3) |

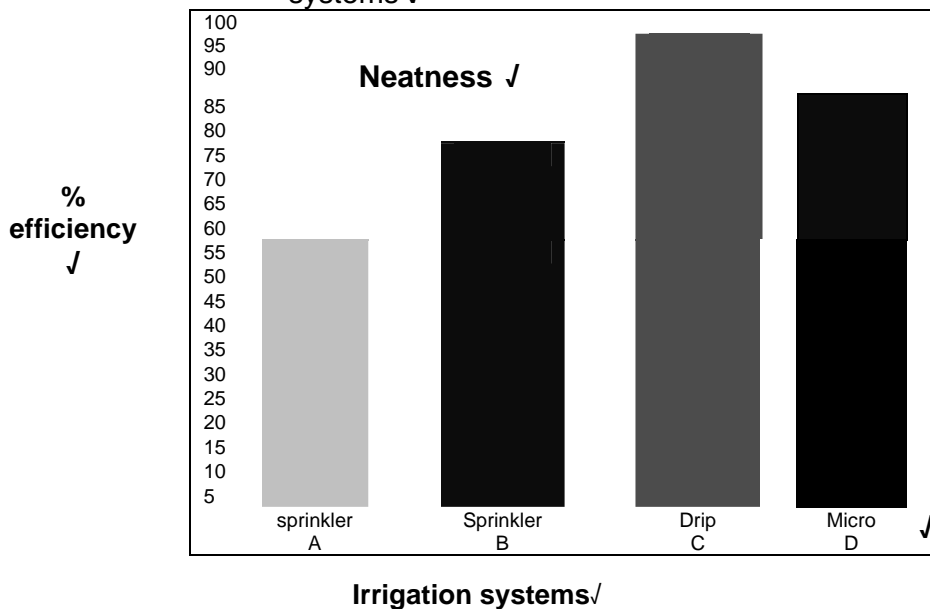
[14]

4.4 **IRRIGATION SYSTEMS**

- 4.4.1
- Irrigation system A: sprinkler irrigation ✓
 - Irrigation system B: drip irrigation/micro irrigation ✓
- (2)

4.4.2 **Graph: Efficiency of irrigation system**

Heading: A comparison of water use efficiency of different irrigation systems ✓



| CRITERIA | INDICATORS | | |
|-------------------------------|--|---|--|
| Heading | No heading 0 | Correct heading 1 | |
| Indicators | No indicators 0 | Only one axis has an correct indicator 1 | Both axes provided with correct indicators 2 |
| Descriptors | No descriptors 0 | All bars have correct descriptors 1 | |
| Neatness, size and proportion | No neat bars and did not use a ruler for lines and no measured distances Not in proportion, incorrect size and wrong scale. 0 | Neatly drawn bars and used a ruler for lines and measured distances and in perfect proportion and correct size and correct scale 1 | |
| TOTAL | (5) | | |

[7]
[35]**TOTAL SECTION B: 105****GRAND TOTAL: 150**