



education

Department:
Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATION - 2007

AGRICULTURAL SCIENCE P1

HIGHER GRADE

MAY/JUNE 2008

MEMORANDUM

MARKS: 200

This memorandum consists of 11 pages.

SECTION A**QUESTION 1****1.1**

1.1.1 C✓✓

1.1.2 D✓✓

1.1.3 A✓✓

1.1.4 A✓✓

1.1.5 B ✓✓

1.1.6 B✓✓

1.1.7 C✓✓

1.1.8 C✓✓

1.1.9 C✓✓

1.1.10 A✓✓

(10 x 2) (20)

1.2

1.2.1 Fertilising✓✓

1.2.2 Soil profile✓✓

1.2.3 Urea✓✓

1.2.4 Calcium ✓✓

1.2.5 Soil form✓✓

(5 x 2) (10)

1.3

1.3.1 Proteins ✓✓

1.3.2 Hydrogen ✓✓

1.3.3 Glucose / Carbohydrates✓✓

1.3.4 Calcium✓✓

1.3.5 Sodium✓✓

(5 x 2) (10)

1.4

- 1.4.1 B✓✓
1.4.2 C✓✓
1.4.3 E✓✓
1.4.4 G✓✓
1.4.5 H✓✓

(5 x 2) (10)

TOTAL SECTION A: 50**SECTION B****QUESTION 2: SOIL SCIENCE**

2.1 Soil horizons

A Horizon:

- Usually topsoil horizon in absence of O – horizon. ✓ (1)
- Consists of mineral particles. ✓ (1)
- Which are mixed with decayed organic matter. ✓ (1)
- Soluble salts (minerals) are leached from this horizon/elluviated layer. ✓ (1)

(Any 2)

C Horizon

- Loose unconsolidated mineral materials. ✓ (1)
- Which include partly weathered rock. ✓ (1)
- No horizon development below it. ✓ (1)

(Any 2)

R Horizon

- Consists of solid rock/consolidated rock. ✓ (1)
- Strictly speaking not a horizon. ✓ (1)
- Parent material for soil (soil minerals). ✓ (1)

(Any 2)

2.2 FOUR factors that influence the development (formation) of aggregates.

- Wetting and drying / alternating moisture and drought ✓ (1)
- Organic matter / colloidal matter in the soil ✓ (1)
- Type of clay mineral ✓ (1)
- The climate ✓ (1)
- Plant roots ✓ (1)

(Any 4)

2.3

2.3.1

- Bulk density = $\frac{M}{V}$ ✓ (1)
- = $\frac{100 \text{ kg}}{5 \text{ m}^3}$ ✓ (1)
- = 20 ✓ kg/ m³ ✓ (2)

- 2.3.2 Difference between micro and macro pores.
- Macro pores are bigger pore spaces that allow free movement of air and percolating water and responsible for adequate aeration ✓✓ (2)
 - Micro pores are smaller pores that restrict the movement of air and water. ✓✓ (2)
- [8]**

2.4

- 2.4.1 Concept "evaporation"
- Loss of water from the soil surface ✓ in the form of vapour ✓ (2)
 - or
 - Water changes from a liquid form to a gas form

- 2.4.2 FOUR ways in which run-off can be prevented
- Redesigning irrigation systems or more effective use of the irrigation system. ✓ (1)
 - Covering soil with either crops or grass. ✓ (1)
 - Light cultivation where crusts tend to form. ✓ (1)
 - Adding organic matter to improve structure and water infiltration. ✓ (1)
 - Constructing field contours, dams and water canals. ✓ (1)
- Any 4 **[6]**

2.5 TWO types of forces which lead to matrix potential

- Adsorption force/Adhesion forces ✓ (1)
- Capillary forces ✓ (1)

2.6 Soil texture

- 2.6.1 36% ✓ to 60% ✓ (2)
- 2.6.2 20% clay ✓ and 25% silt ✓ (2)
- 2.6.3 Loam soil ✓ (1)
- 2.6.4
- Good water retention capacity ✓ (1)
 - Good aeration ✓ (1)
 - Good fertility ✓ (1)
 - Well balanced particle composition ✓ (1)

Senior Certificate Examination
Memorandum

- Easy to cultivate/plough/till ✓ (1)
- (Any 2) [7]

2.7 Process of transpiration

- This is the process by which water vapour is lost ✓ (1)
- Through the stomata of the leaves/plant parts. ✓ (2)

[35]

QUESTION 33.1 **Organic matter**

- Remains of plants and animals. ✓ (1)
- Can see origin (leaf, stem, root, etc) and be handled. ✓ (1)
- It is of any colour depending on the conditions at that particular moment. ✓ (1)

Humus

- Final product of decomposition of organic matter. ✓ (1)
- Original origin cannot be recognised when handled. ✓ (1)
- Usually indicated by dark colour in the soil. ✓ (1)
- It is a colloidal mass ✓ (1)
- It has large influence on physical and chemical composition of soil. ✓ (1)

Any 4 (two from each)

3.2 Five factors that influence soil temperature

- Radiation and reflection of rays of the sun / absorption and loss of solar energy. ✓ (1)
- Moisture content of the soil. ✓ (1)
- Orientation of the land / soil slope. ✓ (1)
- Soil colour. ✓ (1)
- Soil depth. ✓ (1)
- Vegetation. ✓ (1)
- Seasonal changes. ✓ (1)

(Any 5)

3.3 FOUR groups of clay minerals

- Illite. ✓ (1)
- Vermiculite. ✓ (1)
- Montmorillonite. ✓ (1)
- Kaolinite. ✓ (1)

3.4 Type of soil colloids

- Organic colloid / Humus. ✓ (1)
- Inorganic colloid / Clay mineral. ✓ (1)

3.5 Soil definition by equation

- S = Soil ✓ (1)
 f = function ✓ (1)
 P = Parent material ✓ (1)
 R = Topography (Region) ✓ (1)
 Cl = Climate ✓ (1)
 O = Organisms / Vegetation ✓ (1)
 T = Time ✓ (1)

Senior Certificate Examination
Memorandum

- 3.6 FOUR functions of oxygen
- Respiration of plant roots and microbes. ✓ (1)
 - Germination of seeds. ✓ (1)
 - Essential for chemical processes like oxidation. ✓ (1)
 - Essential for the decay of organic matter. ✓ (1)
 - Reduces toxic substances. ✓ (1)
- (Any 4)
- 3.7 Factors influencing speed of cation exchange
- The type of cation. ✓ (1)
 - The concentration of the cations on the soil colloid. ✓ (1)
- 3.8 FIVE effects of alkalinity in soil
- Hydrolysis of sodium in the soil solution causes the pH to rise to above 8.5 ✓ (1)
 - and plant tissues are harmed. ✓ (1)
 - Deflocculating effect of sodium ion ✓ (1)
 - causes the soil to become structureless. ✓ (1)
 - Strong prismatic structure develops in the subsoil due to black brack. ✓ (1)
 - Organic matter dissolves in soil solution causing the soil to be black. ✓ (1)
 - Humus colloids are removed and result in poor soil structure. ✓ (1)
- (Any 5)
- 3.9 TWO major ways of soil erosion
- Physical erosion. ✓ (1)
 - Chemical erosion. ✓ (1)
 - Biological erosion. ✓ (1)
- (Any 2)

[35]**QUESTION 4**

- 4.1 TWO requirements for fruit setting
- Fertilisation ✓ (1)
 - Pollination ✓ (1)
- 4.2 Asexual reproduction concepts in agriculture
- 4.2.1 Rhizomes
- A thickened underground stem ✓ which grows more or less parallel to the soil surface ✓ (2)
- 4.2.2 Bulbs
- A short disc-shaped underground stem ✓ with a number of fleshy scale leaves in which food is stored ✓ (2)

Senior Certificate Examination
Memorandum

- 4.2.3 Runners
- Side shoots with very long joints or internodes✓ which develop adventitious roots where the shoot touches the ground✓ (2)
- 4.2.4 Tubers
- A short, thickened underground stem✓ in which food is stored✓ (2)
- 4.2.5 Budding
- The transferring of a part of one plant to another plant✓ of the same botanical species✓ in such a way that the bark section of the two plants touches one another intimately✓ (2)
(Any 2)
- 4.3 • Starch-free seed✓ (1)
- 4.4
- 4.4.1 Labels of parts A to F
- A: Endocarp✓ (1)
 - B: Seed✓ (1)
 - C: Placenta✓ (1)
 - D: Fruit locule✓ (1)
 - E: Remains of style and calyx✓ (1)
 - F: Pericarp✓ (1)
- 4.4.2 Class of the fruit
- Accessory fruit / Apple✓ (1)
- [7]**
- 4.5 FOUR factors causing abscission
- Biological factors✓ (1)
 - Climatic factors✓ (1)
 - Spraying of trees✓ (1)
 - Soil factors✓ (1)
- 4.6 Fertilisation in plant reproduction
- The union of the haploid gametes ✓of the male and female ✓to form a diploid zygote✓ (2)
(Any 2)
- 4.7 THREE agents of cross pollination
- Rainfall / water✓ (1)
 - Animals / insects / birds / bats / mice✓ (1)
 - Wind✓ (1)

Senior Certificate Examination
Memorandum

- 4.8 FOUR functions of Auxins
- Elongation of stem cells✓ (1)
 - Inhibition of abscission✓ (1)
 - Rapid fruit growth✓ (1)
 - Initiation of lateral root formation / stimulate root growth of cuttings✓ (1)
 - Vegetative phototropism(positive and negative)✓ (1)
 - Positive and negative geotropism✓ (1)
 - Inhibition of lateral bud development✓ (1)
 - Used as herbicides for broad-leafed plants. ✓ (1)
- (Any 4)
- 4.9 TWO methods of plant breeding
- Purposeful crossing✓ (1)
 - Random crossing✓ (1)
 - Radiation (mutations)✓ (1)
- (Any 2)

[35]**QUESTION 5: PLANT NUTRITION**

- 5.1 Manipulation of plants to increase photosynthesis
- 5.1.1 (a) High density type of planting/narrow spacing
- Edranol cultivar ✓ because it: (1)
 - grows upright. ✓ (1)
 - has no overcrowding/overshadowing of branches. ✓ (1)
 - allows more penetration of sunlight✓ (1)
- Any 2 reasons
- (b) Low density planting/wide spacing
- Fuerte cultivar✓ because: (1)
 - of its large size and spreading habit, ✓ (1)
 - its branches are easily overshadowed due to overcrowding✓ (1)
 - sunlight penetration is less✓ (1)
- Any 2 reasons
- 5.1.2 Two ways to manipulate the Fuerte trees to increase photosynthesis
- Pruning✓ (1)
 - Low density planting/wide spacing✓ (1)
 - Trellising✓ (1)
 - Bend branches✓ (1)
 - Nutrition/chemicals/growth stimulants✓ (1)
- (any 2) **[8]**

5.2

5.2.1 Macro-element that influences phase/stage of plant growth

- (a) Stage A: Nitrogen. ✓ (1)
- (b) Stage B: Phosphorous. ✓ (1)
- (c) Stage C: Nitrogen. ✓ (1)
- (d) Stage D: Phosphorous/ potassium. ✓ (1)
- (e) Stage E: Phosphorous/potassium. ✓ (1)

5.2.2 Letter of the diagram representing the sexual phase

- B ✓ (1)
- [6]**

5.3 Factors that influence photosynthesis

5.3.1 Sufficient sunlight:

- Light intensity and light period determine the tempo/speed of photosynthesis. ✓ (1)
 - Greater intensities degrade chlorophyll. ✓ (1)
 - Optimal light conditions will give optimal rate of photosynthesis. ✓ (1)
- (Any 2)

5.3.2 Suitable temperature:

- If the temperature is too high, the enzymes cannot function normally. ✓ (1)
 - If the temperature is too low the enzymes cannot function normally. ✓ (1)
 - Maximum rate of photosynthesis is reached at the optimum temperature of 37^oC. ✓ (1)
- (Any 2)

5.3.3 Optimal soil moisture content

- Enough accessible water is essential for photosynthesis during the light phase (photolysis). ✓ (1)
 - Water is also essential for the normal functioning of plants physiological process (turgidity). ✓ (1)
 - Low water content will result in a low photosynthesis rate. ✓ (1)
 - High water content will result in high photosynthesis rate. ✓ (1)
- (Any 2)

- 5.3.4 Enough carbon dioxide
- The higher the carbon dioxide concentration, the greater is the tempo of photosynthesis. ✓ (1)
 - The lower the carbon dioxide concentration, the lower the tempo of photosynthesis. ✓ (1)
 - CO₂ is a basic necessity for the dark reactions in the synthesis of carbohydrates. ✓ (1)
- (Any 2) **[8]**

5.4

- 5.4.1 The cause of “internal cork” in apples
- Boron (B) ✓ – micro-element ✓ (2)
- 5.4.2 Chlorosis at leaf edge with cup-shape:
- Copper (Cu) ✓ – micro-element ✓ (2)
- 5.4.3 Intervarial chlorosis of young leaves assuming “ little leaf” shape
- Zinc (Zn) ✓ – micro-element ✓ (2)
- [6]**

5.5 Calculate its phosphorous content in %

$$\frac{3}{9} \times \frac{25}{1} \checkmark \quad (1)$$

$$= \frac{25}{3} \checkmark \quad (1)$$

$$= \underline{8.3\% \checkmark} \rightarrow \quad (1)$$

5.6 FIVE functions of water in plants

- Required for the light reaction of photosynthesis. ✓ (1)
 - Required for the dark reaction of photosynthesis. ✓ (1)
 - Hydrolyses stored plants nutrients/important solvent. ✓ (1)
 - Provides mechanical rigidity. ✓ (1)
 - Serves as a transport medium within the plant. ✓ (1)
 - It has a cooling/stabilising influence on the plant temperature. ✓ (1)
- (Any 5)

5.7	FOUR factors that influence the composition of farm manure	
	• The type of feed/ration✓	(1)
	• The age of the manure✓	(1)
	• Storing of the manure✓	(1)
	• The type of animal✓	(1)
	• The age of the animal✓	(1)
		(Any 4)
5.8	Fertilising practices	
5.8.1	Foliar/leaf application/broadcasting✓	(1)
5.8.2	Foliar/leaf/aerial application✓	(1)
5.8.3	Band application✓	(1)
5.8.4	Foliar/leaf application✓	(1)
5.8.5	Broadcasting/fertigation/liquid application✓	(1)
		[5]
		[45]
	TOTAL SECTION A	50
	TOTAL SECTION B	150
	GRAND TOTAL	200