education

Department:
Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATION – 2008

AGRICULTURAL SCIENCE P1

HIGHER GRADE

MAY/JUNE 2008

MARKS: 200

TIME: 2 hours

This paper consists of 13 pages.

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. This question paper consists of TWO sections, namely SECTION A and SECTION B.
3. Answer ALL the questions in an agricultural context in the ANSWER BOOK provided.
4. Start EACH question on a NEW page.
5. Number the answers exactly as the questions are numbered.
6. Read the questions carefully and answer what is asked.
7. Non-programmable calculators may be used.
8. Write neatly and legibly.

SECTION A

QUESTION 1

1.1 Various possible options are provided as answers to the following questions. Choose the answer and write only the letter (A – D) next to the question number (1.1.1 – 1.1.10) in the ANSWER BOOK, for example 1.1.11 D.

1.1.1 The presence of the polar water molecule in the soil causes …

A water to have a high heat capacity.
B weak adhesion forces at the surface of the soil particles.
C soil particles to be electrically charged by induction.
D strong cohesion forces at the surface of the soil particles.

1.1.2 The most desired structural shape for agricultural purposes is a … structure.

A platy
B prismatic
C blocky
D spheroid

1.1.3 When soil particles are large, …

A the total surface area is small.
B the reaction surface is large.
C the total surface area is large.
D None of the above-mentioned

1.1.4 Superphosphate is never used as top-dressing because it …

A hardly moves in the soil.
B is readily available to the plant.
C burns the leaves of plants.
D is easily leached from the soil.

1.1.5 The end products of the light phase of photosynthesis are ...

A oxygen, ADP and NADP.
B oxygen, ATP and $NADPH_2$.
C oxygen, ADP and $NADPH_2$.
D carbon dioxide, ATP and oxygen.

1.1.6 The following chemical reaction represents the equation that occurs in an acid soil when agricultural lime is applied:

A $Ca^{++} + H_2CO_3 \longrightarrow 2H^+ + CaCO_3$
B $2H^+ + CaCO_3 \longrightarrow Ca^{++} + H_2CO_3$
C $2H^+ + CaSO_4 \longrightarrow Ca^{++} + H_2SO_4$
D $Ca^{+\,+} + 2HSO_4 \longrightarrow 2H^+ + CaSO_4$

1.1.7 When a soil sample is taken, the most important factor to remember is that the sample must …

A be placed in an old fertiliser bag.
B weigh 2 kg.
C be representative of the whole area.
D be dispatched as soon as possible.

1.1.8 Plants require the element nitrogen for normal growth. It is absorbed from the soil as ... by plants.

A nitrogen gas
B nitrite ions
C nitrate ions
D urea

1.1.9 The temperature range between 25 ºC to 30 ºC represents the ... range for plant growth for most summer crops.

A minimum
B maximum
C optimum
D critical

1.1.10 Which ONE of the following nitrogenous fertilisers will be most suitable to use on alkaline soil?

A Ammonium sulphate
B Limestone ammonium nitrate
C Urea mixed with gypsum
D Urea mixed with lime (10 x 2) (20)

1.2 Write the agricultural term/phrase for each of the following descriptions next to the question number (1.2.1 – 1.2.5) in the ANSWER BOOK:

1.2.1 The practice that is used by the gardener to replace nutrients that have been removed by previous crops

1.2.2 The vertical exposure of soil layers

1.2.3 The white crystal-like, water-soluble fertiliser that contains 46% nitrogen

1.2.4 The macro-element that is responsible for blossom-end rot in tomatoes when it is deficient

1.2.5 A unique vertical succession of diagnostic horizons (5 x 2) (10)

1.3 The following statements are FALSE. Change the underlined word(s) to make each statement TRUE. Write only the word(s) next to the question number (1.3.1 – 1.3.5) in the ANSWER BOOK.

1.3.1 Carbohydrates consist of long chains of amino acids linked to one another.

1.3.2 Nitrogen ions determine the acidity of a soil solution.

1.3.3 During the dark phase hydrogen atoms react with carbon dioxide to form peptones.

1.3.4 Magnesium is a constituent of middle lamella in plant cells.

1.3.5 The hydrogen ion has a deflocculating effect on soil colloids. (5 x 2) (10)

1.4 Choose a word/term from COLUMN B that best matches a description in COLUMN A. Write only the letter (A – J) next to the question number (1.4.1 – 1.4.5) in the ANSWER BOOK, for example 1.4.6 K.

COLUMN A		**COLUMN B**
1.4.1	Inflorescence of the wheat plant	A sessile
1.4.2	Collection of ovaries formed from a collection of flowers to form a single fruit	B spike C compound fruit
1.4.3	The falling of fruit during the first ten days of formation	D simple fruit E ablactation
1.4.4	The grafting technique that involves diagonal cutting at the bottom of the grafting slip	F tongue grafting G machine grafting
1.4.5	Cells destroyed when the pollen tube grows into the embryo sac	H auxiliary cells I antipodal cells J parthenocarpy

(10)

TOTAL SECTION A: 50

SECTION B

QUESTION 2: SOIL SCIENCE

Start this question on a NEW page.

2.1 Describe the A, C and R horizons, as they would appear in an ideal soil profile. (6)

2.2 Name FOUR factors that influence the development (formation) of aggregates in the soil. (4)

2.3 Answer the following with regard to soil pore spaces:

2.3.1 Given that the mass of soil is 100 kg and its volume is 5 m^3, calculate its bulk density. Also show the formula in your calculations. (4)

2.3.2 Differentiate between micro- and macro-pores. (4)

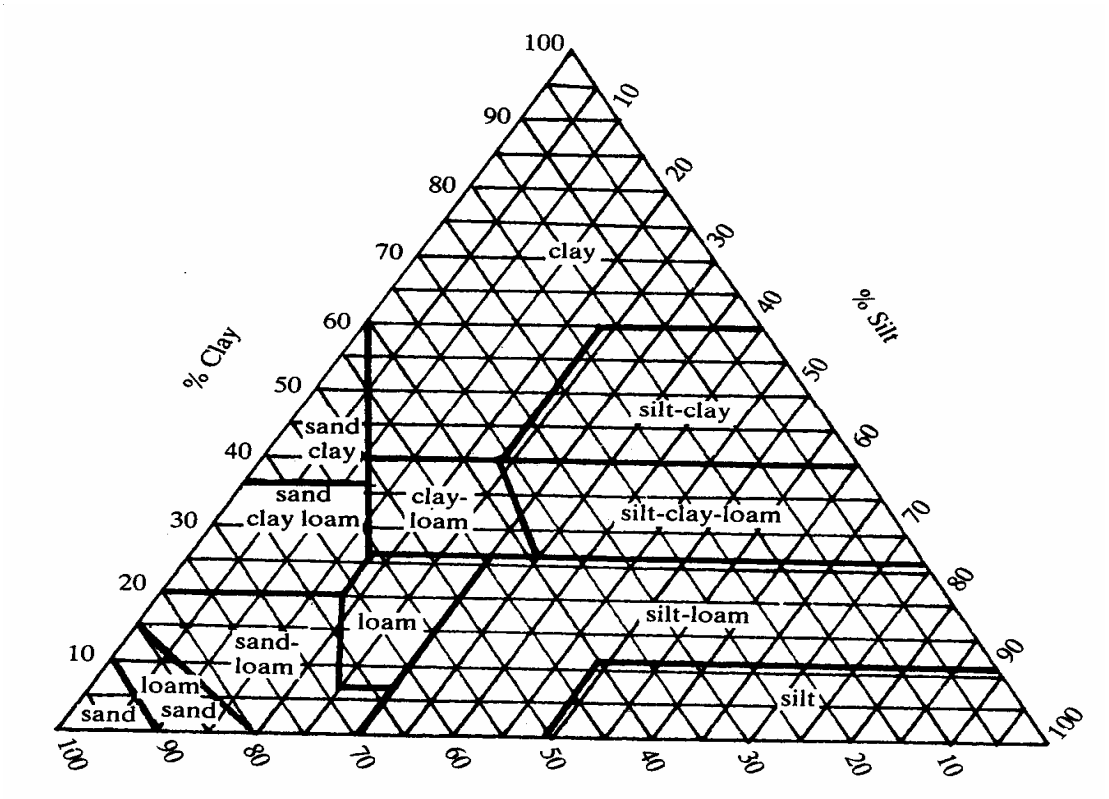
2.4 Answer the following with regard to soil water:

2.4.1 Explain the term *evaporation*. (2)

2.4.2 Indicate FOUR ways in which run-off can be restricted. (4)

2.5 Predict TWO types of forces that lead to the attraction that soil particles and pores have on water (matrix potential). (2)

2.6 The soil texture diagram below is used in South Africa to determine the soil texture classes. Answer QUESTIONS 2.6.1 to 2.6.4.



2.6.1 Determine the range of the clay content (%) of a sand clay soil. (2)

2.6.2 Determine the clay (%) and silt (%) contents respectively of a loam soil with 55% sand content. (2)

2.6.3 Give the texture class best suited to crop production. (1)

2.6.4 Deduce TWO reasons to support your answer to QUESTION 2.6.3. (2)

2.7 Briefly explain the process of transpiration. (2)
[35]

QUESTION 3: SOIL SCIENCE

Start this question on a NEW page.

3.1 Distinguish between fresh organic matter and humus. (4)

3.2 Name FIVE factors that influence soil temperature. (5)

3.3 Clay minerals occur in the soil. Name FOUR groups of clay minerals. (4)

3.4 Identify TWO types of colloidal material found in the soil. (2)

3.5 The definition of the soil formation process is indicated by the following equation. Explain the meaning of each factor in this equation.

S = f(P, R, Cl, O, T) (7)

3.6 Air is an important component of soil. State FOUR functions of oxygen in the soil. (4)

3.7 The speed of cation exchange is mainly determined by two factors. Name these TWO factors. (2)

3.8 Soils can be acid or alkaline depending on certain factors. Critically discuss FIVE effects of alkalinity in the soil. (5)

3.9 The erosion of parent material to form soil is a result of various factors. Indicate TWO major ways by which erosion takes place. (2)
[35]

QUESTION 4: PLANT REPRODUCTION

Start this question on a NEW page.

4.1 Name the TWO most important requirements for normal fruit setting to take place. (2)

4.2 Briefly explain what is understood by the following asexual reproduction terms in agriculture:

4.2.1 Rhizomes (2)

4.2.2 Bulbs (2)

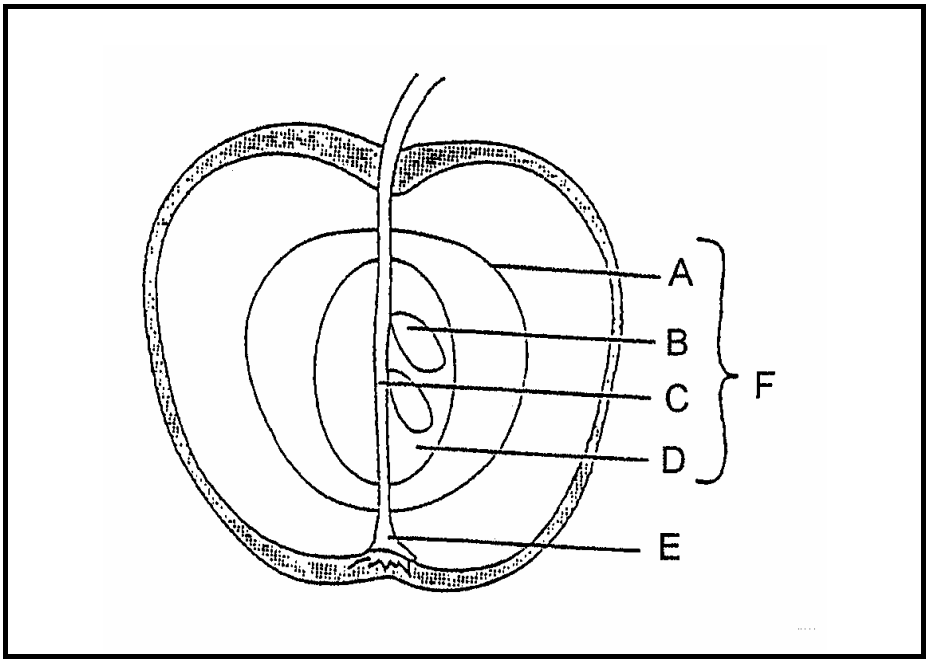
4.2.3 Runners (2)

4.2.4 Tubers (2)

4.2.5 Budding (2)

4.3 What do you call a seed where starch is being absorbed by the embryo and the rest of the seed does not contain any starch? (1)

4.4 The diagram below represents a cross-section of a fruit.



4.4.1 Name the parts labelled A to F in your ANSWER BOOK. (6)

4.4.2 Name the type of fruit illustrated by the diagram above. (1)

4.5 Identify FOUR main factors causing ablactation of fruits in plant reproduction. (4)

4.6 Briefly explain fertilisation in plant reproduction. (2)

4.7 Identify THREE main agents of cross-pollination in plant reproduction. (3)

4.8 State FOUR functions of auxins as chemical factors (hormones) in plant reproduction. (4)

4.9 State TWO methods generally used for plant breeding. (2)
[35]

QUESTION 5: PLANT NUTRITION

Start this question on a NEW page.

5.1 The following information about Fuerte and Edranol avocado cultivars was presented to the horticulturist who intends to plant them and maximise production per hectare.

AVOCADO CULTIVAR	TREE GROWTH HABIT
Fuerte	Large and spreading
Edranol	Upright and slow-growing

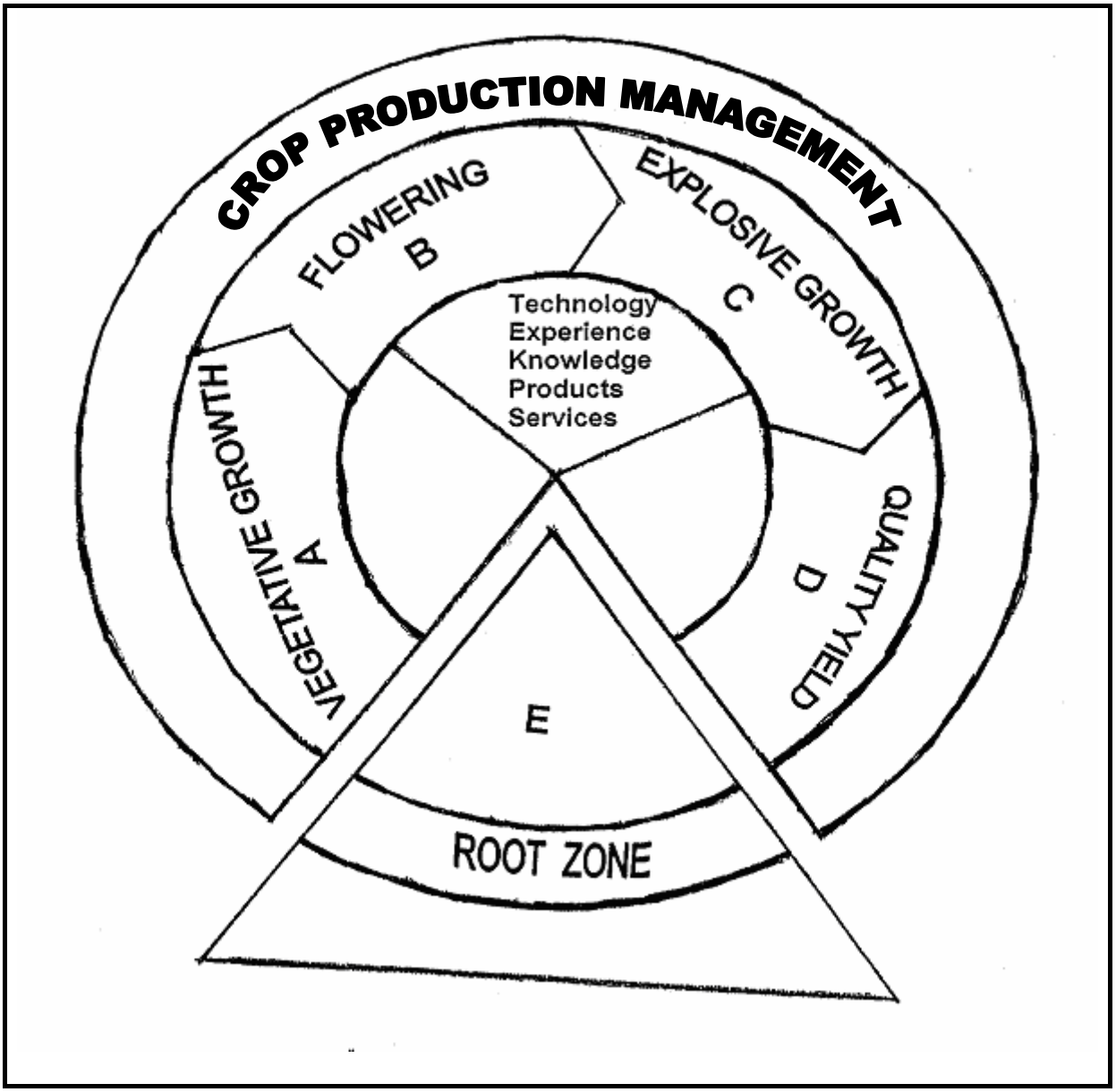
5.1.1 Suggest a suitable cultivar (from the above) that may be planted according to EACH of the following types of plant population and give TWO reasons for your choice:

(a) High-density planting/narrow spacing (3)

(b) Low-density planting/wide spacing (3)

5.1.2 Name TWO ways by which the horticulturist may manipulate the Fuerte trees to increase the rate of photosynthesis in the orchard. (2)

5.2 The accompanying diagram depicts plant nutrition. The farmer manages crop production based on the nutritional application needed in a balanced way. The crop's growth pattern has four stages/phases (A to D) and the root zone (E) as the basis for growth.



[Source: *Farmer's Weekly*]

5.2.1 Suggest the most suitable macro-element that influences each phase/stage indicated below:

(a) Stage A (1)

(b) Stage B (1)

(c) Stage C (1)

(d) Stage D (1)

(e) Stage E (1)

5.2.2 Which letter of the diagram represents the reproductive phase of the crop's growth? (1)

5.3 Briefly explain how each of the following factors will influence the biochemical process of photosynthesis:

5.3.1 Sufficient sunlight (2)

5.3.2 Suitable temperature (2)

5.3.3 Optimal soil moisture content (2)

5.3.4 Enough carbon dioxide (2)

5.4 Identify the elements that may be associated with the following deficiencies in plant nutrition. Write down the name of the element and next to each indicate whether it is a macro-element or micro-element, for example: Nitrogen: macro-element.

5.4.1 The cause of internal cork in apples (2)

5.4.2 Chlorosis at leaf edge with a cup-shaped appearance (2)

5.4.3 Intervenial chlorosis of young leaves resulting in little leaf shape (2)

5.5 A fertiliser bag has a composition of 2:3:4 (25). Calculate its phosphorous content as a percentage. Show ALL the calculations. (3)

5.6 Name FIVE functions of water in plants. (5)

5.7 Indicate FOUR factors that influence the composition of farm manure. (4)

5.8 Name the fertilising practice you would apply under each of the following conditions:

5.8.1 Fertilising a dry land vineyard after harvest (1)

5.8.2 Fertilising with nitrogen fertiliser a mature dry-land maize crop with a dense (narrow) plant density (1)

5.8.3 Fertilising of a very quick-growing crop in poor soil during sowing time (1)

5.8.4 Applying a micro-element needed on a land where one has to do pest control (1)

5.8.5 Fertilising pastures in the cheapest possible way (1)
[45]

TOTAL SECTION B: 150
GRAND TOTAL: 200