education

Department:
Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATION - 2007

AGRICULTURAL SCIENCE P1

HIGHER GRADE

FEBRUARY/MARCH 2007

802-1/1

MARKS: 200

TIME: 2 hours

AGRICULTURAL SCIENCE HG: Paper 1

802 1 1E HG

X05

This question paper consists of 11 pages.

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INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. This question paper consists of TWO sections: SECTION A and SECTION B.
3. Answer ALL the questions in the 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. Write neatly and legibly.
8. Non-programmable calculators may be used.

SECTION A

QUESTION 1

1.1 Various possible options are provided as answers for the following questions. Write only the letter (A – D) of the most correct answer next to the question number (1.1.1 - 1.1.10) in the answer book, for example: 1.1.11 D.

1.1.1 A soil profile refers to the ...

A longitudinal appearance of the horizons.
B vertical appearance of the horizons.
C appearance of the upper layer of the soil .
D appearance of the substrata horizons. (2)

1.1.2 The attraction of water molecules to an object that is in a solid phase is called ...

A absorption.
B gravitational potential.
C adsorption.
D matrix potential. (2)

1.1.3 Bulk density refers to the ...

A mass of a soil sample.
B total volume of a soil sample.
C ratio of the mass to the total volume of the soil sample.
D addition of water to a dry soil so as to increase its weight. (2)

1.1.4 The colloid that possesses the highest cation adsorption capacity is ...

A kaolinite clay.
B illite clay.
C the organic colloid.
D montmorillonite clay. (2)

1.1.5 The slope in South Africa to be avoided because of frost damage to plants is the ... slope.

A northern
B western
C southern
D eastern (2)

1.1.6 The fertiliser, which has the most acidifying effect on soil, is ...

A LAN.
B urea.
C ammonium sulphate.
D potassium sulphate. (2)

1.1.7 'Whiptail' in cabbage is an indication of deficiency of ...

A boron.
B copper.
C zinc.
D molybdenum. (2)

1.1.8 The nutrient which stimulates flower formation, seed and fruit production is ...

A phosphorus.
B calcium.
C potassium.
D nitrogen. (2)

1.1.9 The active absorption of plant nutrients takes place by means of ...

A osmosis.
B absorption.
C carrier molecules.
D diffusion. (2)

1.1.10 Applying ... can assist in the treatment of alkaline soils.

A calcium carbonate
B ammonium sulphate
C superphosphate
D organic matter (2)

1.2 Choose the description from COLUMN B that best matches the word(s) in COLUMN A. Write only the letter (A - H) next to the question number (1.2.1 - 1.2.5) in the answer book, for example 1.2.6 I.

	COLUMN A		COLUMN B
1.2.1	Artificial cross-pollination	A	attached to the egg cell
1.2.2	Gibberellic acid	B	the structure covering the seed
1.2.3	Testa	C	fruits that develop directly from the ovary
1.2.4	Spike	D	hormone used to produce seedless fruit
1.2.5	Vegetative parthenocarpy	E	crossing of selected parent plants with the aim of breeding new cultivars
		F	inflorescence of the wheat flower
		G	fruit which develops without the stimulus of pollination
		H	fruit that develops after the fruit formation has been stimulated by hormones (5 x 2)

(10)

1.3 Write the agricultural term for each of the following statements next to the question number (1.3.1 - 1.3.5) in the answer book:

1.3.1 The major soil horizon that occurs under very high rainfall conditions (2)

1.3.2 The type of soil texture that has the highest cohesion and plasticity (2)

1.3.3 The name given to the highly decomposed form of organic matter that is dark and without specific shape (2)

1.3.4 The type of cell division which takes place just after fertilisation (2)

1.3.5 The uniform spreading of fertilisers over a planted area (2)

1.4 The following statements are FALSE. Change the underlined word(s) to make each statement TRUE. Write only the correct word(s) next to the question number (1.4.1 - 1.4.5) in the answer book.

1.4.1 The sodium ions have a flocculation effect on soil colloids, causing the soil to be structureless.

1.4.2 Mulching is the addition to the soil of plant material still in an immature succulent stage.

1.4.3 Hydration is the reaction of water with minerals to form new softer minerals.

1.4.4 Depending on the type of clays present in a soil, the quantity of cations absorbed may differ.

1.4.5 The R-horizon is rich in organic material. (5 x 2) (10)

TOTAL SECTION A: 50

SECTION B

QUESTION 2: SOIL SCIENCE

Start this question on a NEW page.

2.1 Indicate the form of water loss that can be prevented or reduced through the application of the following measures:

2.1.1 Making contour walls (1)

2.1.2 Growing wind breaks (1)

2.1.3 Guarding against excessive nitrogen fertilising (1)

2.1.4 Controlling irrigation (1)

2.1.5 Soil mulching (1)

2.1.6 Weed control (1)

2.2 Compare clay and sandy soils under the following headings:

2.2.1 Tillability (2)

2.2.2 Water storage (2)

2.2.3 Aeration (2)

2.3 The following questions are based on soil pore space:

2.3.1 Define *soil pore space.* (2)

2.3.2 Briefly explain how soil pore space will be influenced by texture of the soil. (3)

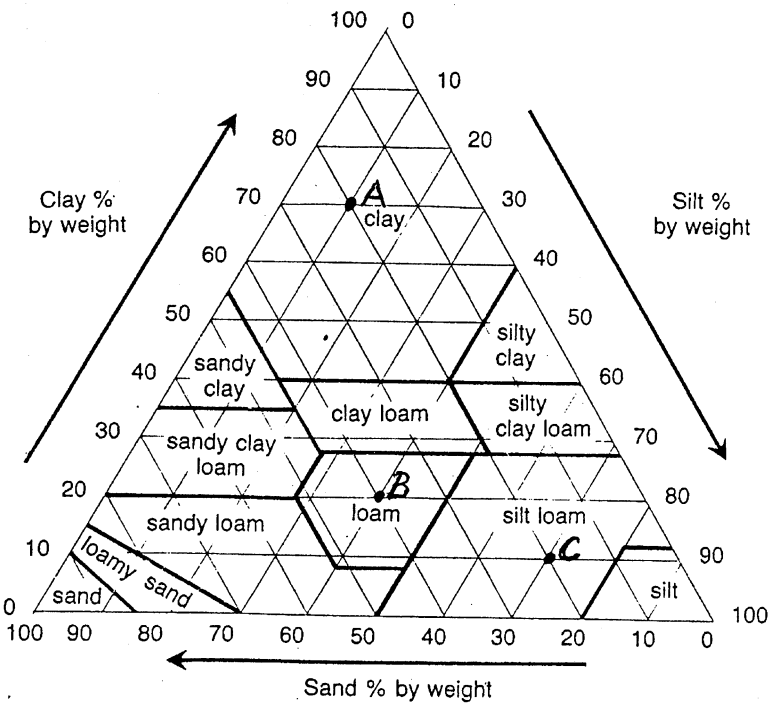
2.4 Explain how the water-retention capacity of the soil can be influenced by the following factors:

2.4.1 Soil texture (3)

2.4.2 Organic matter content (2)

2.5 Soil texture has an important influence on the ability of soil to perform certain functions such as tillability. State THREE other physical properties of soil texture that may influence crop production. (3)

2.6 The diagram below represents the textural triangle diagram. Answer the questions that follow:



2.6.1 Name the soil texture types that are dominant at points A and C. (2)

2.6.2 Indicate the % of clay, silt and sand at points A and B. (6)

2.7 The composition of the water molecule determines its ability to interact in soil and plant reactions. Indicate the electrical charge distribution on a water molecule. (2)

[35]

QUESTION 3: SOIL SCIENCE

Start this question on a NEW page.

3.1 Briefly differentiate between oxidation and reduction as soil forming processes. (4)

3.2 Discuss the influence of soil temperature on crop production by referring to the following factors:

3.2.1 Frost damage (2)

3.2.2 Evaporation and transpiration (2)

3.2.3 Early crops (2)

3.3 Forces of adsorption of cations on colloids depend on THREE factors. Name and explain them. (9)

3.4 Briefly explain what is meant by *soil classification*. (2)

3.5 Indicate any THREE groups of clay minerals, which are formed through chemical weathering of rocks. (3)

3.6 Name FOUR base-forming cations that are found in the soil. (4)

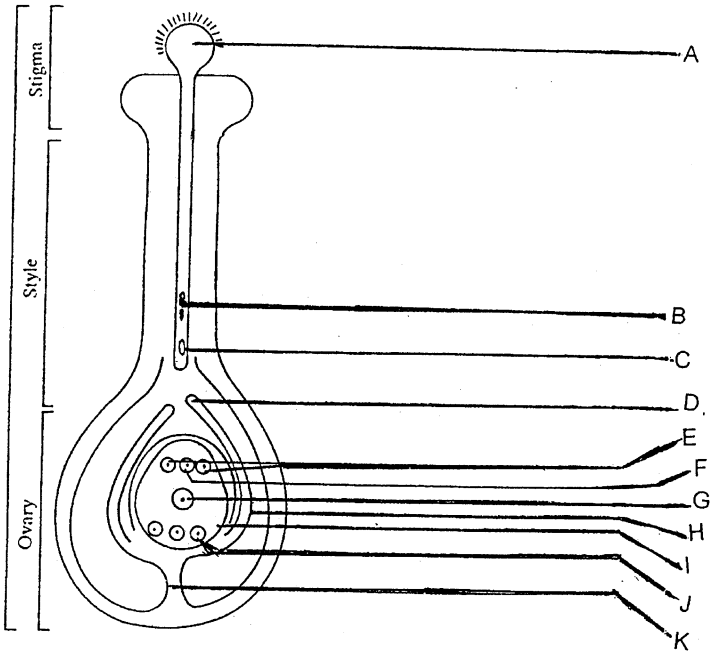
3.7 State FIVE functions of soil as a plant growth medium. (5)

3.8 Define the *cation exchange capacity* of colloids. (2)
[35]

QUESTION 4: PLANT REPRODUCTION

Start this question on a NEW page.

4.1 Answer the questions based on the following diagram.



4.1.1 Identify parts labelled A, B, C, D, F, I and K. (7)

4.1.2 What are the functions of parts labelled B and C? (2)

4.1.3 Briefly explain what happens to parts E and H after fertilisation. (2)

4.1.4 Describe the development of a pollen grain from the stigma into the ovule. (5)

4.2 Briefly explain the meaning of stimulative parthenocarpy and give an example. (3)

4.3 Beehives are placed in a plum tree orchard. Explain the relationship between insects and plum trees that results in cross-pollination. (5)

4.4 Describe the structures from which the following fruits developed:

4.4.1 Accessory fruit (2)

4.4.2 Multiple fruit (2)

4.4.3 Compound fruit (2)

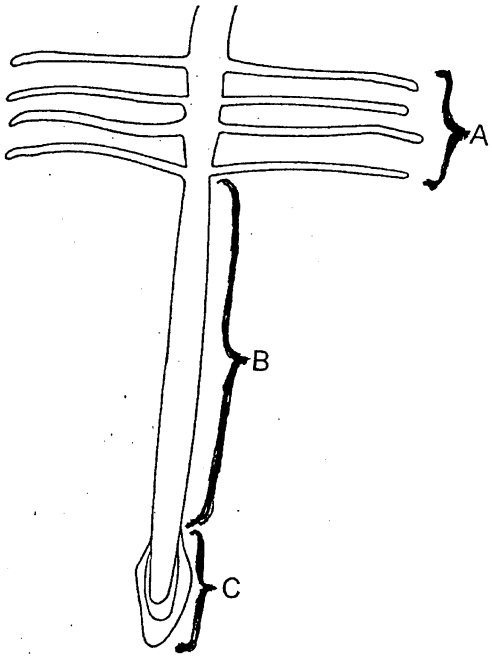
4.5 Name THREE grafting techniques. (3)

4.6 Define *fruit setting.* (2)
[35]

QUESTION 5: PLANT NUTRITION

Start this question on a NEW page.

5.1 The diagram below represents a part of the plant root. Answer the questions that follow:



5.1.1 What are the functions of the parts labelled A, B and C? (3)

5.1.2 Provide the passive process by which plant roots absorb water. (1)

5.1.3 Mention FIVE functions of water in plants. (5)

5.2 The farmer planted lupins, velvet beans and groundnuts and later ploughed them back into the soil while they were still succulent and in an immature state.

5.2.1 What would be the final product of this process after complete decomposition? (1)

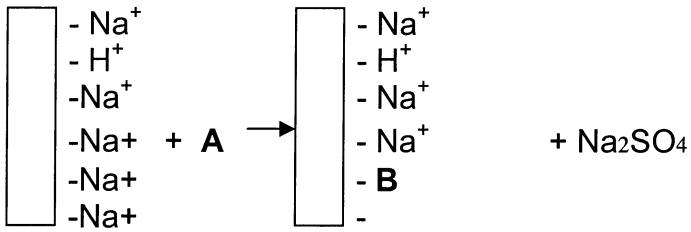
5.2.2 What is the collective term for the crops that are mentioned in this process? (1)

5.2.3 What is the main function of these crops in the soil in relation to the soil microbes? (1)

5.2.4 State FIVE advantages of using this process in the soil. (5)

5.3 Describe the procedure of taking leaf samples until they are ready for dispatch. (6)

5.4 The following diagram illustrates soil that is highly alkaline (brackish) with sodium ions predominantly adsorbed by the colloids. The farmer has taken steps to reclaim it.



5.4.1 What chemical substance does A represent? (1)

5.4.2 What cation does B represent? (1)

5.4.3 Briefly explain how the farmer can reclaim alkaline soil. In your explanation, make use of the above diagram. (5)

5.5 Briefly explain what takes place during splitting of water molecules in the light phase of photosynthesis. (3)

5.6 Define the term *broadcasting* of fertilisers. (2)

5.7 Indicate when and how lime is applied in the agricultural production process. (2)

5.8 Name TWO types of lime commonly used in South Africa and indicate the chemical composition of each type. (6)

5.9 Name TWO fertilisers which are used for foliar application. (2)

[45]

TOTAL SECTION B: 150

GRAND TOTAL: 200