education

Department:
Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATION - 2006

AGRICULTURAL SCIENCE PAPER 1

HIGHER GRADE

OCTOBER/NOVEMBER 2006

802-1/1E

AGRICULTURAL SCIENCE HG: Paper 1

MARKS: 200

TIME: 2 hours

802 1 1E HG

X05

This question paper consists of 13 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 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. 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) 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 gas that is produced during respiration by soil microbes is ...

A oxygen.
B carbon dioxide.
C methane.
D nitrogen. (2)

1.1.2 The form in which soil water is not available to plants is ...

A hygroscopic water.
B free water.
C apparent capillary water.
D true capillary water. (2)

1.1.3 Non-saline black brack soils ...

A have a pH value of less than 8,5.
B have a well-developed structure.
C have a pH value of more than 8,5.
D can be reclaimed easily. (2)

1.1.4 An ion, which is bivalent, is...

A sodium.
B potassium.
C calcium.
D hydrogen. (2)

1.1.5 The gas in the soil that is responsible for dilution of soil oxygen:

A Oxygen
B Nitrogen
C Carbon dioxide
D Water vapour (2)

1.1.6 The top of the pedicel on which the whorls of floral leaves are carried is known as the ...

A apex.
B carpel.
C sepal.
D receptacle. (2)

1.1.7 Application of dolomitic lime will increase the ... content of the soils.

A calcium and sodium
B calcium and manganese
C magnesium and calcium
D magnesium and potassium (2)

1.1.8 The unit value of LAN (28%) was calculated to be R16,00. What is the price of LAN per ton?

A R44,00
B R448,00
C R280,00
D R160,00 (2)

1.1.9 When fruit develops without a stimulus of pollination it is known as ...

A vegetative reproduction.
B sternospermacarpy.
C stimulative parthenocarpy.
D vegetative parthenocarpy. (2)

1.1.10 The nutritional element applied to the pasture field for vegetative growth and a leaf-green colour is ...

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

1.2 Choose an item/word from COLUMN B that matches a description 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	Clay minerals inclined to form blocky structures	A	micropores
1.2.2	Strong cohesive forces	B	high bulk density
1.2.3	Organic colloids	C	loam
1.2.4	Capillary water	D	clay
1.2.5	Low total pore space	E	montmorillonite
		F	sand
		G	amorphous
		H	macropores (5 x 2)

(10)

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

1.3.1 The highly decomposed form of organic matter with a dark colour and without a specific shape (2)

1.3.2 The organs that are utilised to store nutrients in seeds like beans (2)

1.3.3 The removal of some branches in a tree to optimise photosynthesis (2)

1.3.4 The transfer of ripe pollen grains from the anther of one flower to the ripe receptive stigma of another flower on another plant of the same species (2)

1.3.5 A short, disc-shaped underground stem with a few fleshy leaves for food storage (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 loss of water from the green plant leaves through stomata is called evaporation. (2)

1.4.2 Mulching is the addition to the soil of green plant material still in an immature succulent stage. (2)

1.4.3 Capillary water is the type of soil water which percolates deep into the soil surface after heavy rainfall. (2)

1.4.4 The endospermic nucleus controls the growth direction of the pollen tube. (2)

1.4.5 Self-pollinating plants are usually genetically heterozygotic. (2)

TOTAL SECTION A: 50

SECTION B

QUESTION 2: SOIL SCIENCE

Start this question on a NEW page.

2.1 Give a brief description of the following major soil horizons:

2.1.1 O horizon (4)

2.1.2 C horizon (3)

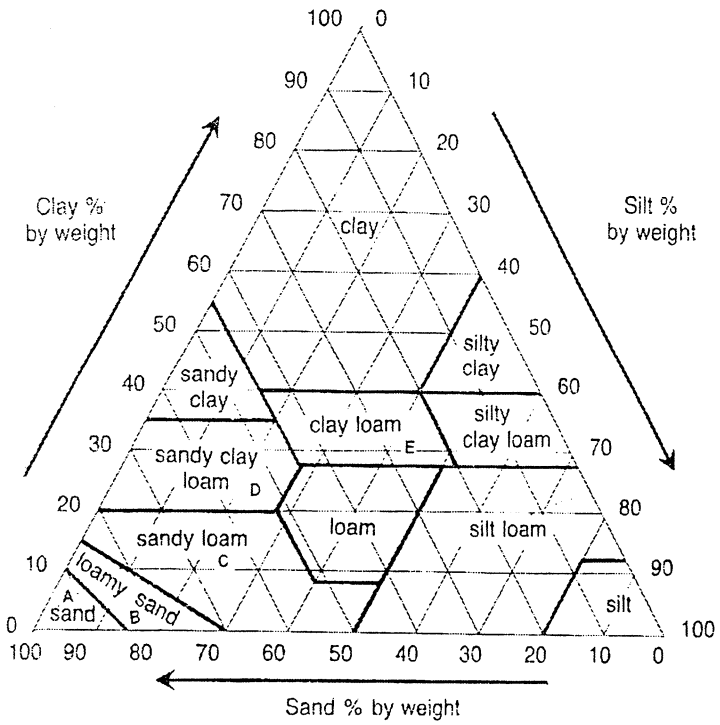
2.2 Differentiate between a soil profile and a soil horizon. (2)

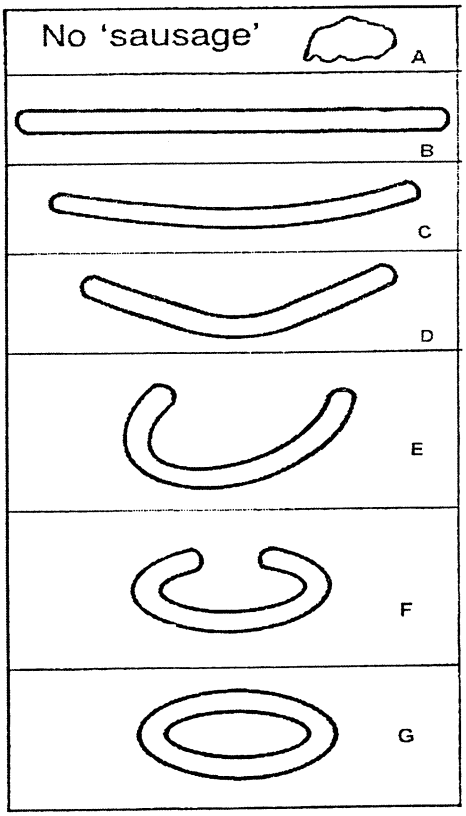
2.3 Mrs Masinga wants you to advise her on the soil that appears on her farm. You observe differences in soil colour and make some deductions.

2.3.1 Give THREE deductions made from soil with a yellow colour. (3)

2.3.2 Give FIVE deductions made from soil with a dark colour. (5)

2.4 When wet soil is rolled into a sausage between the palms of your hand, certain observations can be made as explained below. Use the following diagrams to indicate the type of soil texture classes in each case:





2.4.1 No sausage (1)

2.4.2 Sausage can be formed but cracks upon bending (1)

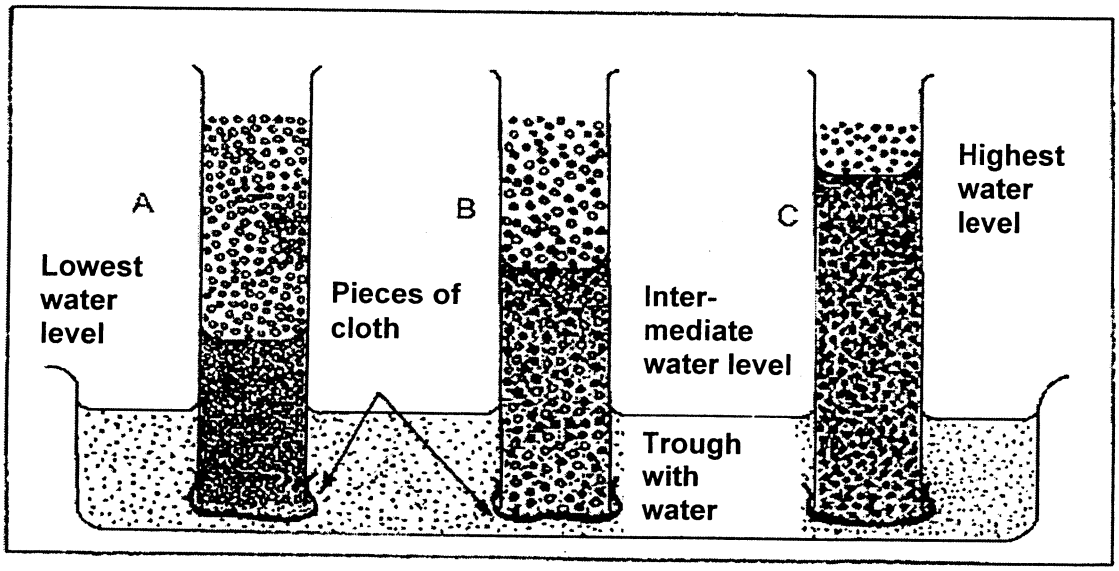
2.4.3 Bends a little (1)

2.4.4 Bends readily before cracking (1)

2.4.5 Bends into a U shape (1)

2.5 Suggest TWO ways in which water losses by percolation (seepage) can be reduced. (2)

2.6 The following diagram indicates three glass tubes A, B and C with open ends, which have been filled with sand, loam and clay soils. The bottom of each glass tube is tightened with a cloth and placed in a large trough filled with water and left standing for 24 hours.



2.6.1 Indicate the letter of the glass tube that has been filled with:

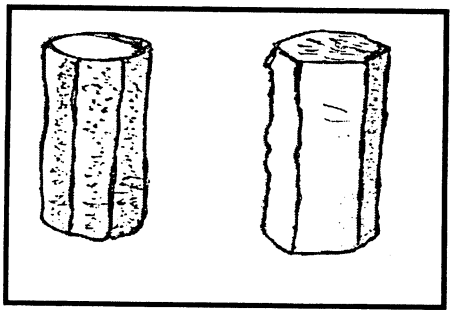
(a) Loam soil (1)

(b) Sand soil (1)

(c) Clay soil (1)

2.6.2 Give reasons to support your answers in QUESTION 2.6.1 by referring to each glass tube indicated in the above-mentioned diagram. (6)

2.7 Identify and describe a soil structure that looks like pillars. Refer to the diagrams below: (2)



[35]

QUESTION 3: SOIL SCIENCE

Start this question on a NEW page.

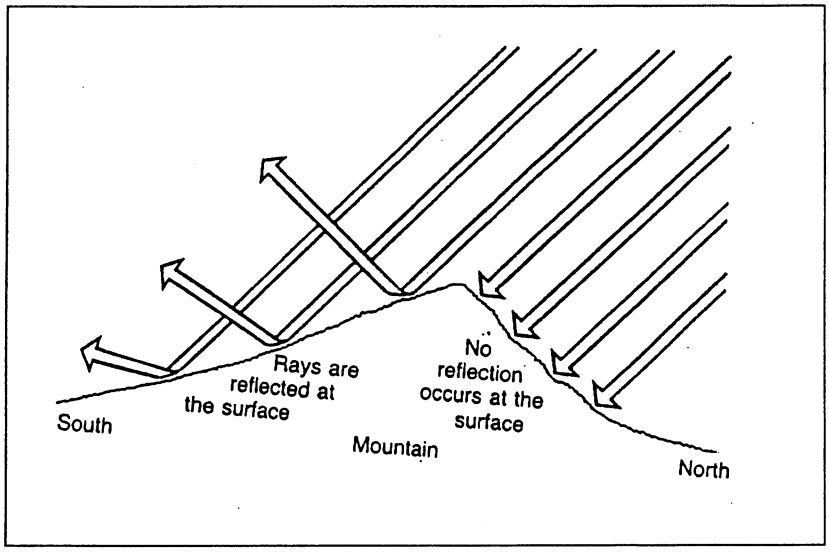
3.1 Briefly discuss chemical weathering of rocks under the following headings:

3.1.1 Hydrolysis (4)

3.1.2 Hydration (4)

3.1.3 Solution/acids (2)

3.2 The following diagram represents the soil slope on a particular farm in South Africa. The farmer has two crops to plant, namely a frost-resistant crop and a frost-sensitive crop. Answer the following questions:



3.2.1 On which slope should the farmer plant a frost-sensitive crop? Why? (2)

3.2.2 On which slope should the farmer plant a frost-resistant crop? Why? (2)

3.2.3 Which of the two slopes is hotter? Give a reason for your answer. (2)

3.2.4 Which slope is ideal for most of the crops? (1)

3.3 The soil colloids have a large quantity of adsorbed sodium (Na^+) and hydrogen (H^+) ions. The soil solution has a high concentration of magnesium (Mg^{++}) and calcium (Ca^{++}) ions.

3.3.1 Explain the process that will take place in the soil. (4)

3.3.2 Give a reason for the occurrence of the process. (1)

3.3.3 How will the soil solution change when potassium chloride (KCl) is applied? (2)

3.4 Indicate the predominant cations and pH levels present in each of the following cases:

3.4.1 Acid soil (2)

3.4.2 Neutral soil (2)

3.4.3 Brackish soil (2)

3.5 State FIVE characteristics of white brack soils. (5)
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QUESTION 4: PLANT REPRODUCTION

Start this question on a NEW page.

4.1 Vegetative parthenocarpy is important in farming.

4.1.1 Give THREE examples of crops in which fruit setting takes place through vegetative parthenocarpy. (3)

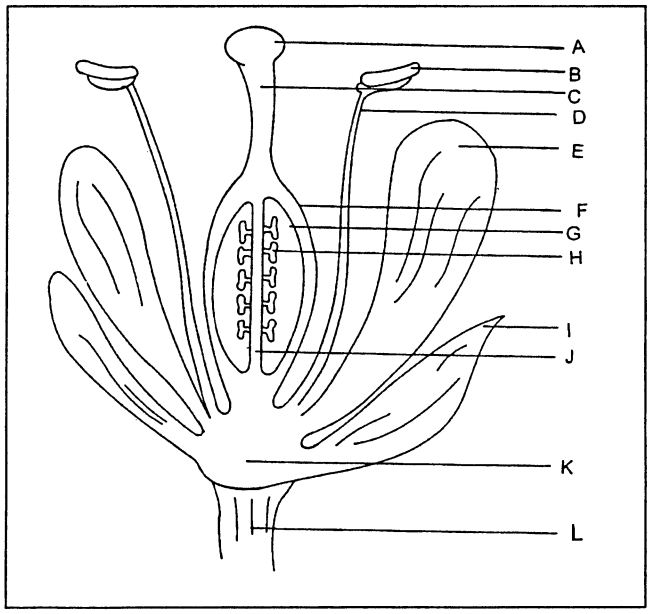
4.1.2 Give TWO examples of crops that are propagated by means of runners in plant reproduction. (2)

4.1.3 Which hormone is sprayed on leaves of plants to obtain bigger fruit? (1)

4.2 State FOUR factors which may cause ablactation in peach trees. (4)

4.3 Which substance is used to seal wounds during grafting? (1)

4.4 Study the following diagram of a dicotyledonous flower and answer the following questions:



4.4.1 Identify the parts labelled A, C, E, G and I. (5)

4.4.2 Give the collective name for parts labelled F, G and H. (1)

4.4.3 Write the letter of the structure in which the female gametes are produced. (1)

4.4.4 Identify the letter which refers to the whorl, which is important for the attraction of insects for pollination. (1)

4.4.5 Which letter represents the part that will develop into a seed? (1)

4.4.6 Which letter represents the protective whorl which protects the flower when it is still in bud? (1)

4.4.7 Does the above drawing represent a monoecious or dioecious flower? Give a reason for your answer. (2)

4.5 A rose flower with brightly coloured petals needs to be pollinated. Which TWO agents could lead to the pollination of this flower? (2)

4.6 Your friend wants to start a nursery. How would you explain the following to him/her:

4.6.1 A rhizome and give TWO examples (4)

4.6.2 Producing trees using slips (2)

4.6.3 Differences between budding and grafting (4)
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QUESTION 5: PLANT NUTRITION

Start this question on a NEW page.

5.1 A maize farmer did a series of tests to determine the optimal yields of different maize population densities.

Test Number	Number of plants/ha	Yield per hectare (tons/ha)
1	7 000	20
2	8 000	40
3	9 000	60
4	10 000	80
5	11 000	70
6	12 000	50
7	13 000	30

5.1.1 Draw a bar graph to represent the test results given in the above table. (NB: Marks will be allocated for correctness, naming and scale of axes.) (5)

5.1.2 Which plant population density provided the highest yield per hectare? (2)

5.1.3 Suggest why there were increases and decreases when the plant density was increased. (3)

5.2 The agronomist wants to fertilise crops using phosphatic fertiliser. The local agricultural cooperative sells superphosphate (11,3%) at R1 865/ton and raw phosphate (12,8%) at R1 958/ton.

5.2.1 Calculate the unit value of these two fertilisers. (6)

5.2.2 Which ONE of these two fertilisers would you recommend to the farmer to buy? Give a reason for your answer. (3)

5.3 Give FOUR reasons for applying fertilisers in liquid form. (4)

5.4 State THREE harmful effects of acid soils on plant growth. (3)

5.5 QUESTIONS 5.5.1 and 5.5.2 are based on the following biochemical equation:

$$6\ CO_2 + 6\ H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$$

5.5.1 State FIVE requirements for this process. (5)

5.5.2 Name THREE of the primary products of this process. (3)

5.6 Name FOUR fertilisers that can be applied through irrigation water. (4)

5.7 Name FOUR methods of fertiliser application. (4)

5.8 List any THREE examples of inorganic fertilisers. (3)
[45]

TOTAL SECTION B: 150

GRAND TOTAL: 200