



education

Department:
Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

AGRICULTURAL SCIENCE P1

EXEMPLAR 2008

MARKS: 150

TIME: 2 hours

This question paper consists of 20 pages and an answer sheet.

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. SECTION A (QUESTION 1) must be answered on the attached ANSWER SHEET.
3. SECTION B (QUESTIONS 2 to 4) must be answered in the ANSWER BOOK.
4. Start each question from SECTION B on a NEW page.
5. Read the questions carefully and make sure you answer what is asked.
6. Number the answers correctly according to the numbering system used in this question paper.
7. Work neatly and legibly.
8. Place your ANSWER SHEET for SECTION A (QUESTION 1) within your ANSWER BOOKLET.

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) on the attached ANSWER SHEET.
- 1.1.1 The soil-water fraction which only moves in the soil as a gas is called ...
- A soaking water.
 - B free water.
 - C hygroscopic water.
 - D capillary water.
- 1.1.2 Base saturation refers to the ...
- A percentage of CO₂ in the soil.
 - B relative amount of adsorbed and exchangeable basic cations.
 - C balance between the hydroxyl and aluminium ions.
 - D amount of Ca²⁺ and Mg²⁺ in the soil solution.
- 1.1.3 The structural unit in soil that best describes pot-clay is a ...
- A blocky structure.
 - B structureless-massive structure.
 - C prism-like structure.
 - D platy structure.
- 1.1.4 The clay mineral that loses K⁺ ions when it erodes, is known as ...
- A montmorillonite.
 - B kaolinite.
 - C vermiculite.
 - D illite.
- 1.1.5 Photosynthesis can be represented as follows:
- A $6\text{H}_2\text{O} + 6\text{O}_2 + \text{energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{CO}_2$
 - B $6\text{CO}_2 + 6\text{H}_2\text{O} + \text{energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$
 - C $\text{C}_6\text{H}_{12}\text{O}_2 + 6\text{O}_2 + \text{energy} \rightarrow 6\text{O}_2 + \text{H}_2\text{O}$
 - D $\text{H}_2\text{O} + \text{CO}_2 + \text{energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + \text{energy}$

- 1.1.6 Which of the following is NOT a characteristic of viruses?
- A Plants are small and unproductive.
 - B Millions of microscopic spores are produced that germinate under favourable conditions.
 - C Much smaller than bacteria and can only be seen with powerful electron microscopes.
 - D A viral infection results in low yield and poor quality.
- 1.1.7 The following methods can be used to control pests and diseases organically.
- i Use a pesticide bait made with sugar.
 - ii Do not overcrowd plants.
 - iii Use crop rotation.
 - iv Plant into soil that drains well.
- A i, ii and iii
 - B i, iii and iv
 - C ii, iii and iv
 - D i, ii and iv
- 1.1.8 The primary responsibility of the farming industry is to produce maximum raw materials and food, respecting the principle of ...
- A optimal soil utilisation.
 - B maximal profit generation.
 - C optimal resource utilisation.
 - D maximum turnover.
- 1.1.9 One of the three targets stated in the Agri BEE framework is ...
- A keeping to the Land Tenure Rights Act (1966).
 - B restitution, redistribution and tenure reform.
 - C 30% of land to be transferred to black farmers by 2014.
 - D 2% of land to be made available to farm workers.
- 1.1.10 A soil survey is a means through which the ... of each management unit is assessed.
- A drainage potential
 - B soil texture classification
 - C soil fertility status
 - D general production potential
- (10 x 2) (20)

- 1.2 In the table below a statement with two possible answers are given. Decide whether the statement in COLUMN B relates to ONE, BOTH or NONE of the answers in COLUMN A and write only the letter (A – D) next to the question number (1.2.1 – 1.2.5) on the attached ANSWER SHEET.

Example:

COLUMN A		COLUMN B
A:	O-horizon	Contains solid rock
B:	C-horizon	

Answer:

The statement refers to:			
Only A	Only B	A and B	None
A	B	C	D

COLUMN A		COLUMN B	
1.2.1	A:	poison residues may occur on food	Pesticides hold in two ways a direct danger to mankind.
	B:	small quantities ingested with food	
1.2.2	A:	greenhouses	The possibility of exercising control over one or more of the factors contributing to climate is attainable.
	B:	tin houses	
1.2.3	A:	algae	These organisms supply oxygen (air) to plants in the saturated soil of rice fields.
	B:	fungi	
1.2.4	A:	nitrogen fixation	This process increases the levels of nitrates in the soil.
	B:	nitrogen mineralisation	
1.2.5	A:	powdery mildew	This is an example of a fungous disease in plants.
	B:	stem-end rot	

(5 x 2) (10)

- 1.3 Give ONE term for each of the following descriptions. Write only the term next to the question number (1.3.1 – 1.3.5) on the attached ANSWER SHEET.

1.3.1 The soil gas that is important to dilute the oxygen in soil air

1.3.2 The horizon that consists of fresh and partially decomposed organic matter and which is found in the top layer of soil

1.3.3 The method of vegetative reproduction where the bud of a mother plant is implanted on a suitable root stock

1.3.4 The transfer of ripe pollen grains from the anthers to the ripe, receptive stigma of a flower on another plant of the same species

1.3.5 The artificial removal of excess amounts of gravitational water from the root zone of crops

(5 x 2) (10)

1.4 Change the underlined words in the following to make the statement TRUE. Write the appropriate word next to the question number (1.4.1 – 1.4.5) on the attached ANSWER SHEET.

- 1.4.1 The weathering process where a mineral reacts with water to form a new, softer and more easily erosive mineral, is called oxidation.
- 1.4.2 A well aerated soil that contains iron compounds and little organic matter and which is well drained, normally has a grey colour.
- 1.4.3 Inbreeding is the crossing of plants with different characteristics to get a combination of desirable characteristics in the offspring.
- 1.4.4 Micro-elements are nutrients in the soil which are required in large quantities by plants.
- 1.4.5 Subsistence farming is a form of agriculture that uses very advanced technology, including computers and satellite images, to optimise farming production.

(5 x 1)

(5)
[45]

TOTAL SECTION A: 45

SECTION B

START THIS QUESTION ON A NEW PAGE IN THE ANSWER BOOK PROVIDED.

QUESTION 2

- 2.1 A group of Agricultural Science learners wanted to confirm some data with regard to soil temperature.

This group of learners then decided to place FOUR different pots filled with soil in a greenhouse at their school.

The pots were filled with air-dried soil to ensure that all the soils had basically similar water levels. The pots were filled with the soil in the following way:

Pot 1 was filled with a light coloured sandy soil, Pot 2 was filled with a dark-coloured organic soil, Pot 3 and Pot 4 were filled with similar soil to the same levels.

A device to measure temperature was placed in each pot. In Pot 1 and Pot 2 this device was placed at a depth of 15 cm, in Pot 3 this device was placed at a depth of 5 cm and in Pot 4 this device was placed at a depth of 20 cm.

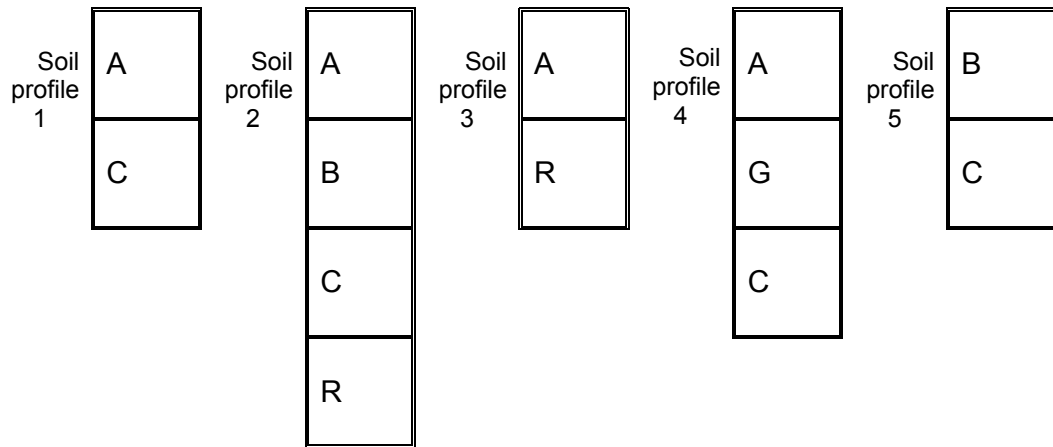
The data they collected is summarised in the following table that gives the average temperatures over a period of a month. These temperatures were measured at different times of the day.

POTS	Average temperatures
Unknown	18 °C
Pot 2	16 °C
Unknown	12 °C
Pot 1	13 °C

- 2.1.1 Name the device or instrument that was used to measure the temperature. (1)
- 2.1.2 Give reasons why these pots were placed in a greenhouse. (1)
- 2.1.3 Why did the group use similar soils in Pots 3 and 4 respectively? (1)
- 2.1.4 Explain the temperature difference in Pots 1 and 2. (2)
- 2.1.5 Deduce from the above information what the average temperature in Pots 3 and 4 were respectively. (2)
- 2.1.6 Give a reason for your answer in QUESTION 2.1.5. (1)

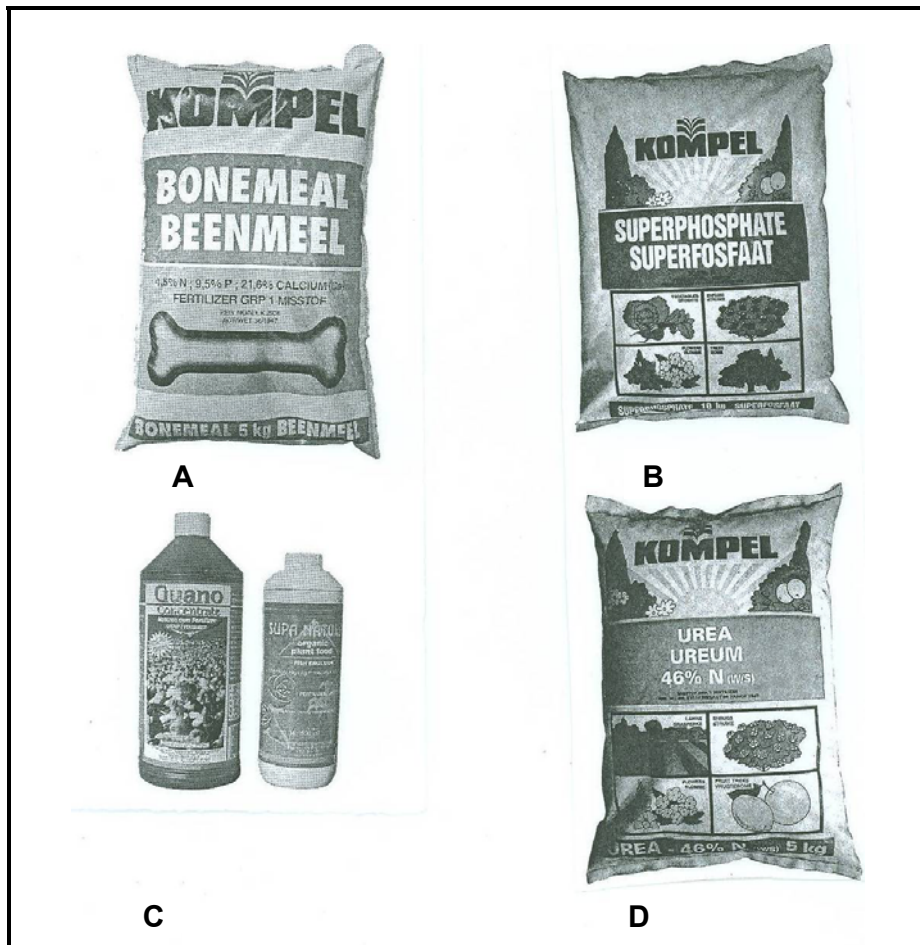
- 2.2 A major soil horizon represents a horizontal layer of soil which has formed under different environmental conditions from the parent material. In a soil profile these horizontal soil layers will be visible. Each soil profile has its own unique succession of horizons.

Study the following soil profiles (1, 2, 3, 4 and 5) and answer the questions that follow.



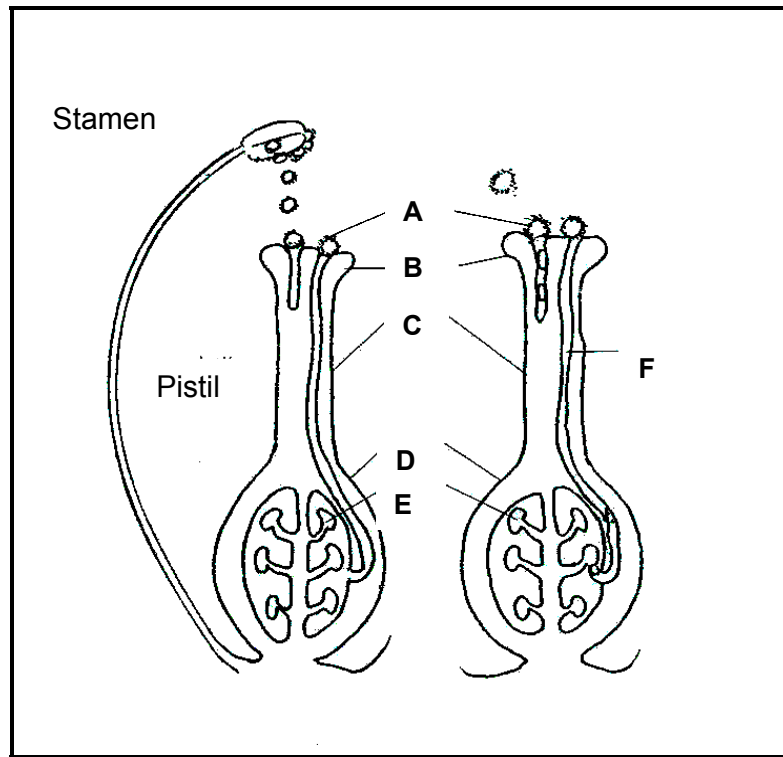
- 2.2.1 Indicate from the above representations the major horizon(s) which form(s) part of the topsoil layer. (1)
- 2.2.2 Choose from the above soil profiles ONE which is most suited for crop production. Give a reason for your answer. (2)
- 2.2.3 In which of the major horizons indicated above would erosion processes of parent material be most active? (1)
- 2.2.4 Identify ONE soil profile from the profiles numbered 1 to 5 above which represents a wet soil. (1)

- 2.3 During the mid 1800s crop producers began to develop a clear understanding of the nutritional requirements of plants. After the most important nutritional requirements of plants had been identified the fertiliser industry began to develop in an attempt to supply these nutrients. In the past organic fertilisers were mainly used but today inorganic fertilisers are mainly used for crop production. The following diagrams represent different fertilisers that are used by crop growers at present.



- 2.3.1 Identify the organic fertilisers represented in the above diagrams. (2)
- 2.3.2 State TWO main advantages of inorganic fertilisers. (2)
- 2.3.3 Organic fertilisers are not as concentrated as inorganic fertilisers. What then, would, be the appropriate way to apply organic fertilisers to a pasture crop? (1)
- 2.3.4 Organic fertilisers are very bulky and large quantities need to be applied. What implication will this have on the cost of fertilisation? Explain your answer. (2)

2.4 The pollination of a flower is illustrated below.



- 2.4.1 Which of the parts labelled A – F in the above illustration will develop to form the fruit? (1)
- 2.4.2 Identify the type of pollination taking place in the above illustration. (1)
- 2.4.3 Explain the adaptation of the flower for the type of pollination mentioned in QUESTION 2.4.2 which is visible in the illustration. (2)
- 2.4.4 Name THREE structural adaptations of the flower in the photograph below that would make it suited for pollination by insects or other animals.



(3)

2.5 Imagine that you are going to plant a field of maize. Listed below are four alternative crops that you could intercrop with your maize.

Two are legumes, two repel insects and one is an indigenous herb.

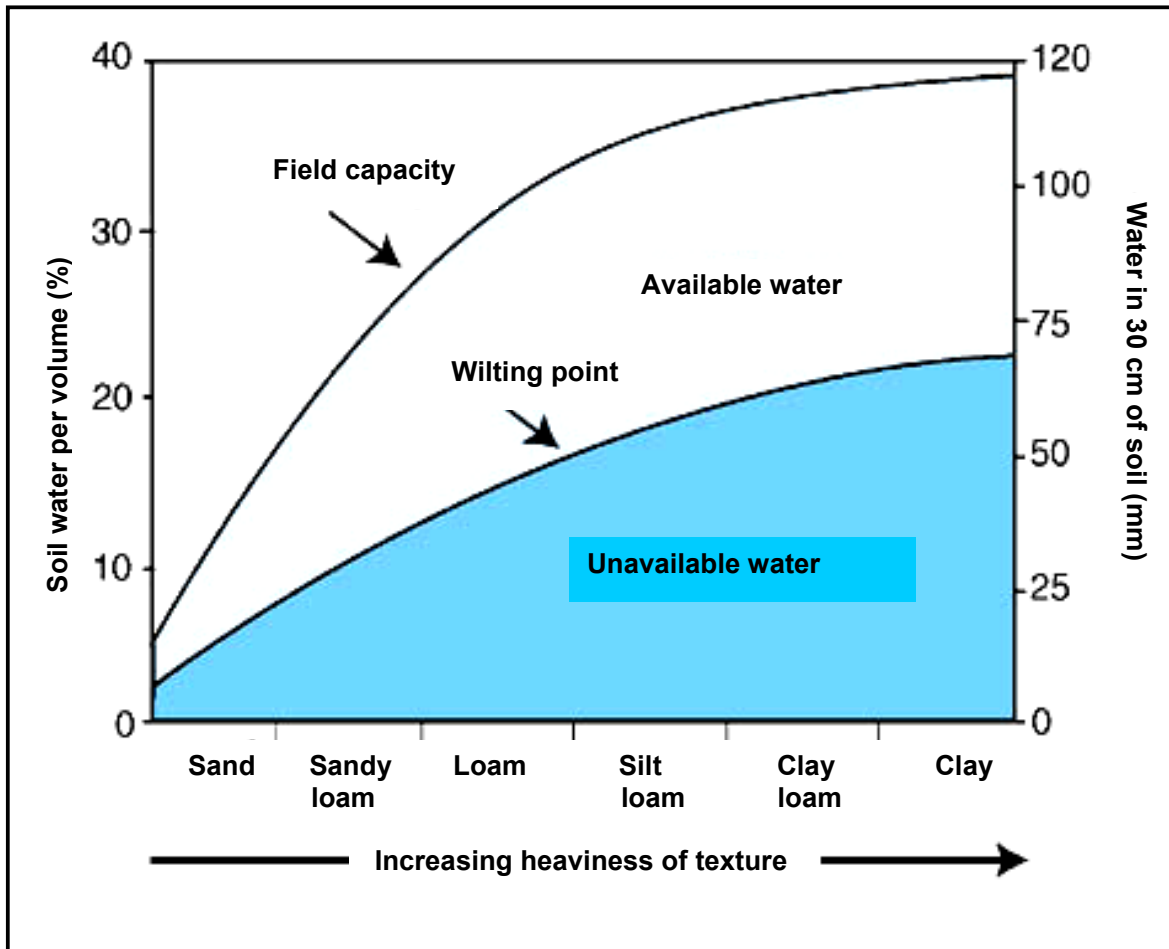
- Cowpeas and beans (add nitrogen to the soil)
- Garlic and desmodium (repel insects or pests)
- Garlic (indigenous herb)

2.5.1 Define the term *intercropping*. (2)

2.5.2 Design an intercropping system and present it as a schematic drawing. Use maize and two or more of the crops listed above. Justify your choice of crops. (6)
[35]

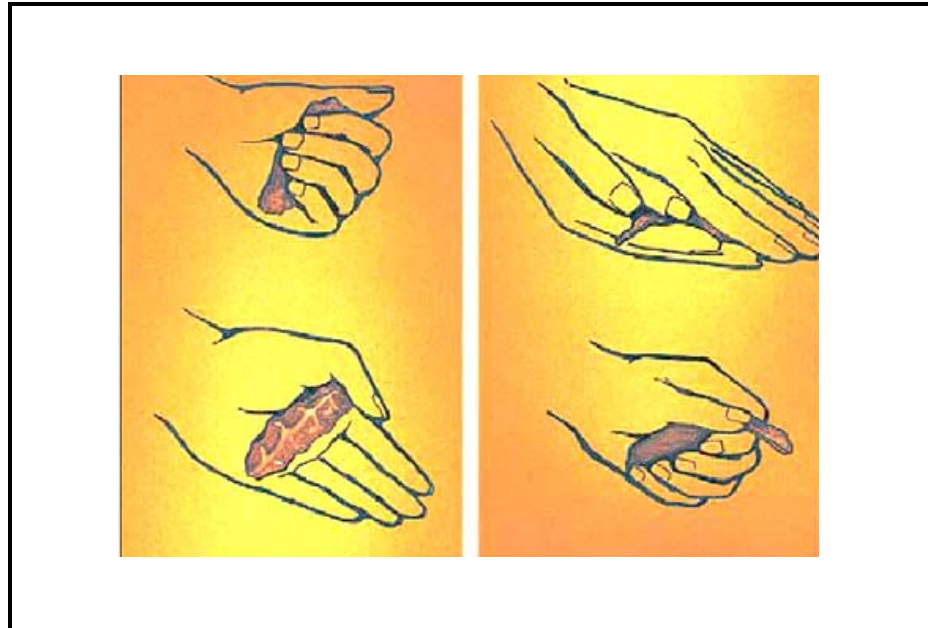
START THIS QUESTION ON A NEW PAGE.**QUESTION 3**

- 3.1 The following graph represents the quantities of available and unavailable water in soil with different texture classes.



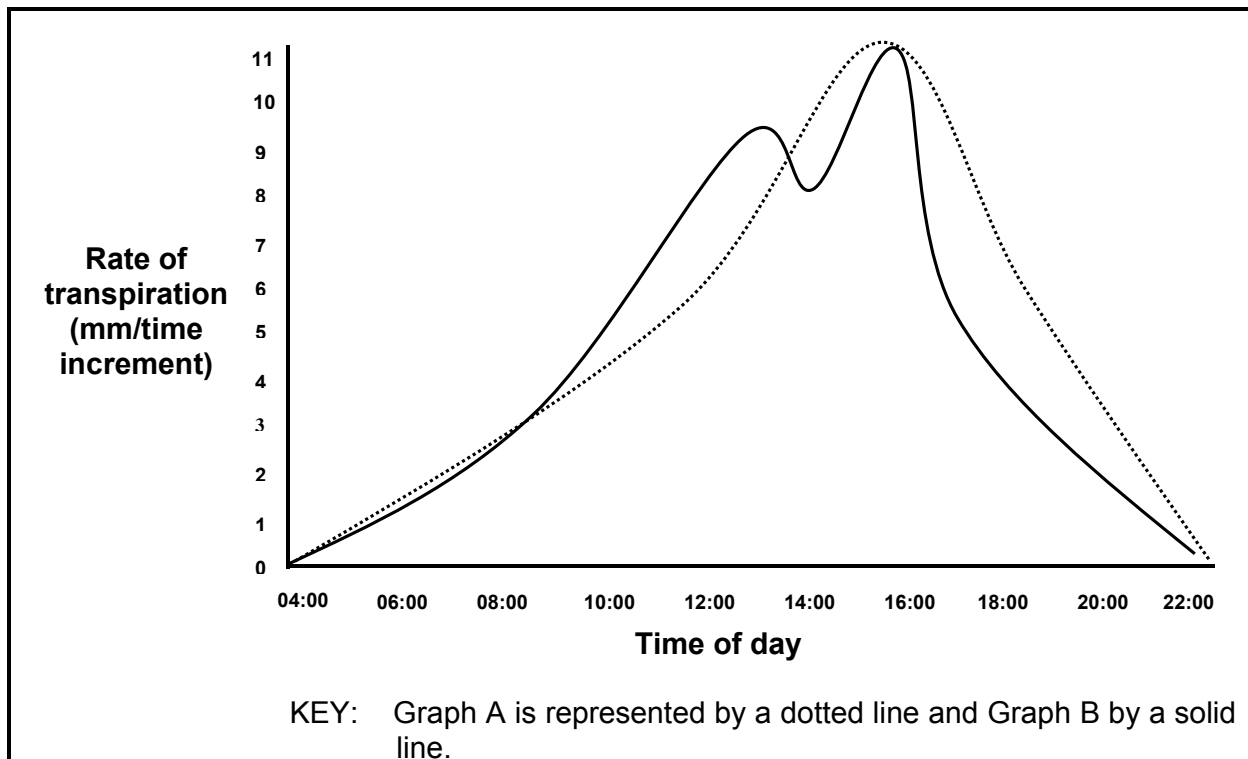
- 3.1.1 Indicate the texture class in the above diagram which would be the heaviest texture class. (1)
- 3.1.2 Calculate from the graph the quantity of water measured in mm (in 30 cm of soil) which contains 40% water per volume. (1)
- 3.1.3 Determine the maximum quantity of water held by 30 cm of sandy soil measured in mm at wilting point. (1)
- 3.1.4 Describe the relationship between field capacity and soil texture. (2)
- 3.1.5 Discuss the difference in soil water management between a sandy loam soil and a clay loam soil by referring to the above graph. (4)
- 3.1.6 Describe the ideal soil moisture conditions for optimal growth. Motivate your answer. (3)

3.1.7 Identify from the illustration below the method of soil analysis which could assist the crop farmer. Refer to the graph on page 12.



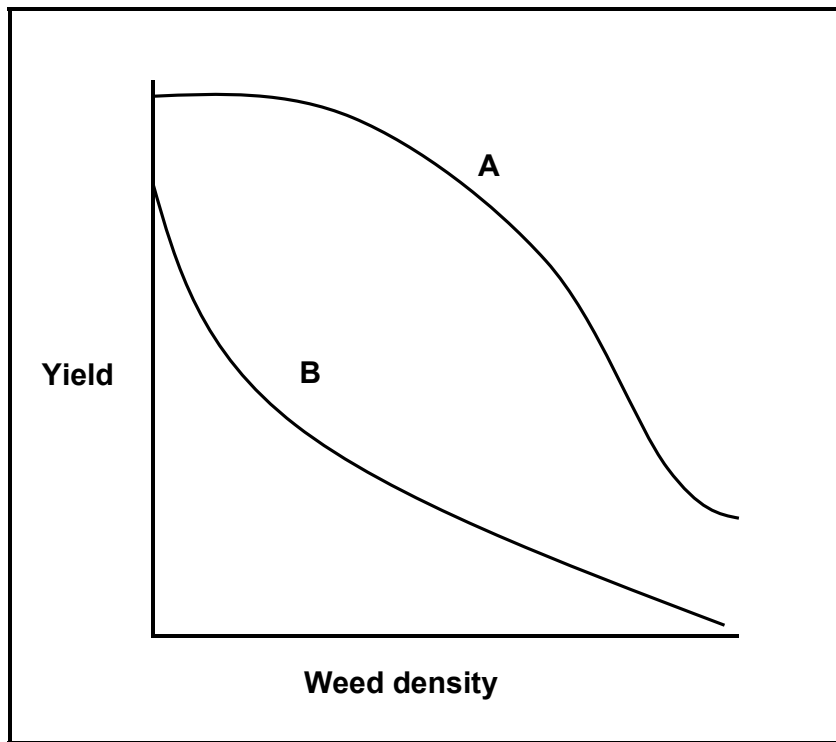
(1)

3.2 In an investigation two potometers (apparatus to measure the rate of transpiration) were placed in different environments. One potometer was placed in a controlled environment, while the other was placed in an open environment (exposed to wind, cloud cover, heat of the sun, et cetera). The data collected is reflected in the following graphs.



- 3.2.1 Determine the time of the day at which the rate of transpiration was the highest in Graph B. (1)
- 3.2.2 Describe the main difference between Graph A and Graph B. Give a possible reason for your answer. (3)
- 3.2.3 Indicate which graph represents the potometer that was placed in a controlled environment. Give a reason for your answer. (2)
- 3.2.4 Which structure in the leaf is responsible for the sharp increase in the rate of transpiration? Explain your answer. (2)

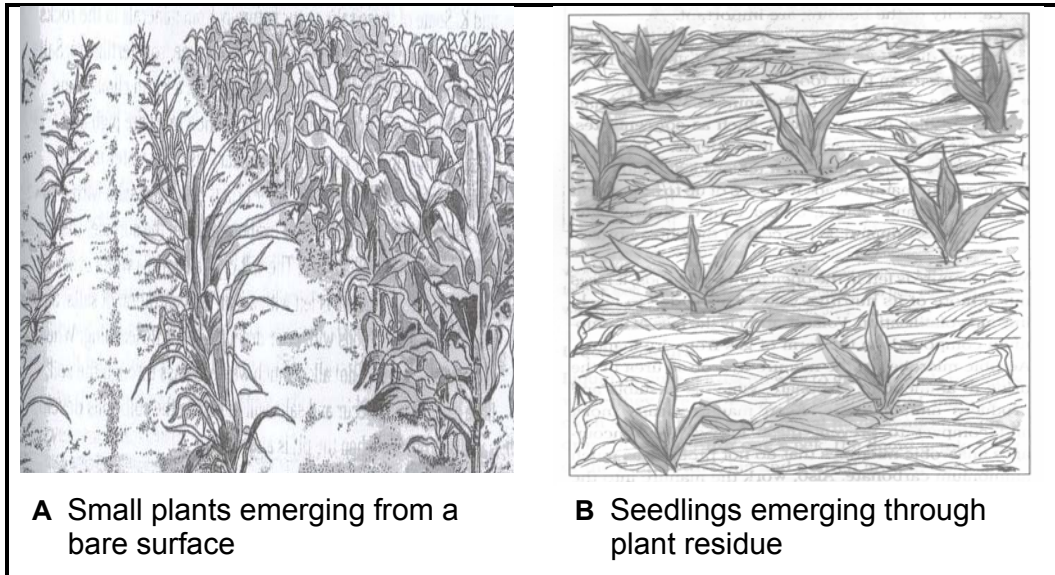
- 3.3 The following graph shows the relation between weed density and yield at two different locations, A and B.



- 3.3.1 The data for this graph was gathered from two different rainfall areas (a high rainfall area and a lower rainfall area) with similar soil types. Give the possible rainfall scenarios for A and B respectively and give a reason for your answer. (4)
- 3.3.2 Describe the relationship between weed density and yield with reference to Graph A. (2)
- 3.3.3 In your own words, give TWO reasons why the graph has a tendency as indicated in QUESTION 3.3.2. (2)

3.4 Different crops have different tillage needs.

3.4.1 Identify the TWO tillage practices indicated in the diagram below.



(2)

The following table contains some research results that show the effects of the above tillage methods at different locations.

LOCATIONS	EFFECTS	DIAGRAM A	DIAGRAM B
Location 1	Soil moisture (mm water/m ³)	0,19	0,28
Location 2	Soil loss (t/ha/year)	9,1	2,7

3.4.2 Interpret the data on soil moisture when the practices followed in Diagram A is compared to that of Diagram B.

(3)

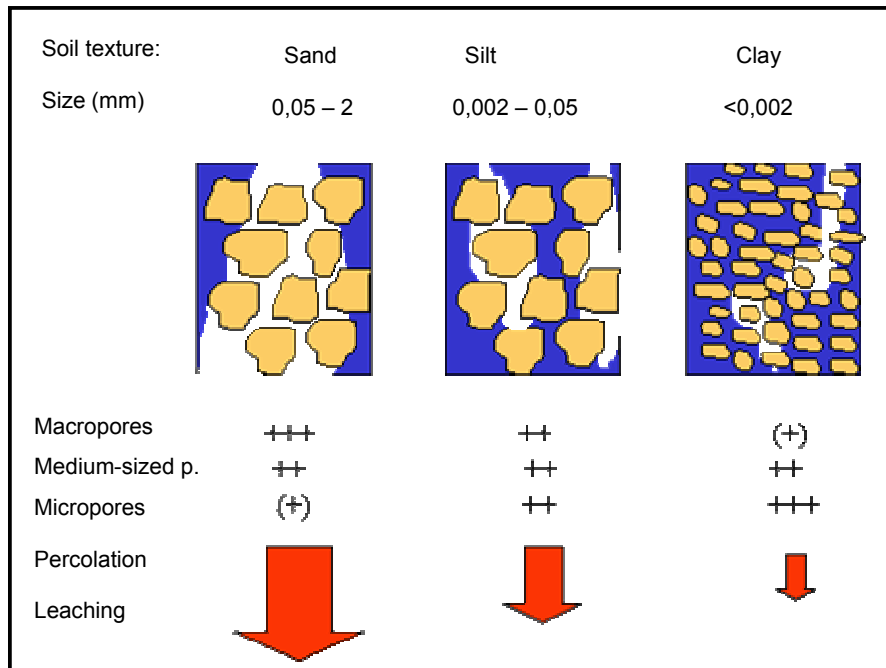
3.4.3 Identify the tillage practice that leads to a high level of soil erosion.

(1)

[35]

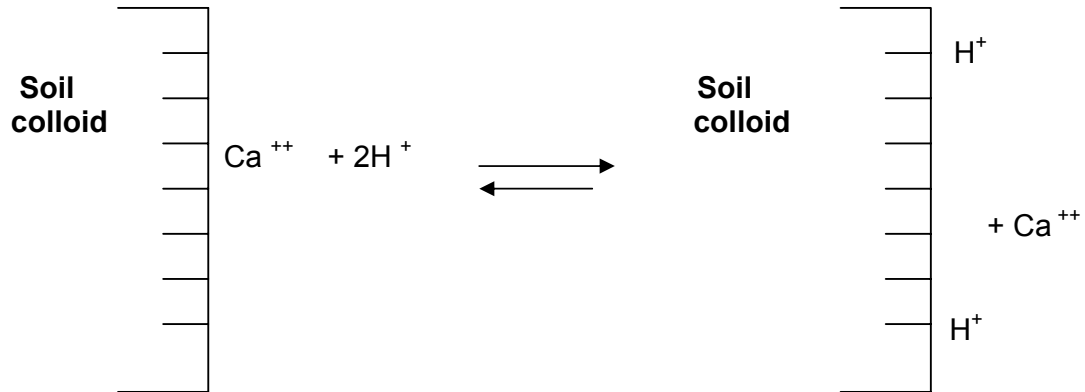
START THIS QUESTION ON A NEW PAGE.**QUESTION 4**

- 4.1 The following diagram is a schematic representation of the different homogenous soil texture types and some of their characteristics. The representation also indicates how these characteristics are interlinked. Answer the questions that follow.



- 4.1.1 A sieve was used to sort the above particles into homogenous groups. Determine the size of the openings in the sieve to collect the sand particles. (1)
- 4.1.2 Compare these homogenous soils with regard to the quantity of macropores in each component of the soils. (2)
- 4.1.3 Indicate the soil component which has the most micropores. (1)
- 4.1.4 Deduce the relation between pore size and percolation as seen in the above diagram. (2)

- 4.2 The following is a representation of a chemical reaction in soil. The reaction occurs between a negatively charged colloid and ions in the soil solution.



- 4.2.1 Identify the process that takes place when the reaction proceeds to the right. (1)
- 4.2.2 Indicate a physical property of soil that will cause the reaction in QUESTION 4.2.1 to proceed faster to the right. (1)
- 4.2.3 How would the soil pH change when the reaction proceeds to the left? (1)
- 4.3 The following photograph illustrates disease symptoms on the leaf of a plant. Learners took the opportunity to measure the impact of this disease on the area of photosynthesis on the leaf. Two leaves were selected. The one leaf developed normally and the other leaf showed possible symptoms of this disease. The area of the healthy green part of the leaf was measured each day by using transparent material (plastic) on which the leaf area was duplicated.

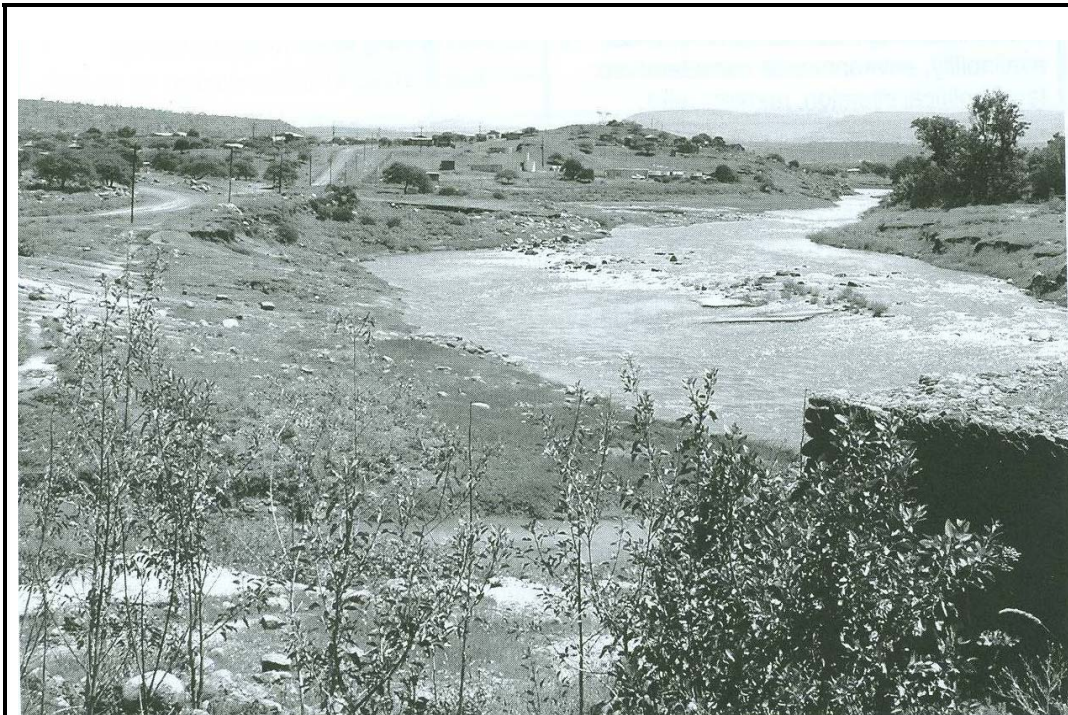


Time (weeks)	Leaf surface in (cm ²) (infected leaf)	Leaf surface area (cm ²) (healthy leaf)
1	12,38	12,35
2	13,43	14,83
3	15,50	19,56
4	18,34	24,77
5	20,55	30,86
6	17,43	35,92
7	14,23	35,92
8	7,03	35,92

4.3.1 Draw a bar graph that represents the leaf surface area data of the healthy leaf and that of the infected leaf (on the same axis) against time. The numbers in the table should be rounded off to the nearest whole number before the points are plotted. (6)

4.3.2 Give a reason why the healthy leaf surface stayed at a constant level after six weeks. (1)

4.4 A local farmer has approached you for advice in connection with his newly acquired land shown below. Examine the photograph and consider the facts listed below it.



- Sparse vegetation
- Shallow topsoil
- Rocky landscape

4.4.1 Suggest the best agricultural production he/she can practice from the possibilities indicated below.

pasture production; grain production; fruit production (orchard)

(1)

4.4.2 Indicate which conditions in the soil would be responsible for the following conditions:

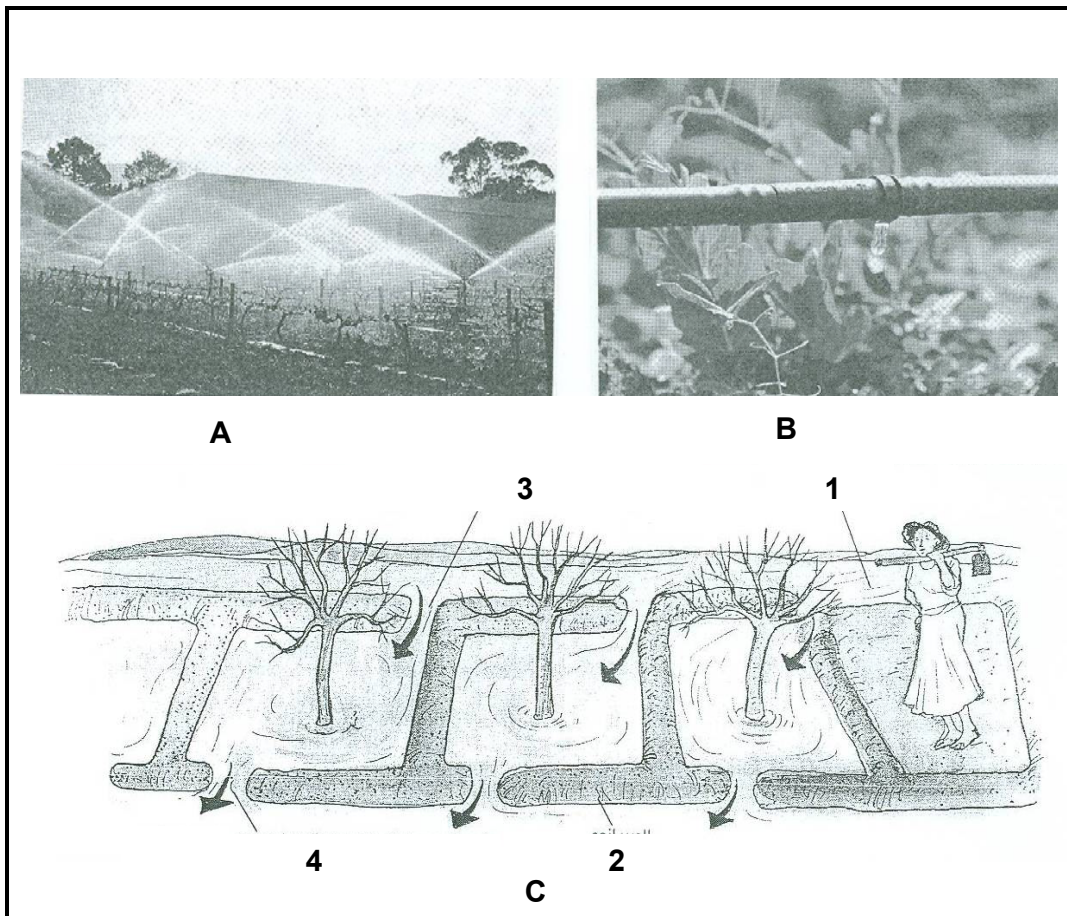
(a) Shallow topsoil and rockiness (2)

(b) Little organic material in the soil (2)

4.4.3 The soils in the photograph on page 18 were found to be very sandy. Give a possible reason for this. (1)

4.4.4 Which legal measure has the government put in place to ensure that land that is ploughed for the first time is protected? (1)

4.5 There are a number of different irrigation methods a farmer can choose from. They range from the simplest form like a hosepipe to more complicated and costly systems used to water crops on a large scale. Some of these systems are illustrated below.



- 4.5.1 Indicate how each of the irrigation methods on page 19 labelled A to C would influence crop health by using the following indications.
- Minimum effect
 - Increases root diseases
 - Increases leaf diseases
- Give a reason for your choice in each case. (6)
- 4.5.2 Recommend an irrigation system for trees, vines and orchards. (1)
- 4.6 Livestock impact negatively on vegetation if overgrazing, selective grazing and trampling is allowed. Livestock can cause soil erosion through the formation of paths. They can also compact the soil by trampling it with their hooves.
- State FIVE management practices that livestock farmers should adopt to ensure that their livestock do not impact negatively on the natural resources. (5)
- [35]**
- TOTAL SECTION B: 105**
- GRAND TOTAL: 150**

SECTION A

EXAMINATION NUMBER: _____

QUESTION 1.1

1.1.1	A	B	C	D
1.1.2	A	B	C	D
1.1.3	A	B	C	D
1.1.4	A	B	C	D
1.1.5	A	B	C	D
1.1.6	A	B	C	D
1.1.7	A	B	C	D
1.1.8	A	B	C	D
1.1.9	A	B	C	D
1.1.10	A	B	C	D

(10 x 2) (20)

QUESTION 1.2

	ONLY A	ONLY B	A and B	None
1.2.1	A	B	C	D
1.2.2	A	B	C	D
1.2.3	A	B	C	D
1.2.4	A	B	C	D
1.2.5	A	B	C	D

(5 x 2) (10)

QUESTION 1.3

1.3.1 _____

1.3.2 _____

1.3.3 _____

1.3.4 _____

1.3.5 _____

(5 x 2) (10)

QUESTION 1.4

1.4.1 _____

1.4.2 _____

1.4.3 _____

1.4.4 _____

1.4.5 _____

(5 x 1) (5)

TOTAL SECTION A: 45