



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 11

NOVEMBER 2011

AGRICULTURAL SCIENCES P1

MARKS: 150

TIME: 2½ hours

This question paper consists of 14 pages, including an answer sheet.

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions from BOTH SECTIONS A and B.
2. SECTION A (QUESTION 1) must be answered on the attached ANSWER SHEET.
3. Place your ANSWER SHEET for SECTION A (QUESTION 1) within your ANSWER BOOK.
4. SECTION B (QUESTIONS 2 to 4) must be answered in the ANSWER BOOK.
5. Start each question from SECTION B on a NEW page.
6. Read the questions carefully and make sure you answer what is asked.
7. Number the answers correctly according to the numbering system used in this question paper.
8. DO NOT SPLIT the answers to the questions.
9. Write neatly and legibly.

SECTION A**QUESTION 1**

- 1.1 Various options are provided as possible answers to the following questions. Choose the correct answer and make a cross (X) over the appropriate letter in the block (A – D) next to the question number (1.1.1 – 1.1.10) on the attached ANSWER SHEET. No marks will be allocated if more than one cross (X) appears for an answer.

Example: 1.1.11

| | | | |
|---|---|---------------------------------------|---|
| A | B | <input checked="" type="checkbox"/> C | D |
|---|---|---------------------------------------|---|

- 1.1.1 An atom has 19 protons and 20 neutrons in the nucleus .There will therefore be ... valence electrons.
- A 6
B 8
C 2
D 1
- 1.1.2 Amino acids are the basic units of all proteins. The functional groups for all amino acids are ...
- A amino and hydroxyl groups.
B carboxyl and hydroxyl groups.
C peptide and amino groups.
D carboxyl and amino groups.
- 1.1.3 The beneficial effect of organic matter to a clay soil will...
- A lower bulk density.
B improve structure.
C lower infiltration.
D improve capillarity.
- 1.1.4 The only group of soil micro-organism that contains chlorophyll is...
- A protozoa.
B actinomycetes.
C algae.
D fungi.
- 1.1.5 Dextrin and chitin are classified as polysaccharides .The smallest units of these molecules are joined by ...
- A ester bonds.
B peptide linkage.
C glycosidic bond.
D covalent bond.

1.1.6 Which ONE of the following characteristics does not fit well on sandy textured soil?

- A Acid under high rainfall conditions
- B Lower water holding capacity
- C Poor in plant nutrients
- D Difficult to cultivate

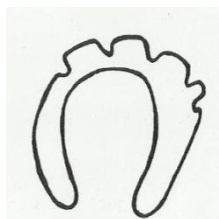
1.1.7 When it is impossible for a farmer to use laboratory tests to determine the soil texture, the farmer can do it using the so called 'field method'. Identify from the texture diagrams below the one that characterises pure clayey soil.



A



B



C



D

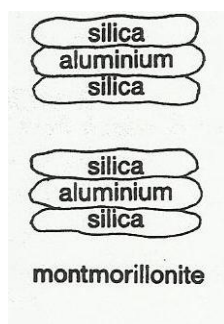
1.1.8 Some soils have calcium ions (Ca^{2+}) and magnesium ions (Mg^{2+}) that are predominant cations of the colloid. In that situation the pH of the soil will be ...

- A neutral.
- B high.
- C low.
- D extremely low.

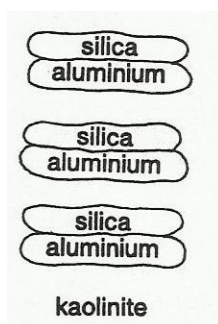
1.1.9 The preparation of *umqombothi* (Xhosa traditional beer) involves mixing mealies, sorghum, water and adding little quantity of yeast. The readiness of this mixture for consumption purpose depends on the process of ...

- A respiration.
- B accumulation.
- C fermentation.
- D cooling.

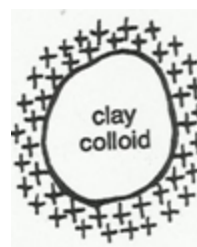
1.1.10 The illustrations below are the examples of silicate clays. Which one characterises the ratio of 2:1 in its formation?



A



B



C



D

(10x2) (20)

- 1.2 In the table below, a statement and two answers are given. Decide whether the statement in COLUMN B relates to A only, B only, both A and B or none of the answers in COLUMN A. Choose the correct answer and make a cross (X) in the appropriate block next to the question number (1.2.1 – 1.2.5) on the attached ANSWER SHEET.

Example:

| | COLUMN A | COLUMN B |
|-------|-------------|-------------------|
| 1.2.6 | A: Vitamins | Organic compounds |
| | B: Fats | |

Answer:

| | | | | |
|-------|--------------------------|--------------|---------|------|
| | The statement refers to: | | | |
| | Only A | Only B | A and B | None |
| 1.2.6 | A | B | C | D |

| | COLUMN A | COLUMN B |
|-------|----------------------------------|----------------------------------|
| 1.2.1 | A: Usually poisonous gases | Halogens |
| | B: Chemically very reactive | |
| 1.2.2 | A: Suitable for crop cultivation | Crumb structure |
| | B: Flatten appearance | |
| 1.2.3 | A: Starch molecules | Polypeptides |
| | B: Glycogen and cellulose | |
| 1.2.4 | A: Necessary for photosynthesis | Oxygen |
| | B: Seeds germinate easily | |
| 1.2.5 | A: Soil surface evaporation | Loss of soil water and nutrients |
| | B: Leaching and run-off | |

(5x2) (10)

- 1.3 Give ONE TERM/DESCRIPTION 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 product formed from the combination of two amino acids linked by a peptide bond
- 1.3.2 Artificial removal of excess water in a badly, waterlogged soil
- 1.3.3 A colloidal solution in which both dispersed and dispersion medium are in liquid form
- 1.3.4 A horizon characterised by fresh and partly decomposed organic matter
- 1.3.5 An interesting movement of nutrients and water from the plant's roots up to the stem and leaves

(5x2) (10)

- 1.4 Change the UNDERLINED WORDS in the following statements to make them TRUE. Write only the appropriate word(s) next to the question number (1.4.1 – 1.4.5) on the attached ANSWER SHEET.

- 1.4.1 Ammonification is the process by which nitrogen compounds are converted to nitrites.
- 1.4.2 Sodium is a cation predominantly adsorbed in the colloids of acid soil
- 1.4.3 The slope in the RSA to avoid due to frost damage to plants is the northern slope.
- 1.4.4 A homogenous colour made of mixture of colours and is also described as mottled, usually become badly waterlogged during heavy rains.
- 1.4.5 When carbon dioxide dissolved in water, it forms a weak acid called humic acid.

(5x1) (5)

TOTAL SECTION A: 45

SECTION B**START THIS QUESTION ON A NEW PAGE****QUESTION 2**

- 2.1 Most countries produce ethanol from sugarcane as it is the most efficient source of fermentable carbohydrates. The cane is pressed, fermented and distilled at large ethanol plants or industries. The stalk fibres that are left over from sugarcane processing are used as fuel by refineries, thus reducing the production costs. Ethanol is sold at regulated prices to the oil companies.

Most cars run either on ethanol or a mixture of petrol and ethanol. The ethanol for fuel program significantly reduced the countries oil impact bill, and noticeable improved the air quality in the cities. This is because the cars that are using ethanol or the ethanol mixtures produce fewer air pollutants than the vehicles that only use petrol and diesel. Sugarcane fields are traditionally burned just before harvest time in order to remove leaves and kill snakes.

- 2.1.1 To which organic compounds would you classify sugarcane? (1)
- 2.1.2 Suggest THREE processes from the scenario that are involved in the formation of ethanol. (3)
- 2.1.3 Supply the functional group for ethanol. (1)
- 2.1.4 Draw the molecular and structural formula of ethanol. (4)
- 2.1.5 Deduce ONE reason for ethanol being more preferred to petrol and diesel as a source of energy. (1)
- 2.1.6 Which phrase from the scenario indicates the environmental and social problems of ethanol for the fuel program? (1)
- 2.2 Analyse the following soil profiles (1, 2, 3, and 4) and answer the questions that follow:

| | |
|-----------|---|
| Soil | B |
| Profile 1 | C |

| | |
|-----------|---|
| Soil | A |
| Profile 2 | G |
| | C |

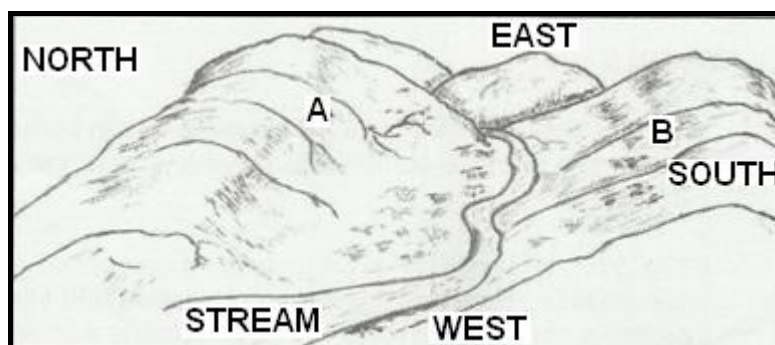
| | |
|-----------|---|
| Soil | A |
| Profile 3 | C |

| | |
|-----------|---|
| Soil | A |
| Profile 4 | B |
| | C |
| | R |

- 2.2.1 Match the soil profiles above according to the following soil descriptions given below.
- (a) Young soil (1)
- (b) Adult soil (1)
- (c) Wet soil (1)
- (d) Eroded soil (1)

- 2.2.2 Indicate from the examples of soil profiles above the major horizon which forms part of the top soil. (2)
- 2.2.3 In which of the major horizons indicated above will the erosion process of parental material be most active? (1)
- 2.2.4 Identify the horizon which represents solid rock. (1)

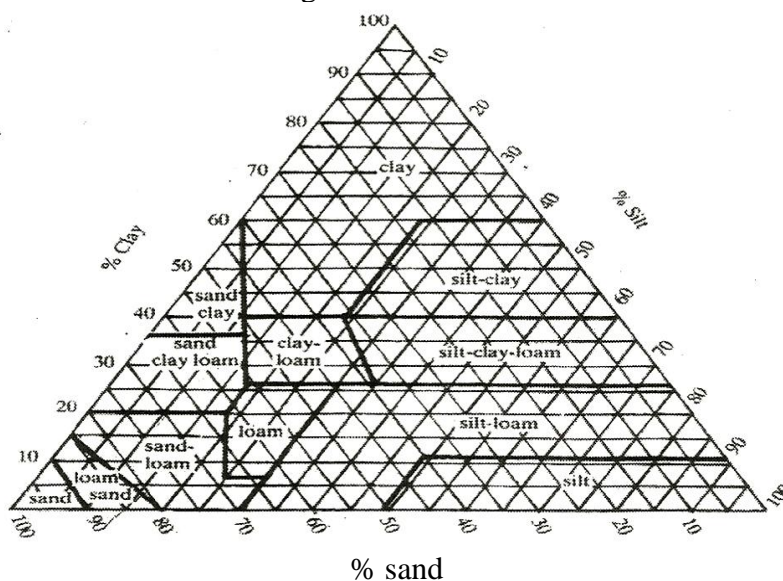
- 2.3 The simple map below represents a valley in the part of South Africa. Answer the questions based on it.



- 2.3.1 Indicate the slope between A or B where the soil will be warmer. (1)
- 2.3.2 Justify your answer to QUESTION 2.3.1 above. (2)
- 2.3.3 Predict any THREE beneficial effects of warm soil for crop production. (3)

- 2.4 Grade 11 learners were given a task to do physical analysis of soil on a certain farm. After obtaining the percentage of three major soil fractions, they had to use the texture diagram shown below to determine the various textural classes of soils.

Texture diagram used in South Africa



The table below shows some of the results they have obtained

| Soil sample | % sand | % silt | % clay |
|-------------|--------|--------|--------|
| A | 30 | 50 | 20 |
| B | 15 | 15 | 70 |
| C | 55 | 25 | 20 |

- 2.4.1 Determine the *textural class* for the soil samples A, B, and C. (3)
- 2.4.2 Which of the soil samples in the table above would you recommend as the most suitable for crop cultivation? (1)
- 2.4.3 Justify your answer given in QUESTION 2.4.2. (2)
- 2.4.4 Identify FOUR bad effects of soil sample B on the productivity and the general usage of soil. (4)

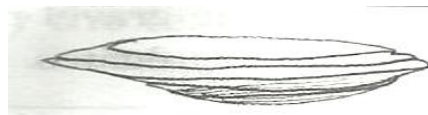
[35]

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

- 3.1 The following are various types of soil structures. Answer the questions based on them.



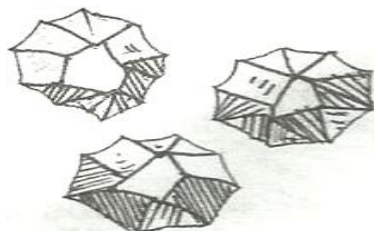
Granular or crumb structure



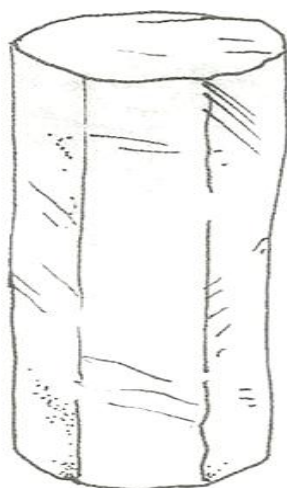
Platy structure



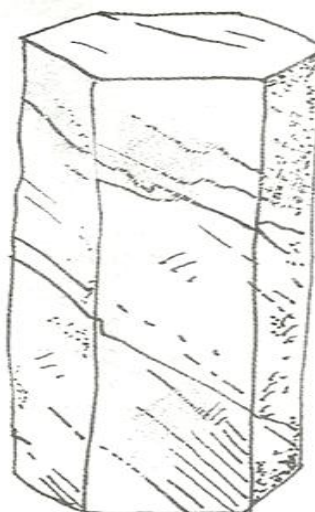
Sub-angular blocky structure



Angular blocky structure



Columnar structure



Prismatic structure

Supply the name of the soil structure which is best associated with the following explanation:

- 3.1.1 This structure usually occurs in the clay pan soils. (1)
- 3.1.2 The structural shapes have units which are vertically longer than they are broader. (1)
- 3.1.3 The structure found in B-horizon with sharp angles and sides which are approximately equal in length. (1)
- 3.1.4 The aggregates (peds) are round and harder grains. (1)
- 3.1.5 The most desirable soil structure for vegetation and strong influence by the organic material. (1)

- 3.2 Name any FOUR ways that can lead to the destruction of soil structure. (4)
- 3.3 The pH is the degree of acidity, neutrality or alkalinity of a substance and its scale ranges from 0 – 14. Use the table below to categorise the commonly used household substances according to the pH categories.

| Substance | pH value | pH categories | |
|---------------|----------|---------------|-----|
| Baking powder | 8,4 | 3.3.1 | (1) |
| Oranges | 3,4 | 3.3.2 | (1) |
| Pure water | 7,0 | 3.3.3 | (1) |
| Vinegar | 2,8 | 3.3.4 | (1) |

- 3.3.5 If an acid solution is mixed with an alkaline solution, a chemical reaction takes place especially if the reaction is controlled by adding the correct amounts. Supply the name of the reaction. (2)
- 3.4 Fats and oils are obtained from both plants and animals. Substances which contain the carboxyl group, -COOH , make up the family of compounds known as fatty acids or carboxyl acids.
- 3.4.1 Differentiate between *fats* and *oils*. (2)
- 3.4.2 Mention the TWO building blocks of a fat molecule or an ester. (2)
- 3.4.3 Deduce any THREE negative impacts of high consumption of fat on human life. (3)

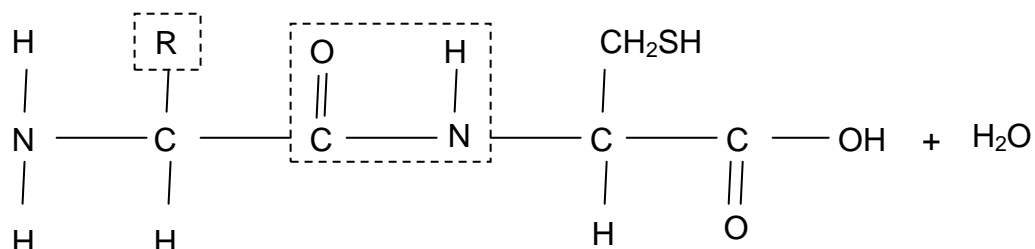
- 3.5 Grade 11 learners were given an investigation on how the heat capacity of soil correlates with the moisture content of soil. The light coloured soil together with a dark coloured soil was used for the investigation which took seven (7) weeks and the results were tabulated as follows:

| Weeks | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|--|----|----|----|----|----|----|----|
| Moisture content of light coloured soil (mm) | 40 | 25 | 20 | 18 | 12 | 09 | 05 |
| Moisture content of dark coloured soil (mm) | 46 | 44 | 40 | 35 | 30 | 20 | 15 |

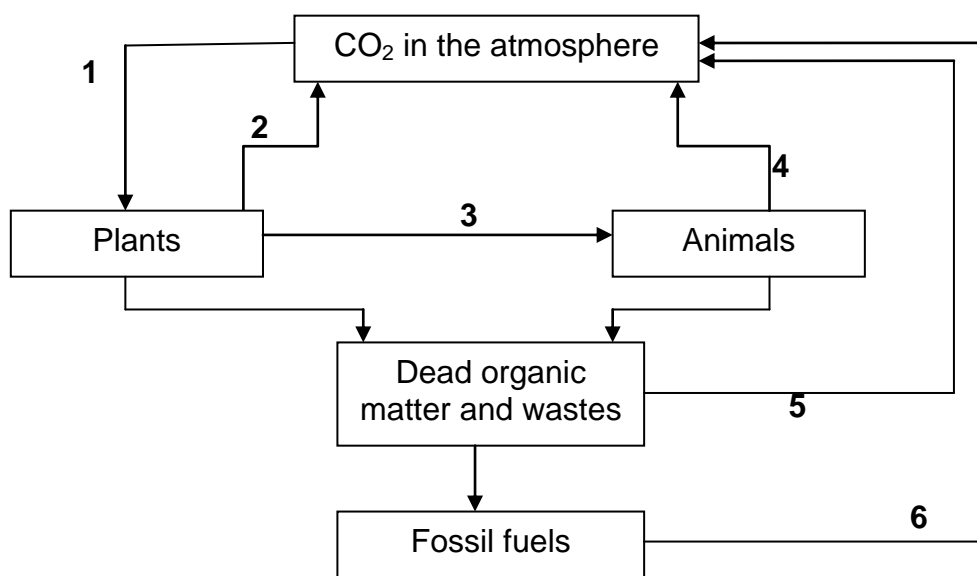
- 3.5.1 Plot the *line graphs* of the moisture content for both the light coloured soil and the dark coloured soil *on the same set of axes* against time with weeks on the X-axis and the percentage of moisture content on the Y-axis. (6)
- 3.5.2 Indicate the colour of soil that shows a rapid decrease in the percentage of the moisture content from the data given in the table above. (1)
- 3.5.3 Justify the answer given in QUESTION 3.5.2 above. (2)
- 3.5.4 Compare the heat absorption capacity of the two soil colours using moisture content as the baseline. (4)

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

4.1 Analyse the structural formula below and answer the questions that follow.



- 4.1.1 Supply the name of the organic compound shown above. (1)
- 4.1.2 Identify the TWO amino acids that were used in the formation of the product mentioned above. (2)
- 4.1.3 Indicate the linkage shown in this product. (2)
- 4.1.4 Briefly explain the FOUR beneficial effects of the product above in human life. (4)
- 4.1.5 In young ones/babies the deficiency of this product can result in a serious disease. Identify the name of the disease. (1)
- 4.2 Carbon dioxide forms part of carbon cycle in which carbon is recycled from the atmosphere to the living organisms and back again.



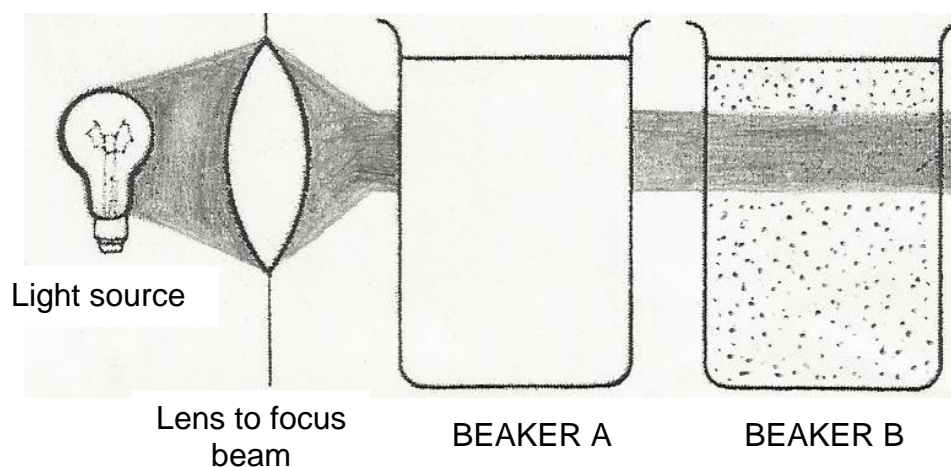
Complete the schematic representation of the carbon cycle shown above by providing labels for the parts numbered 1 to 6, using the concepts provided in the box below.

**Combustion, Decomposition, Photosynthesis,
Respiration, Feeding**

Note: The same concept can be used more than once.

(6)

- 4.3 The illustration below represents different effects solutions and colloidal system has on light. Analyse the schematic representation and answer the questions that follow.



- 4.3.1 Suggest the name of this phenomenon. (2)
- 4.3.2 Evaluate the illustration above based on what you see and identify the beaker between A and B that represents the following:
- (a) Colloid (1)
 - (b) Solution (1)
- 4.3.3 Justify the answer in ...
- (a) QUESTION 4.3.2(a) above. (1)
 - (b) QUESTION 4.3.2(b) above. (1)
- 4.4 Distinguish between *soil form* and *soil series*. (2)
- 4.5 A traditional farmer owns chicken intensive farming near the river valley in her/his location. This river valley supplies the farmer with clean fresh water for the chicken farming. The farmer collects chicken-litter weekly, which will be used as manure during crop cultivation.
- 4.5.1 Briefly explain the physical effect of the application of chicken litter as manure on soil. (2)
- 4.5.2 State any THREE functions of water to the chickens. (3)
- 4.5.3 Soil contains FIVE major groups of micro-organisms. Identify any THREE of them. (3)
- 4.5.4 Bulk density is the mass per volume of oven dried soil expressed in kg/m^3 or g/cm^3 . Calculate the bulk density of a soil sample with a mass of 450 g and a volume of 46 cm^3 . Show all calculations. (3)

[35]**TOTAL SECTION B: 105****GRAND TOTAL: 150**

ANSWER SHEET**AGRICULTURAL SCIENCES P1****NAME AND SURNAME** _____**SECTION A****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 |

(10x2) (20)

QUESTION 1.2

| | ONLY A | ONLY B | BOTH 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 |

(5x2) (10)

QUESTION 1.3

- 1.3.1 _____
- 1.3.2 _____
- 1.3.3 _____
- 1.3.4 _____
- 1.3.5 _____

(5x2) (10)

QUESTION 1.4

- 1.4.1 _____
- 1.4.2 _____
- 1.4.3 _____
- 1.4.4 _____
- 1.4.5 _____

(5x1) (5)

