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**NATIONAL
SENIOR CERTIFICATE**

GRADE 11

NOVEMBER 2017

AGRICULTURAL SCIENCES P1

MARKS: 150

TIME: 2½ hours

This question paper consists of 14 pages.

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions in the ANSWER BOOK.
2. Start EACH question on a NEW page.
3. Read ALL the questions carefully and answer only what is asked.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Non-programmable calculators may be used.
6. Show ALL your calculations, including units and formulae, where applicable.
7. Write neatly and legibly.



SECTION A**QUESTION 1**

1.1 Various options are provided as possible 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 A.

1.1.1 ... is an example of an organic compound.

- A Glucose
- B Ammonia
- C Carbon dioxide
- D Water

1.1.2 The type of bond formed when two amino acids are joined resulting in the loss of water:

- A Covalent
- B Ionic
- C Peptide
- D Hydrogen

1.1.3 The following are properties of acids:

- (i) They release hydrogen ions into water to form a hydronium
- (ii) They corrode active metals
- (iii) They are proton acceptors
- (iv) They have a high concentration of hydrogen ions

Choose the correct combination:

- A (i), (iii) and (iv)
- B (ii), (iii) and (iv)
- C (i), (ii) and (iv)
- D (i), (ii) and (iii)

1.1.4 An advantage of good soil structure for the farmer is ...

- A improved emergence of seedlings due to increased soil crusting.
- B increased waterlogging for root penetration.
- C increase soil crusting with improved biological activity.
- D reduced salt imbalances due to enhanced buffering capacity of soil.

- 1.1.5 The following statement is TRUE about the difference between soil air and atmospheric air:
- A Soil air contains ten times less carbon dioxide than atmospheric air
 - B Soil air contains less oxygen and a greater amount of water compared to atmospheric air
 - C Atmospheric air is much more concentrated with carbon dioxide and nitrogen than soil air
 - D Atmospheric air is highly concentrated with moisture than soil air
- 1.1.6 The following is NOT influenced by soil temperature:
- A Soil formation
 - B Metabolic processes in plants
 - C Soil depth
 - D Activity of soil micro-organisms
- 1.1.7 The method of controlling soil salinity by removing salts on soil surface by mechanical means is ...
- A flushing.
 - B scraping.
 - C leaching.
 - D dissociation.
- 1.1.8 The diagnostic subsoil horizon that is formed under waterlogged conditions is ...B horizon.
- A gleycutanic
 - B humic
 - C melanic
 - D orthic
- 1.1.9 The fungi that forms a symbiotic relationship with plant roots so that plants absorb more phosphorus is ...
- A centipedes.
 - B actinomycetes.
 - C rhizobium.
 - D mycorrhiza.
- 1.1.10 ... is a measure the farmer can take to reduce water loss through transpiration.
- A Minimum tillage
 - B Removing weeds
 - C Terracing the land
 - D Reducing percolation
- (10 x 2) (20)

- 1.2 Indicate whether each of the descriptions in COLUMN B applies to **A ONLY**, **B ONLY**, **BOTH A and B** or **NONE** of the items in COLUMN A. Write **A only**, **B only**, **both A and B** or **none** next to the question number (1.2.1–1.2.5) in the ANSWER BOOK, for example 1.2.6 B only.

COLUMN A			COLUMN B
1.2.1	A	Glycerol	Building block of carbohydrates
	B	Glucose	
1.2.2	A	Hydrolysis	Chemical reaction resulting in the breaking down of chemical bond by addition of water
	B	Condensation	
1.2.3	A	Cohesion	Collection of molecules of a substance on the surface of another substances
	B	Adhesion	
1.2.4	A	Sieve method	Method of determining texture by releasing a soil sample into the water in a cylinder
	B	Settling columns	
1.2.5	A	Sodium bicarbonates	Deteriorates the structure of the soil due to removal of organic matter
	B	Sodium carbonates	

(5 x 2) (10)

- 1.3 Give ONE word/term for each of the following descriptions. Write only the word/term next to the question number (1.3.1–1.3.5) in the ANSWER BOOK.

1.3.1 The disaccharide formed when glucose bonds with fructose

1.3.2 A characteristic of a carbon atom that enables it to bond with itself to form a long chain

1.3.3 The movement of water in soil due to the force of gravity

1.3.4 The mass per unit volume of oven dry soil.

1.3.5 Soil colour with patches of different colours caused by periodic saturation

(5 x 2) (10)

- 1.4 Change the UNDERLINED WORD(S) in each of the following statements to make it 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 Propanol is the product of fermentation of sugar in alcoholic drinks.

1.4.2 Soil compaction is the arrangement of soil particles into units to give a distinctive characteristic pattern.

1.4.3 Nitrogen is a gas that reacts with insoluble calcium carbonate and changes it to soluble calcium bicarbonate.

1.4.4 The moisture that is held tightly by the soil particles and cannot be used by plants is capillary.

1.4.5 Mineralisation is the conversion of an element from an inorganic to an organic form in microbial or in plant tissues.

(5 x 1) (5)

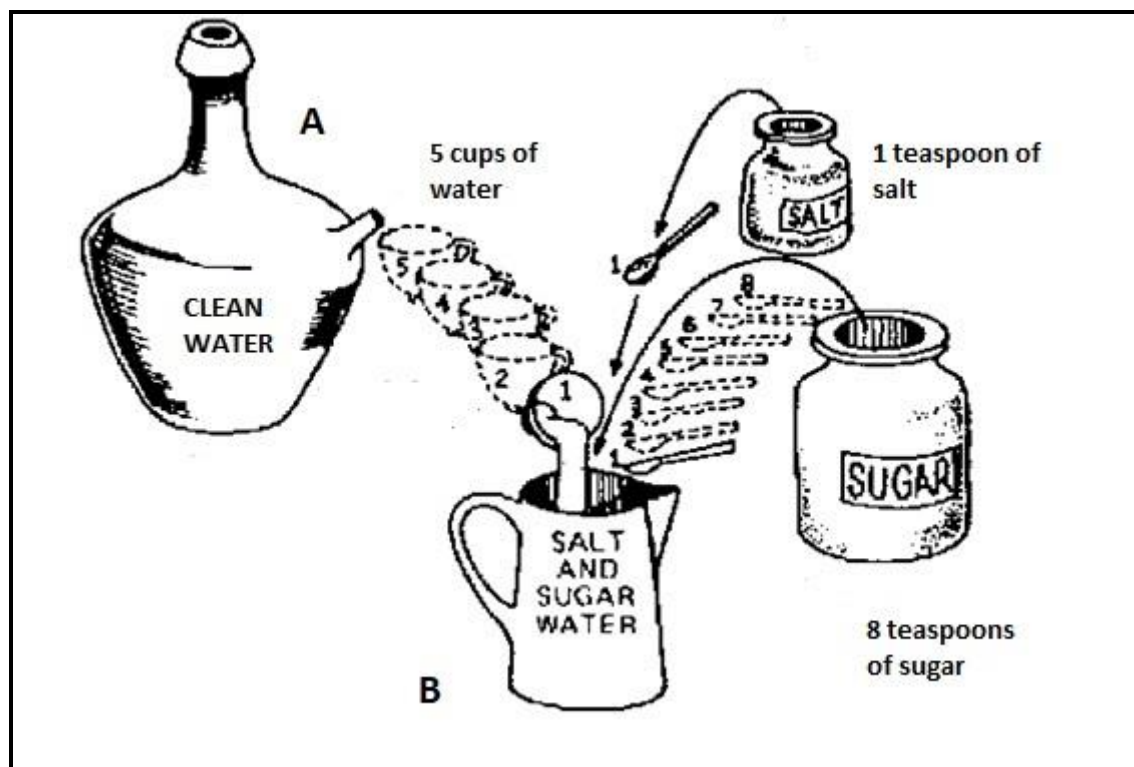
TOTAL SECTION A: 45

SECTION B

QUESTION 2: BASIC AGRICULTURAL CHEMISTRY



Start this question on a NEW page.

2.1 The illustration below shows substances used in agriculture.



- 2.1.1 Indicate the substance (**A** and **B**) from the above illustration that represents a compound and a mixture. (2)
- 2.1.2 Give a difference between substances labelled **A** and **B**. (2)
- 2.1.3 Use a diagram to show the chemical bond when the substance in picture A is formed. (3)

2.2 The pictures below show food types containing different fats.

FOOD A	FOOD B
	

2.2.1 Classify the fat in the food above as unsaturated and saturated. (2)

2.2.2 Identify the fat from the food types above that is recommended to be included in a diet. (1)

2.2.3 Give TWO reasons for your answer in QUESTION 2.2.2. (2)

2.2.4 Distinguish between food A and food B under the following headings:

(a) Melting point (2)

(b) Bond between the carbon atoms (2)

2.3 Proteins are complex organic compounds and have different functions depending on their shape.

2.3.1 Name the building block of a protein molecule. (1)

2.3.2 Give a difference between *simple* and *complex protein*. (2)

2.3.3 Indicate the reason to give animals protein in each of the following situations:

(a) Racing horse (1)

(b) Injured animal (1)

(c) Newly born animal (1)

- 2.4 The table below shows basic groups of organic compounds, structural formula as well as molecular formula

Name of a compound	Functional group	Structural formula	Molecular formula
A (1)	Hydrocarbon	$ \begin{array}{ccccc} & \text{H} & - & \text{H} & - & \text{H} \\ & & & & & \\ \text{H} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{H} \\ & & & & & \\ & \text{H} & - & \text{H} & - & \text{H} \end{array} $	B (1)
Ethanol	C (1)	D (2)	C ₂ H ₅ OH
E (1)	F (1)	$ \begin{array}{c} \text{H} \quad \quad \text{O} \\ \quad \quad \\ \text{H} - \text{C} - \text{C} - \text{OH} \\ \\ \text{H} \end{array} $	G (2)

2.4.1 Complete the table by providing labels **A** to **G**. (9)

2.4.2 Indicate ONE important use of the compound labelled **E** for rural communities. (1)

- 2.5 Below are pictures of carbohydrate-rich foods.



2.5.1 Classify the food above into different types of carbohydrates. (2)

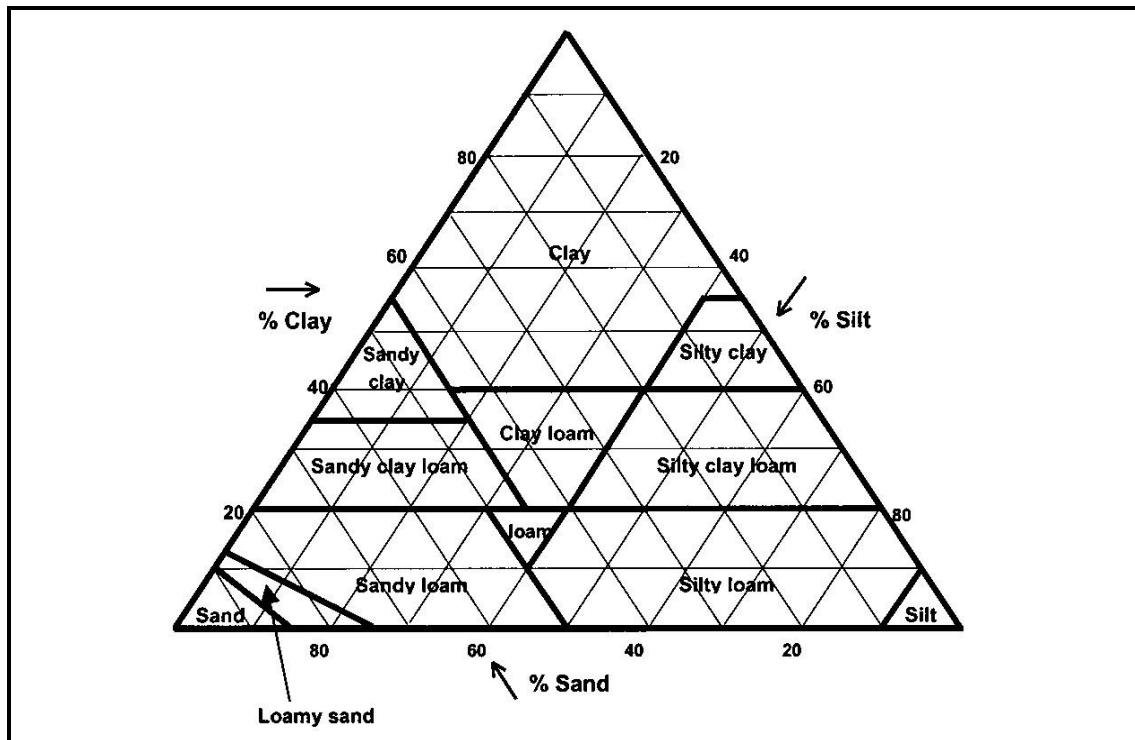
2.5.2 Write the chemical formula of the type of carbohydrate which sugar belongs. (1)

[35]

QUESTION 3: SOIL SCIENCE

Start this question on a NEW page.

- 3.1 Soil texture is the proportion of sand, silt and clay in a given soil sample. Below is a texture diagram used to identify soil texture classes, on the basis of particle-size analysis.

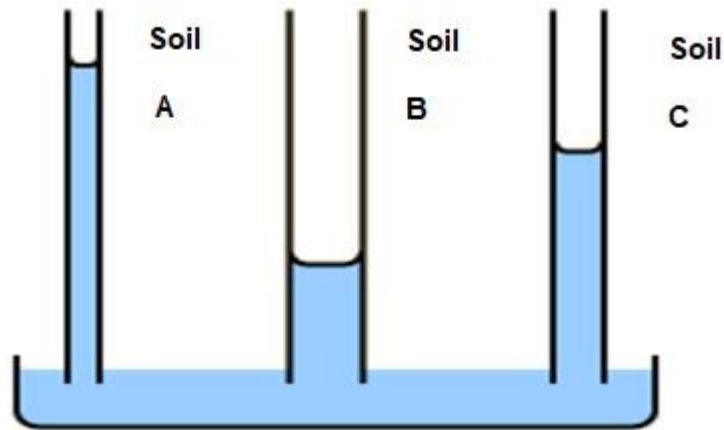


- 3.1.1 Use the texture diagram above to determine the percentage of sand and clay in the following texture classes:
- Clay loam (2)
 - Silt loam (2)
- 3.1.2 The texture class with 20% sand, 20% silt and 60% clay has an influence on soil characteristics. Substantiate this statement by explaining how this texture influences the following:
- Tillability of soil (2)
 - Drainage of soil (2)
- 3.1.3 Indicate the texture from the texture triangle that is ideal for crop cultivation. (1)

3.2

Grade 11 learners conducted an experiment to determine the movement of water in different soil textures. Three soil columns containing sand, loam/ silt and clay were set up and placed in a pan with water. Two observations were made:

- Height at which the water rises in each soil column
- Time the water took to reach the highest level



- 3.2.1 Formulate a hypothesis for the experiment above. (2)
- 3.2.2 Indicate the type of water movement the learners demonstrated in the experiment. (1)
- 3.2.3 Based on the observations, label the soil types represented by **A**, **B** and **C**. (3)
- 3.2.4 Indicate the soil where the following occurs: (1)
- Water rises most rapidly (1)
 - Water rises the slowest (1)
- 3.2.5 Give a reason for the answer in QUESTION 3.2.4 (a) and (b). (2)

- 3.3 The data below shows the soil temperature readings at two different depths measured from 06:00 until 18:00.

Time	Temperature reading on the surface (°C)	Temperature reading 20 cm deep (°C)
06:00	08	04
08:00	10	04
10:00	14	05
12:00	21	12
14:00	27	16
16:00	24	18
18:00	19	16

- 3.3.1 Draw a bar graph showing soil temperature readings at different depths during different times of the day. (6)
- 3.3.2 State your observations about the trend of temperature on the soil surface. (1)
- 3.3.3 Name TWO ways to minimise the situation in QUESTION 3.3.2. (2)
- 3.4 Soil colour is a useful indicator of some properties of soil. Different soil colours exist as a result of certain soil conditions.
- Indicate the cause of the following soil colours:
- 3.4.1 Black (1)
- 3.4.2 Red (1)
- 3.4.3 Grey (1)
- 3.5 Total pore space in soil is important for successful crop production because of its influence on the soil's ability to hold water, air and nutrients.
- Explain the influence of the following soil characteristics on the total pore space:
- 3.5.1 Soil depth (2)
- 3.5.2 Crumb structure (2)

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QUESTION 4: SOIL SCIENCE

Start this question on a NEW page.

4.1 The table below shows soil profile with different combination of soil horizons.

SOIL PROFILE A	SOIL PROFILE B	SOIL PROFILE C	SOIL PROFILE D
$\frac{A}{C}$	$\frac{A}{E}$ $\frac{B}{C}$	$\frac{A}{G}$ C	$\frac{B}{C}$

4.1.1 Identify the soil profile labelled **A**, **B**, **C** and **D**. (4)

4.1.2 Name the horizon that is associated with the following statements:

- (a) Receives soil material (1)
- (b) Mixture of inorganic matter and fully decomposed organic matter (1)
- (c) Soil is directly formed through physical weathering (1)

4.2 Soil classification is a systematic way of grouping soil into classes according to certain characteristics. Procedure is followed when classification is done.

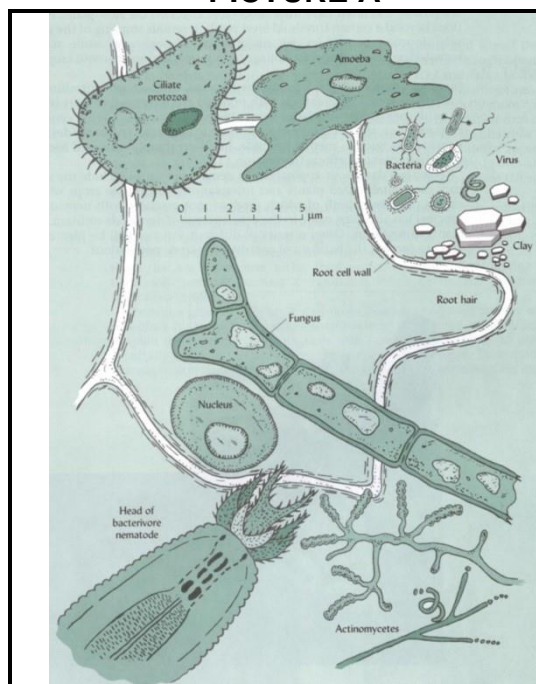
4.2.1 Re-arrange the steps below to be followed when classifying soil in the correct sequence:

- Establish soil form
- Determine soil series
- Identify diagnostic horizons
- Series characteristics are identified
- Demarcate master horizons (5 x 1) (5)

4.2.2 'In South Africa, a binomial soil classification system is used when classifying soil'. Explain this statement. (2)

4.3 The pictures below show some living organisms found in soil.

PICTURE A



PICTURE B



4.3.1 Classify the organisms in pictures **A** and **B**. (2)

4.3.2 The organisms in the pictures above need certain conditions in order to survive. Mention **THREE** conditions needed for the survival of these organisms. (3)

4.3.3 Explain how the organisms in the pictures above improve the following in the soil:

(a) Soil structure (2)

(b) Soil fertility (2)

4.4 The table below shows two farms with different soil conditions.

FARM A	FARM B
<ul style="list-style-type: none"> • Upper layer of soil is black • Soil particles dissociate • Reduced water infiltration • Poor seed germination due to dispersed particles blocking pores 	<ul style="list-style-type: none"> • White layer of salts appear on the soil surface • Water take a long time to infiltrate the soil • Crops appear wilted even after irrigation • On hot days water evaporates leaving salts on soil

4.4.1 Predict the pH of soils in **Farm A** and **Farm B**. (2)

4.4.2 Indicate the common terms used to describe the pH levels of **Farm A** and **Farm B**. (2)

4.4.3 Name the salts that predominate in **Farm A** soil. (1)

4.4.4 Suggest TWO measures in which the condition of soil in **Farm A** can be corrected. (2)

4.5 Soil colloids both inorganic and organic are tiny soil particles which determine the fertility of the soil.

4.5.1 Give an example of organic colloid. (1)

4.5.2 Differentiate between *organic* and *inorganic colloid* with regard to shape. (2)

4.5.3 Explain how organic and inorganic colloids improve soil fertility. (2)
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TOTAL SECTION B: 105
GRAND TOTAL: 150