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GRADE 11

NOVEMBER 2018

AGRICULTURAL SCIENCES P1

MARKS: 150

TIME: 2½ hours



This question paper consists of 16 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 correctly 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 Elements containing equal number of protons but different number of neutrons in the nuclei of their atoms.

- A Compounds
- B Isotopes
- C Actinides
- D Isomers

1.1.2 An atom with one or more extra electrons is called ...

- A cation.
- B proton
- C valence.
- D anion.

1.1.3 When hydrochloric acid dissolves in water the following chemical reaction occurs:

- (i) Hydrochloric acid donates a proton to water molecule.
- (ii) Water molecule gives up a proton and the acid accept a proton.
- (iii) A hydronium ion is formed.
- (iv) The hydrochloric acid will give up hydrogen.

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 a good soil structure for the farmer is ...

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

1.1.5 ... is NOT an agent responsible for aggregation of soil particles.

- A Clay
- B Microbial gum
- C Carbon dioxide
- D Iron oxide

1.1.6 The procedures below can be followed when reclaiming brackishness in soil:

- (i) Adding CaSO_4 .
- (ii) Growing asparagus and barley.
- (iii) Adding CaCO_3 .
- (iv) Apply heavy irrigation.

Choose the correct combination:

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

1.1.7 A situation describing the presence of water in a freely drained soil.

- A Saturation point
- B Field capacity
- C Wilting point
- D Drainage point

1.1.8 The following characterises a G horizon.

- A Sign of reduction under anaerobic conditions.
- B Presence of iron oxides and aluminium.
- C Mineral particles mixed with decayed organic material.
- D Aerobic conditions rich in iron.

1.1.9 The ... is the factor responsible for light colour in soils.

- A presence of organic matter
- B gleying condition
- C carbonates
- D presence of water

1.1.10 The process whereby nitrogen is incorporated into microbial cells.

- A Mineralisation
- B Immobilisation
- C Ammonification
- D Solubilisation

(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 Period	Elements that have the same number of electrons in their outer orbital
	B Groups	
1.2.2	A Catenate	Carbon can bond with itself to form long chain
	B Coalision	
1.2.3	A Coarse sand	Larger total surface area for chemical reactivity
	B Large soil particles	
1.2.4	A Gleycutanic	Subsoil diagnostic horizon found under waterlogged soil conditions
	B Hard plinthic	
1.2.5	A Cation exchange capacity	A quantitative measure of the ability of soil to exchange cations with the soil solution
	B Cation adsorption	

(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 A group of two or more atoms which are bound together to form a compound which behaves differently from the original atoms

1.3.2 The conversion of fat into oil during which the double bond between carbon atoms is broken down by the action of hydrogen

1.3.3 The part of a bulk volume of soil that is not solid units

1.3.4 A vertical cut in the soil exposing the arrangement of horizontal layers of a soil

1.3.5 The colour of soil with a number of different flecks

(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 A molecule is when two or more substances combine but each substance retains its own chemical identity.
- 1.4.2 Percolation is the movement of water through a narrow tube against the force of gravity.
- 1.4.3 Soil series is a unique vertical succession of diagnostic horizons.
- 1.4.4 A soil ped is a very tiny particle that can be suspended in water for a long time due to its size.
- 1.4.5 Solubilisation is the conversion of nutrients from organic form to inorganic form during decomposition (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 diagram below is the periodic table showing the arrangements of different elements according to their atomic numbers.

Periodic table of the elements

Callout box for Silver (Ag):
 47 ——— Symbol
 Ag ——— Name
 107,868 ——— Atomic weight

- 2.1.1 Refer to the periodic table above to complete the table below: DO NOT RE-DRAW the table.

ELEMENTS	VALENCE ELECTRONS	ATOMIC NUMBER	MASS NUMBER
Copper	(a)	29	(b)
Magnesium	2	(c)	(d)
Calcium	(e)	(f)	40

(6)

- 2.1.2 Elements in the periodic table are arranged in periods and groups. Indicate the common characteristic of elements in the same:

(a) Period (1)

(b) Group (1)

- 2.1.3 Elements in group 17 and group 18 differ. Explain how the elements in these groups differ with regard to chemical reactivity. (2)

- 2.1.4 Give a reason for the answer in QUESTION 2.1.2. (2)

2.2 Analyse the structural formula of compounds below and then answer questions that follow:

A	B
$ \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{OH} \\ \quad \\ \text{H} \quad \text{H} \end{array} $	$ \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array} $
C	D
$ \begin{array}{c} \text{O} \\ \\ \text{H}-\text{C}-\text{OH} \end{array} $	$ \begin{array}{c} \text{H} \\ \\ \text{H}-\text{N} \\ \\ \text{H} \end{array} $

2.2.1 Indicate the functional group of each of the compounds labelled:

(a) **A** (1)

(b) **C** (1)

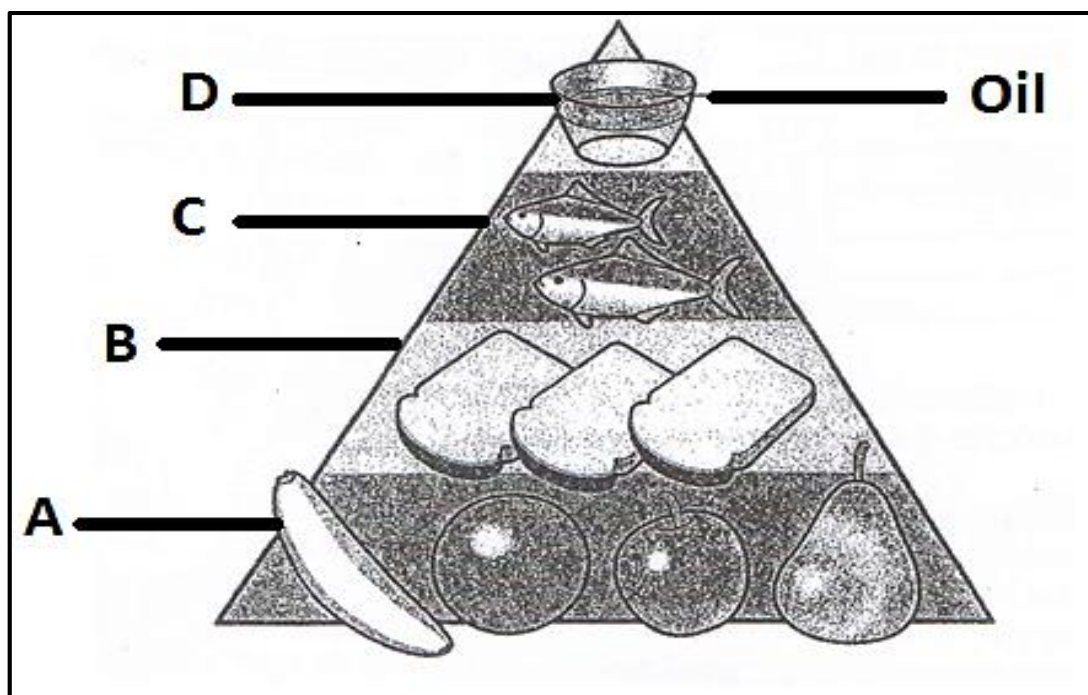
2.2.2 Write down the chemical formula of the compound labelled **C**. (2)

2.2.3 The compound labelled **B** plays a protective role in plants. Justify this statement by explaining THREE roles. (3)

2.2.4 Draw the Lewis structure of the compound labelled **D** showing a covalent link between the atoms. (4)

2.2.5 Compare compound **A** and **B** on the basis of their structural formulae. (2)

- 2.3 The pyramid below shows the feed components and their quantities that are included in a ration prepared for animals:



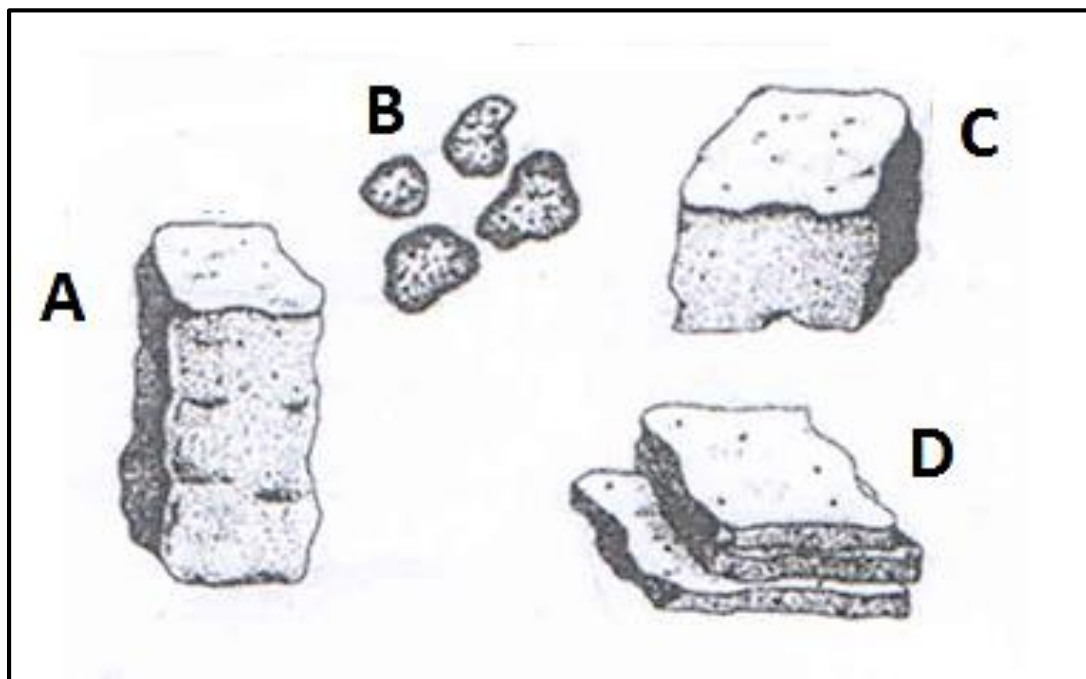
- 2.3.1 Name the organic compound in **A** and **C**. (2)
- 2.3.2 Indicate the building block of the compound in **C** and **D**. (2)
- 2.3.3 The compound in **C** can be simple or complex. Provide a distinction between the two. (2)
- 2.3.4 State TWO reasons why the compound labelled **B** is important. (2)
- 2.3.5 Indicate whether the compound in **D** is saturated or unsaturated. (1)
- 2.3.6 Support with a reason the answer in QUESTION 2.3.5. (1)

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QUESTION 3: SOIL SCIENCE

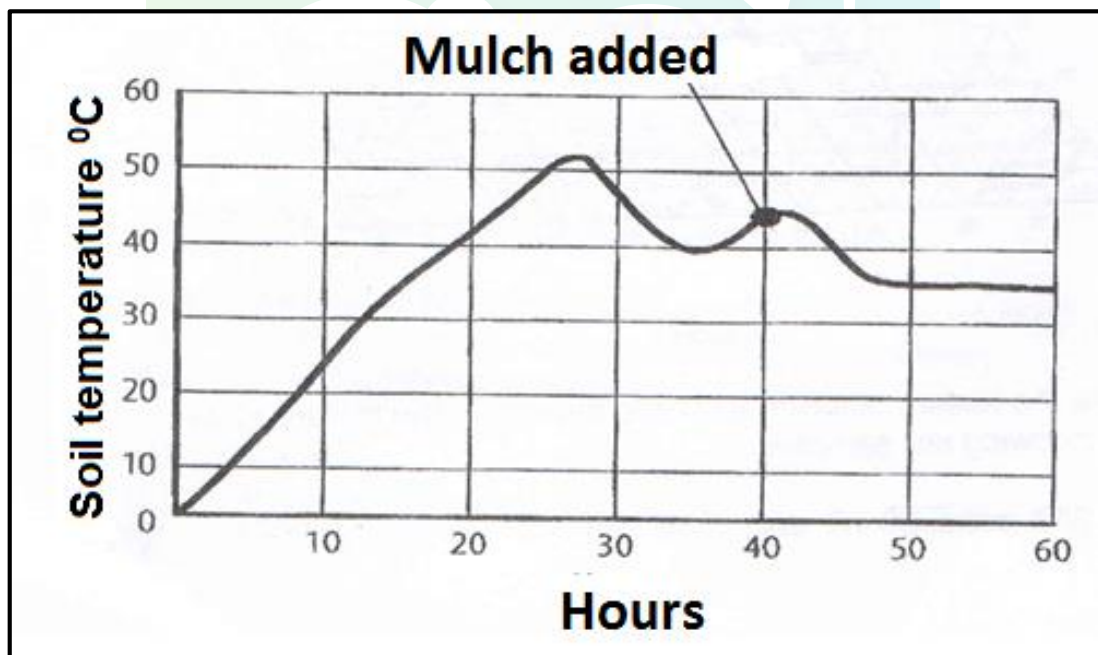
Start this question on a NEW page.

3.1 The diagrams below show different structures based on their shape.



- 3.1.1 Identify the structure labelled **A**. (1)
- 3.1.2 The structure labelled **B** can be destroyed through malpractices by the farmer. Justify this statement by explaining THREE malpractices that can lead to the destruction of soil structure. (3)
- 3.1.3 State TWO ways in which compaction in structure labelled **C**, can be prevented. (2)
- 3.1.4 Compare with a reason the structures labelled **B** and **D** with regard to suitability for cultivation. (4)

- 3.2 Different texture classes can be known through determining the quantity of clay, silt and sand in a given soil sample. Indicate the method of determining texture through the following:
- 3.2.1 Diagram showing the percentage of clay, silt and sand of a given sample. (1)
 - 3.2.2 Allowing light to pass through a dispersion of particles. (1)
 - 3.2.3 Soil sample is released into water and the size of particles reaching the bottom is determined. (1)
- 3.3 Explain the influence of clay and sand on the following soil characteristics:
- 3.3.1 Chemical reactivity (2)
 - 3.3.2 Fertility (2)
 - 3.3.3 Erodability (2)
- 3.4 The graph below shows soil temperature ranges over 60 hours.



- 3.4.1 Explain the trend of soil temperature as reflected in the graph above. (2)
- 3.4.2 Use a table to present the information given in the graph above. (6)
- 3.4.3 Name TWO ways in which the farmer can manipulate temperature other than the one shown on the graph. (2)

- 3.5 Soil air makes up the volume of soil not occupied by liquid. The amount of gases in soil is determined by the condition of soil. The oxygen content in lower horizons is less due to poor diffusion and carbon dioxide can escape easily in soils with a low total porosity.

- 3.5.1 Deduce TWO factors that influence storage and movement of soil air from the scenario above. (2)
- 3.5.2 Compare the levels of gases mentioned in the scenario above with those in the atmosphere. (2)
- 3.5.3 Explain the relationship between porosity and bulk density. (2)

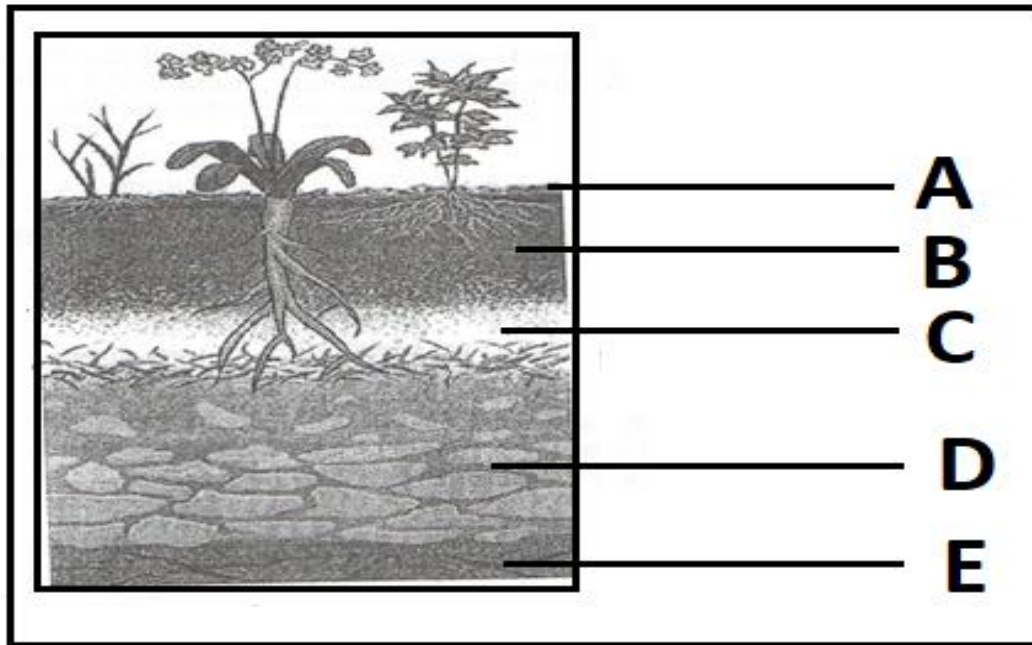
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QUESTION 4: SOIL SCIENCE

Start this question on a NEW page.

4.1 The diagram below shows horizontal layers.



4.1.1 Identify the letter of the horizon in which the following information applies:

- (a) Soil is directly formed (1)
- (b) Physical weathering occurs (1)
- (c) Signifies the loss of organic matter (1)
- (d) Decomposed organic matter mixed with mineral particles (1)

4.1.2 Sketch the profile of the following soils:

- (a) Wet soil (2)
- (b) Eroded soil (2)

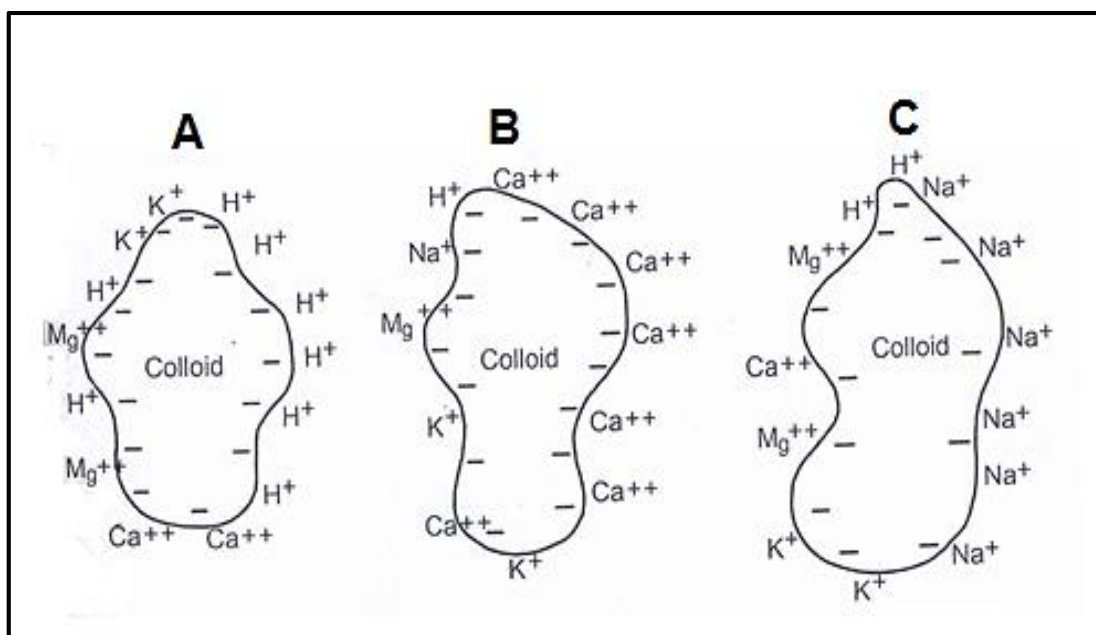
4.2 Soil classification is an important aspect of agriculture.

4.2.1 Outline THREE reasons why soil classification is important in agriculture. (3)

4.2.2 In South Africa soil classification system contains two categories or levels. Name these categories. (2)

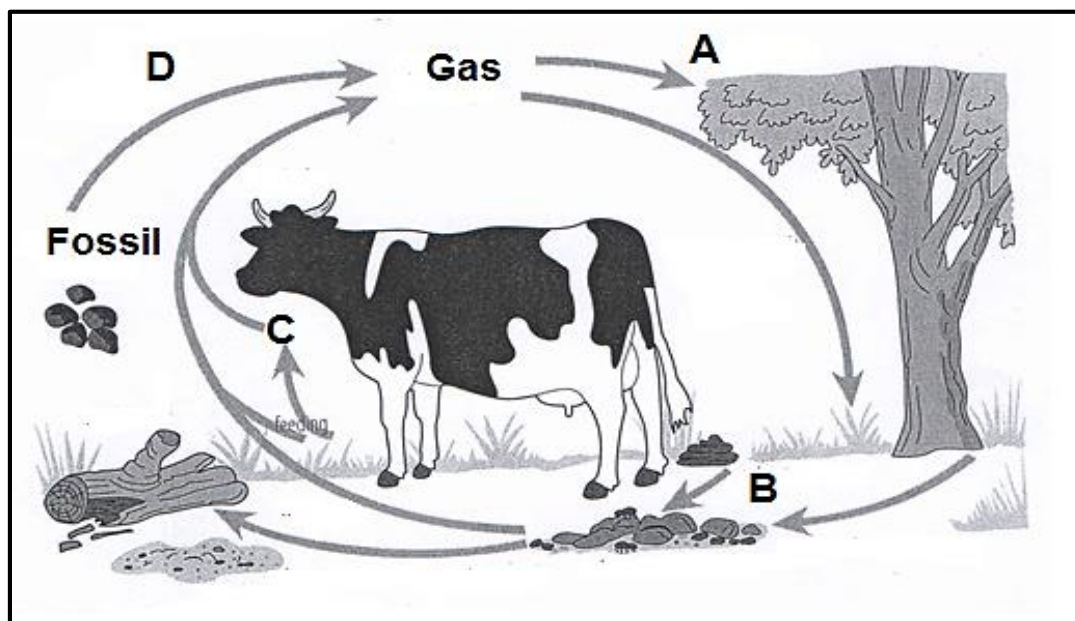
4.2.3 During soil classification, diagnostic horizons are identified. Name TWO visible characteristics showing a Vertic A horizon. (2)

- 4.3 The schematic representation below illustrates the cation adsorption on the surface of the colloids.



- 4.3.1 Indicate the type of acidity illustrated in the colloid labelled **A**. (1)
- 4.3.2 Give a reason for the answer in QUESTION 4.3.1. (2)
- 4.3.3 Name TWO factors that may be the cause of the colloidal condition labelled **A**. (2)
- 4.3.4 The colloidal condition labelled **C** causes the soil to be brackish. Justify this statement. (2)
- 4.3.5 Name the chemical substance that can be used to reclaim brackishness in soil. (1)

- 4.4 Nutrient cycling is important in agriculture as it ensures availability of nutrients over and over again for the next cropping season. Analyse the illustration below showing nutrient cycling.



- 4.4.1 Identify the nutrient cycle illustrated above. (1)
- 4.4.2 The processes labelled **A** and **C** ensure that the nutrient identified in QUESTION 4.4.1 reaches the living organisms. Name the processes in **A** and **C**. (2)
- 4.4.3 Indicate the processes in which the gas above is returned to the atmosphere as illustrated in label **D**. (1)
- 4.4.4 Explain the role of soil organisms in the cycle illustrated above. (2)
- 4.5 The table below shows TWO farmers specialising in crop production using different methods.

FARMER A	FARMER B
<ul style="list-style-type: none"> • Soil is tilled every year 	<ul style="list-style-type: none"> • Uses a no till method
<ul style="list-style-type: none"> • Cultivation of maize only every year 	<ul style="list-style-type: none"> • Maize is rotated with legume crop and a cover crop
<ul style="list-style-type: none"> • Enriches the soil with superphosphate and LAN 	<ul style="list-style-type: none"> • Enriches soil with compost, manure and green manure

- 4.5.1 Identify the farmer that is likely to have soil with the following:
- (a) High organic matter content (1)
 - (b) Low organic matter content (1)
- 4.5.2 Explain how soil tillage can have an impact on the level of organic matter content. (2)
- 4.5.3 Indicate TWO physical effects of the high organic matter content on soil. (2)
- [35]**

TOTAL SECTION B: 105
GRAND TOTAL: 150

