Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 11

NOVEMBER 2023

AGRICULTURAL SCIENCES P1

MARKS: **150**

TIME: **2½ hours**

IAGRSE1

This question paper consists of 15 pages.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of TWO sections, namely SECTION A and SECTION B.
2. Answer ALL the questions in the ANSWER BOOK.
3. Start EACH question on a NEW page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. You may use a non-programmable calculator.
6. Show ALL calculations, including 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 numbers (1.1.1 to 1.1.10) in the ANSWER BOOK, for example 1.1.11 A.

1.1.1 Which ONE of the following is an example of organic compounds? .

A Carbon dioxide
B Lipids
C Ammonia
D Water

1.1.2 The valence electron of an element with a mass number of 27 and an atomic number of 13 will be …

A 2.
B 4.
C 1.
D 3.

1.1.3 The following statements are TRUE with regard to methane:

(i) Is the simplest alkane and the main component of natural gas
(ii) It produces O_2 and H_2O when it burns in excess of CO_2
(iii) It is used as a source of energy in rural homes
(iv) Has one carbon and four hydrogens

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 The monomers of starch and glycogen are connected by … bonds.

A peptide
B ester
C dative
D glycosidic

1.1.5 The following is NOT the factor influencing the development of soil structure.

A Presence of organic matter
B Activity of earthworm
C Unchanged soil moisture condition
D High clay content

1.1.6 The mottled appearance in soil is an indication of the following:

(i) The reduction of red ferric ion to bluish-grey ferrous ion
(ii) Many flecks in the subsoil
(iii) Patches of rust, yellow and grey colours
(iv) Waterlogging for part of the day

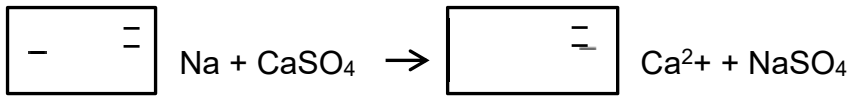
Choose the correct combination:

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

1.1.7 A loss of water through transpiration can be controlled by …

A reducing excessive use of nitrogen fertilisers.
B applying ammonium phosphate.
C choosing a cultivar with a high transpiration ratio.
D allowing weeds to cover the soil.

1.1.8 The schematic representation below demonstrates the …



A reclamation of neutral soil.
B reclamation of soil fertility.
C reclamation of brackish soil.
D reclamation of soil acidity.

1.1.9 The following is NOT the procedure followed when classifying the soil.

A Identification of master horizons
B Improving diagnostic horizons
C Determining soil series characteristics
D Determining soil family

1.1.10 The soil micro-organisms responsible for the decomposition of plant and animal residues.

A Bacteria and earthworms
B Nematodes and actinomycetes
C Mice and moles
D Fungi and millipedes (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 numbers (1.2.1 to 1.2.5) in the ANSWER BOOK, for example 1.2.6 B only.

COLUMN A			COLUMN B
1.2.1	A:	Anion	Positively charged ion
	B:	Cation	
1.2.2	A:	Compound	A substance consisting of two or more different elements combined in a fixed ratio
	B:	Mixture	
1.2.3	A:	Soil compaction	Arrangement of soil particles to form aggregates
	B:	Soil texture	
1.2.4	A:	Fine texture	High degree of cohesive forces and plasticity
	B:	Coarse texture	
1.2.5	A:	Humic A	Diagnostic horizon characterised by high organic matter content
	B:	Melanic A	

(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 numbers (1.3.1 to 1.3.5) in the ANSWER BOOK.

1.3.1 The smallest particle of a substance which can exist independently and still retain the properties of that substance

1.3.2 The structure in which the outer electron(s) of an atom is/are represented by dots or crosses

1.3.3 A texture that has a diameter of less than 0,002 mm

1.3.4 The degree of bulk volume of soil that is not solid units

1.3.5 Very small negatively charged particles that can be suspended in water

(5 x 2) (10)

1.4 Change the UNDERLINED WORD(S) in EACH of the following statements to make them TRUE. Write only the answer next to the question numbers (1.4.1 to 1.4.5) in the ANSWER BOOK.

1.4.1 A <u>complex</u> protein yields only amino acids when hydrolysed.

1.4.2 <u>Wilting</u> point is the maximum moisture holding capacity of soil where all pore spaces are filled with water.

1.4.3 <u>Cation exchange capacity</u> is the bonding of cations on the surface of the colloid soil.

1.4.4 Nitrogen <u>mineralisation</u> is the absorption and fixation of available nitrogen compounds by soil micro-organisms.

1.4.5 <u>Eluviation</u> is the process whereby material from A-horizon is deposited to a B-horizon.

(5 x 1) (5)

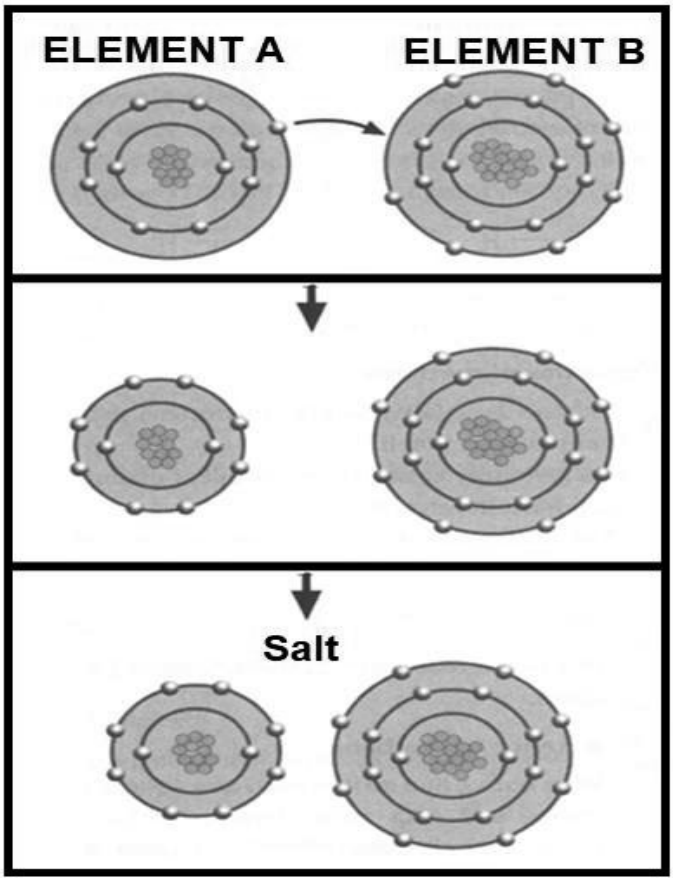
TOTAL SECTION A: 45

SECTION B

QUESTION 2: BASIC AGRICULTURAL CHEMISTRY

Start this question on a NEW page.

2.1 The table below shows substances used in agriculture.



2.1.1 Classify the compound in the table above. (1)

2.1.2 Name the elements labelled **A** and **B**. (2)

2.1.3 Describe the type of bond involved in the table above. (2)

2.1.4 Indicate the charge of the elements below after bonding:

(a) Element **B** (1)

(b) Element **A** (1)

2.1.5 Name ONE importance of the compound in the table above. (1)

2.2 In an experiment, the educator mixed equal quantities of HCℓ and NaOH with the same concentration.

2.2.1 Predict the pH of the mixture. (1)

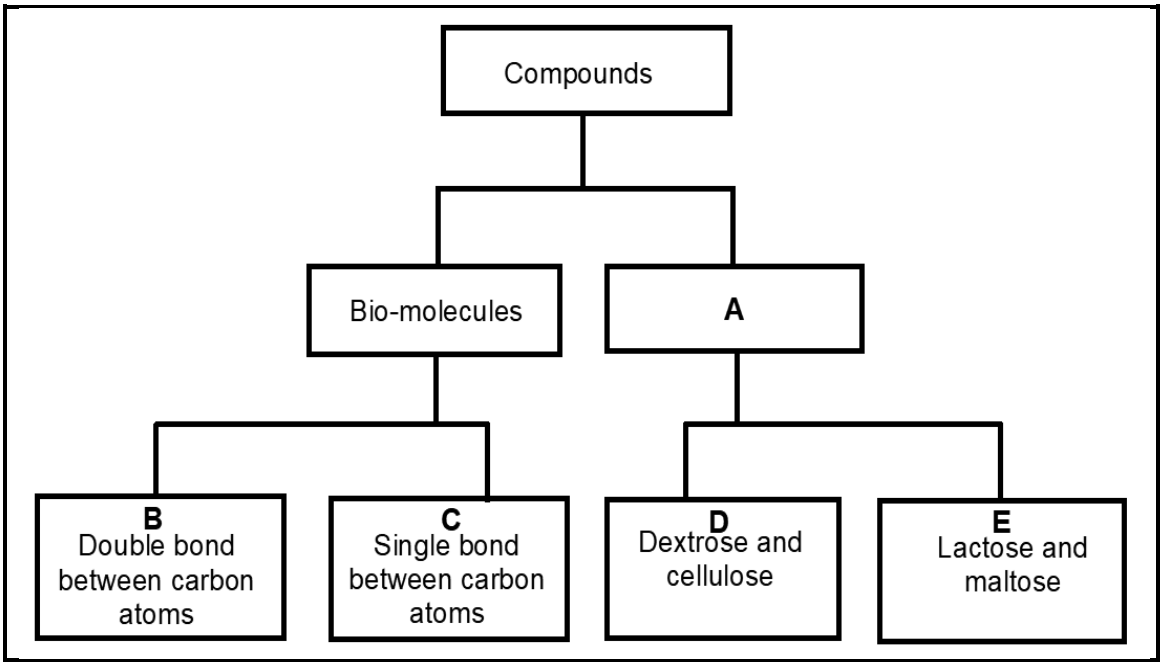
2.2.2 Indicate the substance in the mixture that is:

(a) A base (1)

(b) An acid (1)

2.2.3 Tabulate TWO differences between the substances in the mixture. (4)

2.3 Analyse the flow chart below and answer the questions based on it.



2.3.1 Name the compound labelled **A**. (1)

2.3.2 Identify label **B** and **C**. (2)

2.3.3 Indicate the letter of a bio-molecule that matches each of the characteristics below:

(a) It is of animal origin (1)

(b) Liquid at room temperature (1)

2.3.4 Give TWO functions of the compound named in QUESTION 2.3.1. (2)

2.3.5 Write the chemical formula of the compounds labelled **D**. (1)

2.4 Sugarcane and maize are grown and processed for their alcohol content produced by means of fermentation as shown in the equation below:

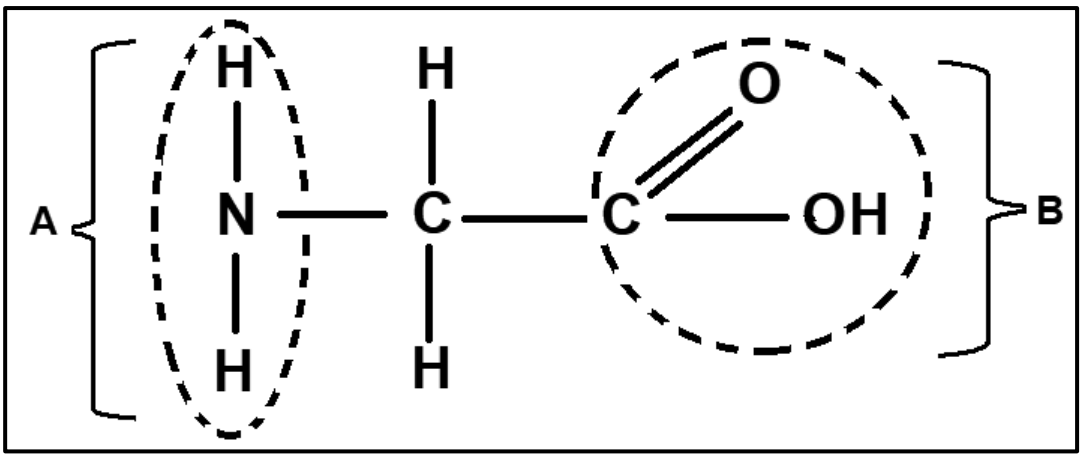
$$C_6H_{12}O_6 \longrightarrow 2C_2H_5OH + 2\ CO_2$$

2.4.1 Name the alcohol in the equation above. (1)

2.4.2 Draw the structural formula of the alcohol in QUESTION 2.4.1. (3)

2.4.3 State ONE difference between alcohols and alkanes based on their structural formulae. (2)

2.5 The structure below represents a structural formula of an organic compound.



2.5.1 Identify the structure illustrated above. (1)

2.5.2 Provide the label for **A** and **B** in the structure above. (2)

2.5.3 Name the polymer formed when the structures above are joined in a chain. (1)

2.5.4 Give TWO functions of the polymer stated in QUESTION 2.5.3. (2)

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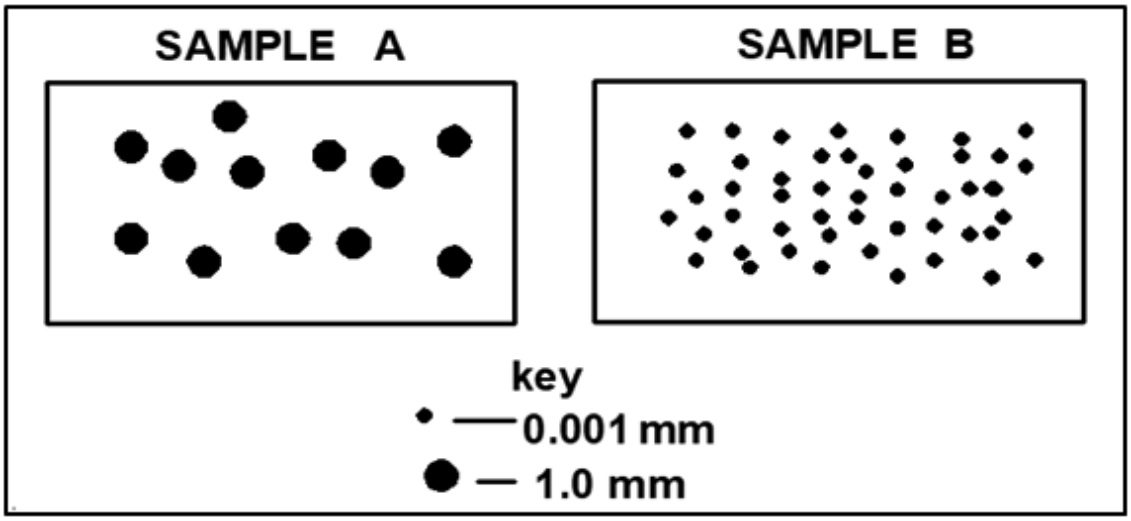
QUESTION 3: SOIL SCIENCE

Start this question on a NEW page.

3.1 The illustration below represents soil samples with different particle sizes.



3.1.1 Indicate the sample that matches each of the characteristics below:

(a) Larger surface area for chemical reactions (1)

(b) Low ability to retain moisture and nutrients (1)

(c) High heat conduction (1)

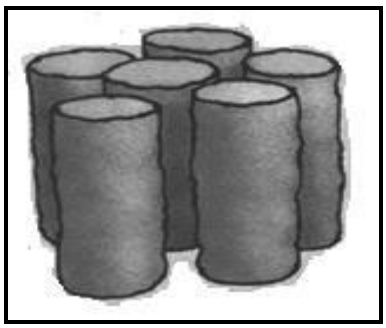
3.1.2 **SOIL SAMPLE B** has a mass of 480 g and occupies a volume of 460 cm^3.
Calculate the bulk density of **SOIL SAMPLE B**. (3)

3.1.3 Name ONE reason why farmers need to know the textural class of the farm soil. (1)

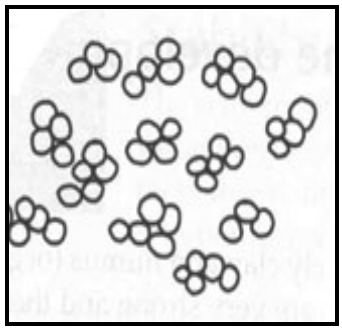
3.2 The diagrams below show different soil structures based on their shape.

A

B



C



3.2.1 Identify the structures labelled **A**, **B** and **C**. (3)

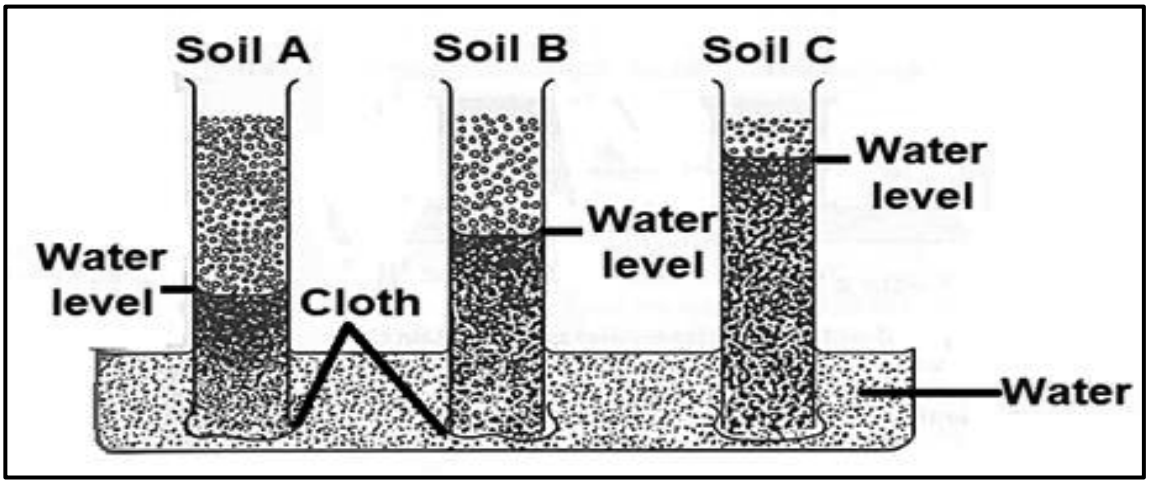
3.2.2 Indicate the letter representing the structure that is:

(a) Commonly found in clay pan soils (1)

(b) Suitable for crop production (1)

3.2.3 Name TWO factors that contributed to the development of the soil structure labelled **C**. (2)

3.3 The diagram below illustrates water movement through the soil.



3.3.1 Indicate the water movement demonstrated above. (1)

3.3.2 Name TWO forces that have an effect on the water movement in Soil **C**. (2)

3.3.3 Identify the soils represented by each of the following: (1)

(a) Soil **C** (1)

(b) Soil **A** (1)

3.3.4 Suggest a reason for each of the following:

(a) Highest water level in soil **C** (1)

(b) Lowest water level in soil **A** (1)

3.4 The colour of the soil gives information about soil properties and the condition if it is correctly interpreted.

Indicate the condition of the soil with regard to moisture and air when the following colours are predominant:

(a) Red (2)

(b) Grey (2)

3.5 A soil scientist conducted an experiment to test the influence of soil air in plants.

EXPERIMENT NO.	**EXPERIMENT 1**	**EXPERIMENT 2**
SOIL CONDITION	Seeds planted in soil that is waterlogged	Seeds planted in crumbled soil and watered when there is a need
RESULTS	No growth occurred	Growth occurred

3.5.1 Name the gas that is deficient in **EXPERIMENT 1**. (1)

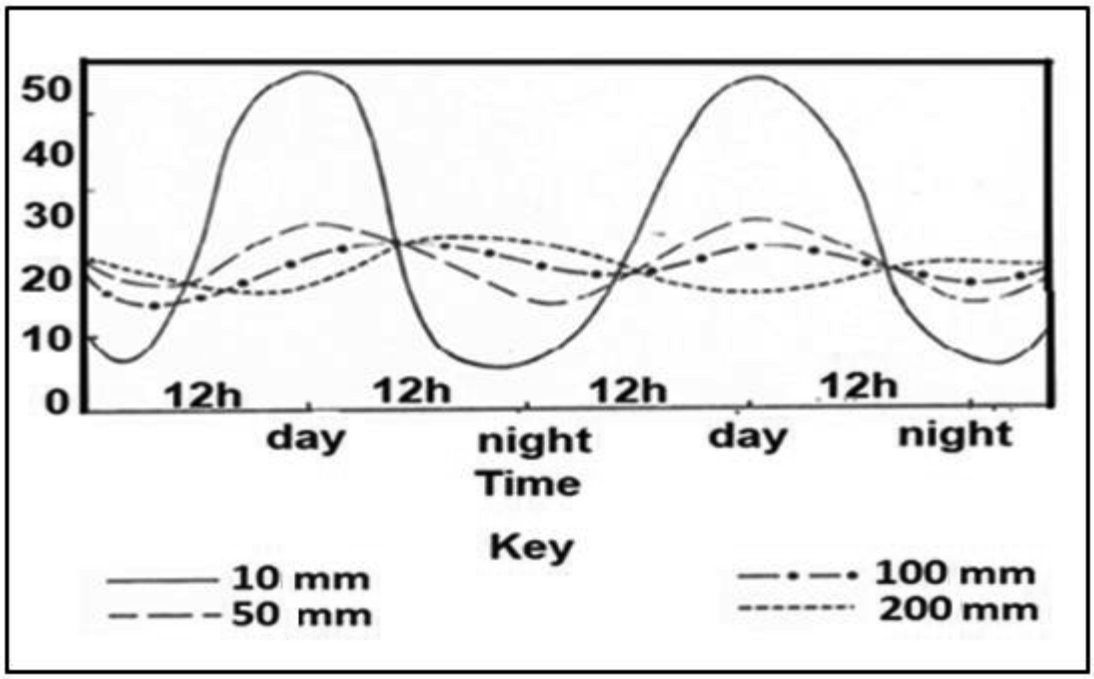
3.5.2 Indicate the role that the gas mentioned in QUESTION 3.5.1 could have played if it was not deficient. (1)

3.5.3 Compare the atmospheric gases and soil gases in:

(a) Experiment 2 (2)

(b) Experiment 1 (2)

3.6 The graph below shows a factor that has an influence on soil temperature.



3.6.1 Identify the factor influencing the soil temperature as illustrated in the graph above. (1)

3.6.2 Explain how the factor identified in QUESTION 3.6.1 has an influence on soil temperature. (2)

3.6.3 Name ONE effect of soil temperature on the chemical processes that take place in the soil. (1)

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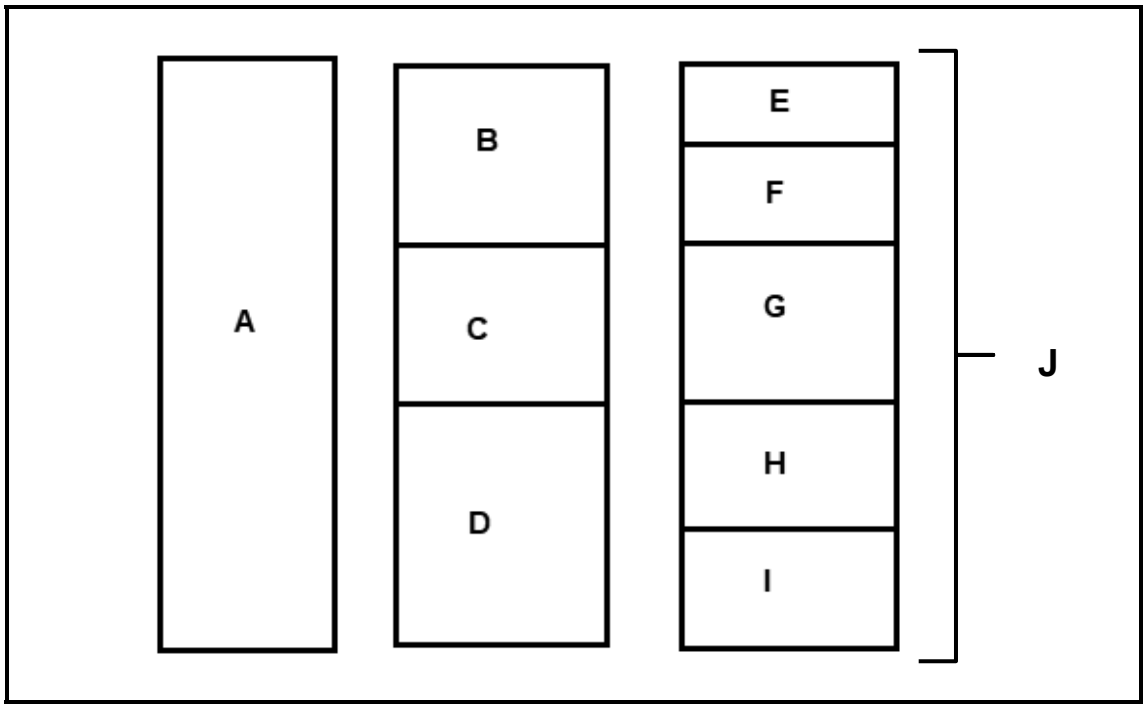
QUESTION 4: SOIL SCIENCE

Start this question on a NEW page.

4.1 The schematic representation below shows horizontal layers of soil.



4.1.1 Select a letter (**A** to **I**) representing a horizon that matches each of the descriptions below:

(a) Partly weathered material (1)

(b) Consolidated rock (1)

(c) Partly decomposed organic matter (1)

4.1.2 Identify the part labelled **J** from the schematic representation above. (1)

4.1.3 Sketch the profile of the soil with the horizontal layers illustrated in the schematic representation in QUESTION 4.1. (2)

4.1.4 Name TWO diagnostic horizons that may be visible in the horizon labelled **F** in the above schematic representation. (2)

4.2 Soil classification is the method used by soil scientists to group the soil into different classes according to particular characteristics.

4.2.1 State TWO reasons why classification of soil is important in agriculture. (2)

4.2.2 Name the soil classification system which is used in South Africa. (1)

4.3 The table below shows the soil pH values and phosphorus availability.

SOIL PH	AVAILABILTY OF PHOSPHORUS (g)
2	0
4	1
6	3
8	4
10	8
12	14

4.3.1 Present the information in the above table, in the form of a line graph. (6)

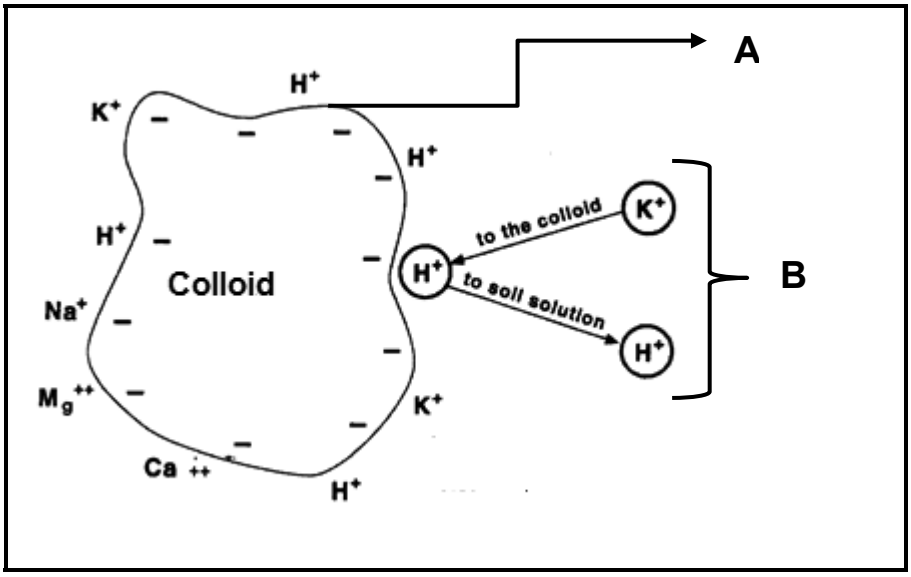
4.3.2 Deduce the influence of acidity and alkalinity on the availability of phosphorus. (2)

4.3.3 Indicate the chemical substance a farmer can apply to solve the following conditions:

(a) Decreased availability of phosphorus in soils with a pH of between 2 and 4 (1)

(b) Toxic quantities of phosphorus in soil with pH of 14 (1)

4.4 The schematic representation below shows cation in soil solution and soil colloid.



4.4.1 Deduce the term that is applicable to the process in **B**. (1)

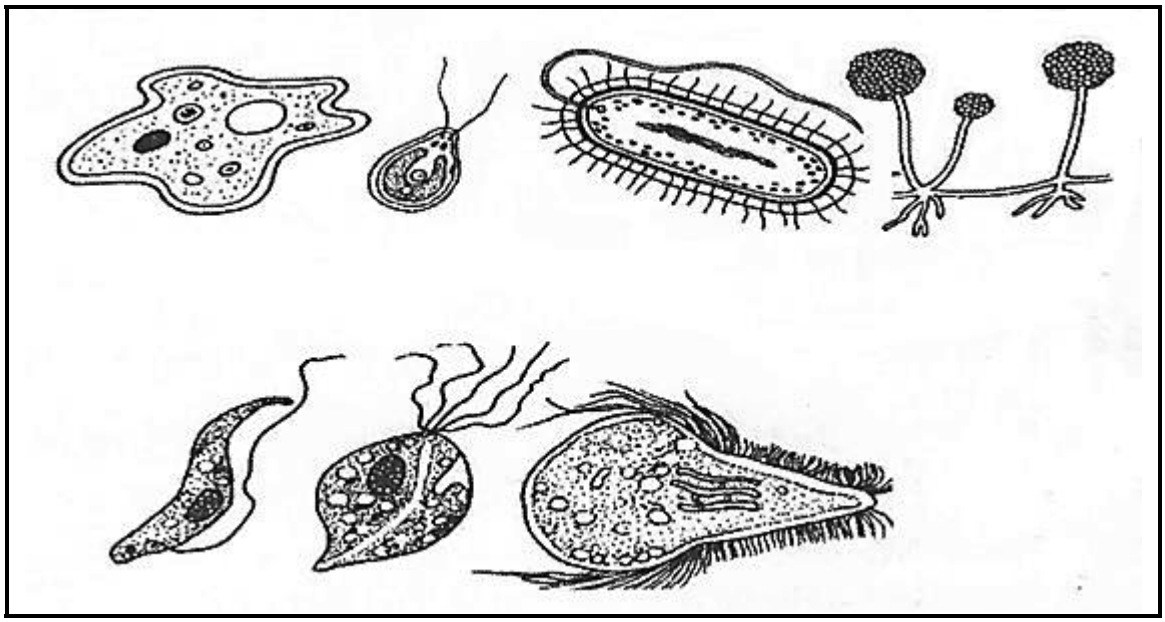
4.4.2 Give a reason for the answer in QUESTION 4.4.1. (1)

4.4.3 Indicate the type of acidity in **A** and **B**. (2)

4.4.4 Identify the cation illustrated by the colloid above that can cause sodicity in soil if it is in excess. (1)

4.4.5 State TWO effects of the presence of the cation in QUESTION 4.4.4 on plant growth. (2)

4.5 The diagram below represents soil organisms found in soil.



4.5.1 Classify the soil organisms in the diagram above. (1)

4.5.2 State TWO importance of soil organisms in QUESTION 4.5.1. (2)

4.5.3 Name TWO requirements for the effective functioning of the soil organisms in the diagram above. (2)

4.6 Plants and animals play an important role in the development of soil through the addition of organic matter.

Indicate TWO factors that lower the organic matter content in soil. (2)
[35]

TOTAL SECTION B: 105
GRAND TOTAL: 150