



Province of the  
**EASTERN CAPE**  
EDUCATION

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Provinsie van die Oos Kaap: Departement van Onderwys  
Porafensie Ya Kapa Botjhabela: Lefapha la Thuto

# **NATIONAL SENIOR CERTIFICATE**

**GRADE 11**

**NOVEMBER 2024**

**AGRICULTURAL SCIENCES P1**

**MARKS: 150**

**TIME: 2½ hours**



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This question paper consists of 18 pages.  
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**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 D.

1.1.1 A bond that joins monomers of carbohydrates.

- A Peptide
- B Glycosidic
- C Ester
- D Covalent

1.1.2 Hydrogen and helium are found in ... 1 of a periodic table.

- A vertical
- B group
- C column
- D period

1.1.3 ... electrons in the outermost shell of an atom take part in the formation of chemical bonds.

- A Core
- B Valence
- C Positively charged
- D Neutral

1.1.4 Proteins are essential to both animals and human beings; they form part of:

- (i) Enzymes
- (ii) Hormones
- (iii) Cellulose component
- (iv) All cells in the body

Choose the CORRECT combination:

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

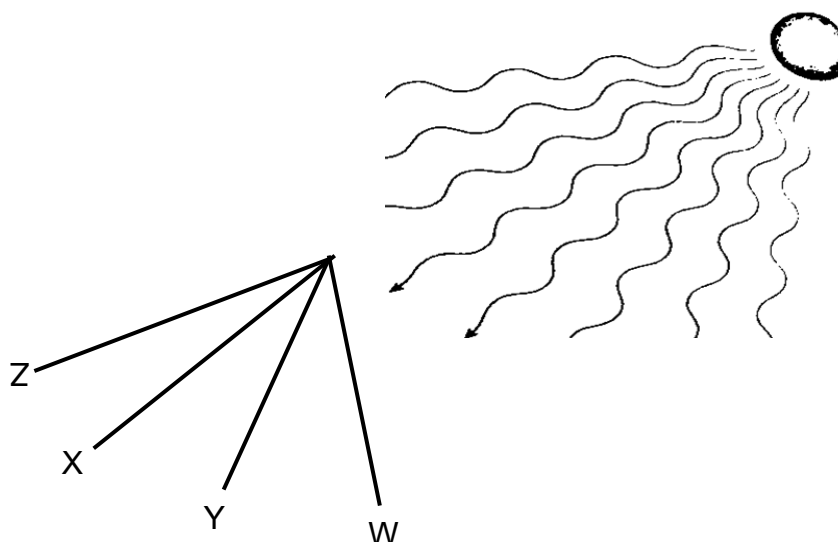
1.1.5 Influence of sand particles on soil properties.

- (i) Minerals do not decay quickly
- (ii) Makes tilling easier
- (iii) Increases macro-pore space
- (iv) Result in a large surface area for chemical reactions

Choose the CORRECT combination:

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

1.1.6 The slope that is warmer and yields the earliest crop is ...



- A W
- B X
- C Y
- D Z

1.1.7 A gas that is ten times higher in soil air as compared to atmospheric air.

- A Water vapour
- B Nitrogen
- C Oxygen
- D Carbon dioxide

1.1.8 The following are macro pore features, EXCEPT for:

- A Water movement is restricted
- B Infiltration capacity is high
- C Good aeration and rapid drainage
- D Found in coarse textured soil

1.1.9 ... is a gas that is fixed by lightning.

- A Nitrogen
- B Oxygen
- C Vapour
- D Carbon dioxide

1.1.10 One of the following is NOT a requirement for optimal growth of soil organisms.

- A Soil water
- B Ideal temperature
- C Soil pH of between 10 and 12
- D Oxygen

(10 x 2) (20)

- 1.2 Indicate whether each of the descriptions in COLUMN B apply 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:	Hydrophilic	A simple fatty acid end that does not bond with water
	B:	Hydrophobic	
1.2.2	A:	Isomer	Compounds with the same molecular formula, but different structures
	B:	Isotope	
1.2.3	A:	Gravitational	Water that is not held in the pores but on the surface of soil particles
	B:	Hygroscopic	
1.2.4	A:	Rich in iron and aluminium	Red soil colour
	B:	Good yield	
1.2.5	A:	Organic O-horizon	Subsoil diagnostic horizons
	B:	Orthic A-horizon	

(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 A negatively charged functional group consisting of a combination of hydroxyl (OH) carbonyl (O) groups attached to a single carbon atom

1.3.2 The reduced amount of this gas in the soil affects plant physiological processes

1.3.3 Organic component of soil which is the end-product of the decomposition of leaves and other plant material by soil micro-organisms

1.3.4 Accumulation of dissolved or suspended soil materials in one horizon as result of percolation from another

1.3.5 Very small inorganic and organic particles found in soil with a spherical diameter ranging between 1 and 1 000 nm (5 x 2) (10)

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

1.4.1 Acids are a chemical species that accepts a hydrogen ion.

1.4.2 Permanent wilting point is when the soil does not provide enough water to the plant to enable it to retain its turgidity, but when plants are watered they recover.

1.4.3 Immobilisation is the microbial conversion of nutrients in organic form to inorganic form during decomposition.

1.4.4 Organic matter improves aeration in sandy soil.

1.4.5 Denitrifying bacteria converts ammonia into nitrates. (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 shows the arrangement of different elements.

The diagram is a standard periodic table of elements. It is organized into rows (periods) and columns (groups). The elements are arranged in order of increasing atomic number. The table includes the following elements:

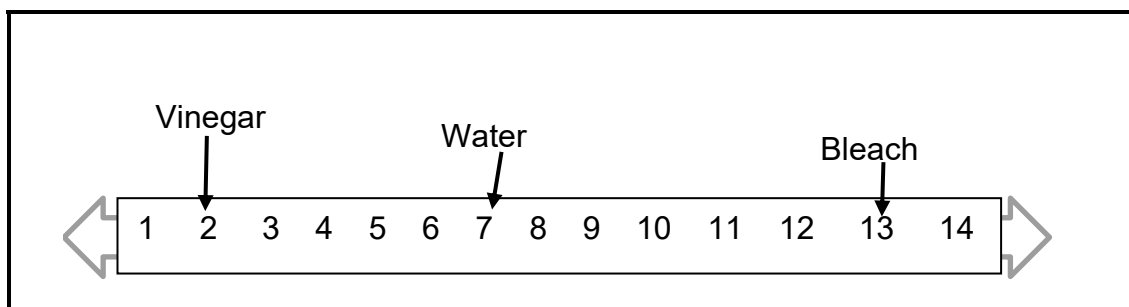
- Period 1:** H, He
- Period 2:** Li, Be, B, C, N, O, F, Ne
- Period 3:** Na, Mg, Al, Si, P, S, Cl, Ar
- Period 4:** K, Ca, Sc, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, Ge, As, Se, Br, Kr
- Period 5:** Rb, Sr, Y, Zr, Nb, Mo, Tc, Ru, Rh, Pd, Ag, Cd, In, Sn, Sb, Te, I, Xe
- Period 6:** Cs, Ba, La, Hf, Ta, W, Re, Os, Ir, Pt, Au, Hg, Tl, Pb, Bi, Po, At, Rn
- Period 7:** Fr, Ra, Ac, Th, Pa, U, Np, Pu, Am, Cm, Bk, Cf, Es, Fm, Md, No, Lr

The Lanthanide and Actinide series are shown separately at the bottom of the table.

- 2.1.1 Identify the diagram above. (1)
- 2.1.2 Identify the criteria which is used to arrange elements in the diagram above. (1)
- 2.1.3 Differentiate between *ionic* and *covalent* bonding. (2)
- 2.1.4 Use the diagram above to predict the type of bond that will be formed between the following elements:
- (a) Magnesium and chlorine (1)
  - (b) Carbon and oxygen (1)
- 2.1.5 Draw a Lewis Dot Structure to illustrate the following compounds:
- (a) Water (3)
  - (b) Sodium chloride (3)
- 2.1.6 Give TWO examples of particles that make up an atom. (2)



2.2 The diagram below shows the pH values of a few chemicals.



2.2.1 Name the instrument used to determine the pH values of substances in the diagram above. (1)

2.2.2 State the name given to reactions between substances like vinegar and bleach that are found at opposite ends of the pH scale. (1)

2.2.3 Give TWO products of the reaction in QUESTION 2.2.2 above. (2)

2.3 Study the table below and answer the questions that follow.

COMPOUND	CHEMICAL FORMULA	STRUCTURAL FORMULA
(a)	CO <sub>2</sub>	O=C=O
Ammonia	(b)	$\begin{array}{c} \text{H} \quad \text{H} \\ \diagdown \quad \diagup \\ \text{N} \\   \\ \text{H} \end{array}$
(c)	C <sub>2</sub> H <sub>6</sub>	(d)

2.3.1 Identify the compounds (a) and (c). (2)

2.3.2 Provide a chemical formula of (b). (1)

2.3.3 Draw the structural formula of (d). (3)

2.3.4 Describe the important role of compound (a) in plants. (1)

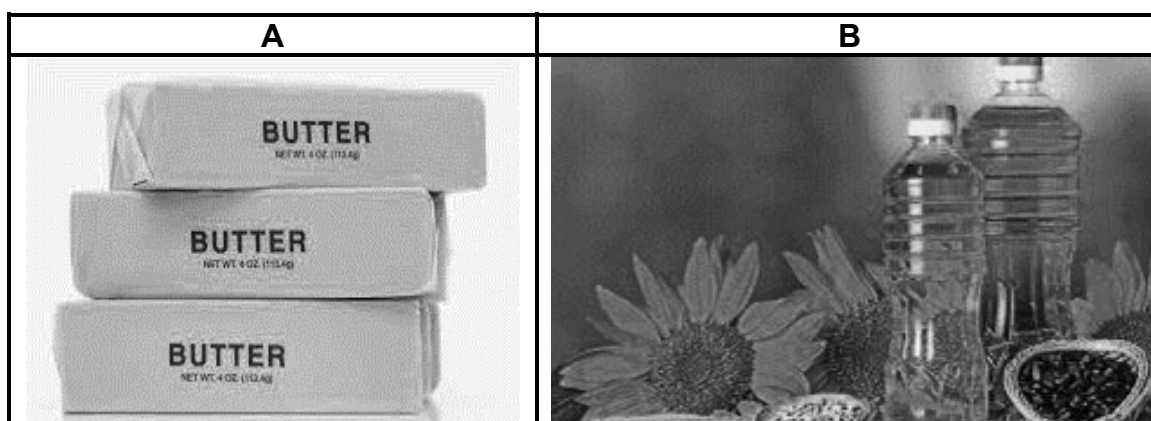
2.3.5 Classify the compound in (c) as organic or inorganic. (1)

- 2.4 Methane is the simplest alkane and the main component of natural gas. Burning methane in the presence of oxygen produces heat, carbon dioxide and water. The relative abundance of methane makes it a useful fuel. Ethanol is a volatile, flammable and colourless liquid. The fermentation of sugar into ethanol is one of the earliest organic reactions which humans perfected and used.

2.4.1 Deduce the importance of methane for human use in the scenario. (1)

2.4.2 Identify an alcohol and an alkane from the scenario above. (2)

2.5 The pictures below show two examples of organic compounds.



2.5.1 Identify the group of organic compounds to which the compounds in the pictures above belong. (1)

2.5.2 Differentiate between the two organic compounds above based on double bonds in their hydrocarbon chains. (2)

2.5.3 Mention TWO functions of the compounds in living organisms. (2)

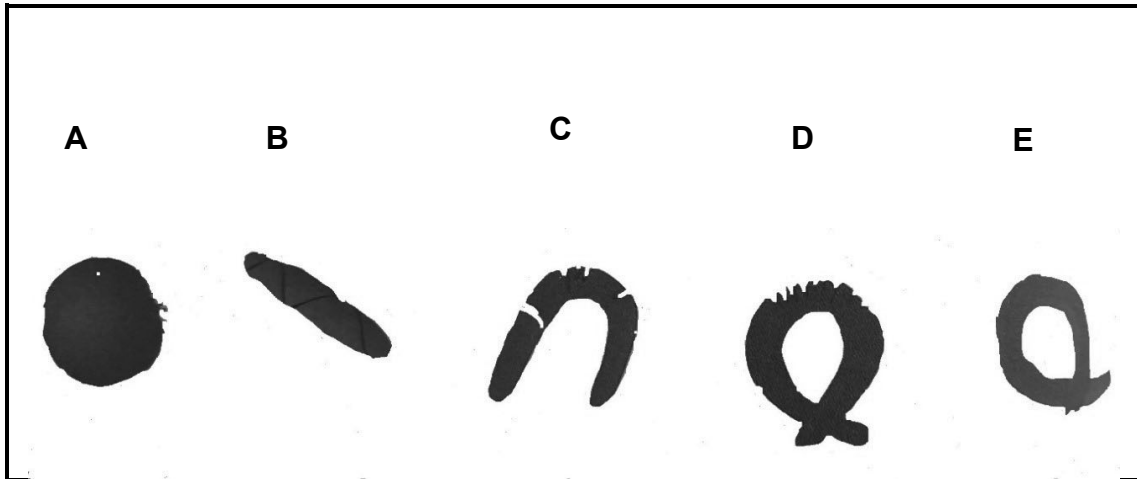
2.5.4 Name the process during which manufacturers add hydrogen to compounds like those in PICTURE B. (1)

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**QUESTION 3: SOIL SCIENCE**

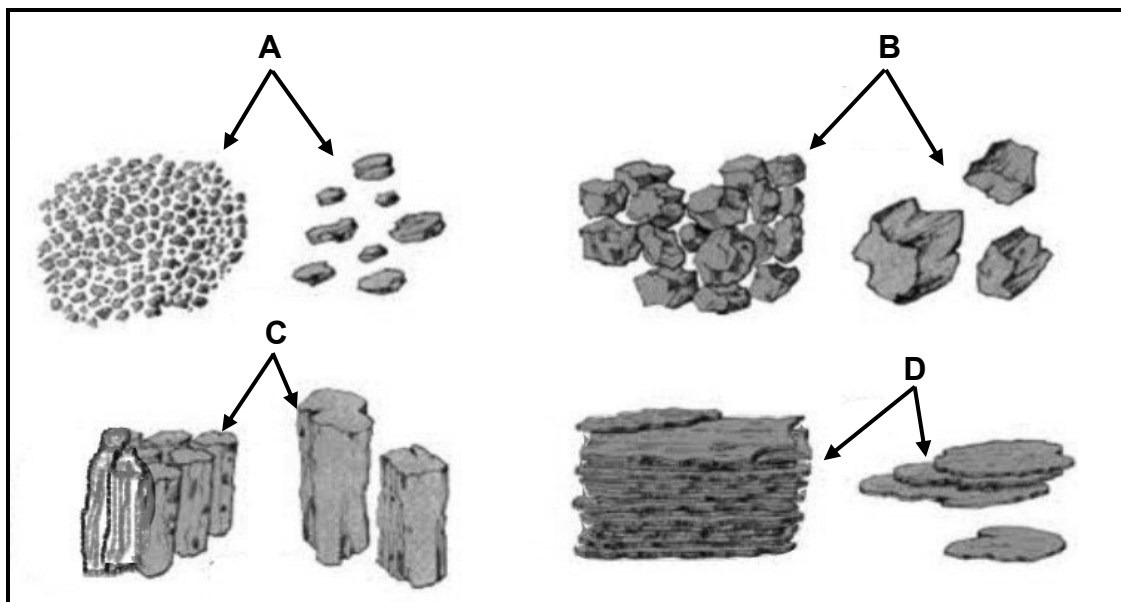
Start this question on a NEW page.

- 3.1 The pictures below show a method used to determine the textural class of soil in the field.



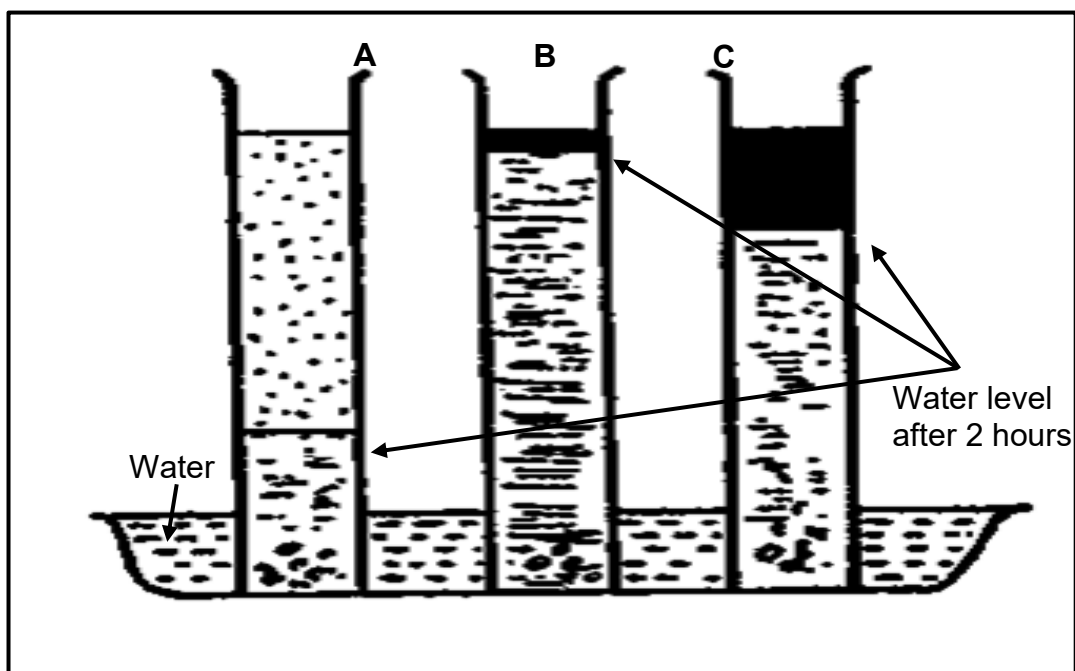
- 3.1.1 Identify the method used in the pictures to determine the soil's textural class. (1)
- 3.1.2 Deduce the textural class of soil in PICTURES **A** and **E** based on their shapes. (2)
- 3.1.3 Mention TWO other methods that can be used to determine soil texture other than the one shown in the picture above. (2)
- 3.1.4 Indicate THREE reasons why farmers need to know the textural classes of soil on their farms. (3)

3.2 The diagrams below show different types of soil structure.



- 3.2.1 Identify the soil structures in the PICTURES **B** and **C** above. (2)
- 3.2.2 Describe THREE malpractices that lead to soil structure destruction. (3)
- 3.2.3 Identify the soil structure that is recommended for cropping (Give only the letter). (1)

- 3.3 An experiment was conducted on three soils of different texture, contained in tubes. They were tied with a piece of cloth at the bottom and placed into a water trough to allow water to enter through the cloth. Analyse the diagram and answer the questions that follow:



- 3.3.1 Formulate a hypothesis for the experiment conducted. (2)
- 3.3.2 Identify the process illustrated in the diagram above. (1)
- 3.3.3 Assuming the tubes contain either loam, clay or sand textured soil. Identify the soil texture in TEST TUBE B. (1)
- 3.3.4 Motivate the answer in QUESTION 3.3.3. (2)
- 3.3.5 Name the force of nature that is responsible for the movement of water in the experiment. (1)
- 3.3.6 Name the force of nature that opposes water movement in QUESTION 3.3.2. (1)

- 3.4 Soil colour is determined by various factors. The colour of soil provides clues regarding the mineral composition and chemical reactions taking place in the soil. Soil can be of different colours, namely: dark, yellow, light and red.

3.4.1 Indicate the factors that influence the colours below:

(a) Yellow (2)

(b) Light (2)

3.4.2 Differentiate between *homogeneous* and *non-homogenous* soil colour. (2)

- 3.5 Fine textured soil usually has a bulk density which is good for the growth of plants. Before planting season, farmers usually till the soil to break up clods. Plant roots can easily absorb moisture in such a soil as compared to the one with high bulk density. The bulk density of soil is inversely related to soil porosity.  
A farmer wants to know the bulk density of a 750 g soil sample that occupies a volume of 500 cm<sup>3</sup>.

3.5.1 Calculate the bulk density for this farmer. (3)

3.5.2 Comment on the suitability of soil with such a bulk density for cultivation. (2)

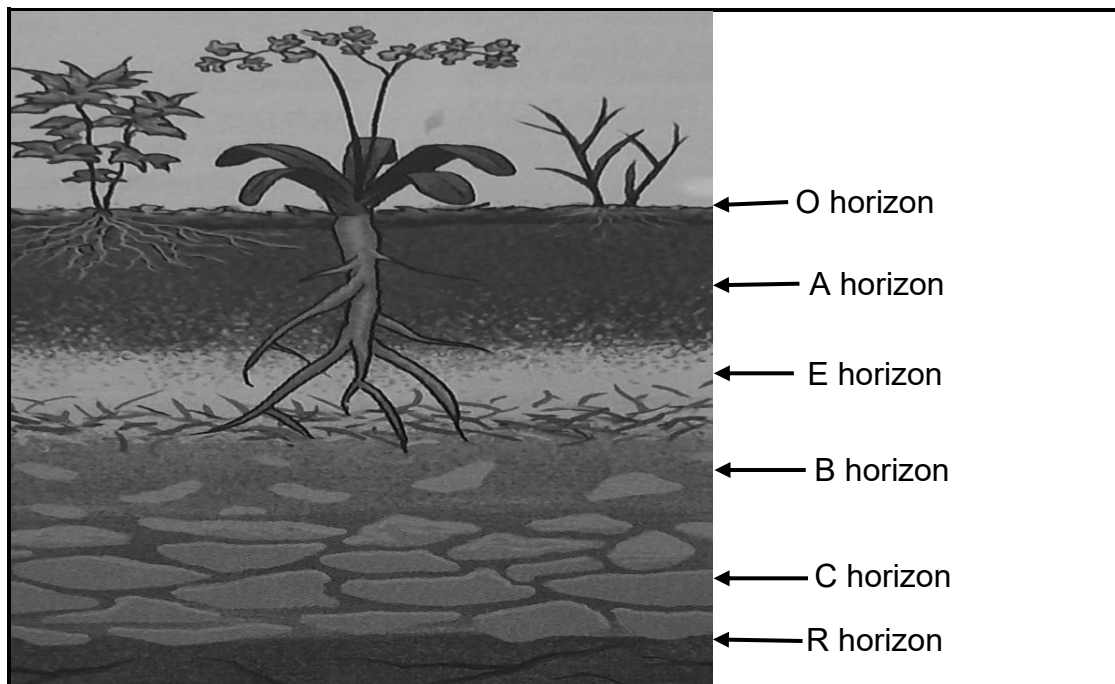
3.5.3 Define the concept *porosity*. (2)

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**QUESTION 4: SOIL SCIENCES**

Start this question on a NEW page.

4.1



4.1.1 Identify the structure in the diagram above. (1)

4.1.2 Match the horizons in the soil profile above with the descriptions below:

- (a) White coloured and poor organic matter content (1)
- (b) Occurs in the subsoil and consists of a concentration of clay and/or iron, aluminium and manganese oxides (1)
- (c) Usually occurs closer to the surface and consists of humus and mineral particles (1)
- (d) Occurs in the substrata and consists of soft materials and weathered rock (1)
- (e) Appears on the surface and consists of fresh and or partly decomposed organic matter (1)

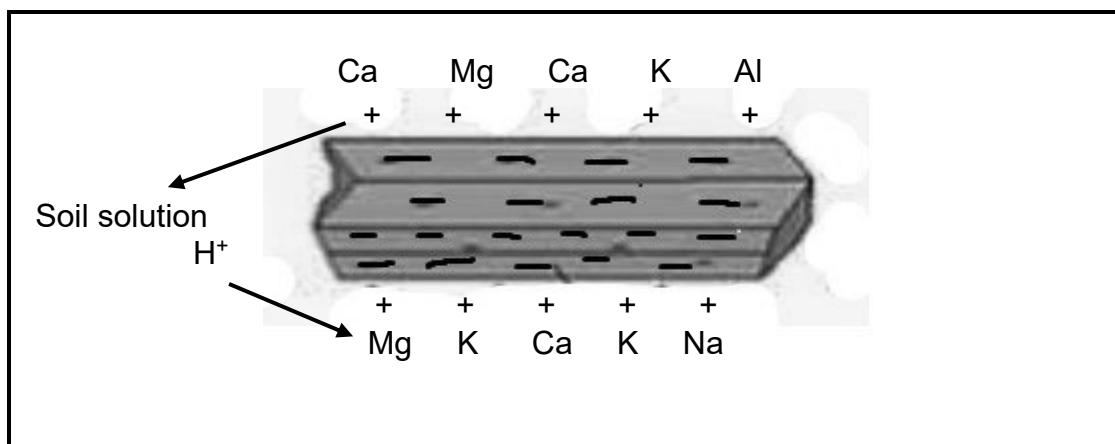
4.1.3 Schematically represent the combination of the soil master horizons of the different soil types below:

- (a) Eroded soil (1)
- (b) Water-logged soil (1)
- (c) Young soil (1)

- 4.2 Soil is classified according to the following characteristics: morphological, physical, chemical and mineralogical characteristics. The O horizon and all A horizons in South African soils are diagnostic. In South Africa soil is classified on two levels, that is the soil form and soil series.

- 4.2.1 Identify the system used to classify soil in South Africa. (1)
- 4.2.2 Describe TWO uses of soil classification data on farms. (2)
- 4.2.3 Describe the first TWO steps taken during soil classification. (2)

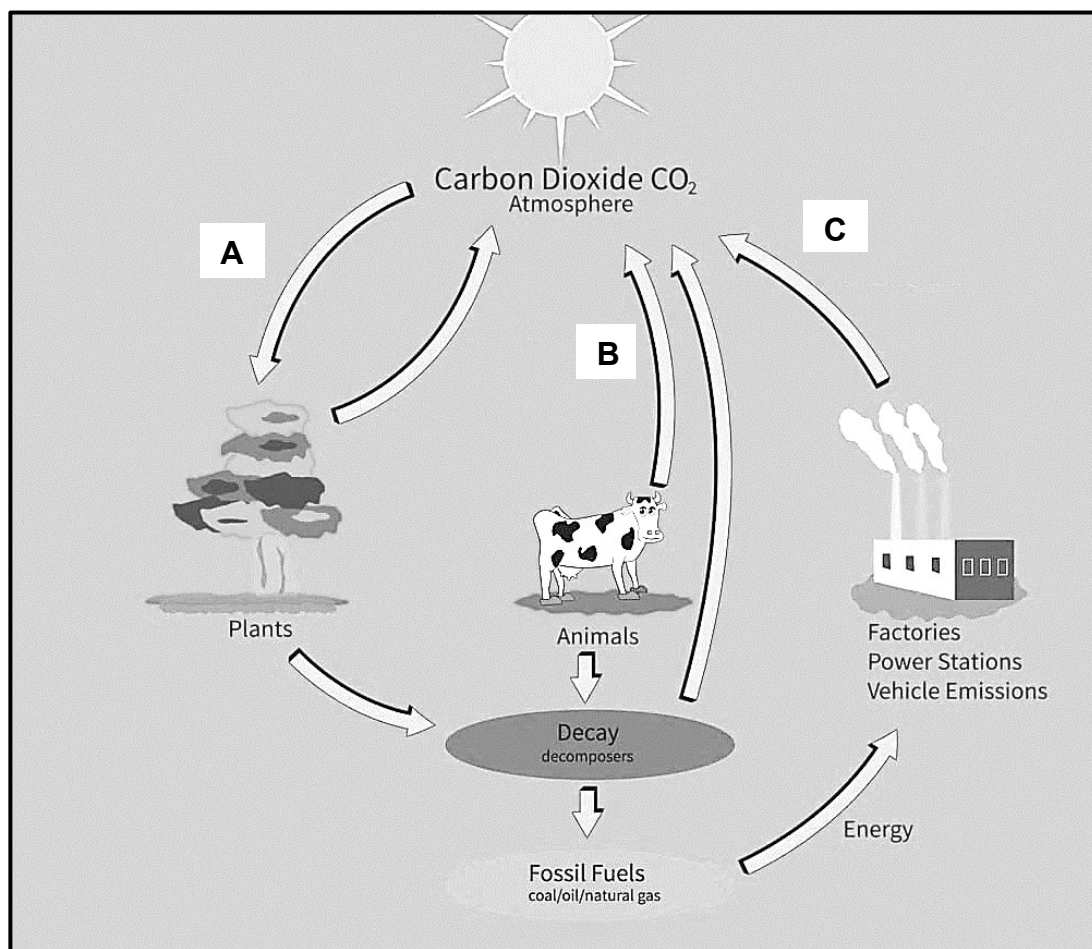
4.3



- 4.3.1 Classify the colloid depicted above, based on its shape. (1)
- 4.3.2 Identify the process depicted in the diagram above. (1)
- 4.3.3 Deduce the pH class of the soil in the illustration above. (1)
- 4.3.4 Motivate your answer in QUESTION 4.3.3. (1)
- 4.4 Soil reclamation is the corrective process that farmers use when the soil has deteriorated. The longer the deterioration process continues, the more difficult it will be to reclaim. Agricultural lime is used in the reclamation of certain soils.
- 4.4.1 Identify the type of soil that is reclaimed through agricultural lime application. (1)
- 4.4.2 Use a schematic diagram to show what happens at colloidal exchange sites during liming. (3)
- 4.4.3 Describe TWO negative effects of using the soil in QUESTION 4.4.1 without reclaiming it. (2)



4.5



4.5.1 Identify the nutrient cycle depicted in the diagram above. (1)

4.5.2 Write the LETTER for the following processes occurring in the diagram above.

- (a) Converts carbon dioxide and water into carbohydrates using energy from the sun. (1)
- (b) Chemical reaction between substances, usually including oxygen accompanied by the generation of heat. (1)

- 4.6 The table below shows the influence of soil texture on soil organic matter loss over a period of 5 weeks.

WEEK	SOIL ORGANIC MATTER (grams)	
	SAND	LOAM
1	10	10
2	6	8
3	4	7
4	3	6
5	2	5

- 4.6.1 Draw a line graph to compare soil organic matter losses in sand and loam soils over 5 weeks. (6)
- 4.6.2 Deduce the trend presented in the graph. (2)
- [35]

**TOTAL SECTION B: 105**  
**GRAND TOTAL: 150**











