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**GRADE 11**

**NOVEMBER 2016**

**AGRICULTURAL SCIENCES P1**

**MARKS: 150**

**TIME: 2½ hours**



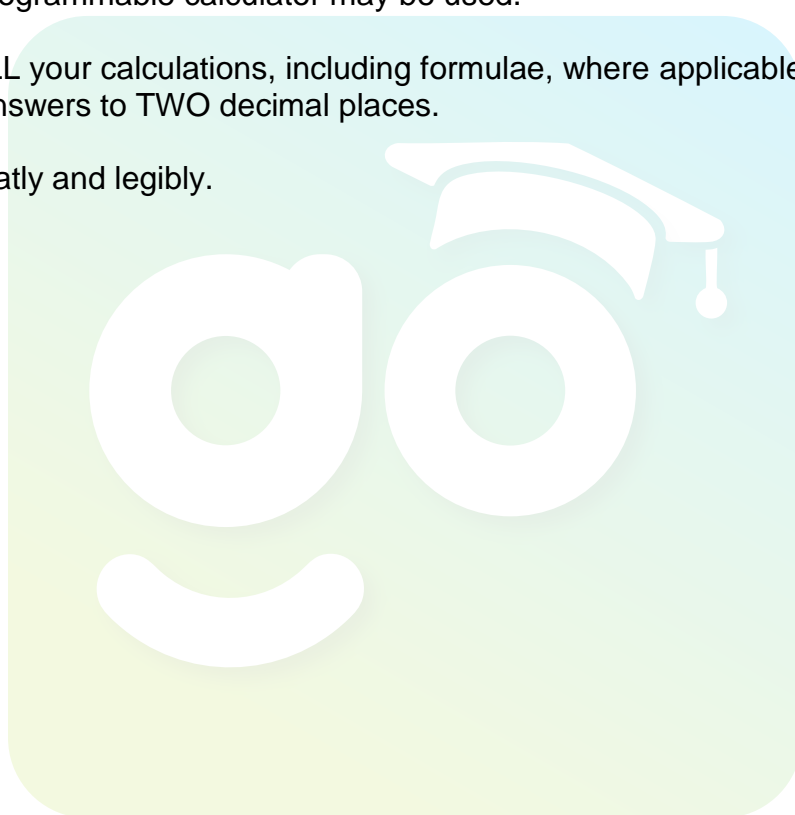
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This question paper consists of 15 pages.

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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. Read ALL the questions correctly and answer only what is asked.
5. Number the answers correctly according to the numbering system used in this question paper.
6. A non-programmable calculator may be used.
7. Show ALL your calculations, including formulae, where applicable and round off the answers to TWO decimal places.
8. 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 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.

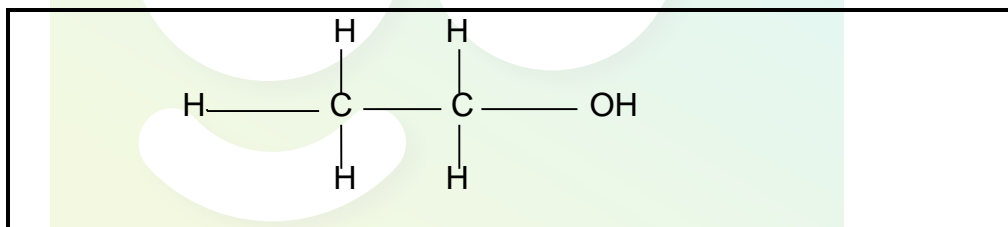
1.1.1 ... is a building block of a fat molecule.

- A Glucose
- B Amino acid
- C Glycerol
- D Lactose

1.1.2 The chemical substance consisting of one type of atom and cannot be broken down is a/an ...

- A compound.
- B mixture.
- C atom.
- D element.

1.1.3 The structure below represents the structural formula of an organic compound.



- (i) It turns into vapour easily.
- (ii) It is an excellent solvent in many industries.
- (iii) It is used as a preservative.
- (iv) It can be used as an alternative to petrol.

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 yellow colour in soil is an indication of ...

- A signs of reduction in soil.
- B the presence of organic matter.
- C the presence of enough air and less water.
- D signs of oxidation.

1.1.5 Horizons in the soil develop over time through the action of parent material and climate. The following statement characterises the E-horizon.

- A It has plenty of decayed organic matter.
- B It is a zone of leaching.
- C It is sticky due to permanent waterlogging.
- D It has unweathered material.

1.1.6 The illustration below shows an example of an inorganic colloid.

|               |
|---------------|
| Silica sheet  |
| Alumina sheet |
| Silica sheet  |

- (i) It is sticky and expand quickly when exposed to water.
- (ii) It is an end product of weathering.
- (iii) It is grouped under smectites.
- (iv) It has a higher absorption surface area.

Choose the correct combination.

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

1.1.7 The reason for alkalinity in soil is the accumulation of ... ions in the soil.

- A calcium and hydrogen
- B sodium and aluminium
- C magnesium and calcium
- D potassium and sodium

1.1.8 The fungi that help plant roots to absorb more phosphorus through a symbiotic relationship is ...

- A mycorrhiza.
- B rhizobium.
- C azotobacter.
- D clostridium.

1.1.9 The following is NOT influenced by soil temperature.

- A Seed germination.
- B Soil formation.
- C Microbial action.
- D Soil colour

1.1.10 The agricultural practice below lead to the destruction of structure.

- A Introduction of pasture crop into crop rotation system.
- B Avoiding soil disturbances when it is wet.
- C Continuous soil cultivation.
- D Minimum tillage to preserve organic content of soil. (10 x 2) (20)

1.2 Indicate whether each of the following statements/items in COLUMN B applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the statements/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: | Anion            | Atoms with more electrons                          |
|          | B: | Cation           |  |
| 1.2.2    | A: | Valence electron | An outermost energy level of an atom               |
|          | B: | Valence shell    |  |
| 1.2.3    | A: | Adhesion         | The attraction between molecules of the same kind  |
|          | B: | Cohesion         |  |
| 1.2.4    | A: | Soil horizon     | Arrangement of soils into groups based on features |
|          | B: | Soil profile     |  |
| 1.2.5    | A: | Salinity         | Excess of chlorides and sulphates of sodium        |
|          | B: | White brack      |  |

(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 The arrangement of elements according to their atomic number
- 1.3.3 A comparison between mass and volume of dried soil
- 1.3.4 The colour of soil with a number of flecks due to seasonal waterlogging
- 1.3.5 A condition of a substance having a higher concentration of hydroxyl than hydrogen ions (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 number (1.4.1–1.4.5) in the ANSWER BOOK.
- 1.4.1 Polarity is the sharing of electrons by atoms.
- 1.4.2 The amount of water held in a well-drained soil is the wilting point.
- 1.4.3 B-horizon occurs in poorly aerated soil conditions.
- 1.4.4 Mineralisation is the conversion of nutrients from inorganic to organic in the bodies of micro-organisms.
- 1.4.5 The exchangeable aluminium and hydrogen ions on the surface of soil colloids is sodicity. (5 x 1) (5)

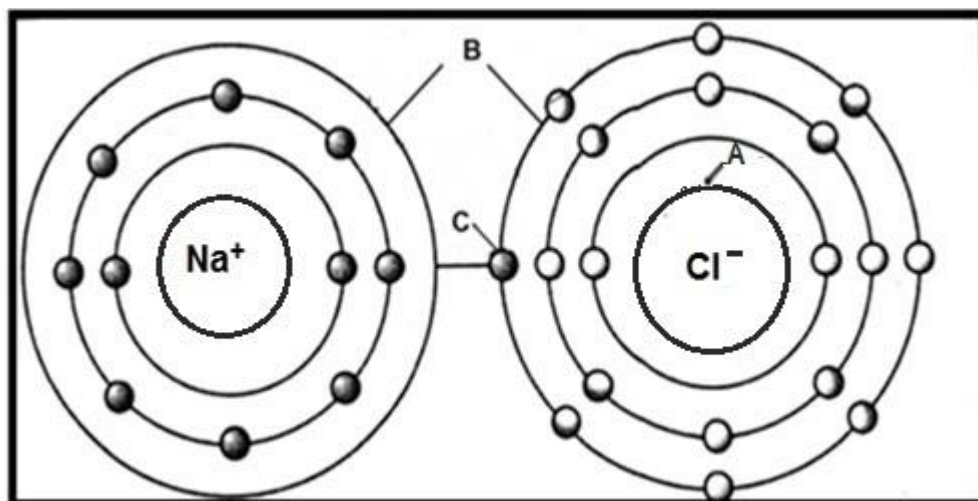
**TOTAL SECTION A: 45**

**SECTION B**

Start this question on a NEW page.

**QUESTION 2: BASIC AGRICULTURAL CHEMISTRY**

- 2.1 The diagram below illustrates atoms responsible for the formation of a compound.

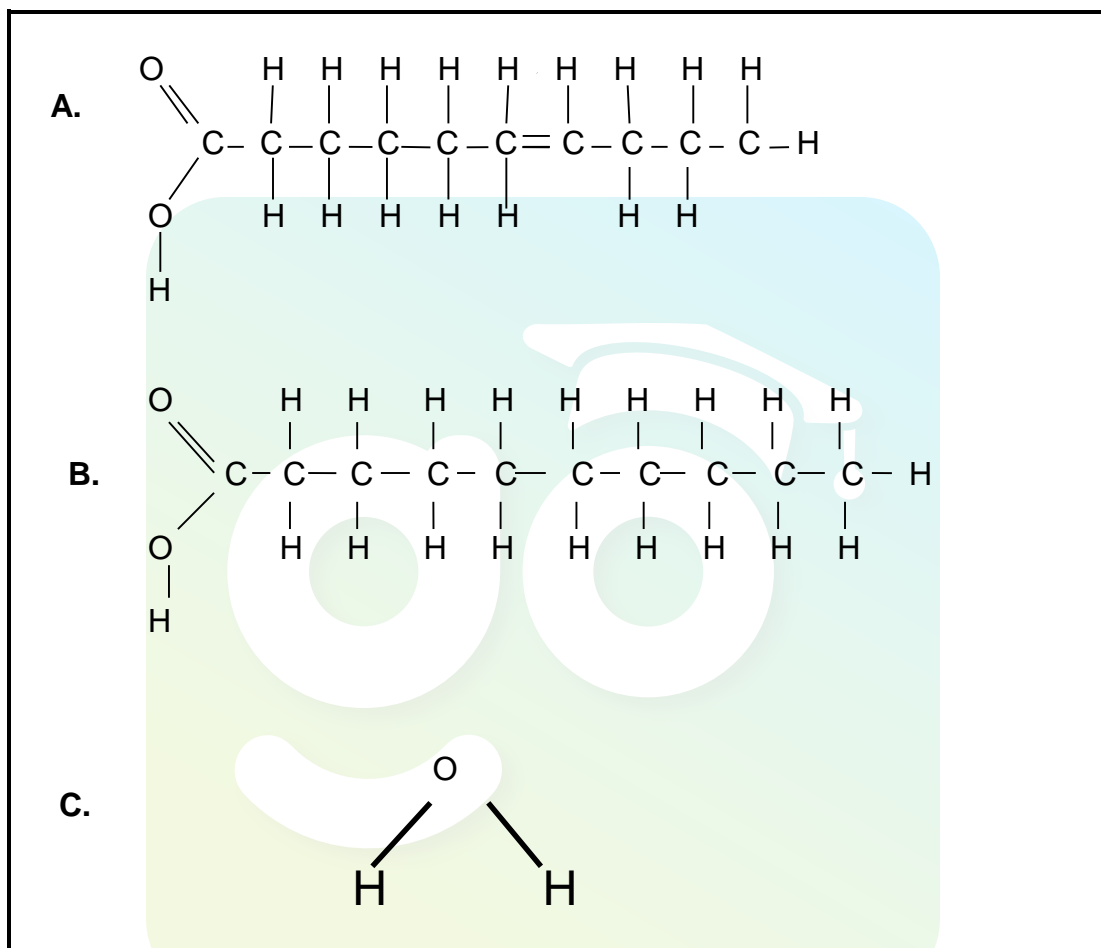


- 2.1.1 Identify the compound formed by the atoms in the diagram above. (1)
- 2.1.2 Indicate the health benefit of the above compound in food. (1)
- 2.1.3 Name the parts labelled **A**, **B** and **C**. (3)
- 2.1.4 Elements in the periodic table are grouped according to similar chemical characteristics. Indicate the group to which each of the elements illustrated in QUESTION 2.1 belong. (2)
- 2.1.5 Name TWO common characteristics of the elements in a group where Cl belong. (2)
- 2.2 Disaccharides are formed when two monosaccharide molecules join to form one molecule which can be broken down during hydrolysis process. Name a disaccharide formed when the following monosaccharide's are joined together:
- 2.2.1 A glucose and a fructose (1)
- 2.2.2 A glucose and a galactose (1)
- 2.2.3 Write a chemical formula of the molecules mentioned in QUESTION 2.2.1 and QUESTION 2.2.2 above. (2)

2.2.4 Mention the importance of starch in animals prepared for the following functions:

- (a) Racing (1)
- (b) Selling at a market (1)

2.3 The following structures illustrate the compounds playing a role in agriculture.



2.3.1 Classify the compounds labelled **A** and **C**. (2)

2.3.2 Indicate the name of the fatty acids labelled **A** and **B**. (2)

2.3.3 Write only the letter representing a fatty acid to which each of the following statement applies:

- (a) It is of animal origin (1)
- (b) Has a low melting point (1)

2.3.4 The compound labelled **C** plays an important role in agriculture. Justify this statement with TWO important roles of this compound. (2)

2.4 HCl and NaOH are chemical formulae of substances used in agriculture.

2.4.1 Identify the chemical formula representing the following:

(a) Alkali (1)

(b) Acid (1)

2.4.2 Show the chemical reaction when HCl dissolves in water. (3)

2.5 The products below are displayed in a retail shop. Carefully analyse the products and answer questions that follow.



2.5.1 Indicate the functional group of products **A** and **B**. (1)

2.5.2 Give the scientific name of both products **A** and **B**. (2)

2.5.3 Identify the product (A or B) which is ideal to be used for heating. (1)

2.5.4 Write the structural formula of product **B**. (2)

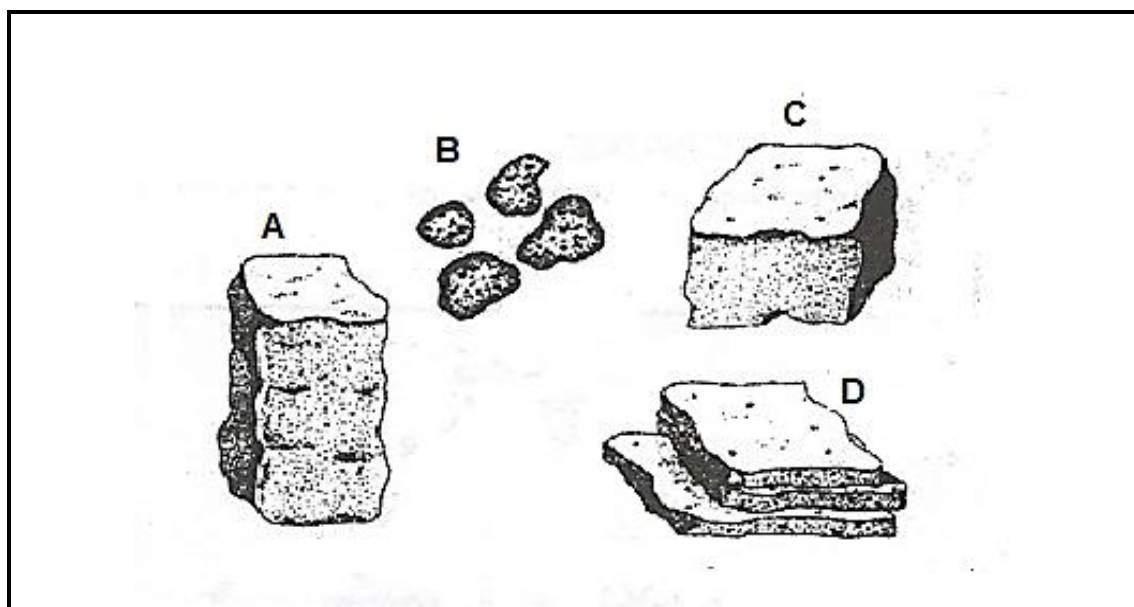
2.5.5 Product **A** can be oxidised to form another product. Give the scientific name of that product. (1)

[35]

**QUESTION 3: SOIL SCIENCE**

Start this question on a NEW page.

- 3.1 Soil particles are grouped together to form aggregates or peds. These peds are classified on the basis of shape. The diagrams below show different structures based on shape.



- 3.1.1 Identify the structure types labelled **A** and **D**. (2)
- 3.1.2 Indicate the letter representing a structure to which each of the following statements applies:
- (a) It is found in compacted soil. (1)
  - (b) Develops in soils with a high concentration of kaolinite. (1)
- 3.1.3 Indicate the letter of the structure you would recommend to the farmer for crop production. (1)
- 3.1.4 Give THREE reasons for the recommendation in QUESTION 3.1.3. (3)

3.2

A soil analyst conducted a research to establish the correlation between the particle size, pore space and water behaviour of a soil sample. The scientist used the following indicators:

- Macro-pores      0 0
- Micro-pores    + +
- Percolation     ^ ^
- Drainage        - -

| Sample A |
|----------|
| 0 0 0 0  |
| ++       |
| ^ ^ ^ ^  |
| - - - -  |

| Sample B |
|----------|
| 0 0      |
| ++       |
| ^^       |
| - -      |

| Sample C |
|----------|
| 0        |
| ++++     |

3.2.1 Identify the soil texture represented by soil samples **A** and **C**. (2)

3.2.2 Give ONE reason for each of the identifications in QUESTION 3.2.1. (2)

3.2.3 Texture has a great influence on the behaviour and characteristics of soil. Indicate the letter representing the soil sample with the following influence on soil:

- (a) Larger surface area for chemical reactions (1)
- (b) Lower degree of cohesion between soil particles (1)
- (c) Particles increases the angle of diffraction because of size (1)
- (d) High permeability (1)

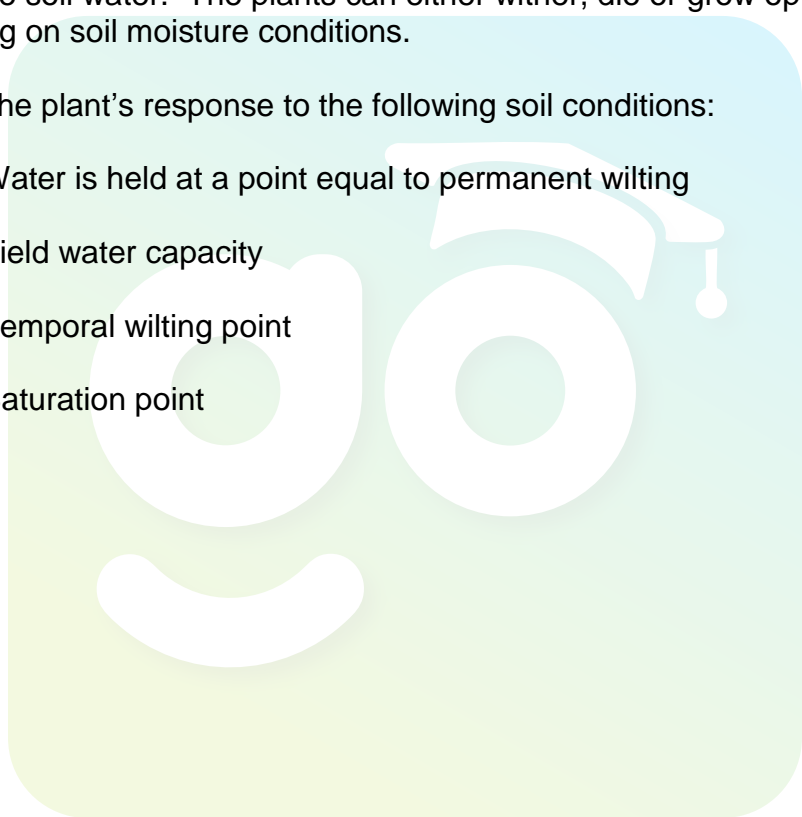
3.3 The table below shows the mass, volume, bulk density and the percentage pore space of different soil samples.

| SOIL SAMPLE | MASS (g) | VOLUME (cm <sup>3</sup> ) | BULK DENSITY (g/cm <sup>3</sup> ) | PORE SPACE (%) |
|-------------|----------|---------------------------|-----------------------------------|----------------|
| A           | 450      | 600                       | 0,75                              | 62,7           |
| B           | 620      | 550                       | 1,13                              | 56,2           |
| C           | 880      | 500                       | -----                             | 52,5           |
| D           | 680      | 80                        | 8,5                               | 30,8           |

3.3.1 Use the information in the table to draw a bar graph showing the mass and the volume of the soil sample. (6)

3.3.2 Identify the soil that has not been disturbed by heavy implements. (1)

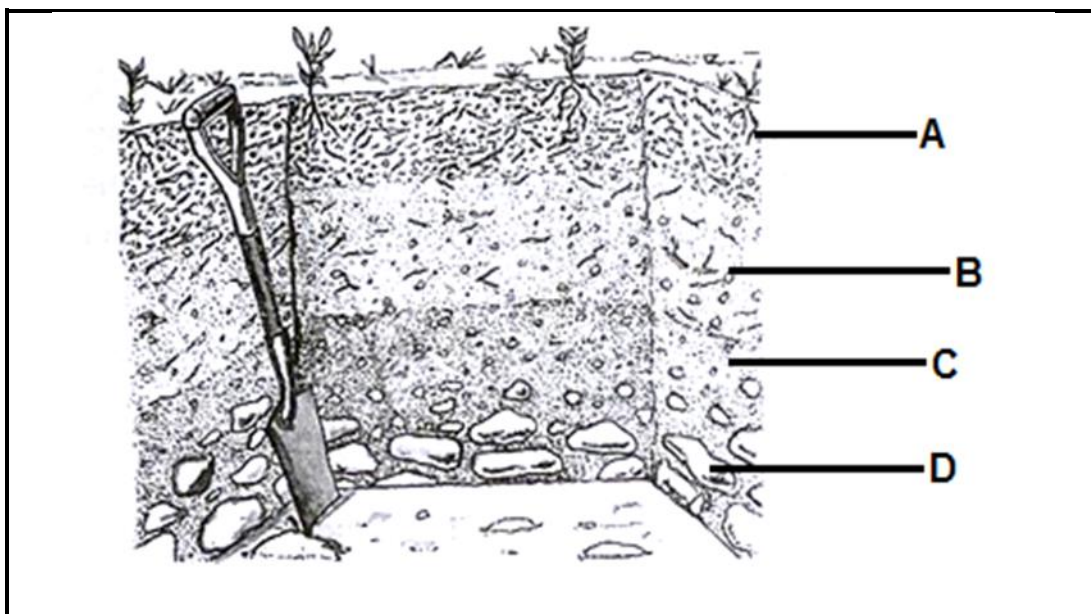
- 3.3.3 Deduce TWO reasons from the data in the table above for your answer in QUESTION 3.3.2. (2)
- 3.3.4 Calculate the bulk density of soil sample C. (3)
- 3.4 Name the gas that is responsible for each of the functions below:
- 3.4.1 Inaccessible compounds become accessible to plant roots (1)
- 3.4.2 Slows down oxidation process in soil (1)
- 3.4.3 Improves the formation of humus in soil (1)
- 3.5 The availability of water for plants is influenced by the presence of accessible soil water. The plants can either wither, die or grow optimally depending on soil moisture conditions.
- Indicate the plant's response to the following soil conditions:
- 3.5.1 Water is held at a point equal to permanent wilting (1)
- 3.5.2 Field water capacity (1)
- 3.5.3 Temporal wilting point (1)
- 3.5.4 Saturation point (1)
- [35]**



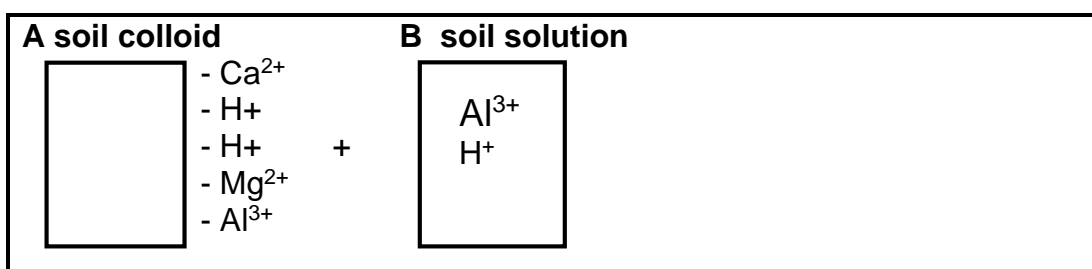
**QUESTION 4: SOIL SCIENCE**

Start this question on a NEW page.

- 4.1 The schematic representation below shows different horizons visible after digging through the soil.

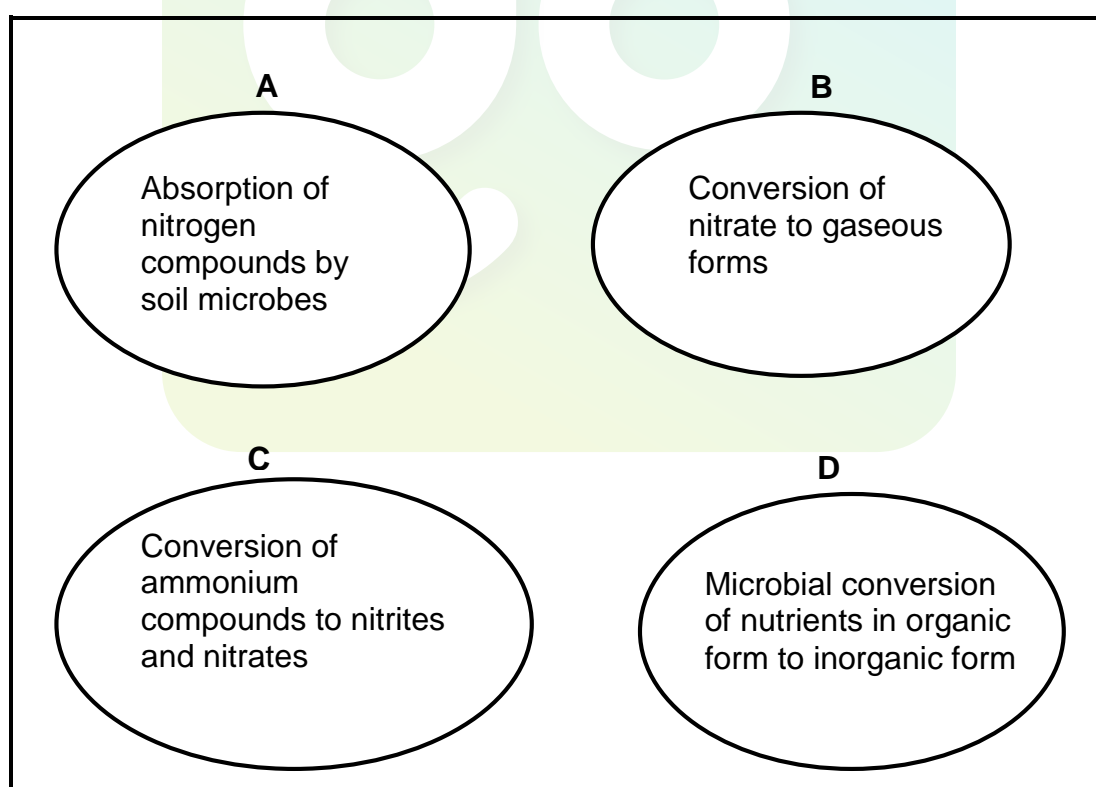


- 4.1.1 Determine the age of the soil above. (1)
- 4.1.2 Give a reason for the answer in QUESTION 4.1.1 above. (2)
- 4.1.3 Sketch the profile of the above soil. (2)
- 4.1.4 Indicate the letter representing a horizon with the following characteristics:
- (a) Enriched with eluviated material. (1)
  - (b) Inorganic material mixed with organic matter. (1)
- 4.1.5 Name TWO diagnostic horizons of the horizon labelled **B**. (2)
- 4.2 Cation absorbed on the surface of the colloid can be exchanged with cation predominant in the soil solution. The diagrams below show cations adsorbed on the colloid and in the soil solution.



- 4.2.1 Identify the form of acidity labelled **A** and **B**. (2)
- 4.2.2 Justify the answer in QUESTION 4.2.1 above. (2)

- 4.2.3 Indicate the letter representing acidity that will have an effect on plant growth. (1)
- 4.2.4 Suggest a reason for the answer in QUESTION 4.2.3 above. (1)
- 4.2.5 Give an appropriate term for the ability of soil to exchange cations with the soil solution. (1)
- 4.3 Compare in a table form saline and sodic soils with regard to the following:
- 4.3.1 (a) Dominant salts (2)
- (b) Colour (2)
- 4.3.2 The farmer can correct sodicity through the application of gypsum. Show the exchange reaction during the reclamation process when gypsum is added to soil. (3)
- 4.4 Soil micro-organisms have a specific functions in soil and without them, soil will not be able to support plants. Explain TWO ways in which the soil can benefit from the breaking of plant and animal residue by soil microbes. (4)
- 4.5 The illustrations below shows the processes during nitrogen cycle.



- 4.5.1 Identify the processes labelled **A**, **B**, **C** and **D**. (4)
- 4.5.2 Name the soil conditions favouring the process in **B**. (1)

- 4.6 Organic matter contributes to plant growth through its effect on the physical, chemical and biological properties of soil.

Name THREE practices that may lead to the decline in the organic matter content of the soil.

(3)  
[35]

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



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