



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 11

NOVEMBER 2014

AGRICULTURAL SCIENCES P1

MARKS: 150

TIME: 2½ hours



This question paper consists of 14 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. 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. Non-programmable calculators may be used.
7. Show ALL your calculations, including units and formula, where applicable.
8. Write neatly and legibly.

SECTION A

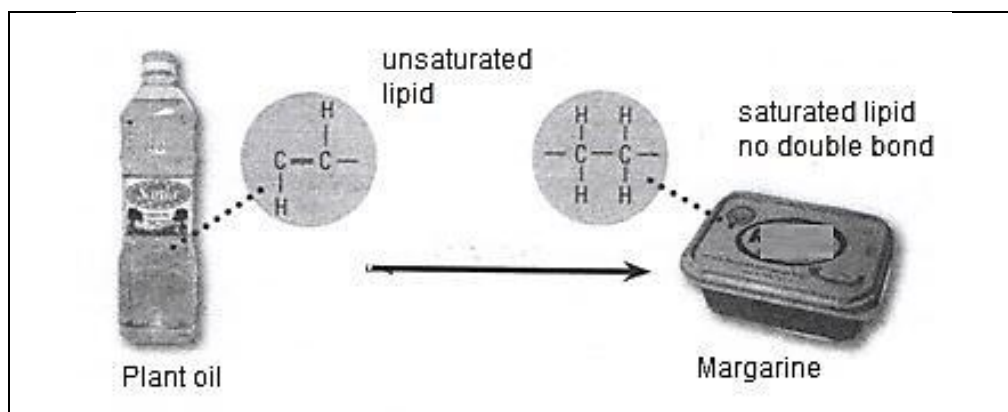
QUESTION 1

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 The inorganic compound which was commonly used by indigenous people to make food last longer, is known as ...

- A sodium sulphate.
- B sodium chloride.
- C sodium carbonate.
- D sodium hydroxide.

1.1.2 The illustration below indicates ...



- A hydrogenation of fat.
- B hydrolysis of fat.
- C condensation.
- D dehydration.

1.1.3 Which of the following are properties of acids?

- (i) Acids release hydrogen ions into water.
- (ii) When acids react with metal, it produces a compound with a cation of the metal, anion of the acid and hydrogen gas.
- (iii) Acid release hydroxide ions into water.
- (iv) Acids are soapy or slippery.

Choose the correct combination.

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

1.1.4 Soil temperature influences both the chemical and physical reactions occurring in soil. ONE of the following is NOT influenced by soil temperature.

- A Soil formation
- B Metabolic processes in plants
- C Activity of soil micro-organisms
- D Soil depth

1.1.5 The movement of a liquid in a tube against the force of gravity is ...

- A seepage.
- B saturated flow.
- C capillarity.
- D percolation.

1.1.6 Bulk density determines how densely packed the particles are. ONE of the following statements is correct about bulk density.

- A It is inversely related to the porosity of the soil.
- B Low bulk density is not favourable for cultivation.
- C Low bulk density indicates high compaction.
- D Root development is restricted in soils with low bulk density.

1.1.7 The illustration below shows an inorganic clay colloid.

Alumina sheet
Silica sheet

The following is NOT the characteristic of this colloid.

- A It is the end product of weathering.
- B Little or no adsorption surface.
- C Referred to as 1 : 1 clay mineral.
- D Platelets are held lightly together and swell considerable.

1.1.8 Soil scientists follow a certain procedure to identify and classify soil using a binomial system. The step after the major horizon has been demarcated involves ...

- A determining soil series.
- B identifying diagnostic horizon.
- C determining series characteristics.
- D establishing soil form.

1.1.9 Which of the following are visible signs of sodic soil?

- (i) Bare patches appear on the land.
- (ii) Organic matter dissolves in soil solution and precipitates in the upper soil horizon.
- (iii) Strong development of a prismatic structure.
- (iv) Soil surface tends to be powdery.

Choose the correct combination

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

1.1.10 The conversion of nutrients from inorganic to organic form in the bodies of micro-organisms is known as ...

- A solubilisation.
- B assimilation.
- C mineralisation.
- D immobilisation.

(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 1.2.1 A only.

COLUMN A		COLUMN B
1.2.1	A Covalent bonding	Copper chloride
	B Ionic bonding	
1.2.2	A Hydroxyl group	Ethanol
	B Flammable	
1.2.3	A Signs of reduction	C-horizon
	B Gley condition	
1.2.4	A Denitrification	Reduction of nitrates to nitrites.
	B Nitrification	
1.2.5	A Dark colour	Oxidised haemitite
	B Red colour	

(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 tabular arrangement of the elements according to their atomic number so that elements with same properties are in the same column
- 1.3.2 The form of acidity in which hydrogen and aluminium ions are adsorbed on the soil colloid
- 1.3.3 The portion of soil moisture which is held in the soil at a point equal to permanent wilting point
- 1.3.4 The gas that dilutes active elements of oxygen in the soil
- 1.3.5 The property of soil which allows it to be deformed rapidly without cracking or crumbling and maintain the deformed shape after the deforming force has been released (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 Blocky structure usually occurs in clay pan soils and has limited permeability.
- 1.4.2 The sum total of the exchangeable cation that a soil can adsorb is known as cation adsorption.
- 1.4.3 Emulsion is an intimate homogeneous mixture of substances in the same phase.
- 1.4.4 Noble gases are elements in the periodic table which have 7 electrons in their outer energy level and are most reactive.
- 1.4.5 Isomers are atoms which have the same atomic number, but have different mass numbers. (5 x 1) (5)

TOTAL SECTION A: 45

SECTION B

Start this question on a NEW page.

QUESTION 2: BASIC CHEMISTRY

2.1 PUMPING BIOFUEL OUT OF JOHNSON GRASS

Johnson grass is found to be packed with energy. A master distiller from the Free State has developed a process of producing bioethanol from perennial and invasive Johnson grass by converting its cellulose. It is an excellent source of biomass and produces more ethanol as compared to maize. It is an ideal crop to be planted on marginal land and is produced with fewer input cost.

Producing ethanol from Johnson grass uses up to 70% less fossil fuel in the production process than petrol, so fewer greenhouse gases are released to the atmosphere.

[Adapted from, *Farmers weekly*, April 2009]

2.1.1 Mention the functional group of ethanol. (1)

2.1.2 Design a structural formula of an ethanol. (3)

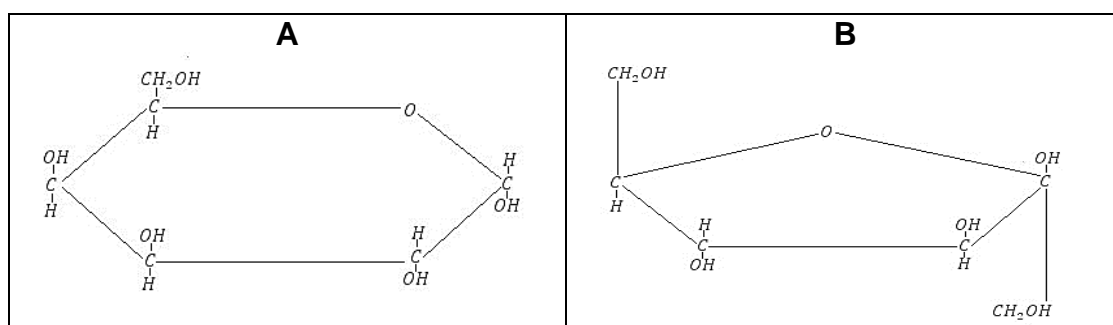
2.1.3 Explain how the use of ethanol above can be an advantage:

(a) Environmentally (1)

(b) Economically (1)

2.1.4 Name and categorise the carbohydrate in the scenario. (2)

2.2 Analyse the diagrams (A and B) below and answer the questions that follow.



2.2.1 Identify the organic compounds labelled A and B. (2)

2.2.2 The carbon atoms are arranged in the form of a ring because of the linking of two carbon atoms to each other by an oxygen atom. Give the name of the rings in A and B. (2)

2.2.3 Although all monosaccharide's have the same chemical formula, they differ. Describe how a glucose molecule differs from a molecule labelled **A**. (2)

2.3 Indicate where the following polysaccharides are found:

2.3.1 Lignin (1)

2.3.2 Starch (1)

2.3.3 Glycogen (1)

2.4 List THREE indigenous foods that can be used as a source of starch. (3)

2.5 The table below shows the amount of carbohydrates, protein and fat per 100 g of different foods.

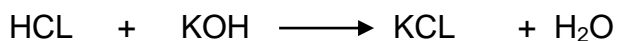
Food	Carbohydrates (g)	Protein (g)	Fat (g)
Oats porridge	56	12	9
Peanut butter	24	23	50
Tuna fish	0	27	15

2.5.1 Draw a bar graph to compare the amount of protein, fat and carbohydrates in oats porridge and peanut butter. (6)

2.5.2 Select the food from the table that contains saturated fat. (1)

2.5.3 Justify your answer in QUESTION 2.5.2. (2)

2.6 Analyse the following reaction and answer the following questions.



2.6.1 Identify the chemical reaction illustrated above. (1)

2.6.2 Give a reason for your answer in QUESTION 2.6.1. (1)

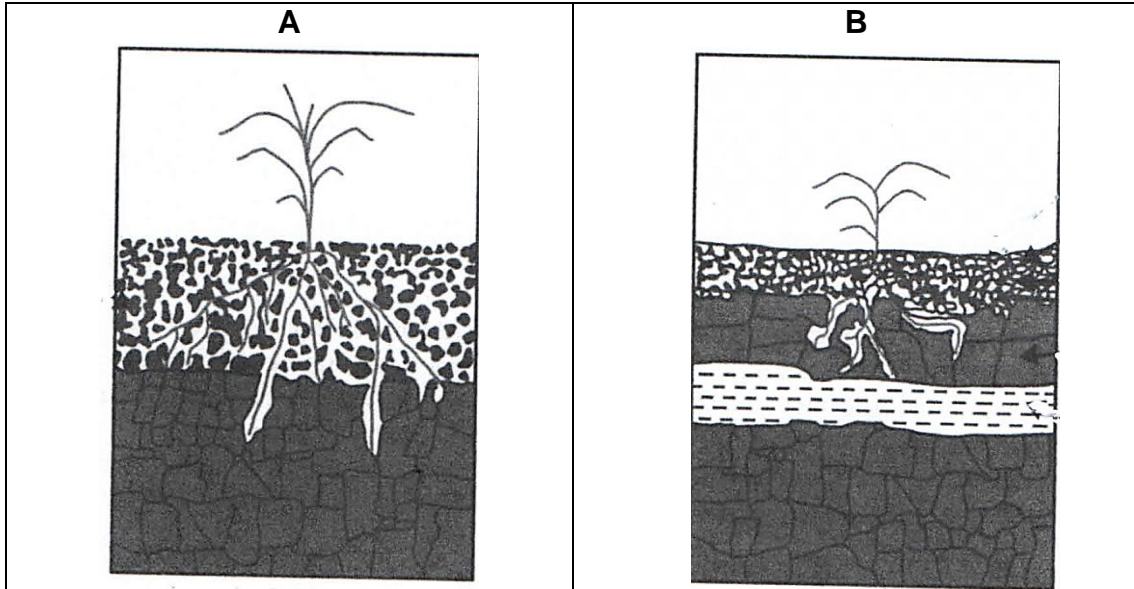
2.6.3 State TWO chemical bonds that are involved in the above reaction and give ONE example of each. (4)

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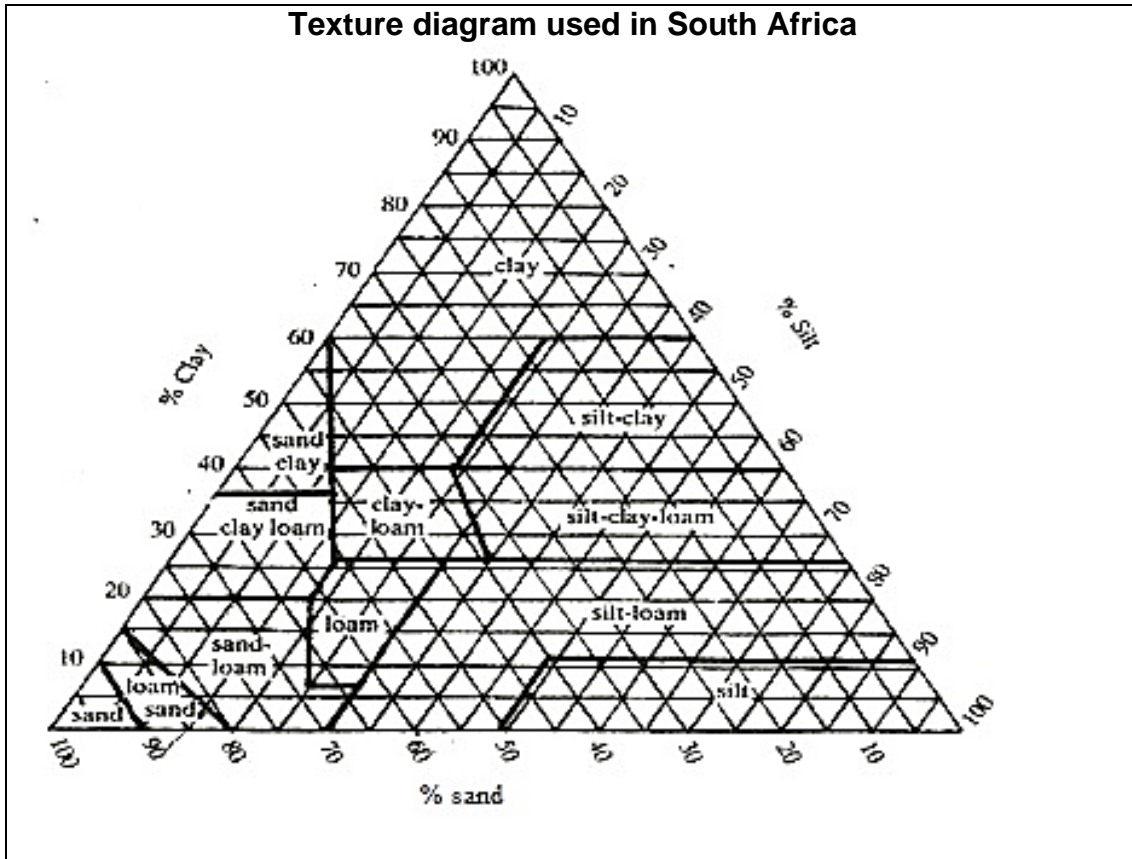
QUESTION 3: SOIL SCIENCE

3.1 The pictures below show soil with a good structure and compacted soil. Analyse the pictures and answer questions.



- 3.1.1 Identify the soil (**A** or **B**) that is compacted from the pictures. (1)
- 3.1.2 Justify your answer in QUESTION 3.1.1 by indicating TWO visible signs. (2)
- 3.1.3 Provide TWO traditional methods in which the compaction can be improved. (2)
- 3.1.4 Mention THREE advantages of soil with a good structure like in **A**. (3)

- 3.2 When soil is to be allocated to a particular texture class, analysis is done in a laboratory where particle sizes are expressed as a percentage in respect of other particles. Knowledge of the texture class influences the decisions farmers make about farming and also assist traditional people to make pots which they use to serve traditional beer during certain ceremonies.



- 3.2.1 Analyse the texture diagram above to determine the texture class of the following soil samples.

A	60% sand, 20% clay, 25% silt	(1)
B	40% sand, 50% clay, 10% silt	(1)
C	95% sand, 3% clay, 2% silt	(1)

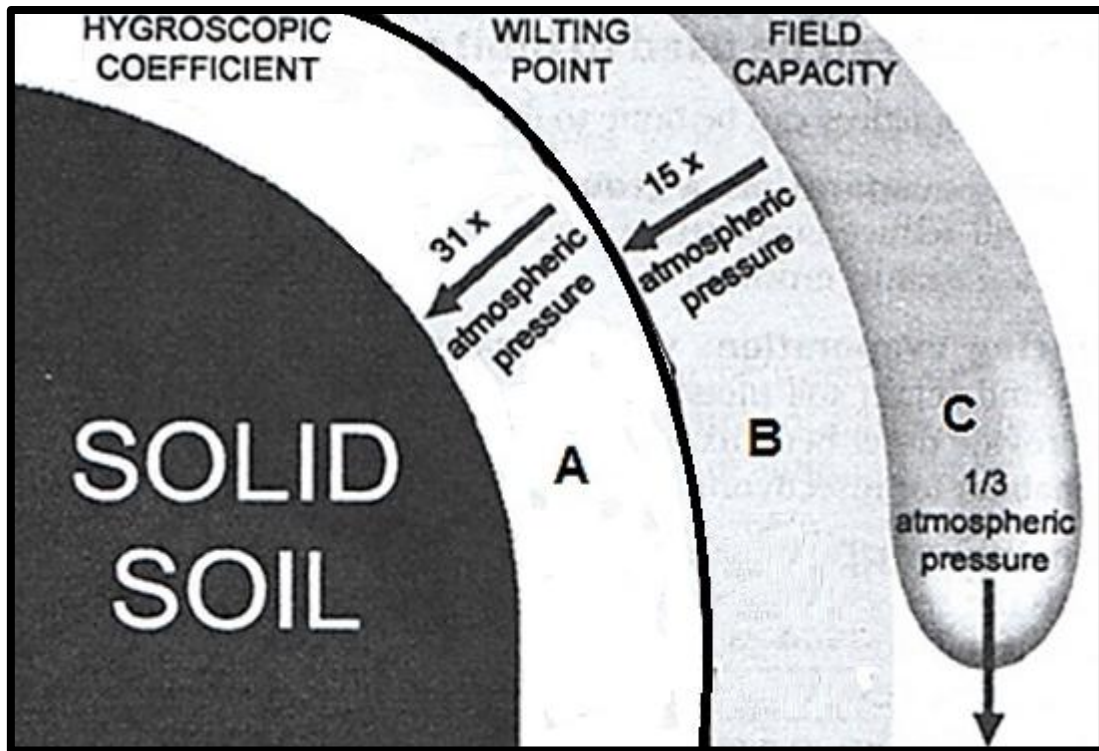
- 3.2.2 Indicate the sample (**A**, **B** and **C**) to which each of the following characteristics applies.

(i)	Application of lime is recommended when a farmer cultivates crops sensitive to acidic soil.	(1)
(ii)	Suitable for pottery work by rural communities.	(1)
(iii)	Most suitable for cultivation.	(1)

- 3.3 Soil colour is a useful indicator of some physical and chemical properties that occur beneath the surface. Compare red and grey coloured soils with regard to the following:

3.3.1	Air	(2)
3.3.2	Moisture	(2)

3.4 The schematic representation below indicates the forces with which water is attracted to soil particles at different distances.



- 3.4.1 Deduce the forces that attract water molecules at distances labelled **A**, **B** and **C**. (3)
- 3.4.2 Explain the reason why water drains away at **C**. (2)
- 3.5 Soil water balance is a useful concept for effective water management. Through the use of soil water balance equation, periods of water scarcity can be managed. Display the soil water balance equation. (3)
- 3.6 A soil sample of an oven dried soil has a mass of 580 g in 250 cm³.
 - 3.6.1 Calculate the bulk density of this soil sample. (3)
 - 3.6.2 Comment on the suitability of this sample for root crops. (2)
- 3.7 Soil temperature plays an important role in many processes which take place in soil. These include chemical reactions, biological and physical actions.
 - 3.7.1 Explain how soil temperature has an influence on chemical processes in soil. (2)
 - 3.7.2 Name TWO ways in which a farmer can manipulate soil temperature for better production. (2)

[35]

Start this question on a NEW page.

QUESTION 4: SOIL SCIENCE

- 4.1 The illustration below shows the possible combination of horizons under different soil forming conditions.

A.	$\frac{A}{C}$	or	$\frac{A}{R}$
B.	$\frac{G}{C}$	or	$\frac{O}{G}$
C.	$\frac{A}{B}$ $\frac{C}{R}$	or	$\frac{A}{E}$ $\frac{B}{C}$
D.	$\frac{B}{C}$		

Relate the combination of the horizons above with each of the following descriptions. Use the letters (A–D) that represents the profile.

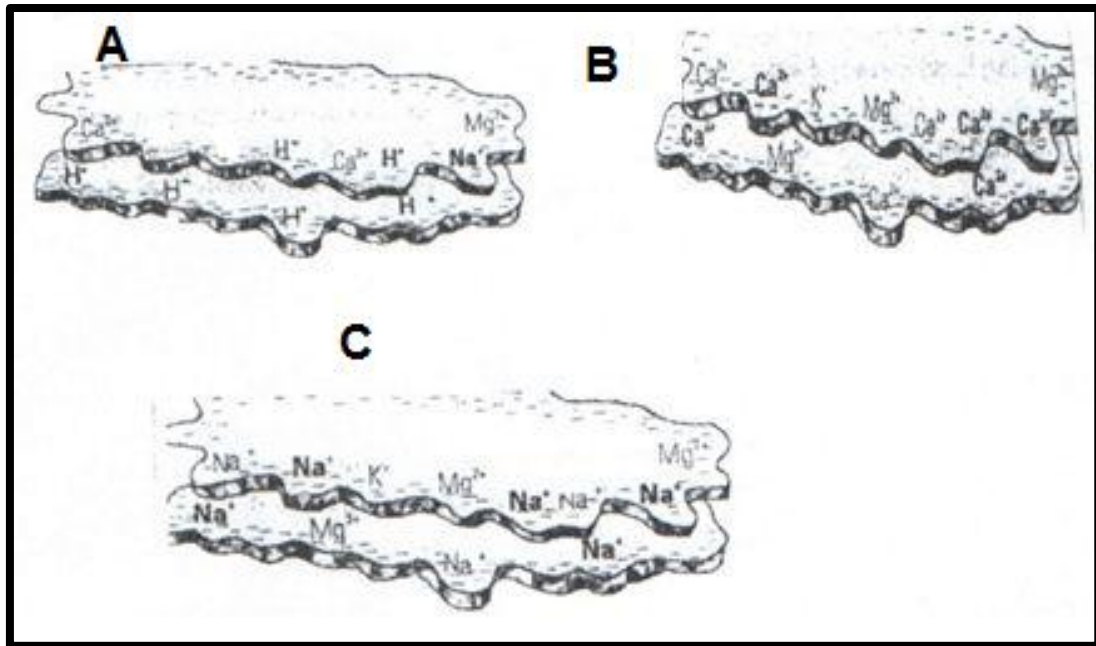
- 4.1.1 Soil forming factors have had sufficient time to produce a profile with horizons which are in balance with local conditions. (1)
- 4.1.2 Soil will battle to support plants and microbial life because of waterlogging. (1)
- 4.1.3 This combination results from soil mismanagement. (1)
- 4.1.4 Transported soils where soil material has been brought by aeolian or alluvial conditions. (1)
- 4.2 Soil scientists visited a farm to do soil classification to ensure the optional use of the soil. The results are displayed below.

SOIL PROFILE FORM		
LOCATION	:	154 Drum Alley
SIZE	:	110 Hectares
PROFILE NUMBER	:	00232
TOP SOIL	:	Vertic-horizon
SUBSOIL	:	Soft plinthic-horizon
SOIL COLOUR	:	Dark
SOIL STRUCTURE	:	Blocky

Answer the following question based on the information above.

- 4.2.1 Identify TWO master horizons in this land. (2)
- 4.2.2 Describe TWO series characteristics visible in the soil. (2)
- 4.2.3 Supply TWO characteristics of a diagnostic horizon of the topsoil. (2)

4.3 Refer to the illustration of the colloids (A, B and C) to answer the following questions.



- 4.3.1 Identify the colloidal condition of each of the colloids (A, B and C) based on the cation adsorbed. (3)
- 4.3.2 Mention TWO factors influencing the colloidal condition in A. (2)
- 4.3.3 Show the exchange reaction taking place during the reclamation process of the colloid in A. (3)
- 4.4 Compare in a table form sodic and saline soils with regard to the following:
 - 4.4.1 Dominant salts (2)
 - 4.4.2 Surface appearance (2)
 - 4.4.3 Corrective measures (2)
- 4.5 Comment on the fertility level of soils dominated by the following clay minerals:
 - 4.5.1 Vermiculite (2)
 - 4.5.2 Kaolinite (2)

4.6 Organic matter is an active and important component of soil. It occurs mainly in top soil and has an influence on soil characteristics and properties.

4.6.1 Outline THREE practices that can lead to the decline of organic matter in soil. (3)

4.6.2 Describe the influence of organic matter on the biological properties of soil. (2)

4.6.3 Explain TWO ways in which plants benefit from a mycorrhiza relationship. (2)

[35]

TOTAL SECTION B: 105

GRAND TOTAL: 150

