



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 11

NOVEMBER 2013

AGRICULTURAL SCIENCES P1

MARKS: 150

TIME: 2½ hours

This question paper consists of 14 pages, including an answer sheet.

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions from BOTH SECTIONS A and B.
2. SECTION A (QUESTION 1) must be answered on the attached ANSWER SHEET.
3. Place your ANSWER SHEET for SECTION A (QUESTION 1) within your ANSWER BOOK.
4. SECTION B (QUESTIONS 2 to 4) must be answered in the ANSWER BOOK.
5. Start each question from SECTION B on a NEW page.
6. Read the questions carefully and make sure you answer what is asked.
7. Number the answers correctly according to the numbering system used in this question paper.
8. DO NOT SPLIT the answers to the questions.
9. 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 make a cross (X) over the appropriate letter in the block (A–D) next to the question number (1.1.1–1.1.10) on the attached ANSWER SHEET. No marks will be allocated if more than one cross (X) appears for an answer.

Example: 1.1.11

A	B	C	D
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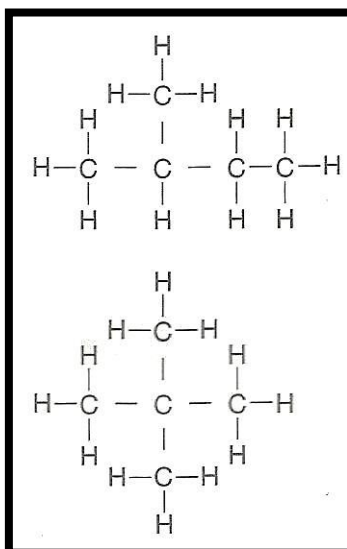
1.1.1 The smallest form of matter that can exist alone is a/an ...

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

1.1.2 The small groups of atoms within a molecule that are responsible for certain properties of the molecule and the reactions which are taking place are called ...

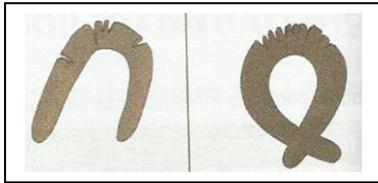
- A ionic groups.
- B phosphate groups.
- C functional groups.
- D radical groups

1.1.3 Molecules with the same molecular formula but different arrangement in atoms are isomers. The following illustrations show the isomers of ...



- A methane.
- B propane.
- C butane.
- D pentane.

- 1.1.4 The unit of coherent soil particles which is formed by natural processes is called ...
- A gravel.
 - B clay.
 - C peds.
 - D silt.
- 1.1.5 The instrument used to measure the density of soil and water mixture is called ...
- A photometer.
 - B hydrometer.
 - C thermometer.
 - D barometer.
- 1.1.6 The field method for determining soil texture is very important to give the soil characteristics. The diagram below shows soil which is accumulated with particles of ...



- A sand.
 - B loam.
 - C clay loam.
 - D silt.
- 1.1.7 The following are the factors that influence the bulk density of soil except ...
- A amount of organic matter in the soil.
 - B colour of soil.
 - C compaction of soil.
 - D degree of cultivation.
- 1.1.8 The type of soil water which forms a very thin film around the soil particles and is not available to plants.
- A Hygroscopic water
 - B Gravitational water
 - C Capillary water
 - D Cohesion water
- 1.1.9 A soil surface horizon lacking fine stratification and which is slightly coloured with low organic carbon is ...
- A orthic.
 - B vertic.
 - C melanic.
 - D humic.

1.1.10 The process occurs when the nitrogen supply is limited which lead to the situation whereby the soil microbes compete with plants for the fertiliser nitrogen is called ...

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

(10 x 2) (20)

1.2 In the table below, a statement and TWO answers are given. Decide whether the statement in COLUMN B relates to A only, B only, both A and B or none of the answers in COLUMN A. Choose the correct answer and make a cross (X) in the appropriate block (A–D) next to the question number (1.2.1–1.2.5) on the attached ANSWER SHEET.

Example:

COLUMN A		COLUMN B
A:	Orange	Base or alkaline
B:	Soap	

Answer:

The statement refers to:			
Only A	Only B	A and B	None
A	B	C	D

	COLUMN A		COLUMN B
1.2.1	A:	Adhesion	Water force of attraction
	B:	Cohesion	
1.2.2	A:	Amino acids	Monomers of all carbohydrates
	B:	Glucose	
1.2.3	A:	Buffer	The molecules that prevent large changes in the pH solutions
	B:	Neutraliser	
1.2.4	A:	Catabolic	Refers to a process that occurs when the molecules or the compounds are broken down into simpler substances
	B:	Anabolic	
1.2.5	A:	Homogenous	The factors determining soil colour
	B:	Non homogenous	

(5 x 2) (10)

- 1.3 Give ONE TERM/PHRASE for each of the following descriptions. Write only the term/phrase next to the question number (1.3.1–1.3.5) on the attached ANSWER SHEET.
- 1.3.1 The reaction occurs when an isotope of an atom gives off bursts of energy
- 1.3.2 The point at which all the pores between soil particles are filled with water
- 1.3.3 A polymer found in the plant cell that makes the cells woody and sturdy
- 1.3.4 The chemical reaction that occurs when water is added to a molecule to break the bonds holding its atoms together
- 1.3.5 The close, solid packing of soil particles
- (5 x 2) (10)
- 1.4 Change the UNDERLINED WORD(S) in the following statements to make them TRUE. Write only the appropriate word(s) next to the question number (1.4.1–1.4.5) on the attached ANSWER SHEET.
- 1.4.1 Electrons are positively charged and are found in the nucleus of an atom.
- 1.4.2 A gas has a distinct volume independent of its container but without specific shape.
- 1.4.3 Soil particles within the aggregates are held together by atomic forces.
- 1.4.4 Neutralisation is the decomposition process by which the compounds are rapidly broken down into elements such as ammonium, sulphur, phosphate ions, carbon dioxide and water.
- 1.4.5 The loss of water from the soil surface into the atmosphere in a vapour form is called transpiration.
- (5 x 1) (5)

TOTAL SECTION A: 45

SECTION B**START THIS QUESTION ON A NEW PAGE.****QUESTION 2: BASIC AGRICULTURAL CHEMISTRY**

2.1 Nutritionists conducted a research on the use of biofuel waste in animal feed, with possible benefits for the rural agricultural communities. The objective is to make biofuel more economical to produce and create manufacturing industries in semi-urban and rural areas. This can include biofuel processing or the industries created to add value to the processing of by-products such as oil cake meal. This process will eliminate high pollution of air with carbon dioxide and the reduction of the greenhouse effect. Biofuel production ended up being established in the animal feed market and is increasing rapidly.

- 2.1.1 Suggest the role that the production of biofuel can play in improving livestock nutrition. (1)
- 2.1.2 How can the biofuel industry help rural areas and small scale farmers? (1)
- 2.1.3 Mention the benefits to the environment of using biofuel. (1)
- 2.1.4 Explain why the production of biofuel is increasing. (1)

2.2 Use the periodic table below to answer the following questions.

1A 1 H 1.00794 Hydrogen																	8A 2 He 4.002602 Helium
3 Li 6.941 Lithium	2A 4 Be 9.012182 Beryllium											3A 5 B 10.811 Boron	4A 6 C 12.0107 Carbon	5A 7 N 14.0067 Nitrogen	6A 8 O 15.9994 Oxygen	7A 9 F 18.9984032 Fluorine	10 Ne 20.1797 Neon
11 Na 22.989769 Sodium	12 Mg 24.3050 Magnesium	3B	4B	5B	6B	7B	8B		1B	2B	3A 13 Al 26.9815386 Aluminum	4A 14 Si 28.0855 Silicon	5A 15 P 30.973762 Phosphorus	6A 16 S 32.065 Sulfur	7A 17 Cl 35.453 Chlorine	18 Ar 39.948 Argon	
19 K 39.0983 Potassium	20 Ca 40.078 Calcium	21 Sc 44.955912 Scandium	22 Ti 47.887 Titanium	23 V 50.9415 Vanadium	24 Cr 51.9961 Chromium	25 Mn 54.938045 Manganese	26 Fe 55.845 Iron	27 Co 58.933195 Cobalt	28 Ni 58.6934 Nickel	29 Cu 63.546 Copper	30 Zn 65.38 Zinc	31 Ga 69.723 Gallium	32 Ge 72.64 Germanium	33 As 74.92160 Arsenic	34 Se 78.96 Selenium	35 Br 79.904 Bromine	36 Kr 83.796 Krypton
37 Rb 85.4678 Rubidium	38 Sr 87.62 Strontium	39 Y 88.90585 Yttrium	40 Zr 91.224 Zirconium	41 Nb 92.90638 Niobium	42 Mo 95.96 Molybdenum	43 Tc [98] Technetium	44 Ru 101.07 Ruthenium	45 Rh 102.90550 Rhodium	46 Pd 106.42 Palladium	47 Ag 107.8682 Silver	48 Cd 112.411 Cadmium	49 In 114.818 Indium	50 Sn 118.710 Tin	51 Sb 121.760 Antimony	52 Te 127.60 Tellurium	53 I 126.90447 Iodine	54 Xe 131.293 Xenon
55 Cs 132.9054519 Cesium	56 Ba 137.327 Barium	57-71 Lanthanides	72 Hf 178.49 Hafnium	73 Ta 180.94788 Tantalum	74 W 183.84 Tungsten	75 Re 186.207 Rhenium	76 Os 190.23 Osmium	77 Ir 192.217 Iridium	78 Pt 195.084 Platinum	79 Au 196.966569 Gold	80 Hg 200.59 Mercury	81 Tl 204.3833 Thallium	82 Pb 207.2 Lead	83 Bi 208.98040 Bismuth	84 Po [209] Polonium	85 At [210] Astatine	86 Rn [222] Radon
87 Fr [223] Francium	88 Ra [226] Radium	89-103 Actinides	104 Rf [261] Rutherfordium	105 Db [268] Dubnium	106 Sg [271] Seaborgium	107 Bh [272] Bohrium	108 Hs [270] Hassium	109 Mt [276] Meitnerium	110 Ds [281] Darmstadtium	111 Rg [280] Roentgenium	112 Cn [285] Copernicium	113 Uut [284] Ununtrium	114 Uuq [289] Ununquadium	115 Uup [288] Ununpentium	116 Uuh [293] Ununhexium	117 Uus [294] Ununseptium	118 Uuo [294] Ununoctium
Lanthanides		57 La 138.90547 Lanthanum	58 Ce 140.116 Cerium	59 Pr 140.90765 Praseodymium	60 Nd 144.242 Neodymium	61 Pm [145] Promethium	62 Sm 150.36 Samarium	63 Eu 151.964 Europium	64 Gd 157.25 Gadolinium	65 Tb 158.92535 Terbium	66 Dy 162.500 Dysprosium	67 Ho 164.93032 Holmium	68 Er 167.259 Erbium	69 Tm 168.93421 Thulium	70 Yb 173.054 Ytterbium	71 Lu 174.9668 Lutetium	
Actinides		89 Ac [227] Actinium	90 Th 232.03806 Thorium	91 Pa 231.03588 Protactinium	92 U 238.02891 Uranium	93 Np [237] Neptunium	94 Pu [244] Plutonium	95 Am [243] Americium	96 Cm [247] Curium	97 Bk [247] Berkelium	98 Cf [251] Californium	99 Es [252] Einsteinium	100 Fm [257] Fermium	101 Md [258] Mendelevium	102 No [259] Nobelium	103 Lr [262] Lawrencium	
Alkali Metals	Alkaline Earth	Basic Metal	Halogen	Noble Gas	Non Metal	Rare Earth	Semi Metal	Transition Metal									

2.2.1 Identify the lightest element from the periodic table. (1)

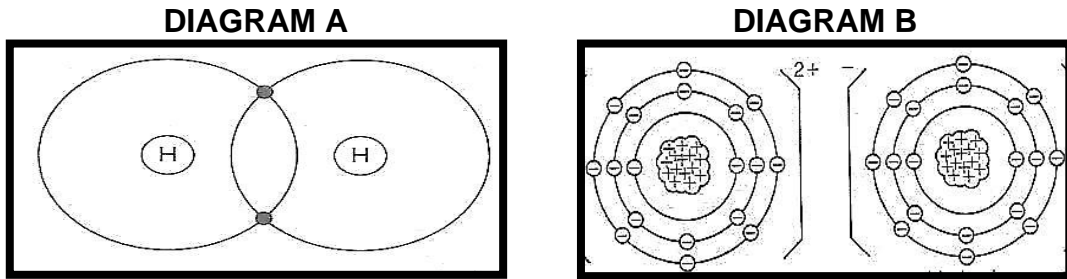
2.2.2 Group 18 on the periodic table is composed of gases that are chemically inactive and cannot react with others as indicated in the periodic table grouping. Suggest the name given to this group and give TWO examples. (3)

2.2.3 Copy and complete this table in your answer book.

ELEMENT	VALENCY ELECTRONS	ATOMIC NUMBER	MASS NUMBER
Magnesium			
Sulphur			

(6)

2.3 The illustration below shows the types of chemical bonding. Answer the questions based on these illustrations.



2.3.1 Identify the type of bond shown by diagrams **A** and **B**. (2)

2.3.2 Differentiate between the two types of bonds, **A** and **B** you have mentioned in QUESTION 2.3.1 above. (2)

2.3.3 Draw the Lewis structure of the sodium chloride (NaCl) and the magnesium oxide (MgO) respectively and also show how bonding is formed with cations and anions. (4)

2.4 The table below shows the fat content of different nutritional values of fats. Analyse it and answer the questions that follow.

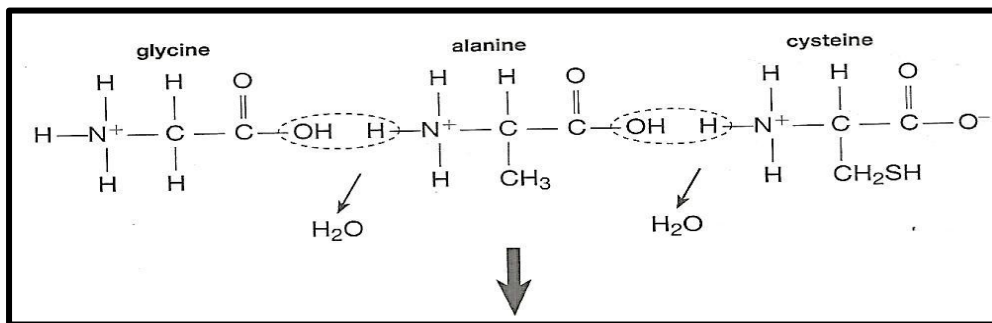
Nutritional value per 100 g	Olive oil (g)	Sunflower (g)	Hard margarine	Butter (g)
Total fat	98	91,6	80	81
Saturated fat	14	12,0	42	51
Unsaturated fat	73	17,0	28	20
Polyunsaturated	11	59,0	10	03

2.4.1 Draw a bar graph to compare the amount of saturated, unsaturated and the polysaturated fat in lipids that are analysed in the above table. (6)

2.4.2 Distinguish between the saturated and the unsaturated fat. (2)

2.4.3 Mention any TWO functions of fats/lipids in living organisms. (2)

2.5 The structure below shows the structural formula of an incomplete polypeptide chain.



2.5.1 Complete the structure and show how peptides bonds are formed. (2)

2.5.2 Define *polypeptide*. (1)

START THIS QUESTION ON A NEW PAGE.

QUESTION 3: SOIL SCIENCE

- 3.1 The sieve method is one of the important methods to determine the soil texture. Before sieving, the soil sample is weighed and then placed in the top sieve. The entire set of sieves vibrate automatically, or can be shaken by hand. Soil samples should be crushed to break the peds before sieving. The soil sample is usually dried and any organic matter is burned off or removed. Thereafter the individual weights are calculated as a percentage of the total weights. In an experiment 3 800 g of soil mass was taken to determine the weights of different sizes which are as follows, 1 700 g of sand, 1 200 g of clay and 900 g of silt.

- 3.1.1 Calculate the percentage weight of sand in the soil sample. (3)
- 3.1.2 Apart from the sieve method, mention the other TWO methods that are used in determining soil texture. (2)
- 3.1.3 Why should the farmer know the textural class of his/her soil? (1)
- 3.2 The illustrations below show the different types of soil structures that are found in the soil.



A

B

C



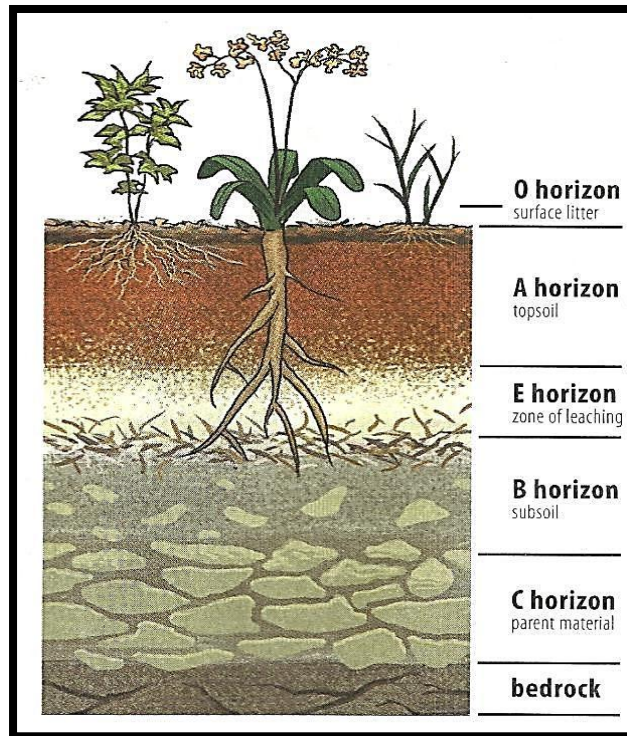
D

E

F

- 3.2.1 Identify the types of soil structure from A–F. (6)
- 3.2.2 Suggest TWO factors that influence the development of soil structure. (2)
- 3.2.3 Indicate TWO methods that a farmer can apply to improve the soil structure. (2)

3.3 The diagram below shows the development of master horizons and the schematic representation of a soil profile. Answer the questions based on it.



Use the diagram above and relate the horizons with the following characteristics:

- 3.3.1 The horizon formed by marked loss of soil structure (1)
 - 3.3.2 Mineral particles are found in this horizon (1)
 - 3.3.3 Contains only inorganic material (1)
 - 3.3.4 Mixture of inorganic and fully decomposed organic matter (1)
 - 3.3.5 Material from which soil is directly formed (1)
 - 3.3.6 Physical weathering occurs in it (1)
- 3.4 Carbon dioxide from the root respiration and the decomposition of organic matter reacts with water to form carbonic acid. Carbon dioxide in the air combines with rain water to also form carbonic acid.
- 3.4.1 Carbon dioxide + water = carbonic acid
Express this as a chemical equation. (2)
 - 3.4.2 Indicate THREE functions of carbon dioxide in soil. (3)
- 3.5 Soil colour has a great influence on the fertility and productivity of soil.
- 3.5.1 Compare the interpretation of dark coloured and light coloured soils based on crop productivity. (4)

3.6 Bulk density is the mass per unit volume of any substance. The sample of oven dried soil has a mass of 560 g and 75 cm³ of volume.

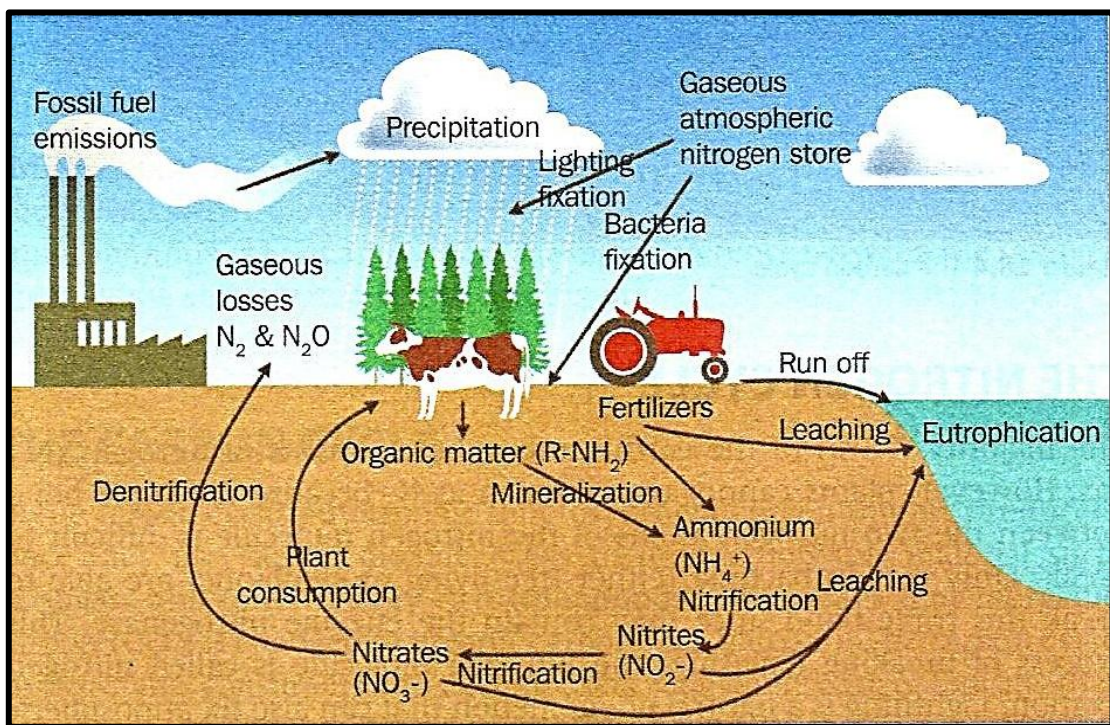
3.6.1 Use the information above to calculate the bulk density of the soil sample. (4)

3.6.2 Supply ONE factor influencing bulk density of soil. (1)
[35]

START THIS QUESTION ON A NEW PAGE.

QUESTION 4: SOIL SCIENCE

4.1 Analyse the schematic representation of the nitrogen cycle below.



Indicate which of the processes mentioned in the nitrogen cycle above result in:

4.1.1 Conversion of inorganic nitrogen to another inorganic form. (1)

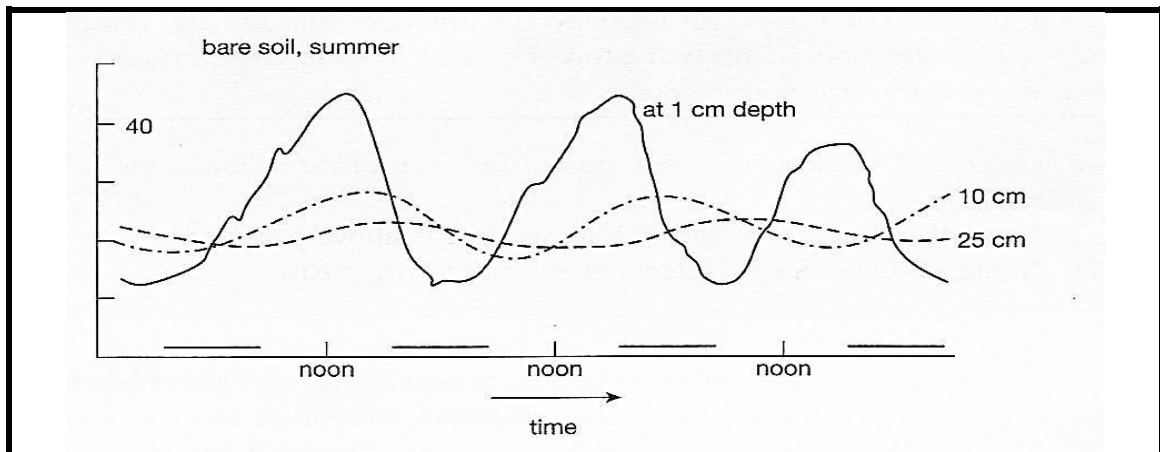
4.1.2 Conversion of organic nitrogen to inorganic nitrogen. (1)

4.1.3 Conversion of inorganic nitrogen to organic nitrogen. (1)

4.1.4 Briefly explain the phenomenon/process in the nitrogen cycle that turns water to a green colour caused by algae growth. (2)

4.1.5 Differentiate between nitrification and denitrification. (2)

4.2 The following graph represents soil temperatures taken at different depth positions in the soil.



- 4.2.1 Indicate the depth of soil which has the least difference between day and night temperatures. (1)
- 4.2.2 Describe the differences in soil temperature in a soil at a depth of 1 cm and 10 cm. (2)
- 4.2.3 Justify the response given in QUESTION 4.2.2 above. (2)
- 4.2.4 Identify THREE factors influencing soil temperature, beside the one shown in the graph above. (3)
- 4.3 Tabulate any THREE human activities that can increase and decrease the organic matter content of soil. (6)
- 4.4 Farmers tend to classify soil according to texture, structure and fertility.
 - 4.4.1 Briefly explain FOUR reasons for soil classification. (4)
 - 4.4.2 Re-arrange the following steps of soil classification according to their correct sequence. (6)
 - Establishment of the soil form
 - Demarcate the soil series
 - Dig a soil profile or clean an existing soil profile
 - Identify the series characteristic of soil
 - Demarcate the master horizon
 - Identify the diagnostic horizon
- 4.5. Compost is one of the most popular and accessible organic fertilisers that can be developed using household waste material.
 - 4.5.1 Briefly explain the procedure that can be followed when designing a compost heap to maximise nitrogen assimilation in soil. (4)

[35]

TOTAL SECTION B: 105
GRAND TOTAL: 150

ANSWER SHEET**AGRICULTURAL SCIENCES P1**

NAME AND SURNAME: _____

SECTION A**QUESTION 1.1**

1.1.1	A	B	C	D
1.1.2	A	B	C	D
1.1.3	A	B	C	D
1.1.4	A	B	C	D
1.1.5	A	B	C	D
1.1.6	A	B	C	D
1.1.7	A	B	C	D
1.1.8	A	B	C	D
1.1.9	A	B	C	D
1.1.10	A	B	C	D

(10 x 2) (20)

QUESTION 1.2

	ONLY A	ONLY B	BOTH A and B	None
1.2.1	A	B	C	D
1.2.2	A	B	C	D
1.2.3	A	B	C	D
1.2.4	A	B	C	D
1.2.5	A	B	C	D

(5 x 2) (10)

QUESTION 1.3

1.3.1 _____

1.3.2 _____

1.3.3 _____

1.3.4 _____

1.3.5 _____

(5 x 2) (10)

QUESTION 1.4

1.4.1 _____

1.4.2 _____

1.4.3 _____

1.4.4 _____

1.4.5 _____

(5 x 1) (5)

45
