education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT

GRADE 11

AGRICULTURAL SCIENCES P1

NOVEMBER 2024

MARKS: 150

TIME: 2½ hours

This question paper consists of 13 pages and a periodic table.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of TWO sections, namely SECTION A and SECTION B.
2. Answer ALL the questions on the FOLIO PAPER.
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) on the FOLIO PAPER, for e.g. 1.1.11 A.

1.1.1 ONE of the following elements is NOT an alkaline earth metal:

A Calcium
B Sodium
C Magnesium
D Beryllium

1.1.2 An example of a mixture:

A Sodium chloride
B Air
C Water
D Carbon dioxide

1.1.3 Indicate a balanced chemical equation that represents the combustion of propane (C_3H_8), a common fuel used in agricultural machines.

A $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$
B $C_3H_8 + 3O_2 \rightarrow 3CO_2 + 4H_2O$
C $C_3H_8 + 4O_2 \rightarrow 3CO_2 + 4H_2O$
D $C_3H_8 + 6O_2 \rightarrow 3CO_2 + 4H_2O$

1.1.4 A saturated fatty acid implies that the fatty acid:

(i) Is of animal origin
(ii) Can help reduce LDL cholesterol levels
(iii) Is solid at room temperature
(iv) Has no double bonds between the carbon atoms

Choose the CORRECT combination:

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

1.1.5 The ability of a soil to hold nutrients and to make these nutrients available to plants:

A Cohesion
B Erodibility
C Cation exchange capacity
D Workability

1.1.6 The following are the steps used for soil classification:

(i) Establish the soil form
(ii) Demarcate master horizons
(iii) Add organic matter to the soil
(iv) Determine the soil series

Choose the CORRECT combination:

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

1.1.7 Soil acidity is a problem due to a combination of toxicity of … and impaired absorption of certain nutrients.

A sodium
B aluminium
C magnesium
D potassium

1.1.8 ONE of the following is NOT a control measure for managing soil sodicity:

A Avoiding irrigation with sodic water
B By removing excess sodium content from the soil
C By adding gypsum into the soil
D Excessive use of sodium-based fertilisers

1.1.9 A sign that the soil is rich in organic matter content.

A Increased growth of plants
B Increased soil acidity
C Decreased water retention in the soil
D Reduced microbial activity in the soil

1.1.10 Most microbial activity stops below a temperature of …

A 3 ^{o}C.
B 12 ^{o}C.
C 5 ^{o}C.
D 14 ^{o}C. (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) on the FOLIO PAPER, example 1.2.6. B only.

COLUMN A			COLUMN B
1.2.1	A	C_3OH	Butanol
	B	CH_3CH_2OH	
1.2.2	A	Organic matter content	A factors that can influence the development and stability of soil structure
	B	Soil compaction	
1.2.3	A	Nitrification	A close association of interdependent species
	B	Assimilation	
1.2.4	A	Lightning	A natural phenomenon that can also fix atmospheric nitrogen
	B	Rainfall	
1.2.5	A	Centipedes	They eat decaying organic residues
	B	Millipedes	

(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) on the FOLIO PAPER.

1.3.1 The arrangement of electrons in an atom

1.3.2 A type of gas that is responsible for the germination of seeds in plants

1.3.3 The microbial conversion of organic nitrogen to inorganic nitrogen

1.3.4 The very stable end-product of the decomposition of organic matter

1.3.5 The loss of soil quality and fertility (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) on the FOLIO PAPER.

1.4.1 All acids dissolve in water to produce <u>hydroxide</u> ions.

1.4.2 <u>0,25 mm to 0,50 mm</u> is the diameter of very coarse sand.

1.4.3 <u>Mineralisation</u> is the process whereby an insoluble substance is made soluble.

1.4.4 The addition of <u>cover crops</u> such as manure may contribute to the increase of organic matter content.

1.4.5 <u>Cations</u> are organic compounds that bind with metal ions to form a ring structure. (5 x 1) (5)

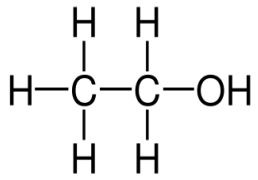
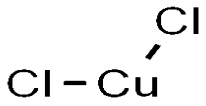
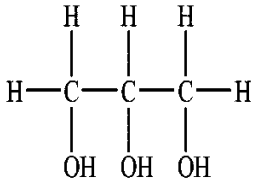
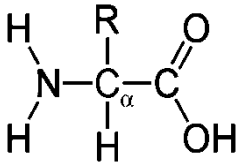
TOTAL SECTION A: 45

SECTION B

QUESTION 2: BASIC AGRICULTURAL CHEMISTRY

Start this question on a NEW page.

2.1 The illustrations below show different organic and inorganic compounds.

			
COMPOUND A	**COMPOUND B**	**COMPOUND C**	**COMPOUND D**

2.1.1 From the illustrations above, classify compound **A**. (1)

2.1.2 Identify from the compounds above, only the LETTER that best suites the following descriptions:

a) Building blocks of proteins (1)

b) An important constituent of fats (1)

c) A valuable micronutrient for plant growth (1)

2.1.3 Identify from the illustrations above compounds **A**, **C** and **D**. (3)

2.2 The block below gives an element in the periodic table.

$$^{94}\mathrm{Pu}\ ^{239}$$

2.2.1 Indicate the number of each of the following:

a) Neutrons (1)

b) Protons (1)

c) Electrons (1)

2.2.2 Provide a collective name for protons, electrons and neutrons. (1)

2.2.3 Name the particle in QUESTION 2.2.1 that does NOT contribute to towards the mass of an atom. (1)

2.3 The periodic table is a table of the elements; the elements are ordered and grouped according to their properties.

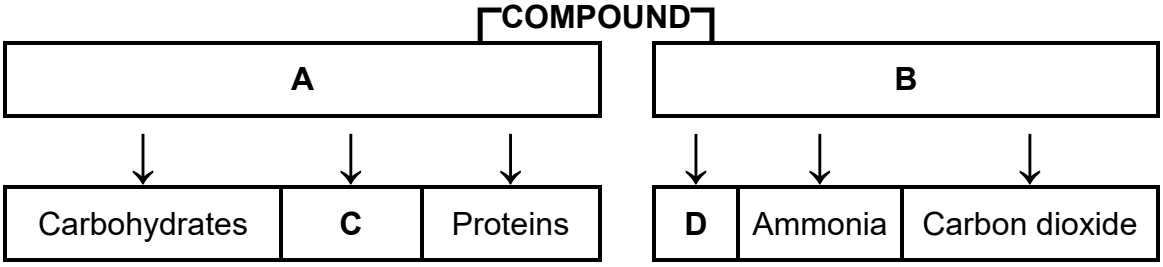
2.3.1 Give THREE characteristics of the periodic table. (3)

2.3.2 Provide chemical symbols for *mercury* and *molybdenum*. (2)

2.4 A Lewis-dot-structure is a diagram that represents the valence electrons of atoms within a molecule.

Draw a Lewis-dot-structure of oxygen. (2)

2.5 The schematic representation below shows the types of compounds.



2.5.1 Identify the compounds represented by letters **A** and **B**. (2)

2.5.2 Identify the letter in the schematic representation above that matches each of the following statements. Write only the letter (A–D).

a) Provides thermal insulation to maintain body temperature (1)

b) Transports nutrients in living organisms (1)

c) This type of compound is typical of geological systems (1)

2.6 Provide TWO functions of ammonia in agricultural production. (2)

2.7 Differentiate between *essential* and *non-essential amino acids*. (2)

2.8 Alkanes refer to a series of saturated and unsaturated hydrocarbons.

2.8.1 Provide a chemical formula for butane. (1)

2.8.2 Give TWO functions of alkanes in agricultural production. (2)

2.9 Give TWO differences between *fats* and *oils*. (4)

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QUESTION 3: SOIL SCIENCE

Start this question on a NEW page.

3.1 Name the master horizon, diagnostic topsoil horizon, age of the soil or diagnostic subsoil horizon used in the following descriptions:

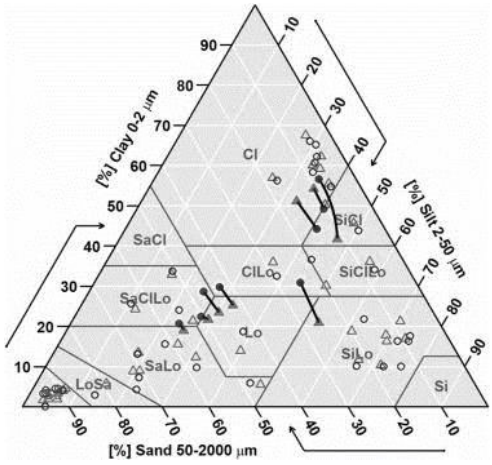
3.1.1 The most common diagnostic topsoil horizon (1)

3.1.2 The naturally occurring consolidated bedrock (1)

3.1.3 The soil horizon which is mostly found in waterlogged areas (1)

3.1.4 The diagnostic subsoil horizon that has a uniformly red colour (1)

3.2 The pictures below show different methods of determining soil texture.



METHOD A

METHOD B

3.2.1 Identify the two methods above:

a) method **A** (1)

b) method **B** (1)

3.2.2 Give ONE advantage of using method **B**. (1)

3.2.3 Outline TWO reasons why a farmer should know the textural class of soil for crop production. (2)

3.3 The table below shows characteristics of different soil structures.

SOIL 1	SOIL 2	SOIL 3
Irregular blocks that are usually 1,5 cm – 5,0 cm in diameter.	Particles are arranged around a plane, generally horizontal.	Soil is broken into individual particles that do not stick together.

3.3.1 Identify the THREE different soil structures described by SOIL **1**, **2** and **3**. (3)

3.3.2 Identify from the table above the SOIL that is mostly found in B-horizons. (1)

3.3.3 State TWO factors that could cause the destruction or decline of soil structures. (2)

3.4 Match soil colour to the statements in QUESTION 3.4.1 to 3.4.4. Write ONLY the letters (A–E) next to the question numbers (3.4.1 to 3.4.4).

A Dark brown or black
B Grey
C Yellow
D Red
E Mottled

3.4.1 Highly oxidized iron minerals like hematite. (1)

3.4.2 Patches of different colours suggesting waterlogging. (1)

3.4.3 Presence of organic matter content. (1)

3.4.4 Loss of oxidized iron from lack of oxygen and poorly drained. (1)

3.5 A soil sample has a mass of 800 g with a volume of 450 cm^3.

3.5.1 Use a formula and calculate the bulk density of this soil sample. (3)

3.5.2 State TWO factors that influence the bulk density of soil. (2)

3.6 The soil temperatures were collected at different times of the day. The results are shown in the table below.

	TIME OF THE DAY	TEMPERATURE (^{O}C)
1.	08h00	11
2.	10h00	16
3.	13h00	22
4.	16h00	24
5.	20h00	18

3.6.1 Draw a bar graph showing the soil temperature at different times of the day. (6)

3.6.2 Name ONE important factor influencing soil temperature. (1)

3.7 Soil air is similar in composition to that in the atmosphere.

3.7.1 Indicate the type of soil air (gas) that is responsible for the following functions.

a) Necessary for respiration of plant roots and soil organisms. (1)

b) Combines with soil water to dissolve rocks. (1)

3.7.2 State TWO factors that affect the composition of soil air. (2)
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QUESTION 4: SOIL SCIENCES AND SOIL ORGANIC MATTER

Start this question on a NEW page.

4.1 Name a micro-organism that best suits the following descriptions:

4.1.1 Threadlike bacteria that look like fungi. (1)

4.1.2 A microscopic roundworm that is most abundant in the soil. (1)

4.1.3 A multicellular organism that forms a mass of tangled threads called mycelium. (1)

4.1.4 A simple unicellular organism that lacks a cell wall. (1)

4.1.5 A micro-organism that can synthesize and make their own food. (1)

4.2 Soil pH is a measure of the acidity or alkalinity of the soil, expressed on a scale of 0 to 14.

4.2.1 Indicate the pH of the soil where the following ions are predominant:

a) A higher concentration of potassium (K^+) and sodium (Na^{2+}) ions. (1)

b) A higher concentration of magnesium (Mg^{2+}) and calcium (Ca^{2+}). (1)

4.2.2 Differentiate between *reserve acidity* and *active acidity*. (2)

4.3 The table below provides information on two micro-organisms that are found in plants.

MICRO-ORGANISM A	MICRO-ORGANISM B
It helps plant roots to absorb more phosphorus.	It helps legume plants to absorb nitrogen from the atmosphere. In return, the micro-organism gets food from the plant.

4.3.1 Indicate the type of symbiotic relationship that is illustrated by micro-organism **B**. (1)

4.3.2 Give TWO reasons why these micro-organisms are important in soil. (2)

4.3.3 List TWO requirements that allow micro-organisms **A** and **B** to perform their functions. (2)

4.3.4 Identify micro-organisms **A** and **B** in the table above. (2)

4.4 Soil colloids influences the physical and chemical characteristics of soil.

4.4.1 Define the concept *soil colloids*. (2)

4.4.2 Give TWO ways of manipulating the cations and cation exchange in a soil that is nutrient poor. (2)

4.5 Soil organic matter is the fraction of the soil that consists of plant and animal tissue in various stages of decomposition.

4.5.1 Name THREE factors that lower the organic matter content of soil. (3)

4.5.2 Give TWO biological effects of a decline in organic matter. (2)

4.5.3 Provide the names of TWO elements that are released when organic matter is mineralised. (2)

4.5.4 Name TWO chemical effects of organic matter in the soil. (2)

4.5.5 Give TWO practices that improve organic matter content. (2)

4.6 The following table shows different processes that occur during farming practices and a nutrient cycle.

PROCESS 1	PROCESS 2	PROCESS 3
Farmers add the gas to the soil to improve and increase crop production.	The substance is converted into nitrates by the soil microbes.	Nitrates are converted back to the substance by the soil microbes.

4.6.1 Identify, in the table above, processes **1**, **2** and **3**. (3)

4.6.2 State the type of nutrient cycle in the table above. (1)

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TOTAL SECTION B: 105
GRAND TOTAL: 150

THE PERIODIC TABLE OF ELEMENTS/*DIE PERIODIEKE TABEL VAN ELEMENTE*

KEY/*SLEUTEL*

Electronegativity / *Elektronegatiwiteit* → 1,9
Symbol / *Simbool* → Cu
Atomic number / *Atoomgetal* → 29
Approximate relative atomic mass / *Benaderde relatiewe atoommassa* → 63,5

1 (I)	2 (II)	3	4	5	6	7	8	9	10	11	12	13 (III)	14 (IV)	15 (V)	16 (VI)	17 (VII)	18 (VIII)
2,1 H 1																	2 He 4
1,0 Li 7	1,5 Be 9											2.0 B 11	2.5 C 12	3.0 N 14	3.5 O 16	4.0 F 19	10 Ne 20
0,9 Na 23	1,2 Mg 24											1.5 Aℓ 27	1.8 Si 28	2.1 P 31	2.5 S 32	3.0 Cℓ 35,5	18 Ar 40
0,8 K 39	1,0 Ca 40	1,3 Sc 45	1,5 Ti 48	1,6 V 51	1,6 Cr 52	1.5 Mn 55	1.8 Fe 56	1.8 Co 59	1.8 Ni 59	1.9 Cu 63,5	1.6 Zn 65	1.6 Ga 70	1.8 Ge 73	2.0 As 75	2.4 Se 79	2.8 Br 80	36 Kr 84
0,8 Rb 86	1,0 Sr 88	1,2 Y 89	1,4 Zr 91	41 Nb 92	1,8 Mo 96	1.9 Tc 43	2.2 Ru 101	2.2 Rh 103	2.2 Pd 106	1.9 Ag 108	1.7 Cd 112	1.7 In 115	1.8 Sn 119	1.9 Sb 122	2.1 Te 128	2.5 I 127	54 Xe 131
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
0,7 Cs 133	0,9 Ba 137	57 La 139	1,6 Hf 179	73 Ta 181	74 W 184	75 Re 186	76 Os 190	77 Ir 192	78 Pt 195	79 Au 197	80 Hg 201	81 Tℓ 204	82 Pb 207	83 Bi 209	84 Po	85 At	86 Rn
55	56		72														
0,7 Fr 87	0,9 Ra 226	89 Ac															
87	88																

58 Ce 140	59 Pr 141	60 Nd 144	61 Pm	62 Sm 150	63 Eu 152	64 Gd 157	65 Tb 159	66 Dy 163	67 Ho 165	68 Er 167	69 Tm 169	70 Yb 173	71 Lu 175
90 Th 232	91 Pa	92 U 238	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr