Education and Sport Development

Department of Education and Sport Development
Departement van Onderwys en Sportontwikkeling
Lefapha la Thuto le Tlhabololo ya Metshameko
NORTH WEST PROVINCE

PROVINCIAL ASSESSMENT

GRADE 11

AGRICULTURAL SCIENCES

JUNE 2018

MARKS: 150

TIME: 2½ hours

This examination paper consists of 12 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. 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 the calculations, including formulae, where applicable, and round off the answers to TWO decimal places.
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 number (1.1.1–1.1.10) in the ANSWER BOOK, for example 1.1.11 A.

1.1.1 The group of elements usually occurring in proteins are …

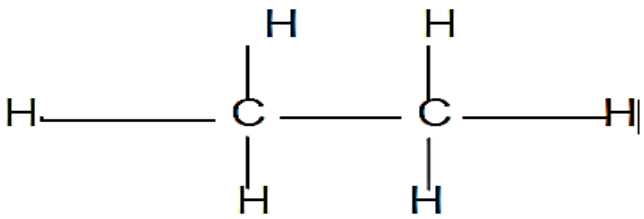
A C, P, Ca, O and Mg.
B C, H, O, N and P.
C S, C, N, O and H.
D Mg, K, H, Ca and Zn.

1.1.2 The statement below does not apply to the following group of elements:

Li	Na	K	Rb	Cs	Fr

A They are alkali metals.
B They belong to group 1A and have one valence electron.
C They are non-reactive.
D They are highly reactive.

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



(i) It is a colourless, odourless gas.
(ii) It is used for ethylene production.
(iii) It can be described as a hydrocarbon.
(iv) It is an important alcohol in nature.

Choose the CORRECT combination:

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

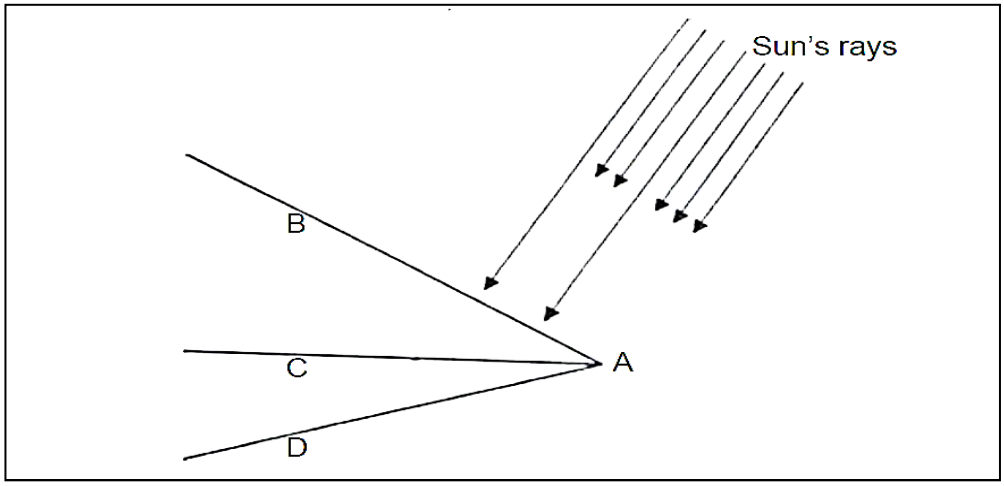
1.1.4 The texture has an effect on the …

A growth rate of plants.
B water holding capacity of soil.
C organic content of soil.
D structure of soil.

1.1.5 The following statement refers to the bulk density:

A The more the pore space, the lower the bulk density
B The more the pore space, the lower the bulk density
C The lesser the pore space, the higher the bulk density.
D Soil with high clay has a lowered bulk density.

1.1.6 The diagram below shows a factor influencing soil temperature.



A Seed germinate soil represented by letter B.
B Sun rays strike the soil obliquely at letter D.
C The soil at point B receives greater number of sun rays.
D The soil at point B receives greater number of sun rays.

1.1.7 The Schematic representation below demonstrates the following:

$$\boxed{}\ Na + \quad CaSO_4 \quad \boxed{}\ Ca^{2+} + Na_2SO_4$$

A The increase of the soil pH.
B Improving soil fertility.
C Reclamation of brackish soil.
D Correcting soil acidity.

1.1.8 The binomial soil classification system contains a broad and more general level regarding (a) … and a lower and more specific level regarding (b) …

	(a)	(b)
A	Soil form	Soil family
B	Soil series	Soil form
C	Soil form	Soil horizon
D	Soil profile	Soil horizon

1.1.9 The physical influence of organic matter on soil is …

A more nutrients become available.
B a decrease in the swelling of clay soil when wet.
C an increase in the number of micro-organisms.
D that the soil become fertile due to high cation absorption capacity.

1.1.10 The G horizon is an indication of …

A gleying condition.
B absence of organic matter.
C oxidation process.
D accumulation of iron oxides. (10 x 2) (20)

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 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	Atomic number	Number of protons and neutrons
	B	Atomic mass	
1.2.2	A	Carbon	An element which is able to catenate
	B	Hydrogen	
1.2.3	A	Nitrification	Reduction of nitrates under the anaerobic conditions.
	B	Denitrification	
1.2.4	A	Hygroscopic	The type of water that forms a thin film around soil particles.
	B	Adhesion	
1.2.5	A	Vertic A	Diagnostic horizon with a mass of cemented mottles. (5 x 2)
	B	Humic A	

(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 smallest particle of a substance which can exist independently still retain the properties of that substance

1.3.2 The conversion of insoluble inorganic forms of nutrients to soluble forms by action of bacteria

1.3.3 The point in soil where all pore space are completely filled with water

1.3.4 The concentration of nutrients and certain chemical compounds in only one part of the soil and absent somewhere else

1.3.5 The soil structure that has thin peds which are orientated in a horizontal direction. (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 Dextrin is an example of <u>disaccharide</u>.

1.4.2 <u>Isotopes</u> are organic compounds that have the same molecular formulae but different arrangement of atoms.

1.4.3 <u>Hydrolysis</u> is the transfer of an amino group from one chemical compound to another.

1.4.4 A <u>homogeneous</u> soil colour occurs when there is a mixture of soil material of mineral composition.

1.4.5 Cation <u>adsorption</u> is the sum total of the exchangeable cations in the soil. (5 x 1) (5)

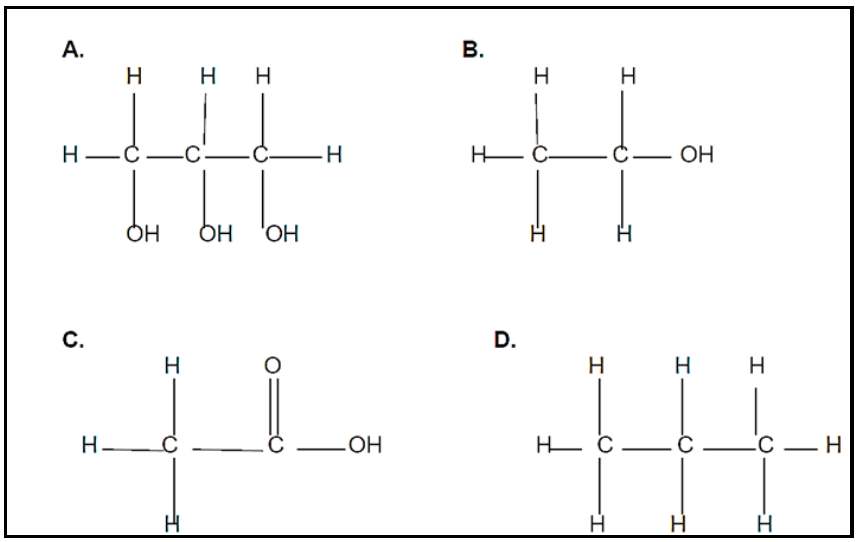
TOTAL SECTION A: 45

SECTION B

QUESTION 2: BASIC AGRICULTURAL CHEMISTRY

Start this question on a NEW page.

2.1 The chemical properties of organic compounds are determined by their functional groups and the formulas below are the compounds are important for humans.



2.1.1 Indicate the letter of a compound that matches each of the following descriptions:

(a) Formed by the fermentation process. (1)

(b) It is also known as acetic. (1)

(c) It is formed when the structure represented by letter B reacts with structure in C. (1)

(D) Can be used for heating in rural homes with no electricity. (1)

2.1.2 Explain the impact of a compound labelled D on the environment. (2)

2.1.3 Describe the benefit of using a compound labelled C as a source of energy of cars Instead of petrol. (2)

2.1.4 Indicate the function group of compound labelled B and C. (2)

2.2 Salt forms part of a diet for animals and human beings. It is important part of the fluid electrolytes of humans and other living organisms.

2.2.1 Give the chemical name and formula for salt. (2)

2.2.2 Indicate the bond that exists between the elements forming salt. (1)

2.2.3 During ancient times, salt was a valuable mineral in people's daily lives. Validate this Statement by giving THREE uses of salt during this era. (3)

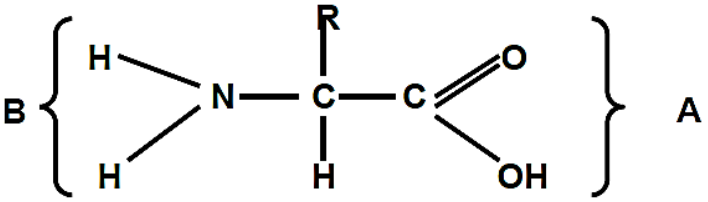
2.3 Acids and bases play a vital role in agriculture.

2.3.1 Indicate TWO differences between acid solution and base solution. (4)

2.3.2 If an acid solution is mixed with an alkaline solution, a chemical reaction takes place. Give the name of this reaction. (1)

2.3.3 State TWO products of the chemical reaction QUESTION 2.3.3 above. (2)

2.4 Analyse the structure below and answer the questions based on it.



2.4.1 Identify the structure above. (1)

2.4.2 Indicate the letter (A or B) that gives the structure in QUESTION 2.4.1 the following:

(a) Basic property (1)

(b) Acidic property (1)

2.4.3 Two or more of the structures mentioned in QUESTION 2.4.1. Above, can be joined together to form a polymer. Provide the name of this reaction. (1)

2.4.4 The polymer formed from joining two or more of the structures above plays a vital role in the body of an animal. Justify this statement with THREE reasons. (3)

2.5 Carbohydrates are organic molecules which act as energy suppliers in the food of animals. Some carbohydrates are very large and complex while others are simple. Different food supply different types of carbohydrates.

Indicate the example of monosaccharide or disaccharide or polysaccharide supplied by each of the following food and plant source:

2.5.1 Fruits (1)

2.5.2 Milk (1)

2.5.3 Sugar cane (1)

2.5.4 Wood (1)

2.5.5 Plant cell (1)
[35]

QUESTION 3: SOIL SCIENCE

Start this question on a NEW page.

3.1 The table below shows the physical characteristics of soil on two wheat farms.

PHYSICAL SOIL CHARACTERISTICS	FARM A	FARM B
Structure	Crumb	Blocky
Soil fraction(mm)	2.00 – 0.50	Less than 0.002
Depth(mm)	950	450
Colour	Light	Grey

3.1.1 Indicate the farm which is likely to be easily saturated with water. (1)

3.1.2 Give TWO reasons for the answer in QUESTION 3.1.1. From the table. (2)

3.1.3 Deduce the farm which is likely to have higher wheat yield. (1)

3.1.4 Justify by explaining TWO characteristics from the table which can result in higher yield. (4)

3.1.5 State THREE benefits of the structure in farm A. (3)

3.2 Pore space of soil is important because soil pores are filled with water and gases which are important for plant growth. The percentage of the total pore space is determined by various factors.

3.2.1 Describe the influence of the following factors on the total pore space:
(a) Soil depth (1)

(b) Soil cultivation (1)

3.2.2 Name TWO other factors that may have an influence on the total pore space. (2)

3.3 The colour of the soil can give much information to the farmer or to the soil scientist provided if it is interpreted correctly.

Indicate the colour of the soil that is likely to occur under the following climatic conditions:

3.3.1 Cool temperature regions (1)

3.3.2 Humid regions (1)

3.3.3 Dry conditions (1)

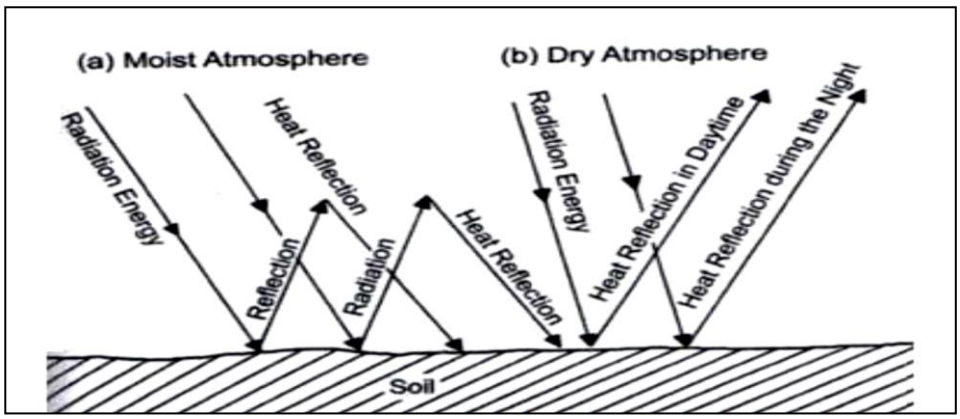
3.4 Due to different moisture conditions, a piece of land was divided into two, one for vegetables and another for maize. The farmer cleared the land in preparation for planting. Soon after the preparation there was heavy rain for two days and the land was saturated with water. The moisture content of both pieces was measured for a period of ten days and the results are shown in the table below.

DAY	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Moisture content of land for maize (%)	20	13	9	7	5	4	3	2	1	1
Moisture content of land for vegetable (%)	20	18	16	14	13	12	10	7	6	5

3.4.1 Plot a line graph of the moisture content for two pieces of land against time indays. (6)

3.4.2 Suggest THREE ways to limit the loss of water in the land used for maize. (3)

3.5 The illustration below indicate the factors that influences soil temperature.



3.5.1 Indicate the factor influences temperature as illustrated above. (1)

3.5.2 Explain the reason for each of the following soil temperature:

(a) Land will be warmer for a long time under moist and cloudy condition. (2)

(b) Low temperature in light coloured soils as compared to dark soils. (2)

3.5.3 State THREE influences of soil temperature on biological processes taking place in soil. (3)

[35]

QUESTION 4: SOIL SCIENCE

4.1 The horizontal layers of the soil are the result of environmental factors, particularly climatic factors and have developed over the period of time. One process occurs after the other until all horizons are visible

4.1.1 Rearrange the following processes showing the development of master horizons over time.

(a) Through the process of littering, plants will drop leaves and twigs onto soil to form the O-horizon.
(b) Small pieces of rocks formed C-horizon.
(c) Weathered rock undergoes chemical weathering to form soil which becomes the medium for vegetation to grow.
(d) A- Horizon is formed.
(e) The rock expands and contract leading to physical weathering.
(f) Micro- organisms convert organic debris of the soil through the process of humification. (6)

4.1.2 Suggest the condition leading to the development of an E-horizon. (1)

4.1.3 If you are asked to dig a profile test hole of a well-developed soil, predict THREE characteristics that may be revealed to show that you are in the B-horizon. (3)

4.2 Soil classification is the systematic arrangement of soil into classes or categories based on their most important properties and giving names to the unique arrangement or combination of these classes.

4.2.1 Determine the procedure for soil classification in a sequential order. (5)

4.2.2 Outline TWO reasons why soil is classified. (2)

4.3 Soil reaction influences not only the nutrient content of the soil, but also the structure, drainage and microbial composition of the soil. All these aspects of soil have a direct impact on crop production. The pH of the soil is determined by the relative concentration of adsorbed cations on soil colloids.
The most common adsorbed cations include the following:
H^+ , Ca^{+2} , K^+ , Al^{+3} , Mg^{+2} and Na

4.3.1 From the list of ions above, select TWO (in each case), that influences the soil reactions below:
(a) Alkalinity (2)

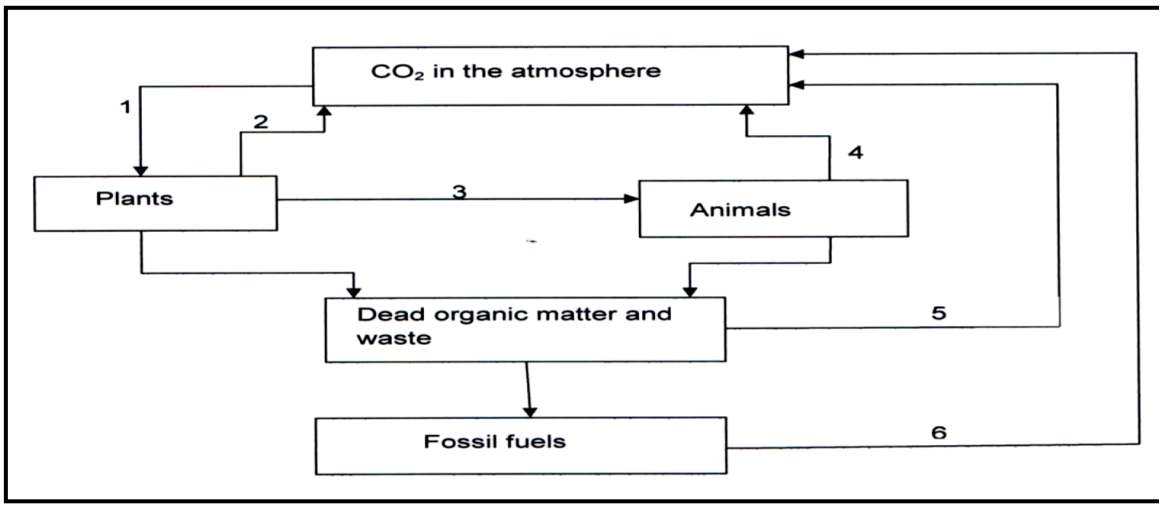
(b) Acidity (2)

(c) Neutrality (2)

4.3.2 Indicate TWO negative impacts of soil dominated by Al on crop production. (2)

4.3.3 Suggest the method to control problem stated in QUESTION 4.3.2 above. (1)

4.4 The schematic representation below illustrates the recycling of carbon dioxide from the atmosphere to the living organisms and back again.



4.4.1 Provide labels for the processes numbered 1,3,4,5 and 6. (5)

4.4.2 Name TWO important soil microorganisms that play a role during the process labelled 5. (2)

4.4.3 State TWO requirements of the organisms in QUESTION 4.4.2 above. (2)
[35]

TOTAL SECTION B: 105

GRAND TOTAL: 150