NATIONAL SENIOR CERTIFICATE (NSC)

GRADE 11
FINAL EXAMINATION

AGRICULTURAL SCIENCES PAPER 1
(NAE-09)

TIME: 09H00 – 11H00        TOTAL: 150 MARKS
DURATION: 2 HOURS        DATE: 31 OCTOBER 2012

This question paper consists of 16 pages.
INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions:

1. Answer ALL the questions.
2. Answer SECTION A (Question 1) on the attached ANSWER SHEET.
3. Answer SECTION B (Questions 2, 3 and 4) in the ANSWER BOOK provided.
4. Start each question from SECTION B on a NEW page.
5. Read the instructions carefully for each question and answer only what is required.
6. Begin with the question for which you think you'll get the best marks.
7. Number the answers correctly according to the numbering system used in this question paper.
8. Except where otherwise instructed, give your answers in full sentences.
9. The mark allocation of each question will determine the length of your answer. Give enough facts to earn the marks allocated. Don't waste time by giving more information than required.
10. Please write neatly – we cannot mark illegible handwriting.
11. Place the completed ANSWER SHEET for SECTION A (Question 1) inside the ANSWER BOOK.
12. Any student caught cheating will have his or her question paper and notes confiscated. The College will take disciplinary measures to protect the integrity of these examinations.
13. If there is something wrong with or missing from your question paper or your answer book, please inform your invigilator immediately. If you do not inform your invigilator about a problem, the College will not be able to rectify it afterwards, and your marks cannot be adjusted to allow for the problem.
14. This question paper may be removed from the examination hall after the examination has taken place.

This question paper consists of TWO sections: Section A and Section B. Answer ALL the questions.

<table>
<thead>
<tr>
<th>Question</th>
<th>Section</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A: Answer the question</td>
<td>45</td>
</tr>
<tr>
<td>2</td>
<td>B: Answer all the questions</td>
<td>105</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TOTAL: 150 MARKS
QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Choose the correct answer and make a cross (X) 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 awarded if more than one cross (X) appears for an answer.

EXAMPLE:

1.1.1 Which ONE of the following gives the best description of water?
   i. two hydrogen atoms and one oxygen atom
   ii. bonding is covalent
   iii. slightly positive at the oxygen end
   iv. most effective solvent

A. i., ii. and iii.
B. ii., iii. and iv.
C. i., ii. and iv.
D. i., iii. and iv.

1.1.2 The pH of an acid soil can be corrected by the application of . . .

A. farm manure.
B. superphosphate.
C. LAN.
D. agricultural lime.

1.1.3 Which ONE of the following gasses is essential for the synthesis of microbe protein?

A. nitrogen
B. oxygen
C. carbon monoxide
D. carbon dioxide
1.1.4 Organic colloids are also known as . . .
   A. isotopes.
   B. humus.
   C. brack.
   D. fertile soil.

1.1.5 If _____ it may lead to a temporary nitrogen deficiency caused by microbic activity in the soil.
   A. soil is ploughed too much
definition
   B. large quantities of fresh organic material is added to the soil
   C. fertilizer were recently added to the soil
   D. the soil were planted too early

1.1.6 A high bulk density occurs in the following conditions, except . . :
   A. fine sandy soil.
   B. single grain soil.
   C. soil which is continuously cultivated.
   D. soil with a high humus content.

1.1.7 Which ONE of the following is not a contributory factor to soil erosion in South Africa?
   A. incorrect cultivation
   B. temperature
   C. slope of land
   D. veld fires

1.1.8 The mass number of an atom represents its . . .
   A. neutrons and protons.
   B. electrons.
   C. electrons and protons.
   D. neutrons.

1.1.9 When a farmer practices mulching, it results in . . .
   A. an increase in water infiltration.
   B. an increase in evaporation losses.
   C. the weakening of soil structure.
   D. a fluctuation in soil temperature.

1.1.10 Which ONE of the following is NOT an advantage of hydrogenation of unsaturated fats?
   A. Changes the consumption of animal fats to the staple part of the diet.
   B. Changes plant oils into a more acceptable and usable hardened form.
   C. Converts oil into fat.
   D. Hardening of oil makes margarine. (10 × 2 = 20)
1.2 Choose a description from Column B that matches a concept / phrase in Column A. Write only the letter (A. – H.) next to the question number (1.2.1 – 1.2.5) on the attached ANSWER SHEET, for example 1.2.6 J.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2.1</td>
<td>clay mineral inclined to form bloody structures</td>
</tr>
<tr>
<td>1.2.2</td>
<td>strong, cohesive forces</td>
</tr>
<tr>
<td>1.2.3</td>
<td>organic colloids</td>
</tr>
<tr>
<td>1.2.4</td>
<td>capillary water movement</td>
</tr>
<tr>
<td>1.2.5</td>
<td>low total pore space</td>
</tr>
</tbody>
</table>

(5 × 2 = 10)

1.3 Give ONE agricultural 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 electrons found on the outer orbit of the atom
1.3.2 The phenomenon by which the path of light, passing through a colloidal dispersion, can easily be seen
1.3.3 The flow of water that takes place in all directions
1.3.4 The carbohydrate part of cell walls of plants
1.3.5 The clay mineral that is the least expansible when it becomes wet

(5 × 2 = 10)

1.4 Change the UNDERLINED WORD(S) in the following to make the statements TRUE. Write the appropriate word(s) next to the question number (1.4.1 – 1.4.5) on the attached ANSWER SHEET.

1.4.1 The illuvial horizon is where mobilisation and migration of iron and aluminium from the A-horizon to the B-horizon take place.
1.4.2 In emulsions the dispersed particles are larger than ordinary molecules, but not large enough to settle under the influence of gravity.
1.4.3 Colloidal particles absorb ions to their surface.
1.4.4  Hydration is the reaction of minerals with water to form a softer, more porous mineral.

1.4.5  The oxygen atom is the characteristic atom that is present in all organic compounds.  

\(5 \times 1 = 5\)  

TOTAL SECTION A: 45
QUESTION 2

2.1 Study the chemical reaction below and answer the following questions.

\[
\begin{array}{ccc}
\text{A} & \text{B} & \text{C} & \text{D} \\
K^+OH^- & + & H^+Cl^- & \rightarrow & KCl & + & H_2O \\
\end{array}
\]

2.1.1 Identify the type of reaction illustrated above. (2)

2.1.2 Which letter represents:
   A. an acid solution? (1)
   B. an alkaline solution? (1)

2.1.3 Identify C and D. (2)

2.1.4 Name the so called 'spectator' ions. (2)

2.2 Differentiate between a covalent and an ionic bond and give one example of each. (4)
2.3 Learners worked in a group to build a model of a chemical compound in an activity in their class. They used match sticks, straws, tooth picks, small potatoes, garden peas and onions to build their model. The following diagram represents the model that they built in their class group.

2.3.1 Deduce from the diagram the chemical elements represented by the potato, garden peas and onions respectively. (3)

2.3.2 Determine from the diagram the possible carbohydrate that this model represents. (2)

2.3.3 Deduce from the model the possible function of the straws, tooth picks or match sticks in this representation of a molecule. (2)

2.3.4 Indicate the solubility of the chemical compound in water. (2)

2.3.5 Name THREE examples of common carbohydrates. (3)
2.4 The Agricultural Sciences learners at your school dug a soil profile to classify the soil to help them decide on which plants to grow and how to prepare the soil.

2.4.1 Define a soil profile. (2)

2.4.2 Identify TWO restrictions in the soil on the school ground as seen in the soil profile. (2)

2.4.3 Discuss the measures the learners could take to overcome these constrictions. (2)

2.4.4 Explain the difference between horizons C and R. (2)

2.4.5 Briefly discuss the conclusion you can make from interpreting the colour of the soil. (3) [35]

QUESTION 3

3.1 Study the diagrams illustrating soil structures before answering the questions:

3.1.1 Identify the structures A to C as shown in the diagrams. (3)

3.1.2 Which structure will hamper root penetration? (1)

3.1.3 Name the only way through which roots can penetrate the structure named in 3.1.2. (1)
3.1.4 Explain what a farmer can do to improve root penetration in the structure named in 3.1.2. (1)

3.1.5 Indicate which structure in the diagram is the most ideal for optimum plant production. Motivate your answer. (2)

3.2 The soil texture diagram below is used in SA to determine the soil texture classes. Answer the questions that follow.

3.2.1 Determine the range of the clay content (%) of a silt-clay soil. (2)

3.2.2 Determine the clay (%), silt (%) and sand (%) contents respectively of a loam soil indicated as A by an arrow pointing to the specific position of the measurement. (3)

3.2.3 Give the texture class best suited to crop production. (1)

3.2.4 Give ONE reason to support your answer to question 3.2.3 (1)
3.3. Topography can cause many differences in weather phenomena from place to place. You may have discovered that certain positions in a field are better for certain crops than others. The following diagram (in the southern hemisphere) shows the effect of sun rays on different slopes.

3.3.1 Indicate the slope which receives the most radiation from the sun. Give a reason for your answer. (2)

3.3.2 Deduce from the diagram the slope which experiences low temperatures. Briefly explain your answer. (2)

3.3.3 You need to plant frost resistant and frost sensitive cultivars of a crop. Indicate the position where these cultivars will be planted with regard to the slope. (2)

3.3.4 Which of the above mentioned slopes are facing north? Substantiate your answer. (2)

3.4 The following is a schematic representation of a clay mineral.

<table>
<thead>
<tr>
<th>Silica tetrahedral</th>
<th>Aluminimium octahedral</th>
<th>Silica tetrahedral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica tetrahedral</td>
<td>Aluminimium octahedral</td>
<td>Silica tetrahedral</td>
</tr>
<tr>
<td>Silica tetrahedral</td>
<td>Aluminimium octahedral</td>
<td>Silica tetrahedral</td>
</tr>
</tbody>
</table>

3.4.1 Give an example of a clay mineral with a similar layered structure. (1)

3.4.2 Indicate THREE differences between this clay colloid compared with other clay colloids due to the forces of attraction between the different platelets. (3)
3.4.3 Explain how the forces of attraction between platelets influence the following:

A. The ability of the colloid to swell when wet

B. The absorption surfaces of the colloid.

3.5 Study the diagrams below and answer the questions that follow.

3.5.1 Identify the type of weathering that is taking place in diagrams A and B.

3.5.2 Briefly explain how the weathering illustrated in diagram B causes the rock to weather.

QUESTION 4

4.1 An excess of mineral salts has a negative effect on the production potential of the soil. The high concentration of dissolved salts makes it difficult for plant roots to absorb water.

4.1.1 List TWO types of salt that occur in salinity (white brack) and alkalinity (black brack).

4.1.2 Identify THREE disadvantages of white brack salts on plants and the soil.

4.1.3 The salts of alkalinity have a deflocculating reaction in soil. Name FOUR characteristics of this type of soil.
4.2 The photo below shows soil bacteria that plays an important role in the nitrogen balance in soil.

4.2.1 Name the type of bacteria present in the root modules. (2)

4.2.2 Summarise the process that occurs in the root modules in your own words. (4)

4.2.3 Name **TWO** examples of plants where the relationship illustrated above can be found. (2)

4.2.4 Indicate and describe the type of symbiosis that exists between the bacteria and the roots of the above plants. (3)

4.3 Ammonification, dentrification and nitrification are stages in the nitrogen cycle. The cycle involves the conversion of nitrogen compounds, particularly proteins in the soil by microbes.

Indicate the end product of **EACH** of the stages of the nitrogen cycle mentioned above. (3)
Are you killing plant roots?

Plant hair roots discharge enzymes, amino acids and sugars to attract microbes for food exchange. You can reduce the use of nitrogen fertilizer by approximately 40%, and still increase harvest volumes by 30% by using microbial products. This happens because of the microbes that use and return nitrogen to the plants, allowing the plant roots to absorb the released nitrogen through osmosis.

4.4.1 Give THREE examples each of soil organisms found in soil flora and soil fauna. (6)

4.4.2 Name the essential elements released in the process described in the above paragraph. (2)

4.4.3 Name TWO beneficial effects of soil micro-organisms. (2)

4.5 Name the TWO types of colloids that are found in soil. (2) [35]

TOTAL SECTION B: 105

GRAND TOTAL: 150 MARKS
ANSWER SHEET FOR SECTION A

Please detach and hand in with your answer book.

STUDENT NAME: __________________________________________________________

STUDENT NUMBER: ________________________________________________________

QUESTION 1

<table>
<thead>
<tr>
<th>1.1.1</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.2</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>1.1.3</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>1.1.4</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>1.1.5</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>1.1.6</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>1.1.7</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>1.1.8</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>1.1.9</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>1.1.10</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
</tbody>
</table>

(10 × 2 = 20)

1.2.1 ____________________________________

1.2.2 ____________________________________

1.2.3 ____________________________________

1.2.4 ____________________________________

1.2.5 ____________________________________ (5 × 2 = 10)

1.3.1 ____________________________________

1.3.2 ____________________________________

1.3.3 ____________________________________

1.3.4 ____________________________________

1.3.5 ____________________________________ (5 × 2 = 10)
1.4.1 ____________________________________
1.4.2 ____________________________________
1.4.3 ____________________________________
1.4.4 ____________________________________
1.4.5 ____________________________________ (5 × 1 = 5) [45]

TOTAL SECTION A: 45