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.
4. Read all the questions carefully and make sure you answer only what is asked.
5. Number the answers correctly according to the numbering system used in this question paper.
6. Place the completed ANSWER SHEET for SECTION A (QUESTION 1) inside the ANSWER BOOK.
7. You may use a non-programmable calculator and appropriate mathematical instruments.
8. Please write neatly – we cannot mark illegible handwriting.
9. Any student caught cheating will have his or her examination paper and notes confiscated. The College will take disciplinary measures to protect the integrity of these examinations.
10. 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.
11. 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: ONE question</td>
<td>45</td>
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<tr>
<td></td>
<td>Answer the question</td>
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<td>2</td>
<td>B: THREE questions</td>
<td>105</td>
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<tr>
<td>3</td>
<td>Answer ALL the questions</td>
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<td>4</td>
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<td><strong>TOTAL MARKS:</strong></td>
<td></td>
<td><strong>150</strong></td>
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</tbody>
</table>

**NOTE:** An answer sheet has been attached at the back of the question paper. Fill in your name and student number in the appropriate spaces, detach it from your question paper and place it inside your answer book.
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.

EXAMPLE:

1.1.6 A B C D

1.1.1 Which one of the following is found in proteins but not in lipids?
A. oxygen
B. nitrogen
C. phosphorus
D. sulphur

1.1.2 Carbohydrates can be stored in animals as glycogen and in plants as starch. Which one of the following characteristics makes glycogen and starch suitable storage molecules?
A. They are very large.
B. They contain a lot of energy.
C. They have glycosidic bonds.
D. They do not dissolve in water.

1.1.3 Clay colloids have a number of negative charges which make them capable of adsorbing cations. Which one of the following has the highest cation adsorption capacity?
A. clay particles with a 1 : 1 layered structure
B. clay particles with a large internal surface area
C. clay particles with strong bonds between the layers
D. clay particles that developed from the kaolinite clay minerals

1.1.4 The quantity of capillary water in the soil is dependent on:
A. soil colour.
B. soil temperature.
C. soil reaction.
D. cohesion forces.
1.1.5 The biological factor that causes the weathering process of rocks is called:

A. rainfall.
B. hydration.
C. plant roots.
D. hydrolysis.

1.1.6 The colloid that possesses the highest cation adsorption capacity is the:

A. montmorillonite colloid.
B. organic colloid.
C. illite colloid.
D. kaolinite colloid.

1.1.7 The most desirable soil structural shape for agricultural purposes is a:

A. spheroid.
B. blocky.
C. prismatic.
D. platy.

1.1.8 A soil containing iron in the ferric form has:

A. no oxygen.
B. a yellow colour.
C. enough oxygen.
D. a large quantity of calcium.

1.1.9 Which one of the following is a macro-organism that plays an important role in nitrification?

A. pseudonas
B. fungus
C. rhizobium
D. nitrobacter

1.1.10 A high bulk density does not occur in:

A. fine, sandy soil.
B. single grain soil.
C. soil with a high organic content.
D. soil which is continuously cultivated. (10 × 2 = 20)
1.2 Choose a description from Column B that matches a concept / phrase in Column A. Write only the letter (A. – G.) 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 polysaccharide is a common carbohydrate</td>
<td>A. micro pores</td>
</tr>
<tr>
<td>1.2.2 the greatest portion of free water is inaccessible to plants</td>
<td>B. organic matter</td>
</tr>
<tr>
<td>1.2.3 during the night heat radiation increases to a large extent</td>
<td>C. glucose</td>
</tr>
<tr>
<td>1.2.4 colloid dispersion with the same charge</td>
<td>D. deflocculation</td>
</tr>
<tr>
<td>1.2.5 soils that have a fine texture are poorly aerated</td>
<td>E. dead water</td>
</tr>
<tr>
<td></td>
<td>F. emulsion</td>
</tr>
<tr>
<td></td>
<td>G. macro pores</td>
</tr>
</tbody>
</table>

(5 x 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 compound product between two molecules of glucose
   1.3.2 an atom that has obtained an electrical charge due to the gain or loss of an electron
   1.3.3 the soil gas that is important to dilute the oxygen in soil air
   1.3.4 the process by which yellow limonite is formed from red haematite
   1.3.5 an intimate homogeneous mixture of substances in the same phase

(5 x 2 = 10)

1.4 Change the UNDERLINED WORD 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 Nitrogen ions are cations that are predominant in acid soils.
   1.4.2 Soil structure is determined by the amounts of the different particle sizes in the soil.
   1.4.3 The formation of dark coloured, amorphous, colloidal matter from organic material is called nitrification.
1.4.4 A well aerated soil that contains iron compounds, little organic matter and which is well drained, normally has a grey colour.

1.4.5 Swelling clays are ideal for making pots to store foods in.  

TOTAL SECTION A: 45
QUESTION 2

2.1 The following table reflects the fat content of bacon measured on different slaughtering stadia (marketing stadia):

<table>
<thead>
<tr>
<th>Slaughtering stadia (months)</th>
<th>Total fat content (g fat / 100 g meat)</th>
<th>Saturated fat (g fat / 100g meat)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>6</td>
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<td>12</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>10</td>
<td>5</td>
</tr>
</tbody>
</table>

2.1.1 Calculate the amount of unsaturated fats present in 250g bacon if the pigs were slaughtered at an age of six months. Show all calculations. (3)

2.1.2 Tabulate the differences between sunflower oil and pork fat according to the following characteristics:

A. melting point
B. amount of saturated fatty acids
C. amount of double bonds (7)

2.2 A group of learners in grade 11 were given equipment to do a physical analysis of the soils of a certain farm. After obtaining the percentages of the three major soil fractions, they had to use the texture diagram to determine the various textural classes of the soils. The table below shows some of the results they obtained:

<table>
<thead>
<tr>
<th>Soil sample</th>
<th>% sand</th>
<th>% silt</th>
<th>% clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>55</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>B</td>
<td>95</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td>30</td>
<td>20</td>
<td>50</td>
</tr>
</tbody>
</table>

2.2.1 Determine the textural class for soil sample B and critically discuss FOUR practical ways in which a farmer will be able to make such a soil more productive. (5)

2.2.2 Which of the soil samples in the table above would you recommend as the most suitable for cultivation? (1)

2.2.3 Identify the soil sample (A, B or C) indicated above that will have the highest capillarity. Give a reason for your answer. (2)
2.3 Answer the following questions regarding soil structure:

2.3.1 Identify **FOUR** types of soil structure. (4)

2.3.2 Describe how colloidal matter in soil plays a role in the development of soil structure. (4)

2.3.3 Which soil structure has limited permeability? (1)

2.3.4 In which soil structure would you find montmorillonite clays? (2)

2.4 Briefly explain the influence of dry regions on soil colour. (2)

2.5 Briefly describe the origin of the following colours in soil:

2.5.1 yellow (2)

2.5.2 red (2) [35]

**QUESTION 3**

3.1 A soil sample collected has a volume of 175 cm³ and a mass of 455 g. Calculate the bulk density of this sample. Show all your calculations. (4)

3.2 Study the following graph and answer the questions that follow:

Source: *Study and Master Agricultural Sciences*, Gr. 11 & 12, C.E. Lang, M.M. Mavovana
3.2.1 Differentiate between accessible and inaccessible soil water and provide examples of both. (4)

3.2.2 Explain the meaning of the flat curve of sandy soil above a moisture tension of four in comparison with the steeper curve of the clay soil at the same moisture tension. (4)

3.3 Briefly describe the condition in the soil that affects the soil temperature with regard to the following situations:

3.3.1 Under cloudy conditions, soil has a higher night temperature than under dry, cloudless conditions. (2)

3.3.2 Dark-coloured soil has a higher average temperature than light-coloured soil. (2)

3.3.3 There is less variation between the day and night temperatures of a soil with a plant cover. (2)

3.3.4 When it is cold, wet soil has a higher average temperature than too dry soil. (2)

3.4 Name the FIVE major horizons, from the top downwards and give the main properties of each. (5 × 2 = 10)

3.5 Give FIVE criteria that are used during soil classification to differentiate between soil series of soil families within the same soil form. (5) [35]

QUESTION 4

4.1 Give an example of the effect of cations on the chemical properties of soils with reference to:

4.1.1 acid soil (2)

4.1.2 brack soil (2)

4.1.3 sweet soil (2)

4.2 Briefly explain why the water from the wet lands is dark in colour while run-off water from a bare land is brown in colour. (2)
4.3 Saline soils contain high levels of soluble salts. A soluble salt refers to a salt that readily dissolves in water. Some of these salts occur naturally from minerals in the rocks that have undergone weathering, some from solutes in irrigation water and some from fertilisation. Salts accumulate in soils mainly in areas with a warm climate and low rainfall. In hot, dry conditions evaporation rates are very high and it leads to capillary rise. The salt crystals form a white crust on the soil surface.

The pictures below illustrate the white crust that forms due to high levels of soluble salts.

Source: NSC Agricultural Sciences Paper 1, Gr. 12, November 2008

4.3.1 Define the term 'capillary rise'. (2)

4.3.2 Describe THREE conditions that may lead to the formation of white brack conditions by referring to the picture above. (3)

4.3.3 Using the pictures, give TWO disadvantages of white brack conditions on crop production. (2)

4.3.4 Explain how a farmer can prevent or control the situation as illustrated in the picture. (4)

4.3.5 Name a fertiliser that is used mainly to correct a high level of sodium in the soil. (2)

4.3.6 Draw a simple schematic representation of the exchange reaction that takes place when the fertiliser mentioned in Question 4.3.5 is used on that soil. (3)
4.4 Water has an effect on microbiological processes in the soil and affects the availability of a number of nutrients such as nitrogen and phosphorous. Study the graph and answer the questions that follow:

Source: Old DBE Exam Paper

4.4.1 At what stage (%) will ammonification, nitrification and carbon dioxide production increase? (2)

4.4.2 According to the graph, what chemical reaction will increase when pore spaces are filled with more than 60% water? (2)

4.4.3 What will happen with the organic forms of nitrogen as the soil dries to below field capacity? (2)
4.4.4 Identify which chemical reactions in the graph takes place under the following conditions:

A. aerobic conditions (2)
B. anaerobic conditions (1)

4.4.5 Why would ammonia accumulate in dry land soils after prolonged dry periods? (2) [35]

TOTAL SECTION B: 105

GRAND TOTAL: 150 MARKS
GRADE 11
FINAL EXAMINATION
AGRICULTURAL SCIENCES PAPER 1
ANSWER SHEET

Detach from your question paper and place inside your Answer Book.

NAME: __________________________________________________________________

STUDENT NUMBER: _______________________________________________________

QUESTION 1.1

<table>
<thead>
<tr>
<th></th>
<th>A.</th>
<th>B.</th>
<th>C.</th>
<th>D.</th>
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<tbody>
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<td>1.1.1</td>
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<td>1.1.10</td>
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(10 × 2 = 20)

QUESTION 1.2

1.2.1  __________________________________________________

1.2.2  __________________________________________________

1.2.3  __________________________________________________

1.2.4  __________________________________________________

1.2.5  __________________________________________________ (5 × 2 = 10)
QUESTION 1.3
1.3.1
1.3.2
1.3.3
1.3.4
1.3.5 (5 × 2 = 10)

QUESTION 1.4
1.4.1
1.4.2
1.4.3
1.4.4
1.4.5 (5 × 1 = 5) [45]

TOTAL SECTION A: 45