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Province of the

**EASTERN CAPE**

EDUCATION

**NATIONAL**

**SENIOR CERTIFICATE**

**GRADE 11**

**NOVEMBER 2010**

|  |
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| **AGRICULTURAL SCIENCES – PAPER 1** |

**MARKS: 150**

**TIME: 2½ hours**

|  |
| --- |
| This question paper consists of 14 pages and 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 ALL 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 possible options are provided as 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: | | 1.1.11 | A | B | C | D |  |  |
|  |  | | | | | | | |  |
|  | 1.1.1 | An isotope of calcium has a mass number of 43 and a total of 20 electrons around the nucleus. This isotope would have ... protons in its nucleus. | | | | | | |  |
|  |  |  | | | | | | |  |
|  |  | A 23 | | | | | | |  |
|  |  | B 43 | | | | | | |  |
|  |  | C 63 | | | | | | |  |
|  |  | D 20 | | | | | | |  |
|  |  |  | | | | | | |  |
|  | 1.1.2 | The dipeptide below is a union of ... | | | | | | |  |
|  |  | **H O H CH3 O**  **H N C C N C C OH**  **H H H** | | | | | | |  |
|  |  |  | | | | | | |  |
|  |  | A glycine and alanine. | | | | | | |  |
|  |  | B cysteine and glycine. | | | | | | |  |
|  |  | C alanine and cysteine. | | | | | | |  |
|  |  | D glycine and methionine. | | | | | | |  |
|  |  |  | | | | | | |  |
|  | 1.1.3 | This is not a characteristic of a saline soil. | | | | | | |  |
|  |  |  | | | | | | |  |
|  |  | A Poor drainage. | | | | | | |  |
|  |  | B Accumulation of neutral and alkaline salts. | | | | | | |  |
|  |  | C Better absorption of water by plants. | | | | | | |  |
|  |  | D Soil becomes less toxic to plants. | | | | | | |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  | 1.1.4 | Carbon dioxide is produced by processes such as the burning of materials, decay of plant and animal tissue by soil micro-organisms, and respiration by plants and animals. This gas may be converted to plant carbon through the process of ... |  |
|  |  |  |  |
|  |  | A oxidation. |  |
|  |  | B photosynthesis. |  |
|  |  | C symbiotic nitrogen fixation. |  |
|  |  | D denitrification. |  |
|  |  |  |  |
|  | 1.1.5 | Seepage refers to the downward movement of water through the soil, whereas the phenomenon of the upward movement of water through the soil is known as ... |  |
|  |  |  |  |
|  |  | A osmosis. |  |
|  |  | B capillarity. |  |
|  |  | C drainage. |  |
|  |  | D gravitation. |  |
|  |  |  |  |
|  | 1.1.6 | These are typical examples of polysaccharides. |  |
|  |  |  |  |
|  |  | 1. Starch and maltose |  |
|  |  | 1. Galactose and chitin |  |
|  |  | 1. Glycogen and dextrins |  |
|  |  | 1. Cellulose and starch |  |
|  |  |  |  |
|  |  | A i and ii |  |
|  |  | B ii and iii |  |
|  |  | C i and iv |  |
|  |  | D iii and iv |  |
|  |  |  |  |
|  | 1.1.7 | The schematic equation below represents the application of agricultural lime to an acid soil. |  |
|  |  |  |  |
|  |  | **A B**   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | colloid | H+  +  H+ | CaCO3 |  | colloid | Ca+2 | + H2CO3 | |  |
|  |  |  |  |
|  |  | What physical property of the soil would move the reaction faster from B to A? |  |
|  |  |  |  |
|  |  | A Texture |  |
|  |  | B Colour |  |
|  |  | C Temperature |  |
|  |  | D Slope |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 1.1.8 | This is one advantage of the adding of kraal manure to cultivated soils by indigenous farmers. |  | |
|  |  |  |  | |
|  |  | A Change the texture of the soil. |  | |
|  |  | B Decrease the rate of chemical reactions in the soil. |  | |
|  |  | C Improve soil structure. |  | |
|  |  | D Decrease soil aeration and drainage. |  | |
|  |  |  |  | |
|  | 1.1.9 | This is NOT a characteristic of the sub-soil. |  | |
|  |  |  |  | |
|  |  | A Usually occurs between the A- and the B-horizons. |  | |
|  |  | B Compose of fresh and partly decayed organic matter. |  | |
|  |  | C Has an appreciable concentration of silicate clay minerals. |  | |
|  |  | D Has a high concentration of organic matter. |  | |
|  |  |  |  | |
|  | 1.1.10 | Consider the following covalent compounds labelled A to C whose structural formulae are indicated below. |  | |
|  |  |  |  | |
|  |  | **A B C**    H  │  H – C – H O ═ C ═ O H ─ N ─ H  │ │  H H |  | |
|  |  |  |  | |
|  |  | Which of the above will be found in coals mines and is/are formed during the decomposition of organic matter? |  | |
|  |  |  |  | |
|  |  | A A, B and C |  | |
|  |  | B A only |  | |
|  |  | C B and C |  | |
|  |  | D A and B (10 x 2) | (20) |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1.2 | In the table below a statement with two possible answers is given. Decide whether the statement in COLUMN B relates to ONE, BOTH or NONE of the answers in COLUM A and indicate the correct answer by making a cross (X) in the 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: | Electrons | Sub-atomic particles | |  | B: | Protons |  |  |  |  |  |  | | --- | --- | --- | --- | --- | | 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: | Fungi | Soil micro-organisms | | B: | Earth worms | | 1.2.2 | A: | Vermiculite | Swelling clay | | B: | Montmorillonite | | 1.2.3 | A: | Carbohydrates | Essential for growth of animals | | B: | Proteins | | 1.2.4 | A: | Milk sugar | Monosaccharide | | B: | Sucrose | | 1.2.5 | A: | Over-cultivation | Destruction of soil structure | | B: | Judicious liming | | | |  |
|  | (5 x 2) | | | (10) |
|  |  | |  |  |
| 1.3 | Give ONE term/phrase for each of the following descriptions. Write only the term next to the question number (1.3.1 – 1.3.5) on the attached ANSWER SHEET. | | |  |
|  |  |  | |  |
|  | 1.3.1 | A single dominant soil colour. | |  |
|  |  |  | |  |
|  | 1.3.2 | The reaction between an acid and a base. | |  |
|  |  |  | |  |
|  | 1.3.3 | The splitting of a complex organic molecule into simpler forms in the presence of water. | |  |
|  |  |  | |  |
|  | 1.3.4 | The factor which controls soil temperature most. | |  |
|  |  |  | |  |
|  | 1.3.5 | The organic compound which has the molecular formula: CH3COOH. | |  |
|  |  | (5 x 2) | | (10) |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1.4 | Change the UNDERLINED WORDS in the following statements to make them TRUE. Write the appropriate word or term next to the question number (1.4.1 – 1.4.5) on the attached ANSWER SHEET. | | |  |
|  |  |  | |  |
|  | 1.4.1 | All proteins consist of long chains of bonded fatty acids. | |  |
|  |  |  | |  |
|  | 1.4.2 | Seepage is the removal of nutrients by soil water through gravitation. | |  |
|  |  |  | |  |
|  | 1.4.3 | Nitrogen gas is converted into ammonia (NH3) and other ammonium (NH4+) compounds by *clostridium* bacteria in the root of leguminous plants. | |  |
|  |  |  | |  |
|  | 1.4.4 | Carbon dioxide dissolves in soil water to form humic acid. | |  |
|  |  |  | |  |
|  | 1.4.5 | The tendency of cations to stick to the surfaces of soil colloids is called flocculation. | |  |
|  |  | (5 x 1) | | (5) |
|  |  |  | |  |
|  |  | **TOTAL SECTION A:** | | **45** |
|  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **SECTION B** | | |  |
|  | | |  |
| **START THIS QUESTION ON A NEW PAGE IN THE ANSWER BOOK PROVIDED.** | | |  |
|  | | |  |
| **QUESTION 2** | | |  |
|  |  | |  |
| 2.1 | Lipids in plants are mostly composed of unsaturated fatty acids. These lipids are usually referred to as oils. On the other hand, lipids which occur in animals are made up saturated fatty acids and called fats. Fats and oils are chemically similar, the only difference being that fats are solids at room temperature while oils are liquids.  When human beings eat lots of fats, their blood cholesterol increases. High cholesterol levels lead to an accumulation of waxy materials deposited in the blood vessels. The blood vessels then harden and get blocked resulting in a condition known as arteriosclerosis. The dangers arising from arteriosclerosis are high blood pressure, stroke and heart attack.  Hydrogenation is chemical process whereby unsaturated lipids are converted to fats. When unsaturated plant oils (such as sunflower oil) undergo hydrogenation, fats are formed which are used in the manufacture of margarine. The hydrogenated oils, when consumed by humans, reduce the risk of having high levels of cholesterol and are therefore safer to use. | |  |
|  |  | |  |
|  | 2.1.1 | Explain the meaning of saturated fatty acids. | (2) |
|  |  |  |  |
|  | 2.1.2 | Suggest THREE advantages the consumption of less animal fats would have on humans globally. | (3) |
|  |  |  |  |
|  | 2.1.3 | Using ONE word, indicate how plant oils are converted to fats. | (1) |
|  |  |  |  |
|  | 2.1.4 | Give ONE example of an unsaturated fatty acid. | (2) |
|  |  |  |  |
| 2.2 | Soil temperature plays a tremendous role in the physical and chemical properties of the soil. | |  |
|  |  |  |  |
|  | 2.2.1 | Indicate FOUR factors that influence soil temperature. | (4) |
|  |  |  |  |
|  | 2.2.2 | Discuss FOUR reasons why a relatively higher soil temperature will enhance crop production. | (4) |

|  |  |  |  |
| --- | --- | --- | --- |
| 2.3 | Soil reaction or pH 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 direct impact on crop production. The pH of soils is determined by the relative concentration of adsorbed cations on the soil colloids.  The commonest adsorbed cations include the following:  **H+; Ca+2; K+; Al+3; Mg+2; Na+** | |  |
|  |  |  |  |
|  | From the above list of ions, select TWO ions that would bring about: | |  |
|  |  |  |  |
|  | 2.3.1 | soil alkalinity | (2) |
|  |  |  |  |
|  | 2.3.2 | soil acidity | (2) |
|  |  |  |  |
|  | 2.3.3 | soil neutrality | (2) |
|  |  |  |  |
| 2.4 | Consider the following gases labelled A, B and C in the boxes below. | |  |
|  |  |  |  |
|  |  | **C**  **O2**  **B**  **N2**  **A**  **CO2** |  |
|  |  |  |  |
|  | Suggest the LETTER and NAME of the gas that would: | |  |
|  |  | |  |
|  | 2.4.1 | prevent the production of toxic substances in soils. | (2) |
|  |  |  |  |
|  | 2.4.2 | dissolve in soil water and contribute towards weathering of rocks. | (2) |
|  |  |  |  |
|  | 2.4.3 | reduce the oxidative processes in soils. | (2) |
|  |  |  |  |
|  | 2.4.4 | be required for the respiration of plant roots and micro-organisms. | (2) |
|  |  |  |  |
| 2.5 | In the construction of a road, a civil engineer had to cut through a badly eroded land where the top- and the sub-soils had been removed. The erosion had been caused by unchecked run-off water. It also became necessary that the contractor cuts through the substrata as well.  Before this land became eroded, all previous profile pits which were dug on that land had exposed the five major horizons. | |  |
|  |  |  |  |
|  | 2.5.1 | In a sequential order, indicate the THREE horizons which had been washed away by water. | (3) |
|  |  |  |  |
|  | 2.5.2 | Which horizons constituted the substrata? | (2) |
|  |  |  | **[35]** |

|  |  |  |  |
| --- | --- | --- | --- |
| **QUESTION 3** | | |  |
|  | | |  |
| **START THIS QUESTION ON A NEW PAGE.** | | |  |
|  |  | |  |
| 3.1 | Five Grade 11 learners were assigned to do a mechanical analysis of the soil in their school garden. The learners after analysing the soil presented their results as shown in the pie chart below: | |  |
|  |  |  |  |
|  |  | |  |
|  | The Agricultural Sciences educator for the grade requested the entire class to use the Texture Triangle below to classify the soil. | |  |
|  |  |  |  |
|  |  | |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 3.1.1 | Based on the results obtained by the five learners, determine the textural class of the soil around the school garden. | | |  | (3) |
|  |  |  | | |  |  |
|  | 3.1.2 | Predict FOUR physical effects the addition of organic matter would have on the texture stated in QUESTION 3.1.1 above. | | |  | (4) |
|  |  |  | | |  |  |
|  | 3.1.3 | Re-draw the table below in your answer book, substituting the texture mentioned in QUESTION 3.1.1 for “X”, and make a comparison between that texture and sand on the basis of the properties indicated. | | |  |  |
|  |  |  | | |  |  |
|  |  | **Property** | **X** | **Sand** |  |  |
|  |  | Water retention/holding |  |  |  |  |
|  |  | Ease of tillage |  |  |  |  |
|  |  | Infiltration capacity |  |  |  | (6) |
|  |  |  | | |  |  |
| 3.2 | The diagram below is an illustration of the carbon cycle. | | | |  |  |
|  |  | | | |  |  |
|  |  | | | | |  |
|  |  |  | | |  |  |
|  | 3.2.1 | Assuming the processes A, B and C cease to occur in nature, deduce FIVE consequences this could have on earth. | | |  | (5) |
|  |  |  | | |  |  |
|  | 3.2.2 | Mention THREE groups of micro-organisms which are involved with process A. | | |  | (3) |

|  |  |  |  |
| --- | --- | --- | --- |
| 3.3 | Consider the following organic and inorganic substances A, B, C, D, E and F: | |  |
|  |  |  |  |
|  |  | A = Ethanol |  |
|  |  | B = Calcium carbonate |  |
|  |  | C = Ammonia |  |
|  |  | D = Glycerol |  |
|  |  | E = Butanoic acid |  |
|  |  | F = Sodium carbonate |  |
|  |  | |  |
|  | 3.3.1 | Write the LETTER and FORMULA of the substance used to correct soil acidity. | (2) |
|  |  |  |  |
|  | 3.3.2 | Indicate the LETTER and draw the STRUCTURE of the substance which is found in wine and other fermented drinks. | (3) |
|  |  |  |  |
|  | 3.3.3 | What is the functional group of E? | (1) |
|  |  |  |  |
|  | 3.3.4 | Write down the LETTER of the substance that occurs in all fats and oils. | (1) |
|  |  |  |  |
|  | 3.3.5 | Predict ONE substance that will cause both saline-alkaline conditions and black brackishness of soils. | (2) |
|  |  |  |  |
|  | 3.3.6 | Suggest (indicating only the LETTER) the substance that would react with sulphuric acid to form (NH4)2 SO4. | (1) |
|  |  |  |  |
| 3.4 | Symbiotic nitrogen fixation is a process which results in the addition of nitrogen into the soil through the activities of certain micro-organisms in the presence of oxygen. | |  |
|  |  |  |  |
|  | 3.4.1 | Indicate as to whether the process is aerobic or anaerobic. | (1) |
|  |  |  |  |
|  | 3.4.2 | Predict TWO conditions which will make this process take place successfully. | (2) |
|  |  |  | **[35]** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **QUESTION 4** | | | |  |
|  | | | |  |
| **START THIS QUESTION ON A NEW PAGE.** | | | |  |
|  | | | |  |
| 4.1 | Water is obtained in soils either through rainfall or irrigation. Soil water occurs in the pores within the soil. Water that enters the soil may seep downward by means of gravitation; evaporate from the soil or be absorbed by plants through the process of osmosis. | | |  |
|  |  |  | |  |
|  | 4.1.1 | Mention the TWO pores that occur in the soil matrix. | | (2) |
|  |  |  | |  |
|  | 4.1.2 | Which of the two pores is responsible for the retention of water in the soil? | | (1) |
|  |  |  | |  |
|  | 4.1.3 | State FOUR factors that influence the water-holding capacity of soils. | | (4) |
|  |  |  | |  |
|  | 4.1.4 | Explain the concept of osmotic potential. | | (3) |
|  |  |  | |  |
|  | 4.1.5 | Suggest FOUR major functions that water performs in plants. | | (4) |
|  |  |  | |  |
| 4.2 | The table below shows the major groups of soil structure and some of their types. | | |  |
|  |  | | |  |
|  | **MAJOR GROUP** | | **TYPES** |  |
|  | Blocky | | Angular blocky |  |
|  | Sub-angular blocky |  |
|  | Prism-like | | Columnar |  |
|  | Prismatic |  |
|  | Spheroid | | Granular |  |
|  | Crumb |  |
|  | Platy | |  |  |
|  | Amorphous | |  |  |
|  |  | | |  |
|  | 4.2.1 | Which type of soil structure is most desirable for arable farming? | | (1) |
|  |  |  | |  |
|  | 4.2.2 | Suggest FIVE benefits an indigenous farmer operating on the type of structure mentioned in QUESTION 4.2.1, has over other farmers who operate on different types of structures. | | (5) |
|  |  |  | |  |
|  | 4.2.3 | Mention TWO factors which lead to the formation of soil structure. | | (2) |
|  |  |  | |  |
|  | 4.2.4 | Indicate THREE processes that could lead to the destruction of soil structure. | | (3) |

|  |  |  |  |
| --- | --- | --- | --- |
| 4.3 | In the binomial classification of soils, the nomenclature is that a soil form is determined first followed by the soil series. | |  |
|  |  | |  |
|  | 4.3.1 | Identify FOUR criteria that may be used to determine the soil series. | (4) |
|  |  |  |  |
|  | The colour of a particular soil does not only predict its nutrient status and moisture content, but also gives an idea about the climatic conditions under which the soil was formed. | |  |
|  |  | |  |
|  | 4.3.2 | Make a vivid comparison between a dark-coloured and a light-coloured soil on the basis of their constitution, and suitability for crop production. | (6) |
|  |  |  | **[35]** |
|  |  |  |  |
|  |  | **TOTAL SECTION B:** | **105** |
|  |  |  |  |
|  |  | **GRAND TOTAL:** | **150** |

**ANSWER SHEET**

**SECTION A**

### NAME: ………………………………………………………………..

### QUESTION 1.1

## QUESTION 1.3

|  |  |
| --- | --- |
| 1.3.1 |  |
| 1.3.2 |  |
| 1.3.3 |  |
| 1.3.4 |  |
| 1.3.5 |  |

(5 x 2) (10)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 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 QUESTION 1.4  |  |  | | --- | --- | | 1.4.1 |  | | 1.4.2 |  | | 1.4.3 |  | | 1.4.4 |  | | 1.4.5 |  | |  | |   (5 x 1) (5) |
| 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 | 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)

|  |  |
| --- | --- |
| TOTAL SECTION A: | 45 |