higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

SOIL SCIENCE
NQF LEVEL 2

(1011002)

24 November 2023 (Y-paper)
13:00–16:00

This question paper consists of 10 pages.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)
SOIL SCIENCE
NQF LEVEL 2
TIME: 3 HOURS
MARKS: 150

INSTRUCTIONS AND INFORMATION

1. Answer all the questions.
2. Read all the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Use only a black or blue pen.
5. Write neatly and legibly.

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SECTION A

QUESTION 1

Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (1.1–1.10) in the ANSWER BOOK.

1.1 Nitrogen reduces lush vegetative plant growth.

1.2 Warm air can hold more moisture than cold air.

1.3 Charged atoms are called ions.

1.4 When water seeps into cracks of rocks and freezes there, it causes rocks to break up.

1.5 The atomic number of an atom is equal to the sum of protons and electrons.

1.6 The cohesive forces between clay particles are very weak.

1.7 Calcium deficiency can cause plant leaves to curl.

1.8 Matter has three states.

1.9 Cobalt is one of the micro elements that plants require in a small quantity.

1.10 A big difference between wet-bulb and dry-bulb readings indicates saturated air. (10 × 1) **[10]**

QUESTION 2

Give ONE word or term for each of the following descriptions. Write only the answer next to the question number (2.1–2.10) in the ANSWER BOOK.

2.1 It is made up of different substances that can be separated by a physical process like distillation.

2.2 The loss of water from the stomata of leaves.

2.3 Soil that is very smooth and doesn’t have a sandy feeling.

2.4 A substance found in soil which assist plants during the uptake of nutrients from the soil.

2.5 The sharing of electrons to form a polar molecule.

2.6 The direction at which the slope faces.

2.7 Lack of nutrient in the soil.

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2.8 Loss of water in the form of water vapour at a temperature below boiling point.

2.9 When a substance causes something to happen.

2.10 When a particle is too small to make a difference.

(10 × 1) **[10]**

QUESTION 3

Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (3.1–3.10) in the ANSWER BOOK.

3.1 The melting point of ice is …

A 100 ˚C
B 70 ˚C
C 0 °C
D 200 ˚C

3.2 The best time to take leaf samples for analysis is from …

A the end of January until the beginning of February.
B the beginning of January until the end of February.
C the end of February until the beginning of March.
D the beginning of February until the end March.

3.3 The first energy level of an atom can hold these electrons only.

A 8
B 6
C 10
D 2

3.4 These are warmer slopes, that is why crop farmers in those areas deliver early crops.

A North
B South
C East.
D North west.

3.5 Plant nutrients in soil are made up of …

A gas.
B elements.
C protons.
D nucleus

3.6 Water that moves deeper into soil.

A Capillary
B Hygroscopic
C Gravitational
D Free water

3.7 An element can be defined by its …

A energy levels.
B nucleus.
C atomic number.
D mass number.

3.8 …. are crops that replace nitrogen in the soil.

A Maize
B Legumes
C Carrots
D Spinach

3.9 An atom which is number one on the periodic table.

A Oxygen.
B Hydrogen.
C Helium.
D Boron.

3.10 Non-scientific name for hydrochloric acid.

A Spirits of salts
B Vinegar
C HCl
D Tar

(10 × 1) **[10]**

TOTAL SECTION A: 30

SECTION B

QUESTION 4

4.1 What is soil? (2)

4.2 In which phase does soil consist of mainly minerals and rocks. (1)

4.3 Calculate the percentage of organic matter in a sample of soil with the following details:

Mass 1 (M1) = 2g, Mass 2 (M2) = 22g and Mass 3 (M3) = 15g (4)

4.4 Give the name of the soil horizon suitable for each of the descriptions below.

4.4.1 Solid rock.

4.4.2 Sub-soil

4.4.3 A layer of organic matter.

4.4.4 Loose parent material.

4.4.5 A topsoil.

(5 × 1) (5)

4.5 Farmers around your area only know about dark soil and red soils and how good these soil colours are in terms of crop production.

Expand their knowledge by giving them the other THREE soil colours they should expect to find in other areas of their farms. (3)

4.6 Define the following soil scientific terms:

4.6.1 Capillarity

4.6.2 Eluviation

4.6.3 Soil profile

4.6.4 Altitude

(4 × 2) (8)

4.7 Draw a pie chart of an average composition of soil, indicating the percentages of the following soil components: air, liquid and solid only. (4)

4.8 Explain why the factors of soil formation in the formula S = F(P , R, Cl, O, T) are equally important. (3)

[30]

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QUESTION 5

5.1 Study the symbol below and answer the following questions in the ANSWER BOOK.



[Source: *https://www.rsc.org/periodic-table/element*]

FIGURE 1

5.1.1 What is the name of the atom represented in FIGURE 1? (1)

5.1.2 Which letter represents the atomic number of the atom as indicated in FIGURE 1. (2)

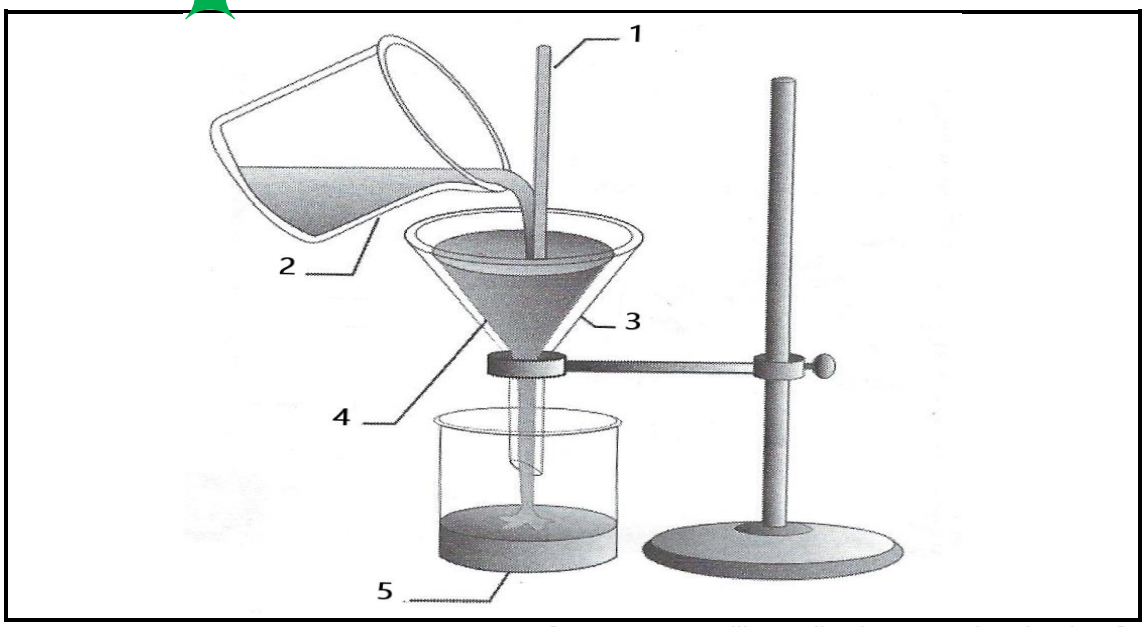
5.1.3 What is the atomic number of this atom? (2)

5.1.4 Which letter represent the mass number of this atom? (2)

5.1.5 Name the type of chemical bonding that will cause this atom to react with sodium to form the compound, sodium chloride. (2)

5.1.6 Define the chemical bonding type mentioned in QUESTION 5.1.5 (2)

5.2 Study the diagram below and answer the questions that follow in the ANSWER BOOK.



[Source: *Macmillan soil science student book L2*]

FIGURE 2

5.2.1 Name items 1 to 5 by writing only the answer next to the number (1–5) in the answer book. (5)

5.2.2 Which process is being investigated in FIGURE 2 above? (1)

5.2.3 Explain the process answered in QUESTION 5.2.2. (3)

5.3 Name THREE particles of an atom (3)

5.4 Answer the following questions based on water molecules.

5.4.1 Draw a Couper diagram of a water molecule showing a bond angle of 105˚. (3)

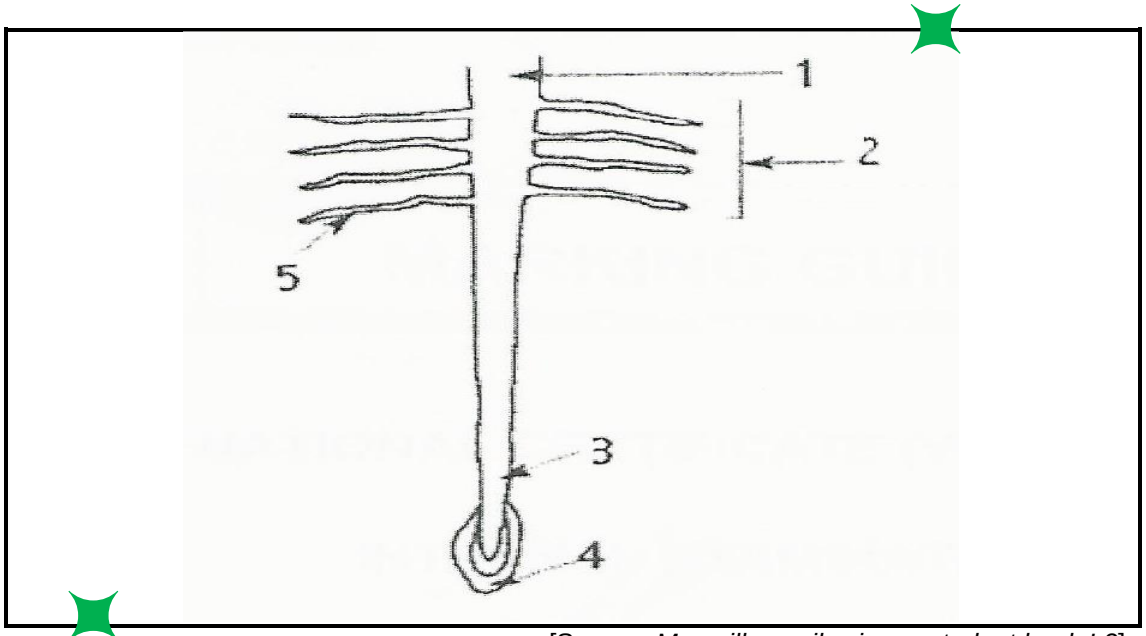
5.4.2 Is this a polar or a non-polar molecule? (2)

5.4.3 Give the molecular formula of water. (2)

[30]

QUESTION 6

6.1 Study FIGURE 3 below and answer the questions that follow.



[Source: *Macmillan soil science student book L2*]

FIGURE 3

6.1.1 Name the parts of the root labelled 3, 4 and 5 by writing only the answer next to the question number (3–5) in the ANSWER BOOK. (3)

6.1.2 What is the function of the part numbered 4? (2)

6.1.3 Which number represent the older root zone? (1)

6.1.4 Part numbered 2 is called the region of … (complete the sentence). (1)

6.2 Explain how suction is created by plant leaves. (3)

6.3 Mineral absorption by plant roots involves THREE absorption processes. Name them. (3)

6.4 When farmers add nutrients in the soil for plants to absorb, they exclude hydrogen and oxygen, because plants get them from … (complete the sentence) (1)

6.5 Discuss FIVE functions of water in plant growth. (10)

6.6 What would indicate to a farmer that a phosphorus deficiency is the problem with his crop? (4)

6.7 Explain the meaning of the term, *available plant nutrients*. (2)

[30]

QUESTION 7

7.1 Differentiate between:

7.1.1 Diffusion and back diffusion.

7.1.2 Dry-bulb thermometer and wet-bulb thermometer.

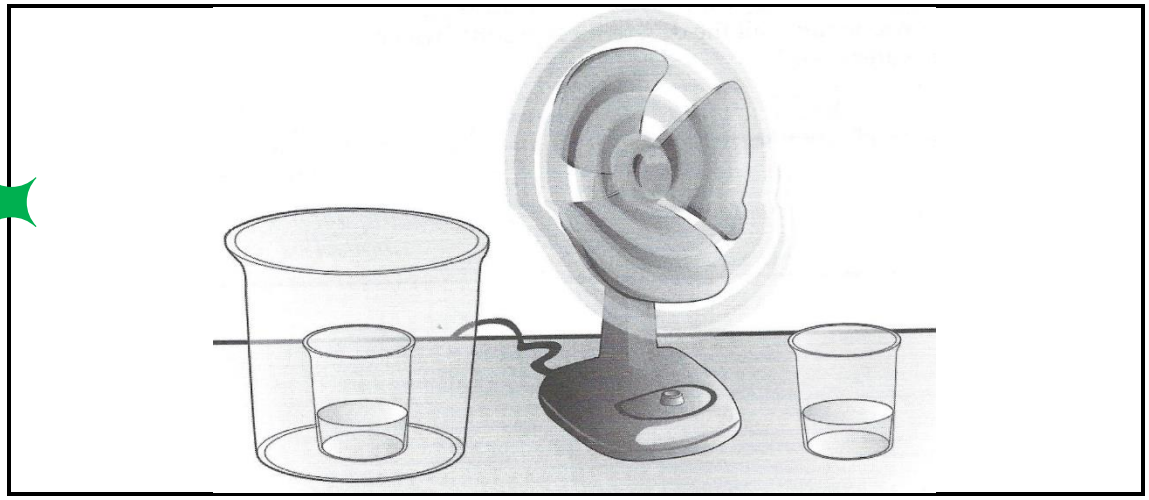
7.1.3 Dew and dew point.

(4 × 3) (12)

7.2 Explain the statement, the *relative humidity in the store room is 70%.* (3)

7.3 FIGURE 4 below shows a blowing fan and two small beakers containing equal amount of water.

Briefly explain what will happen to the TWO beakers in the FIGURE. (3)



[Source: *Macmillan soil science student book L2*]

FIGURE 4

7.4 What is vaporisation? (2)

7.5 Farmers may use a number of mulching materials to reduce surface water loss through evaporation in their fields.

Name FOUR of these materials. (4 × 2) (8)

7.6 What is transpiration? (2)

[30]

TOTAL SECTION B: 120
GRAND TOTAL: 150

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