higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

SOIL SCIENCE
NQF LEVEL 2

(1011002)

20 November 2018 (X-Paper)
09:00–12:00

This question paper consists of 11 pages.

NCV

Copyright reserved

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. Start each question in this section on a NEW page.
5. Write neatly and legibly.

NCV

SECTION A

QUESTION 1

1.1 Various options are given as possible answers to the 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.

1.1.1 Atoms loose electrons and become …

A an ion.
B compounds.
C ions.
D cations.

1.1.2 Sharing of electrons between two atoms combining:

A Ionic bond
B Chemical bond
C Covalent bond
D Polar bond

1.1.3 These are positively charged particles of an atom:

A Neutrons
B Electrons
C Nucleus
D Protons

1.1.4 At boiling point water molecules leave the surface of water in the form of …

A gas.
B water.
C carbon dioxide.
D nitrogen.

1.1.5 Water moves from the soil through root hairs into the xylem vessels of the plant by … process.

A diffusion
B active transport
C osmosis
D evapotranspiration

NCM

1.1.6 It is a plant nutrient that neutralises acids in plants that are formed during protein synthesis.

A Zinc
B Calcium
C Molybdenum
D Nitrogen

1.1.7 The … region of a plant root is the most important area of water absorption.

A root hair
B growing point
C root cap
D mature

1.1.8 Weathering of rocks that can be caused by temperature changes.

A chemical weathering
B biological weathering
C physical weathering
D tension weathering

1.1.9 Bed rock horizon.

A A
B C
C R
D O

1.1.10 S = F (P, R, Cl, O, T) is an equation representing soil …

A formation.
B erosion.
C development.
D depth.

(10 × 1) (10)

1.2 Give ONE term/word for each of the following descriptions. Write only the term/word next to the question number (1.2.1–1.2.10) in the ANSWER BOOK.

1.2.1 A substance made up of more than one type of atom bonded together to form a molecule.

1.2.2 The process of changing steam into liquid water.

1.2.3 The soil colour with very high percentage of organic matter and is very also good for crop production.

NCM

1.2.4 The temperature at which saturated air is cooled and causes some water to condense to a liquid.

1.2.5 Collection of leaves from the plant for analysis to determine nutrient status of leaves.

1.2.6 A substance made up of one kind of an atom.

1.2.7 Loss of water from the soil through plant leaves by openings called stomata.

1.2.8 The layer that covers the mature region of the root and stops water movement from soil into the plant root.

1.2.9 Floating of particles in the middle of a liquid.

1.2.10 A simple way of showing covalent bonding pair of electrons by a line between the symbols of atoms involved.

(10 × 1) (10)

1.3 Choose a word from COLUMN B that best suit the description in COLUMN A. Write only the letter (A–L) next to the question number (1.3.1–1.3.10) in the ANSWER BOOK.

COLUMN A		COLUMN B	
1.3.1	Diatomic molecules	A	evaporation
1.3.2	Total transferring of electrons from one atom to the other	B	accretion
1.3.3	Converting liquid to a vapour at a temperature below boiling point	C	available plant nutrients
1.3.4	The direction at which the slope faces	D	water
1.3.5	The gas phase of the soil	E	neutrons
1.3.6	Build-up caused by adding things.	F	H2
1.3.7	It acts as a solvent of plant nutrients before they are absorbed	G	G. distillation
1.3.8	Plant nutrient available for plant use during a particular growing season	H	H. iron
1.3.9	Neutral particles of an atom	I	soil air
1.3.10	A process used to separate mixtures	J	aspect
		K	ionic bonding
		L	latitude

(10 × 1) (10)

Copyright reserved

1.4 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'True' or 'False' next to the question number (1.4.1–1.4.10) in ANSWER BOOK.

1.4.1 Electrons of atoms plus neutrons represent mass number.

1.4.2 Moving water is an agent of physical weathering.

1.4.3 Humus is not the final product of decomposition.

1.4.4 Nutrient absorption is only by active transport.

1.4.5 Clay colloids form very strong cohesive forces between clay particles of soil.

1.4.6 Water we find on grass in the morning especially when the previous day was very hot is dew.

1.4.7 An extremely small particle of an atom is a neutron.

1.4.8 Partially decomposed organic matter is fibrous type of organic matter.

1.4.9 Seeds germinate properly within a temperature limit of 150° C and 200° C.

1.4.10 Soil and leaf analysis are procedures used by chemists to determine the nutrient status of soil and leaves.

(10 × 1) (10)
[40]

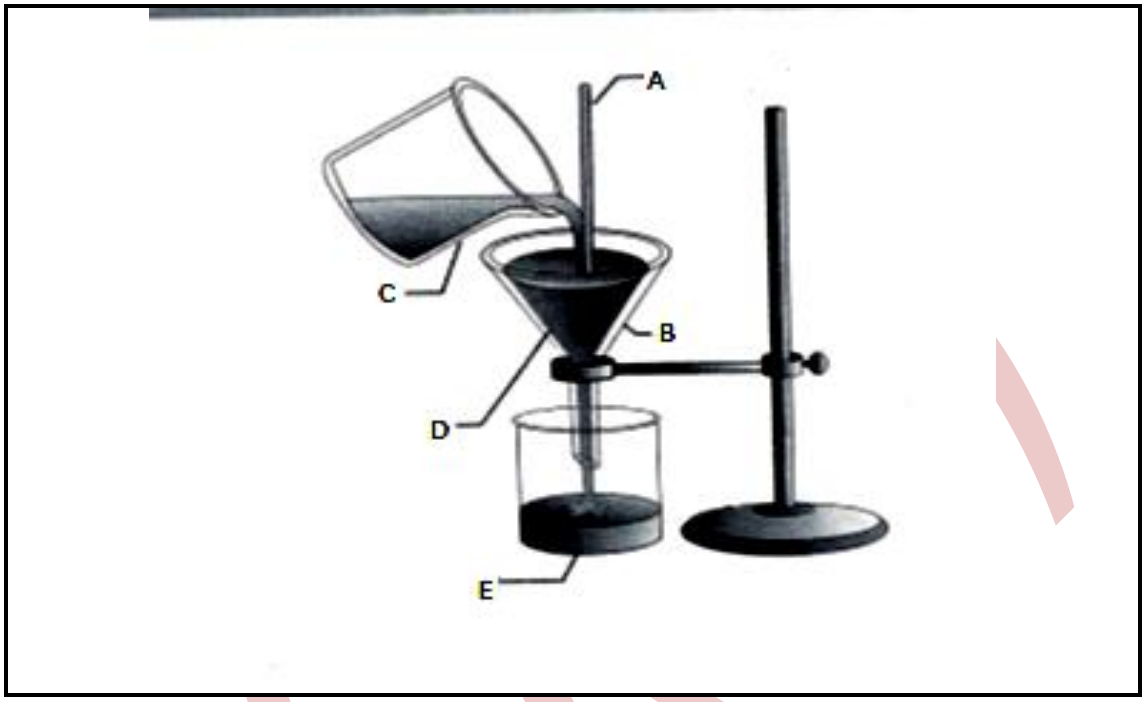
TOTAL SECTION A: 40

NCV

SECTION B

QUESTION 2

2.1 Study DIAGRAM 1 below and answer the questions.



[SOURCE: *Soil Science L2 (Macmillan) student's book by W.Burger*]

DIAGRAM 1

2.1.1 Identify the apparatus marked A, B, C, D and E. (5)

2.1.2 Name the process depicted by the above diagram. (1)

2.1.3 Define the process named in QUESTION 2.1.2. (2)

2.1.4 Name and define the other separating process except the one depicted by the diagram above. (3)

2.2 Give the scientific names of the following elements

2.2.1 Al

2.2.2 Mg

2.2.3 Si

2.2.4 H

2.2.5 Na

(5 × 1) (5)

2.3 An atom consists of three types of particles with different electrical charges.

Name those particles and their relevant charges. (6)

2.4 Differentiate between evaporation and vaporisation. (4)

2.5 The formula of a compound CH_4 is given.

2.5.1 Name the elements of this compound. (2)

2.5.2 Give the name of this compound. (1)

2.5.3 Is this a polar or a non–polar molecule? Give a reason for your answer. (3)

2.6 Define the following terms:

2.6.1 Dew point

2.6.2 Relative humidity

2.6.3 Back diffusion

2.6.4 Mulching

2.6.5 Atom

(5 × 2) (10)

2.7 Briefly describe the usual method which is used when measuring dew point. (2)

2.8 Answer the following questions based on a water molecule.

2.8.1 Give the size of the bond angle formed when a water molecule is formed. (1)

2.8.2 Draw the structure showing the polarity of a water molecule (3)

2.8.3 Name TWO atoms that form a water molecule. (2)

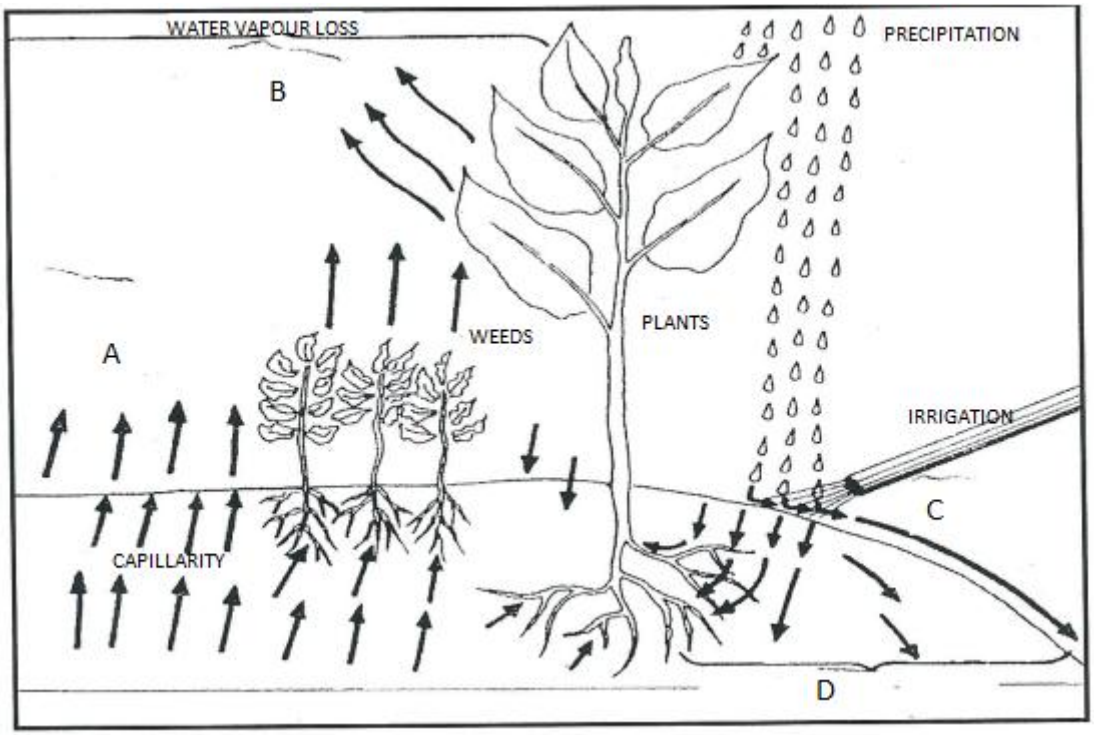
[50]

NCM

QUESTION 3

3.1 DIAGRAM 2 below illustrates different ways through which water is lost from the soil. Study it and answer the questions based on it.

3.1



[SOURCE : *Google chrome internet*]

DIAGRAM 2

3.1.1 Name the processes presented by A–D on the diagram above. (4)

3.1.2 Define only processes A and B. (4)

3.1.3 Name only TWO ways farmers can use to limit process B. (2)

3.2 Read the case study below and answer all questions.

Before digging a compost hole a farmer removed all organic debris from the surface of the soil. The farmer dug the hole until cutting through the underlying rock. Before filling the hole with the materials to develop compost a soil scientist passed by and noticed FOUR major horizons exposed in this hole with different degrees of deviation from the mother material.

3.2.1 Name the FOUR horizons in order (from top to bottom) that were visible and caught the attention of a soil scientist. (4)

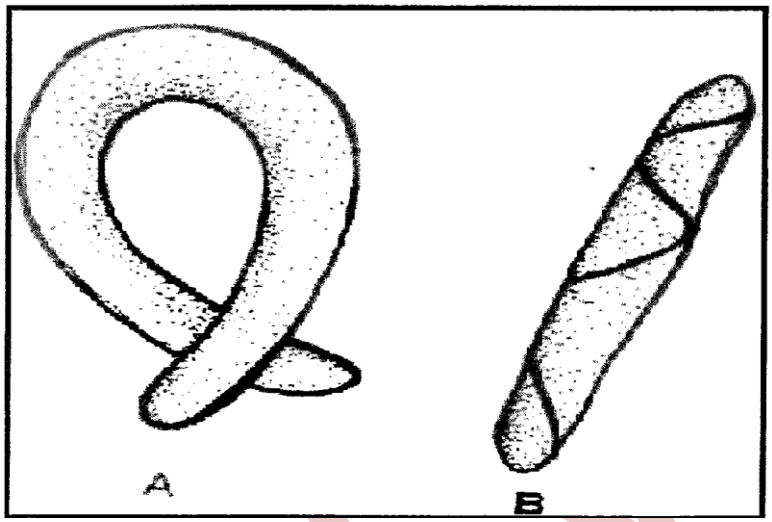
3.2.2 Which horizon was removed before digging that hole by the farmer and why do you say so. (2)

3.2.3 Differentiate between *illuviation* and *eluviation*. (2 × 2) (4)

3.3 Name THREE types of soil water. (3)

3.4 Name any TWO factors that influence soil temperature. (2)

3.5 Study the diagram below and answer all the questions.



3.5.1 Which diagram, A or B represents clay soil? Explain why that is the one. (3)

3.5.2 Which diagram, A or B represents sandy loam soil? (1)

3.5.3 From the types of soils represented by the two diagrams A and B which one is suitable for potato production? Explain why the type of soil is suitable for the production of potato. (3)

3.5.4. Which diagram, A or B represents the soil type in which one can feel the sand grains? (1)

3.5.5 Texture classes are represented by diagrams A and B above.

Name TWO other texture classes that are determined by the field method used to determine texture classes. (2)

3.6 Name THREE groups into which the organic matter in the soil can be classified. (3)

3.7 Name TWO agents of physical weathering. (2)
[40]

NCV

QUESTION 4

4.1 Indicate whether the nutrients listed below are either MICRO or MACRO plant nutrient. Write 'micro plant nutrient' or 'macro plant nutrient' next to the question number (4.1.1–4.1.5) in the ANSWER BOOK.

4.1.1 Molybdenum

4.1.2 Calcium

4.1.3 Iron

4.1.4 Copper

4.1.5 Nitrogen

(5 × 1) (5)

4.2 Define the following terms:

4.2.1 Total plant nutrients

4.2.2 Osmosis

4.2.3 Luxuriant growth

(3 × 2) (6)

4.3 Which area of the root is responsible for absorption? (1)

4.4 Briefly describe the THREE important elements of phosphorus in plant development. (3)

4.5 Give the forms in which each of the following plant nutrients are taken up by the plant roots.

4.5.1 Nitrogen

4.5.2 Potassium

4.5.3 Calcium

4.5.4 Iron

4.5.5 Phosphorus

(5 × 1) (5)
[20]

TOTAL SECTION B: 110
GRAND TOTAL: 150

Copyright reserved