education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT

GRADE 11

AGRICULTURAL SCIENCES P1
NOVEMBER 2024
MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 11 pages.

SECTION A

QUESTION 1

1.1	1.1.1	B ✓✓		
	1.1.2	B ✓✓		
	1.1.3	A ✓✓		
	1.1.4	D ✓✓		
	1.1.5	C ✓✓		
	1.1.6	C ✓✓		
	1.1.7	B ✓✓		
	1.1.8	D ✓✓		
	1.1.9	A ✓✓		
	1.1.10	C ✓✓	(10 x 2)	(20)
1.2	1.2.1	None ✓✓		
	1.2.2	Both A and B ✓✓		
	1.2.3	None ✓✓		
	1.2.4	A only ✓✓		
	1.2.5	B only ✓✓	(5 x 2)	(10)
1.3	1.3.1	Electron configuration ✓✓		
	1.3.2	Oxygen ✓✓		
	1.3.3	Ammonification ✓✓		
	1.3.4	Humus ✓✓		
	1.3.5	Soil degradation ✓✓	(5 x 2)	(10)
1.4	1.4.1	Hydrogen ✓		
	1.4.2	1.00mm to 2.00mm ✓		
	1.4.3	Solubilisation ✓		
	1.4.4	Compost ✓		
	1.4.5	Chelates ✓	(5 x 1)	(5)

TOTAL SECTION A: 45

SECTION B

QUESTION 2:

2.1 Organic and inorganic compounds

2.1.1 Classifying structure A
Alcohol ✓ (1)

2.1.2 Identifying structures
a) **Building blocks of proteins**: D ✓ (1)
b) **Important constituent of fats**: C ✓ (1)
c) **Valuable nutrient for plant growth**: B ✓ (1)

2.1.3 Identifying compounds A, C and D
A – Ethanol ✓ (1)
C – Glycerol ✓ (1)
D – Amino group ✓ (1)

2.2 Plutonium

2.2.1 The number of
a) **Neutrons -** 145 ✓ (1)
b) **Protons -** 94 ✓ (1)
c) **Electrons -** 94 ✓ (1)

2.2.2 Collective name for protons, electrons and neutrons
Subatomic particles ✓ (1)

2.2.3 Particle that does not contribute towards the mass of an atom
Electron ✓ (1)

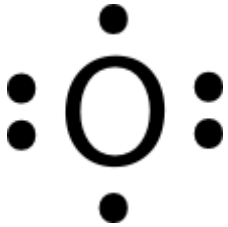
2.3 Periodic table

2.3.1 THREE characteristics of a period table
- The periodic table is organised in a grid, with rows running left to right and columns running from top to bottom ✓
- Each element is placed in a specific place on the grid because of the way it behaves / the amount of subatomic particles ✓
- Each of the rows is a different period. Elements in the same row have something in common ✓
- Every element in the top row has one atomic orbital for its electrons. ✓
- All of the elements in the second row have two atomic orbitals for their electrons, and so on down the periodic table. ✓
- The maximum number of electron orbitals or electron shells for any element is seven ✓
- Each column running top to bottom is called a group ✓
- The elements in a group have the same number of electrons in their outer orbital / valence electrons ✓

- Every element in the first column group one has one (valence) electron in its outer shell ✓
- Every element on the second column group two has two (valence) electrons in the outer shell ✓ etc. (3) (Any 3)

2.3.2 **Chemical symbols of:**
MERCURY – Hg ✓
MOLYBDENUM – Mo ✓ (2)

2.4 **Lewis dot structure of oxygen**



MARKING GUIDELINES
- Oxygen atom ✓
- Six valence electrons ✓ (2)

2.5 **Organic and inorganic compounds**

2.5.1 **Identifying compounds A and B**
A – Organic compound ✓
B – Inorganic compound ✓ (2)

2.5.2 **Identifying letters A–D**
a) **Provides insulation** – C ✓ (1)
b) **Transports nutrients** – D ✓ (1)
c) **Found in non-living organisms** – B ✓ (1)

2.6 **TWO functions of ammonia for agricultural production**

- Used as a fertiliser ✓
- Source of nitrogen ✓
- Used in pharmaceutical industry to produce medicine✓ (Any 2) (2)

2.7 **Difference between essential and non-essential amino acids**

ESSENTIAL AMINO ACIDS – Amino acids that are obtained from the feed of living organisms ✓
NON-ESSENTIAL AMINO ACIDS – amino acids that can be synthesized by the body of living organisms ✓ (2)

2.8 **Alkanes**

2.8.1 **Chemical formula of Butane**
C_4H_{10} ✓ (1)

2.8.2 **TWO functions of alkanes in agricultural production**
- Used to fuel machinery such as irrigation pumps, harvesting machines and tractors ✓
- Used as primary raw materials in the production of plastics ✓
- Used to form herbicides and pesticides ✓ (Any 2) (2)

2.9 **TWO differences between fats and oils**

FATS
- Animal origin ✓
- Solid at room temperature ✓
- Higher melting point ✓
- Increases cholesterol levels ✓
- Have single bonds between carbon atoms ✓ (Any 2) (2)

OILS
- Plant origin ✓
- Liquid at room temperature ✓
- Lower melting point ✓
- Decreases cholesterol level in the blood ✓
- Single or double bonds between carbon atoms ✓ (Any 2) (2)

[35]

QUESTION 3: SOIL SCIENCES

3.1 **Soil horizons**

3.1.1 **Most common diagnostic topsoil horizon**
Orthic O ✓ (1)

3.1.2 **Naturally occurring consolidated bedrock**
R horizon ✓ (1)

3.1.3 **Soil horizon found in wet soil**
E/G horizon ✓ (1)

3.1.4 **Diagnostic subsoil which has a uniformly red colour**
Red apedal/B-horizon✓ (1)

3.2 **Methods of determining soil texture**

3.2.1 **Identifying methods A and B**
a) **METHOD A** – Texture triangle diagram ✓
b) **METHOD B** – Sieve method ✓ (2)

3.2.2 **ONE advantage of using method B**
- Simple and cost-effective/cheaper ✓
- More accurate ✓ in separating soil particles than other methods (Any 1) (1)

3.2.3 **TWO reasons for knowing the soil texture for crop production**
- To assess the efficacy of various fertilsers and soil additives ✓
- To understand the effectiveness of irrigation better ✓
- To have a better understanding of how soil will react to temperature changes ✓
- To be guided as to which type of crop to cultivate ✓ (Any 2) (2)

3.3 **Soil structure**

3.3.1 **Soil structure 1, 2 and 3**
- **SOIL 1** – Blocky structure ✓ (1)
- **SOIL 2** – Platy structure ✓ (1)
- **SOIL 3** – Single grain ✓ (1)

3.3.2 **Identification of the SOIL found in B-horizon**
SOIL 1 ✓ (1)

3.3.3 **TWO factors that could cause the destruction or decline of soil structures**
- Cultivation of wet soils ✓
- Excessive cultivation ✓
- Flood irrigation ✓
- Heavy machinery and treading by animals ✓
- Overgrazing ✓
- Removal of plant residues ✓ (Any 2) (2)

3.4 **Soil colour**

3.4.1 **Highly oxidised iron**
D ✓ (1)

3.4.2 **Patches of different colours suggesting waterlogging**
E✓ (1)

3.4.3 **Presence of organic matter content**
A ✓ (1)

3.4.4 **Loss of oxidized iron from lack of oxygen, poorly drained**
B/C ✓ (1)

3.5 **Bulk density**

3.5.1 **Bulk density calculation**

BD = $\frac{\text{Mass of oven dried soil g}}{\text{volume of oven dried soil cm}^3}$ ✓

= $\frac{800 \text{ g}}{450 \text{ cm}^3}$ ✓

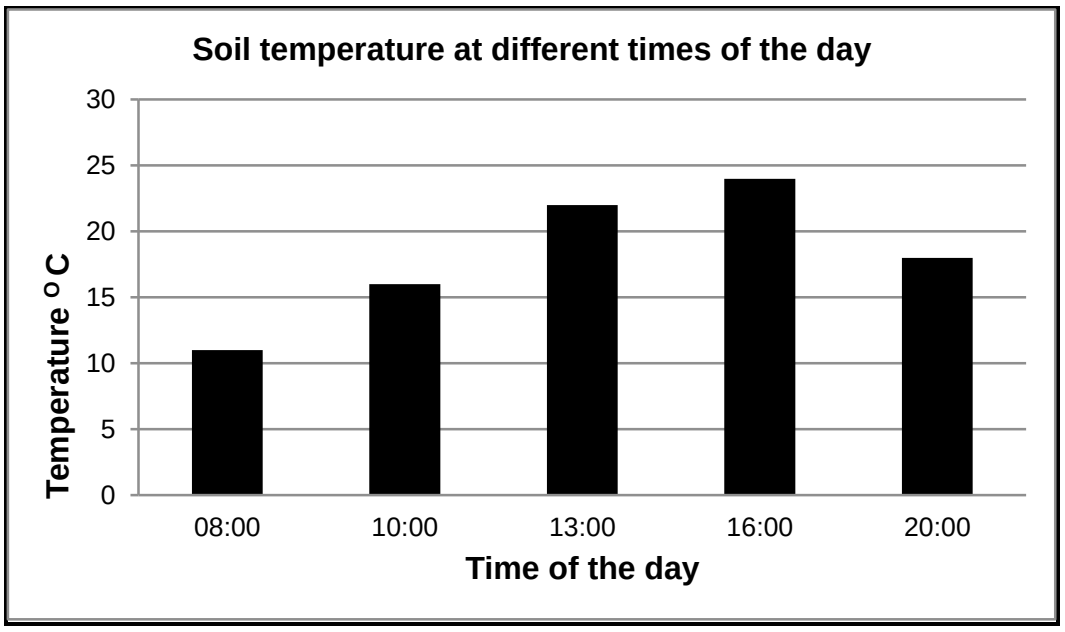
= 1,78 g/cm^3 ✓ (3)

3.5.2 **TWO factors that influence the bulk density of the soil**

- Amount of organic matter ✓
- Compaction/Degree of compaction ✓
- Minerals/mineral composition ✓
- Presence or absence of soil structure ✓
- Size of its particles ✓ (Any 2) (2)

3.6 3.6.1 **Bar graph**

Bar graph to show temperature at different times of the day



CRITERIA/RUBRIC/MARKING GUIDELINES

- Correct heading with both variables ✓
- X-axis: Correctly calibrated with label (Time of the day) ✓
- Y-axis: Correctly calibrated with label (Temperature) ✓
- Correct units (^{0}C) ✓
- Bar graph ✓
- Accuracy (80% + correctly plotted) ✓ (6)

3.6.2 **ONE important factor influencing soil temperature**

- Altitude ✓
- Colour of the soil ✓
- Distance from the equator ✓
- Seasons ✓
- Slope/aspect ✓
- Vegetation ✓
- Wind ✓ (Any 1) (1)

3.7 **Soil air**

3.7.1 **Type of soil air**

a) **Respiration of plant roots**
Oxygen ✓ (1)

b) **Dissolves rocks**
Carbon dioxide ✓ (1)

3.7.2 **TWO factors that affect the composition of soil air**

- Composition of soil air ✓
- Microbial activity ✓
- Nature and condition of soil ✓
- Seasonal variation ✓
- Temperature ✓
- Type of crop ✓ (Any 2) (2)

[35]

QUESTION 4: SOIL ORGANIC MATTER

4.1 **Naming of micro-organisms**

4.1.1 **Thread-like bacteria that looks like a fungi**
Actinomycetes ✓ (1)

4.1.2 **Microscopic roundworm**
Nematode ✓ (1)

4.1.3 **Multicellular organism**
Fungi ✓ (1)

4.1.4 **Unicellular organism that lacks a cell wall**
Protozoa ✓ (1)

4.1.5 **Micro-organism that can synthesise and make their food**
Bacteria ✓ (1)

4.2 Soil pH

4.2.1 Identification of a soil pH

a) **Higher concentration of potassium (K^+) and sodium (Na^{2+}) ions**:
Alkaline / pH >7 ✓ (1)

b) **Higher concentration of magnesium (Mg^{2+}) and calcium (Ca^{2+}) ions:**
Neutral / sweet soils / pH 7 ✓ (1)

4.2.2 Difference between reserve acidity and active acidity

RESERVE ACIDITY – refers to hydrogen ions (H^+) bound onto soil particles ✓

ACTIVE ACIDITY – refers to the hydrogen ions (H^+) concentration in soil water ✓ (2)

4.3 Symbiosis in mycorrhiza fungus and rhizobium bacteria

4.3.1 Symbiotic relationship in MICRO-ORGANISM B

Mutualistic/Mutualism ✓ (1)

4.3.2 TWO importance of micro-organisms A and B in the soil

- Helps roots to absorb zinc and copper ✓
- Produce a sticky substance to glue soil particles together ✓
- Protect plants against diseases ✓
- Provides phosphorus to crops that grow on poor soils ✓
- Nitrogen fixation in legume crops ✓
- Decomposition of organic matter ✓ (Any 2) (2)

4.3.3 TWO requirements of living organisms

- Soil fertility ✓
- Soil moisture ✓
- Soil temperature ✓
- Soil air and aeration ✓
- Light ✓
- Soil pH ✓
- Food and energy supply ✓ (Any 2) (2)

4.3.4 Indicating the type of micro-organism

MICRO-ORGANISM A: Mychorrhizae fungi ✓
MICRO-ORGANISM B: Rhizobium bacteria ✓ (2)

4.4 Soil colloids

4.4.1 Definition of soil colloids

- A soil colloid is a very small particle ✓
- that can be either inorganic or organic / that can be suspended in water for a very long time / have a small negative charge that attracts cations / is the most active part of soil ✓ (2)

4.4.2 **TWO ways of manipulating the cations and cation exchange in a soil that is nutrient poor**

- Add nutrients in the form of fertilisers ✓
- Increases the capacity of the soil to hold available nutrients ✓
- Remove unwanted cations such as aluminium from the soil solution through desorption ✓ (Any 2) (2)

4.5 **Organic matter in the soil**

4.5.1 **THREE factors that lower the organic matter content of the soil**

- Climate ✓
- Cultivation of natural veld ✓
- Drainage ✓
- Irrigation ✓
- Monoculture ✓
- Plant cover ✓
- Poor veld management practices ✓
- Texture ✓
- Tillage of the soil ✓
- Type of plant ✓
- Use of artificial fertilisers ✓ (Any 3) (3)

4.5.2 **TWO biological effects of a decline in organic matter**

- Increased presence of saprophytic organisms ✓
- Lowers the energy levels of micro- and macro-organisms in the soil ✓
- Lowers the rate of production of antibiotics in the soil ✓
- Micro- and macro organisms run out of food and die ✓
- Plants will not be protected against pathogens ✓ (Any 2) (2)

4.5.3 **TWO elements released when organic matter is mineralised**

- Nitrogen ✓
- Phosphorus ✓
- Sulphur ✓ (Any 2) (2)

4.5.4 **TWO chemical effects of organic matter in the soil**

- Provides pH buffering of the soil ✓
- Helps to amend soils with high aluminium content ✓
- Large volumes of carbon dioxide are generated ✓
- Large amounts of nitrogen, phosphorus and sulphur are released during the mineralisation of plant nutrients ✓
- Organic matter can form chelates ✓ (Any 2) (2)

4.5.5 **TWO practices that improve organic matter content**

- Cover crops ✓
- Compost ✓
- Minimum tillage ✓ (Any 2) (2)

4.6 **Nutrient cycle**

4.6.1 **Identifying processes 1, 2 and 3**
PROCESS 1 – Fertilisation ✓
PROCESS 2 – Nitrification/nitrogen fixation ✓
PROCESS 3 – Denitrification ✓ (3)

4.6.2 **The type of nutrient cycle**
Nitrogen cycle ✓ (1)
[35]

TOTAL SECTION B: 105
GRAND TOTAL: 150