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**NATIONAL
SENIOR CERTIFICATE**

GRADE 11

NOVEMBER 2023

**AGRICULTURAL SCIENCES P1
MARKING GUIDELINE**

MARKS: 150

This marking guideline consists of 12 pages.

SECTION A**QUESTION 1**

1.1	1.1.1	B ✓✓		
	1.1.2	C ✓✓		
	1.1.3	A ✓✓		
	1.1.4	D ✓✓		
	1.1.5	C ✓✓		
	1.1.6	D ✓✓		
	1.1.7	A ✓✓		
	1.1.8	C ✓✓		
	1.1.9	B ✓✓		
	1.1.10	B ✓✓	(10 x 2)	(20)
1.2	1.2.1	B only ✓✓		
	1.2.2	A only ✓✓		
	1.2.3	None ✓✓		
	1.2.4	A only ✓✓		
	1.2.5	Both A and B ✓✓	(5 x 2)	(10)
1.3	1.3.1	Molecule ✓✓		
	1.3.2	Lewis structure ✓✓		
	1.3.3	Clay ✓✓		
	1.3.4	Porosity ✓✓		
	1.3.5	Colloids ✓✓	(5 x 2)	(10)
1.4	1.4.1	Simple ✓		
	1.4.2	Saturation ✓		
	1.4.3	Cation adsorption ✓		
	1.4.4	Assimilation ✓		
	1.4.5	Illuviation ✓	(5 x 1)	(5)
TOTAL SECTION A:				45

SECTION B**QUESTION 2: BASIC AGRICULTURAL CHEMISTRY****2.1 Bonding****2.1.1 Classification of compounds****A** – Inorganic ✓

(1)

2.1.2 Name of the elements**A** – Sodium ✓

(1)

B – Chloride ✓

(1)

2.1.3 Explanation of ionic bonding

It is a bonding where electrons are transferred ✓ from one atom to another. ✓

(2)

2.1.4 Indication of the charge of elements(a) **Element B** – Negatively charged ✓

(1)

(b) **Element A** – Positively charged ✓

(1)

2.1.5 ONE importance of salt

- It is an important part of the fluid electrolytes of living organisms ✓
- Used to preserve food ✓
- Inhibits the growth of bacteria ✓
- Used in the treatment of hides and skins ✓
- Acts as a flavour enhancer in food ✓

(Any 1 x 1)

(1)

2.2 Acids and bases**2.2.1 Prediction of the pH in the mixture**

Neutral ✓

(1)

2.2.2 Indication of the substance(a) **Base** – NaOH ✓

(1)

(b) **Acidic** – HCl ✓

(1)

2.2.3 TWO differences between acid/HCl and base/Na

ACIDS/HCl	BASE/NaOH
• Donates hydrogen ions to water molecules ✓	• Accepts hydrogen ion from water molecules ✓
• Taste sour ✓	• Taste bitter ✓
• Turns litmus paper red ✓	• Turns litmus paper blue ✓
• High concentration of hydrogen ions (H ⁺) ✓	• High concentration of hydroxide ions (OH ⁻) ✓

(Any 2 x 2)

(4)

2.3 Organic compounds**2.3.1 Name of a compound**

Carbohydrates ✓

(1)

2.3.2 Identification of**B** – Unsaturated fats ✓

(1)

C – Saturated fats ✓

(1)

2.3.3 Indication of the letter(a) **Animal origin** – C ✓

(1)

(b) **Liquid at room temperature** – B ✓

(1)

2.3.4 TWO functions of carbohydrates

- Source of energy for living organisms ✓
- Constituent of cell walls in plants ✓
- Fibre improves functioning of the digestive system ✓
- Contribute in cellular functions such as cell growth ✓ (Any 2 x 1)

(2)

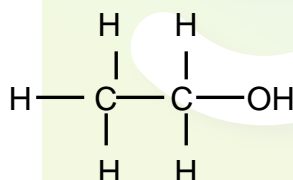
2.3.5 Chemical formula of disaccharides $C_{12}H_{22}O_{11}$ ✓

(1)

2.4 Alcohols**2.4.1 Name of an alcohol**

Ethanol ✓

(1)

2.4.2 Structural formula of an ethanol**Marking criteria**

- Presence of 5 hydrogen ✓
- Presence of 2 carbons ✓
- Presence of OH ✓

(3)

2.4.3 ONE difference between alcohols and alkanes

Alkanes consist of carbon and hydrogen atoms only ✓ and in alcohols one hydrogen atom is replaced by – OH ✓

(2)

2.5 Protein**2.5.1 Identification of the structure**

Amino acid ✓

(1)

2.5.2 Labelling**A** – Amino group ✓

(1)

B – Carboxyl group ✓

(1)

2.5.3 Name of the polymer

Protein ✓

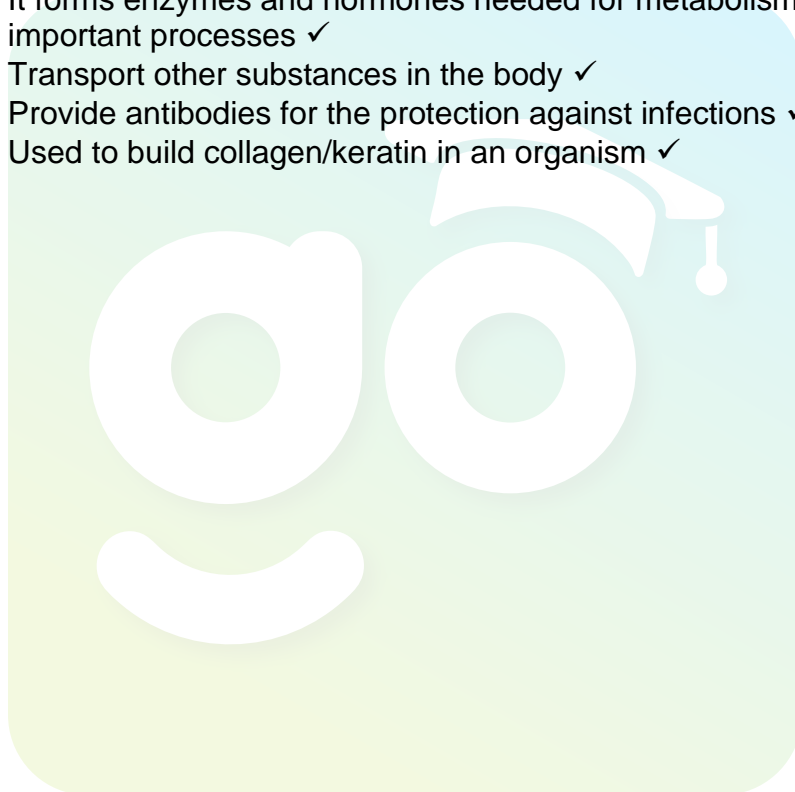
(1)

2.5.4 TWO functions of the proteins

- Important for growth and repair of muscles/bones ✓
- It forms enzymes and hormones needed for metabolism and important processes ✓
- Transport other substances in the body ✓
- Provide antibodies for the protection against infections ✓
- Used to build collagen/keratin in an organism ✓

(Any 2 x 1)

(2)

[35]

QUESTION 3: SOIL SCIENCE**3.1 Soil texture****3.1.1 Indication of the sample**

- (a) Sample B ✓ (1)
- (b) Sample A ✓ (1)
- (c) Sample A ✓ (1)

3.1.2 Calculation of bulk density

$$\begin{aligned}\text{Bulk density} &= \frac{\text{Mass (g)}}{\text{Volume (cm}^3\text{)}} \checkmark \\ &= \frac{480 \text{ g}}{460 \text{ cm}^3} \checkmark \\ &= 1,04 \text{ g/cm}^3 \checkmark\end{aligned}$$

(3 x 1) (3)

3.1.3 ONE reason of knowing the texture class of the soil

- To adopt the crop production adapted to the characteristics of soil/ to make crop choices ✓
 - To know when to cultivate and which implements to use ✓
 - To be able to assess the efficacy of fertilisers ✓
 - To know the type of irrigation to use ✓
 - To understand how soil will react better to temperature changes ✓
- (Any 1 x 1) (1)

3.2 Soil structure**3.2.1 Identification of the structure**

- A – Platy ✓ (1)
- B – Prism-like/columnar/prismatic ✓ (1)
- C – Crumb/spheroid ✓ (1)

3.2.2 Indication of the letter representing the structure

- (a) A ✓ (1)
- (b) C ✓ (1)

3.2.3 TWO factors contributing to the development of structure

- Activity of soil organisms/microbial gum ✓
 - Alternate moisture and drought ✓
 - Type of clay mineral present ✓
 - Colloidal matter in the soil/clay/organic matter content ✓
 - Climate ✓
 - Plant roots ✓
- (Any 2 x 1) (2)

3.3 Soil moisture

3.3.1 Indication of the water movement

Capillary movement ✓

(1)

3.3.2 TWO forces that have an effect on capillary movement

- Adhesion ✓
- Cohesion ✓

(2)

3.3.3 Identification of soils

(a) **C** – Clay ✓

(1)

(b) **A** – Sand ✓

(1)

3.3.4 Reason

(a) **Highest water level in soil C** – Particles are close together and capillarity forces are stronger ✓

(1)

(b) **Lowest water level in soil A** – Many of the pores are too large and low capillarity ✓

(1)

3.4 Soil colour

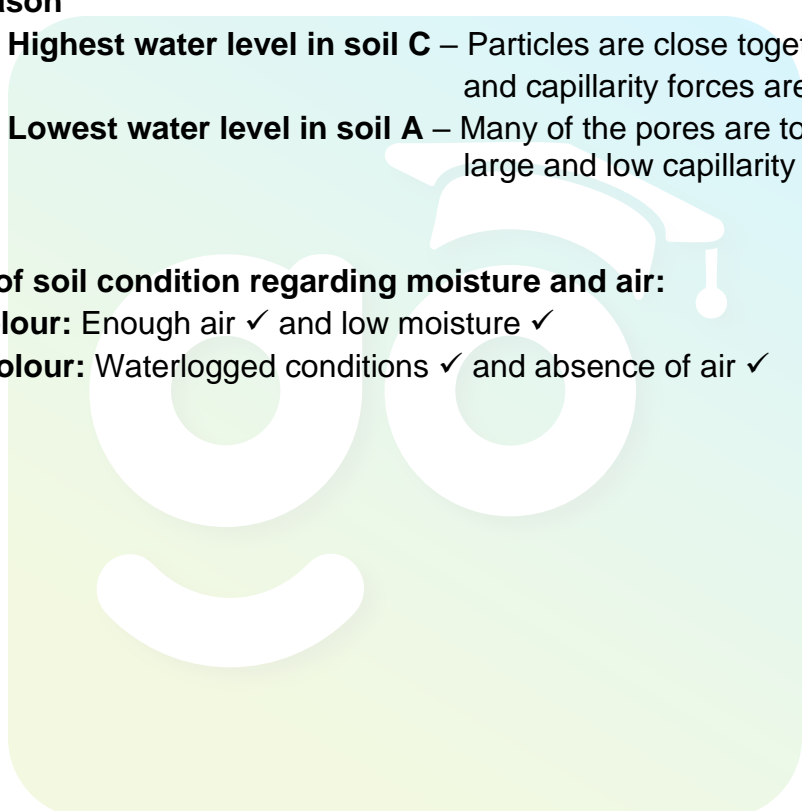
Indication of soil condition regarding moisture and air:

(a) **Red colour:** Enough air ✓ and low moisture ✓

(2)

(b) **Grey colour:** Waterlogged conditions ✓ and absence of air ✓

(2)



3.5 Soil gas

- 3.5.1 **Indication of the gas deficient in experiment 1**
Oxygen ✓ (1)
- 3.5.2 **Role the gas could have played if not deficient**
Influenced seed germination ✓ (1)
- 3.5.3 **Comparing atmospheric gases and soil gases in experiment 2 and experiment 1**
- (a) **Experiment 2** – Soil air contains much more carbon dioxide ✓ than atmospheric air ✓ (2)
 - (b) **Experiment 1** – Soil air contains less oxygen ✓ than atmospheric air ✓ (2)

3.6 Soil temperature

- 3.6.1 **Identification of the factor influencing the soil temperature**
Soil depth ✓ (1)
- 3.6.2 **Explanation of how soil depth has an influence on soil temperature**
Soil temperature variation decreases ✓ with an increase in soil depth ✓ (2)
- 3.6.3 **ONE effect of soil temperature on the chemical processes in soil**
- Faster chemical reactions in the soil ✓
 - More nutrients are released ✓
 - At high temperatures soil water dissolve more plant nutrients ✓
- (Any 1 x 1) (1)
- [35]**

QUESTION 4: SOIL SCIENCE**4.1 Soil horizons****4.1.1 Letter representing a horizon**

- (a) **Partly weathered material** – H ✓ (1)
 (b) **Consolidated rock** – I ✓ (1)
 (c) **Partly decomposed organic matter** – E ✓ (1)

4.1.2 Indification of

J – Soil profile ✓ (1)

4.1.3 Sketching the soil profile

O
A ✓✓
B
C
R

(2)

4.1.4 TWO diagnostic horizons of A horizon

- Humic ✓
- Vertic ✓
- Melanic ✓
- Orthic ✓

(Any 2 x 1) (2)

4.2 Soil classification**4.2.1 TWO reasons for classification of soil**

- Optimal utilisation of country's natural resources ✓
- Scientific planning of farm ✓
- Determining the crop production potential of the soil ✓
- Improved soil science communication ✓
- Development of new regions ✓
- Valuation of soils ✓

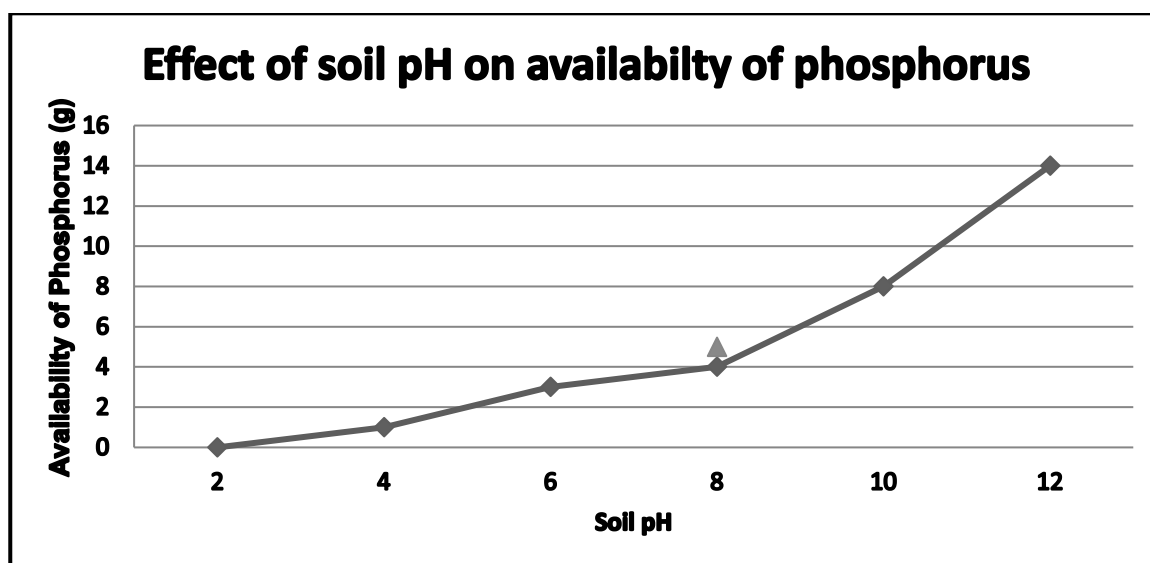
(Any 2 x 1) (2)

4.2.2 System used in South Africa to classify soil

Binomial system ✓ (1)

4.3 Soil pH

4.3.1 Line graph

**Criteria/rubric/marketing guideline**

- Correct heading ✓
 - X-axis: Correctly calibrated and labelled (Soil pH) ✓
 - Y-axis: Correctly calibrated and labelled (Availability of phosphorus) ✓
 - Line graph ✓
 - Accuracy ✓ (80% or more correct plot(ing))
 - Correct unit (g) ✓
- (6)

4.3.2 **Deduction of the influence of acidity and alkalinity on the availability of phosphorus.**

In acid soil/low pH phosphorus is less available ✓

In alkaline soil /high pH phosphorus is more available ✓ (2)

4.3.3 **Chemical substance to be applied to solve.**

(a) **Decreased availability of phosphorus in soils with a pH of between 2 and 4**

Application of basic fertilisers such as lime/ CaCO_3 ✓ (1)

(b) **Toxic quantities of phosphorus in soil with pH of 14**

Application of gypsum/ CaSO_4 ✓ (1)

4.4 Soil colloid**4.4.1 Deduction of the term applicable to the process****B** – Cation exchange ✓

(1)

4.4.2 Reason for cation exchange

Potassium cation from the soil solution exchange with the hydrogen adsorbed in the colloid ✓

(1)

4.4.3 Type of acidity**A** – Reserve acidity ✓

(1)

B – Active acidity ✓

(1)

4.4.4 Identification of cation Na^+ ✓

(1)

4.4.5 TWO effects of sodicity on plant growth

- Hydrolysis of sodium in soil solution causes the pH to rise above 8,5 ✓
- Has a deflocculating effect on soil colloids causing the soil to become structureless ✓
- Humus dissolves in the soil and precipitates in the upper soil horizon ✓
- Leads to the development of a prismatic soil structure ✓
- Leads to poor seed germination ✓
- High concentration makes it difficult for plants to absorb water ✓

(Any 2 x 1)

(2)

4.5 Soil organisms**4.5.1 Classification of soil organisms**

Micro-organisms ✓

(1)

4.5.2 TWO importance of soil organisms

- They break down/decompose plant and animal remains to release plant nutrients ✓
- Bind nitrogen in the atmosphere in the form of ammonium salts/ Play an important role in the nutrient cycling ✓
- Secrete substances to stimulate plant growth ✓
- Secrete sticky substance that glue soil particles to form aggregates ✓
- Degrade many harmful chemicals in the soil ✓

(Any 2 x 1)

(2)

4.5.3 TWO requirements for the survival of worms

- Organic nutrients ✓
 - Mineral nutrients (nitrogen/phosphorus/potassium) ✓
 - Soil moisture close to field water capacity ✓
 - Soil air for respiration ✓
 - Optimum temperature (temperature between 25 °C and 30 °C) ✓
 - Optimum soil pH ✓
- (Any 2 x 1) (2)

4.6 Organic matter**TWO factors that lower the organic matter content on soil**

- Tillage of soil ✓
- Type of plant ✓
- Monoculture ✓
- Use of artificial fertilisers ✓
- Climate ✓
- Poor veld management and burning ✓
- Poor drainage ✓
- Climate ✓

(Any 2 x 1) (2)
[35]

TOTAL SECTION B: 105
GRAND TOTAL: 150

