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**GRADE 11**

**NOVEMBER 2018**

**AGRICULTURAL SCIENCES P1  
MARKING GUIDELINE**

**MARKS: 150**

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This marking guideline consists of 9 pages.

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**SECTION A****QUESTION 1**

- |     |        |                  |          |      |
|-----|--------|------------------|----------|------|
| 1.1 | 1.1.1  | B ✓✓             |          |      |
|     | 1.1.2  | D ✓✓             |          |      |
|     | 1.1.3  | A ✓✓             |          |      |
|     | 1.1.4  | D ✓✓             |          |      |
|     | 1.1.5  | C ✓✓             |          |      |
|     | 1.1.6  | C ✓✓             |          |      |
|     | 1.1.7  | B ✓✓             |          |      |
|     | 1.1.8  | A ✓✓             |          |      |
|     | 1.1.9  | C ✓✓             |          |      |
|     | 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  | Both A and B ✓✓  |          |      |
|     | 1.2.5  | A only ✓✓        | (5 x 2)  | (10) |
| 1.3 | 1.3.1  | Molecule ✓✓      |          |      |
|     | 1.3.2  | Hydrogenation ✓✓ |          |      |
|     | 1.3.3  | Porosity ✓✓      |          |      |
|     | 1.3.4  | Soil profile ✓✓  |          |      |
|     | 1.3.5  | Mottled ✓✓       | (5 x 2)  | (10) |
| 1.4 | 1.4.1  | Mixture ✓        |          |      |
|     | 1.4.2  | Capillary ✓      |          |      |
|     | 1.4.3  | Soil form ✓      |          |      |
|     | 1.4.4  | Colloid ✓        |          |      |
|     | 1.4.5  | Mineralisation ✓ | (5 x 1)  | (5)  |

**TOTAL SECTION A: 45**

**SECTION B****QUESTION 2: BASIC AGRICULTURAL CHEMISTRY****2.1 Periodic table****2.1.1 Completion of the table**

- (a) 3 ✓
- (b) 63,5 ✓
- (c) 12 ✓
- (d) 24 ✓
- (e) 2 ✓
- (f) 20 ✓ (6)

**2.1.2 Common characteristic of elements in**

- (a) Period They have the same number of atomic orbitals/  
electron shell ✓ (1)
- (b) Group Have the same number of electrons in their outer  
orbital ✓ (1)

**2.1.3 Difference between halogens and noble gases regarding chemical reactivity**

- Halogens/group 17** They are very chemically reactive ✓
- Noble gases/group 18** They are chemically inactive gases ✓ (2)

**2.1.4 Reason for a difference in halogen and noble gases**

- Halogens** They require one electron to fill their outer shell ✓
- Noble gases** They have a full outer shell ✓ (2)

**2.2 Structural formula of compounds****2.2.1 Indication of the functional group**

- (a) A: Hydroxyl/OH ✓ (1)
- (b) C: Carboxyl/ COOH ✓ (1)

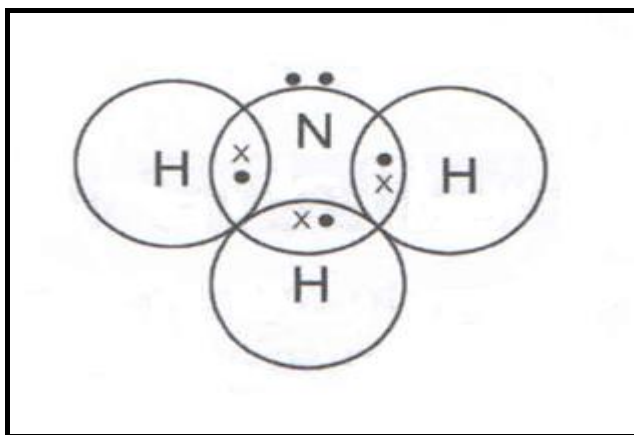
**2.2.2 Chemical formula of methanoic**

- H ✓. COOH ✓ (2)

**2.2.3 THREE protective roles of ethane in plants**

- It is found in cuticle and therefore protects plants against water loss ✓
- Protects against bacteria, fungi and harmful insects ✓
- Prevents the leaching of minerals during irrigation or rainy days ✓ (3)

## 2.2.4 Lewis structure of ammonia



## Criteria to mark Lewis structure

- Correct elements (H) ✓
- Correct element (N) ✓
- Correct number of valence electrons ✓
- Correct bonding ✓

(4)

## 2.2.5 Comparing compound A and B based on structural formula

**Compound A/ethanol** one hydrogen atom is replaced by a hydroxyl/ OH ✓

**Compound B/ethane** two carbons and six hydrogen atoms combine ✓

(2)

## 2.3 Pyramid of organic compounds

## 2.3.1 Naming of the organic compound

A: Carbohydrate ✓

C: Protein ✓

(2)

## 2.3.2 Indication of the building block of the compound

C Amino acid ✓

D Fatty acid and glycerol ✓

(2)

## 2.3.3 Distinction between simple and complex protein

- Simple proteins are proteins which yield only amino- acids when broken down ✓
- Complex proteins are simple proteins combined with a non-protein material ✓

(2)

2.3.4 **TWO reasons why compound B is important.**

- Source of energy ✓
  - Forms structural material in plants ✓
  - Provides fibre for the functioning of digestive system ✓
- (Any 2)

(2)

2.3.5 **Indication of compound in D as saturated or unsaturated**

Unsaturated ✓

(1)

2.3.6 **Reason**

It has a double bond between carbon atoms ✓

(1)

**[35]****QUESTION 3: SOIL SCIENCE**3.1 3.1.1 **Identification of the structure labeled A**

Prism-like structure

(1)

3.1.2 **THREE malpractices leading to the destruction of structure**

- Excessive cultivation/tillage accelerates the decomposition of organic matter ✓
- Cultivation of wet soil increases compaction ✓
- Removal of plant residue prevent building up of organic matter ✓
- Overgrazing reduces soil organic matter ✓
- Use of heavy material lead to soil compaction ✓
- Practising flood irrigation ✓

(Any 3) (3)

3.1.3 **TWO ways to prevent compaction in structure C**

- Application of organic content on soil ✓
- Reducing tillage/minimum tillage ✓
- Mulching/soil cover ✓
- Avoid tillage when the soil is wet ✓

(Any 2) (2)

3.1.4 **Comparing with a reason the structure B and D regarding suitability for cultivation**

**Structure B** Suitable for cultivation ✓ because the peds are softer and more porous ✓

(2)

**Structure D** Not suitable for cultivation ✓ because it has a limited permeability ✓

(2)

3.2 **Indication of the method to determine soil texture**

3.2.1 Texture diagram ✓

(1)

3.2.2 Laser diffraction ✓

(1)

3.2.3 Settling columns ✓

(1)

**3.3 Influence of clay and sand on soil characteristics**

**3.3.1 Chemical reactivity** Clay has a larger surface area for chemical reactions because particles are small ✓  
Sand has a small surface area for chemical reaction due to bigger particles ✓ (2)

**3.3.2 Fertility** Clay is more fertile because it has a higher cation adsorption capacity ✓  
Sand soil is less fertile due to low organic matter and low cation adsorption capacity ✓ (2)

**3.3.3 Erodability** Clay particles are bound together and not easily eroded ✓  
Sandy soil is light and loose therefore easily eroded ✓ (2)

**3.4 Soil temperature**

**3.4.1 Explanation of the trend in soil temperature**  
Gradual increase of temperature from 10 hours until it reaches the peak at 28 hours ✓ and declines afterwards ✓ and stabilises from 45–60 hours ✓ (2)

**3.4.2 Table:**  
**The table showing soil temperature ranges over 60 hours**

HOURS	SOIL TEMPERATURE °C
10	23
20	41
30	46
40	44
50	35
60	35

**Criteria/rubric/marketing guidelines:**

- Correct heading ✓
- Table ✓
- Hours and soil temperature ✓
- Correct unit (°C) ✓
- Accuracy of values for hours column ✓
- Accuracy of values for the temperature column ✓ (6)

**3.4.3 TWO ways to manipulate temperature other than mulch**

- Managing soil moisture content/Irrigation and draining soil ✓
- Clear plastic cover ✓
- Shading ✓
- Controlled environment/greenhouse ✓
- Tillage practices like deep or shallow ploughing to allow more air circulation (Any 2) (2)

**3.5 Soil air****3.5.1 Deduction of TWO factors influencing storage and movement of soil air from the scenario**

- Soil condition ✓
- Soil depth ✓
- Pore size distribution/porosity ✓ (Any 2) (2)

**3.5.2 Comparison between oxygen and carbon dioxide in soil with those in the atmosphere**

Soil air contains a much greater proportion of CO<sub>2</sub> than atmospheric air ✓

Level of oxygen in soil air is less than the oxygen level in the atmosphere ✓ (2)

**3.5.3 Relationship between porosity and bulk density**

The higher the bulk density ✓ the lesser the pore space ✓

OR

The lower the bulk density ✓ the more the pore space ✓ (2)  
**[35]**



**QUESTION 4: SOIL SCIENCE****4.1 Soil horizontal layers****4.1.1 Identification of the letter representing the horizon**

- (a) D ✓  
 (b) E ✓  
 (c) C ✓  
 (d) B ✓ (4)

**4.1.2 Soil profiles**

- (a) Wet soil  
 $\frac{A}{\frac{G}{C}}$  OR  $\frac{O}{G}$  ✓✓ (2)
- (b) Eroded soil  
 $\frac{B}{C}$  ✓✓ (2)

**4.2 Soil classification****4.2.1 THREE reasons for soil classification**

- Determining the crop production potential of soil ✓
- Improved soil science communication ✓
- Optimal utilization of country's natural resources ✓
- Valuation of soil ✓
- Scientific planning of a farm ✓
- Development of new regions ✓ (Any 3) (3)

**4.2.2 Categories of a binomial soil classification system**

- Soil form ✓
- Soil family/soil series ✓ (2)

**4.2.3 TWO visible characteristics showing Vertic A horizon**

- Strongly developed structure/blocky ✓
- Sticky when wet ✓
- Large cracks ✓
- High plasticity index ✓
- Dark-coloured or red ✓ (Any 2) (2)

**4.3 Cation adsorption****4.3.1 Type of acidity in colloid A**

Reserve acidity ✓ (1)

**4.3.2 Reason for the reserve acidity**

Hydrogen cation ✓ are adsorbed on the surface of colloid ✓ (2)

**4.3.3 TWO factors causing acidity**

- Carbon dioxide dissolving in water ✓
- Application of nitrogen fertilisers containing ammonium ✓
- Fertilisers containing sulphur which add a hydrogen ✓
- Acid rain ✓
- High rainfall leaching basic cations ✓

(Any 2) (2)

**4.3.4 Justification of the brackishness**

Sodium cation ✓ are adsorbed on the colloid ✓

(2)

**4.3.5 Chemical substance to reclaim brackishness**

Gypsum ✓

(1)

**4.4 Nutrient cycle****4.4.1 Identification of the nutrient cycle**

Carbon cycle ✓

(1)

**4.4.2 Processes in A and C**

A – Photosynthesis ✓

C – Feeding ✓

(2)

**4.4.3 Indication of the processes in D**

Combustion ✓

(1)

**4.4.4 Role of soil organisms in the cycle**

They break down plant and animal remains ✓ to release carbon dioxide into the atmosphere to continue with the cycle ✓

(2)

**4.5 Scenario on organic matter content****4.5.1 Identification of farmer with****(a) High organic matter content** – Farmer B ✓**(b) Low organic matter content** – Farmer A ✓

(2)

**4.5.2 Explanation of how soil tillage can impact on the level of organic matter content**

Tillage stimulates soil microbes ✓ which feed on the organic matter and therefore lowers organic matter content on soil ✓

(2)

**4.5.3 TWO physical effects of high organic matter content on soil**

- Compaction is prevented ✓
- Soil is well drained/aerated ✓
- Soil is less susceptible to erosion ✓
- Improved water absorption ✓
- Increased water – holding capacity ✓
- Soil becomes warmer as it absorbs more heat ✓
- Soil is less inclined to swell when wet ✓
- Soil cultivates easily ✓

(Any 2) (2)

**[35]****TOTAL SECTION B: 105****GRAND TOTAL: 150**