



NATIONAL SENIOR CERTIFICATE EXAMINATION  
MAY 2025

**AGRICULTURAL SCIENCES**  
**MARKING GUIDELINES**

Time: 3 hours

300 marks

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**These marking guidelines are prepared for use by examiners and sub-examiners, all of whom are required to attend a standardisation meeting to ensure that the guidelines are consistently interpreted and applied in the marking of candidates' scripts.**

**The IEB will not enter into any discussions or correspondence about any marking guidelines. It is acknowledged that there may be different views about some matters of emphasis or detail in the guidelines. It is also recognised that, without the benefit of attendance at a standardisation meeting, there may be different interpretations of the application of the marking guidelines.**

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

- 1.1
  - 1.1.1 K
  - 1.1.2 H
  - 1.1.3 L
  - 1.1.4 O
  - 1.1.5 R
  - 1.1.6 J
  - 1.1.7 A
  - 1.1.8 F
  - 1.1.9 Q
  - 1.1.10 C
- 1.2
  - 1.2.1 Progeny selection
  - 1.2.2 Management/entrepreneurship
  - 1.2.3 Heredity
  - 1.2.4 Biometrics
  - 1.2.5 Parthenocarpy
  - 1.2.6 Heterozygote/heterozygous
- 1.3
  - 1.3.1 Leadership skills / communication skills / interpersonal skills
  - 1.3.2 Vision
  - 1.3.3 Punctuality
  - 1.3.4 Perseverance
  - 1.3.5 Interpersonal skills/communication skills
  - 1.3.6 Self-confidence

- 1.4 1.4.1 Demand curve
- 1.4.2 Market equilibrium
- 1.4.3 Surplus
- 1.4.4 Supply curve
- 1.4.5 Shortage
- 1.4.6 Equilibrium price/market price
- 1.5 1.5.1 Natural
- 1.5.2 Variation
- 1.5.3 Soil surveys
- 1.5.4 Heritability
- 1.5.5 Precision
- 1.5.6 Law of segregation
- 1.6 1.6.1 C
- 1.6.2 D
- 1.6.3 E
- 1.6.4 F
- 1.6.5 A
- 1.6.6 B

**SECTION B****QUESTION 2****2.1 The schematic representation showing marketing****2.1.1 Identification of the functions of agricultural marketing**

- A** – Processing
- B** – Storage
- C** – Packaging
- D** – Transportation

**2.1.2 TWO guidelines for packaging**

- Product identification
  - Recyclability (Biodegradability)
  - Containment
  - Protection
  - Health risk
- (Any 2)

**2.1.3 TWO advantages of processing to the consumer**

- Good quality products
  - Prevent food-contamination
  - Provide employment to a large population
  - Safety of products
  - Product available to consumers throughout the year
- (Any 2)

**2.2 Identification of the marketing approaches**

2.2.1 Sustainable marketing

2.2.2 Multi segmented marketing

2.2.3 Niche marketing

2.2.4 Mass marketing

**2.3 The graphs representing price elasticity**

2.3.1 (a) Graph B

(b) Graph C

(c) Graph A

(d) Graph D

### 2.3.2 TWO factors affecting supply of agricultural products

- Price of the product
  - Production costs/input costs
  - Change in technology
  - Nature / seasonality / droughts / diseases
  - Number of suppliers
  - Price expectations
  - Future expectations
  - Legislation/government policies
  - Price of related goods
- (Any 2)

## 2.4 The parts of a flower

### 2.4.1 Labelling of parts

- A** – Pistil
- B** – Stigma
- C** – Ovary
- D** – Anther
- E** – Stamen
- F** – Ovules/eggs

### 2.4.2 ONE function of:

- (a) **Ovary (C)**
- Produces ovules/egg cells
  - Prepare the ovules for fertilisation
  - Protect developing zygotes
  - Develop into a seed-bearing fruit
- (Any 1)
- (b) **Anther (D)**
- Help the flower to produce pollen/male sex cells
  - Assists in storage of pollen until they are dispersed
- (Any 1)
- (c) **Ovules (F)**
- Produces a seed that remains dormant until germination outside the fruit
  - Carries the set of chromosomes from the female
- (Any 1)

### 2.4.3 Identification of a letter representing:

- (a) **Female part of a flower: A**
- (b) **Male part of a flower: E**

## 2.5 Production factors

### 2.5.1 The production factor rewards labelled

**A** – Profit

**E** – Wages / payment / salary

### 2.5.2 Identification of the production factors labelled

**B** – Capital

**C** – Land

**D** – Labour

### 2.5.3 ONE way to increase productivity of land

- Use of good fertilisers
  - Use of scientific methods
  - Improved crop breeding/seeds
  - Maximising soil cover/mulching
  - Wise use of water/irrigation
  - Correct land use practices / proper land use / avoid overgrazing / use of rotational grazing
  - Multiple cropping/avoid monoculture
  - Adapting to climate change
  - Ownership of land
  - Government policies
  - Trained labour
- (Any 1)

### 2.5.4 Differentiation between enterprise budget and whole-farm budget

**An enterprise budget** – includes all costs and returns associated with producing one enterprise in a particular manner

**The whole-farm budget** – is a classified and detailed summary of the major physical and financial features of the entire farm business

**QUESTION 3****3.1 Animal diseases**

- A** – Ringworm
- B** – Fungi
- C** – Anthrax
- D** – Bacteria
- E** – Redwater/babesiosis
- F** – Protozoa
- G** – Rift Valley Fever/RVF
- H** – Virus
- I** – Lumpy wool
- J** – Fungi

**3.2 Oestrus cycle****3.2.1 The name of the reproductive cycle**

Oestrus cycle

**3.2.2 Identification of stages of oestrus cycle**

- A** – Met-oestrus
- B** – Di-oestrus
- C** – Pro-oestrus
- D** – Oestrus

**3.2.3 THREE noticeable characteristics of a cow on oestrus**

- Standing heat
  - Mucus discharge from the vagina
  - Swollen, moist and reddish vulva
  - Cow become excited/restless
  - Cow mounting other cows
  - Bellowing
  - Cow urinates frequently/dribbling
  - Fluffed hair on the tail head and rump
- (Any 3)

**3.2.4 TWO practical methods to identify cows on heat**

- Use of Kamar heat mount detectors/pressure pads
  - Use of tail paint/tail chalking
  - Use of chin ball marker
  - Observation of the cow's behaviour
  - Placing of a bull near cow's pen, the cow will move to the bull
  - Placing a pedometer on the cow's leg
- (Any 2)

### 3.3 Pollination in flowers of plants

#### 3.3.1 The phenomenon shown by the diagrams

Pollination

#### 3.3.2 Types of pollination

(a) **DIAGRAM A:** Cross-pollination

(b) **DIAGRAM B:** Self-pollination

#### 3.3.3 THREE agents of pollination

- Insects/bees
  - Wind
  - Water
  - Animals
  - Birds/bats
- (Any 3)

### 3.4 Types of marketing systems

#### 3.4.1 Identification of the marketing system

Co-operative marketing system

#### 3.4.2 TWO types of co-operative marketing

- Agricultural inputs and service / commercial / purchasing / consumer
  - Production
  - Processing
  - Marketing
- (Any 2)

#### 3.4.3 THREE principle of cooperative marketing system

- Voluntary and open membership
  - Members contribute equally
  - Each member has a single vote
  - Democratic in nature
  - Autonomy and independence
  - Based on pool system
  - Cooperation amongst members
  - Assists in training and educating its members
  - Members receive a limited interest on their share capital
  - Only members may deliver products and benefit
  - Products from members are standardised before selling
  - Products are graded according to quality and members paid in advance
  - After liquidation, the surplus is shared amongst members
- (Any 3)

**3.4.4 TWO other marketing systems**

- Free marketing
- Controlled marketing

**3.5 Polygenic inheritance****3.5.1 The type of inheritance**

Polygenic inheritance/polygenes

**3.5.2 Justification**

Polygenic inheritance occurs when one character is controlled by two or more genes/traits that are controlled by multiple genes

**3.5.3 Calculation of milk yield of the dairy cow with PpQqrR genotype**

$$150 + 25 + 25 + 25 \\ = 225 \text{ litres}$$

**3.5.4 The genotype of a dairy cow that will produce 200 litres of milk**

- PPqqrr
  - ppQQrr
  - ppqqRR
  - PpQqrr
  - ppQqRr
  - PpqqRr
- (Any 1)

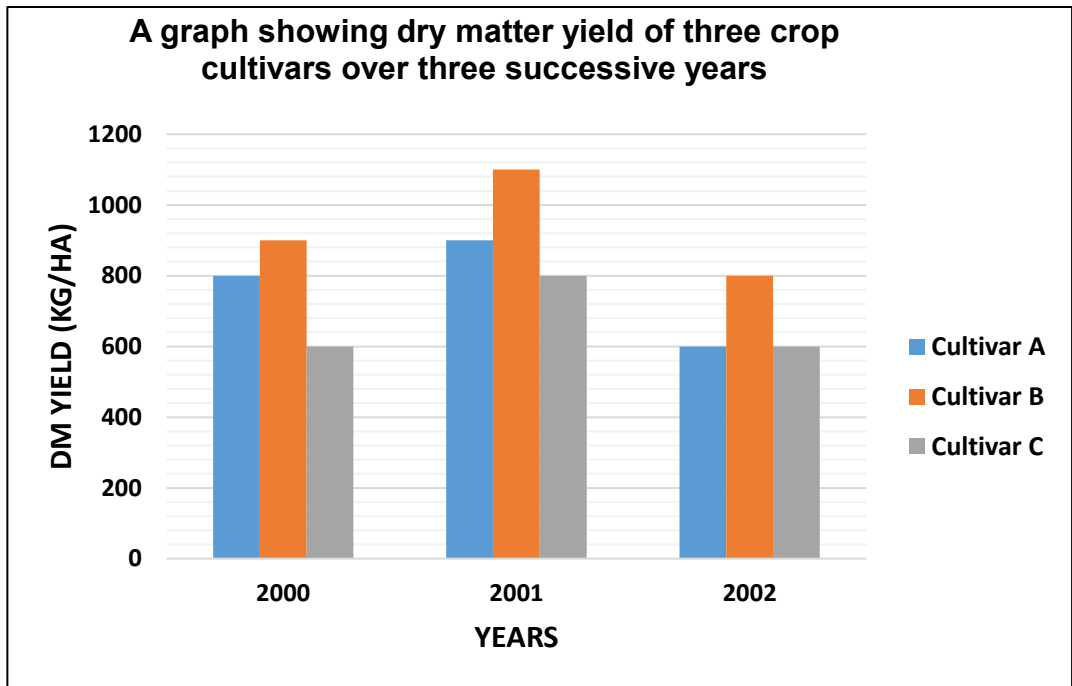
**QUESTION 4**

**4.1 Graph**

**4.1.1 Identification of a cultivar with the highest yield per hectare**

Cultivar B

**4.1.2 A combined bar graph**



**Marking criteria:**

- Correct heading
- Correct type of graph (combined bar graph)
- X-axis: Labelled (Years)
- X-axis: Correctly calibrated
- Y-axis: Labelled (DM yield)
- Y-axis: Correctly calibrated
- Correct units on Y-axis (kg/ha)
- Accurate plotting:
  - Only 1 set of combined bars is correctly plotted: 1 mark
  - Only 2 sets of combined bars are correctly plotted: 2 marks
  - All 3 sets of combined bars are correctly plotted: 3 marks

**1.4.3 Calculation of the total production in 2001 expressed in tons for:**

**(a) CULTIVAR C of FARMER A**

$$\begin{aligned}
 \text{Total production} &= 65 \text{ ha} \times 800 \text{ kg/ha} = 52\,000\text{kg} \\
 &= \frac{52\,000}{1\,000} \\
 &= 52 \text{ tons}
 \end{aligned}$$

(b) **CULTIVAR A of FARMER B**

$$\begin{aligned} \text{Total production} &= 56 \text{ ha} \times 900 \text{ kg/ha} = 50\,400\text{kg} \\ &= \frac{50\,400}{1\,000} \\ &= 50,4 \text{ tons} \end{aligned}$$

4.1.4 **The difference in yield between FARMER A and FARMER B cultivars expressed in tons:**

$$\begin{aligned} 52 \text{ tons} - 50,4 \text{ tons} \\ = 1,6 \text{ tons} \end{aligned}$$

4.2 **Monohybridism**

4.2.1 **Punnet square**

<b>Gametes</b>	<b>G</b>	<b>G</b>
<b>g</b>	<b>Gg</b>	<b>Gg</b>
<b>g</b>	<b>Gg</b>	<b>Gg</b>

**Marking rubric**

- Correct gametes of parent one
- Correct gametes of parent two
- Correct genotypes of the offspring
- Punnet Square (populated with gametes and offspring)

4.2.2 **The genotype ratio of the F<sub>2</sub> generation**

$$1 \text{ GG} : 2 \text{ Gg} : 1 \text{ gg}$$

4.2.3 **Identification of the dominant genetic characteristic**

Green leaves

4.2.4 **Calculation of the percentage of F<sub>1</sub> generation with yellow leaves**

$$\begin{aligned} \text{Yellow leaves} &= \frac{0}{4} \times 100 \\ &= 0\% \end{aligned}$$

4.2.5 **Phenotypic ratio of F<sub>2</sub>**

3:1

$$\begin{aligned} \text{Therefore:} &= \frac{1}{4} \times 28 \\ &= 7 \text{ yellow leaves} \end{aligned}$$

### 4.3 Breeding methods

#### 4.3.1 Identification of the breeding method

- (a) **PICTURE A** – Cross-breeding
- (b) **PICTURE B** – Species crossing

#### 4.3.2 Justification

- (a) **PICTURE A:** Mating of Jersey bull and Friesland cow which are two different cattle breeds of the same species.
- (b) **PICTURE B:** Mating of donkey and horse resembles a cross between two animals belonging to different species.

#### 4.3.3 ONE advantage for:

- (a) **PICTURE A (Cross breeding)**
  - Increased genetic variation to develop new breeds
  - Increased fertility
  - Produces more hybrid vigour/heterosis than parents
  - Produces progeny with better adaptability to varying environments
  - Improves performance in terms of vitality, longevity, feed efficiency, and disease resistance(Any 1)
- (b) **PICTURE A (Species crossing)**
  - Produces hard working progeny
  - Produces a progeny that is stronger than parents
  - The progeny lives longer than parents(Any 1)

### 4.4 Variation

#### 4.4.1 The importance of variation in a breeding programme

- Foundation of selection and breeding programme
  - Improves crop varieties and livestock breeds over time
  - Enables individuals to adapt to changing environment
- (Any 1)

#### 4.4.2 TWO genetic causes of variation

- Meiosis / crossing over / genetic recombination
  - Random fertilisation
  - Mutation
- (Any 2)

**QUESTION 5****5.1 Calculation of profit or loss****5.1.1 Identification of a pie chart that represents a farmer with the highest profit**

Farmer C pie chart

**5.1.2 Calculation of the profit or loss for FARMER B**

$$\begin{aligned}\text{Profit/loss} &= \text{Total income} - \text{Total expenditure} \\ &= \text{R}96\,000 - \text{R}5\,309\,000 \\ &= -\text{R}5\,213\,000\end{aligned}$$

**OR**

$$\begin{aligned}\text{Profit/loss} &= \text{Total income} - \text{Total expenditure} \\ &= \text{R}96\,000 - \text{R}5\,309\,000 \\ &= \text{R}5\,213\,000 \text{ (loss)}\end{aligned}$$

**5.1.3 Viability of FARMER B business and justification**

**Viability:** Farmer B business is not viable/unviable

**Justification:** The business is operating at a loss

**5.2 Genetic Modification****5.2.1 Identification of the technique**

- Bacterial carriers
  - *Agrobacterium tumefaciens*
- (Any 1)

**5.2.2 TWO potential benefits of GM crops to the environment**

- Less chemicals / pesticides / insecticides are used/less susceptible to diseases
- It is target specific

**5.2.3 TWO potential risks of genetic modified crops**

- Health
  - Environmental
  - Socio-economic
- (Any 2)

### 5.3 Soil surveys

#### 5.3.1 TWO aims of soil surveys in the agriculture industry

- To determine suitability of soil for agricultural purpose
  - Data obtained on soil, climate and topography is used to determine the type of crop or animal to farm with
  - Soil mapping is used to get reliable data on soils
  - Optimal utilisation of land available
- (Any 2)

#### 5.3.2 TWO reasons for classifying soils in agriculture

- To know which crop to cultivate
  - To estimate agricultural productivity potential of soils
  - To know how to correctly fertilise crops
  - To know how to manage irrigation of the crops
- (Any 2)

### 5.4 The pedigree diagram

#### 5.4.1 Number of generations obtained from parents 1 and 2

3

#### 5.4.2 Number of white male individuals

4

#### 5.4.3 Genotypes of individuals

(a) 1 – Dd

(b) 5 – dd

#### 5.4.4 Indication of whether an individual is homozygous or heterozygous

(a) 6 – Heterozygous

(b) 10 – Homozygous

#### 5.4.5 Reason for the answer to Question 5.4.4 (b)

- The offspring is white in colour which is recessive and can only be expressed in homozygous condition
  - White recessive pure breed
- (Any 1)

## 5.5 Different fruit types

### 5.5.1 Classification of the fruits

- (a) **Simple** – C
- (b) **Compound** – A
- (c) **Accessory** – B

### 5.5.2 Reason for fruit B classified as accessory fruit

Fruit B developed from a ripened ovary or ovaries, but they also have tissue that comes from parts of the plant outside the ovary

### 5.5.3 Part of a flower from which the fruit structure develops

- (a) **Seeds** – Ovules
- (b) **Fruit** – Ovaries

## 5.6 Vegetative reproduction

### 5.6.1 Identification of the type of asexual reproduction technique

**B** – Tissue culture/micro propagation  
**C** – Grafting/graftage

### 5.6.2 THREE steps taken to perform the method in PICTURE A

- Removal of a single bud with a piece of bark used as a scion
- Insertion of the bud under the bark of the prepared rootstock
- The loosened bark is folded over the bud and tightened leaving the bud exposed

### 5.6.3 TWO challenges of using asexual reproduction

- No genetic variation in the progeny / there is only limited diversity within the life forms / meiosis does not occur
  - Undesirable characteristics are transferred to progeny / harmful mutation will also pass on to the offspring
  - The organisms produced have shorter lifespans
  - It is hard to control the increasing population on the natural veld
  - Progeny is less adaptable to the changing environment
- (Any 2)

### 5.6.4 Difference between epigeal and hypogeal germination

**Epigeal germination** – cotyledons are pushed above the ground

**Hypogeal germination** – cotyledons remain in the ground

**SECTION C**

**QUESTION 6**

**Topic:** 'Discuss how soil degradation can be a threat to agricultural productivity'

CRITERIA	MARK ALLOCATION	DESCRIPTORS			
		POOR	FAIR	GOOD	EXCELLENT
Introduction	3 marks	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>
		No attempt made to do an introduction	Poorly defined main points of the topic and relevant background	Fairly defined main points of the topic and relevant background	Clearly defined main points of the topic and relevant background
Definition of terms	4 marks	<b>0</b>	<b>1</b>	<b>2</b>	<b>4</b>
		No definition of terms	Only soil degradation defined	Both soil degradation and agricultural productivity definitions provided	More than two terms (soil degradation and agricultural productivity) provided
Body	10 marks	<b>0</b>	<b>2</b>	<b>6</b>	<b>10</b>
		No attempt to discuss 'how soil degradation can be a threat to agricultural productivity'	Only one way in which soil degradation can be a threat to agricultural productivity was discussed	Only two different ways in which soil degradation can be a threat to agricultural productivity were discussed	More than two ways in which soil degradation can be a threat to agricultural productivity were discussed
Conclusion	3 marks	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>
		No conclusion done	Conclusion speaks only to soil degradation	Both soil degradation and agricultural productivity were discussed in the conclusion	Good cohesion between introduction, body and conclusion
<b>GRAND TOTAL</b>	<b>20 marks</b>	<b>00</b>	<b>05</b>	<b>12</b>	<b>20</b>

**Total: 300 marks**