NATIONAL SENIOR CERTIFICATE EXAMINATION
MAY 2024

AGRICULTURAL SCIENCES

MARKING GUIDELINES

Time: 3 hours 300 marks

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.

SECTION A

QUESTION 1

1.1
1.1.1 E ✓✓
1.1.2 F ✓✓
1.1.3 D ✓✓
1.1.4 B ✓✓
1.1.5 C ✓✓
1.1.6 A ✓✓

1.2
1.2.1 A ✓✓
1.2.2 D ✓✓
1.2.3 D ✓✓
1.2.4 A ✓✓
1.2.5 B ✓✓
1.2.6 C ✓✓
1.2.7 A ✓✓
1.2.8 B ✓✓
1.2.9 D ✓✓
1.2.10 C ✓✓

1.3
1.3.1 B only ✓✓
1.3.2 A only ✓✓
1.3.3 A only ✓✓
1.3.4 None ✓✓
1.3.5 Both A and B ✓✓
1.3.6 B only ✓✓

1.4
1.4.1 Skills Development Act 97 of 1998 ✓✓
1.4.2 Biotechnology / Genetic Engineering/ Genetic Modification ✓✓
1.4.3 Gene mutation ✓✓
1.4.4 Vas deferens/ Sperm Duct ✓✓
1.4.5 Balance sheet ✓✓
1.4.6 Quarantine ✓✓

1.5
1.5.1 Pollination ✓✓
1.5.2 Movable ✓✓
1.5.3 Ablactation ✓✓
1.5.4 Meiosis ✓✓
1.5.5 Assets ✓✓
1.5.6 Upgrading ✓✓

1.6
1.6.1 F ✓✓
1.6.2 J ✓✓
1.6.3 C ✓✓
1.6.4 H ✓✓
1.6.5 A ✓✓
1.6.6 L ✓✓

SECTION B

QUESTION 2

2.1 2.1.1 Soil profile ✓✓

2.1.2 Taxonomic soil classification system / Binomial soil classification system ✓✓

2.1.3 1 – O ✓
2 – A ✓
3 – E ✓
4 – B ✓
5 – C ✓
6 – R ✓

2.1.4 Reasons for classifying soil:
- Effective and optimal utilisation of soil ✓
- Farm can be divided into homogenous production units ✓
- Accurate choice of crops that suits the soil unit ✓
- Planning of farming activities in a scientific way ✓
- Allocation of land accordingly ✓
- Valuation of land becomes easy ✓ (Any 3)

2.1.5 Differentiation between soil form and soil family:
- **Soil** form – is a particular combination and succession of diagnostic horizons ✓✓
- Soil family – category is a group of soils within a subgroup and describes the physical and chemical properties that affect the response of soil to agricultural management ✓✓

2.2 2.2.1 Aims of soil surveys:
- To determine suitability of soil for agricultural purposes ✓
- 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)

2.2.2 Description of the soil survey process in agriculture:
- Aerial photographs of the region are taken and studied (gives preliminary layout, topography, drainage and soil differences) ✓✓
- Visit the area for further details such as arable lands, boundaries, fences, roads and buildings (so that these can be indicated on the aerial map) ✓✓
- Development of the preliminary mapping of the land and veld types within the region (land divided into homogenous land and veld types) ✓✓
- Soil profiles are used for soil classification (soil profiles are studied to distinguish the horizons and identify soil form) ✓✓
- Morphological properties of each soil horizon are indicated on a soil chart (properties such as soil depth, colour, mottling, structure and consistency) ✓✓

- Interpretation of all the collected data, so that each hectare of soil is utilised according to its potential ✓✓ (Any 2 × 3)

2.3 2.3.1 (a) Monohybrid ✓

(b) Justification – The crossing that involves only one trait / genetic crossing between parents that differ by the alleles they have for one particular gene ✓✓

2.3.2 (a) bull – BB / homozygous black ✓✓
(b) cow – bb / homozygous white ✓✓

2.3.3 Complete dominance / Dominance ✓

2.3.4 Punnet square to determine possible genotypic and phenotypic ratios of the F_2 generation.

	B	b ✓
B ✓	BB	Bb ✓✓
b	Bb	bb

- Genotype – 1:2:1 ✓
- Phenotype – 3:1 ✓

2.3.5 Calculation of the percentage of the white offspring in F_2 generation
1/4 × 100 ✓
= 25% ✓

2.4 2.4.1 Incomplete dominance ✓✓

2.4.2 The offspring inherited none of the colours of the parents/ (No parent is dominant) ✓
The offspring are grey/intermediate/neither black nor white ✓

2.4.3 (a) WW ✓
(b) BB ✓
(c) W ✓
(e) B ✓
(f) BW/WB ✓

QUESTION 3

3.1 3.1.1 Agrobacterium tumefaciens / Bacterial carrier✓✓

3.1.2
- Gene gun / Biolistics ✓
- Electroporation✓
- Microinjection ✓

3.1.3
- Toxicity. Genetically engineered foods are inherently unstable. ✓
- Allergic reactions ✓
- Antibiotic resistance ✓
- Immuno-suppression ✓
- Cancer ✓ (Any 3)

3.1.4
- Increased crop yields ✓✓
- Reduced costs for food or drug production ✓✓
- Reduced need for pesticides ✓✓
- Enhanced nutrient composition and food quality ✓✓
- Resistance to pests and disease ✓✓
- Greater food security ✓✓
- Medical benefits to the world's growing population ✓✓ (Any 2)

3.2 3.2.1 Artificial selection ✓✓

3.2.2 **A –** Mass selection ✓
B – Pedigree selection ✓
C – Family selection ✓
D – Progeny selection ✓

3.3 3.3.1 **A –** Simple fruit ✓
B – Compound/ Aggregate fruit ✓
C – Multiple fruit ✓
D – Accessory fruit ✓

3.3.2

Strawberries	Compound/ Aggregate fruit ✓
Apple	Accessory fruit ✓
Pineapples	Multiple fruit ✓
Grapes	Simple fruit ✓

3.4 3.4.1 (a) Number 11 – aaBB/ homozygous horned and black ✓✓

(b) Number 14 – Aabb/ heterozygous polled and homozygous red ✓✓

3.4.2 (a) Number 6 – Polled and red ✓✓
(b) Number 12 – Horned and black ✓✓

3.4.3 9 Black and polled : 3 Black and horned : 3 Red and polled : 1 Red and horned ✓✓

3.5 3.5.1 Pollination ✓✓

3.5.2 (a) **Diagram 1**: Self-pollination ✓
(b) **Diagram 3**: Cross pollination ✓

3.5.3 (a) G ✓
(b) D ✓
(c) F ✓
(d) B ✓
(e) E ✓

3.5.4
- Wind ✓
- Water ✓
- Insects ✓
- Animals ✓ (Any 2)

QUESTION 4

4.1 4.1.1 Liver fluke✓✓

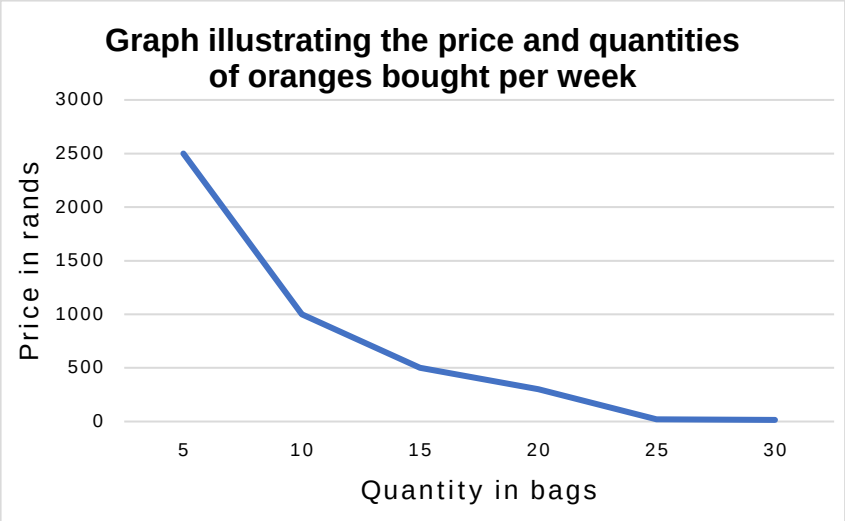
4.1.2 Snail ✓✓

4.1.3 Roundworm ✓
Tapeworm ✓

4.1.4
- Depriving host of nutrients ✓✓
- Sucks host's blood/causes anaemia ✓✓
- Lesions/cysts inside host ✓✓
- Decreases host's productivity ✓✓
- Progressive weakness ✓✓
- Can result in death ✓✓
- The farmer spends money on medication/veterinary services
- Loss of income (Any 2)

4.1.5
- Rotational grazing ✓✓
- Resting of infected pastures ✓✓
- Allowing animals that are resistant to specific internal parasites ✓✓
- Keep hosts away from wet places ✓✓
- Use of zero grazing ✓✓
- Removal of manure/hygienic measures ✓✓ (Any 2)

4.2 4.2.1



Criteria/rubric/marking guidelines.

- Correct heading ✓
- Correct type of graph (Line graph) ✓
- X-axis: Correctly calibrated/scale ✓
- X-axis: Correct label (Quantity) ✓
- Y-axis: Correctly calibrated/scale ✓
- Y-axis: Correct label (Price) ✓
- Correct units in both axis (Rand and Bags) ✓
- Correct plotting ✓

4.2.2 When the price of oranges is high ✓ the quantity supplied increases ✓ and quantity demanded decreases ✓ / The higher the price ✓ the higher the supply ✓ the lesser the demand ✓

OR

When the price of oranges is low ✓ the quantity supplied decreases ✓ and quantity demanded increases ✓ / The lower the price ✓ the lower the supply ✓ the higher the demand ✓

4.3 4.3.1

- Low wages ✓
- Lack of training/unskilled labour ✓
- Low productivity ✓
- Long working hours ✓ (Any 2)

4.3.2 (a) Wages/working hours ✓✓

(b) Provided a training centre to address training/educational needs ✓✓

4.3.3

- Higher wages/payment of employees ✓
- Full-time nurse/primary health care ✓
- Social worker ✓
- Provision of housing ✓
- Education/training ✓ (Any 3)

4.4 4.4.1 **A –** Provision of mineral resources ✓
B – Food production/raw materials ✓
C – Space/area for production ✓
D – Space/area for capital wealth/human settlement/industry ✓

4.4.2
- The use of scientific methods/technology/precision farming ✓
- Provision of water ✓
- Consolidating uneconomical farming units ✓
- Suitable crops/use for the land ✓ (Any 2)

4.5 4.5.1 **Casual labourer –** Construction of tunnels for vegetable production ✓✓
4.5.2 **Permanent labourer –** Cultivation of fields with a tractor ✓✓
4.5.3 **Seasonal labourer –** Wool shearing ✓✓

4.6
- Short term ✓ – Production capital ✓
- Medium term ✓ – Farm equipment / Livestock ✓
- Long term ✓ – Fixed assets / land✓ (Any 2)

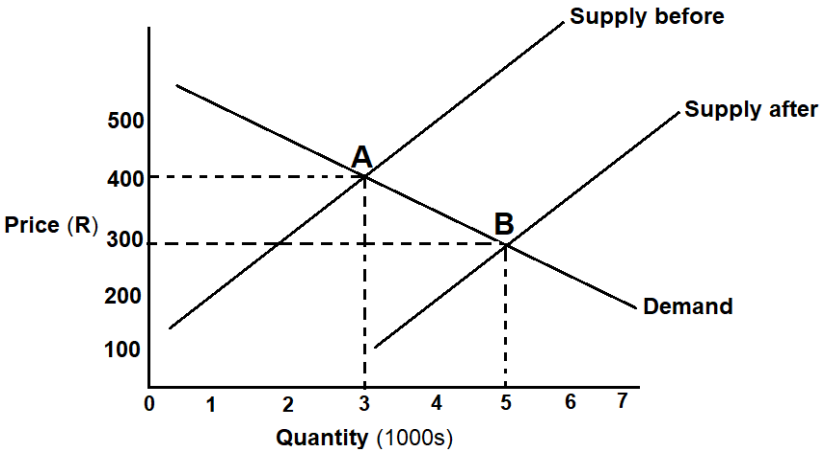
QUESTION 5

5.1 5.1.1 November ✓✓

5.1.2 R81 ✓ × 27 ✓
= R2187 ✓

5.1.3 The farmer might have run out of stock after December ✓✓
OR
Supply is inelastic in a short time ✓✓ (Any 1)

5.2 The graph below shows changes in the price as quantity supplied changes



5.2.1 R300 ✓✓

5.2.2 3 000 ✓✓

5.2.3 Motivation – Out of season there is less fruit supplied, the equilibrium price was R400 and at this price the quantity supplied was 3000 (lower supply, high price), ✓ and in season more fruit is supplied, about 5 000, and the equilibrium price was R300 (higher supply, low price). ✓

5.2.4 In the short term, supply of agricultural products is inelastic because it is difficult to produce immediately for the market. ✓ Agricultural products need specific period/season for production. ✓

5.2.5
- Value adding ✓
- Can even sell it out of season ✓
- It can be kept for a long time (long shelf life) ✓
- Less transportation costs ✓

5.3 5.3.1 Balance sheet ✓✓

5.3.2 Re-drawn table

Assets	**Value (R)**	**Liabilities**	**Value (R)**
Value of farm	R3 500 000✓	Bond balance	R1 800 000✓
Cash on hand	R 500 000 ✓	Overdraft	R 150 000✓
		Tractor loan	R 365 000✓
Total	R4 000 000✓	Total	R2 315 000✓

5.3.3 Net worth = Value of assets – Value of liabilities ✓
= R4 000 000 – R2 315 000✓
= R1 685 000 ✓

5.3.4 The farming business is viable. ✓✓

5.3.5 Justification – The value of assets is more than the value of liabilities / the business has a positive net worth ✓✓

5.4 5.4.1 E ✓

5.4.2 Spermatogenesis ✓

5.4.3 **Sperm cell A** – Without a tail it cannot move to the fertilisation site ✓
Sperm cell G – No nucleus to fertilise the egg cell ✓

5.4.4
- Good quality semen is opaque, milky white and sticky ✓
- Should contain less than 15 dead sperm cells ✓
- At least 80 sperm cells should show forward motion ✓
- Sperm concentration is important ✓ (Any 2)

5.5 5.5.1 Progesterone ✓

5.5.2 Di-oestrus ✓
Reason: Corpus luteum reaches its maximum size and produces large amounts of progesterone ✓

5.5.3 Ovulation ✓

5.5.4
- Standing heat/cow stands to be mounted ✓
- Mucus discharge from vulva ✓
- Swollen vulva with moist and red interior ✓
- Restlessness ✓
- Hair on the tail area fluffed up ✓ (Any 2)

5.6 C ✓
D ✓
A ✓
E ✓
B ✓

SECTION C

QUESTION 6

Definition of free-market system and examples

A free-market system is where:

- The general population is free to produce goods and to offer goods for sale to the rest of the population ✓
- The rest of the population is free to buy these goods ✓
- The price of goods is determined by demand and supply ✓
- There is no government intervention at any stage ✓
- Examples: selling products at the farm gate, ✓ fruit and vegetable stores, ✓ supermarkets ✓ (Any 5)

Advantages of free-market system

- Producers are free to produce what they want and consumers are free to buy what they want ✓
- Price is determined by demand and supply ✓
- There are no barriers to stop new producers, which leads to better competition ✓
- Better competition can lead to better products and better prices. New products and ideas are easily developed ✓
- Entrepreneurs have the opportunity to grow their businesses and create wealth ✓
- A free-market economy can encourage agricultural production. This contributes to national economic growth and an increase in employment ✓
- The products are usually of a high quality ✓
- Payment is usually in the form of cash ✓
- The middlemen in the marketing process are limited or eliminated ✓
- Free marketing stimulates the entrepreneur to work harder ✓
- There is usually very little delay in receiving payment ✓ (Any 5)

Disadvantages of free-market system

- No regulation of products can lead to harmful products being sold ✓
- Overproduction can lead to big surpluses ✓
- In a free market there are no barriers to stop foreign countries dumping their overproduced goods ✓
- Producers try to form monopolies ✓
- Necessary products such as electricity can become too expensive if the price is not fixed ✓
- The desire for big profits can lead to lower wages for workers ✓
- Prices fluctuate considerably ✓
- Marketing costs are high ✓
- The producer is responsible for the marketing of the product ✓
- The producer has a limited bargaining power ✓
- The producer runs a great risk ✓ (Any 5)

Market channels of a free-market system

- Farm gate markets ✓
- Fresh-produce markets ✓
- Stock sales ✓
- Direct marketing ✓
- Internet marketing ✓

Total: 300 marks