NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2020

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	Integrated Pest Management
1.1.2	Parthenocarpy
1.1.3	Depreciation
1.1.4	Unskilled labour
1.1.5	Mutation
1.1.6	Co-dominance

1.2

1.2.1	C
1.2.2	E
1.2.3	D
1.2.4	A
1.2.5	F
1.2.6	B

1.3

1.3.1	A only	B only	A and B	~~None~~
1.3.2	~~A only~~	B only	A and B	None
1.3.3	A only	~~B only~~	A and B	None
1.3.4	A only	B only	~~A and B~~	None
1.3.5	A only	B only	A and B	~~None~~
1.3.6	~~A only~~	B only	A and B	None

1.4

1.4.1	Soil surveying
1.4.2	Urethra
1.4.3	Atavism
1.4.4	Oxytocin
1.4.5	Zoonotic
1.4.6	Monoculture

1.5

1.5.1	A	~~B~~	C	D
1.5.2	A	B	~~C~~	D
1.5.3	A	B	~~C~~	D
1.5.4	A	B	C	~~D~~
1.5.5	~~A~~	B	C	D
1.5.6	A	~~B~~	C	D
1.5.7	A	B	C	~~D~~
1.5.8	A	B	~~C~~	D
1.5.9	A	B	C	~~D~~
1.5.10	~~A~~	B	C	D

1.6

1.6.1	J – Stamen / I – Anther
1.6.2	E – Corolla
1.6.3	D – Pistil
1.6.4	B – Style
1.6.5	C – Ovary
1.6.6	A – Stigma

SECTION B

QUESTION 2

2.1 Rabies

2.1.1 The pathogen that causes rabies

- Virus

2.1.2 Explanation of the phrases:

(a) **Acute disease**

- A disease that causes sudden onset of severe symptoms.

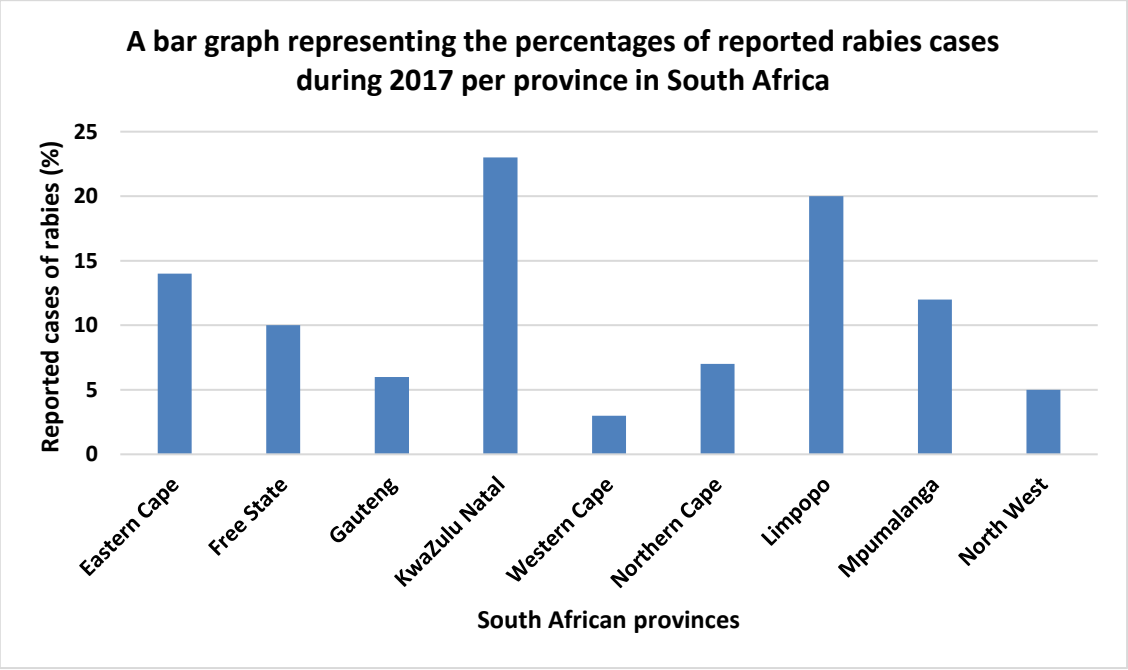
(b) **Notifiable disease**

- Any disease that is required by law to be reported to government authorities when identified.

(c) **Endemic disease**

- A disease that is always present in a certain population or region and can be predicted.

2.1.3 Graph: Reported cases of rabies



Marking checklist for the graph:

Criteria	YES	NO
Correct type of graph (bar)	1	0
Suitable caption / heading / title	1	0
Correct labelling of X-axis (Provinces)	1	0
Correct labelling of Y-axis (Reported cases of Rabies)	1	0
Correct calibration of Y-axis	1	0
Correct units (%)	1	0
Accuracy	1	0

2.1.4 **Explanation of the trend in the reported cases of rabies**

- Reported cases of rabies were high in 2017 and dropped in 2018

2.1.5 **TWO possible reasons for the trend observed**

- Public awareness
- Vaccination programme

2.2 **Biosecurity – a very important component for livestock farmers**

2.2.1 **Definition of *biosecurity***

- Biosecurity involves management practices to prevent the introduction and spread of diseases.

2.2.2 **Explanation of FIVE measures that should be included in the farmer's biosecurity plan**

- Clean and disinfect: all equipment, vehicles, footwear must be cleaned before and after contact with animals.
- Restrict movement: movement of people, vehicles and equipment should be controlled around the animals to prevent contamination.
- Limit access to the farm: to avoid spread of diseases through clothes, footwear, vehicles, etc.
- Use footbaths: disinfectants should be placed at the entrance to animal enclosures, especially poultry.
- Avoid contact between different species: ostriches should be kept away from domestic poultry.
- Prevent overcrowding of animals, especially poultry.
- Buy stock from reputable breeders and acquire knowledge of health status of animals.
- Avoid buying breeding stock at auctions.
- Isolate new animals for at least 30 days.
- Disinfect shearing equipment and the clothes of shearers

2.3 **The scenario about breeding merino sheep.**

2.3.1 **Expected genotype of the ram and the ewe**

- **Ram:** Pp
- **Ewe:** Pp

2.3.2 **F1 or F2 generation?**

- F2

2.3.3 **Motivation**

- F1 generation will all be heterozygous but will only display the dominant phenotype.

2.3.4 **Expected phenotype of the ram**

- Polled

2.3.5 **Assumption that the lamb with horns was a male and the other three were all ewes.**

(a) **Punnet square to show the possible pairings and their offspring's genotypes**

Possible pairing 1

	p	***p***
P	**P*p***	**P*p***
p	***pp***	***pp***

OR

Possible pairing 2

	p	***p***
P	**P*p***	**P*p***
P	**P*p***	**P*p***

Marking checklist:

- First gametes set (pp): 1
- Second gametes set (Pp): 1 or pp
- 4 × offsprings: 1 × 4 = 4

(b) **Indication of the percentile composition of the offspring**

Possible pairing 1		**Possible pairing 2**
50% polled	**OR**	100 % polled
50 % horned		

2.4 **Indication of the pattern of inheritance that leads to different phenotypes.**

2.4.1 Polygenic inheritance

2.4.2 Incomplete dominance

QUESTION 3

3.1 Case study

3.1.1 Entrepreneurship

- Yes, Thabo is an entrepreneur.

3.1.2 Justification

- Thabo took the initiative to organise a farming venture to take advantage of the business opportunity from the gift of a pregnant heifer given to him by his father.

3.1.3 Identify THREE entrepreneurial success factors for Thabo and motivation for each based on the case study.

- Confidence: Farming is in me, it runs in my blood and veins, I am a farmer by birth.
- Perseverance: He nurtured the bull calf until 2017.
- Market driven / Communication: He sold it to another farmer at a reasonable price.
- Vision / Hard-working: At an age of fourteen he received his identification certificate to become a commercial farmer.
- Courage / Motivation: The young farmer owns 790 hectares of land.
- Interpersonal skills / Communication: Four permanent workers.
- Achievement: Achieved 98% calving rate.
- Knowledge: Thabo is doing very well in his business. (Any 3)

3.1.4 Identification of phrases from the case study that relate to the FOUR agricultural production factors.

- Land: The young farmer owns 790 hectares of land.
- Labour: Thabo has four permanent workers.
- Capital: Thabo owns animals and land.
- Management: He nurtured the bull calf / received his identification certificate from the Department of Agriculture.

3.2 Passage on animal reproduction: oestrus.

3.2.1 Indication of the FOUR phases of oestrus cycle.

- Pro-oestrus
- Oestrus
- Met-oestrus
- Di-oestrus

3.2.2 THREE visible signs for a cow in oestrus.

- Restlessness.
- Making bellowing noise.
- Loss of appetite.
- Jumps on other cows / Allows other cows to jump on her.
- Vulva become swollen, larger and softer.
- Excessive mucus secretions from the vulva.

3.3 **The pictures of equipment used in the animal reproduction industry.**

Identification of a letter of the equipment used for each of the functions.

3.3.1 **Assists the farmer in identifying a cow on heat.**
- C

3.3.2 **To recover the embryo from the uterus of the donor.**
- B

3.3.3 **To collect semen from the bull.**
- A

3.4 **The reproductive process of male and female animals in its chronological order.**

3.4.1 **Identification of the reproductive process illustrated in the schematic representation.**
- Natural mating / Mating

3.4.2 **Names given to stage A, B, C and D in the correct order.**
- **Stage A:** Courtship
- **Stage B:** Mounting
- **Stage C:** Copulation
- **Stage D:** Ejaculation

3.5 **Multiple birth**

3.5.1 **Types of multi births**
- **A:** Non-identical / Dizygous
- **B:** Identical / Monozygous
- **C:** Freemartin

3.5.2 **Identification of the part labelled 1 on the twin set B.**
- Ovum / Egg cell / Female reproductive organ / Female gamete.

3.5.3 **The process indicated in 2 on twin set A**
- Fertilisation

3.6 **Breeding technique chronological order.**

3.6.1 **Indication of the name of the breeding technique.**

- Nuclear transfer / Cloning

3.6.2 **Correct sequence.**

- Collection of somatic cells from the animal to be cloned.
- Nucleus that contains the DNA of the donor animal is removed from an egg and placed into the somatic cell.
- The egg is treated and cultured in the laboratory to allow fusion with nucleus.
- The cell is artificially activated to start dividing until it turns to blastocyst.
- Transplantation into the recipient animal occurs in order to get replicas of the donor.

QUESTION 4

4.1 Passage on citrus farming.

4.1.1 FOUR different types of fruit and ONE example for each.

Type of fruit	Examples
Simple fruit	Oak nuts/ acorns Grapes (Any 1)
Compound/ Aggregate fruit	Figs Pineapples (Any 1)
Multiple fruit	Strawberries Raspberries (Any 1)
Accessory fruit	Apples Pears (Any 1)

4.1.2 The fertilised flower gives rise to seeds and fruit.

(a) **Labels for A, B and C**
- **A:** Exocarp
- **B:** Endocarp
- **C:** Mesocarp

(b) **The part of flower that develops into a fruit.**
- Ovary

4.1.3 Sale of oranges in different sizes.

(a) **Naming of the marketing.**
- Facilitating / Packaging / Standardisation / Grading / Classification.

(b) **TWO factors used in the grading of the oranges.**
- Size and appearance of oranges.

(c) **THREE factors that could hamper the marketing of the oranges.**
- Poor infrastructure.
- Lack of capital.
- Perishability of agricultural products.
- Ineffective control of production.
- Wide distribution of product and distance from the market.
- Low value in relation to volume.
- Seasonal fluctuation in production.
- Accidents / Theft / Spoilage along the marketing chain.

(Any 3)

(d) **Brief description of THREE advantages of processing oranges.**

- Reduces wastage of extra supply.
- Provides job opportunities.
- Increases value of the product.
- Allows for easy handling and packaging.
- Increases farmers' profit margin.
- Results in products with longer shelf life. (Any)

4.1.4 **Pollination**

(a) **Identification of the TWO types of pollination.**

- **A:** Self-pollination
- **B:** Cross-pollination

(b) **Differentiation between the TWO types of pollination identified.**

Self-pollination	Cross-pollination
Occurs when pollen is transferred from the anther of a flower to the stigma of the same flower on the same plant.	Happens when pollen is transferred from the anther of one flower to the stigma of another flower on a different plant.

4.2 **The diagram of asexual reproduction methods.**

4.2.1 **Identification of the artificial propagation technique.**

- Budding / Bud grafting.

4.2.2 **Methods A, B and C.**

- **A:** Chip
- **B:** T-budding
- **C:** Patch

4.2.3 **Identification of the THREE steps involved in each method.**

- **Step 1:** Preparing the bud.
- **Step 2:** Preparing the rootstock.
- **Step 3:** Inserting the bud into the rootstock.

4.2.4 **Tabulation of TWO advantages and disadvantages of asexual reproduction.**

Advantages	Disadvantages
It allows for rapid populating.	It hinders diversity.
It does not require mobility; it is done in a single area.	It poses some inheritance issues because genetic defects and mutations are transferred to the offspring.
It does not require mates.	It can lead organisms to being prone to extinction.
It is friendly to the environment.	Less variation can cause organisms to not be able to adapt.
Reproducing identical plants.	Little or no control over productivity of offspring.
Desirable traits are known.	Increased likelihood for mutations since all offspring are clones.
Hardier root stock results in better growth.	

4.3 **Citrus fruit farming.**

4.3.1 **Identification of the different types of labourers:**

(a) Casual / Part-time

(b) Seasonal

(c) Permanent / Full-time

4.3.2 **Effect of HIV and AIDS pandemic on farm productivity.**

(a) **Explaination of how HIV and AIDS impact farm productivity.**

- Farm workers often become sick / absent / weak labourers.
- Planning becomes difficult due to unplanned absence of workers.
- Loss of skilled and experienced workers.
- Increased costs of training new workers.
- Labour shortage results in unfinished tasks.

(b) **Limiting the impact of HIV and AIDS on productivity.**

- Awareness campaigns / education and training.
- Provision / access to free condoms.
- Supplying anti-retroviral medication.
- Providing access to treatment for sexually transmitted infections.
- Encourage good values / encourage abstinence.
- Establish support groups.

QUESTION 5

5.1 Genetically modified organisms.

5.1.1 Identification of the technique used to produce the modified Bt maize plant.

- Gene gun / Biolistics.

5.1.2 THREE potential environmental hazards of genetic modification.

- Use of excessive amounts of herbicides.
- Gene might spread GM crops into the wild / development of super weeds.
- Beneficial insects and pests could be killed.

5.1.3 TWO reasons for modifying animals genetically.

- For improving genetic characteristics.
- For improving food quality.
- To produce products for human therapeutic use.
- To produce industrial products.

5.1.4 Define *precision farming*.

- It is a farming management concept based on observing, measuring and responding to inter- and intra-field variability in crops through the use of GPS and GNSS.

5.1.5 Explanation of THREE main aims of precision farming.

- To enable the farmer to have more precise control over natural variation in soil.
- Optimal production through effective use of natural and other resources.
- Less damage to environment by preventing over-utilisation/ fertilisation.
- Sustainability of production through conservative use of resources.
- Healthier food for all by preventing practices that lead to soil/ product pollution.

(Any 3 × 2)

5.2 Soil classification.

5.2.1 Indication of labels for parts 1 to 6.

- 1: topsoil
- 2: subsoil
- 3: O horizon
- 4: A horizon
- 5: B horizon
- 6: C horizon

5.2.2 **THREE reasons for the farmers to classify soil on the farm.**

- Optimal utilisation of land according to soil potential.
- Homogenous production units for planning of soil utilisation.
- Choice of crop according to soil characteristics.
- Valuation of the soil to determine the economic value of the land. (Any 3 × 2)

5.3 **Estimated income and expenditure plan.**

5.3.1 ***Income statement***

INCOME		**EXPENDITURE**	
TRANSACTION	**AMOUNT (R)**	**TRANSACTION**	**AMOUNT (R)**
• Sale of sheep • Interest from savings • Sale of wool	77 500 1 800 8 900	• Wages of farm workers • Repayment of loans and overdraft • Feed and medication	22 400 13 700 15 000
TOTAL INCOME	**88 200**	**TOTAL EXPENSES**	**51 100**

5.3.2 **Calculation**: Profit or loss

- Profit = Total income – Total expenditure
  = R88 200 – R51 100
  = R 37 100

5.3.3 **Define the following terms:**

(a) **Overdraft:** A deficit in a bank account caused by drawing more money than the account balance.

(b) **Collateral:** Something of value pledged as security for repayment of a loan, to be forfeited in the event of a default.

5.4 **Matching the marketing channels and descriptions.**

5.4.1 Stock sales

5.4.2 Internet marketing

5.4.3 Contract market

5.4.4 Farm-gate marketing

5.4.5 Fresh-produce markets

SECTION C

QUESTION 6

Topic: Soil conservation and erosion and its impact on farming productivity

CRITERIA	MARK ALLOCATION	DESCRIPTORS			
		POOR	FAIR	GOOD	EXCELLENT
Definition of soil erosion	3	0	1	2	3
		No definition provided at all in the discussions	Partial definition of soil erosion mentioning only one cause	Partial definition of soil erosion mentioning two causes	Full definition of soil erosion mentioning all three causes
Causes of soil erosion	6	0	2	4	6
		None of the causes of soil erosion mentioned in the discussions	Incomplete discussion about the causes of soil erosion highlighting only one category	Incomplete discussion about causes of soil erosion highlighting just two categories	Complete discussion of the causes of soil erosion explaining all three causes well
Impact or effects of soil erosion on farming	5	0	2	3	5
		No mention of the impact or effects of soil erosion on farming	One impact or effect of soil erosion on farming cited in the discussions	Two to three impacts or effects of soil erosion on farming cited in the discussions	More than three impacts or effects of soil erosion on farming cited in the discussions
Ways to promote soil conservation	6	0	2	4	6
		In the discussion there are no comments about the strategies farmers can implement to promote soil conservation	Only one strategy that farmers can use to promote soil conservation is discussed	Fewer than four strategies that farmers can use to promote soil conservation are discussed	More than four strategies that farmers can use to promote soil conservation are discussed
GRAND TOTAL	**20**	**0**	**7**	**13**	**20**

Total: 300 marks